

A·B·C· GUIDE TO PHOTOGRAPHY



ALHAMBRA BOOK CO., CHICAGO.

A. B. C.
Guide to Photography

ILLUSTRATED.

A practical handbook. Containing full instructions for
amateur Photographers. Simply written,
easily understood.

COMPILED BY
T. STITH BALDWIN.



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PREFACE.

The development of the hand camera from the original crude box dignified by the name of camera into the present perfect instrument, has placed photography, that fascinating, delightful pursuit, within the easy reach of every one. The camera is now recognized as a factor in the fields of pleasure, profit and instruction and is used by every class of citizen; by the tourist and other pleasure seeker as an adjunct to further the enjoyment of a vacation and to provide lasting souvenirs of a pleasant experience; by the professional man as a most valued assistant in scientific research; by the itinerant photographer as a means of livelihood, as he travels from place to place.

Any man, woman or child of ordinary intelligence, without previous experience, by simply following printed instructions, can soon acquire the knowledge necessary to properly operate the camera, develop the plate (or film), and print and finish the picture.

The spread of photography as a popular pastime, great as it has been, is hardly a matter for wonder when we consider that there are few, if any, hobbies which form so constant a source of both pleasure and instruction, at so small an expense. For every amateur who dabbled in photography in the old "wet-plate" days, there are now thousands who, thanks to "dry-plates," and improved and cheapened apparatus, are enabled to pursue this fascinating art-science, and to their ranks recruits are flocking every day. It is more particularly in the interests of these recruits that this little volume is written, and the writer has endeavored in the following pages to impart such information and instruction as will enable the novice to avoid the snares and pitfalls which beset the path of the beginner, and to make an encouraging start on the high road to success. The first of the following chapters deals with various pieces of apparatus necessary to form a useful outfit, and then in the succeeding pages the several steps in the making of a photograph are taken up one by one, and each operation is treated fully under its proper heading.

PREFACE.

The writer has endeavored to give especially clear instructions on those points where the beginner is most likely to err, and if these are attended to with care the would-be photographer is not likely to go very far astray. No amount of reading will enable the amateur to succeed, unless it be followed up by careful practical work. The majority of amateur photographers gain their experience from their failures, but failures are not encouraging, and it is hoped that the readers of this little book will be enabled to reduce their number to a minimum and to gain that more pleasing kind of experience which results from success.

In conclusion, the writer begs to impress upon the amateur's mind the imperative necessity for constant, earnest, watchful attention to all details. He has done all in his power to make photography simple and popular; the result must remain with the amateur.

T. S. BALDWIN.

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CHAPTER I.

THE APPARATUS REQUIRED.

Before the amateur commences the work of taking photographs he must provide himself with the necessary apparatus. Cameras adapted for the amateur's use are divided into two classes, known respectively as Hand Cameras and Viewing Cameras, and these classes are further subdivided into many varieties. Of necessity the choice of the amateur must fall upon one or the other of the two classes, and in a large measure his choice must be controlled by the use to which the instrument is to be put.

Should the choice of the amateur fall upon the Hand Camera, the list of apparatus required would be as follows; only those items which are absolutely necessary being mentioned:

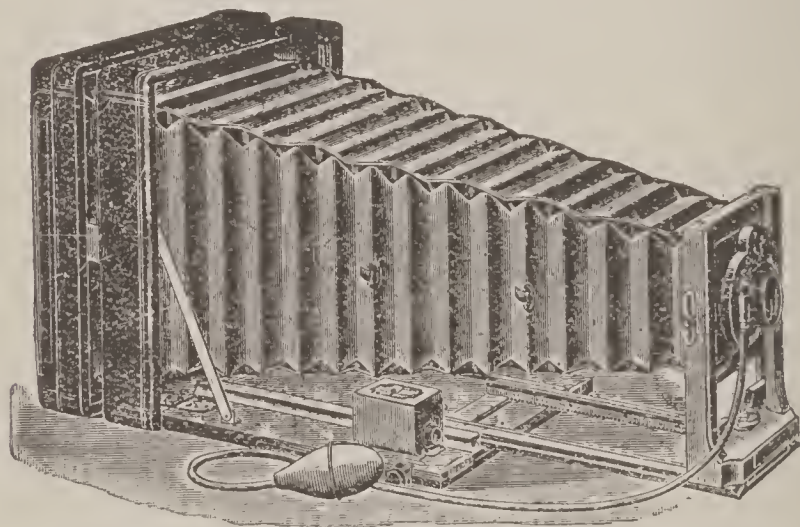
Camera, complete with Plate Holder, Lens and Shutter, Developing Trays, Toning Trays, Graduated Measuring Glass, Printing Frame, Ruby Lamp.

If his preference should be the Viewing Camera, the above list must be augmented by the addition of a Tripod and Focussing cloth.

Chemicals for making the developing and toning solutions and paper and dry plates will also be required, but particulars of these will be included in the chapters devoted to those subjects later on. For the present, my remarks will be confined to the apparatus. The articles mentioned in the above list may be purchased separately or they may be all bought together in the form of a complete equipment. In addition to the above list, there are many other pieces of apparatus made, such as plate and print washing appliances, drying racks, plate lifters, and the like, but convenient as these may be, they are not absolutely essential, and may be left over for purchase when the beginner has achieved some progress and feels justified in making the additional outlay. The cost of photographic apparatus varies considerably, according to quality, but as you have to pay just as much for your plates and papers, whether you use a good or poor camera it is economy in the long run to buy the best apparatus your pocket can afford.

HAND CAMERAS.

As indicated by its name, a "hand" camera is one



Long Focus Folding Hand Camera. (Class 2.)

that is intended primarily to be used when held by the hands, and, therefore except on rare occasions, such an instrument does not require a tripod as in the case of the field cameras previously referred to. As, however, it is practically impossible to hold a camera in the hand with sufficient steadiness to give an exposure of more than about the tenth-part of a second, all hand cameras are provided with a shutter of more or less intricate character so as to enable quick exposure to be given.

The most popular size for a hand camera is 4x5, though some users are not satisfied with so small a picture and go in for a 5x7 instrument or even 6½x8½ or 8x10. As a rule, a 4x5 or 5x7 camera will be found quite large enough for all ordinary snap-shot work. It is not many years ago that a hand camera was regarded as a toy or plaything rather than as an instrument for serious picture-taking, but this opinion has now practically died out, owing to the development of this most useful instrument from the original crude box to the present perfect apparatus.

For some classes of work a hand camera is even better than its brother on the tripod, as, for instance, in depicting street scenes. In this case, a tripod

camera, erected in a busy thoroughfare, would not only be a serious obstruction to the traffic, but would attract far more attention to the operator than the latter would care for. With a hand camera the amateur can stroll about when and where he will and take a shot here and a shot there, without attracting undue notice or inconveniencing anybody. For cyclists, too, a hand camera is extremely convenient, as it is compact, is easily carried, and can be used at a moment's notice during a ride.

Hand cameras may be divided into four classes, as follows:

Class 1. Those in which a number of plates or cut films are stored in a chamber or magazine, the plates being changed after each exposure by means of mechanism. These are known as Magazine Cameras.

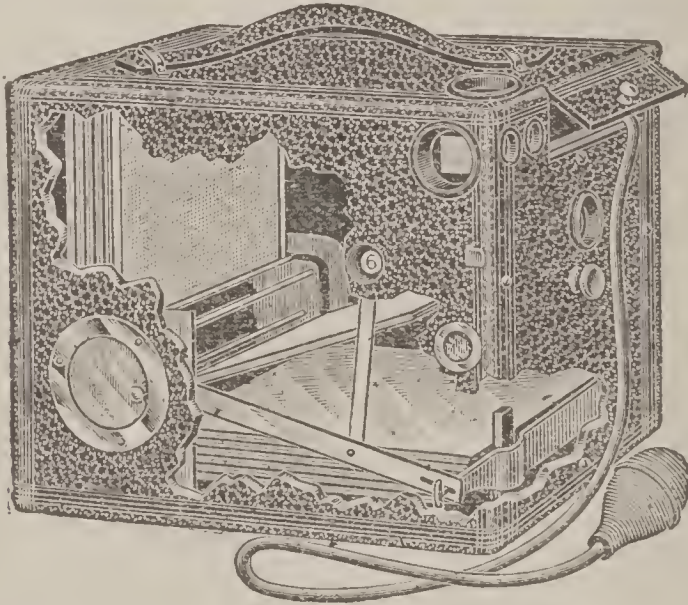
Class 2. Those which are so constructed that when not in use are self contained in a neat leather covered box, but when desired, by pressing a concealed button one side of the box is caused to be lowered, forming a bed upon which the camera front containing the lens and shutter is drawn out, rendering the instrument adaptable for instant use. This style is known as the Folding Hand Camera. They are provided with ground glass screen, tripod sockets, and focussing scale and can be used either as a Hand Camera or upon a tripod as a regular Viewing Camera. In them can be used either dry-plates, sheet films or films in rolls, the various holders required being interchangeable. Additionally, some forms of Folding Cameras are made to contain the magazine of the regular mechanical plate changing apparatus. These are called Folding Magazine Cameras. The Folding is the popular style camera of the day and its use is rapidly superseding that of all other styles.

Class 3. Those known as Fixed Focus or Box style, in which the plates are contained in plate holders, as with a tripod camera.

Class 4. Those in which flexible films in rolls are used instead of glass plates, the film being wound on spools or rollers. The action of winding up the exposed portion of the film unwinds a fresh portion ready for the next exposure.

In the first of the above classes the plates are usually placed in metal carriers, and as a rule each camera holds twelve plates. Many of the less expensive forms of hand cameras are made on this principle, and in purchasing such an instrument it is

necessary to see that the changing mechanism works

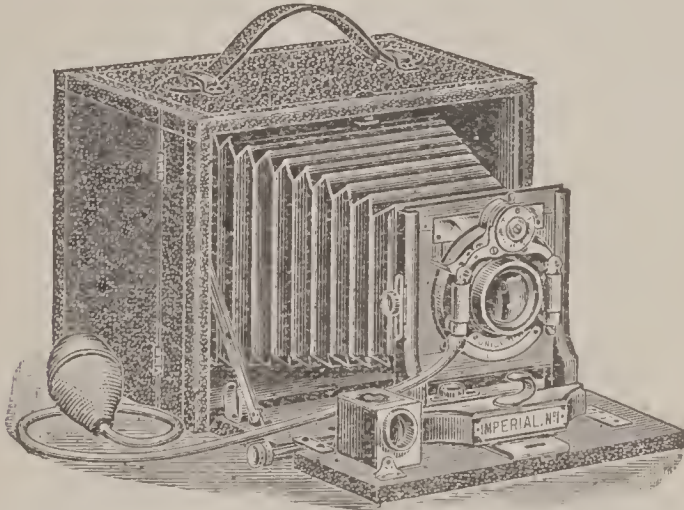


Magazine Camera. Takes 12 plates or films in carriers
Mechanical Plate changing.

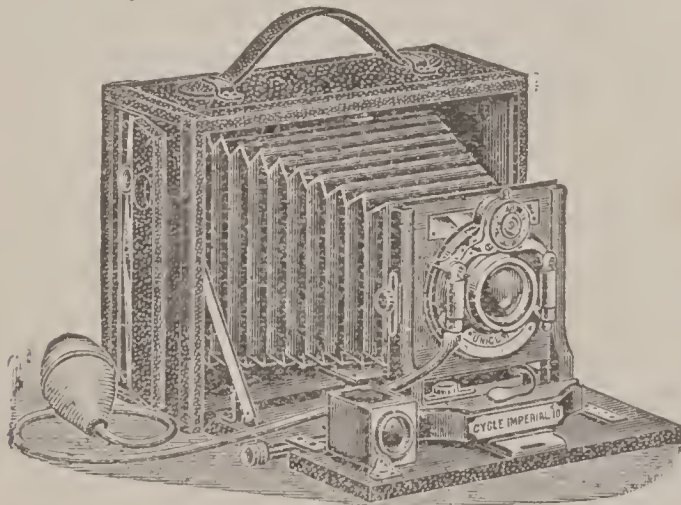
without a hitch. This class of cameras possesses the advantage of enabling the user to make several exposures in quick succession, and in many cases this power is a decided convenience. The cameras in class 3 are usually provided with space for three double plate holders, taking six plates. In some instruments there is space for carrying all three holders in the body of the camera while in others there is only room for one holder, the other two being carried in the pocket.

A camera of the class of style 2, with plate holders, is specially suitable when a varied range of work is to be done, as plates of different speeds can be carried in the holders and a fast or slow plate can thus be selected according to the needs of the subject to be taken. A plentiful supply of plates is not always a blessing to the hand camera worker, for he is then often tempted to spend a plate on a subject of little or no interest, whereas, if only a smaller supply of plates was available greater care in the selection of the view would be expended.

The cameras in class 4 appeal perhaps most strong-



Folding Hand Camera, Box Style. (Class 2.)
 ly to the tourist and holiday-maker as they enable
 material for a large number of exposures to be car-
 ried with very little weight. There are some very

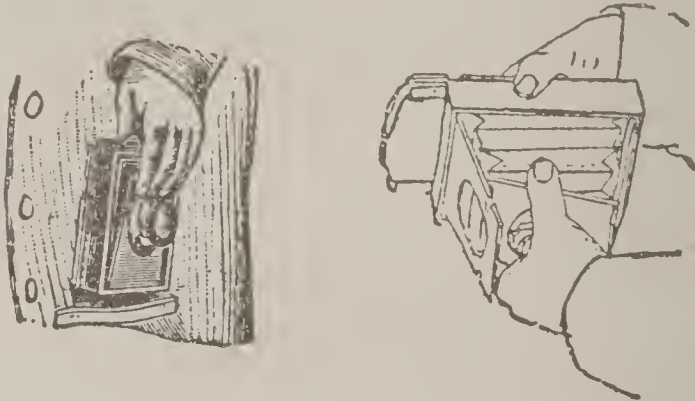


Folding Hand Camera, Cycle Style. (Class 2.)
 good instruments of this kind on the market, which
 are well worth attention.

With a viewing camera the operator is en-
 abled to compose or arrange his view on the
 ground-glass focussing screen, but in a hand camera
 this process is usually performed by means of a little

appliance termed a view finder. There are many forms of such finders made, but the one most generally found on hand cameras consists of a small lens, fixed in one of the upper corners of the camera front, and behind which is placed a sloping mirror. The view in front of the camera is projected by the lens on to the sloping mirror and is thence reflected upwards on to a small piece of ground glass let into the top of the camera. On this ground glass the picture appears in miniature as it will be taken on the glass plate when the exposure is made.

All hand cameras using rectangular shaped plates should be provided with two such view finders, one for horizontal pictures and one for vertical pictures.



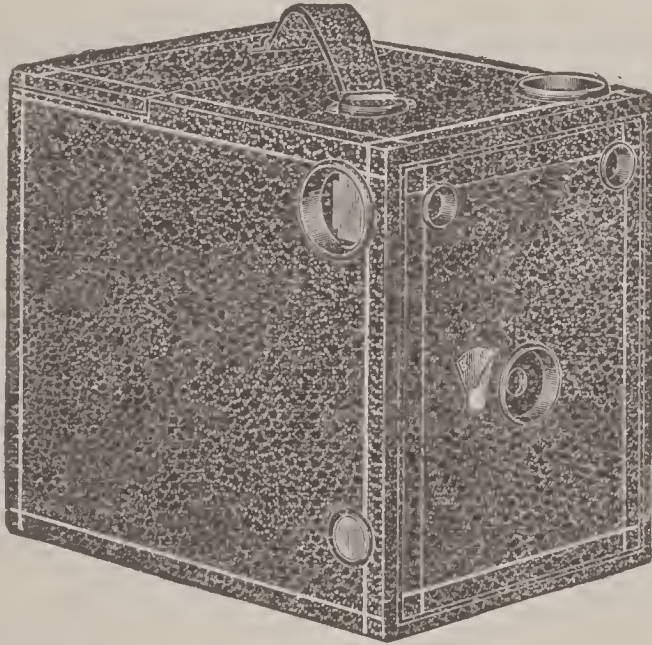
FOLDING POCKET CAMERAS—(Class 4)

Many hand cameras are of the "fixed-focus" type. This means that everything beyond a certain distance (usually about 7 to 9 feet) from the camera is in correct focus on the plate, and for the majority of snapshot pictures a camera of this kind will do all that is required.

If the reader wishes to go in for portraits and figure studies, however, he must obtain a camera with a focussing arrangement so that nearer subjects can be successfully taken. Apparatus of this kind is described under class 2. This focussing can be performed by examining the picture on a focussing screen and then racking the camera in or out until it appears perfectly sharp, or by judging or measuring the distance at which the subject is placed from the camera and then racking the camera front out

until it is set for that distance, as indicated on a small graduated scale termed the focussing scale.

With portraits and figure studies the focussing adjustment is specially required so as to enable the figures to be taken of sufficient size.

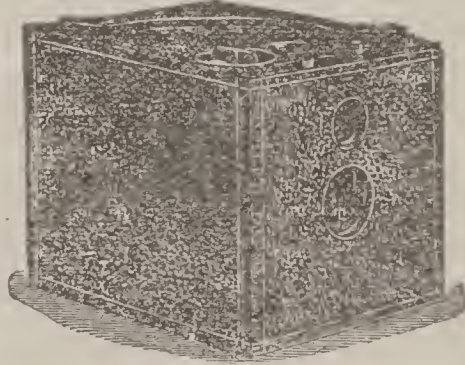


Fixed Focus, Box Style Camera.

On the cheaper kinds of hand cameras single lenses are usually fitted, and, as stated, for landscape work such lenses are very suitable, but a rapid rectilinear lens is to be preferred, if the extra cost can be afforded. The Waterhouse stops are not suitable for hand camera lenses and either the Iris or Disc Rotary form of diaphragm is always used. On account of the quick exposures necessary for hand camera work, it is seldom permissible to use a very small stop, and it will be found that F-8, F-11, and F-16 are the three most suitable stops, F-8 being perhaps the one best suited for general use.

The shutters supplied with hand cameras are extremely varied in design, and it will suffice perhaps if I state the points which should be looked for in this portion of the apparatus. The shutter should be both

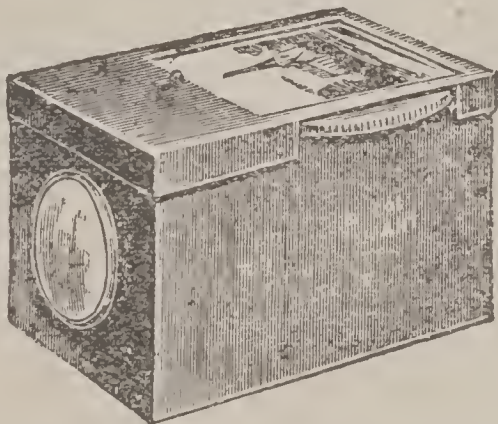
set and released from the outside of the camera, and the latter operation should be performed without the necessity for undue movement or pressure. The shutter should be capable of being adjusted for various speeds, and if there is an indicator to show the vari-



The Eastman "Bull's eye" Camera, Class 4. Takes a cartridge of roll-film sufficient for 12 pictures. $3\frac{1}{2} \times 3\frac{1}{2}$. Size of camera: $4\frac{1}{2} \times 4\frac{5}{8} \times 5\frac{7}{8}$ -in. Weight: 20 oz. Can be unloaded and loaded in daylight.

ous speeds at which it works, so much the better. The range of adjustment should be from about one-tenth of a second to not less than one-fifteenth, and the shutter should also be capable of giving time exposures if necessary. I may here remark that when it is desired to give a time exposure with a hand camera, it is usual to rest the instrument on a convenient fence or post, or else on a tripod. A further point with regard to the shutter is that it should not uncover the plate when being set. This is usually guarded against by a safety cap which covers the aperture in the shutter while the latter is being set, and then drops back out of the way ready for the exposure to be made. For ordinary snap-shot work a shutter speed of about one-twenty-fifth of a second is the most suitable, and the reader will not often require to make a quicker exposure than this. The higher the speed of the shutter, the greater the danger of underexposure.

As far as possible, all the movements should be accessible from the outside of the camera and the various working parts should be easily get-at-able for cleaning, adjustment, and repair. A numerical indicator should be connected to the plate-changing



The "Brilliant" view finder.

mechanism, in the case of Magazine Cameras, to show how many plates have been exposed, and it should be possible to remove the exposed plates at any time without interfering with those which may still be unexposed.

VIEWING APPARATUS.

SIZE OF THE OUTFIT.

The first point the amateur must decide upon is the size of the pictures he wishes to take, and upon this will largely depend the outlay he will have to make. Now camera manufacturers have adopted a series of standard sizes for their instruments, and on one of these particular sizes the choice of the reader must fall. Very large cameras may be left out of the question as unsuited to the general requirements of amateur workers, and the following sizes considered as those from which a selection can be made. The figures given are the dimensions of the largest picture which each camera is capable of taking:

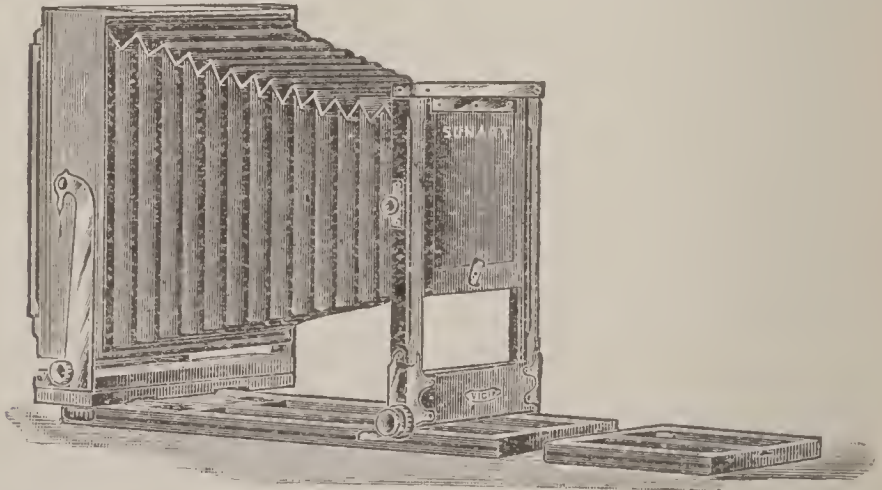
4x5-in., 5x7-in., 5x8-in., $6\frac{1}{2}$ x $8\frac{1}{2}$ -in., 8x10-in.

Of the above sizes there are three which are far more in use than of the others. These are 4x5, 5x7, and $6\frac{1}{2}$ x $8\frac{1}{2}$. If the reader wishes to keep both his initial and working expenses as low as possible, he should content himself with the smallest size, but if he can afford it, I would certainly advise the purchase of at least a 5x7 instrument. When he has gained some experience and is fairly proficient, he

may perhaps feel tempted to go in for a $6\frac{1}{2} \times 8\frac{1}{2}$ camera, and it is certainly very nice to be able to take an $6\frac{1}{2} \times 8\frac{1}{2}$ picture, when a suitable subject presents itself. All things considered, however, a 5×7 instrument is the best size for the beginner to commence with. By a simple contrivance known as a "kit" smaller pictures can be taken with a 5×7 or larger camera, so that if the reader wishes to experiment in a small way at the start, it is a very easy matter for him to do so.

THE POINTS OF A GOOD CAMERA.

The following particulars of the features which a good camera should possess will be of service to the reader when making a choice of an instrument. Since the camera has to be carried about from place to place it is obvious that it should be as light as possible, and that it should fold up into a small compass. These qualities, however, should not be obtained at



Viewing Camera with conical bellows, swing and reversing backs, and rising front.

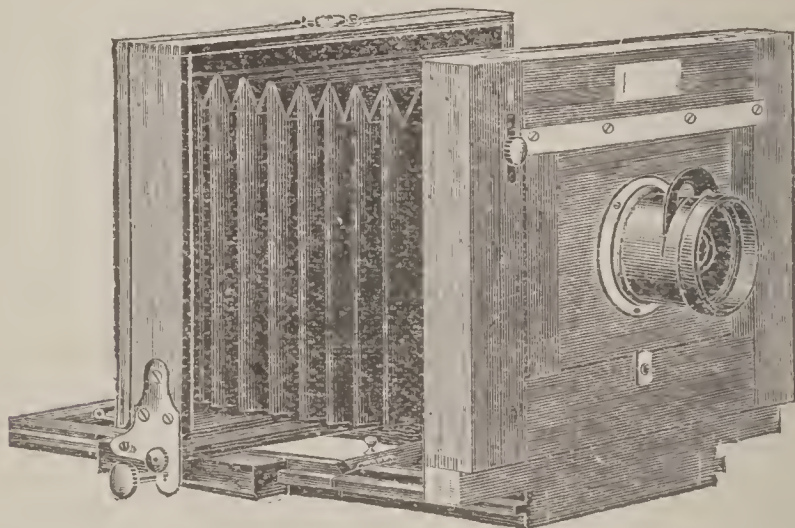
the sacrifice of rigidity, for it is upon the firmness of the camera and its support, that the sharpness of the resultant picture largely depends. The front of the camera should be provided with a rising and falling adjustment, so that the lens may be moved above or below the level of the center of the plate, though it should be exactly opposite this point when in its nor-

mal position. The use of the rising and falling front is to enable the operator to vary the position of the picture on the plate so as to cut off or add to the amount of sky or foreground included.

The bellows should be made of leather or bellows cloth, and may be either parallel or tapering in shape. The latter kind is known as a "conical" bellows, and is generally preferred by amateurs on account of the saving in weight which their use allows. When a conical bellows is fitted, the purchaser should satisfy himself that if the back of the camera is moved close up to the front, as is the case when using a short-focus lens, no part of the picture on the plate is cut off.

It is essential for good work that the camera should be provided with what is termed a "swing-back." This means that the back of the camera which receives the plate holder containing the plate, is pivoted horizontally so that it can be swung out of the vertical position to slant either backwards or forwards. In landscape photography this provision is often of value as it enables a better general focus to be secured, but its chief use is when photographing buildings, and for such work it is absolutely essential. It frequently happens that in order to include the whole of a building from a particular standpoint, the camera has to be pointed upwards, and this movement at once throws the back out of the perpendicular. The swing-back, however, enables the vertical position to be regained without moving the camera as a whole. The rule is that when photographing a building, the plate must be truly vertical, or else it will be found that the vertical lines in the building being taken will converge together in the picture. The swing-back will also be found useful in such cases as when taking a portrait of a person sitting down, or when taking the interior of a small room. Cameras are sometimes provided with a back which swings on a vertical axis as well as on a horizontal one, but this extra movement is rarely needed.

The amateur will find it of great advantage to have a camera with a reversing back, that is a back which is detachable from the camera and which will fit in both a horizontal and a vertical position. The plates as will be seen from the foregoing list of standard sizes, are made oblong in shape, and the reversing back enables the plate to be used either vertically or horizontally, as required. A sheet of ground glass,



Viewing Camera with Square or Parallel Bellows. termed the "focussing screen," of the same size of the plate, is let in the back, and on this the picture to be taken is arranged and focussed. When the camera is first set up and pointed at the subject to be taken, it will be probably found that the picture appears very indistinct and fuzzy. The amateur may be surprised to also find that the picture appears upside down on the glass, but this is the natural resultant of the action of the lens, and is a peculiarity to which he will soon get quite accustomed. The front of the camera is then moved in or out by means of a rack and pinion movement until the picture appears nice and sharp on the ground glass. With a $6\frac{1}{2} \times 8\frac{1}{2}$ camera, sufficient adjustment should be provided to enable an extension of about 16 or 17 inches to be made. The woodwork of the camera should be of well-seasoned mahogany.

THE LENS.

The camera having been selected, the next article which must receive the attention of the reader is the lens. There are four types of lenses in general use, each type possessing special features of its own. They are as follows:

1. The single lens.
2. The portrait lens.
3. The rapid rectilinear lens.
4. The wide-angle lens.

A single lens, as its name implies, contains but one "combination," a combination being two or more glass elements cemented together with Canada balsam. The chief advantage which the single lens offers to amateur workers is that it is considerably lower in price than the other types. For landscape photography, and for figure studies, a good single lens will prove extremely satisfactory, and it will also answer for portraiture if rapid exposures are not necessary. To the amateur, however, who wishes to do as great a variety of work as possible with one lens, the single type has a great disadvantage in that it is entirely unsuited for taking any subject where straight lines have to be included, such as in photographs of buildings, copying drawings, etc., for in such cases it distorts the straight lines into a more or less curved form.

A portrait lens is intended for portrait work and is designed with a view to render the exposure as short as possible. It is of but little use for other classes of work, so that unless the reader purposes to confine his work to portrait taking, he will be better advised to choose one of the other types.

Undoubtedly the best kind of lens for all-round work, is the rapid rectilinear, and, as may be guessed from the term "rectilinear," the pictures taken with a lens of this type are absolutely free from distorted or curved lines. This is obtained by using two combinations placed at a suitable distance apart, and each producing opposite kinds of curvature. The distortion produced by one combination is therefore counteracted by the opposite kind of distortion produced by the other combination.

A further advantage of this lens over the single lens is that it is much quicker in working. A rapid rectilinear lens may be used with good results for any of the following classes of work:

Landscape, architectural subjects, copying, portraits, groups, and figure studies. It is also very suitable for instantaneous and snap-shot pictures.

Rapid rectilinear lenses are made in many grades and of many types, and are marketed under various names, such as Rectilinear, Anastigmats, symmetricals, etc., the double Anastigmats being the highest grade.

A wide-angle lens is intended for use in confined positions. It takes in a much wider angle of view than the ordinary rapid rectilinear lens, and for photographing high buildings in narrow thoroughfares, for

interiors of small rooms, and for similar work, it is almost indispensable. A disadvantage attaches to its use, however, in the fact that the perspective of the view so taken appears exaggerated and displeasing to the eye, but since there is no means of taking many subjects except by the aid of such a lens, this alteration in the appearance of the perspective must be accepted with good grace.

From the foregoing remarks, then, it will be seen that the outfit of an amateur aiming at all-round photographic work should include a rapid rectilinear lens, and also if possible a wide-angle lens. The latter article, however, is only occasionally required, and if expense has to be considered its purchase may be deferred.

All lenses are provided with "diaphragms" or "stops," for the purpose of regulating the size of the aperture through which light can pass. There are three kinds of diaphragms fitted to lenses, viz., "Waterhouse" diaphragms, "Iris" diaphragms, and "rotary" or "wheel" diaphragms. A Waterhouse diaphragm is a small piece of sheet metal, having

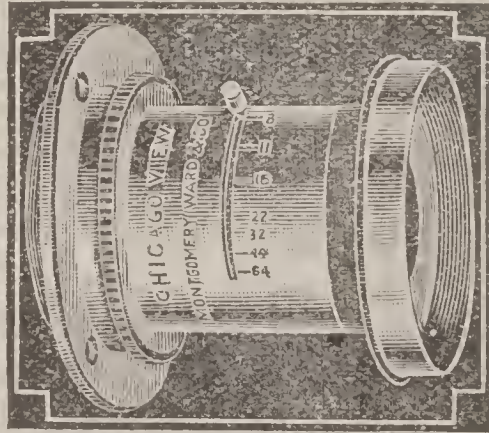


Fig. 3. Lens with Iris Diaphragm.

a circular hole made in the center. This is inserted in a slot cut in the brass lens mount and blocks out all the light except that which passes through the hole. A set of these is provided, having different sized holes. An Iris diaphragm consists of a set of

thin plates overlapping one another and fixed inside the lens mount. These are so arranged that when a circular ring that is fitted to the outside of the mount is rotated, the plates move in or out and so vary the size of the opening in the center, the action being very similar to the action of the iris of the human eye. A rotary diaphragm takes the form of a circular disc, with several different sized holes therein. This is pivoted on the lens mount, and as it is rotated so one or the other of the various holes comes opposite the center of the lens opening.

The two former kinds of diaphragms are those most commonly used, and for general convenience the Iris pattern is greatly to be preferred. It has the advantage of being in one with the lens mount, so that it cannot be mislaid or left behind as is the case with the Waterhouse type. An Iris diaphragm is a little more expensive, but the extra quality is money well spent. Rotary diaphragms are often used for hand camera lenses.

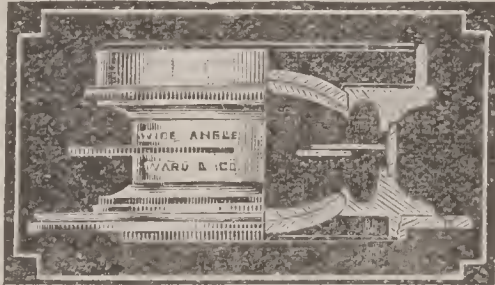


Fig. 4. Wide-angle lens with "Rotary," or "wheel" diaphragm.

The diaphragm apertures commencing with the largest will be found to be marked as follows:

F-8, F-11, F-16, F-22, F-32, F-45, F-46.

These figures mean that the diameter of the hole in the diaphragm, say the one marked F-8 is used, is one-eighth of the focal length of that particular lens, if F-11 is used then it is one-eleventh, and so on.

When parallel rays of light fall upon a lens, they are reflected and brought to a point of focus on the other side. The distance of the spot at which this occurs from the lens is termed the focal length of that lens. Stops serve two useful purposes, they enable the amount of light falling on the plate to be regulated, and they enable a greater depth of focus to be obtained than the lens without a stop would give.

The meaning of the latter phrase is that, if when the stop marked F-8 is inserted in the lens, the picture on the ground-glass shows that an object say 20 feet away is quite sharp, while those objects which are nearer and those which are more distant are fuzzy, then this undesirable condition of affairs may be remedied by the insertion of a smaller stop. If the stop marked F-16 is inserted, it will be found that the general sharpness or focus of the picture is greatly improved, and this will be still more marked if F-32 be used. The smaller the stop, however, the greater the amount of light that is cut off, and, therefore, the longer the exposure required. A safe rule for guidance in this respect is to double the length of the exposure for every decrease which is made in the size of the stop. Thus, if with F-8 the correct exposure is 1 sec., then, with F-11, it will be 2 secs., with F-16, 4 secs., with F-22, 8 secs., and so on.

To convey to the beginner some idea as to when to use a large stop and when to use a small one, I give the following hints, though it should be borne in mind that they are not to be taken as hard and fast directions, but should be modified according to the particular circumstances under which the picture is taken:

For portraits, and for subjects requiring a very short exposure, use a large stop, say F-8 or F-11.

For groups, and for cases where the objects to be taken are not very far apart, use F-16.

For landscapes, buildings, and general view work, use F-32.

The stops smaller than these need only be used in cases where extreme sharpness in the negative is desired.

THE PLATE HOLDER.

The plate holder holds the plate for exposure and fits the camera back between the ground glass screen and the camera body. It is not placed in position until after the picture has been focussed on the ground-glass screen. Then when the plate holder is inserted and the slide drawn, the sensitive side of the plate occupies exactly the same position as the ground-glass screen. Plate holders are generally made to hold two plates back to back, with a fixed opaque-division piece of sheet-metal or cardboard in between. This prevents the light falling on one plate during exposure from injuring the plate behind.

When an exposure has been made on one of the plates the holder is removed from the camera, until it is necessary to make the next exposure. It is then

replaced in a reversed position, thus enabling the second plate to be used.

Most cameras as sold are provided with one double plate holder, but it is advisable to purchase at least two extra, so that when a day's photographic outing is made, enough plates for six pictures can be taken. If three holders are bought, they should be numbered consecutively on both sides—1 and 2, 3 and 4, 5 and 6, so that the exposures may be recorded as made and the plates subsequently identified in the dark-room.

THE TRIPOD.

In choosing a tripod the great point to study is rigidity, and also worthy of consideration, though of lesser importance, comes the question of compactness and portability. The fewer the joints in a tripod, the more rigid it is likely to be, and for this reason a two-fold one is likely to be better than a three-fold one, though the latter can be packed into a more convenient form for carrying. The tripod is provided with a top or head, of either triangular or circular shape, and to this head the baseboard of the camera is attached by means of a thumbscrew.

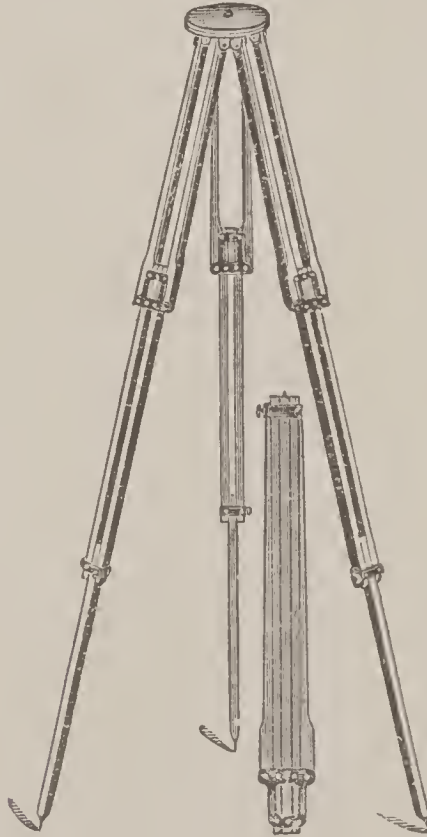
Of all the items in the amateur's kit, there is not one which is so liable to get lost or left behind as this tripod screw, and therefore, if the reader is wise, he will, by means of a string or light chain, attach it to the tripod head and thus make sure of its always being found when wanted. The tripod head should be covered with felt or leather, as the camera can then be screwed down without incurring scratches or other damage.

SHUTTERS.

If the reader wishes to go in for taking photographs of moving objects, a shutter must be obtained, though for all ordinary work requiring exposures of $\frac{1}{2}$ a second and upwards, such an article is not absolutely necessary.

The shutter is usually attached to the lens, and in its most simple form may consist of a piece of wood or metal, in which an opening is cut, and which slides up and down in a frame supported by the lens. As the opening in the slide passes in front of the lens, the exposure is made, the duration of which depends on the size of the aperture and the speed at which

the slide is moving. In most shutters of this type, the motion is obtained by allowing the sliding piece



Model Combination Sliding and Folding Tripod.

to fall by its own weight when released, though the speed thus obtained may be considerably increased by using an extended India rubber band to exert a pull. In more expensive forms of shutters, such as the Thornton-Pickard, roller-blinds are used with excellent results, the shutter being set by simply pulling a cord and the release being made by squeezing an India rubber bulb attached to a closed tube, this action releasing the spring mechanism which actuates the blind. The characteristics of a good shutter are as follows:

It should be light and not unwieldy in shape. It should work quietly and without imparting vibration or jar to the camera. It should be adjustable for

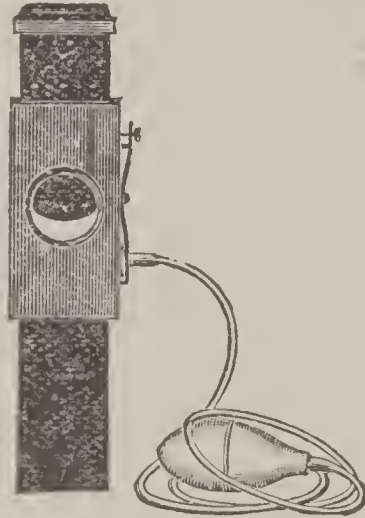


Fig. 9. Universal Drop Shutter. In this shutter the sliding piece is propelled by the action of a rubber band as shown in the illustration.

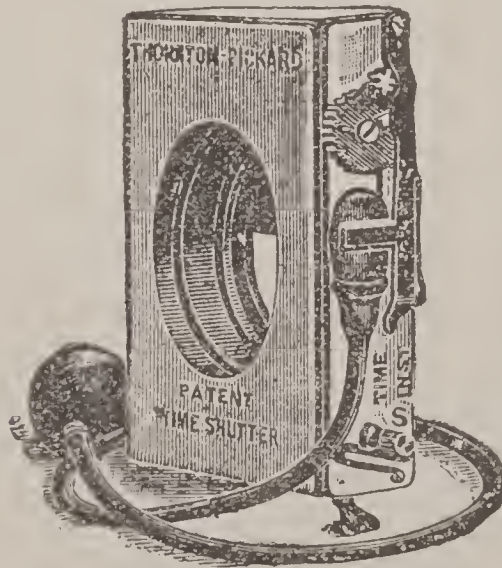
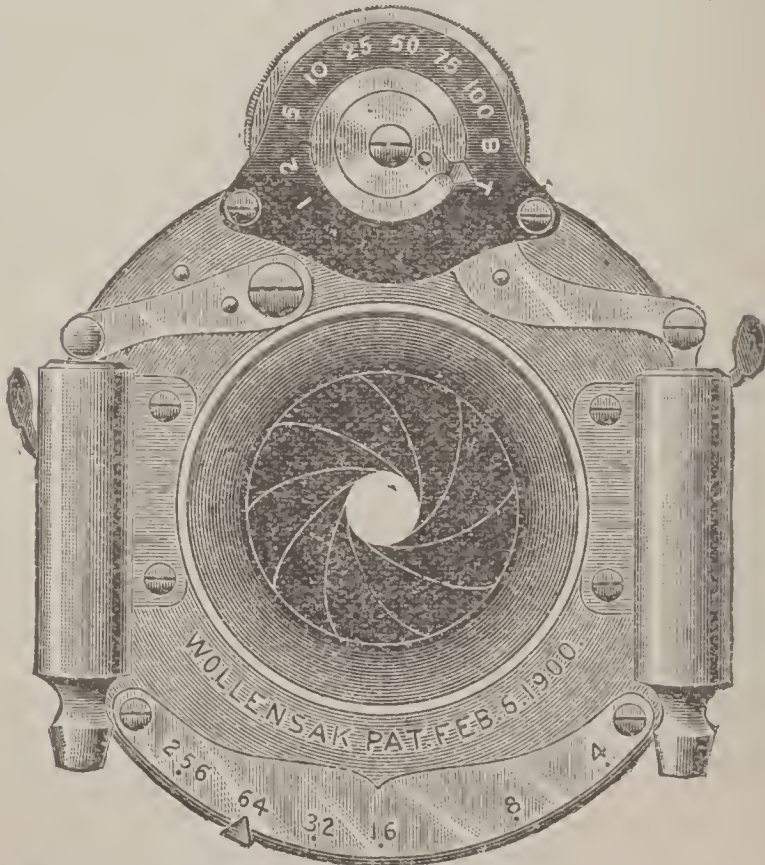


Fig. 9a. The Thornton-Pickard Time and Instantaneous Shutter. Works on roller-blind principle. Set by pulling a cord, pneumatic release by pressing an India rubber ball.

various speeds and for time and instantaneous exposures. It should be certain in its action, and it should enable the operator to actuate the release without taking his eyes off the subject to be photographed. A good though not absolutely essential feature is that the shutter should be capable of being set without necessity of covering the plate during the operation. If the shutter does not admit of this being done, the difficulty can easily be got over by setting the shutter before drawing the slide of the plate. When photographing children or animals, the best results are obtained with a shutter which works as noiselessly as possible.

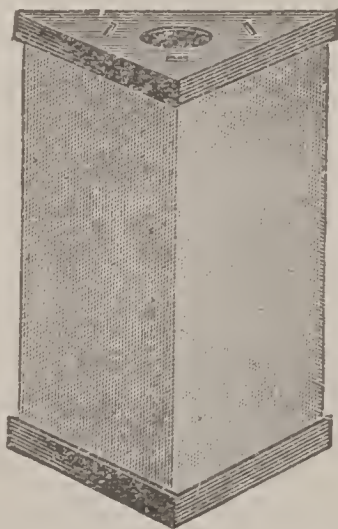


Excellent forms of shutters are those supplied with Iris diaphragm and that are provided with the mechanism for making instantaneous, time, and

bulb exposures. There are several forms of these now on the market; all are provided with both finger and pneumatic bulb release and work automatically for instantaneous exposures from 1-100 to one second or over. We illustrate one of the most popular.

THE RUBY LAMP.

As will be explained further on, the sensitive plates upon which the photographs are taken must not be allowed to receive the faintest trace of white light or daylight except that which reaches them when the exposure is made in the camera. They are, however, practically unaffected by a deep ruby-colored light, and, therefore, the operation of opening a packet of plates to fill the camera, and the later op-



Folding Ruby Lamp.

erations of developing and fixing, must either be carried on in perfect darkness or by the aid of a lamp fitted with ruby-colored glass. An alternative method when the above operations are performed in the daytime is to cover the window of the room used for this purpose with a ruby cloth or fabric, but as this will be referred to again in the chapter on development, I will at present only consider the question of lamps. The cheapest form of ruby lamp has a metal top and bottom, the body being made of a

square metal frame, covered with ruby cloth or fabric. The top and bottom portions of this lamp can be taken off, and the body folded up flat, so that the whole thing can be packed in a shallow cardboard box. The light is obtained by placing inside the lamp a small night lamp or the end of a candle. This form of lamp is very useful for changing plates by, or even for occasional developing when traveling, but it is hardly substantial enough for everyday work. It is better to buy a lamp with a good metal body and fitted with a burner for oil. It should be capable of holding a fair supply of oil and the arrangement for raising the wick should be accessible from the outside of the lamp.

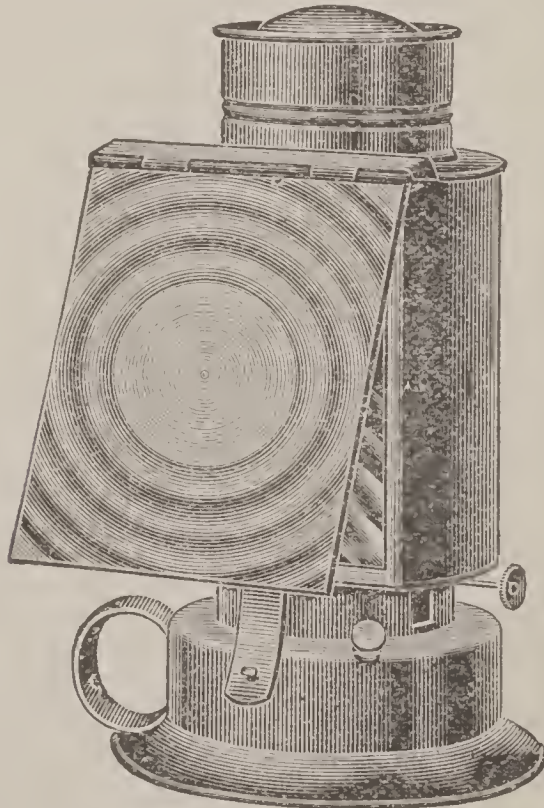


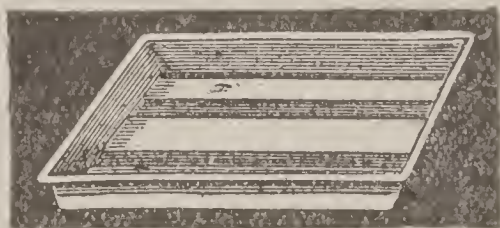
Fig. 19. The Chicago No. 2 Darkroom Lamp. Burns kerosene. With ruby and canary glass. These can be used separately or together.

Although the color of the glass in the lamp may be red, it does not necessarily follow that the light which passes through it does not affect the plate to some degree. In order to test whether the light is actually safe or not, the following plan may be adopted: Place a plate in the plate holder in the usual way. Then close the holder and draw the slide so that four-fifths of the plate are exposed to the rays of the lamp. Leave the slide in this position for say two minutes. Then push the slide in so that only three-fifths of the plate are exposed, and leave for another two minutes. Then again push the slide in so that only two-fifths are exposed, and leave for four minutes this time. Then push the slide so that it leaves only one-fifth of the plate exposed, and leave this open for another ten minutes. Thus one portion of the plate has not been exposed at all, the next has had two minutes' exposure, the next four minutes, the next has eight minutes, and the last eighteen minutes. The plate should then be developed in the ordinary way as explained in Chapter III., and it will be readily seen by comparison with the appearance of the exposed part how far the light has affected the remaining portions of the sensitive surface. The actual time that a plate is exposed to the light of the lamp during an ordinary case of development is not above say two minutes, so that if this exposure to the lamp produces no injurious effect, the light may be regarded as fairly safe. The process of developing and fixing of course takes longer than two minutes, but all careful workers make a point of keeping the plate carefully screened from the direct rays of the lamp, except when a close scrutiny of the image is necessary.

DEVELOPING TRAYS.

The smallest number of dishes which will be required for developing the negative is two, one for the developing solution and one for the fixing solution, but an extra dish should be procured, however, as in some instances an alum bath is required. These dishes are made in various materials, such as porcelain, fibre, and rubber. It does not matter very much which of these materials is selected. Fibre dishes are, perhaps, as cheap as any, and they are also very light. The dishes chosen may be of different colors, say one black, one brown, and one white.

This will make it easy to always keep the same dish for the same purpose—a precaution which should invariably be adopted. If the dishes are all one color,

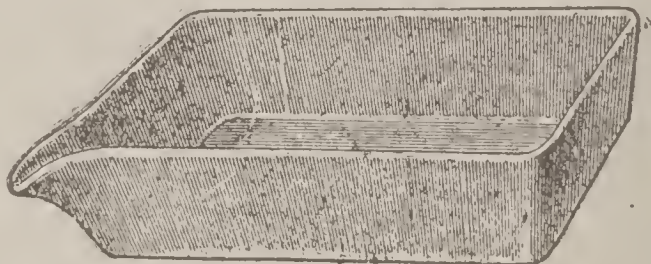


Fibre Developing Dish.

it is an easy matter to mark them underneath, "developer," "hypo," and "alum," respectively.

TONING TRAYS.

The dishes employed for toning should be deeper than those used for developing, as it is usual to tone a number of prints together in the same dish, and there should be plenty of room for the prints to be always kept on the move. Perhaps rubber or fibre dishes are the best for this purpose, and to facilitate manipulation of the prints the dishes should preferably be a size or two larger than those used for development. Two dishes will be required,

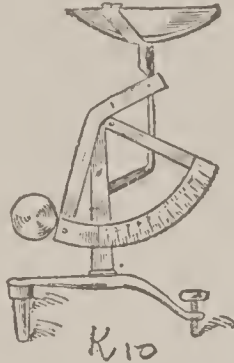


Toning Tray.

one for fixing and one for toning. In thus stating the number of dishes required I am assuming that the amateur will be able to obtain the use of some large sized domestic dishes, which are very useful for washing plates and papers in. If this cannot be done, a few large dishes for this purpose should be purchased.

SCALES.

For the purpose of weighing out the various chemicals employed in mixing his solutions, the amateur will require a small pair of scales. The chief point



Self-Balancing Scales.

to be considered is that the pan in which the substance to be weighed is placed should be made of glass. Glass is preferable to brass in that it is not likely to have any contaminating effect on the substance placed therein, and also it is much easier to keep clean.

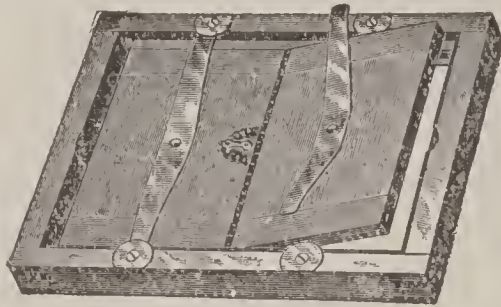
GRADUATED GLASS MEASURES.

These are required for measuring and mixing solutions, and two of different capacities should be obtained. Usually a two-ounce measure and a four-ounce measure is all that will be required.

PRINTING FRAME.

When a plate has been exposed and developed, it is termed a negative, and from the negative thus produced, paper positives, or "prints," are made by placing the sensitive surface of a piece of prepared paper in contact with the negative and exposing it to daylight. To facilitate this operation a "printing-frame" is employed, made something like an ordinary picture frame, but with a removable back. The back is pressed down by springs, and thus keeps the paper in close contact with the negative. In most printing

frames the back is made in halves, so that one-half can be raised occasionally during the printing



Printing Frame., Made of Cherry, with Piano Hinge. process, to ascertain what progress the printing is making. Printing frames are generally made of some hardwood, and that portion of the frame whereon the negative rests should be perfectly flat, otherwise the pressure of the springs may cause the glass to fracture.

FOCUSSING CLOTH.

A focussing cloth will be required to shut out the light from round the ground glass screen when focussing, to enable the operator to see his subject on the glass to advantage. A focussing cloth may be purchased ready made, or the amateur may get a lady member of his family to make one for him.

CARRYING CASE.

Having collected the various items of his outfit together, the amateur will require a case to carry them in. For ordinary traveling, a canvas case is quite good enough, but if the one case is to contain all the apparatus, it should be provided with a broad strap. A case in which to carry a tripod is more of a luxury than a necessity, as straps are usually provided with a tripod to fasten the three legs together when folded.

CHAPTER II.

THE CHOICE OF PLATES OR FILMS.

A photographic plate depends for its action upon the fact that the salt known to chemists as bromide of silver, when associated with some organic matter such as gelatine, has conferred upon it by even a momentary flash of light the property of turning to the metallic silver when subjected to the action of certain chemicals. That is to say, when a piece of glass, coated with bromide of silver and gelatine, is exposed in a photographic camera, all those portions upon which the light has fallen are, in some subtle manner, which no one understands, changed in nature, so that when treated with a chemical solution, called the "developer," they are darkened, while those parts which have been affected by light remain in their pristine whiteness.

It should be pointed out here that red light has little power over a photographic plate. White light is composed of all the colors of the rainbow, mixed in certain definite proportions, and also of a certain amount of light which is invisible—light which is of such a deep red color that to our eyes it appears simply black, and light which is so highly violet, as it were, that we cannot see it at all. It is the violet rays and the ultra violet rays that have the greatest effect upon the photographic plate, and the power of the rays diminishes as you get farther away from the violet end of the spectrum, until—except under certain conditions, which I shall explain later on—you come to the yellow, orange, red, and infra red, where the effect is almost nil. A photographic plate is not materially affected by red light, and this peculiarity gives the photographer an opportunity of conducting all those operations which would otherwise have to be gone through in the dark, by the aid of a light with which he is able to see what he is doing.

The incipient photographer should decide at the outset upon one brand of plates and stick to it until he has mastered the initial stages of his art. He must not blame the results of his own faults upon

the plate-maker and try his luck with another brand, for that way lies confusion.

Each different kind has its peculiarities, which must be studied to be understood, and this understanding will never be arrived at by wandering about from one brand to another in the hope of finding one upon which a slipshod photographer will be able to produce a good negative. The nomadic photographer—and most amateurs come under this head, for, in the pursuit of their hobby, they are likely to wander about the country in search of the picturesque—should decide upon a popular make of plate that he is moderately sure to be able to procure in any out-of-the-way town in which he may find himself.

Celluloid films are coated with the sensitive emulsion as well as glass plates, and in many cases the traveling photographer will do well to employ them, for they have some advantages over plates. They are much lighter, and a gross occupies but little more space than a dozen glass plates. Glass plates and celluloid films can in many cases be procured from the same makers and may be treated exactly alike, both as regards exposure and development.

I will assume that the amateur photographer has settled to his own satisfaction what brand of plates he intends to use, and as the treatment for films is precisely similar to that for plates as regards exposure, it will be understood that the following remarks apply to both, unless otherwise stated.

The first thing to do is to place the plate or film in the plate holder. Remember, the plate is VERY sensitive to light—sensitive in a way that few beginners can understand or calculate for. Very great care must be taken that the dark room is safe, that no extraneous light is allowed to enter, for if it does all your future efforts will be useless. The best test is to shut yourself up in the dark room, and when your eyes have become accustomed to the gloom, if you can see no light leaking in you may consider that the room is "safe," but if you can see streaks under the door or round the blocked-up window, stop them up.

The lamp by whose light you are to conduct most of your operations, because it is glazed with red glass, must not be considered of necessity "safe." It must shed a particular quality of red light, and not too much of it.

The beginner will do well to confine himself at

first to the slow variety of plates. He will find that every maker produces plates of two or three different "speeds," and he should not be led into purchasing a quick plate simply for the reason that it can be had at the same price as a slower one. Slow plates are easier to use because with them a stronger red light may be employed with safety, and, as a beginner is likely to take a long time over such operations as this placing of the plates in the holders, the plate that is least likely to be affected by undue lingering near the red lamp is the best for his purpose.

First, dust out the inside of all the plate holders, for every grain of dust that settles on the plates will leave a little white speck upon the finished negative. Then, as far away from the red light as you can comfortably see, open the packet of plates. Every pair will be face to face, with a piece of card at the edges to prevent them from actually touching one another. If there is any doubt as to which is the face, remember that the shiny side is the plain glass—or celluloid film, as the case may be—and that, of course, is the back. Put them in the plate holder, one in each side. The sensitized side of the plate has to face the lens of the camera, so that the plate must be placed in the plate holder with the dull side next the slide.

All the holders having been charged in this manner, and securely closed before leaving the shelter of the dark room, our photographer is ready for the fray. Let us suppose that he is sensible enough to have chosen a landscape or even a chimney-potscape for his maiden efforts, and does not intend to launch boldly into portraiture at the very beginning, for portraiture is the most difficult branch of photography that he could select.

LANDSCAPES.

The very first difficulty which presents itself is as regards the length of exposure. How long shall the cap be kept off the lens? is the question, and it is a most difficult one to answer. We will suppose that the photographer possesses only one lens, that he has decided to keep to one size of stop for the present—say F-32, and that he intends only to use one brand of plates. Thus three of the several factors which govern the length of the exposure are fixed and the matter is considerably simplified. The chief factors which remain are the nature of

the subject and the quality of the light with which it is illuminated. Let us suppose that a landscape is chosen for a first attempt.

It is an old adage to say that you should expose for the shadows and let the high lights take care of themselves. The darkest portions are to be found among the trees, and as a general rule it may be taken that the nearer the object is to the camera, the longer will be the exposure it will require, for there is less of that ever-present haze between it and the lens, and that haze, often invisible, reflects into the camera a considerable quantity of the kind of light which affects the plate. We will suppose that a summer's day has been chosen, and the exposure is to be made somewhere towards noon. The lens is F-32, and the plate a slow one. An exposure of three seconds should be about right, but there are so many things which have a modifying effect upon it that it is quite impossible to give more than the merest idea of its length. To expose correctly can only be learned by considerable experience, by repeated trials and careful comparisons of the results. Full directions will be given in the next chapter, when development comes under consideration, by which the novice can tell whether he has erred on the side of over or under exposure, and he will soon learn to estimate pretty correctly the approximate extent of the error. A few trials made with intelligence will speedily give him a very good idea as to the duration of the exposure for a given subject under given conditions, and from the knowledge thus gained he will be able to calculate the correct exposures for other conditions.

This same view made the subject of a photograph at midday in the winter would require an exposure of longer duration, according to the quality of the light. Or, again, towards evening, even in the middle of summer, when the sun is in the west, and the whole landscape is bathed in the reddening rays of the setting sun, the three seconds' exposure may be multiplied without fear of the picture being overdone. It is impossible to teach the art of correct exposure; it will only come as the result of experience. The beginner should do his best to keep the conditions as invariable as possible: that is to say, he should, just at first, keep to one class of subject and one time of day, as well as to one lens and one plate. Then he can get his exposure right with very little trouble for that one set of factors.

We want our finished photograph to show a fair

amount of detail, but we must be careful, in our anxiety to secure this result, that we do not over-expose the distant hills so that they become merged in the sky and get lost. If in the developed negative the landscape stands out almost white, while the sky is a dense black, and the hills much too plainly marked, the exposure has been too short, and the result is extreme contrasts of black and white with no delicate half-tones and an absolute lack of detail in all the deeper shadows. If, on the other hand, there is any amount of detail in the landscape, while the sky is a thin grey, with the hills invisible, and there is a general dullness and lack of contrast about the whole thing, it may be safely surmised that over-exposure is the fault. This matter will be more fully dealt with in the next chapter. For the present I will confine myself to again hinting that it is better to over than to under expose, for this defect can often be compensated for in development, while for the other there is no cure, and we will imagine that the exposure of this particular subject has been mastered so that we can pass on to the consideration of others.

In an open view, where there are no heavy shadows in the foreground, the necessary exposure will be much shorter, and where a landscape is taken from the top of a hill or high building, the time should be very short, indeed, for all portions of the view are distant. In a view of this description, where there is already a great lack of contrast, full advantage should be taken of the fact that under exposure, accompanied by judicious "forcing" in development, tends to increase of contrast. Photographs taken in woods and wherever there are dense masses of foliage will require a much longer exposure than at first sight would seem necessary, owing to the fact that the green light which finds its way through the interstices of the trees is to a great extent robbed of its actinic power, and is no longer able to affect the sensitive plate to the same degree.

PORTRAITURE.

To take a successful portrait is not by any means an easy thing to do. In the first place, a large amount of light is required in order to keep the length of exposure within reasonable bounds, and that light must come in such a direction that it will illuminate the face of the sutter in a suitable manner, and it is upon

this that the success or failure of a portrait to a very great extent depends.

A room with a large window should be chosen as the scene of operations, and a day when the sun is not shining through that window, but when its light is reflected in by a white cloud or a light-painted house opposite. Place the sitter about three or four feet from the window and slightly behind it, so that the majority of the light falls upon his face from the front and from above. This will leave the other side of the face in deep shadow—a grave fault which must be removed by the aid of a large looking-glass, or, failing that, a white screen such as can be improvised by hanging a white sheet over a clothes-horse. This mirror or reflector should be placed beside the sitter, but slightly in front on the opposite side to the window, and its position may be varied and the quantity and direction of the light from the window modified, by drawing the curtains from place to place, until that species of illumination is obtained which appears pleasing and is calculated to give the best effect to the sitter's particular kind of beauty. Remember that, in portraiture, as in most indoor photography, there is a tendency to very high contrasts in the resultant print. A face which is much more brightly lighted on one side than on the other, though not sufficiently so to seem objectionable, will appear in the photograph perfectly white and absolutely black—like so much chalk and soot. Do all you can to lessen the contrasts by carefully arranging the light before exposure, and then don't be in too great a hurry to put the cap on the lens, for a full exposure will materially help you to get the desired effect. Of course, it must not be overdone. There must be considerably more light on one side of the face than on the other, or it will appear perfectly flat and chalky, with many of the features invisible altogether. It is only necessary to remember that in indoor portraiture the contrasts are liable to exaggeration, and precautions should be taken against an undue hardness in the resulting print.

Portraits can be taken very well in the open air, and, indeed, provided certain precautions be observed, this method is more likely to give satisfactory results in the hands of an amateur who does not possess a regular studio than that just described. In this case, to cut off the light which comes in the directions in which it is not required in order to give value to that which falls in the right direction, the sitter should

be placed in an angle of a wall so that the building shields him from the light on one side, and if there be any means of cutting off some of the top light, so much the better. As an idea of the exposure required in such a case, between five and six seconds may be quoted, where the F-32 lens aperture is retained with the slow plates on a fine day in summer. This should be only taken as a basis from which the exposure may be calculated, for in a general way it will be better to employ a larger lens aperture and give a proportionately shorter exposure. A stop of four times the diameter, which would be called F-8, would necessitate an exposure, as already explained, only one-sixteenth as long, or under half a second; and in this time the sitter will have little chance of moving, while the photographer has the opportunity of seizing that moment for exposure when the subject appears at his best, without being obliged to run the risk of spoiling everything by giving a warning that he is ready to take the picture.

In the case of the portrait taken in the interior of an ordinary room, the larger lens aperture is a positive necessity, for the exposure necessary with the smaller one would be so inordinately long as to tire out the most patient sitter. It is impossible to give even the vaguest idea of what would be the correct exposure for a portrait in an ordinary room: there are so many varying conditions to be considered that any attempt to take them into account in imagination would only be confusing. There is nothing for it but for the tyro to make a guess at its length and then to correct it according to results. Then, having ascertained what length of time will yield satisfactory results under a certain set of conditions, its estimation for varying cases is as much a matter of calculation as anything else. Remember that when you double the diameter of the aperture of the lens you increase its size fourfold, so that it will pass four times as much light and the photograph taken with it will only require one-quarter the time of exposure. The length of the exposure is inversely as the square of the diameter of the lens aperture.

INTERIORS.

Closely allied to portraiture in ordinary rooms is the photography of interiors, for in many respects there are points of similarity. For instance, there is a decided tendency to the exaggeration of the contrasts, which has to be overcome in the same manner in this case

as in the former: by equalizing the illumination as much as possible, reducing the depth of the shadows and toning down the brilliancy of the high lights, and by giving exposures of amply sufficient length. As a general rule, it may be taken that in the photography of interiors it is better to use a small stop in the lens and to give a corresponding long exposure. This will tend towards the reducing of the inordinate contrasts, and there is seldom any reason why the time should be unduly hurried as it often must be in the case of portraiture.

The first thing to be considered as regards interior photography, as in most other branches of the art, is the point of view from which the picture shall be taken. In the case of a small room, it is impossible to take in anything but just one corner of it—unless what is known as a wide-angle lens be employed—and the difficulty which immediately presents itself is to make that one corner appear in the photograph as representative of the whole as possible. En passant, a wide-angle lens is an instrument which has been designed to overcome this difficulty in connection with the small angle of view which the ordinary lens is able to embrace. It is a lens of very short focus in relation to the size of plate which it will cover, and consequently it gives much smaller images and can cram a large quantity of them on to a plate of given size. However, the result is also that the lines of perspective are very much distorted in a photograph taken in this manner, and a small room appears like a long gallery filled with horribly disproportionate furniture. It is perhaps better to be content with an incomplete but true representation of an interior than to produce a view which shows more, but shows it incorrectly. In a general way it is best to take up a position for the camera in one corner of the room, for in a square room this gives a greater distance, and the opposite corner has better pictorial possibilities than a flat wall would have. The camera should be placed as nearly as possible at the height of the eye, so that the resulting photograph will represent the view as it would be seen by a person standing at the point whence the photograph was taken.

Again, as regards exposure, it is impossible to give any definite instructions, for it may vary to any extent from half a minute to half an hour, and under difficult conditions may easily reach half a day or even more. The only thing in the nature of a suggestion which I can give is to hint that the beginner

might try an exposure about ten times as long as that which he would guess to be correct, and he probably will not be far out. He should be very careful that no windows form any portion of the picture, unless it is absolutely impossible to leave them out of it, for these, being far more brilliantly lighted than the other portions, will be sufficiently exposed when the rest of the picture requires a hundred times as long. The result of including them would be that the extra exposure, as it were, would, by the action known as halation, spread to the surrounding portions of the picture and fog them in that distressing manner sometimes seen in photographs of churches and other similar subjects. If the light from the window which must appear in the picture can be blocked out by such means as drawing a heavy blind, or hanging a thick sheet outside—the interior, of course, receiving its illumination from some other source—there is no reason why the result should not be satisfactory, and, otherwise, a great deal may be done by the use of some form of non-halation or “backed” plates; but this matter will be more fully treated of later on. Care should also be taken that no polished metal objects are allowed to reflect light directly into the camera, for if they do, except where the specially prepared plates are used, such things will appear surrounded with a halo which will not add to their beauty.

ARCHITECTURAL SUBJECTS.

Architectural subjects are deservedly great favorites with many photographers, for it is in the making of pictures that come under this heading that photography finds one of its most pleasing fortes. Its practice is not attended with any particular difficulties, but it is one of those branches of the art which will reward, by conferring the ability to produce fresh beauties, the most painstaking labor of the most highly accomplished photographer. Although the merest tyro may begin on architectural work at once if he please, yet it is almost impossible to come within hail of finality in it, for very rarely is a photograph of a given building produced that is so good that, under certain conditions, a better one could not be made.

All architecture is full of straight lines, therefore it is necessary to use when portraying it—more than in anything else—apparatus which will not give distortion. In the first place, a rectilinear lens is a necessity for reasons already stated, and in the second we shall

find the use of the rising front and the swing back with which the camera is fitted, but which, up to the present, has been somewhat of a mystery.

Suppose you wish to take a photograph of the exterior of a high building. In order to include the upper portion in your picture it will be necessary to tilt your camera upwards. Now, the upper parts will be farther away from the lens than the lower portions, consequently they will be reproduced smaller in proportion, and all parallel lines running upwards will follow the venal law of perspective and appear to converge. But artists do not recognize that parallel lines running upwards in a high building must appear in the eye of an observer stationed below to converge towards the top, and we are so used to seeing pictures with the vertical lines of buildings drawn strictly parallel, that a photograph in which they are shown convergent gives to the building a drunken, toppling-down look, which is not pretty. It is the function of the swing back to overcome this defect. Keep the back of the camera always strictly vertical when photographing architectural subjects, and the upright lines in the original will be reproduced upright in the resulting picture. There is another method by which the same result may be brought about, and that is by the employment of a rising lens board which obviates the necessity of tilting the camera at all so that the back is still kept vertical and the upper part of the view is brought within range by raising up the lens. This method has the disadvantage, however, that in extreme cases it may be necessary to raise the lens to such an extent that the light passing through it cannot reach the lower portion of the plate, which is therefore left blank. As regards the actual length of exposure where architectural subjects are concerned, this is governed in much the same manner as in the case of landscape, but as a general rule the times should be shorter. A new white building will only require about half the time that would be necessary for a landscape view under similar conditions as to lighting, and so on, while one that is built of red brick or that has become blackened with age will necessitate a correspondingly longer exposure.

COPYING.

It occasionally happens that the amateur may wish to make a photographic copy of a painting or engraving of another photograph which has acquired value

owing to the death, perhaps, of the original of the portrait. Where any quantity of such work has to be done, special apparatus should be employed, whereby the camera may be always retained with its optical axis exactly at right angles to the plane of the picture to be copied, but for the occasional requirements of the amateur a more makeshift method will be found to answer the purpose. The picture to be copied should be attached by any ready means to a vertical board placed as near as possible to a window through which a strong diffused light shines upon it. A very good plan is to attach it to the folding shutter of the window, if it has one, for that can be placed at different angles until a position is found where the light falls upon it in the most suitable direction. The camera, which must be of the long bellows variety, so as to admit of being racked out to a considerable extent, is placed exactly opposite it, both as regards height and lateral position, and it will be found that some considerable maneuvering is necessary in order to bring the image into the desired position on the ground glass screen and of the right size and in good focus. When this is satisfactorily accomplished, the smallest stop should be inserted in the lens, and a rather long exposure given.

Care should be taken that the lighting is not too much from the side of the grain of the paper, or the brush marks, as the case may be, will be painfully apparent on the finished copy; but, on the other hand, the light must not fall too perpendicularly upon the work, or some of it will be reflected directly into the lens from the shiny surface, which last state is worse than the first. In the case of engravings or other pictures having black lines on a white ground, the exposure should be comparatively short, in order to avoid the flatness which would result from weakness of contrast in the negative, and in copying paintings and all colored objects very great advantage will accrue from the use of orthochromatic plates in conjunction with a yellow screen, which method will be more fully explained in another chapter.

SNAP-SHOTS AND INSTANTANEOUS PHOTOGRAPHY.

There is a deal of misconception in the public mind with regard to what is called instantaneous Photography. Many people seem to consider that it is quite

a distinct invention, and that it requires a peculiar set of apparatus. It is not so. If you possess a lens which is sufficiently perfect to enable you to use a large aperture without seriously impairing its defining powers, and you use a rapid plate, you will simply require a mechanical contrivance to uncover the lens and cover it up again very quickly, in order to blossom out as a full-blown instantaneous photographer, only you **MUST** confine yourself to brilliantly-lighted subjects. It is here that the difference lies. An instantaneous photograph can only be taken in a good light. That which used to be known as a Detective Camera, because it was hoped that it would prove useful to the police—which it never has—and what is now more correctly known as the Hand Camera, is merely an ordinary camera fitted with an instantaneous shutter, and so made to be convenient for use in the hand without any other support.

There is a strong temptation towards indiscriminate snap-shooting when using a hand camera, for a new plate is so easily brought into position and exposed that the user is often inclined to waste it on an unworthy subject. Care and thought should always be bestowed upon every photograph that is taken, whether it be a 8x10 landscape or a 4x5 snap-shot, and the knowledge which has been gained in landscape and similar work should be applied to the apparently much simpler hand camera photography. A street scene can only be successfully taken in the brightest hours near noon, because it contains all those elements—heavy shadows in the foreground, etc.—which in landscape work necessitate a longer exposure, and as in this case the time cannot be drawn out because of the moving objects in the picture, the other factor—light—must be increased in compensation. Out in the country, however, where the light is not partially absorbed by a heavy pall of smoke, those pleasing little studies of children and “grown-ups” and of pastoral life generally, of which the hand camera is such an excellent portrayer, may be successfully attempted in spring or autumn, while sea and sky effects—the brightest things in nature—can be photographed in midwinter, and even skating scenes, when the sun is shining, and there is plenty of snow about to reflect its light, come just within the scope of the hand camera bearer.

The two great things to bear in mind when contemplating instantaneous exposures are: hold the camera

perfectly still, for the least tremor is disastrous, and be quite sure there is sufficient light upon the subject. Then with rapid plates and a quick lens and an eye well enough trained to choose a good position, a good subject, and to seize the right moment for exposure, a satisfactory photograph can hardly fail to result.

CHAPTER III.

DEVELOPMENT AND COMPLETION OF THE NEGATIVE.

EQUIPMENT AND ARRANGEMENT OF THE DARK-ROOM.

As pointed out in a previous chapter, the process of developing the negative has to be carried on by the aid of the light from a ruby lamp, and since all other light must be excluded, the room which is devoted to this work is usually termed the "dark-room." If the reader is fortunate enough to possess a spare room at home, which can be set apart solely for photographic operations, his path of progress will be rendered considerably more comfortable than if he has to develop his negatives when and where he can. I have known amateurs who, when they have grasped the idea that inky darkness is an essential quality of the dark-room, have forthwith concluded that the "cupboard under the stairs," or even the family coal cellar, was the very best place for their purpose, and not until they have run the risk of an untimely ending to their photographic career, by slow suffocation, have they realized that a more suitable scene of action might be found. It is quite a mistake to imagine that any cupboard will do for the dark-room, even if it is big enough for the photographer to get inside. Unless the work can be done comfortably, it is hardly likely to be satisfactory, and therefore it is much the best policy to select a room where both fresh air and elbow-space exist in plenty. If the amateur has a room which he can devote entirely to photography, he will find the following items of furniture and fittings useful:

A table on which to do the developing, though better still than this would be a specially-made developing sink; a cupboard or chest of drawers, in which to keep his stock of plates, papers, and various items of apparatus; and a set of shelves fixed on the wall, close to the developing table or sink, on which would

be placed bottles of the various chemicals and solutions required for development. If gas is available, the burner bracket should be fixed just over the developing table; and if the convenience of a continuous water supply is also to be had, the tap should be in an equally handy position. If a continuous water supply is not available, a small tank fixed to the wall above the sink may be made to answer the purpose. Failing this, a bucket or large jug of fresh water should be kept at hand.

If a separate photographic room is not at the reader's command, the next best in order of convenience is the bathroom, and an excellent substitute it makes. In either case, daylight may be excluded by a light structure of wood of such a size as to just fit into the frame of the window, and covered with some opaque material. I say opaque, for even in the daytime it is better to develop by artificial light, as daylight is continually varying in intensity, and thus makes it difficult to judge the density of the negatives. If, however, the reader prefers to work by daylight he can secure a fairly safe light by substituting for the opaque material two thicknesses of colored fabric, one thickness being a ruby color and the other a deep canary or orange. If this plan be adopted, the screen thus made should be as little exposed to sunlight as possible, otherwise the color will rapidly deteriorate, and the screen will be thereby rendered unsafe. Such a screen should certainly be tested from time to time.

Having thus prevented the admission of white light through the window, attention should be paid to the door, and any stray light finding its way through the keyhole or crevices should be promptly checked by brown paper. While, however, the room should be made perfectly light-tight, it should not be air-tight, for unless the bad air is able to escape, and fresh air is able to replace it, the atmosphere will soon become oppressive and even injurious.

There are some very convenient ready-made dark-rooms sold by tent makers, which are suitable for being erected in the garden or even inside one of the rooms of the house itself. They can be fitted up with sink, shelves, and ruby glass window complete, and if the amateur can afford such a luxury as this, it may often save him from proving an unintentional nuisance to the remainder of his household. If such a dark-room is used indoors, an ordinary oil lamp or

candle placed outside the ruby window can be used to give the necessary light, and in this way the atmosphere of the dark-room is kept both cooler and less vitiated.

In the event of neither of the above-mentioned rooms being available, the amateur must make the best of the accommodation afforded by one of the ordinary rooms of the house. In such case, of course, he must exercise especial care and cleanliness in handling his various solutions, so as not to damage the carpet or furniture.

THE CHOICE OF A DEVELOPER.

A "developer" may be defined as a chemical solution which, when applied to a plate which has been suitably exposed in the camera, will bring out or make visible the image produced by the action of the light on the silver bromide in the sensitive emulsion with which the plate is covered. That image is invisible until the plate has been subjected to the action of the developer, so that when the amateur removes his exposed plates from the plate holder they will appear precisely the same as when first placed in the holder ready for exposure. In making the image visible, what the developer really does is to reduce the opaque metallic silver—those parts of the silver bromide which have been affected by the light—and to leave unaltered those portions upon which the light has not acted. When the plate has been developed, and the latent image has been brought out, it has to be "fixed" before it can safely be allowed to make an appearance in daylight again. Immediately the plate has been developed it is subjected to a short washing in clean water and is then immersed in a "fixing" bath. After having been "fixed," the plate is unaffected in any further way by exposure to light, and all that remains to do is to thoroughly wash it and let it dry.

But this explanation is carrying me ahead of my subject, for my present purpose is to indicate the nature and uses of the various developing agents commonly employed. This information may, perhaps, best be imparted in the following form:

AMIDOL.—This developer is chiefly used for two classes of work: snap-shot negatives and developing papers. It is very energetic in its action and is a good developer for bringing out detail. When used for bromide papers, no clearing bath is required.

EIKONOGEN.—Very suitable for snap-shots and for portrait negatives. It is, however, but slightly soluble in water, and is, therefore, usually made up in quantity. It is rather difficult to obtain full density with this developer unless very pure crystals are employed, and the exposure of the plate has been reasonably correct. If combined with a density-giving developer, such as quinol, good results may be secured.

FERROUS OXALATE.—This is a developer which at one time was very popular for negatives, but of late has been largely superseded by other substances. To secure the best results the exposure of the negative must be as nearly correct as possible.

GLYCIN.—This is a slow developer, giving grey-black images free from fog. It is much used for negatives for photo-mechanical processes.

HYDROQUINONE OR QUINOL.—This developer is a great favorite among amateurs on account of the cleanliness and ease with which it may be used. It gives blackish negatives and may be used repeatedly until exhausted. It is liable to produce harsh contrasts with an insufficiency of detail, and is slower in operation than some of the other developing agents. It is very suitable for bromide papers.

METOL.—Metol is one of the most energetic of modern developers and with short exposures produces negatives of extreme softness. A combination of metol and hydroquinone makes a very satisfactory developer.

PYROGALLIC OR PYRO.—Of all developers, this is the one which is most widely known and has the longest reputation. By suitably modifying the constituents of the solution employed, pyro enables excellent negatives to be obtained, even in cases where the exposure has been far from correct, and in the hands of an intelligent user this power becomes of considerable value and importance. Further than this, it is fairly rapid in its action, any amount of density can be obtained, and the resultant negatives are of good printing quality. As an all-round developer for negatives, pyro is still without a superior.

RODINAL.—Another name under which rodinal is sometimes sold is paramidophenol. It is chiefly used for developing hand camera negatives, but while it brings out plenty of detail, there is occasionally trouble in obtaining satisfactory density. It is also a useful developer for bromide papers.

The chemical substances mentioned in the above list

are termed "agents," and are not used by themselves to produce development, but are mixed in certain proportions with a substance termed the "alkali," and with a bromide termed the "restrainer." The various portions of agent, alkali and restrainer are dissolved in a suitable amount of water to form the developing solution. Where these are all mixed together, the developer thus formed is termed a "one-solution" developer. As, however, modifications in the relative proportions of the constituents will enable the operator to produce corresponding modifications in the character of the resulting negative, it is often a convenience to have two solutions mixed up, one containing the agent and the other the alkali. Then, by taking more of the one solution and less of the other, or vice versa, the development of the negative may be had more fully under control. Thus the rate of development may be hastened or retarded, and the contrasts in the negative accordingly increased or diminished. At the present moment the reader may not fully understand the significance of these facts, but the matter will be made clearer to him when I come to deal with the actual process of development. From the list of developing agents which I have just given the reader will see that he has a pretty wide field from which to choose. With a developer, as with the particular brand of plate, once the selection has been made, it should be adhered to, and its capabilities and peculiarities thoroughly mastered. Now, different makers of plates recommend different formulæ for development, even though the same constituents may be employed in each, and whatever the brand of plates selected, while the general facts will still hold good, the particular formulæ recommended by the makers of those plates should be adhered to when mixing the developer.

HOW TO MIX THE DEVELOPER.

The various chemicals of which the developers are composed are usually supplied in powders or crystals, and they should be stored in glass bottles, with close-fitting corks. India rubber corks should always be used in the case of potash or soda. Each bottle should be carefully and accurately labeled with the name of the substance contained therein, and the label should be as far as possible indestructible. That is, the inscription should be either sand-blasted on to the glass or should be written on a gummed label,

which should be afterwards sized and varnished. No chemical or solution should be placed in a bottle which has previously contained another substance, unless the bottle has first been thoroughly washed out. On no account should any solution be poured into a labelless bottle, as the amateur will almost certainly forget just what the composition of the solution was, and when that is the case, it is useless to him. If space is limited, developers may be purchased in the form of powders. These developing powders are put up in small packages, occupying very little room, and when a developing solution is required, it is simply necessary to dissolve one or more powders in water, according to instructions.

The dissolving of solid substances in water may be hastened by two methods: Firstly, by crushing the substance into a powder or very small pieces, and secondly, by using hot water instead of cold. The solution should, however, always be allowed to cool before it is used to develop with, otherwise the firm of the plate will be injuriously affected.

HOW TO DEVELOP A NEGATIVE.

I will now assume that the reader has exposed a half-plate in the camera, and that he is ready to make his first essay at development. I will further assume he has prepared the solutions required according to the special instructions contained in the package of dry plates that he has used. He must then proceed as follows: Light the ruby lamp and place the developing-dish about twelve inches in front, or at such a distance as you can just see what you are doing. Next open the plate-holder, take out the exposed plate, and after lightly brushing it with a flat camel's-hair brush to remove any particles of dust, place it film-side uppermost in the developing-dish. Then, with a steady, sweeping motion, pour the developer over the surface of the plate. It is absolutely essential that the developer should cover the whole plate and that no air bubbles should be allowed to remain, otherwise the negative will be disfigured by markings due to unequal development. No signs of the picture will appear for about a minute or so, but the dish should be gently rocked during this period, to keep the developer in motion. If the exposure has been about correct, the plate will then gradually darken in places, these representing the portions of the picture to show up, while in a portrait, the white

shirtfront and collar will appear, to be quickly followed by the face. The reader should remember that in a negative everything is reversed—that is, a white collar comes out black, while a black hat will show white, or rather almost clear glass, in the finished negative. This being clearly borne in mind, the reader will be better able to follow the progress of the development. After the whitest portions of a picture, or the "high-lights," as they are termed, have appeared, they will be followed by the half-tones, and ultimately by the shadows. If the picture appears gradually, in these successive stages, the development should be allowed to continue until all the details are fully brought out. If the plate is then held up to the ruby lamp and examined, the high-lights should be nearly opaque, while the deepest shadows should be trans-



Fig. 25. Examining a negative during development. Illustration shows use of rubber sleeve protectors.

parent, but should clearly show the details. In a landscape, for example, the opaque part should be the sky, or the side of a whitewashed cottage, while the transparent part should be in heavy foliage on trees or bushes, but the leaves and branches visible in the actual landscape should also be faintly seen in the negative, i. e., the deepest shadows should not appear as absolutely unaltered patches of the film. The edges of the plate which have been held by the rebate of the plate-holder will, of course, remain perfectly white, and it is a fairly safe rule to continue development until every part of the plate which has been exposed turns slightly grey, while the edges remain clear white.

The moment these edges show any signs of becoming grey, the plate should be removed from the de-

veloper and washed. With most plates there is another means of ascertaining if development has been carried far enough, and this is to examine the negative from the glass side, or back, by reflected light. If the development is sufficient, the high-lights and the less deep half-tones will be visible from this side. Until the development has been completed the dish should be rocked from time to time as mentioned.

After the plate has been developed, it should be washed under the tap, or in a dish of clean water, and should then be immersed in a fixing-bath, composed as follows:

Hyposulphite of soda 16 ozs. or 20 parts

Water up to 80 ozs. or 100 parts

Hyposulphite of soda is commonly referred to as "hypo."

The above quantity of solution will serve for fixing a large number of plates, and if only a small quantity is required for a few plates, it can be easily mixed, provided the same proportions are maintained, viz., four parts of water to one part of hypo.

The hypo bath does not take very long to prepare, and may be mixed, if preferred, just before development is commenced. The plate should be placed in the fixing-bath and left for several minutes, until it is completely fixed. This may be readily judged by examining the back of the negative by reflected light. If any of the unaltered silver bromide is still undissolved, it will appear as a creamy white patch, and until the whole of this has been dissolved away, and

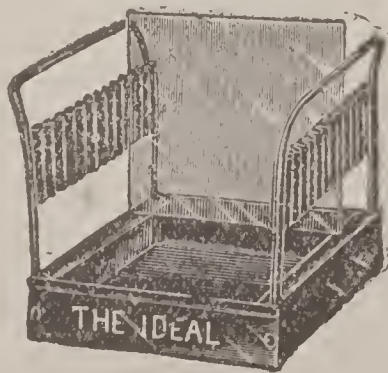


Fig. 27. Rack for draining water off negatives after washing. The upright portions fold flat when not in use.

nothing but the picture on the clear glass remains, the fixing process should be continued.

After the negative has been fixed, it should be thoroughly washed, either in running water or in several changes, the period required to eliminate all the hypo being about one hour, provided a thorough and continual change of the water is arranged for.

When washed, the negative may be allowed to dry. Heat should not be applied to effect this quickly, as the gelatine will be in great danger of becoming melted. The negative should be placed in an almost upright position, in a dry, cool place, where no dust is likely to collect.

HOW TO RECOGNIZE AND CORRECT UNDER AND OVER EXPOSURE.

The foregoing description of the progress and development was based on the assumption that the exposure of the plate in the camera had been fairly correct. It is, however, extremely likely that the beginner will for some time, at any rate, make numerous mistakes in judging the correct exposure, and I will, therefore, now proceed to explain how such mistakes may be compensated for by a modification of the development. The reader will remember that I said the high lights in the picture would first begin to appear about a minute after the commencement of the development, if the exposure had been approximately correct. We will now suppose, however, that at the expiration of that time no indication of the picture appeared, and that in fact two or three minutes had elapsed before the plate first began to darken. If, after this, the high-lights and half-tones came up quickly, and yet, in spite of a prolongation of development, no detail appeared in the shadows, it is a pretty sure sign that the plate was under exposed. The opposite case to this, viz., over exposure, is indicated by the picture appearing considerably before the expiration of a minute, and, instead of coming out regularly and gradually, it makes its full appearance in a very short space of time. In cases of gross over exposure, the whole picture seems to flash out at once, almost directly the developer is poured over the surface, and the film appears to go gray and foggy. Of the above faults, under exposure is the more serious, as, in many cases, it is impossible to bring detail out in the under exposed parts, no matter how the

development may be modified. With care all but very extreme cases of over exposure can be sufficiently controlled to enable a satisfactory negative to be obtained.

If the negative appears to suffer from under exposure, as indicated above, the following procedure should be adopted:

Pour the developer back into the cup or mixing glass, and replace it in the developing dish with clean water. The developer must then be weakened or diluted with about an equal bulk of water. Pour off the water from the dish and continue the development with the weakened developer. The developer should be allowed to act until the high-lights have become quite opaque, and probably by that time a good deal of the details in the shadows will have appeared. I may here give the reader a hint as to altering the strength or proportions of the developer in use in the developing dish. This should never be done by adding the water or fresh solution to the developer while it is in the dish, as it is impossible for a thorough mixing to take place in this way, and unequal or patchy development of the plate will result. The developer should first be poured off into the mixing glass, and the requisite addition made. It can be then returned to the dish with comparative safety.

The correction of over exposure will require more prompt attention than that of under exposure, for in the former case the mischief is soon accomplished. As soon as there is an indication that over exposure is the fault, the developer should be at once poured back into the graduate glass, and very greatly reduced in strength by adding water. Also put in a few drops of a strong solution of bromide of ammonium. The development can then be continued until the contrasts appear likely to be about normal, or until the action of the solution appears to be less vigorous.

HOW TO INTENSIFY A NEGATIVE.

The reader will sometimes find that a negative, after development and fixing, appears thin; that is, there is plenty of detail and gradation, but the image is not sufficiently opaque to yield satisfactory prints. This may be due to one of several causes. For instance, it may be caused by over exposure; by removal from the developer before sufficient density was obtained; or by the thinness of the emulsion with which the plate was coated. A negative of this kind may be considerably improved by the process known as "in-

tensification." The following is the method of procedure:

After the negative has been fixed it must be thoroughly washed and then placed in a strong alum bath for about ten minutes. After a further washing it is placed in the intensifying solution, made as follows:

Mercuric chloride..... $\frac{1}{2}$ oz. or 5 parts
 Hydrochloric acid.....45 grains or 1 part
 Water10 ozs. or 100 parts

A note of warning with regard to mercuric chloride: This is a strong poison and is sometimes known as corrosive sublimate or bichloride of mercury. It should not be allowed to come into contact with any cuts, etc., on the hands or fingers.

The negative should be kept in the above solution till it becomes a grayish white all over and then thoroughly washed and placed in a second bath composed of:

Liq. ammonia (U. S. P.)..... 1 oz
 Water up to20 ozs

When the action of this bath is completed, as may be noted by the cessation of a visible change in the color of the negative, the latter is taken out and thoroughly washed and dried.

HOW TO REDUCE A NEGATIVE.

In contradistinction to the foregoing, a process called "reduction" may be necessitated, if the negative should be so dense as to make it difficult to obtain a print. This is usually caused by the development having been too prolonged. The following is the method of obtaining a reduction of this excessive density.

The negative must be thoroughly washed after fixing, and should then be placed in a dish and covered with a clean solution of hypo. A solution of potassium ferricyanide is then made, as follows:

Potassium ferricyanide 1 oz
 Water up to10 oz

Pour off the hypo from the dish into a measuring dish, add a few drops of the above solution and again pour over the plate. Reduction will at once commence and will proceed pretty rapidly, the rate depending upon the amount of ferricyanide added. As soon as the negative is nearly reduced enough, take it out of the bath and thoroughly wash. The image will be reduced a little more during washing. The

above formula is that known as Howard Farmer's reducer.

FOG AND ITS CAUSES.

Fog on a negative may result from several causes. It may be caused by defective light from the dark-room lamp; by a leaky plate-holder allowing daylight access to the plate; by gross over exposure; or from defective emulsion on the plate. To protect plates as much as possible from the first of the above causes it is a good plan to cover the developing dish over during the greater part of the time development is proceeding, only removing the cover for the purpose of examination, or of altering the developer. To avoid fog from the second cause, plate-holders containing plates should be kept out of sunlight, or direct daylight, as much as possible, and also should be covered round by the focussing cloth, while the slide is drawn during exposure. A kind of fog known as "green fog" sometimes occurs, and usually this may be traced to either using too much alkali in the composition of the developer, or to the action of the impure atmosphere in which the plates may have been stored. A remedy for green fog is the application of the reducer, as described above, and a subsequent intensification of the negative.

PINHOLES.

Pins may not appear to have a very direct connection with photography, but I imagine that the beginner will not have produced very many negatives before he discovers the nature of "pinholes." These are tiny transparent spots which make their appearance on the film during the development and fixing of the negative. These transparent spots of course allow light to pass through freely, and, therefore, when a print is taken from the negative, every pinhole is represented by a little dark spot on the print. The chief cause of pinholes is dust on the plate during exposure, and the surest way to prevent their appearance is to dust out the plate-holders every time plates are to be put in, and also to lightly dust the surface of the plates themselves before putting them in the holders. This operation is best performed with a broad, flat camel's-hair brush, which should be perfectly clean and dry. If pinholes do occur in a negative in spite of all precautions, the best way to nul-

lify their ill effects is to touch or spot them out by carefully working over them with a lead pencil. Transparent spots of a larger kind than pinholes may be caused by the presence of air bubbles in the developer, and as these are more difficult to remedy than the pinholes, great care should be taken when developing to see that no such air bubbles are allowed to exist.

HALATION.

Halation or spreading of the high-lights usually occurs in negatives of subjects in which high-lights and very deep shadows occur, as, for instance, in an interior of a building, where a strongly-lighted window has to be included on the same plate as a dimly-lighted portion of the room. For the shadows a long exposure must be given and this exposure, being far in excess of that required for the window, the light from the latter seems to spread and form a mist or halo round that portion of the plate. This misty appearance is caused by the reflection of some of the high-light which has managed to pass through the film to the back of the plate. There are two ways out of the difficulty; one is to use specially coated plates—non-halation plates—and the other to “back” ordinary plates. To “back” a plate means to coat the glass side of the plate with some substance which will absorb any light which falls upon it, and thus prevent it being reflected back again. The following is a useful formula for preparing this “backing” mixture:

Burnt sienna	2 ozs
Caramel	1 oz
Gum mucilage	1 oz

Grind the above constituents together thoroughly and then add 2 oz. of methylated spirit. This mixture may be easily applied to the back of the plate with a soft brush or a piece of cotton wool. It can be readily wiped off again, prior to development. The operation of backing the plates must, of course, be performed by the aid of the ruby lamp, in the dark-room.

VARNISHING THE NEGATIVE.

All negatives should be varnished, as a matter of protection. It is quite permissible to take prints from an unvarnished negative, and, indeed, there are many workers who will take the trouble to protect their negatives by a coating of varnish. As, however, there are many negatives obtained which, from the nature

of the subject, it is impossible to replace, I think the practice of varnishing is not an extravagant precaution to take against possible injuries from stray splashes of liquids, or the effects of a damp atmosphere. All photographic dealers supply a clear hard varnish for this purpose, and the method of its application is as follows:

First warm your negative by gently and evenly applying heat until it feels quite hot to the hand. Then hold the negative horizontally, film side upwards, on the finger tips, and pour a pool of varnish in the center. The negative should then be slightly tilted, first one way and then the other, until the varnish has traversed every portion of the surface of the film. Then tilt the negative up at a considerable angle and drain off the surplus varnish into the bottle. The negative may then be gently dried in front of a fire and allowed to cool.

STORING NEGATIVES.

When the amateur has made some progress in the practice of photography, he will begin to accumulate a number of negatives of value and interest, and the question will arise as to how these may best be classified and kept. A simple and inexpensive method is to place each negative inside a plain envelope, and on the outside of this inscribe the subject and the circumstances under which the picture was taken. For example, one inscription might read thus: "Lake steamer entering Chicago harbor. June 25th, 1900. _____'s '_____' plate. Stop F-11. Exposure, one-thirtieth sec." Details such as these often prove of serv-

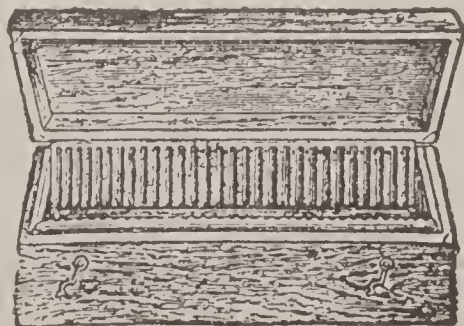


Fig. 28. Wooden box for storing finished negatives.

ice for future reference. The negatives thus encased may be stored in ordinary cardboard boxes, and each box labeled outside with the nature of its contents, thus: "Summer Holiday, 1900. Chicago and neighborhood." Some readers may prefer to buy negative boxes ready made, and these can be obtained at a comparatively small cost. They are provided with grooves into which the negatives drop, and each box contains space for from twenty-five to one hundred plates. If these are numbered, and a list of the subjects pasted inside the box-lid, any desired negative can quickly be found.

CHAPTER IV.

MAKING AND MOUNTING PRINTS.

The initiate in the mysteries of photography has now been carried in imagination through all the operations necessary in the making of the negative. He is the possessor of several first-class but imaginary negatives—pictures in which all those portions which should be white are black and those which should be black are represented by clear glass. He will recognize that this is merely a means to an end, and that the way to produce a positive picture from a negative is to place a sensitive surface in contact with it, and to expose to the action of light so that the rays passing through all those portions of the negative which are transparent, will turn the sensitive surface black in those places, while the dark parts of the negative will protect it from the darkening influence, and so form a print which is positive—which has its lights and shades in the correct relation to one another. The process by which this result is obtained is known as Photographic Printing, and the resultant positives, made on sensitized or printing papers, are called prints.

Until quite recently Albumen Paper was used almost exclusively by the photographer, but while this paper yields most excellent and permanent results, it is extremely tedious and troublesome in manipulation, and of late years the field which it held so long has been almost entirely pre-empted by the ready prepared products.

These prepared papers are of many kinds, and are known, generally, as Aristotype Papers. The word Aristotype, however, covers a very broad field, as nearly all the products are made after different formulæ and each brand has little peculiarities of its own that require special treatment in manipulation. For this reason it is impossible to outline a method of operation that will exactly suit all kinds, and the instructions herewith given are but general.

These various papers are known, generally, as Collodion, Gelatine, Bromide, Ferro-Prussiate, etc.

Some are Printing Out papers,—other Developing papers. From the large number of brands on the market it is possible to obtain almost any grade or texture desired, such as smooth or glossy surface, mat surface, etc.

The various manufacturers enclose with each package of their product specific instructions for manipulation, and the amateur will do well to follow same closely.

PRINTING AND TRIMMING.

In order to hold the paper in contact with the negative during the operation of printing, a special frame is employed, with a hinged back and springs to hold it down, this being known as a Printing Frame. The back is hinged so that while one-half of the print in progress is firmly held by one spring in its position behind the negative, the other half can be turned back by the printer in order to see what progress has been made, with the full assurance that it will drop back exactly into position for further exposure, if that should be necessary.

Though printing paper is sensitive to the action of the light, it is not so to anything like the same degree that a photographic plate or film is. For instance, gas-light has practically no effect whatever upon it, and all the operations of placing it in the printing frames and so on, can be conducted in weak daylight with impunity, instead of in the dark-room.

To make a print, the first thing to do is to remove the back from the printing frame by shifting aside the two pressure springs and lifting it out, when, the frame being laid face downwards on a table, the negative to be printed is placed in it, with the film side uppermost. Then a piece of sensitized paper is placed in position on the negative, with its shiny side downwards, so that the two films are in contact with one another, the back is replaced, the springs brought to bear upon it and the whole placed in some position where plenty of light will fall upon it. On an ordinarily bright summer day, printing frames placed on the window sill on that side of house on which the sun is not shining, will, with negatives of average density, yield prints of good quality at a fair rate of printing. Of course, the amount of exposure which a given print will require depends not only upon the quality and brilliancy of the light, but also very considerably upon the density and the color of the nega-

tive under which it is exposed. Moreover, the speed at which a print is made affects its ultimate quality to a marked extent, and a long exposure in a poor light, tending to brilliancy in the resultant print, will give a more plucky picture, with higher contrasts from the same negative than one in which the exposure has been a short one to a brilliant light. Extra brilliancy is not always desirable, as, for instance, when the contrasts in the negative are already as high as is at all necessary, and in this case a short exposure to very bright light—even to direct sunlight, in extreme cases—will give the best results. On the other hand, when the negative is unduly thin and weak, as when it has been over exposed, a brighter print than would normally result may be obtained by slow printing in a very weak light, or by allowing the light to filter through a piece of tissue paper, placed over the printing frame.

Prints upon printing out papers should always be more deeply printed than it is desired that the finished picture shall be, for they always fade more or less in the subsequent toning and fixing operations. It is difficult to give definite directions for the exact extent to which this extra printing should be carried, especially as it varies for different papers and different toning solutions, but a little experience will soon reveal the amount of fading which has to be guarded against with any particular materials, and precautions can be taken accordingly.

TRIMMING.

The prints should be neatly trimmed before toning, taking off the blank edges caused by the printing frame.

The majority of views are improved by trimming off a liberal margin; especially is this true of views where some central object really comprises the picture.

A good guide for trimming is the glass form, as by its use you can see where to trim to best advantage.

Place the print, with face up, on a clean sheet of glass, and on the print place the glass form. Press down firmly on the form with one hand, and with the other cut along each edge of the form with a sharp knife. An ordinary pocket knife will answer. The knife should be kept well sharpened.

A better method is to use any of the regular print trimmers as sold by dealers in photo materials.

TONING, FIXING AND WASHING.

When the prints are taken from the frame, they are of a bright red color, not altogether a displeasing hue, if it could be retained, but it cannot, nor the effect of the necessary fixing-bath is to transform it into a horrible, bilious brown. In order to avoid this objectionable state of affairs, recourse is had to what is called the "toning bath," a very dilute solution of chloride of gold, in which the prints are placed, whose effect is to throw down on all those portraits of the print in which there is already a deposit of metallic silver, a thin film of metallic gold, which imparts to it the proper tone.

As the toning operation is a somewhat tedious one, giving very nearly as much trouble where only two prints are concerned as for two dozen, it is politic to postpone it until there are a sufficient number of photographs to be toned to make it worth while. Albeit, the treatment should not be put off for too long, as the prints deteriorate with the lapse of time. A week or so, however, will have no appreciable deterrent effect if prints are kept in an absolutely dark receptacle.

As before stated, the formulae and treatment recommended by the manufacturer—who, it is only natural to suppose, knows more about the peculiarities of his own products than any one else—should be strictly adhered to. In the sheet of instructions issued with every packet of paper there is given an extremely simple and excellent recipe for a toning-bath, although it is generally pointed out that any of the recognized formulae for this class of paper may be used.

Chloride of gold is a component part of nearly all toning-baths and it is advisable for the amateur to have always prepared a quantity of gold solution, ready for immediate use.

This chemical (chloride of gold) being a very precious salt, and, moreover, being deliquescent, that is, liable to take up moisture from the air and become liquid, is sold for photographic purposes in tiny, hermetically sealed tubes holding 15 grains apiece. This small quantity of the tiny crystals being practically unweighable by ordinary mortals, it will be

found convenient to mix it with water, which can then be conveniently measured. Procure a 16-ounce stoppered bottle, put 15 ounces of water in it, together with the tube of gold, from which the label must be previously washed with warm water, then insert the stopper and shake the bottle until the tube breaks. You will then have a solution of gold chloride in which every ounce contains one grain of the precious chemical, which can be easily measured out into the required quantities by means of a graduated glass.

Having thus prepared his gold solution, the amateur is ready to make up his toning-bath according to the special instructions accompanying the particular brand of paper he is using.

All photographic chemicals may be very much deteriorated by accidental admixture with foreign substances, but none are so sensitive to contamination as the toning-bath. A separate dish should be reserved for toning, and never on any account used for anything else. Successful toning can only be accomplished by observing the greatest cleanliness in all the operations and all the materials and vessels used, for the smallest quantity of hypo, for instance, will have a very detrimental effect upon the results.

Having mixed up the toning-bath, put it aside while you give the prints their preliminary washing. Place them one by one, taking care that each is submerged before the next is put in, into a large basin full of clean, cold water, and, as soon as all are in, transfer them one at a time to another similar bath of water, and then again to the third, and so on until all have been washed in several changes of water for at least ten minutes.

When the prints are ready for toning, they should be removed from the washing water, for too much soaking is not good for them, and put in a heap to drain. Then one at a time, they are placed in the toning-bath, and kept moving about in the solution until there are about a dozen under treatment. This is about as many as can comfortably be attended to, and by this time the first ones should be nearly toned. As soon as this stage is reached the print should be transferred to another dish of clean, cold water, to stop further action, and a fresh one can be put into the toning-bath to take its place. Meanwhile all the prints in the toning solution must be kept in constant motion to avoid unequal action from which patchy pictures would result: the best plan is to keep contin-

ually drawing the bottom print out of the liquid and placing it on the top, taking each one from the bath as it is seen to be finished, and replacing it with a fresh one from the heap.

When all the prints have been through this operation the fixing bath should be prepared. The fixing bath is much weaker than that used for negative work, and should always be freshly mixed for each batch of prints. The following strength is recommended, though the proportions need not be very exactly measured:

Hyposulphite of soda.....	3 ozs.
Water	20 ozs.



Fig. 20. Print washer. Connected to house-tap by rubber tube. Washes a number of prints at the same time.

Ten minutes will suffice to complete the operation and again care should be taken to prevent the prints sticking too closely to one another and so interfere with the action of the hypo. The final washing, whose duty, as in the case of the negatives, is to remove all trace of the hypo and which must, therefore, be most thoroughly performed, for upon its thoroughness the permanency of the prints almost entirely depends, takes at least fifty minutes, and is best accomplished in a print-washer in running water, if possible, or, failing that, in continual changes, one print at a time.

MOUNTING.

After the prints are washed they are ready for mounting on cardboard, or as usually called, card-mounts; this operation is very simple.

Remove the prints from the water one by one, drain off all surplus water, and place in a pile, with faces down, on a clean sheet of glass.

Apply a thin coat of paste to the back of upper print, using a bristle brush for that purpose; place the print carefully on the card-mount, working from the center to the ends so as to be free from air bubbles. Place a piece of cheese cloth over the print to prevent it from becoming rubbed or torn, and rub the paper with the palm of the hand until the print lies perfectly smooth.

If the prints are not required to be mounted at once on leaving the water, they should be dried, and when mounted subsequently, they should be thrown into clean water until they lie flat, and then mount as usual. Do not try to mount them while dry.

One of the best articles for making prints lie smooth is a small squeegee roller, which are sold by all dealers in photographic materials.

GLACE FINISH.

If you want to mount aristotype prints, a very high polish may be given them by laying them face down on a sheet of ferrotype plate and rub lightly until it lays perfectly flat against the plate. When perfectly dry the print can be removed, when it will have a high glace finish.

A mat surface may be obtained by substituting a sheet of ground glass for the ferrotype plate.

BROMIDE PRINTING.

All methods of printing—and their name is legion—are not confined to the printing-out process. An ordinary photographic dry plate, coated with its bromide of silver emulsion, would, with very short exposure, form a printing material, and a similar emulsion of a slower nature coated upon paper instead of glass gives us the printing surface known as Bromide paper. With such paper, of course, printing is accomplished with a very short exposure indeed, followed by development, but no toning. The work can all be done in an evening by artificial light, which is

often a great advantage to the amateur who likes to devote all the daylight hours at his disposal to the making of negatives which cannot be done at any other time. A bromide print is a study in black and white, and it is very greatly preferred on this account by many people to the warmer-hued pictures on chloride paper. That, of course, is purely a matter of taste, and the choice of a printing process must depend upon the particular predilections of the printer, when no other factors have to be taken into consideration. But bromide paper does not do justice to the majority of small negatives. It is very well in those of a larger growth, where a certain amount of depth of treatment, as the artists call it, does not involve a loss of more essential qualities, but for very small pictures, the lack of brilliancy, which is inseparable from this method of printing, and the loss or rather suppression, of detail which it involves makes it not to be recommended for the greater quantity of subjects.

Some pictures there are which are greatly improved by being printed in this manner, for they neither contain nor require much wealth of detail. It is one of the things which the photographer will realize as he gets more familiar with his art, that the choice of a printing medium must depend entirely upon the nature of the picture which it is to bear, for it will very greatly affect its quality and artistic value.

It will not be necessary to go very extensively into the details of this process, for the photographer is already well acquainted with the treatment of dry plates and the paper merely requires humoring in a very similar manner. Attention must be paid to the different requirements of a positive as compared with a negative, and great care must be taken to prevent the paper from becoming at all fogged, either by stray light or any other cause, but as bromide paper is coated with a much less sensitive emulsion than that used for plates—except where a specially rapid variety is required for enlarging, as will be explained in the next chapter—there is but little difficulty in fulfilling this condition. It is in the development that the chief difference lies between the treatment of the paper and the plates, for a different kind of result is expected of it. In negative work it does not matter if the brightest portions are a little veiled—indeed, they generally are—it merely increases the time required in the subsequent printing to a slight extent,

which is a matter of no moment. But in a print the high lights must be absolutely white, a condition which could scarcely be fulfilled by any of the reducing agents in common use for negative work.

Owing to this requirement the choice of developers is somewhat limited. It will suffice here to describe the one which is generally recognized as the best for the purpose. It is in two solutions, as follows:

NO. I.

Neutral oxalate of potash.....	1 lb. av.
Bromide of ammonium.....	20 grains
Water (warm)	64 ozs.

NO. II.

Sulphate of iron	1 lb. av.
Sulphuric acid	1 drachm
Water (warm)	48 ozs.

Both solutions should be filtered, and will be ready for use when cold. For use, add one ounce of No. II. to six ounces of No. I., but not vice versa, or a heavy yellow precipitate will be thrown down, and the solution be quite unfit for use. The developer when mixed should be of a brilliant red color, like so much red ink, and as clear as crystal, or it is not in good condition. Both ingredients, when separate, are colorless.

The paper is exposed behind a negative in a printing frame to the action of the light of an ordinary gas flame, for a few seconds, the length of time required depending upon the distance and the brilliancy of the source of light, the density of the negative, and the rapidity of the particular brand of paper used. As a rough idea, ten seconds may be quoted for slow bromide paper, a negative of average density—which is necessarily a vague definition—and a gas burner at a distance of about eighteen inches. Rapid bromide paper is usually about five or six times as quick as the slow. The same remarks anent long exposures with a poor light, and vice versa, which were made in connection with printing out paper, apply equally here, but it must be remembered that the law of inverse squares has to be taken into consideration. If you doubt the distance of the source of light, you must quadruple the length of exposure, multiply the distance by three, and the exposure time must be ninefold. You will in each case be giving an exposure of equivalent value, but with the longest time and

the poorest light you will produce the brightest and most plucky points. Bromide printing is in any case inclined to yield results in which there is a tendency to higher contrasts than a chloride print would show, so that with fairly bright negatives a short exposure close up to the light is the thing to be generally aimed for.

Place the exposed print straight into the developing solution without any previous rinsing, and keep it there until the image with all its details appears fully out, but do not continue the operation long enough for the high lights to become at all degraded. When the development is judged to be complete, transfer the print, again without any washing, to a clearing bath made up by adding half an ounce of acetic acid to eighty ounces of water. It should remain in this bath—whose function is to dissolve out the lingering developer, which, if allowed to come in contact with plain water, would deposit an insoluble yellow precipitate in the thickness of the film—for three or four minutes, and then, after a thorough washing to remove all traces of the acid, it is ready for fixing. The hypo should be freshly mixed for each batch of prints and should be of the strength of one pound to two quarts of water, in which bath fifteen minutes' soaking will be sufficient to insure perfect fixation. The washing and drying operations are the same as in the case of gelatino-chloride prints, and mounting may also be accomplished in a similar manner.

Bromide paper is made in several varieties, such as rough slow, rough rapid, smooth slow, smooth rapid, etc. The choice between the rough and the smooth-surfaced papers should be decided by the nature of the subject to be printed thereon. For negatives with plenty of fine detail, a smooth paper is to be preferred.

PLATINUM PRINTING.

So far all the printing methods that have been described depend upon the fact that certain of the salts of silver are sensitive to light; that is to say, they are either directly darkened by the action of light, or they have conferred upon them the susceptibility of the blackening influence of a subsequent chemical operation called development. But one of the most beautiful of all the printing processes at the command of the amateur is that in which the chemical salt of the metal platinum is substituted for

that of silver, and so pleasing are the prints made by this process that it has come to be recognized even by the lay mind as something distinct from the usual run of photography, and "platinotypes" come in for a large share of admiration everywhere.

Platinotype paper can be obtained from most dealers, together with all the accessories required in the working of the process. It cannot be described as a printing out paper, nor is it of a very similar nature to those developing papers which have been described. It requires a long exposure to daylight, though not so long as that necessary for the gelatine and other printing out papers, and after that it has to be developed. But it must not be supposed that the process is a complicated one to work. On the contrary, there are few simpler in the whole range of printing processes known to photographic men, for there is no toning to be looked after, a little very dilute acid answers for the fixing, and there is only one washing and that takes but a quarter of an hour in running water.

Platinotype printing presents no special difficulties when once its little peculiarities are understood, but there is one thing about it which demands most careful attention, for upon that depends in a very great measure the success or failure of the process. The sensitive paper, both before and during printing, is most susceptible to the influence of damp, which, if it has been allowed to affect the paper, will inevitably cause it to yield muddy and degraded-looking prints which are "flat, stale and unprofitable." The paper as supplied by the makers is properly packed in air-tight receptacles, in which it will keep for years, if necessary, without coming to any harm, provided the container has never been opened. But as soon as the paper contained is begun to be used, a different kind of receptacle is necessary, in which to keep the remainder out of harm's way. The special receptacle which has been designed for the purpose is called a "calcium tube," for, in its construction, the well-known eager affinity which quick-lime has for moisture is called into requisition in order to suck up any trace of damp from the air in the tube, around whose joint also a thick rubber band is placed to prevent fresh moisture from entering. As a further precaution against the same evil-working influence, it is necessary to place between the pads of the printing frame and the sensitive paper during exposure, a sheet of

thin vulcanized India rubber, and it is most important that the pads themselves should be perfectly dry. Indeed, that word "dry" is the key-note of the whole thing, every part of the apparatus used and every bit of paper right up to the process of development, must be thoroughly dry if the best results are to be secured.

The only difficulty about the process is as regards the exposure, for not being, strictly speaking, a printing out paper, a certain amount of experience and skill is necessary in order to judge when the operation is complete. It is not so much a case of estimating beforehand the length of exposure necessary, as, for instance, where bromide paper and other processes of printing by development are concerned, for, after the light has done its work, there is a distinct image of the picture upon the paper, from which an experienced printer can tell in a moment whether the operation has been carried sufficiently far or not. It is much more nearly allied to the use of printing out paper, for an ordinary printing frame with its hinged back is employed, and the length of time required is determined, not by previous calculation, but by examining the progress of the print from time to time during exposure.

The paper, when first taken from its tin case, is of a pale canary yellow color, which, by exposure to light, becomes modified into a light greyish brown.

Till about three or four years ago it was customary to develop platinotype prints in a hot bath of oxalate of potash—which, it will be remembered, is one of the constituents of a developer recommended for use with bromide paper—but about that time what is known as the cold-bath process was introduced, with the result of very greatly simplifying the operations necessary in this method of printing. The developer now used consists merely of the usual oxalate of potash solution, such as that of which the ferrous-oxalate developer is chiefly composed, mixed with twice its bulk of water. The formula stands thus (for the bromide of ammonium is not required):

Oxalate of potash solution, normal strength, i. e., 1 lb., dissolved in 50 oz.	
water	1 part
Water	2 parts

The makers usually recommend a special substance which they call by various names for the development of their papers. But as the treatment of the prints

where this developer is used differs in no essential way from the other case, it will be unnecessary to further mention same.

Care should be taken with the prints in all the stages prior to development that they do not become unduly exposed to light, for its action upon the paper does not manifest itself until afterwards. Remember, it is more sensitive than any of the printing out papers, and must be guarded accordingly. When first taken from the frames, unless the prints are destined for immediate development, they should be quickly placed in the calcium tube to protect them from the action of the damp air. Then, when the time comes to develop them, they are floated one by one, face downwards, on the surface of the solution, and the operation takes thirty seconds or possibly more. There is another method of development which has great artistic possibilities in clever hands, and that is by applying the solution, re-strained with glycerine in order to make it slower in its action, by means of a camel's hair brush. Very beautiful effects can be gained by this method, especially if advantage is taken of the restraining power of pure glycerine to hold back those portions of the picture which are not required of such depth as the remainder.

The color of a platinum print is essentially black, but this tone can be modified to a small extent by making the developer very slightly alkaline for a warm black, or acid when cold tones are desired.

As soon as development is complete, the print is transferred to a fixing bath composed of:

Hydrochloric acid (pure)	1 part
Water	60 parts

Immerse the print face downwards in this bath contained in a porcelain dish, and leave it there for five minutes or so, or until all the prints of the batch have been developed and placed in this clearing, or fixing bath. Then, when the last one has had its five minutes' soak, they are all transferred to a second, precisely similar, bath, where they must remain for, say, ten minutes, when they are again transferred to a third bath, compounded in exactly the same manner, and there left for a quarter of an hour. This triple clearing is followed by a good washing in three changes of water—to the second of which a little washing soda may be added to neutralize any acid remaining in the prints—and after fifteen minutes or so, they are ready for drying.

PRINTING-IN CLOUDS.

The time is past and gone when a landscape photograph having a plain white sky is considered complete. It has been recognized that a photograph, like any other picture, must show clouds of some sort, if it has any sky at all, and, as clouds—requiring a very much shorter exposure than the majority of terrestrial objects—rarely appear upon a landscape negative, it is necessary to introduce them into the print by a second exposure to light under a special cloud negative. The amateur will do well to make for himself a set of negatives of different kinds of clouds so that he will have a number to select from, and will be able to find one to suit any picture he may take. Attention should be paid to the direction of lighting of the clouds, so that a landscape lighted from one side may not be wedded to a cloud on which the sun is shining from the opposite direction.

The recently introduced Ray Filters and Ray Filter-graphs render the making of cloud negatives comparatively easy, as they are constructed primarily for this work.

If the black space representing the sky on the landscape negative be not sufficiently dense to prevent the light from darkening the paper behind during printing, it must be painted out or masked to make it so, and this is most easily done in the following manner: Make a rough print upon any kind of printing-out paper and, with a pair of scissors, cut carefully along the line of demarkation between the landscape and the sky portion. Put both pieces in the sunlight to darken, and attach the sky half to the glass side of the negative in the right position to make the sky perfectly opaque, taking care that it does not overlap other portions of the picture. Then make the print in the usual manner, and afterwards print in the sky from a suitable cloud negative, using the other half of the divided photograph as a shield for the landscape portion already printed, in the same manner.

VIGNETTING.

Portraits are sometimes printed in such a manner that the picture gradually fades away towards the edges where there is perfectly white paper. This "artful fakement" is called vignetting, and is accomplished, as will be imagined, by shielding the edges during exposure or printing by means of a suitable

mask. Vignettters, as they are called, can be purchased from any dealer in photographic accessories, but as nearly every different picture or portrait requires a mask of different shape or size, it is less expensive for the amateur to make his own vignetting shapes as he requires them. Take a piece of card of the size of the negative to be vignettted, and cut a hole in it of oval or other shape, as the case may be, and rather smaller than that area of the picture which is to be unaffected by the shielding. Then with a pair of scissors snip out V-shaped pieces so that the hole is serrated all around inside like the edge of a saw. Place this card in the printing frame before you put the negative in, and bulge it out so that the teeth stand out in front of the glass to the extent of about half an inch. Then print in the ordinary manner, but in well diffused light, and the result should be a nicely graduated vignette without a trace of the serrated edges being apparent.

FRAMING.

In choosing a frame for a print—and the same thing applies to the mounts with deep margins which are so deservedly popular—great attention should be paid to the two chief things which have to be considered, namely, the particular character of the picture to be framed, for a very great deal depends upon the suitability of its surroundings, and the coloring and general nature of the wall upon which the frame is to be hung. This last is an item which seldom gets the consideration which it deserves. The beauty of a photograph is very much enhanced if it is surrounded with such colors as will suit its particular characteristics and hue. This is not the place to enter into a discursive consideration of what must, of necessity, be largely a matter of taste; it will be sufficient to point out that a photograph should never be permanently consigned to a frame without due consideration being given to the place and manner in which it is ultimately destined to be hung.

As regards the frame itself, in its relation to the picture, it is difficult to lay down any general rules as to its choice, but it will be safe to say that the mount and frame should both be chosen with a view to heightening the effectiveness of the picture they are to contain and of lending importance and dignity to its salient features. For instance, if the picture contains high lights which require accentuating, a heavy mass of black in the framing—if it be not included in the

picture itself—will be found to lend vigor and brilliancy.

Where the photographs are arranged in albums, the same variety of choice environment is not permissible, but even here there is scope for the exercise of the photographer's good taste, for much may be accomplished in a negative kind of way, by the careful choice of neighbors, so that incongruity of fellowship—whereby the effectiveness of a picture is often entirely nullified—may be avoided, and its telling qualities considerably enhanced by placing it among others whose particular qualities may act as a foil to its beauty.

Very convenient albums known as squeegees have lately been introduced, in which unmounted photographs may be inserted into the thickness of the pages, as it were, in much the same manner as cartes-de-visite and cabinets are slipped in the old-fashioned portrait albums. Photographic mounts, either plain or ornamented with seasonable legendary inscriptions, suitable to Christmas time, etc., built upon the same principle, can also be obtained.

CHAPTER V.

HOW TO MAKE ENLARGEMENTS.

ENLARGING BY DAYLIGHT.

It could hardly be an exaggeration to say that three-quarters of all the photographs taken by the amateurs of the world are, owing to the very great popularity of the hand camera, of the size known as 4x5. It is not only the hand camera that is responsible for this state of things, for even with the more important-looking apparatus on three legs it is often of very great advantage to the traveling amateur to carry about with him plates of the smallest convenient size, for not only is there by so doing a considerable saving of expense and bulk, in the matter of plates alone, but the size of camera, dishes and all the rest of the paraphernalia has to be taken into the question. But 4x5 prints are small and generally fail to satisfy the ambitious cravings of the photographer, so the question presents itself for solution whether it would be better to go in for larger apparatus and face the difficulties of weight and bulk and expense, or take arms against the sea of troubles and, by enlarging, end them.

The enlarging method has many very great advantages. Not only does it admit of carrying smaller equipments, which usually means that the photographer will be enabled to travel farther afield, but the small negatives which he produces are available for enlargement to any reasonable size and dimensions, so that he is not confined to one size of picture, or they may be printed directly in the form of lantern slides, which is a most delightful end to their career. Moreover, the most perfect photographer, even if he work with plates measuring a couple of feet across, rarely produces more than one or two pictures out of a dozen attempts which are worth framing. See what a waste of material and labor there is about those ten or eleven immense failures! for the experientia which docet might be just as well extracted from 4x5 plates, when their failure to come quite up to the scratch would be far less distressing. But when the

small plate user, who has naturally been free to make a far greater number of attempts, succeeds in producing a picture which is really worthy of the honor, he will have very little trouble in enlarging it to almost any size he may wish for.

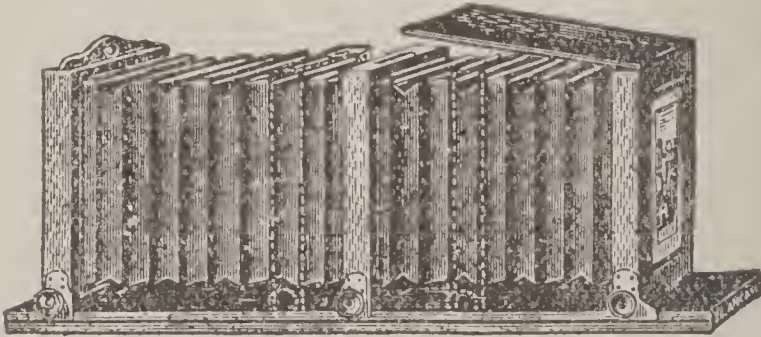


Fig. 30. Combination Enlarging, Reducing and Copying Camera.

I have described the use of what is familiarly known as bromide paper—paper which is coated with an emulsion of bromide of silver and gelatine of the same characteristics as that which is used in the manufacture of dry plates. If a sheet of such prepared paper be attached to an easel, and a negative image be projected upon it, such as would be thrown by a magic lantern in which a photographic negative was placed instead of the ordinary lantern slide, a picture will be produced upon development which is a perfect counterpart on a larger scale of what a print direct from that negative would have been. The result will be—except for a slight woolliness in the finer details, which is unavoidable, but very seldom disagreeable—in every way as perfect as a contact print upon bromide paper direct from a large negative would have been. And although for small work, such as 4x5 photography, bromide paper does not do justice to the capabilities of the negative, unless it is remarkably deficient in detail, it is, where larger work is concerned, often more likely to give satisfactory results than the slower printing-out paper.

An enlarging lantern, properly so called, is not a necessity for this work, except where the amateur is so placed that he is obliged to depend upon artificial light, for during daylight hours he is otherwise engaged—which is rather a paradoxical position for a

photographer to be placed in. The alternative method is to use the camera and lens with which the negative was originally taken to project its enlarged image upon the sheet of bromide paper by means of daylight. The way in which this is done can be plainly seen by reference to the accompanying diagram. The camera

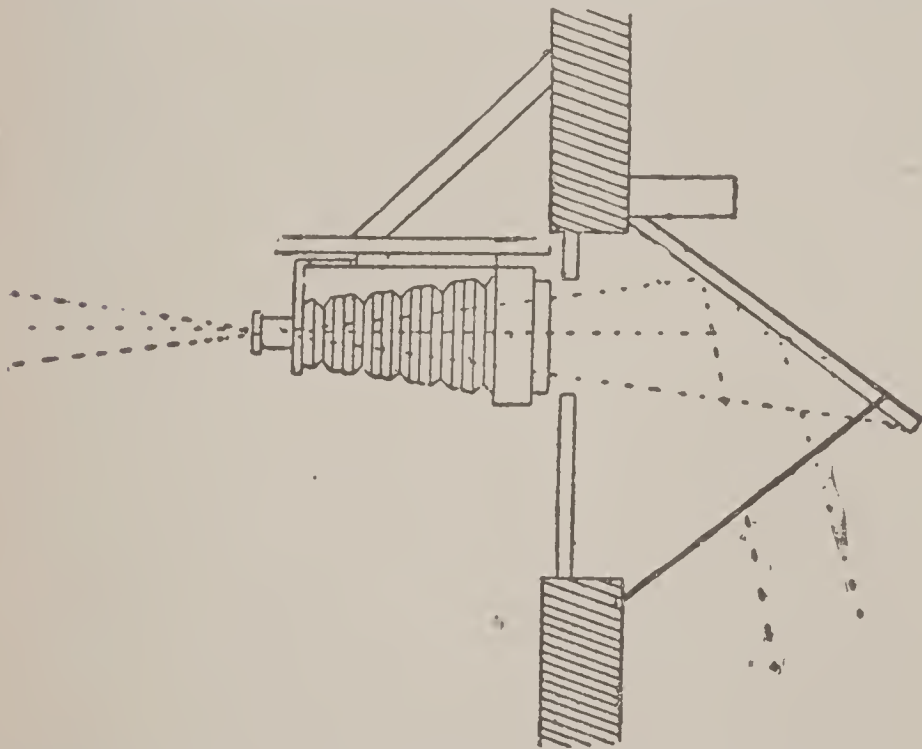


Fig. 31. Showing arrangement for enlarging with an ordinary camera by daylight.

is here shown supported on a table or folding flap just in front of a window which is blocked up with a wooden shutter so that no extraneous light can enter the room. Exactly behind the back of the camera a square or oblong hole is cut in the shutter, a little larger than the negative to be enlarged, and behind this hole—there should be no glass to the window—an inclined mirror is placed, of sufficient size and tilted to such an angle that, on placing the eye in the position occupied by the lens of the camera, a clear and uninterrupted view of the open sky can be obtained

through any portion of the negative. Should this, owing to force of circumstances and the position of the room chosen for the enlarging operations, be impossible, and trees or other undesirable objects will insist upon intruding themselves into the field of view, a sheet of ground glass may be placed an inch or two behind the negative—but not too near, or its grain will appear in the enlargement. This, however, will have the effect, while it equalizes the illumination, of cutting off a quantity of the light so that a longer exposure will be necessary, and there is an alternative method which is open to the same objection, in which the mirror is replaced by a dead white surface, such as a sheet of white card or a whitewashed board, with which, of course, the ground glass will be unnecessary.

With this arrangement, the negative to be enlarged is to be placed in the plate-holder, from which the middle partition has been removed, precisely as if it were a plate on which a photograph were to be taken, with its film side towards the lens. This holder is then fitted into position in the camera, and both slides drawn so that the light has free passage right through the negative from the reflector outside the window to the lens by which the image of the negative will be thrown on to the white screen placed on the easel to receive it. Then the focussing cloth should be carefully draped around the back part of the camera, so as to exclude all stray light which might leak through any space which existed between the opening in the shutter and the plate-holder containing the negative, for the room in which the enlargements are made must be just as carefully guarded from the access of harmful light as an ordinary photographic dark-room.

A square should be drawn upon the paper screen on which the image is to be focussed, to mark the place where the sensitive paper will afterwards come. The focussing is accomplished as accurately as possible by varying the distance between the lens and the negative in the camera in the usual way, and the size of the ultimate picture, of course, depends upon the distance of the screen from the camera. When all the adjustments are satisfactorily made, a trial exposure should be ventured by pinning a narrow strip of bromide paper upon the easel in such a position that it will cross the most salient portions of the picture. For daylight enlarging, where it is always advisable to use a small stop in the lens so as to improve the

definition, the quick variety of bromide paper should be used that the exposure may not be inordinately drawn out, but in any case, except for the smallest pictures, a long exposure will be required. When its length has, as the result of a few of these trial trips, been decided upon, the cap is placed on the lens and the sheet of bromide paper pinned in position. As a help in getting the paper in the right place, a lens cap, which, instead of being opaque, is fitted with a little window of yellow glass, will be found very advantageous, for it will allow sufficient non-actinic light to pass to show the outlines of the picture. After exposure, development, clearing and fixing follow exactly the same, except that in this case the paper being more sensitive to light than that used for contact work, greater care must be taken in all the dark-room manipulation that its whites do not become degraded by extraneous light.

ENLARGING BY ARTIFICIAL LIGHT.

But all amateurs cannot afford to devote daylight hours to the making of enlargements, and some are so placed that it is not convenient to knock holes in the window shutters, and various other objections may occasionally arise to render this method of enlarging a scarcely desirable one, and to cause a good means of enlarging by artificial light to be regarded as a consummation devoutly to be wished.

Either an ordinary magic, or, as it is now called, "optical," lantern, or, better still, one specially built with this object in view, will be necessary; and, if one has to be bought, the amateur will do well to procure one of those instruments which are made primarily for enlarging work with the secondary object of exhibiting ordinary lantern slides when required.

Such lanterns can be had fitted either with a good kerosene lamp, or with the much more perfect lime-light. Incandescent gas light, too, is much recommended for the purpose, and some are loud in their praises of the newly-introduced acetylene gas, which as now produced and used by means of the modern acetylene generator and burner bids fair to oust all competitors from the field, except lime-light and electricity. The qualifications of an illuminant for lantern work—and, therefore, for enlarging with a lantern—are brilliancy and smallness of light source. The latter is a necessity, because a large source of light involves the use of a lens of large aperture, and that means poor

definition, for owing to the peculiar nature of the optical system the lens must on no account be stopped down. But where the length of time occupied in exposure is not a matter of grave consideration, there is a method by which this difficulty may be overcome, and the lens stopped down to any desired extent.

Place in the lantern just behind the condenser—the large lens which is between the light and the slide—a sheet of fine ground glass. This will diffuse and soften the light before it reaches the negative and will, without any reduction in the size of the lens aperture, yield a much more satisfactory and pleasing picture, though it will increase the exposure necessary many times. And this arrangement will also permit of a smaller stop being used, so that greatly improved definition is obtainable, the exposure, of course, following the usual law as regards the size of the aperture. It will be found that with the ordinary optical lantern system as used for enlarging by artificial light there is a tendency to greatly exaggerate all the little defects which are apparent on most negatives, but with this ground glass method which I have suggested, the liability of these defects to show up on a greatly increased scale in the resultant picture is considerably reduced, and is of no greater consequence than in the case of daylight enlarging.

HOW TO MAKE AN ENLARGED NEGATIVE.

There is one other chief means by which the user of a small camera can gratify his natural desire to turn out large pictures, and that is by making an enlarged negative and printing his picture direct from it by contact, by any of the printing methods already described. As may be supposed, the making of an enlarged negative is a very similar operation to the producing of an enlarged positive, the chief difference being that a large sheet of glass has to be handled instead of a piece of paper.

The number of operations to be gone through is doubled, for two negatives and two positives have to be made before the photograph is finished. However, it is not feasible to make a direct photographic enlargement on platinotype paper, for instance, or any of the printing-out papers, and therefore it occasionally happens that an enlarged negative is a necessity.

The first thing to be done is to make by contact a really good positive print on glass—a transparency

which, like a good negative, has that due proportion of detail to density, not too much or too little of either one or the other, which is called good printing quality. It is not necessary to enter into details as to how this is accomplished; suffice it to say that it will be better to employ a glass plate specially prepared for positive transparency work, such as a lantern plate, for instance, and to use one of the developers recommended for positives rather than for negatives. The ferrous oxalate developer, of which the formula was given in connection with bromide paper, will be found to yield excellent transparencies if the instructions as to clearing, etc., be carefully carried out. It should be used in a stronger form than that recommended for the bromide paper, say one part of the iron solution to four, or even less, of the oxalate, the former being, of course, poured into the latter and not in the opposite order. Or the hydroquinone developer, of which a formula will be issued by the makers of the plates, may be used with results that cannot be beaten.

The sensitive glass plate upon which the enlarged negative is to be taken may also with advantage be of the lantern plate variety, though in this case it may be developed with pyro or any other reducing agent which may happen to be the particular favorite of the photographer, provided always that it is suitable to the peculiarities of the plate used. The plate is attached to the easel just as it would be if it were bromide paper, except that the drawing pins being inadmissible, some other method of fastening must be adopted. A very good plan is to drive three wire nails into the woodwork of the easel, two of them on a line with one another and sloping slightly upwards, while the third is considerably higher up on, say, the right-hand side, with its head inclined towards the left. The lower edge of the plate rests on the two lower nails and is pushed up against the remaining one so that it is prevented from falling forward. With regard to the exposure, some idea of its length will have been gained from previous experience with bromide paper, but a preliminary experiment or two should be made on a smaller plate of the same make, for these large ones are expensive and should be economized.

Development is conducted in a precisely similar manner as in the case of an original negative, having regard to the particular printing process for which it

is destined. Thus, for platinum paper it should not be at all yellow and need not be of quite so plucky a character as if it is required for printing upon Printing Out Paper or other similarly constituted medium.

GENERAL REMARKS ON PHOTOGRAPHIC ENLARGING.

The first thing to be taken into consideration is as regards whether what you contemplate enlarging is altogether worthy of the treatment. It should possess some other distinct merit besides mere technical excellence, something which shall give it a claim upon others besides its producer, some value of association, the pictorial record of a holiday, for instance, or it may be the portrait of a friend and therefore valuable for that friend's sake, or, best of all, it may be artistic in itself, a thing of beauty, which it is pleasant to look upon and which will be valued for its own sake.

Secondly, there is the consideration, is the negative sufficiently perfect, technically, to admit of satisfactory enlargement? Remember, all the tiny flaws, all the little scratches, pin-holes and dust marks, even those that are invisible as far as the naked eye is concerned on the original negative, will be produced upon the enlargement with terrible fidelity, and a photograph which is capable of producing a passably satisfactory print may fail utterly in yielding anything but an execrable patchwork when subjected to the searching process of enlargement.

It occasionally happens that the pictorial aspects of a photograph are very greatly improved by a little judicious shielding of one or more portions so that other parts are printed more darkly and certain constituents of the picture accentuated. This is easily accomplished during the progress of the exposure of an enlargement by holding a piece of black card between the lens and the bromide paper or plate at such a distance from the latter that it does not cast a sharp shadow, and moving it about over the parts to be affected so that there shall not be any distinct outline. Of course, considerable taste and no little skill are required in this operation in order that the "faking" may be properly done and done to the right extent, or, instead of being improved, the picture will probably be ruined.

In the same manner, when it is desirable to "print-

in" clouds, the sky portion, instead of being blocked out on the negative—always a tiresome progress—may be shielded during exposure, and then the cloud negative, being inserted in the carrier in place of the other, a second exposure is made while carefully shielding that portion of the sensitive surface which has already received the impression of the landscape.

CHAPTER VI.

LANTERN SLIDES AND TRANSPARENCY MAKING.

THE USES OF LANTERN SLIDES AND TRANSPARENCIES ON GLASS.

A large number of printing methods by which the amateur can turn his negatives into positive pictures have now been treated of, and he should have no difficulty in hitting upon one which will suit his taste. But no book on photography, however unpretending, would approach anything like completion without due attention being paid to transparency work, for that is not only one of the most beautiful of the printing processes at the amateur's disposal, but it is one of the most useful for various decorative purposes.

By far the larger number of photographic transparencies take the form of lantern slides, for this represents a method by which the amateur can exhibit his photographs to the very best advantage, and in such a manner that they will be pleasing and interesting to all his friends—which cannot always be said of a set of miscellaneous prints. It might seem to the superficial observer that transparencies designed for lantern work and those intended merely for visual purposes, would differ only in point of size and not necessarily in that. But that is not so. There is considerable difference in the quality of transparency required for the two purposes, and one which would be most effective for window decoration, say, would be almost useless for lantern work, while a perfect lantern slide when held up and examined in the ordinary way, appears to be very lacking in pluck and vigor and all those brilliant qualities which give to photographic transparencies their chief charm.

The reason for this is of course the very different conditions under which the two are viewed. In the one case, the picture is seen direct by brilliant light pouring right through it and going straight to the eyes, consequently, considerable density and depth of

detail are requisite to give it effect, while in the other, the light after passing through the slide, is spread out over a large white sheet, and reflected by that into the eyes, so that a very slight deposit upon the transparency is sufficient to make a marked difference in the amount of the illumination.

The most desirable qualities in a lantern slide are extreme transparency, so that as much light as possible may be allowed to reach the sheet, consistent with a sufficiency of contrast between the lights and shades; and good definition, for the slight diffusion of focus which is often a distinct artistic gain in the ordinary photograph upon paper or other opaque support, is quite inadmissible in a lantern slide, where such a very great magnification would make the lack of focus seem abominable. Those faults in a negative which, as I have already said in connection with photographic enlargement, though almost invisible and unnoticeable in a direct paper print by contact, show up in a terrible manner when the picture is subjected to the tremendous magnification of an optical lantern. Therefore, "seeing what small things are boisterous there," for "a grain of dust, a gnat, a wandering hair," will appear respectively like a huge boulder, an elephant, and a sea-serpent, it follows that only negatives which are technically perfect or nearly so, are eligible for the purpose of lantern slide making.

LANTERN SLIDE MAKING BY CONTACT.

Optically speaking, there are two methods of making lantern slides—leaving the chemical part of the subject out of the question altogether at present. They are called respectively, the contact method and the reduction method—terms which will hardly require an explanation, for to him who has understood the preceding pages, they are self-explanatory. Lantern slides by contact can, of course, only be made of the same size as the negative from which they are printed, that is to say, the objects which are shown in the negative will be reproduced in the lantern slide of the same size, and if the negative be larger than the lantern plate only a certain portion of the picture can be included in the transparency. Lantern slides are now always made of one standard size, namely, $3\frac{1}{4} \times 4$ inches, and if that portion of your negative which you wish to include in the slide be larger than

three inches across your only plan will be to adopt the reduction method.

However, the majority of photographs taken by amateurs are of the 4x5-in size, and most of these will be of such a character that, by dint of sacrifice half an inch from either side—often not a considerable loss—they are available for lantern slide purposes without further trouble. To make a lantern slide by contact upon a dry plate the operations to be gone through are almost identical with those necessary in printing on bromide paper. Place the negative face uppermost in a printing frame—we will suppose that it is a 4x5 one, for the sake of argument—and place over it, film to film, one of the special lantern plates sold by any of the good makers. Hold the frame up to the light of your red lamp while selecting the best portion of the picture for reproduction, and when the lantern plate has been placed in position to your satisfaction, fasten in the back and expose to gaslight just as you would if it were a print upon bromide paper that you were making.

If certain portions of the picture require shielding during exposure—and as you will probably have had previous experience with the same negative, you will know pretty well what special treatment it wants—this must be accomplished in the manner which has been already explained. And as in the case of bromide paper the character of the results upon lantern plates can be very considerably modified by varying the conditions under which exposure is made, a long exposure to a poor light tending to high contrasts or harshness, while an equivalent exposure under the opposite conditions tends to softness or lack of brilliancy.

LANTERN SLIDE MAKING BY REDUCTION— DAYLIGHT.

But the lantern picture-maker will probably soon find that he is considerably hampered by this necessity to reproduce his negatives in facsimile as regards size, for he will constantly find that he is obliged to cut out portions that are really valuable as pictorial constituents, and that many of his best views are ruined by the limitation of the process. For even 4x5 negatives are not always amenable to being ruthlessly cut off to the square of their smaller diameter, though they have been specially taken with

a view to be ultimately made into lantern slides, while those of a larger growth yield themselves up to the treatment less and less, in proportion to their size. So that if much lantern slide work has to be done, some method of reducing the picture to the standard size soon becomes more or less of a necessity.

Again, the subject is divisible into two principal methods of procedure, which, as in the case of enlargements already treated of, come under the heads of Daylight and Artificial light. We will take them in the order named. If the reader will refer to a diagram which I gave in connection with the subject of enlargement upon bromide paper (see Chapter V.), he will see for that work the light of the sky is reflected by means of a mirror or a suitable substitute through a hole in the shutter of a darkened room, thence through the negative from which the picture is to be made, and afterwards through an ordinary photographic lens by which the image is projected upon the sensitive surface placed to receive it. The size of the resulting picture depends upon the distance of that sensitive surface from the optical system. Now suppose that the sensitive film be moved so close up to the lens that the image of the negative, instead of being enlarged is actually reduced in size, and that the bromide paper is replaced by a lantern plate. Then you have all the elements for a daylight apparatus for making lantern slides by reduction. But it will be much more convenient in this case to turn the camera around so that the lantern plate can be contained in the plate holder instead of the negative to be copied, for that can easily be held in a frame attached to the shutter in which the hole is cut.

The negative to be reduced, then, is supported in front of a hole cut in the shutter of a dark-room, and outside of that shutter there is a mirror or other reflector, by which diffused daylight shines through all parts of the negative equally. Opposite is a photographic camera containing a sensitive plate, and a positive picture of lantern slide size to be made from that negative. Thus it is simply an ordinary photographic operation. The camera must be capable of racking out to twice its normal length and it would be as well to draw upon the ground glass a circle or a square to indicate the position which the lantern plate will occupy when the plate holder is inserted. Focus the image as carefully as possible with the full aperture of the lens, and use a small stop for the ex-

posure. It will be only misleading to attempt to give an idea of the length of time required, there are too many factors to be taken into consideration that cannot be reckoned with beforehand. A few trials will soon show the exposure required, and then Captain Cuttle's advice should be followed to the letter, as in all other cases where the length of exposure has to be found by experiment, "When found, make a note of."

The making of lantern slides by reduction has many distinct advantages over the contact method, which has not yet been touched upon. In the first place it yields far more perfect results as far as good definition is concerned, and that it must be remembered, is a very important matter in connection with lantern slides. Then it admits of conveniently printing in clouds as in the manner described for bromide enlargements, but that is not of so much importance because there is another and even more convenient way of adding suitable skies to photographic transparencies. It is this. The amateur has been advised to make for himself a stock of useful cloud negatives for wedding to his various landscape photographs as occasion may arise. Let him make from these, by contact or reduction, as he likes, for if they are 4x5 negatives it does not much matter, a series of sky pictures, upon lantern plates just as if those plates already contained landscape views to which it was desired to add clouds. Every lantern slide, and, indeed, all other transparencies, is finished by being mounted with a plain glass in front of it, to protect its film from injury. Therefore the easiest way to add clouds to one of these is to print the sky upon that cover glass by a separate photographic operation, and this method has this advantage, that you can "try on" a number of different cloud-scapes upon the landscape picture—just as you would, personally, a number of hats, until you find one that fits. Another advantage of the reduction method of making slides is that it permits the more readily of that judicious "faking" that may often be the means of so greatly improving the artistic value of a lantern picture, but whether the exposure be made in a camera or by the more simple contact method, the next operation to be considered is development.

LANTERN SLIDES BY REDUCTION—ARTIFICIAL LIGHT.

First, however, a word or two as regards the reduction method of making lantern slides by artificial light. If reference will be once more made back to that portion which is devoted to enlarging with a lantern, it will be found that the negative to be operated upon is placed in the slide stage of that instrument. Now, if the front lens of that lantern be removed, and the photographic camera, prepared for lantern slide making exactly as in the last-considered case, put in its place, a reduced image of that negative will be thrown upon the ground glass, and that image, falling upon a lantern plate, gives you the means of producing a slide by reduction with artificial light.

But it has been pointed out that in an optical system of this nature it is not possible to insert a small stop in the lens in order to improve the definition, for such a course would inevitably result in an uneven clouding over of the greater portion of the disc, and, indeed, the aperture of your photographic lens will probably be too small to give a clear image with any form of artificial light at your disposal, and the lantern lens would not be of good enough quality to yield the perfect definition required in a lantern slide.

So recourse must be had to the remedy suggested for this state of things in connection with the making of enlargements, namely, the placing of a sheet of ground glass between the condenser and the source of light. This will have the effect of greatly diminishing the illumination and consequently, of lengthening out the exposure to a very considerable extent, but that will not matter in the least, where lantern slide plates are in use, for the necessary exposure without this obstruction would probably be so very short that it could not be made at all without an instantaneous shutter. As regards all the other proceedings, they are similar to those which pertain to reducing by daylight.

DEVELOPING LANTERN SLIDES.

In developing a lantern slide, the greatest object to be always borne in mind is that the utmost transpar-

ency which it is possible to get, at the same time that the other essentials are not neglected, is the chief thing to be aimed at. All portions of the picture which represent white, that is, all the high lights, must consist of absolutely clear glass. They must not merely appear white by comparison with other portions of the slide, but there must be actually no deposit upon the film, and the test is to lay the slide down upon a sheet of white paper, and if the high lights do not then appear to be at all veiled, it may be pronounced a good one as far as this most important particular is concerned. But that alone is not sufficient to insure a technically perfect lantern slide. It will not do at all if the shadows be all represented by dense, impenetrable black, for then the clearness of the high lights would be only an aggravation of the terrible sootiness of everything else. No portion of a lantern slide should be so dense that the print of a newspaper could not be read through it if both were held up to the light. Remember that the density of a lantern slide appears upon the screen to be exaggerated, and exposure and development must be regulated accordingly, but it does not by any means follow that the height of the contrasts is increased to any extent. A slide must be full of pluck and vigor, but those qualities must be attained rather by the extreme whiteness of the lights than by the heaviness of the darker portions.

As regards the choice of a developer, that should be decided by the recommendations of the makers of the particular plates being used, just as in the case of negative plates or any other commercially-supplied sensitised commodity. As a general rule, hydroquinone, as a developing agent, is one of the best that can be employed, but it requires to be used with care and discretion, for the very qualities which make it valuable to the clever worker—the power which it gives him of obtaining sufficient density from even the most unpromisingly weak negatives, and so on, are of the kind to make it unmanageable in the hands of those who have not taken the trouble to master its peculiarities. Here is a formula which will be found to suit nearly every plate:

A.

Hydroquinone	240 grains
Potassium meta-bisulphite	240 grains
Potassium bromide	60 grains
Distilled water	15 ozs.

B.

Potassium hydrate (sticks)600 grains
 Distilled water 15 ozs.

For use, take of A and B each one part and mix with six parts of water. If this developer does not appear to quite suit the plates, try using a little more water, and that will probably make it right. I have found it to work very well with all the lantern plates that I have used, and that is why I quote it, but all the same, you cannot do better than stick to the one recommended by the plate maker, unless upon trial you find this to yield better results in your hands. For there is no doubt that different workers secure their best results with different developers, even when they are using the same brand of plates, but the developer, whatever it is, must be one that suits the particular peculiarities of the plates with which it is used.

COVERING, BINDING, AND FINISHING SLIDES.

I have already hinted that before a lantern slide is actually finished, it must be mounted by binding it to a protecting cover glass. These cover glasses can be bought ready cut to size and carefully selected so as to be as free as possible from any bubbles or other flaws in the glass. That the glass, both of the slide and the cover, should be very thin, will go without saying when it is remembered that there are two to be mounted together, and it is hardly necessary to again point out how terribly exaggerated are all little specks and flaws when the slides are subjected to the immense magnification of an optical lantern. However, the beginner need not trouble much about these cover glasses at first, for, for every slide that he turns out which will be worthy of mounting, he will in all probability spoil at least one lantern plate, and so, by cleaning off his failures he will be supplied with a sufficient number of cover glasses to mount his successes. The simplest way to remove the films from spoiled plates is to soak them for a while in dilute hydrochloric acid, when the gelatine will float away, leaving the glass support perfectly clean. It then merely requires rinsing in plenty of clean cold water, drying on old linen and subsequently polishing.

Between the photographic slide and its protective cover a paper mask is placed to form a kind of framework to the picture, and also, incidentally, to prevent the two touching one another so that the film might

possibly become chafed after considerable use. It is one of the most important things as regards the ultimate effectiveness of the picture in the lantern, that this mask should be so chosen that it suits the shape and character of the photograph. Color, of course, does not enter into the question at all as it does in considering the framing and mounting of an ordinary picture, for the mask must, of necessity, appear black upon the screen, but masks of all manner of shapes and sizes can be bought and should be carefully chosen for each picture, while for out-of-the-way cases, it is not a very difficult matter to cut a special mask out of black, opaque paper.

Having chosen a suitable mask and placed the cover glass in position, or if necessary, a cover glass bearing clouds of description to fit the view, the next thing is to bind the whole together. Again, the fore-sighted manufacturer comes to your aid with strips of gummed paper, called lantern slide binders. It is quite possible that you will experience some difficulty in making these sticky strips adhere to the glass, in which case strong starch paste, in which a little sugar has been dissolved, applied to them instead of water, will generally be found to overcome the difficulty. Lay the strip, gummy side uppermost, upon a sheet of newspaper, apply the paste evenly with a stiff brush, rubbing it in several times over till the paper is quite limp, and then, beginning right up at the left-hand side, place the compound slide and cover glass in center of the strip and press it down. The next movement I can only describe by asking you to imagine that the glasses are circular instead of square, for it is analogous to rolling them—together, of course—along the length of the strip, so that they pick it up as they go. In reality, this movement is performed one side at a time, and when the third side is lowermost, the paper attached to the first can be folded over and pressed down with the hand, so that at that edge the two glasses are bound firmly together. Then it is moved on to one more place and the second side treated in a similar manner, and so on, until all four are finished. The operation seems somewhat difficult at first, but the knack of it comes with a little practice.

HOW TO USE PHOTOGRAPHIC TRANSPARENCIES FOR HOME DECORATION.

If you hold up a technically-perfect lantern slide and look at it by transmitted light you will see that it is not by any means to be regarded as a perfect transparency for viewing in that manner. It will appear thin and weak in contrast, and of a decidedly wishy-washy character generally. But by this time, it is to be hoped you will be a sufficiently good photographer to overcome that defect when you want to make transparencies for direct visual purposes,



Fig. 32. Lamp-shade for showing off transparencies. Fits the rim of any ordinary duplex lamp, and has grooves to carry the transparencies intended for display. A light touch is sufficient to cause the holder to rotate, so that in turn all the pictures are brought in view.

such as for the decoration of windows and the like. It is really only a matter of judicious development. A transparency that is required for other purposes than lantern work should be carried farther in the developing process; in all other respects, its treatment is precisely similar.

Few people have any idea of the great possibilities as regards home decoration which are opened up to them by photography, especially through the channel of good transparencies. Such pictures come in for a great variety of decorative uses, the number of which, it might also be said, is only limited to the photographer's ingenuity. Lamp shades, fire screens, window blinds and many other things which are often so exceedingly ugly in themselves, can be turned into things of beauty by the tasteful use of photographic pictures in this form. Transparencies destined for this sort of uses should, as I have already said, be specially made upon transparency plates, and back with a sheet of ground glass in order to heighten the effect, and lantern slides which are often too dense to be really serviceable in their original capacity, can be turned to account, in this manner. They may be hung around opal glass lamp globes, for instance, when, besides serving the useful purposes of shielding the eyes from the undue glare, they form a very pretty ornamentation. But numbers of such uses will at once suggest themselves to the fertile imagination of the photographic amateur. It will be quite unnecessary to do more than throw out this suggestion.

CHAPTER VII.

MISCELLANEOUS BRANCHES OF PHOTOGRAPHY.

USE OF ORTHOCHROMATIC PLATES FOR FLOWER PHOTOGRAPHY—COPYING PAINTINGS, ETC.

When the budding photographic genius sees for the first time a certain make of plates advertised under the name of "Orthochromatic," he is generally quite at a loss to discover what particular peculiarities are implied by this curious title. Nor will he be much enlightened if he be told that the alternative name for precisely the same thing is "Isochromatic." The former word signifies "correct color," while the meaning of the latter is "equal color," and as photography up to the present is quite independent of color of any description, for it is unable to reproduce any of the various tints and shades of nature by a direct photographic process, it is difficult to see just where the application of these words comes in.

The idea that these unhappily-chosen adjectives are intended to convey when applied to a photographic plate, is that it is capable of reproducing colored objects in their correct tone-relation to one another. As everybody knows who has had his or her—especially her—photograph taken, the ordinary photography is not able to do this. Not only does it translate all color into sober monochrome, but the tints which it chooses to represent any given hue are generally of a very different shade to that which we would select as being of equivalent light-value. A lady who goes to the photographer's to have her portrait taken, in a bright red dress, finds, to her dismay, when the proof comes home, that, as far as that garment is concerned, she appears to be in deepest mourning, while her peacock-blue bonnet is represented as being nearly white. If the above combination of color is not one that you would wear, please forgive me, gentle reader,

for I am of male extraction, and do not understand these things.

But if the photographer who has to depict this somewhat trying subject were to use isochromatic plates, the red dress would appear of an equivalent shade of grey instead of black, while the blue, instead of coming out white or nearly so, would be represented by a somewhat lighter shade of grey—in fact, the colors would be reproduced just as a painter would show them if told to translate the subject into black and white.

This result is brought about by treating the plates in the course of their manufacture to a staining process with one of the yellow aniline dyes which gives to the bromide of silver emulsion a much lighter degree of sensitiveness to yellow and red light. Still, however, the most highly color-sensitized plates are far more susceptible to the action of what are generally called the actinic rays—those which form the blue and violet portions of the spectrum—and before such plates can be made to yield really correctly-toned photographs, this super-activity of the blue and violet rays must be reduced to a proportionate potential by filtering out a great number of them and allowing only a suitable quantity to pass. This sounds like a large order, but when it is remembered that a piece of what we call yellow glass, say, only appears to us to be yellow because it has the power of stopping all the rays of which light is made up, except those which are yellow in color, and from these, being the only ones to reach our eyes, we get the impression that the piece of glass is of yellow hue.

Now, if a piece of pale yellow glass, or stained gelatine, which is rather more convenient to use, be placed in the lens of the camera in such a way that all the light which passes through has to filter through it, a large proportion of the blue and violet light coming from the objects being photographed will be soaked up and absorbed, and a very much smaller quantity will reach the photographic plate than if the precaution were omitted, while the red and yellow rays are allowed to pass unobstructed. Then, if a plate be used which has been rendered sensitive to the yellow rays in the manner I have suggested, a photograph will be produced in which the various colors of nature will be represented by different shades of grey of a tone-value which will appear to us to be equivalent to the tone-values of the original colors.

This process places in the hands of the photographer a means of dispelling the great reproach which his art has had to bear ever since its conception, that it did not reproduce colors in their equivalent shade of monochrome. By its aid nearly all branches of photography are improved. Landscapes are rendered in a far more life-like and natural manner, for the bright green trees of early summer do not appear in that funereal aspect which was characteristic of the older photography; but it is more in photographing flowers or copying paintings that the orthochromatic process shows up to the best advantage, for in these the colors are of a more lively nature and of a kind to aggravate the faults of the ordinary photography.

The introduction of a yellow screen into the lens prolongs the necessary exposure to light to about twice to four times the time it would otherwise require, because it filters out many of the more active rays. This is one thing which is to be borne in mind when using the process, and the other is that the plates being far more sensitive to red light than those of the ordinary kind, very much greater care is required in handling them in the dark-room. Only a very small amount of light of the deepest ruby color obtainable must be allowed to reach the sensitive surface at any time until after development is completed, and this necessity for working in such deep gloom is certainly a great drawback to the process. But where paintings and flowers have to be photographed or it is desired to reproduce special effects in nature where the colors are of a kind to be spoiled if ordinary plates are used, the disadvantages of the process are well worth braving.

STEREOSCOPIC PHOTOGRAPHY.

Were I to tell you that it was habitual for you to "see double," I fear you might think I was casting aspersions upon your character, or hinting at moral obliquity. Yet it is true. The images which you see with your right and left eyes respectively are not precisely similar to one another. If you hold a book up edgewise, against your nose, you will be able to see one side of it with one eye and the other side with the other. The same thing occurs to a smaller extent with every subject you look at. One eye sees a little more of one side and a little less of the other of every solid object that the eye can embrace. There is not much difference, I admit, but there is a little,

and it is that difference which enables you to tell that an object is solid, without walking around it to make sure. If you stand perfectly still and look at an ordinary landscape, you can be quite certain that some portions of it are nearer to you than others, and you can even make a pretty accurate guess as to the relative distances of different objects. But if you look at a photograph or painting of that landscape you will soon be able to find some details in it which you cannot for the life of you tell which are nearer and which farther away from the observer, while only those things which you know from previous experience must be solid, can you with certainty invest with that quality.

But if you take two photographs of that landscape from standpoints separated from one another by about the distance there is between your two eyes, and place them side by side and look at the right hand one with the right eye and left hand one with the other, these two pictures will be blended together when the impression reaches your brain, and you will get an idea of solidity and differential distance just as if you were looking at the original natural landscape. But there are very few persons who have acquired the art of looking at two different pictures with their two eyes separately, and the majority are obliged to have recourse to a specially-constructed instrument known as a "stereoscope," so called because it enables you to "see solid."

It is not such a very long time since no fashionable drawing-room was deemed complete without its stereoscope and set of photographs for the same, and even now, in many homes, the instrument is to be found enthroned—for at one time this most beautiful branch of photography enjoyed immense popularity. However, its star waned, unfortunately, though the signs of the times are that it is once more in the ascendant. Meanwhile there are many devotees who recognize the marvelously beautiful results which are possible with the stereoscope, and who, by their patient work and excellent photography, will be the means of placing the neglected art once more on its former pedestal.

Stereoscopic photographs are not very difficult to make. A special camera is required, having two lenses exactly alike, separated from one another by about three inches, and each casting an image upon one photographic plate of a suitable shape to receive

them side by side. The interior of the camera is divided into two compartments, so that one picture shall not encroach upon the space reserved for the other. Stereoscopic lenses have to be accurately paired in order to produce pictures of exactly similar character as regards the size of the objects depicted, for lenses of the same make are rarely identical as regards focal length unless specially selected. The two lens caps are attached together by a connecting link in order that exposures of exactly similar length may be given to two constituent halves of the compound photograph, and if instantaneous pictures have to be taken, a specially-designed duplex shutter must be used. All these things can be obtained from the photographic dealers, so that the amateur who aspires to stereoscopic work—and he can hardly have a nobler ambition—will not find any difficulties in procuring the materials he will require.

It is easy to see that some subjects are far more suitable to stereoscopic treatment than others, and success in this branch of photography is largely a matter of the judicious choice of subjects. For instance, an open landscape view, in which all portions are of considerable distance from the camera, will not have its effect at all heightened by stereoscopic treatment, for there are no objects in the foreground round which the camera can look, as it were, and all the constituent parts are so distant and so much of one plane that there is nothing to which solidity can be given. In stereoscopic photography, distance does not lend enchantment to the view, unless there is something in the foreground to accentuate that distance and to give it effect. Choose a subject in which there are several planes, one behind another, clearly defined by some conspicuous object in each, and then the full and marvelous effect of this "solid-seeing" photography will be brought out.

But there is one thing in connection with it which must have particular attention, and that is the great importance of ensuring that that picture which in nature would be seen with the right eye, is placed in the right-hand half of the stereoscope, or else the whole landscape will appear to be turned inside out. It is easy to understand that if one eye receives the impression that ought to go to the other, the brain, whose duty it is to combine the two, gets considerably muddled up between them, and the result is a

most peculiar mixture.

The two pictures fall side by side upon the photographic plate, the left-hand one on the left side, and the right on the other, but each picture is, of course, separately inverted as regards left and right as well as top and bottom. Then, when a print is made from the compound negative, the lateral inversion is corrected, that is to say, the right-hand side of each picture appears upon the right, but both are still upside down. That is easily corrected, you will say, by turning the whole thing the other way up. Yes, that is so. But in so doing you will reverse the relative positions of the pictures, and put that one which has been taken with the left-hand lens upon the right-hand side, which is just what I warned you against. The photographs will require transposing; the print must be cut in half along the central line, and the positions of the halves reversed. The operation, of course, is simply equivalent to taking the two pictures—which were produced upside down in the camera—and separately turning them right way up. If it be particularly required to print upon one piece of paper, the negative itself may be cut in two and its two halves transposed.

FLASH-LIGHT PHOTOGRAPH.

When a thin ribbon made of the metal magnesium is ignited it burns steadily and quietly with a very brilliant, white light, and this light is even more brilliant, photographically speaking, than it is visually, for it is exceedingly rich in those actinic rays which have such very powerful effect upon the sensitive plate. With several of these ribbons plaited together—an arrangement which is called a "Magnesium Torch"—photographs of the interiors of the darkest subterranean caves, where daylight has never penetrated, may be successfully made, and the interiors of buildings, and even portraits, can be taken at night time by this means.

But there is a more convenient method of using the metallic magnesium as a light-giver for portrait work, and that is by using the metal in the form of fine dust, which can be thrown into a very hot flame, with the result of producing a sudden flash of intensely brilliant light. This method has been used with considerable success for photographing dramatic representations, large crowds of persons assembled at political meetings or functions of a similar char-

acter, and when there is no other means of taking such photographs—which constantly happens, for these gatherings usually take place at night—the end is generally sufficiently good to justify the means. But for ordinary portraiture it is rather less successful, for the sudden glare is enough to perturb the most phlegmatic sitter, and cause him to indulge in even more grotesque grimaces than is the wont of sitters for portraiture. For photographing interiors the “flash-light,” as it is called, may be used with better effect, but in either case, several small sources of light should be employed in preference to one big one, so that the illumination may be more evenly diffused, and hard shadows avoided as much as possible.

There are three chief ways of producing the magnesium flash. One is by blowing the powdered metal, by the aid of a puff of wind, into the flame of a spirit lamp; another consists in placing the powder upon a tuft of gun-cotton, which, when ignited, burns very quickly and sets fire to the powder as it blows it into the air, and the third is by means of a pyrotechnic mixture, manufactured and sold under various names as flash-light powders and flash-light cartridges. These mixtures are more or less explosive, and extreme caution must be exercised when using them. The gun-cotton method—though comparatively safe, and quite silent and harmless in action—is inconvenient because of the difficulty in firing a number of charges at the same moment, and stored gun-cotton is, to a small extent, liable to spontaneous ignition, which is not a pleasant habit in substances of this nature.

The remaining method, in which a puff of air carries the powder into a flame, though also open to objection, may be considered the most practical, or perhaps, it would be rather more correct to call it the least impracticable. Magnesium flash lamps are now articles of commerce—like everything else that the photographer can possibly wish for—and they have been brought to as high a pitch of perfection as can reasonably be expected. They consist of a spirit lamp, generally with an annular wick, in the center of which is a tiny reservoir, which has to be charged beforehand with magnesium dust. A pneumatic bulb, very like that used to actuate the release of an instantaneous shutter, only somewhat larger, serves to force the dust into the hottest part of the flame when

the time comes to make the exposure. Several such lamps can be worked at the same moment from one large bulb, by means of a system of branches for the tubes, or, in extreme cases, a specially-made pair of bellows can be substituted for the bulb to send the puff of wind along the several tubes.

The method of taking a flash-light photograph hardly needs description. The camera is focussed, generally with the aid of a lighted candle held near the object, for there is seldom anything in the picture which is sufficiently brightly illuminated to be visible on the ground glass, and then the cap being placed upon the lens, the plate holder is inserted and the slide drawn in the usual way. Just before the exposure is to be made, the cap is removed, and, after the flash is over, it is replaced while the shutter is closed again.

A more satisfactory use for the flash-light is to employ it as a means of auxiliary illumination in photographing insufficiently or unequally lighted subjects, such as interiors where one corner may often be the better for a little extra light. And during the exposure of a portrait, too, it may be useful to cast some further illumination upon that side of the figure which is farthest away from the regular source of light—always provided the sitter has sufficiently strong nerves not to be startled by the sudden flash.

In addition to its more serious picture-making uses, the camera is capable of affording the amateur photographer many opportunities of amusing and mystifying his friends. For instance, so-called "spirit" photographs are by no means difficult to produce, and should the reader desire to try his hand at this variation in the usual photographic routine he should proceed as follows: The sitter should be posed and the camera arranged all ready for the exposure in the usual way. The spirit or ghost must then take up his or her position in some expressive attitude behind the sitter, and, using a small stop, a very short exposure should be given. The spirit then moves away from the scene of action, and without any movement of either camera or sitter, a second exposure of longer duration should be made. On development of the negative, it will be found that the spirit comes out as a shadowy, transparent form, while the remainder of the picture is precisely the same as an ordinary photograph. A more hozy appearance may be imparted to the spirit by placing a piece of fine muslin

gauze in front of the lens during the first exposure. A photograph by this plan can only be achieved, of course, with the connivance of a sitter. If, however, the photographer wishes to obtain a similar result, without the sitter knowing what is being done, the first exposure on the "spirit" may be made some hours or even days before the actual portrait of the sitter is taken, though, of course, the same plate should be used for both exposures.

Some interesting photographic pictures may be obtained by the use of one or more mirrors, and, indeed, by standing opposite a mirror, the budding amateur may perpetuate his own portrait. By placing a sitter between a pair of parallel mirrors, arranged at a certain angle, so as not to reflect either the camera or operator, an interesting multiple portrait may be obtained, the one individual blossoming out into a whole row of exactly similar people. Also by arranging mirrors at proper angles, the full-face and right and left profile views of a person can be obtained on the same plate at one exposure. The distorted images presented by concave and convex mirrors may also be humorously turned to photographic account.

Probably some of my readers have seen photographs of a man playing cards with himself, or of a man about to cut his own head off. These pictures are termed "doubles," and are produced by the aid of an arrangement with two shutters which fits on to the front of the camera and which allows only half the plate to be exposed at once. The card-player seats himself at one side of the card-table and poses ready for the exposure. The right-hand shutter on the exposing apparatus is then opened and one-half of the plate exposed. The man then moves to the other side of the table, and when he has placed himself in proper position, the left-hand shutter is opened and the other half of the plate exposed. A simpler way of achieving the same result is to cut a small disc of black cardboard just to fit inside the front end of the brass lens mount. A segment of this disc of sufficient size to expose rather more than half the plate is then cut off this disc. The lens mount is not screwed tight home in its flange on the camera front, but is left just loose so that it can easily be revolved half a turn without disturbing the camera. The subject should first be focussed, and then the cue disc placed in position with the straight edge vertical. The cap is just on the lens, and when the sitter is posed, the cap taken off and replaced so as to make the

exposure. The lens mount is then turned round through half a revolution, the sitter changes his place to the required position, and the second exposure is made. In each case, of course, the sitter should be directly in front of the uncovered portion of the lens.

Caricature portraits may be made in several different ways. For instance, take two photographs of a friend, one of the head alone and the other of the whole figure; but the latter should be on a much smaller scale than the former. Take a print from each negative, and then neatly cut out the large head from the first print and paste it on to the shoulders of the small figure in the second print. From the composite picture thus obtained, make another negative, and then any number of prints can be obtained from this, showing your friend with a very big head on a very small body. Another plan is to make a comical drawing on a sheet of cardboard of a body and a pair of legs. Then the sitter who is to be caricatured should hold this drawing in front of him, and, placing his head just over the shoulders in the drawing, should be photographed in this position.

An amusing departure from the orthodox style of portraiture may be made by presenting a friend with a picture of himself inside a bottle. This should be prepared as follows. First photograph the individual on a sufficiently small scale to fit in with the size of the bottle. In this picture surrounding objects should not be allowed to appear. Then the bottle is photographed large enough to contain the man, and then by the combined use of the two negatives the finished print is made.

X-RAYS AND THEIR USES.

Quite at the beginning of the year eighteen hundred and ninety-six, the whole scientific world and all the ordinary people thereof were startled by the announcement that a means had been found of photographing the living human skeleton. And when a few days later the statement was substantiated by the actual photographs of the bones of the living hand, popular excitement rose to a height which has rarely been reached on account of a scientific discovery, and which was probably due more to the uncanny nature of the pictures than their importance from a scientific point of view.

Professor Roentgen, of Wurtzburg, was experimenting with some high vacuum electrical apparatus called

after the inventor, "Crookes' Tubes," and he happened to have some sensitive photographic plates lying upon the table, and he found that, by some means he did not understand, these plates, though securely guarded against the action of light in the usual manner by black paper wrappings, became fogged, just as if light had access to them. He, therefore, tried a few experiments with them, and these led to those curious and valuable results which have now made his name famous all the world over. He soon found that there was a kind of invisible radiation from these Crookes's tubes, which is not light, or at any rate is not light of the kind with which we are familiar, for it obeys none of the natural laws which govern all kinds of light, visible and invisible, with which we have ever had to do. The fact that this "New Photography," as it has been popularly christened, has "caught on" to such a wonderful extent, is largely due to the happy thought which suggested that the effect of the new rays should be tried upon the human hand, when it was found that they would penetrate the flesh, but they could not pass the bones. Consequently, upon a photographic plate placed behind, the curious result was obtained of a shadow photograph of part of the living skeleton.

But there are many other substances besides flesh and blood towards which these unknown rays—they are called "X-Rays," because their nature is not known—behave in a peculiar manner, in fact, their effect upon the majority of things is quite different to what might have been expected from our previous experience in relation to ordinary light. For instance, glass is very nearly opaque to this mysterious radiation, while wood and cardboard are almost perfectly transparent. An ordinary photographic lens with which to bring these rays to a focus is, of course, out of the question, but that does not much matter, for, if glass were ever so transparent to them it would not have the desired effect, for the rays cannot be refracted. So it will be seen these "New Photographs" are not taken by means of light, as far as we can make out, and they are certainly not taken with a camera. They are "shadowgraphs," pure and simple, and the agency by which they are made is probably some form of radiant electricity.

In making these "elec'rographs," as we might call them, a large Rhumkorff induction coil is employed

in connection with an electric battery or other source of low tension electricity to furnish the high potential current required to actuate the Crookes's tube. The active rays spring from the negative electrode of the tube when excited by the electricity, and in the best forms of tube for this special purpose, they are received upon a little mirror of platinum, placed just opposite the cathode—as the negative plate is termed—and so inclined that they are reflected downwards towards the sensitive plate placed beneath.

Let us suppose that what up to the present has been the most popular of all subjects has been chosen to be electrographed—the living hand. A large sensitive plate of the ordinary kind is wrapped up in a black paper envelope, which will protect it from the access of light, so that the operation may be conducted in a well-lighted room with impunity. The hand whose bones it is desired to shadowgraph is then laid on the plate, and the vacuum tube arranged at a height of about six inches over it. Then, the owner of the hand, having been cautioned to keep it as still as possible, the electric current is turned on and the invisible radiations from the tube allowed to act upon the plate for a period of five minutes down to half a minute, or even less, according to the size and power of the coil. Then the plate is taken to a dark-room and developed in the ordinary manner, and, all being well, it will show the flesh of the hand of a dark grey on a black background, upon which the bones stand out plainly revealed and almost white, while any metallic objects, such as rings, being absolutely opaque to the rays, will show up with brilliant whiteness.

It is the prints from such negatives as this that are now such familiar objects in the shop windows, where they never fail to attract attention. Though the interest in "The New Photography" cannot last at its present high pitch, after the novelty has worn off, the very great use which the "X-Rays" promise to be in the future, and are even now commencing to be to that noblest of all professions—the alleviation of pain and suffering—will ensure their memory being kept forever fresh.

CHAPTER VIII.

USEFUL FORMULAE AND RECIPES.

AMIDOL DEVELOPER.

Amidol from 30 to 50 grains
Sulphite of soda..... 1 oz.
Water10 ozs.

BELITZKI'S REDUCING FORMULA.

First dissolve 22 grains of potassium ferric oxalate in 1 oz. of water and then add to the solution thus formed 18 grains of sodium sulphite. When this has dissolved, add 3 grains of oxalic acid (crystals), and shake till the color of the solution turns from blood-red to green. Then remove any undissolved acid and add sodium hyposulphite 120 grains, dissolved in $\frac{1}{2}$ oz. of water. The reducer is now complete, and may be applied to freshly-fixed negatives directly after they have had a slight rinsing under the tap. The solution keeps almost indefinitely in the dark, and may be used over and over again until exhausted. If a negative has been previously dried, it should first be well soaked in water before reducing.

BLACK FOR COATING INSIDE OF CAMERAS, DARK-SLIDES, ETC.

The following is a useful black mixture for coating the inside of cameras, or dark-slides, lens mounts, parts of shutters, etc., or any portion of photographic apparatus which requires a dead-black surface: Take 1 oz. of gold size and 1 oz. of lamp black, and grind or rub these together thoroughly. Then add $\frac{1}{2}$ oz. of methylated spirit and 8 ozs. of turpentine. It may be applied with a fine piece of sponge or a soft brush.

BLUE PRINT PAPER—TO USE.

Ferro-prussiate, or blue print paper, may be bought in rolls or in packets cut to size. It is printed under the negative in the printing frame, as in the case of printing out paper, but should be printed in as

strong a light as possible. It should be printed until the shadows are obscured and the picture appears considerably over-printed. The paper should then be removed from the frame and washed in several changes of water, until the last change shows no trace of discoloration. This paper is very useful for quickly taking a number of rough prints from a negative, and with some subjects, such as sea-pictures, very charming results can be obtained. Ferro-prussiate paper may be toned brown by first immersing in a 10 per cent solution of washing soda till the image is bleached, and then removing it to a second solution, composed of tannin, dissolved in water to the proportion of 10 grains of the former to 1 oz. of the latter.

BRASS—TO BLACKEN.

The amateur often requires to re-blacken stops or other portions of the brass work of his apparatus, which have seen considerable use. The old black should first be cleaned off with a piece of fine emery cloth, and the metal should then be dipped in a mixture of equal parts of the following solutions:

NO. I. SOLUTION.

Silver nitrate	40 grains
Water ..	100 minims

NO. II. SOLUTION.

Copper nitrate	40 grains
Water ..	100 minims

When the stops are removed from the above they should be allowed to dry, and then should be uniformly and gradually heated until they assume the desired black color.

COMBINED TONING AND FIXING BATH.

In the chapter on toning the reader was shown how to mix up a toning bath, but the formula then given necessitated the use of a subsequent separate fixing bath. With the following solution, however, the processes of toning and fixing are carried on at the same time, and after this is done the prints only require washing. To obtain the most satisfactory results, however, the reader is strongly advised to use the separate baths as previously described:

NO. I. SOLUTION.

Chloride of gold	15 grains
Water ..	20 ozs.

NO. II. SOLUTION.

Sodium hyposulphite	4 ozs.
Water ..	20 ozs.

Take 4 ounces of No. I. Solution and add gradually to No. II. Solution, making sure that a thorough mixture takes place. The bath may then be used.

CRACKED NEGATIVES—TO PRINT FROM.

If the reader be unfortunate enough to crack a valuable negative, he may still obtain a satisfactory print therefrom, provided the film remains uninjured. The negative should be carefully placed in the printing frame in the usual way and the latter should be covered over with tissue paper or ground glass, so as to diffuse the light as much as possible. The frame should also be continually rotated during printing. If these precautions are taken, the crack in the glass will practically have no effect on the resultant print.

DIRTY BOTTLES—TO CLEAN.

The following is a simple method of effectually cleaning out dirty bottles: Procure a quantity of small lead shot and place them inside the bottle. Then pour in some fairly hot water, care being taken not to crack the bottle, and add a few small crystals of soda. Then shake the contents of the bottle vigorously for a short time, and unless the bottle has been exceptionally dirty, it will be found to be thoroughly cleaned. The contents should then be emptied out and the bottle finally rinsed out with a fresh supply of clean water.

EIKONOGEN DEVELOPER.

NO. I. SOLUTION.

Eikonogen ..	40 grains
Sodium sulphite	40 grains
Water up to	10 ozs.

NO. II. SOLUTION.

Sodium carbonate	200 grains
Potassium hydrate	25 grains
Water up to	10 ozs.

For developing, take equal parts of Nos. I. and II.

EIKONOGEN AND HPDROQUINONE COMBINED DEVELOPER.

Eikonogen	60 grains
Hydroquinone	20 grains
Sodium sulphite	2 ozs.
Water up to	10 ozs.

After the above are all dissolved, add $\frac{1}{2}$ oz. of potassium hydrate.

For developing, dilute with equal bulk of water.

ENLARGING A NEGATIVE.

The following simple plan for enlarging a negative may be found useful:

Make a solution of:

Citric acid	2 ozs.
Hydrofluoric acid	1 oz.
Acetic acid (glacial)	1 oz.
Glycerine	$\frac{1}{2}$ oz.
Water	20 ozs.

Wash well the negative, and immerse it in a deep dish, containing the above solution. The film will float off the glass and will spread out or enlarge evenly in all directions till a certain size is reached. Then remove the film, wash it well, and float it on to a fresh piece of glass of suitable size. It may then be allowed to dry.

FERROUS OXALATE DEVELOPER.

A two solution of ferrous oxalate developer can be made up as follows:

NO. I.

Oxalate of potash	4 ozs.
Water up to	16 ozs.

NO. II.

Ferrous sulphate	1 oz.
Boiled water up to	4 ozs.
Sulphuric acid	3 drops

For use, add 1 oz. of No. I. Solution to 3 ozs. of No. II.

FOCUSSING SCREEN—SUBSTITUTE FOR.

If you have the misfortune to break your focussing screen, an efficient substitute may be made in the following way: Obtain a piece of thin, clear glass,

of exactly the size of the original screen. Then take some negative varnish, dilute considerably with methylated spirit, and varnish the glass in a manner precisely similar to that of varnishing a negative as described in the preceding chapter on development. The glass should then be allowed to cool, and when the varnish has sufficiently hardened, the latter should be rubbed gently with the finger until it loosens in the form of a whitish powder. When this treatment has been applied all over, the powder should be carefully brushed away and the screen is complete.

GLASS.

A useful recipe for a glass cleaning mixture is the following:

Pumice stone (powdered)	2 ozs.
Whiting (powdered)	3 ozs.
Soft water	2 ozs.
Ammonia .880	1 oz.

This should be applied to the glass with a piece of chamois leather, and a final polishing may be given with a tuft of tissue paper.

HYDROQUINONE OR QUINOL DEVELOPER.

One-Solution Developer.

Hydroquinone	4 grains
Carbonate of soda	40 grains
Sodium sulphite	36 grains
Water	2 ozs.

Two-Solution Developer.

No. 1 Solution.

Hydroquinone	120 grains
Water	20 ozs.
Sodium sulphite	2 ozs.

The hydroquinone should be dissolved in the water before the sodium sulphite is added.

No. 2 Solution.

Bromide of potassium	30 grains
Carbonate of potash	4 ozs.
Water	20 ozs.

For use, take equal parts of Nos. 1 and 2.

METOL DEVELOPER.

No. 1 Solution.

Metol	1 part
Sodium sulphite	10 parts
Water	100 parts

No. 2 Solution.

Sodium carbonate crystals	10 parts
Water	100 parts

For use, mix equal parts of Nos. 1 and 2.

METOL AND HYDROQUINONE DEVELOPER.

Metol	12 grains
Sodium Sulphite	$\frac{1}{2}$ oz.
Hydroquinone	18 grains
Potassium carbonate	100 grains

Take 5 ozs. of water and add and dissolve each of the above constituents in the order given. For use, add 1 oz. of water to each ounce of solution.

MOUNTANT FOR PRINTS.

Dissolve 2 ozs. of gelatine in 7 ozs. of water. To this add first $\frac{1}{2}$ oz. of glycerine and then 3 ozs. of methylated spirits. The mountant should be applied to the back of the print with a stiff brush, and the print should then be placed in position on the mount and rubbed or rolled firmly down.

PLATES—TO DRY QUICKLY.

If it is desired to dry a negative with especial quickness after it has been developed and fixed, the following plan may be adopted: First thoroughly wash the negative and then drain off as much of the water as possible. Next immerse it in a bath of pure methylated spirits or alcohol for about five minutes. Then take it out, drain off the alcohol, and stand the negative up on end to dry. Drying will be completed in from five to ten minutes, according to the strength of the spirit.

RUBY GLASS—A SUBSTITUTE FOR.

If the amateur requires a large piece of ruby glass, or has the misfortune to break his ruby lamp, the following hint may prove useful: Procure two sheets of ruby tissue paper and stick one on top of the other

by means of a coating of varnish so as to form a double thickness. If a very deep ruby is required, add an extra sheet in the same way, or, better still, a sheet of orange paper.

RETOUCHING MEDIUM.

When touching out "pinholes" or other blemishes in a negative, the reader will find some little difficulty in making the pencil "bite" the film so as to produce the desired effect. To avoid the trouble, a retouching medium should first be applied to the place where it is desired to work upon. To prepare such a medium, take—

Sandarac	1/2 oz.
Castor Oil	40 grains
Methylated spirits	3 ozs.

The tip of the finger should be moistened with this mixture, and then applied to the negative and rubbed lightly thereon until it commences to grip or stick. The desired retouching may then be readily carried out.

SPOILT NEGATIVES—TO REMOVE FILM FROM.

The reader may sometimes require a piece of clean glass, and such is readily obtainable by stripping the film from a spoilt negative. To do this, immerse it in a weak solution of hydrofluoric acid, and before long the film will leave the glass. If the acid solution is not available at the moment, put the negative, film side up, under the hot water tap. In a few minutes it will be in such a condition as to require but little trouble to remove it.

STOPPERS—TO REMOVE WHEN TIGHT.

In the case of bottles with glass stoppers, trouble may sometimes arise through the stopper sticking and refusing to come out when wanted. Prevention is better than cure, and the way to prevent such an occurrence is to wipe just a suspicion of vaseline round the part of the stopper which enters the bottle. When, however, a stopper does stick, the neck of the bottle should be heated evenly all round, either by the friction of a piece of string drawn rapidly backward and forward, one turn being made round the neck, or by the direct heat of a taper or match. This alone will not loosen the stopper, but it causes the neck of the bottle to slightly expand and the

stopper can then probably be worked loose with the finger and thumb. In obstinate cases, a stick of wood with an oblong hole cut in it to fit the stopper should be fixed thereon, and a steady twisting strain applied.

TEN PER CENT SOLUTIONS.

Strictly speakin, a ten per cent solution is a solution which consists of a liquid having some substance dissolved therein, and of each part, by weight, of the liquid, one-tenth is represented by the weight of dissolved substance contained in that part. For photographic purposes, however, a ten per cent solution is taken to indicate that in a fluid ounce of 480 minims there should be 48 grains of the dissolved substance. To make a ten per cent solution of, say, pyro, take 1 oz. of this substance and add water to make up not ten fluid ounces, but nine fluid ounces, 55 minims. The advantage of such a solution is that a required weight of pyro can readily be measured out without weighing, for if 15 grains are required, then 150 minims of the solution will contain the desired amount and may quickly be poured out exactly, and without trouble.

WEIGHTS AND MEASURES.

Avoirdupois Weight.

27 and 11-32nds grains equal 1 drachm.
16 drachms (1 ounce) equal 437½ grains.
16 ounces (1 pound) equal 7,000 grains.

Note: All chemicals are sold by avoirdupois weight.

Liquid Measure.

60 minims equal 1 drachm.
8 drachms (1 ounce) equal 480 minims.
20 ounces (1 pint) equal 9,600 minims.
8 pints (1 gallon) equal 76,800 minims.

GENERAL INSTRUCTIONS FOR OPERATING FOLDING HAND CAMERAS.

The instructions given below will have to be modified somewhat to suit the peculiarities of the camera used, but as nearly all folding cameras are of the same general construction, the necessary modifications will not be material.

Hold camera in left hand. With thumb or finger of right hand press concealed button on top, which

will release the bed. Lower to a horizontal position until the side arms snap into place, take the bulb and tube from its position and place over the front of bed.

With the thumb and forefinger release the small hook-shaped lever directly under shutter by a slight turn from right to left. Gently pull on same, drawing the bellows and front of camera out upon the bed until the index on left side of front indicates the desired distance, as shown on focussing scale from your position to the object to be photographed, which has previously been measured or estimated. (All objects 100 feet or more away are in focus when index is set on the 100-foot mark on scale.

Take the loaded plate holder from the carrying case, inserting it in back of camera in front of ground glass. Gently move until it snaps into position. Withdraw the slide nearest the front of the camera. Set the shutter as per instructions, composing the view by aid of the view-finder, holding the camera perfectly level. Press the bulb and the exposure is made. Insert the slide in the holder (placing the black side of handle nearest the front of camera, which is an indication that the plate in that side of the holder has been exposed), inserting the slide perfectly even—not one corner at a time. Withdraw holder by using the right hand, drawing slightly toward the rear, reverse holder and proceed as before.

Having completed the exposures desired, withdraw the plate holder from in front of the ground glass, placing it in the space allotted to it in the carrying case. Release the hook-shaped lever and gently press the front back to position within the camera box, tightening the lever by turning from left to right. Place tubing around shutter, allowing the bulb to rest on the opposite side from the view finder. Holding the camera with both hands, gently press with both thumbs on the side arms, which will release them, and close the bed to its original position.

In using the camera with a tripod, set up the tripod, place the camera on top, inserting the tripod screw in the socket of camera, screwing tight. Open camera as per instructions when using by hand. Manipulate the legs of tripod until the camera is level. Turn button in back of camera, which will open panel, exposing the ground glass to view. Set the shutter and turn dial to letter T and press bulb

once, thereby opening shutter. Look upon the ground glass and the view may be plainly seen. A focussing cloth may be used if desired, which will greatly add in composing the view. With the right hand manipulate the front of camera by drawing the bellows forward and back until the correct focus is obtained. When instrument is supplied with rack and pinion, use same when focussing instead of the lever. (Remove focussing cloth if one has been used.) Close the pantl in back of camera and press bulb once to close shutter.

Turn the dial of shutter to the required position for time, bulb, or instantaneous exposure. Set shutter and make the exposure. When all exposures desired are made, close the camera as previously instructed, unscrew it from tripod and place in the carrying case.

The rising front is used when as little foreground as possible is desired. By turning the milled head screw on the side of front and raising the bellows, together with lens and shutter, the result is obtained and can be better understood by raising and lowering the lens while observing the view on the ground glass.

ALWAYS readjust the rising front to the original position before attempting to close the camera.

The entire back containing ground glass may be removed by pressing down on the small spring at top of same and gently drawing the back from the camera. This is used only when a roll holder is being adjusted.

THE SWING BACK

Is used to assist in bringing into focus nearby objects at the same time as those at a distance, and to correct distortions. Should it become necessary to tip the camera in a downward position to get the views, swing top of back out and bottom in. If camera is tipped upward, reverse position of swing, the top in and bottom out. The plate in consequence is nearly perpendicular and the distortion is obviated. It would also apply when back is reversed for upright pictures, the plate in a vertical position, for photographing tall buildings, churches, etc., when it becomes necessary to tip camera up, press top of back in and bottom out. The side swing is used when photographing parallel objects. For illustration, when by the side of a long bridge, when all cannot be brought into focus. By swinging one side of the plate nearer the lens, the other farther from

the lens, the correct focus is obtained. To operate, open the end door and press the two concealed buttons at the rear, opening the top of camera. With one hand release the swing, and with the other hand grasp top of the swing and move to the desired position.

THE HORIZONTAL SWING

Is manipulated by pressing the lower catch on bottom of camera and with the other hand grasp the swing at the bottom and move to desired position. Always straighten the back or swings after using, and before attempting to close the camera.

THE PRINCIPAL OBJECT

Of the Tele-Photo, or long draw camera, is that objects at a distance can be made nearly double in size in the picture. This is accomplished by unscrewing the front combination of the lens from the shutter, using the back lens only. The use of the rack and pinion and focussing on the ground glass will be necessary.

FOR VERTICAL PICTURES.

Open top of camera and press upward on the two brass catches holding back and ground glass in place. Detach the back and reverse, placing ground glass frame in the brass holder or projection at bottom and press back into position until spring catches engage the pins at top. In taking vertical pictures the plate holder is inserted between ground glass and frame from the top of camera instead of from the side.

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