UC-NRLF
B 4 420 945

The University Library
UNIVERSITY OF CALIFORNIA/SANTA CRUZ

The University Library
UNIVERSITY OF CALIFORNIA/SANTA CRUZ

Digitized by the Internet Archive
in 2007 with funding from
Microsoft Corporation

http://www.archive.org/details/modernphotograph00abborich

MODERN PHOTOGRAPHY

IN

THEORY AND PRACTICE

A HAND BOOK FOR THE AMATEUR

BY HENRY G. ABBOTT

LICK OBSERVATORY
UNIVERSITY
1911
OF CALIFORNIA
MT. HAMILTON, CAL.

13288

CHICAGO:
GEO. K. HAZLITT & COMPANY,
PUBLISHERS.

Lick Obs
plcc

Copyrighted 1898
Copyrighted 1899
BY
GEO. K. HAZLITT & CO

TR
146
H4
1899

PREFACE.

This volume has been printed for the convenience of amateur photographers. There are two kinds of amateurs, one that presses the button and allows the professional to do the rest and the other, the earnest student, who has ambition to become, in every sense of the word, a photographer. This volume was not prepared for the former, for he rarely, if ever, makes any progress, and in fact does not seek to do so. Many difficulties and obstacles are encountered by every amateur and this volume is intended to reduce these difficulties as much as possible, by giving advice and instruction, which, if followed carefully, will save the amateur's money and many perplexities and annoyances.

Cleanliness is a prime requisite in all the various branches of photography, from the loading of the plate holder to the finishing of the print, if we would meet with success. Where formulae are given, the exact proportions must be adhered to. There are no short-cuts in photography and no guesswork when using chemicals. Every chemical must be weighed or measured with as much care as though you were putting up a prescription for a patient. Carelessness in regard to either of the above points will only lead to failure and make you disgusted with your camera, your plates and yourself. Ninety-nine times out of a hundred, failures are the result of carelessness and are not the fault of the camera maker, or the plate or paper manufacturer. Mix common sense reasoning with your chemicals. Read carefully, not superficially, all the works and trade journals on photography that are within your reach. The trade journal or book is poor, indeed, which cannot give you some new idea, or at least throw light on some subject which heretofore has been unintelligible to you.

This work is based on the experiences of the writer who is an amateur, not a professional. He has not graduated and probably never will, and is constantly running up against troublesome problems. He well remembers all the perplexities he had to contend with and hopes and believes that this volume will save the amateur much worry and needless expense.

H. G. A.

CONTENTS

MODERN PHOTOGRAPHY.

CHAPTER I.

Cameras are divided into two general classes, snap-shot or box cameras and tripod or professional cameras. It is true that the box camera may also be used in connection with the tripod and that all, or nearly all, of them are arranged for time exposures as well as instantaneous or snap-shot work. Box cameras are again divided into fixed focus and bellows cameras, into those using films and those using glass plates and those using single plates and those fitted with a magazine. Bellows cameras are again divided into two classes, those with a bellows inclosed in the box and worked backward and forward by means of an indicator on the top of the box and those having an exposed bellows which is drawn out by letting down the front of the box. The average amateur buys the cheapest camera he can find, as a rule and often the results obtained disgust him with photography forever. If you desire to take up photography with a view of making good pictures, artistic ones and propose to stick to it until you succeed, by all means purchase a good article at the start. If, however, you simply wish to press the button and then hire some professional to develop your plates and print and tone your pictures, then any camera is good enough for you, no matter how cheap and how poor.

Now as to whether you will select a camera using films or a camera using glass plates you must be the judge. The film camera possesses the advantage of being light and under certain circumstances is to be preferred to a camera which uses glass plates.

The war correspondent and explorer could hardly use glass plates to as good advantage as films, as he would have to rely upon a changing bag to change his plates in and the glass plates being fragile would be liable to be broken and their faces scrubbed and scratched.

Let us explain the difference between a film and a plate camera, in order that you, who have not already made a selection, may thoroughly understand it.

A plate camera is one using glass plates coated with a sensitive emulsion and this plate is held in what is known as a plate holder, with the coated or emulsion side outward, so that the light, passing through the lens, when the shutter is open, falls upon the sensitive emulsion. A film camera is one in which the image is recorded upon a piece of celluloid, which is coated with a sensitive emulsion, as in the case of the glass plate. Films are of two general types, roll, or cartridge and cut or flat films. The roll or cartridge film is a continuous strip which is coated on one side, while the cut

A Study in Lighting. E. Y. Judd, Pendleton, Ore.

film is the size of a single picture. The cut film is held in position in a holder, the same as a plate but the cartridge film needs no holder, since it unwinds from a spool at one side and winds up on another spool on the other. Now there is another difference between a cartridge and a cut film. To load your plate holders with cut films you require a dark room the same as you do if you are using plates but a cartridge film can be put in or taken out of the camera in the daylight. The film is rolled upon a spool and is covered with a strip of black paper from one end to the other and this strip extends several inches beyond the film on each end. This paper connects with the flanges on the spool and thus forms a light-tight spool, known as a cartridge. The spool can be inserted in the camera at the back, after loosening the fastening which holds the black paper in place. The paper is then threaded into the slot on the other spool, which is on the opposite side of the camera. The camera is then closed and the key turned until the black paper has been wound off and the film is then in place ready for exposure. The black paper is still back of the film and at regular intervals, depending on the size of the picture, the black paper is numbered in white ink, from 1 to 12, or whatever number of "exposures" the cartridge contains. In the back of the box will be found a small red window and the white figures are easily seen through it, showing just how far to turn the key.

You cannot become a photographer in a day, or a month, or a year. Some persons seem to have the happy faculty of taking good pictures from the start, while others after months of experience are little better than they were the first week. The theoretical amateur, who can tell you all about lenses and cameras, exposures and development is legion. Theory is all well enough but with your theory combine practice. Never mind about the angle of your lens or its focal length until you have mastered some of the more necessary details.

Before selecting a camera you must make up your mind just what kind of work you wish to do. You can perhaps better understand what you want after we have passed in review the leading types of cameras on the market. The difference between a good camera and a poor one lies very largely in the lens and yet a cheap lens is sometimes very effective. For landscapes a single lens answers very well but when we come to use these lenses in photographing buildings, etc., we find that they have a decided tendency to lean and it makes no difference how careful we may be, this objection cannot be done away with. In late years, however, there has been a marked improvement in all of the cheap, single lenses and we have seen such lenses in very cheap cameras that were so perfect that even tall buildings were perfectly upright and they apparently differed from the better grade of rapid rectilinears only in the depth of detail and the rapidity of action. Most of the modern cameras companies manufacture their box cameras with single achromatic or rapid rectilinear lenses and fix their prices accordingly. The lens is to the camera what the eye is to the human body. If the lens is poor or limited in capacity, to just such an extent will the picture lack details, sharpness and parallelism of lines. Our advice is, if you propose to follow up and master all the details of photography, by all means buy a camera with a rectilinear lens and you will then be fitted for all the various kinds of work, as landscapes, interiors, portraits, views of buildings, etc. For good portrait work, however, a special lens is required, one made for the purpose. Next to the lens in importance comes a good shutter, one that is free from jar and tremble; light, but yet rigid enough to stand the strain of long use. The camera should be simple in construction, free from complicated mechanism, compact and light.

Nearly every camera has its own good points and has its friends and we therefore shall not try to influence the reader in his selection further than to advise him to purchase a good article at the start. We shall review the leading types of cameras on the market and leave the selection to the reader.

CHAPTER II.

We will endeavor to thorough explain the various kinds of cameras on the market. As we said before, box cameras are divided into two general types, those having a fixed focus and those having a bellows. Fig. 1 illustrates the Premo V, a cheap camera of the universal or fixed focus type. By a fixed focus is meant that this camera has no bellows to draw in or out, for the lens is of the single achromatic type, so that no matter whether you are taking a picture six feet or five hundred feet away, it will be in focus just the same. The term focus will be made clear when we come to a description of the practical use of the instrument. This camera, like all others that we shall describe, uses glass plates. The plate is inserted in the holder and the holder is inserted in the rear of the camera box, through a door made for the purpose. Then when the slide is pulled we are ready to take a shot. This camera has an adjustable diaphragm, having large and small openings for the admission of light. The shutter is adapted for

Fig. 1.

both time and instantaneous work and the speed can be governed by means of a small lever at the front. The large central opening in the end is the lens and the two smaller ones at the top and side are the finders. The finder consists of a small lens and just back of it is a small mirror placed at an angle, so that the view is reflected upwards and is seen on the small piece of ground glass inserted in the top of the box. By shading the finder with the hand and pointing the camera in the direction of the object or scene to be photographed, a reduced image of the object may be seen on the ground glass and as the finder is made to coincide with the lens, the view we see in the finer is the one we will have on our plate. The finder gives the same view that the focusing screen at the rear does, except that the view is reduced in size and is not upside down as it is on the focusing screen. On the focusing screen, in the rear of a bellows camera, the view is transmitted by the large lens with which the picture is taken but in the finder it is transmitted by the small finder lens. Other cameras of this type have a bellows concealed in the box and this bellows is moved back

Fig 2.

and forth by a lever. Such cameras do not use fixed focus lenses and hence the necessity of focusing by drawing in or pulling out the bellows.

Fig. 2 illustrates the Premo Sr., a type of bellows or folding box camera. This instrument is first class in every respect and represents one of the very best types of cameras for the amateur. It is made in various sizes from 3¼ x 4¼ to 8 x 10. The 4 x 5 size is the most popular among amateurs in all makes of cameras. It is a great mistake for the novice to purchase a large camera. The larger the camera the greater the expense involved for plates, developing trays, washing and hypo boxes, paper, printing frames and mounts. A well chosen subject, properly exposed, developed and printed, in a 4 x 5 size, will always stand enlarging to 8 x 10 or larger. Mistakes and failures are bound to happen to all amateurs and for this reason it will found much more economical to use a small, rather than a large camera. Plates, paper, etc., for the 4 x 5 size are kept in stock by dealers in all parts of the world, while other sizes are not always to be had so readily. The Premo Sr., 4x5, when closed, measures 4⅝x5⅝x7 inches. Fig. 3 illustrates this camera when closed.

Fig. 3.

By pressing a concealed button at the top, the front falls down into position and is rigidly held there by a brace, which is shown at the right in Fig. 2. Just above the words Premo Sr. you will see a brass lever. This lever is connected with a cam and by turning it, as shown in the illustration, the front of the camera is bound in position. Push this lever to the left, (looking at the camera from the front) and draw out the bellows and clamp it in position by turning the lever as shown in the illustration. On the right hand side will be found a white celluloid scale and an index finger. The scale is for focusing when using the instrument as a hand camera. If the main object to be photographed is fifty feet away, you draw out the bellows until the index finger points to fifty on the scale. The small square box on the left is the view finder previously referred to and it is pivoted so it can be turned over when taking high or panel pictures. Two kinds of pictures can be taken, one which is four inches high by five inches wide and another which is five inches high by four inches wide. The camera is now in a position to take the former and in the event that we wish to photograph a church with a steeple, a high building or tall trees, we simply turn the camera over, with the view finder on top and turn the finder on its pivot. We will now get a picture which is five inches high and four inches wide.

This camera has a rack and pinion for fine focusing when using the ground glass. To the right and left of the bellows will be seen the two milled nuts which operate the mechanism. On the front board will be seen the lens, shutter and diaphragm and in order to examine and understand their workings see the enlarged view at Fig. 4. Ordinarily the diaphragm consists of a circular piece of metal plate with various sizes of holes cut through it and is also known as the stop. This camera has what is known as an iris diaphragm, similar to that in the human eye and this diaphragm opens and shuts by moving the small index at the bottom marked C. The use of the diaphragm will be explained later on. The center is occupied by the lens and as it is of the double variety, one half is located in front and the other half in the rear of the lens tube, leaving room for both the diaphragm and shutter between the front and back combinations. In the illustration the diaphragm is opened to a 16 stop and the shutter is also open. The circular plate above the lens is the shutter mechanism and dial. It will be observed that this dial is marked 100—25—5—2—1—B.—T. If the dial is turned until the hand points to 100, then $\frac{1}{100}$ second exposure will be made, if to 25 the $\frac{1}{25}$,

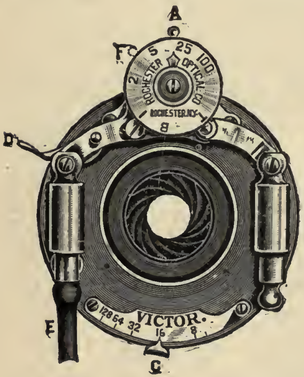
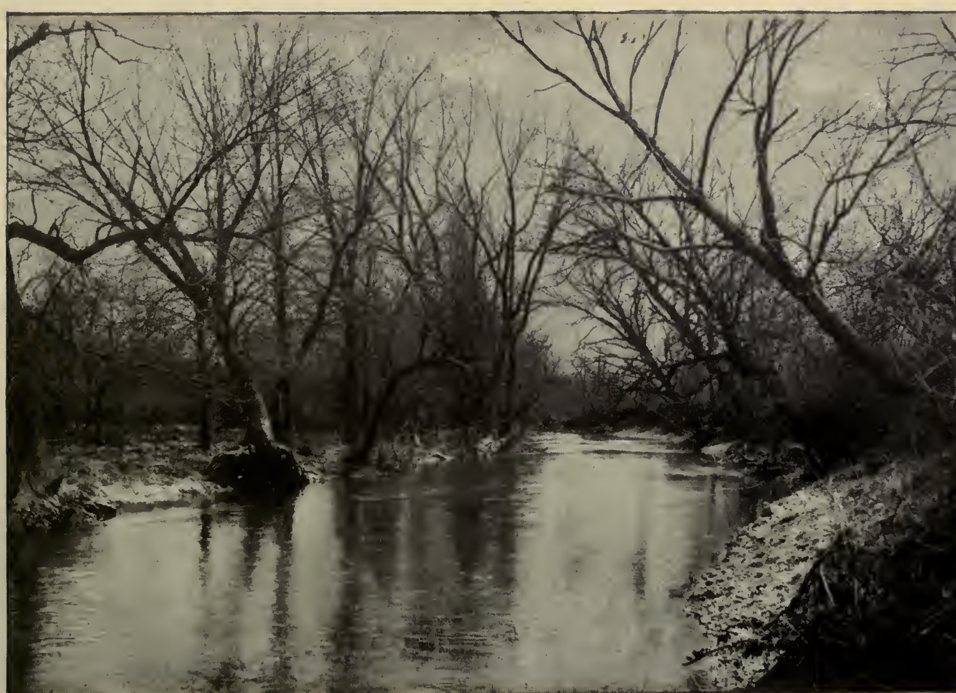


Fig. 4.



Salt Creek in April. Henry G. Mohr, Chicago.

if 5 then $\frac{1}{5}$, if 2 then ½ and if 1 then 1 second exposure. When the dial is turned until the hand points to B then the shutter will remain open so long as the pressure is exerted on the bulb, or if the hand points to T then one pressure of the bulb will open the shutter and the next pressure closes it. To manipulate the shutter, the lever A at the top is moved to the left, as shown by the dotted lines at F, until a click is heard. This winds the spring which sets the shutter in motion. The shutter can be released either by pressing upon the lever D or by pressing the bulb, which is shown in Fig. 2.

The front board of this camera can be moved up or down or to the right or left as occasion may require and is technically known as a double sliding front. By consulting Figs. 2 and 3 you will observe a pair of hinges on the left hand side of the box. By pressing another concealed button you can open the door to which these hinges belong and can then open a small door in the rear of the box. This small door is opened when using the focusing screen. In looking through the side door we see the back of the camera, consisting of a focusing screen, which covers the 4 x 5 opening. This ground glass is spring-actuated and recedes to allow the insertion of the plate holder. Back of the focusing screen there is sufficient space in which to carry two plate holders, so that the camera in all will accommodate three plate holders, holding two plates each or six plates in all. The back of the camera has a double swing; that is, the entire back, focusing screen, plate holder and all can be tilted forward and back or horizontally from right to left. The purpose of this will be explained later. This camera has two tripod plates for holding it in position for either panel or square pictures.

Fig. 5 illustrates the Reversible Back Premo, which is

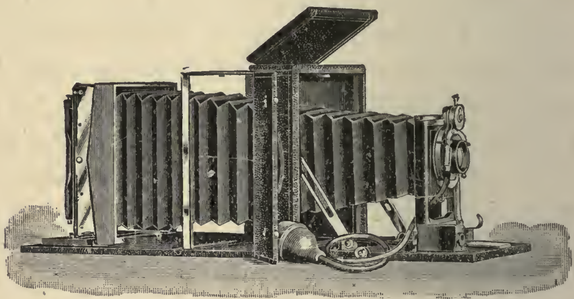


Fig. 5.

very similar to the Premo Sr., except that it has a much longer bellows and the back as well as the front of the box opens and forms a bed for the bellows to work on. When a panel picture is desired with this camera, it is not necessary to turn it over but simply reverse the back without moving the camera itself. This adjustment is especially desirable when the camera is used on a tripod. The bellows on this camera in the 4 x 5 size is 17½ inches long, while the draw of the Premo Sr. is about 8 inches. This extra long bellows is very useful, as the camera will then take full sized pictures; that is, will reproduce objects in their natural size, and with it you can do copying and enlarging. As a usual thing, one plate holder is furnished with each camera and extra

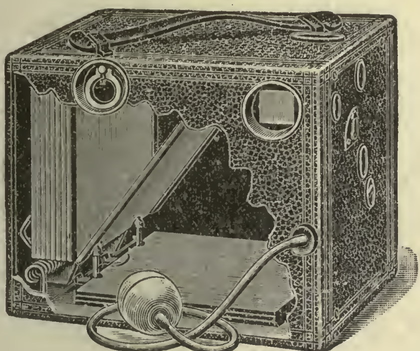


Fig.

holders can be purchased at any time. A good outfit includes six holders but the amateur can get along very nicely with three, as he then has six plates at his disposal before reloading.

Fig. 6 illustrates the Magazine Cyclone Camera, a type of camera which has come on the market in late years. In outward appearance it is not unlike the camera shown in Fig. 1, but internally it is quite different. The box is fitted with a single universal fixed focus lens of good quality and has two view finders. This camera holds twelve plates at one loading and does not require any extra plate holders but is complete in itself. The shutter is always set. The illustration shows the camera with a part of the box cut away so that the magazine is exposed to view. The plate holders or carriers are made of metal, with round holes punched in them at the bottom, for the reception of the supports. When the camera is loaded the twelve carriers stand upright, leaving the outer plate exposed, ready to take the picture. When the picture is taken, turn the button on the top of the camera to the right, which releases and drops the exposed plate, leaving the next one ready for another picture. This operation can be repeated until all of the twelve plates have been exposed. When all the plates have been exposed, the camera is taken into the dark room, the back is removed and the tray containing the twelve plates drawn out. The metal carriers are lifted off the pins, the plates removed and new ones inserted. The tray is now replaced in the camera and the carriers holding the plates are inserted again in an upright position. The back is now put on and you are ready for twelve more views.

Fig. 7 illustrates the Adlake Repeater, a magazine camera, somewhat similar to the one just described. The cut represents the repeater with a portion of the box cut away to show the internal mechanism. The camera holds twelve plate-holders, six of which may be seen standing upright at the back of the camera. The holders have projecting wires at the bottom, which are represented by dots and rest upon metal slides. The front holder has it wires between the teeth of the notched arm. After making an exposure, the lever is moved one number,

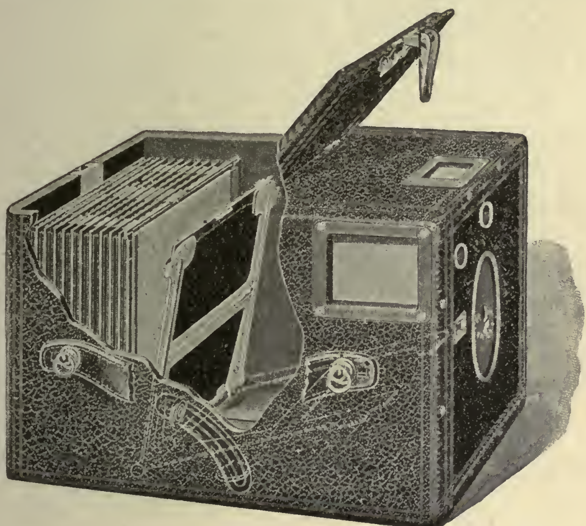


Fig. 7.

which lowers the arm and holder and allows the holder to pass the strip at the top which holds it in position. The holder then falls to the bottom, as indicated by the dotted lines. After exposure the plates are released by reversing the lever, which raises them again into an upright position. A strong spring behind the plate holders, moves them forward and keeps the front plate in the focal plane. This camera, like the others described, is arranged for both time and instantaneous work and has two view finders for panel or square pictures.

We have now described the various classes of cameras on the market, with the exception of special cameras, such as the stereoscopic, panorama, copying, etc., which will be described when we reach the point where the amateur will feel that he can use use them successfully. It is impossible with the space at our command to describe all the various makes of cameras on the market but they all belong to either one or the other of the types already described and vary only in their minor detals of manufacture.

CHAPTER III.

Whether you develop your plates yourself, or have the work done for you by the professional, it is necessary to know something about plates and the chemical action of light and the more you know in this respect the greater your chances of having good negatives. You are doubtless aware of the fact that the action of light is quite different on various materials. With one material it has a tendency to bleach, while with another it has the reverse effect and darkens or discolors. The housewife lays her linen on the grass in the sunlight in order to bleach it and yet the same sunlight changes the color of nearly all red paint to brown or black. The whole principle of photography is based upon the action of light upon certain well known sensitive mediums. These mediums are known as salts, the most sensitive of which is bromide of silver and hence it is used in making photographic plates and certain forms of printing paper. Ordinary printing papers, however, are made not from bromide but from chloride of silver. Chlorine is a gas and it has a great affinity for metals and salts of various kinds and when united with silver forms chloride of silver or when united with sodium it forms chloride of sodium or common table salt. If you have a knowledge of chemistry you are aware that there are many other sensitive salts and chemicals but the principal ones which the photographer has to deal with are chloride and bromide of silver.

If you expose either bromide or chloride of silver to the action of white light, it will turn black in a very short time. A plate is made by coating the piece of glass with a thin film of gelatin, in which the bromide of silver is carried. Bromide of silver is preferred for plates because of its extremely rapid action when exposed to light. The paper on which the picture is printed is like the plate, sensitive but not to such a degree, for it is coated with collodion, gelatin or albumen, in which chloride of silver is carried. Bromide paper differs from the ordinary printing papers in rapidity of action, because it is coated the same as a plate with bromide of silver.

Now, we know that our plate is covered with a solution carrying in it bromide of silver and that when exposed for even the fraction of a second, by the opening of the shutter in the camera, it is sufficient to produce an effect upon the sensitive film on the plate and an image is formed. If we take the plate from the plate holder and examine it, we will see no change in it whatever, as it requires a development in order to produce the image formed thereon. Now, the image on the plate is formed more or less distinctly, according to the length of the exposure and the quality of the light. If the day be a clear one and the light strong, it is said to be *actinic*; that is, the light possesses those rays of the spectrum which are most powerful in producing chemical changes. To the novice light is light and all sunlight is white but to the scientist light is made up of several colors, red, yellow, orange, green, blue, indigo and violet. Now these various colors act very differently on the salts of silver and so it is that the light does not always act the same, either on the plate or printing paper and is one day rapid and another day slow. Blue, indigo and violet rays work the most rapidly, green rays slower and the red, yellow and orange rays are the slowest to affect the salts.

In relation to light there are two other points to be considered, i. e., the time of day and the season of the year. Other things being equal, the light is the strongest in the middle of the day and hence at that time a shorter exposure is required than at any other but much depends on the season of the year and very much depends on the country we are living in. The quality of the light in April, May, June, July, August and September, is much better than that of the other six months of the year and that of a dry climate much quicker than that of a moist one. As a rule, the light in the country is much more actinic than that of large cities, probably owing to the fact that there is less smoke in the atmosphere. For the same reason the light is much more actinic after a heavy rainstorm than before it, as the atmosphere has been cleared of floating particles of dust and soot by the rain. It must be borne in mind that surroundings have a very material effect upon light and cause it to be more or less actinic. A view taken over a body of water, as a lake or the ocean, will not require more than half the length of exposure that would be required for a view taken at the same time of an ordinary open landscape, i. e., one without trees in the foreground. This is caused by the reflected light from the water, so that we see that reflection, as well as light, is a factor in photography. The same is true of snow and the amount of snow on the ground, trees and surroundings, materially affect the length of the exposure.

Now, we have learned two things, first that red, yellow and orange rays act less quickly than blue, indigo, violet and green ones and that reflection is a prime factor in lighting. Therefore, a little reasoning will tell us that a landscape, in which the prevailing colors are green, from grass and trees and blue and indigo from sky, will necessarily require a shorter exposure than would be necessary if we were taking a photograph of a number of red, yellow and orange-colored flowers. If we look directly at a red brick house, a great proportion of the rays coming towards us are red and if we look at a green tree a large proportion of the rays are green. In just the same way the colors of the various objects photographed are reflected back through the lens and on to our plate and our exposure should be varied according as the subject being photographed predominates in color. Now, if we undertake to photograph a bouquet in which there are red, yellow, orange, blue, indigo and violet-colored flowers and green leaves, what will be the result and how shall we time our exposure? Here we have all the spectrum colors and many shades of these colors. We have the colors to which the silver salt is most sensitive and we also have those which have the least effect on this salt. If we give the proper exposure for the red and orange colors, then we will have exposed our plate too long for the blues and indigoes and thus we will have what is known technically as an "over exposure." On the other hand, if we expose just long enough for the blues and indigoes, then the red and orange will be under exposed. There are several remedies but they are all based on one general principle, that of correcting the color value by reducing them all to a common, or uniform value. Special plates are made by which the various colors are reproduced in monochrome in their correct values. These plates are known under the names of the various manufacturers, as "Isochromatic," "Orthochromatic," "Erythro," etc. The "ray filter," or "color screen," is another method of correcting color values. The ray filter is usually a cell composed of two pieces of glass set into a piece of glass tubing and in this cell is confined a liquid carrying picrate of ammonium, bichromate of potash, or some other chemical which tends to correct the color values. The ordinary color screen consists of an orange-yellow glass, confined in a suitable frame and through which the light passes before reaching the plate. As a rule, the Isochromatic and Orthochromatic plates are a trifle slower in their action than ordinary plates and where a color screen or ray filter is used with ordinary plates the time of exposure must be lengthened materially. The use of these plates and screens is described in Chapter XIV.

Manufacturers of plates usually number them according to their sensitiveness, although the number on a plate box is not always a guide to the quickness or slowness of the contents. A slow plate is usually numbered from 20 to 40, a medium from 45 to 50, and yet the Seed 27 plate is supposed to be as fast a plate as is made. This number is supposed to represent the sensitometer value but unfortunately makers of plates do not use the same sensitometer. As a general rule it will be advisable for the novice to start with a slow plate for landscape work. Of course, in photographing moving objects it is necessary to use a quick plate and a short exposure. However, you must be your own judge and experience will teach you when to use a slow and when to use a quick plate. There are many good plates on the market and it matters but little which you may select, but above all things do not constantly change makes and grades of plates. Select a medium plate, say a Seed 26 and stick to it, at least for the first six months or until you know exactly what you can do and what you cannot do with it. Then it is time enough to try a slower or faster plate. Do not be in a hurry to change because some friend tells you of a "better plate." The following is a partial list of the well-known plates on the market:

SEED PLATES. These are made in sensitometer 23, 26, 26x, 27 and Non Halation.

CRAMER PLATES. These are known by name as the "Banner," "Crown," "Isochromatic," slow, medium and instantaneous, "Non-Halation," and "Contrast."

STANLEY PLATES. These are made in sensitometers 35 and 50.

CARBUTT PLATES. These plates are made in sensitometer 16, 23 and 27, in ordinary plates. The "Eclipse," in 27; "Medium Orthochromatic" in 23; "Junior" in 27; a slow plate, "B 16" and a "Non-Halation."

HAMMER PLATES. These are known as "Slow," "Fast," "Extra Fast," and "Aurora" or Non-Halation.

Now that we understand something of the action of light, of the various colors which go to make it up, of the construction of a plate and its sensitiveness to certain colors, we will proceed to load our plate holders and take a practical lesson in the field.

We have learned that our plate is sensitive to white light and that therefore we cannot handle it in either daylight or artificial light. We have also learned that it is less sensitive to red than any other color and for this reason this color has been selected for the glass of dark room lamps. These lamps can now be purchased from the simplest and cheapest for use with a candle, to the finest grades using oil and electric light. The prices vary from forty cents up to three or four dollars, depending on their quality and finish. Fig. 8 illustrates a cheap type of lamp which will answer very well for the novice. This lamp will be found very convenient when traveling as it folds up into a very small space. The top and bottom can be removed and the sides fold in. A ruby-colored fabric takes the place of the ruby glass. We will not undertake to fit up a dark room until you fully understand the requirements and will therefore choose a small room, with say one window, which we can make absolutely light-tight by drawing down the blind and tacking over it a heavy shawl or some opaque oilcloth or other fabric. Now select a small table and chair and place your ruby lamp to the left-hand side of the table and your box of plates to the right. Close the door of your room and see that no light leaks in at the top or bottom and if it does shut it out by means of some opaque fabric. Light the candle in your lamp and close it. When

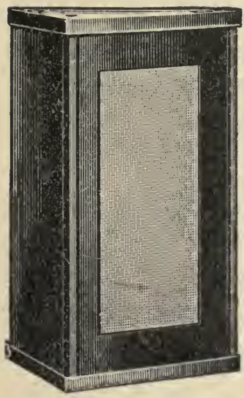


Fig. 8.

all light is shut out from the room, you are ready to proceed with the loading of your plate holder. Turn over your box of plates and you will see, by means of the ruby lamp, that a strip of paper has been pasted over the joint to exclude all light. Carefully insert your knife in the joint and cut the paper around the four sides of the box, when the cover can be easily removed. You will find another box inside the first one and this being opened, will reveal the plates to you. The different manufacturers pack their plates in different ways. Some plates are done up in black paper, six plates in a package and two packages in a box, while others put the twelve plates together and the box is provided with flaps of black paper which fold down from all four sides over the plates. We notice that the upper plate is placed with the film side down and the next one with the film side up. All plates are packed with their film sides next to each other. The film side is the dull side of the plate. Take a plate from the box and bring it close up to the lamp. One side appears to be plain glass which reflects the light readily, while the other appears to be covered with a pinkish wax and is dull in appearance. The dull side is the film side and the film is not really red or pink as it appears but is a creamy white and appears pink on account of the red light from your lamp. Hold this plate in your left hand and scratch the film side, near the edge, with the nail of the first finger of your right hand. Now reverse the plate and scratch the other side and you will see a marked difference. Close the eyes and take another plate from the box and by means of your finger nail try and see if you can tell the film from the glass side of your plate. Practice this several times so that you can feel quite sure that you could distinguish the film side without the aid of the ruby lamp. It is quite important that you be able to do this, as it may be necessary to load your plate holders in the dark some time. The plates are divided into sets of two, film sides together and each set is separated from the next by means of frames made of cardboard or by strips on the end, depending on the manufacturers.

Now let us examine our plate holders. The plate holder is a shallow box having a slide on each side and divided down the middle by a partition of black cardboard so that we can draw the slide from one side without exposing the plate on the other side to the light. Plate holders differ slightly, according to the manufacture of the camera but in general principle are all alike. In some the slides are made of black rubber, while in others they are made of heavy board resembling leather. In the latter style the board is usually black on one side and light on the other and in some styles the slides are lettered on the black side "Exposed." Those holders with black rubber slides have a draw piece at one end made of wood and on examination you will see that this wooden draw piece is light on one side and is painted black on the other. In other varities the rubber is lettered "Exposed" on one side. The object of thus marking or coloring the slides will appear later.

We will take it for granted that our outfit consists of a Premo, Sr., 4x5 camera and three plate holders, for glass plates. As we said before, this camera represents a class and is very similar to many others on the market and we select it simply as a type of popular camera. The plate holders furnished with this camera have black rubber slides. We withdraw the slide and with a camel's hair brush we proceed to thoroughly dust, not only the holder but the slide. This is very important and should be done every time the holders are loaded. We also thoroughly dust the plate before insertion, not only on the film but on the glass side as well but do not overdo it or you will eloctrify the plate and attract the dust particles in the atmosphere.* The smallest speck of dust which may rest on your plate at the time of exposing it will act as a shield for that portion of the plate and thus cut the light off from it and when you come to develop and fix it, it will leave a small white hole in the plate. Now let us examine the holder and at the bottom we will find a small bar of wood. Press on the bar with your thumb nail and you find it recedes but again springs back into position. To load this holder, take it in the left hand and the plate in the right. Place the lower end of the plate in the groove in the spring bar at the bottom, keeping the film side of

*See pages 107 and 108 in regard to the use of the air bulb instead of a brush.

plate out, as shown in Fig. 9 and by pressing on the spring bar with the thumb the plate will fall into place. Keep the holder tilted back so that the plate will fall

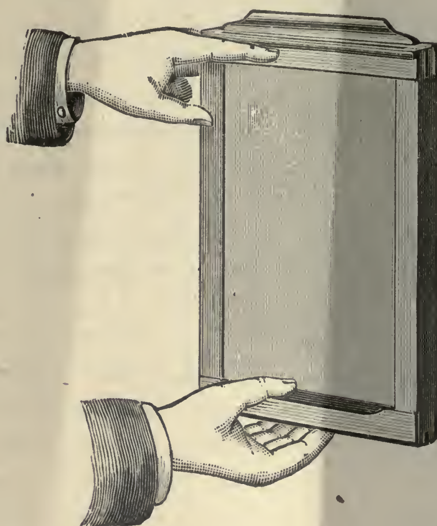


Fig. 9.

into the holder. To unload, press with the thumb on the spring bar, as shown in Fig 10, then by tilting forward the holder, the plate will fall forward, the edge resting against the fingers. The plate is then held in position by the ends only. When the plate is inserted replace the slide with the light side outward, or, if marked, see that the word "Exposed" is on the inside

A Portrait. Alfred Cox, Chicago.

next to the plate. Close your eyes and go through the process of dusting your plate holders and plates and inserting in the holders. In this way you become fami-

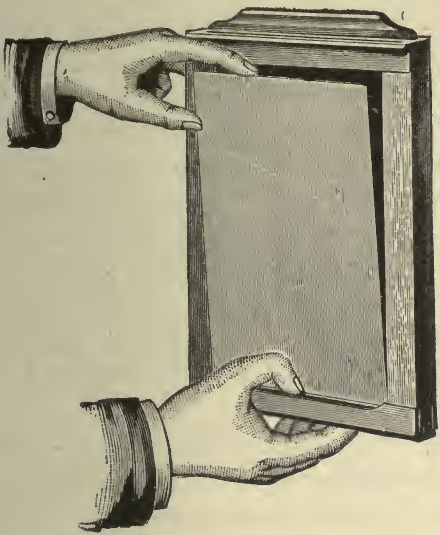


Fig. 10.

iliar with the operation and when necessary you can change your plates in a dark closet without the aid of a ruby lamp. When you return the slide into the holder you will notice that it has to go into a little slit in the holder. This slit is closed automatically by means of a spring, so that when the plate is in the camera and the slide is withdrawn, no light can leak in upon the plate. In returning the slide do not insert one corner first but learn to insert the entire edge of the slide and to rapidly push it in to its proper place. If you insert one corner of the slide you open the slit and allow the light to enter but if you insert the entire edge the spring clamps around both sides of the slide and excludes the light. Of course it makes no difference in the dark room whether you insert the the corner or the entire edge of the slide but it does make a great difference when you are in the daylight and if you acquire a bad habit in the dark room you are very liable to do the same thing in the daylight and thereby ruin an exposure. The light creeping in at this small opening spreads over the plate and blackens it gradually from the opening inward. This blackening is technically known as "fog."

Now it is well to number your plate holders from 1 to 6, i. e., two numbers to each holder, one on each side. You can do this with pencil or pen and ink but it will look neater to use a printed number, which may be gummed to the wood side of the holder just above the rubber slide. In this way you can keep track of your plates, as you expose them and make corresponding entries in your "Exposure Record." You will perhaps see no necessity for an exposure record but it is really a valuable if not an indispensable thing, if you expect to make good pictures and profit by your own experience. These books are for sale by dealers generally, or you

PLATE.		EXPOSED.			DATE.		Holder.	General
No.	Maker.	When	Stop	Time	Mo.	Day.	No.	No.
26	Seed	10:30	8	$\frac{1}{50}$	Aug.	9	3	624

Subject. Yacht Entering Harbor of St. Joe.

Remarks. Light good and plate a trifle over-exposed. Would be better with $\frac{1}{100}$ second exposure.

PLATE.		EXPOSED.			DATE.		Holder.	General
No.	Maker.	When	Stop	Time	Mo.	Day.	No.	No.
50	Stanley	11:20	8	$\frac{1}{25}$	Aug.	9	4	625

Subject. Wood scene on North Bank of river.

Remarks. Exposure good for snapshot. Better is time exposure.

PLATE.		EXPOSED.			DATE.		Holder.	General
No.	Maker.	When	Stop	Time	Mo.	Day.	No.	No.
50	Stanley	1:30	8	$\frac{1}{100}$	Aug	9	5	626

Subject. Lake scene with cloud effect.

Remarks. Fine negative.

PLATE.		EXPOSED.			DATE.		Holder.	General
No.	Maker.	When	Stop	Time	Mo.	Day.	No.	No.
26	Seed	3:00	16	1 sec	Aug.	9	6	627

Subject. Wood interior.

Remarks. Good Plate.

PLATE.		EXPOSED.			DATE.		Holder.	General
No.	Maker.	When	Stop	Time	Mo.	Day.	No.	No.
Inst.	Iso.	10.00	256	4 min	Sept	15	1	628

Subject. Reproduction of oil painting.

Remarks. Exposure a trifle short. 4½ min. better

Fig. 11.

can purchase a small memorandum book and rule and letter it yourself as shown in Fig. 11.

Five entries of this size could be made on each page of such a book and these entries will be found of great value when you come to develop your plate and for general reference at any time when you are about to take pictures under similar existing conditions. It will be noted that in the first column we have written 26 Seed. This shows the number and maker of plate. The next column shows that it was taken at 10:30 a. m., with diaphragm or stop 8 and the time of exposure was $\frac{1}{50}$ of a second. The data further tell you that it was the 9th of August and plate holder was No. 3. The subject was a yacht just entering the harbor and it was consequently a sea and sky picture which, according to our lesson on light, we know to require but a very short exposure. The remarks tell us that although the exposure was a very short one, the picture would have been improved if we had given it but half the time or $\frac{1}{100}$ of a second. All of these entries were made in the exposure record after the plate was exposed except the "26 Seed" and the "3" under holder number. These entries should be made as soon as the plates have been placed in the holders and then we will know just what our holders are loaded with in case they should be set aside for a few days or a week before using.

CHAPTER IV.

Let us now take a photograph together, in order that we may better understand our camera, its attachments, our plates and the value of our records. For convenience sake we will follow the entry in our "Exposure Record." We have loaded our plate holders with No. 26 Seed plates and we are going to take a picture of a yacht which is just about to enter the harbor on a bright day, at 10:30 in the morning. Our three plate holders, holding six plates, are all in the back of the camera box. Fig. 12 illustrates a tripod, a frame consisting of three movable wooden legs held together at the top by a cap-piece which is technically known as the "head." There are many different styles of tripods on the market and it makes but little difference which we select so long as we secure one which is convenient, light and strong. It is important, however, that it be rigid and not easily

Fig. 12.

made to tremble in case of a strong wind, for with a time exposure we cannot tolerate the slightest tremble on the part of the tripod or our picture will be ruined.

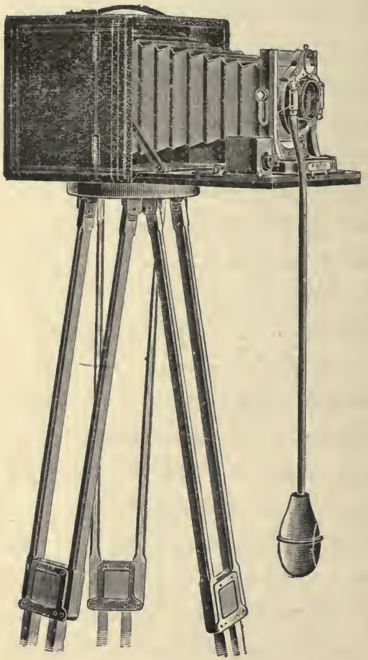


Fig. 13.

The tripod shown in Fig. 12 is a two-piece tripod, the lower legs being made to slide or telescope into the upper, so as to occupy but little space when not in use. Other varieties are made in three pieces and occupy less space still. In the head will be found a brass screw with milled head. This screw goes into the bottom of the camera box and the instrument is then held rigidly in place as shown in Fig. 13.

There is a right and a wrong way to use a tripod. Always see that one of the legs is directly in front and this will place a leg on each side of the camera. If this leg was at the back you would be constantly tripping over it while focusing. Again, the leg in front acts as a swivel on which to turn the entire outfit, and by moving the front leg you can raise and lower the camera without touching the other two. Our lens is pointing toward the west while the sun is in the south, so there is no danger in this quarter. We must always aim to have the sun anywhere but in front of the camera, but it must be borne in mind that shade is as important as light and that it takes both to make a picture, therefore it is not advisable to have the sun directly back of us, for although there will be no danger of it entering the lens when in this quarter, yet the shadows will be away from us and will not show in the picture but we will get a rather glaring picture devoid of interest. If we were to expose a plate while the camera was pointing towards the sun we should certainly ruin the plate, because the direct rays of the sun would enter through the lens and strike the plate.

We now let down the front of the camera box, draw out the bellows and drop down the bulb as shown in the illustration. We will now open the door which we see on the side of the camera box and take out the three plate holders and put them in our pockets or in our carrying case, if we have one. We allow the ground glass in the rear of the box to snap up close to the bellows by pushing the little brass button which we see on the side. We now open the little door in the rear of the box so we can see the ground glass. We turn the little dial just above the lens until the hand points to T and then press the bulb. This opens the shutter as previously described. We now place the little hand just under the lense until it points to 8, which opens the diaphragm to an 8 stop. If we now look at the instrument from the front it will appear as shown at Fig. 4, except that the index at the top points to T and the diaphragm points to 8.

We now spread our focusing cloth, usually made of rubber cloth, over the back of the box, and insert our head under it in order to see what the ground glass shows. With our head still under the focusing cloth we reach the right hand around in front of the camera and move the brass lever, previously described, which binds the bellows in position. We now move the bellows backward and forward until we get a good sharp image on the ground glass.

The water appears to be running up hill, and the yacht, water and all, appear to be upside down. The latter is just what you should expect, as all images on the ground glass are reversed, or upside down, but the former is caused by the camera being out of level. Proceed to level up your camera by drawing in one leg or letting out the other until the instrument stands perfectly level, then you will find that the water is no longer running up hill.

The yacht is moving towards us, however, and it is impossible to keep it in focus for any length of time, and finally we have to select one which is farther away and try again. We get all ready this time without the aid

of the ground glass. We press the bulb to close the shutter, and place the index above the lens at $\frac{1}{50}$, leaving the diaphragm at 8. We insert a plate holder in the back of the camera, between the ground glass and end of the bellows. We pull the lever A, Fig. 4, over to the left until it reaches the point F, when a click is heard and we know the shutter is set. We now draw the slide of plate holder, which is number 3, and draw the bellows out until the pointer on the scale at the side points to 100. Our yacht is still some 300 feet away, and we watch it in the view finder, keeping it in the center as nearly as possible. When it has reached a point about 225 feet away we press the bulb and it is done. We now carefully insert the slide in the holder, being sure not to allow the light to leak in, by throwing the focusing cloth over camera and inserting the slide as directed and as practiced in the dark room.

The view we have taken is what is technically known as a "snap shot." It was a rapid exposure at a moving object. It was impossible to focus it on the ground glass because it was constantly coming closer to us, and it was equally impossible to expose the plate for any length of time for the same reason.

Before developing the plate we will take another picture, this one an entirely different view, with different surroundings. We will go up the south bank of the river so as to have the sun at our back. On the north bank is a dense grove of trees; the sun is shining brightly, and the foreground is well lighted. Away back among the trees it is very dark, and this view is going to test our lens for depth of detail and rapidity. We set our camera up again and proceed to focus on the ground glass. This we can do very well, although the wind is beginning to blow strongly, for we can focus on the tree trunks, which are stationary. We leave the diaphragm at 8 stop, and proceed to move the front of the bellows backward and forward until we get a clear, sharp image on the ground glass. We now bind the bellows in this position by means of the lever in front. and put our plate holder in position again, with plate 4 towards the bellows. We close the shutter, adjust the shutter mechanism, and study the scene before us for a few minutes. It is a dark subject for a "snap shot," and yet the water in the foreground and the leaves on the trees are in motion, and if we give it a time exposure this motion will certainly blur our picture and spoil it. We therefore conclude to try a compromise and give the view a $\frac{1}{10}$ second exposure. This exposure will be short enough not to show the motion of the leaves and will be perhaps long enough to bring out the details of the trees in the foreground, at least. There are no cut and dried rules in photography for exposure. Everything depends on the nature of the view and the kind of light. There is but one good rule in regard to exposure, and that is an old one; it is "expose for the shadows and let the lights take care of themselves," and yet in this

instance it is not practical, for if we expose for the shadows our foreground will show motion perceptibly. "Then all exposures are simply guess-work," you will say. Yes, all are guess-work in a certain sense but guess-work based on experience. This experience you will gain as you go along and if you keep a record book you can refer back to similar subjects and conditions and note your successes or failures. Now how do you know that you have not made both exposures on the same plate and ruined both? Because, first, you have replaced our plate holder slide with the dark side out, which tells you that this plate has already been exposed and second, because you keep a record and your record book shows that the plate in holder 3 was exposed on the yacht scene and the plate in holder 4 was exposed on the wood scene. Always fill out the entry in your record book as soon as the exposure is made. Never put it off and rely on your memory to fill it in at another time.

CHAPTER V.

We have now made two exposures, or taken two pictures, one of a yacht and the other a wood scene with water for a foreground. It will not do to keep on recklessly exposing plates without knowing what we are doing, so we think it advisable to develop these two before going further.

Up to the present time we have no dark room, and we do not think it advisable to build one until we know better what is required, and so we will develop these two plates in the same room in which we loaded our plate holders, taking the same precautions about shutting out all light. Of the various developers and their action we will speak later, but in this instance we will use the developer recommended by the Seed Dry Plate Company, who made the plate which we are about to develop. The second plate was made by the Stanley Dry Plate Company, and it would hardly be advisable to mix up two different developers to develop only two plates, because the same developer will answer for both plates. As a rule, however, it will be found advisable to use the developer recommended by the plate makers. They know the chemical constituents of their plates and are better able to judge which is the best developer for their own plates

We shall need the following trays and adjuncts, and they will all be transferred to our dark room when we build it: Two 4½x5½ developing trays; one 7x9 rinsing tray; one fixing bath; one combined washing and drying rack; one 2-inch camel's hair brush; one minim graduate glass; one four-ounce glass graduate and bottles for your stock solutions of developer and other chemicals. You will also require a pair of scales, a glass funnel, two glass rods, and some filter paper.

Fig. 14.

Fig. 14 illustrates a developing tray. These trays are made of hard rubber, fibre, celluloid, papier mache and tin. We should advise the selection of hard rubber or compressed fibre trays for developing, while a papier mache or tin tray will do very well at the start for rinsing purposes. For the present the fixing might be done in a tray or shallow dish, but as you will want a regular fixing box sooner or later you might just as well purchase it at the start. A very good form of box is shown in Fig. 15, as in using it your fingers

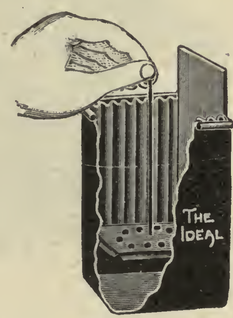


Fig. 15.

need not come in contact with the solution, either in putting the plates in or taking them out of the bath. A false bottom is connected to a central rod and the plates can be lifted out clear of the solution. In selecting trays, never get one with a plain or smooth bottom, but select the variety which has grooves or projections on the bottom. The plate adheres to the bottom of a smooth tray and is often very hard to lift out. The grooves or projections on the bottom allow you to place your finger or the lifter under the plate. Fig. 16 illustrates a lifter, which is made of hard rubber and which will be found very useful for lifting plates out of the trays. They are quite inexpensive and every photographer can afford to have two or three of them, so they will be handy when wanted.

Fig. 16.

Fig. 17 illustrates a combined washing and drying rack. The plates are first washed in this rack and then taken from the water and laid aside to dry. The tray at the bottom being water tight, catches the drippings from the drying plates, which is a very desir-

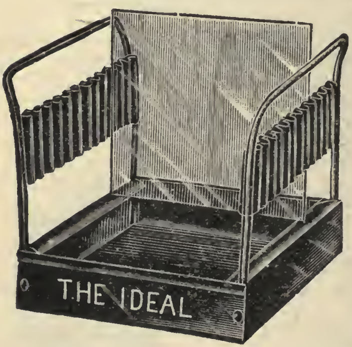


Fig. 17.

able feature. When the plates are dried and removed, the sides can be folded down into the tray and it occupies but little space. Fig. 18 illustrates a four ounce glass, graduate, which you will need when measuring the larger quantities of liquids, while the minim or smaller graduate is used for measuring the smaller quantity. In selecting a funnel be sure and buy one of glass, of the fluted variety, as shown in Fig. 19. A glass funnel can be kept perfectly clean and the fluted variety works much more rapidly than the ordinary funnels when filtering, as the fluted portions allow the air to circulate between the funnel and the filter paper.

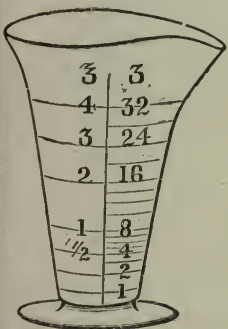


Fig. 18.

Having now secured the requisite chemicals for developer and fixing bath, as given by the plate maker, we are ready for development. Our developing solution is ready in our four ounce graduate, water in the rinsing tray and hypo in our fixing bath. We shall also require a pail full of clean water and a towel on which to dry our hands. All being in readiness we shall proceed with our development. We draw the rubber slide from our plate holder and remove the plate as heretofore described. With the camel's hair brush we remove any particles of dust that possibly may have rested on the


Fig. 19.

plate since it was taken. We now place the plate in one of the 4½ x 5½ trays with the film or sensitive side up and pour the developer over it, gently rocking the tray in the meantime to insure that the solution covers the plate entirely. Keep your tray constantly rocking and look out for air bubbles on the plate, particularly in warm weather. Should there be any, break them by means of the finger tips or a camel's hair brush. If you allow them to remain they will prevent the developer reaching that portion of the plate and a flaw will be the result.

When the plate was placed in the tray there was no trace of an image upon it, but very soon, if it is a properly timed negative, you will observe that the negative darkens in spots. Do not bring the tray too close to the light, especially during the early stages of development. Our negative consists almost entirely of sky and water and it should come up very evenly all over. If it were a landscape the sky would darken first. In other words, the light portions of the picture darken first and then the half-tones and finally the dark portions or shadows are darkened.

The Seed Dry Plate Co., recommend the following Pyro developer:

No. 1.		No. 2.	
Distilled or good well water	16 ozs.	Water	16 ozs.
Sulphite of soda (Crystals)	4 ozs.	Sal soda (crystals)	4 ozs
Pyrogallic acid	1 oz.		
Sulphuric acid	10 drops.		

To develop with this solution take one ounce of No. 1 and one ounce of No. 2, and add to it eight ounces of water. Use less water in cold weather. Now the constituents of the developer are pyrogallic acid, commonly known as Pyro, which is the developing agent proper, sulphite of soda, which is a preservative and is used to keep the solution clear and bright, and sal soda, which is an accelerator, or agent which makes the developer act quickly. Make a solution of one ounce of bromide of potassium in ten ounces of water and keep it in a separate bottle, and when it is found that the developer is working too rapidly, owing to the plate being over-exposed, a few drops of this solution is added, which holds back development and is known as a restrainer. This is known as a ten per cent solution of bromide. We now know the constituents of our developer and how the various chemicals act, and we can govern ourselves accordingly.

We have now reached a critical stage in our development. How long, or how far shall we carry our development? On this depends entirely the success of our picture. If we develop too rapidly the half-tones are lost and if we carry the development too long we will get a flat, muddy negative which has no contrasts. Various methods are pursued by photographers, both amateur and professional. Our method is to keep the plate in the solution until the image has shown fairly strong all over. Now remove the plate from the solution, by means of the lifter shown in Fig. 16, and holding it by the edge, bring it close up to the light and look through it in order to see how far the development has progressed in the shadows and half-tones. Keep your fingers off the film and hold the plate by its edges by pressing against the glass on both sides. If a 4 x 5 plate you can readily hold it in one hand by placing the thumb on one side and the forefinger on the other. Bear in mind that all portions of the negative which have received the black deposit will print white or light in tone, while those portions of the plate which remain white will in reality print black, because the light passes through the clear glass of the negative and prints the paper dark. Now turn the plate over or look at the other side, not through the plate, but by holding it in a horizontal position, and see if the image is beginning to show through the plate. If it is, the development is nearing completion. Return the plate to the solution and continue rocking, examining it from time to time. In a properly timed negative the image should begin to appear on the film side in from 15 to 30 seconds. There is a scientific method of determining when the development has reached the finished stage, but this method we will discuss later.

We continue the rocking of the plate until, in the subdued light of the dark room the entire plate has blackened over. Examine it again by transmitted light and you will see the outline very faintly. Look at the back of the plate and you will see the outlines of highlights and the principal half-tones. Holding the film side towards us and the glass side well up to the ruby glass, we place our finger on the glass back of the sky and find the deposit is so dense we can scarcely see the shadow of our finger.

We now rinse the plate thoroughly in the rinsing tray, in order to remove the developer and small portions of the film which have separated from the plate. This rinsing prevents the contamination of the fixing bath. Our fixing bath, which has previously been prepared, is also in accordance with the Seed formula, which comes with every box of plates. Our plate, after washing, is inserted in the fixing box, shown in Fig. 15. The amateur at this stage usually makes two mistakes, he does not fix his plates thoroughly and more often does not wash them sufficiently to remove the hypo. The plate should be allowed to remain in the fixing bath fully ten minutes after every trace of the white film has been removed and must only be examined by white light when this stage has arrived.

When properly fixed the plate is inserted in the combined washing and drying rack shown in Fig. 17, and the rack placed in the pail of water. The pail may now be taken out of the room and placed in a sink and the water allowed to run into the pail for at least one hour, in a gentle stream about the size of an ordinary lead pencil. Do not allow the stream to strike the plate, but have it go down one side of the pail. It is very essential to thoroughly wash your plates to remove the hypo or they will soon turn yellow and become covered with the hypo salts which will eat away the film. When sufficiently washed remove the rack from the pail, emptying out the water in the tray under the plate and put it away to dry in a place free from dust. Do not attempt to dry the plate in the sun or by artificial heat.

While the first plate is being fixed in the hypo bath, we proceed with the development of the second plate, which we proceed with on the same lines as the first.

CHAPTER VI.

The dark room question is a serious one and you should not be in a hurry about building one until you have a pretty thorough understanding of the requirements of the art. We never knew an amateur whose first dark room suited him perfectly. He generally enlarges it and makes extensive alterations within a year or two after building. Give the question a little serious thought and it may save you considerable time in rearranging and rebuilding, to say nothing of the expense involved. The location is the first consideration, and in choosing this, much depends upon whether you occupy your own house or rent one and the style of the house itself. Stables and outbuildings are as a rule not desirable for the location of dark rooms because they are generally not heated in the winter, and great care must be exercised to select a location where your liquid chemicals will not be liable to freeze and burst the bottles in which they are confined. Again, it is pretty cold work developing and washing plates where there is no heat and the thermometer is ten below zero.

If your house has a basement, say seven or eight feet in height, with a furnace, this will be the place for your dark room. It will be generally be found quite cool, even in the very warm days of summer and warm enough for comfort in the coldest days of winter. If it has no furnace your liquids are liable to freeze, but much depends on the construction of the house and its foundation. If it is safe as regards freezing, then it can be heated to a comfortable degree for working by means of an oil or gas stove prior to the time you wish to do your developing. Next to a basement a small room or good sized closet is desirable.

If a basement or small room is selected and a window can be used, so much the better, for it is desirable to air the dark room from time to time, particularly if you are a smoker, or if you use oil in your dark room lamp, or both. If a window is used it should be carefully covered with at least two thicknesses of post office paper, ruby fabric (a substitute for ruby glass), or black paper. The casings of the window should be examined carefully after this and all cracks covered by pasting over them heavy red express or black paper. The window should not be relied upon for light even when working in the day time and it would, of course, be out of the question at night.

When you have selected a location it will be well to take a piece of paper and lay out a ground plan of your proposed dark room before starting to build. Fig. 20 is a ground plan and Fig. 21 a sketch of a dark room. It is an actual reproduction of a dark room built by an amateur friend, with some minor changes. This dark room is the best fitted and the handiest we have ever seen, either amateur or professional, and is an excellent one to model after. The floor of the dark room is

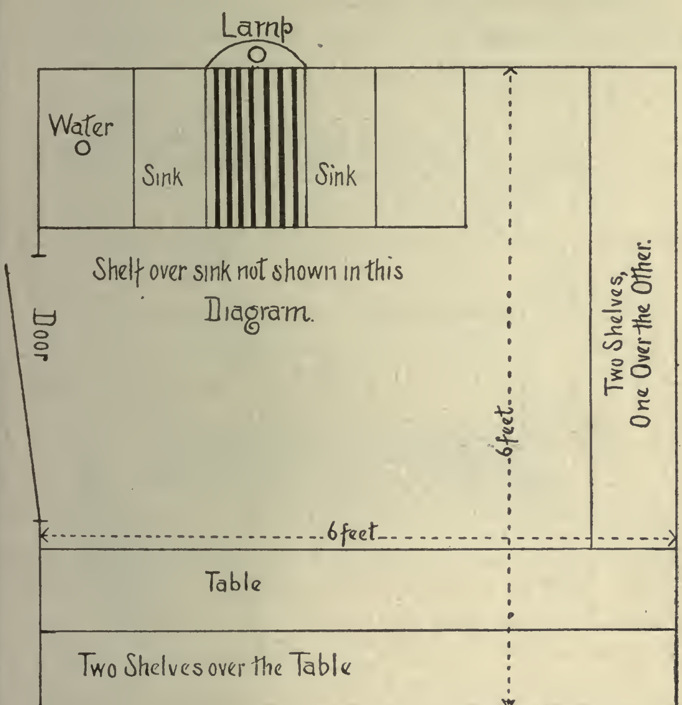


Fig. 20.

three inches above the basement floor so that it is dry at all times, as the air circulates freely under it. It is practically six feet square. The door extends to the basement floor, so there is no necessity of tacking felt to the bottom of it to keep out white light.

The sink, including the two ends, is about four feet in length. The water pipe and the drain pipe enter the

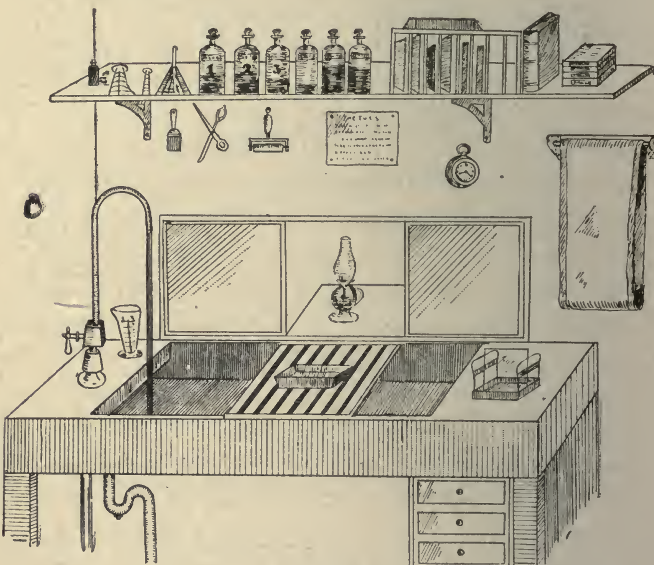


Fig. 21.

sink at the left hand end and at the right is a convenient platform on which to place plates to dry, etc. This sink is about five inches deep and is built of one-inch pine stock. After connecting up the plumbing the sink was given one good coat of white lead, the cracks being first filled in with the stiff white lead by means of a putty knife. When this coat was thoroughly dry it was given three coats of asphaltum mixed to the consistency of paint with benzine. The coats of asphaltum were given at intervals of twenty-four hours, so that one coat was thoroughly dry before the next was applied. The slats in the center rest on the top of the sink and are joined together, and they can be readily removed when desired. The developing tray is used on this rack and any developer which is spilled, does not run onto the floor but runs down into the sink.

It will be noted that this dark room is lighted from the outside, which is really the only good way, if you value your health and desire to keep the dark room cool in summer. There are cases in which it is not possible to so light a dark room, but where possible it is always advisable. In this instance a window six inches square is cut through the partition directly over the center of the sink. A ruby and an orange colored glass are mounted in frames and these frames run in wooden tracks and pass one another so that either or both glasses can be used. The ruby glass runs in the track nearest to the light. The light is an ordinary kerosene lamp placed on a bracket just outside of this window. Gas, of course, could be used as well as a lamp. Immediately under the platform at the right hand side of the sink is a series of six drawers which are convenient for storing away the various devises and odds and ends which the photographer is bound to fall heir to and which accumulate so rapidly.

Immediately above the sink is a shelf four feet long, on which is kept the bottles holding the developer, and those solutions which are most frequently used, the graduates, funnels, and the bromide solution. Beneath the shelf the dusting brush, scissors, print roller, vignetter, kits etc can be kept on suitable hooks or nails. To the right is a towel and rack. Next to the bottles on the shelf is a rack built for trays, so they can be placed on their sides to dry. This shelf can also be used for holding plate boxes, etc. The book shown in the illustration, on the shelf, next to the plate rack, is the scrap book, which will be described later on. Beneath the sink is a good place to keep your hypo bath, and this is the very best place to keep it, as you are sure not to get it mixed with the other chemicals.

By consulting Fig. 20 you will get a good idea of the other side and end of the room. Facing the sink is a wide shelf or table, about two and a half feet from the floor, where you can sit down and dust out your plate holders and load your plates, with your back to the light. Above this table are two shelves for the storage of bottles, boxes, etc., and at the end of the room opposite the door are two more shelves one over the other. You will perhaps think there is a superfluous amount of shelf room, but you will find by the time you have had the dark room say two or three years that you will have to clean house every once in a while to make room to move around.

One very necessary thing, which must not be omitted under any consideration, is a hook for the inside of the dark room door. This will effectually keep out all intruders while you are developing. Ventillation must be secured, and this can be easily effected by boring a series of inch holes at the top of the room over the sink and another series next the floor on the opposite side. Over the series of holes tack some strips of wire screen to keep out rats, spiders, and other vermin. Over the series of holes tack a long strip of tin bent in the from of an inverted L, as shown in Fig. 22. Light refuses to turn a corner, without the aid of prisms or reflection, and if we paint the inside of this tin black we need have no fear of white light entering the room. In Fig. 22, W is the wooden wall of the dark room; H the holes; T the tin strip and S the screws or tacks holding the tin in place. The faucet shown in Fig. 21 is preferable to the ordinary one, as it elevates the stream, and in the case of washing off a plate there is little danger of the film side coming in contact with the faucet. A light rubber hose can be connected with it and the washing box, which is illustrated in Fig. 23. This box is an excellent one as the water

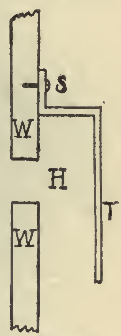


Fig. 22.

enters from the tube at the top and this tube extends to the bottom of the box, where the water is discharged. The water rises between the plates and is carried off at the outlet at the top and to the right hand side. As the box has corrugations on all sides, it is adapted to hold several sizes of plates.

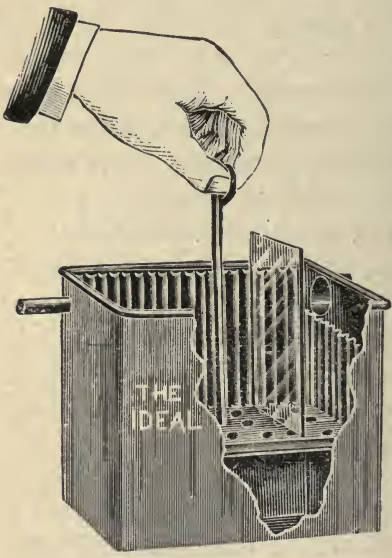


Fig. 23.

Running water is a great convenience, but not an absolute necessity in the dark room. If your dark room is situated at considerable distance from the water supply, or you do not feel that you can afford the expense of putting in the necessary plumbing you can make a good substitute by means of an old water cooler, or by building a box and coating the inside of it thoroughly as advised for the sink. The cooler or box can be located on the end of the sink where the faucet is in Fig. 21. If a cooler is used the rubber tubing can be used the same as on a regular hydrant. If a box is used a faucet of some kind will have to be inserted in the side of the box near the bottom. If a box is used, a cover that fits fairly tight, should be made for it, to keep out all dust. A short piece of waste pipe can be used and the waste water caught in a bucket.

Should it be inconvenient or out of the question to have the light outside of the dark room then a first-class

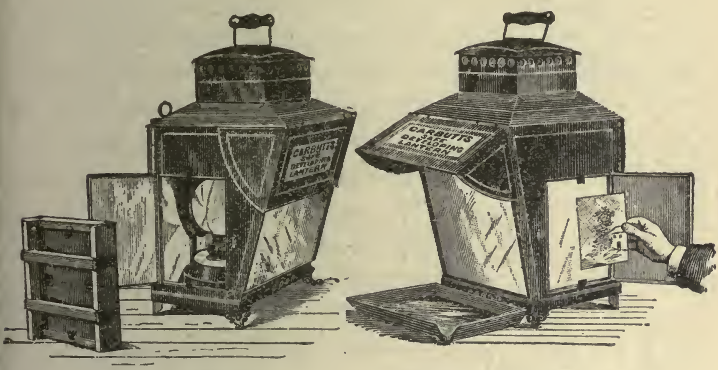


Fig. 24. *Fig. 25.*

dark room lantern is a necessity. Nothing gives the amateur quite as much trouble as the cheap dark room lanterns on the market. The light often goes out at a critical stage, and the smoke and smell is something dreadful. If you cannot afford to buy a first-class lantern, then we should advise you to make one from a soap or starch box rather than invest your money in one which will never give you any satisfaction. Fig. 24

illustrates an excellent form of lantern manufactured by John Carbutt.

In Fig. 24 this lantern is shown with the side door open as used in making bromide prints, while Fig. 25 shows the same lantern as used in developing, and also with the slide door open while examining fixed negatives by the ground glass. Do not make the mistake of buying a small dark room lantern. You may have little room to spare in your dark room, and the small patterns may look very neat and tempting on the photographic supply counter, but in practice they are an abomination. A lantern which is large enough to give a thorough draft and have plenty of air space for the lamp, is the only one which will not smoke. If your purse will not admit of your purchasing a first-class lantern then, as we said before, you had better make one. Fig. 26 shows a diagram of a home made lantern. This lantern can be made from a small box, say 14 inches high by 8 or 10 wide. We believe that the diagram is so explicit that a detailed description will hardly be necessary, but in order that it may be thoroughly understood we have

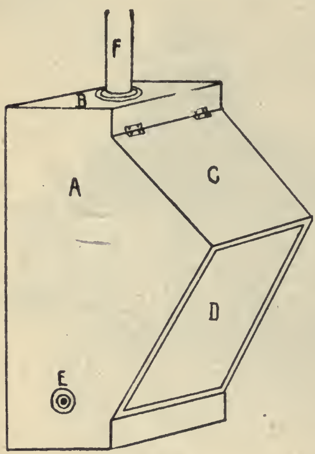


Fig. 26.

lettered the diagram. A, B and C are all made of wood, D is a window glazed with both ruby and orange glass, one back of the other, which makes a very safe light. Each glass is held in a separate groove so that either one or both can be removed at pleasure. C is a hinged cover; E is the button for regulating the flame from the outside of the lamp, and F is a small pipe which should lead outside of the dark room and into a chimney flue if possible, and all heat and smoke are thus carried entirely outside of the dark room. This pipe can be made from a piece of ordinary speaking tube, which can be purchased very cheaply. You can work with a lamp constructed on these lines for hours without fatiguing the eyes, as the light is all thrown downward upon the tray in which you are developing.

Tray covers are a great convenience in a dark room. They can be easily made from pieces of cigar boxes or other light wood. Their use is to cover the trays in the event that it is necessary to open or regulate the dark room lantern, and are constructed similar to the illustration shown in Fig. 27. These tray covers should be made with projections around the four sides so that no light can creep in upon the plate. A small knob should be fastened to the top for convenience in lifting. Another very necessary adjunct is a cover for your drying rack in order to protect your plates from dust while drying. A frame should be made of some light wood which is high enough and wide enough to cover your entire drying rack, as shown in Fig. 28, and this frame should be covered with cheese cloth. You can then place your plates in the direct draft without fear of them becoming covered with dust while drying. This cover

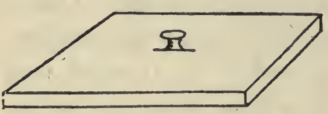


Fig. 27.

can be easily constructed by any ingenious amateur and he will be well repaid for the time expended in its manufacture. The cheese cloth covering catches all the dirt, lint and small fragments which would otherwise stick to your plates. This plate cover, when not in use, should be kept in a square paper bag so that no dirt can accumulate inside of it. You will notice in Fig. 21 that the first three bottles on the shelf are numbered 1, 2 and 3. These are the developer bottles and should always be numbered with large figures so that no mistake can possibly happen in the

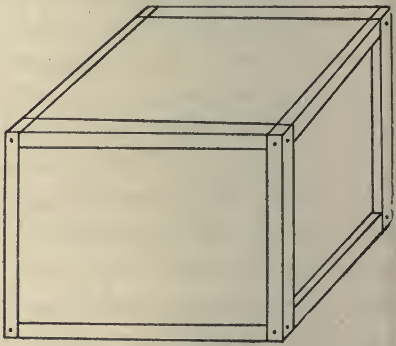


Fig. 28.

dim light of the dark room. These numbers can be painted on the bottles with asphaltum, or large figures can be cut from a calendar or elsewhere and pasted on. The formula of each bottle should also be written on a piece of white gummed paper and attached to the bottle below the number. This should be done in the case of all stock solutions, reducers, intensifiers, etc., and will be found very convenient for reference in the future. A solution which is not in constant use often gets laid to one side and the formula and directions for its use are forgotton, but if labeled as suggested, you always know the contents of the bottle, and when necessary a new solution can be made up from the accompanying directions. Ordinary gummed labels soon become detached from the glass bottles, and to prevent this give them a coat of varnish, allowing the varnish to extend over the edge of the label onto the glass of the bottle. As far as practicable always use bottles with ground glass stoppers, as corks are not reliable with ordinary chemicals. Ground glass stoppers have an aggravating tendency to stick in the mouth of the bottle, but this tendency can be readily overcome by applying a small amount of parafine or vasaline to the stopper.

In the event that your dark room is located in a basement, you will find it wise not to keep your stock of plates and printing papers in it. Negative and lantern slide plates, bromide, silver and gelatine papers deteriorate very rapidly when kept in damp places. Plate holders being usually of very delicate construction and very liable to warp, should never be left in the dark room for any length of time. Hyposulphite of soda and other chemicals should never be kept in the dark room while done up in paper bags or packages. Not only do the chemicals deteriorate when in this shape, but in a basement dark room, which has a tendency to be damp hyposulphite of soda will be carried in the atmosphere and deposited in the form of crystals all over the dark room. Keep your chemicals in wide-mouthed bottles with ground glass stoppers.

CHAPTER VII.

We said there was a scientific method of determining just when to stop development. This method was the result of constant study and experiment on the part of an amateur photographer, Mr. Alfred Watkins, of England, the inventor of the Watkins Exposure Meter. By faithfully following Mr. Watkins' method you need never have an over or under-developed negative. This method is applicable to nearly all developers and should you use a developer which is not in the accompanying table, then you will first have to determine the factor by experiment. The method consists in timing the negative from the moment the developer is flowed upon the plate until the first image appears and multiplying that number of seconds by a known factor and the product will be the length of time for total development.

The factors which Mr. Watkins has figured out for the various developers are as follows:

KIND OF DEVELOPER.	FACTOR.
Pyro Soda, 1 grain of Pyro to the ounce	11
Pyro Soda, 2 grains of Pyro to the ounce	6
Pyro Soda, 3 grains of Pyro to the ounce	5¼
Pyro Soda, 4 grains of Pyro to the ounce	4½
Pyro Soda, 8 grains of Pyro to the ounce	4¾

Kind of Developer.	Factor.
*Carbutt's Pyro Developer	7
Hydrochinon, caustic soda or carbonate	5½
Eikonogen	9
Metol	28
Amidol, 2 grains per ounce	18
Pyro-Metol	9
Rodinal	40
Metol-Hydrochinon	13

Let us see how the factor works in practice. Suppose we are using Carbutt's Pyro developer and the image appears in 15 seconds. We know the factor is 7 so we multiply 15 by 7.

$$15 \times 7 = 105 \text{ sec.} = 1\tfrac{3}{4} \text{ minutes.}$$

This will be the total time required to complete development on an average plate. If the plate has been a trifle over-exposed then the first image will appear in a shorter time and development will not be so long and if it was a trifle under-exposed then *vice versa*. The factor remains the same in all instances except where bromide is added, and in this event the factor will have to be varied. If you are using a developer whose factor is given in the above table and the result should give you a negative not entirely satisfactory to you, then use a higher or a lower factor until the results are satisfactory, and then note down the factor and work by it. If you do this, your negatives will be very even and will all print in about the same time. Some people like great

* This factor was figured out by Mr. Carbutt.

contrasts or blacks and whites in their negatives, while others prefer a softer negative, and so the factor may be increased or diminished to suit your individual taste.

There are a great many developers used by both amateur and professional photographers, but the Pyro developer is probably the most popular to-day. The following are the principal developers used at the present time:

Seed's Pyro-Soda Developer.

No. 1.	No. 2.
Distilled or good well water.....16 oz.	Water..........................16 oz.
Sulphite of Soda (Crystals)..... 4 oz.	Sal Soda (Crystals)............ 4 oz.
Pyrogallic Acid................. 1 oz.	
Sulphuric Acid..............10 drops.	

To Develop Take

No. 1..........................1 oz.	*Water ....8 oz.
No. 2..........................1 oz.	

Seed's Pyro Developer by Hydrometer Test.

No. 1.	No. 2.
Of a clear Sulphite of Soda solution to test 60 with hydrometer, take....................18 oz.	Sal Soda Solution, Hydrometer test 40.
Pyrogallic Acid................. 1 oz.	
Sulphuric Acid..............10 drops.	

To Develop Take

No. 1..........................1 oz.	*Water.........................8 oz
No. 2..........................1 oz.	

REMARKS.—More water gives flatness and less water contrast. Use less water in cold weather. Nos. 1 and 2 are known as stock solutions.

Stanley's Pyro-Soda Developer.

No. 1.	No. 2.
Water..........................80 oz.	Pure Water.............. 80 oz. fluid.
Sulphuric Acid.............. ½ dram.	Sulphite of Soda (Crystals).6 oz. Troy
Pyro....................1 oz. Troy.	Carbonate of Soda (Cryst.).6 oz. Troy.

*For Double-coated plates use 18 ounces of water. If you use Aristo paper for your prints increase No. 2 to 1⅛ ozs. and the water to 10 ozs.

To Develop take equal parts of No. 1 and No. 2.

Stanley's Pyro Developer by Hydrometer Test.

Carbonate of Soda, Hydrometer test 20°........40 oz.
Sulphite of Soda, Hydrometer test 20°........40 oz.
Mix the two for alkaline solution and use pyro solution as above.

Hammer's Pyro Developer.

No. 1.

Pure Water........27 oz.
Oxalic Acid........20 grs.
Dissolve and add pyrogallic acid 1 oz.

No. 2.

Pure Water........32 oz.
Sulphite Soda Cryst........ 8 oz.
Carbonate Soda Cryst........ 4 oz.

To Develop Take

No. 1........1 oz.
No. 2........1 oz.
Water........6 oz.

Hammer's Pyro Developer by Hydrometer Test.

No. 1.

Sulphite Soda solution testing 60 by hydrometer.

No. 2.

Carbonate soda solution testing 30 by hydrometer.

To Develop Take

No. 1 Sulphite solution........1 oz.
No. 2 Carbonate of Soda solution........1 oz.
Pyro Solution........1 oz.
Water........6 oz.

To get an accurate test with hydrometer the temperature of the solutions should be always the same. 65° Fahr. is about right.

Carbutt's Pyro-Soda Developer.

No. 1.

Distilled or Ice Water........10 oz.
Oxalic Acid........15 grs.
Bromide Potass........30 grs.
Then add Pyro 1 oz. and Water to make 16 fluid ozs.

No. 2.

Water........10 oz.
Soda Sulphite Crystals........ 4 oz.
Soda Carb. Crys. (or dry gran. 1 oz)........ 2 oz.
Potash Carbonate........ 1 oz.
Dissolve, and add Water to make measure 16 fluid ozs.

No. 3.

Bromide of Sodium or Potassium, ½ oz. Water, 5 oz.

To Develop Take

No. 1........1 oz.
No. 2........1 oz.
Water........4 oz

Cramer's Pyro-Soda Developer.

No. 1.

Pyrogallic Acid........................1 oz.
Sulphite of Sodium (Crystals)..1 drm.

Dissolve the Sulphite of Sodium in 6 oz. Distilled Water and add Acetic Acid until the solution turns blue litmus paper red and then add the Pyro.

No. 2.

Water ....60 oz.
Carbonate of Sodium Crystals (Sal Soda.)..........................5 oz.
Sulphite of Sodium Crystals.....10 oz.

To Develop Take

No. 1..............................1 drachm. | No. 2..................................1 oz.

In Winter add to this 2 oz. tepid water; in Summer add 3 to 5 ozs. of cold water.

If the high lights are flat use more of No. 1, and if they are too intense use less, but do not use too little of No. 1 or the alkali will be in excess and cause fog.

Stanley's Metol and Hydrochinon Developer.

Metol.................................. ¼ oz.
Hydrochinon .... ¼ oz.
Water.....................................80 oz.

Sulphite of Soda (Crystals).....4 oz.
Carbonate of Soda (Crystals)..2½ oz.

Dissolve in the order given. If the above works too energetically dilute with pure water until the desired result is obtained.

Cramer's Metol and Hydrochinon Developer.

Metol .... ¼ oz.
Hydrochinon........................ ¼ oz.
Water....................................80 oz.

When thoroughly dissolved, add
Sulphite of Soda, Crystals.. 4 oz.
Carbonate of Soda Crystals.. 2½ oz.

To prepare above with Hydrometer, mix

20 ozs. Sulphite of Soda Solution, testing 60.
20 ozs. Carbonate of Soda Solution, testing 30.
¼ oz. Metol, ¼ oz. Hydrochinon, dissolved in 40 oz. Water.

For summer use, dilute the developer with an equal quantity of water, also for large plates, so that the development does not proceed too rapidly and can be properly controlled. If negatives of less contrast are desired use less Hydrochinon and more Metol.

Hammer's Metol and Pyro Developer.

No. 1.

Water ....57 ozs.
Sulphite of Soda (Crystals).. 2½ ozs.
Metol .... 1 oz.

No. 2.

Water ....57 ozs.
Sulphite of Soda (Crystals). 2½ ozs.
Pyro.................................... ¼ oz.

No. 3.

Water ....57 ozs. | Carbonate Potass...............2½ ozs.

For use. Take 3 ounces of water and 1 ounce each of Nos. 1, 2 and 3. This developer may be used repeatedly by adding a little fresh developer as required.

Keep the used developer in separate bottle.

This developer combines the desirable qualities of Metol and Pyro, and gives an ideal negative.

Carbutt's Hydro-Metol Developer.

Water	32 ozs.	Sulphite of Soda Crystals	1½ oz.
Hydrochinon	60 grs.	Bromide of Potash	20 grs.
Metol	45 grs.	Carbonate of Soda Crystals	1½ oz.

Dissolve in the order named, filter, place in 8 oz. bottles filled to the neck. After using a portion place in a separate bottle, which can be used again by adding a portion of fresh developer.

Seed's Eikonogen-Hydrochinon Developer.

No. 1.		No. 2.	
Distilled or pure well water	32 oz.	Water	32 oz.
Sodium Sulphite (Crystals)	4 oz.	Carbonate of Potash	4 oz.
Eikonogen	240 gr.		
Hydrochinon	60 gr.		

To Develop Take

No. 1	2 oz.	†Water	1 oz.
No. 2	1 oz.		

To prepare the above by Hydrometer test.

Sodium Sulphite Solution to test 30	34 oz.	Carbonate of Potash Solution to test 50.
Eikonogen	240 gr.	
Hydrochinon	60 gr.	

To Develop Take

No. 1	2 oz.	†Water	1 oz.
No. 2	1 oz.		

†For Double-coated Plates use 5 oz. water. More water gives less contrast and density.

Cramer's Metol-Bicarbonate Developer.

Metol	1 oz.	Sulphite of Soda, Crystals	6 oz.
Water	60 oz.	Bicarbonate of Soda	3 oz.
Thoroughly dissolve and then add			

To prepare above with Hydrometer, mix
30 oz. Sulphite of Soda Solution testing 75.
30 oz. Bicarbonate of Soda Solution, testing 50.
1 oz. Metol, dissolved in 12 oz. Water.

This developer has excellent keeping qualities, works very uniform and can be used repeatedly, without difference in the results. The Bicarbonate of Soda being a very mild alkali, it is not liable to injure the film, or fog the plate.

Cramer's Bromo-Hydrochinon Developer.

No. 1.

Distilled or Ice Water	25 oz.
Sulphite of Soda, Crystals	3 oz.
Hydrochinon	½ oz.
Bromide of Potassium	¼ oz.

Dissolve by warming and let cool before use.

No. 2.

Water	25 oz.
Carbonate of Soda, Crystals	6 oz.

Mix 1 and 2, equal parts, for use.

Carbutt's Eikonogen and Hydrochinon Developer.

No. 1.	Avoirdupois Weight.
Distilled Water	20 oz.
Sulphite of Soda Crystals	4 oz.
Eikonogen	330 gr.
Hydrochinon	160 gr.
Water to make up to	32 oz.

No. 2.	Avoirdupois Weight.
Distilled Water	20 oz.
Carbonate of Potash	2 oz.
Carbonate Soda Crystals	2 oz.
Water to make up to	32 oz.

To Develop Take

		No. 1.	No. 2.	Water.
For Instantaneous Exposures		1 oz.	1 oz.	4 oz.
For Portraits		1 oz.	1 oz.	5 oz.
For Landscapes,	Sen. 20-27	1 oz.	½ oz.	3 oz.
For Full Exposures,	" 16-20	1 oz.	¾ oz.	4 oz.
For Lantern Slides,		1 oz.	¾ oz.	4 oz.
For Full Exposures,	and 2 to 6 drops 10 per cent solution of Bromide of Potassium to each oz. Developer.			

NOTE.—More of No 1 will increase density, more of No. 2 will increase detail and softness. Temperature of Developer should not vary much below 65° or above 75°. The after-treatment is the same as with any other Developer.

Eastman's Developer for Transparency Plates.

No. 1.

Oxalate of Potash	1 lb.
Hot Water	3 pints.

Acidify with sulphuric or citric acid. Test with Litimus paper.

No. 2.

Photo-Sulphate of Iron	1 lb.
Hot Water	1½ pints.
Sulphuric Acid	½ dram.
Or Citric Acid	¼ oz.

No. 3.

Bromide Potassium	1 oz.
Water	1 quart.

To Develop Take

No. 1, 6 oz.; No. 2, 1 oz.; No. 3, 1 dram.
Mix in the order given. Use cold.

Hydrochinon Developer.

No. 1.		No. 2.	
Hydrochinon	154 grs.	Carbonate of Sodium Crystals	1300 grs.
Sodium Sulphite	2 ozs.	Caustic Potash	154 grs.
Sulphurous Acid	¼ oz.	Distilled Water	10 ozs.
Distilled Water to	10 ozs.		

To use, mix together 1 oz. of each and add 3 ozs. of water.

Eikonogen Developer.

No. 1.

Dissolve 2 ozs. of Sodium Sulphite in 10 ozs. Distilled Water and add 1 drachm of Hydrochloric acid. To this add

Eikonogen	125 grs.
Water to make	25 ozs.

No. 2.

Carbonate of Sodium	2½ ozs.
Caustic Potash	125 grs.
Water to make	25 ozs.

To use, mix in equal parts and add restrainer as in Pyro Developer. We do not recommend this developer to the amateur, for if not carefully handled there is a liability to fog.

Glycine Developer.

No. 1.		No. 2.	
Glycine	300 grs.	Potassium Carbonate	1 oz
Sodium Sulphite	2½ ozs.	Distilled Water	4 oz.
Distilled Water	10 ozs.		

To use, mix ½ oz. of No. 1 and ¼ oz. of No. 2, and add 3 oz. of water. Use restrainer as in Pyro Developer.

The above is a favorite formula for developing films. After the film is fixed and washed it should be soaked for five minutes in water 25 ozs., and glycerine 1 oz. This latter bath has a tendency to keep the film soft and pliable. In developing films they should be treated exactly the same as plates except that they should be soaked in water for about ten minutes, and when developing they should be turned over often, first film up, then film down. The developing should be continued as a rule until the image is denser than that on an ordinary plate, as films seem to lose their density in the hypo more than the average plates do. After washing and giving them the glycerine bath they should be pinned to a board to dry, in order that they may dry perfectly flat.

Rodinal Developer.

Rodinal is a ready prepared developer which is manufactured in Berlin, Germany, and is prepared from paramidophenol. It is a light brown liquid, which is sold in two-ounce bottles. In the case of a normal exposure the developer should consist of 1 part of Rodinal to 25 parts of water. In case of an over-exposure use 1 part of Rodinal to 15 or 20 parts of water, and a 10 per cent solution of bromide can be used with it the same as with other developers. In the case of an under-exposure, use 1 part of Rodinal to 30 or 40 parts of water. A half dozen 4x5 negatives can be developed with ½ drachm of Rodinal to 1½ ozs. of water.

Tolidol Developer.

This developer is the first and in fact, the only developer invented and manufactured in America.

In addition to this distinction, which is purely a patriotic one, is the incontestible fact that it is superior to any and all of the old developers in the number of its perfections and the uniform quality and regularity of its action.

Tolidol is an ideal developing agent for plates and films, as well as for developing papers. Its action is rapid, yet gradual and easily controlled. It does not stain the hands or plates; is not injurious. It dissolves easily, even in cold water. When it is made up according to the formula it will keep in solution before and after use, ordinary care being taken. It can be used repeatedly. Tolidol gives beautifully clear negatives, preserving all the fine gradations and delicate details in the high lights as well as in deep shadows. It is excellent for white drapery or flesh detail and fine effects in Rembrandt lighting. It allows the production of a great variety of tones.

It is excellent for lantern slides and transparencies, for process work, copying work, reproductions and for bromide paper.

Tolidol meets every requirement and is very economical. One ounce makes two and one-half to five gallons of developer, according to taste. One-half grain to one ounce of water will act on a sensitive time-exposed plate. It requires small portions of sulphite and carbonate.

To add more would be equivalent to asserting that we know more than the plate makers and any of them would tell you that that is not and cannot be so.

The use of the alkali in all developers, is to open up the pores of the gelatine to permit the developer to get at the silver salts. When you have accomplished this, any further addition of alkali will simply produce fog and photographers using solutions in which the alkalies are separate, as in two solution developers, should be careful not to add an excess of alkali, as it is bound to prove detrimental to the plates. Many of the published formula err in this respect and many a good formula is rendered greatly inferior in the hands of a careless operator through using too much alkali. Beware of developing formula that contain potash, as potash gives a much stronger and harsher action than soda and is rapidly being discarded in favor of soda for that reason. A further point is that by confining the chemical operations to the use of the various sodas much is gained in simplicity and the liability to serious reactions in developing and fixing solutions and in toning and fixing solutions will be avoided, especially where solutions are kept and used over and over again until exhausted or spoiled.

Bromide of ammonia is highly recommended as a substitute for bromide of potassium as a restrainer, having a less clogging effect in the highlights. It is used as a 10 per cent solution. Chloride of sodium, common table salt, is also excellent as a restrainer in a 10 per cent solution. In using the latter be careful not to restrain too much, as 4 to 6 drops of chloride of sodium will have as much restraining effect as 10 oz. of a like solution of bromide of potassium, but a badly over-exposed plate restrained with chloride of sodium will be much clearer than the same plate treated with bromide of potassium.

Keep the temperature of your developing solution as even as possible and avoid extremes. If necessary in summer, put a piece of ice in your developing tray to keep the solution down to 70° and in winter warm it if necessary to bring it to that point.

The ordinary fixing bath consists of one part of hyposulphite of soda to four parts of water. There are various other fixing baths known as acid baths, alum baths, etc. Fixing baths should be kept free from dust and to do this you should fit a cover to your bath. They should also be filtered occasionally. The various plate manufacturers recommend the following fixing baths:

Seed's Chrome-Alum Fixing Bath.

No. 1.		No. 2.	
Water (3 quarts)	96 oz.	Water	32 oz.
Hypo	2 lbs.	Chrome-Alum	2 oz.
Sulphite of Soda (Crystals)	4 oz.	Sulphuric Acid	¼ oz.

Pour No. 2 into No. 1, while stirring No. 1 rapidly. As the Chrome-Alum dissolves slowly a stock solution of No. 2 can be made up.

Cramer's Acid Fixing Bath.

No. 1.		No. 2.	
Hyposulphite of Soda	48 oz.	Water	32 oz.
Water (3 quarts)	96 oz.	Sulphuric Acid, added gradually	¼ oz.
		Sulphite of Sodium Crystals	4 oz.
		Chrome-Alum	2 oz.

After the ingredients are dissolved pour No. 2 into No. 1. During cold weather one-half the quantity of No. 2 is sufficient. This bath remains clear after frequent use, does not discolor the negatives and hardens the gelatine to such a degree that they can be washed in warm water. They should be left in the bath five to ten minutes after the Bromide of Silver appears to have been dissolved, to insure permanency, freedom from stain and perfect hardening. With the use of tho above described Acid Fixing Bath, there is no danger of frilling, even in tropical climates.

CHAPTER VIII.

Even the professional, who has had years of experience, does not produce a perfect plate every time, and the amateur must not be discouraged if he meets with failures very often. The professional resorts to many different dodges for doctering up his unsatisfactory negatives. The most common faults with amateur negatives are that they are either too thin or too dense, i. e., they are either under or over exposed or developed, or both. To a certain extent these evils can be remedied. If our negative is too thin and gives a flat print with little relief of light and shade, we may improve it by means of intensification. If the negative has been dried it must be soaked in water for about twenty minutes before applying the intensifier. If the negative is not yet dried, it must be very thoroughly washed to remove the very last traces of hypo.

Bi-Chloride of Mercury Intensifier.

No. 1.		No. 2.	
Bi-Chloride of Mercury	31 grs.	Sulphite of Soda, Crystals	154 grs.
Distilled Water	4 oz.	Distilled Water	3 oz.

The negative is laid in a tray and solution No. 1 is poured over it. The tray must be kept rocking constantly as in developing and see that the solution thoroughly covers the entire plate or you will have streaks.

It will soon begin to turn a dirty white and the length of time it is to remain in the solution depends largely on the amount of intensification desired. The negative is removed and rinsed for a few minutes in running water and then put in another tray and solution No. 2 is poured over it. Special trays should be provided for intensification and so labeled and not used for other purposes, unless they are made of glass or porcelain, and then they must be thoroughly cleaned after use. As soon as solution No. 2 begins to turn the plate black, remove it and look through the negative towards the light and when it has blackened sufficiently remove it from the solution and wash for at least one hour in running water and then put it away to dry.

Chloride as well as Bi-Chloride of mercury is used as an intensifier and the following is a standard formula:

Chloride of Mercury Intensifier.

No. 1.		No. 2.	
Chloride of Mercury	100 grs.	Sodium Sulphite	1 oz.
Ammonium Chloride	100 grs.	Distilled Water	16 oz.
Distilled Water	10 oz.		

In making No. 1, dissolve the ammonium chloride in the water and then add the chloride of mercury. Shake the bottle occasionally and when the mercury is all dissolved it is ready for use. The solution acts very much like that previously described. When the plate has turned white it should be lifted out, washed for about twenty minutes and then treated with No. 2 until it turns black and the color is sufficiently dense. Should a very

AN INDIAN RUIN.   S. Narrayen Rao, Bangalore, India.

dense intensification be desired a 5 per cent solution of ammonia may be substituted for the sulphite.

The Cramer Dry Plate Works advise the following:

Cramer Intensifier.

No. 1.		No. 2.	
Bi-Chloride of Mercury, Saturated Solution	*q. s.	Hyposulphite of Soda	1 oz.
Iodide of Potassium	1¼ oz.	Distilled Water	20 oz.
Distilled Water	6 oz.		

In solution No. 1 a saturated solution of the mercury should be made with water, and this should be poured gradually into the solution of potassium and water until the point is reached, when the red precipitate will no longer dissolve by shaking, but be careful not to add more mercury than just enough to make the solution very slightly turbid. You are now ready to add No. 2. You will note this is a single solution intensifier. For use, the above solution should be diluted with about three parts of water. Proceed as with other intensifiers until sufficient intensity is reached and wash thoroughly. Should the plate be over intensified it may be reduced by placing it in the hypo fixing bath for a short time.

Be careful to mark all bottles containing intensifiers POISON and put them away carefully.

Do not try to intensify plates when you have scratches or cuts on your fingers and do not place your face over the solution where you would inhale the fumes of the mercury. Keep your fingers out of all mercury baths as much as possible.

* q. s. signifies a sufficient quantity.

Mr. John Carbutt recommends the following:

Carbutt's Intensifier.

No. 1.		No. 2.	
Bichlor. Mercury	240 grs.	Chloride Ammonia	240 grs.
Chloride Ammonia	240 grs.	Water	20 oz.
Distilled Water	20 oz.		

No. 3.

Distilled Water	6 oz.	Distilled Water	2 oz.
Cyanide Potass, C. P	60 grs.	Nitrate of Silver	60 gr.

Pour the silver into the cyanide solution while stirring. Let the plate to be intensified, wash for at least half an hour, then lay in a 5 per cent solution of alum for ten minutes and again wash thoroughly; this is to insure the perfect elimination of the hypo. The least trace of yellowness after intensifying shows that the washing was not sufficient.

Flow sufficient of No. 1 over the negative to cover it, and allow to either partially or entirely whiten; *the longer it is allowed to act*, the *more intense* will be the result; pour off into the sink, then flow over No. 2 and allow to act one minute; wash off, and pour over, or immerse in No. 3 until changed entirely to a dark brown or black. No. 3 can be returned to its bottle, but Nos. 1 and 2 had better be thrown away. Wash thoroughly and dry.

We do not recommend the mercury intensifiers and advise amateurs to have as little as possible to do with mercury in any form. Even with the most thorough washing you will sometimes fail to eradicate the mercury entirely, and after a while you will find your negative is ruined. The Uranium intensifier gives as good if not better results and without any danger of destroying the plate.

Uranium Intensifier.

No. 1.		No. 2.	
Nitrate of Uranium	15 grs.	Ferri-Cyanide of Potassium	15 grs.
Distilled Water	4 oz.	Distilled Water	4 oz.

For use mix 3 oz. of No. 1, 3 oz. of No. 2 and 1 oz. of Glacial Acetic Acid. The solution is poured over the plate, which has previously been washed, and the tray is kept rocking constantly. At first the plate assumes a dark brown color and later a red color, which prints very well. Do not leave the negative in the intensifier too long as the color is somewhat deceptive and a negative while in the tray may not look strong but when held to the light may be found to be fully intensified. The plate should then be washed for about a quarter of an hour. If washed too long the intensification will be removed and yet it must be washed sufficiently to remove all chemicals from the film. At first the water runs off the plate as though the latter were greased. Washing must be continued until the acid, which causes this greasy appearance, is entirely removed. This solution may also be used for local intensification, i. e., intensification in spots or parts. To do this you first intensify the entire negative aud then proceed to reduce the intensification in places by the application of diluted ammonia with a camel's hair brush. One part of ammonia, specific gravity .96, in twenty parts of water is about right. The intensification fades away under the application of the ammonia. When applying the ammonia a tray of water should be at hand and if the intensification is fading too much or beyond the spots you desire to bleach, dash water over the plate, or better still, hold it under running water. Keep the plate flat when applying the ammonia and apply a little at a time, watching carefully to see that it does not run where it is not wanted. If it is a sky that requires reducing, stand the plate on edge and the sky downward so the ammonia will run away from instead of towards the picture. After this treatment the negative should be washed for fully one hour in order to remove the last traces of ammonia.

Very often the amateur in seeking to bring out every detail in his plate over developes it, i. e., deposits silver on it with such a lavish hand that when he comes to print from the negative he finds it so dense as to require hours to print it. This may be remedied by what is technically known as reduction. There are several formulas for reducers and there is little choice between them.

Hammer's Reducer.

No. 1.		No. 2.	
Water	16 oz.	Water	16 oz.
Ferricyanide of Pottassium	1 oz.	Hyposulphite of Sodium	1 oz.

Keep solution No. 1 in a brown or dark-blue bottle and in the dark room, as it is effected by the light. Take a sufficient quantity of No. 2 to cover the plate in a tray, and add to it a small quantity of No. 1; immerse the plate and watch it carefully. If the solution contains enough of No. 1, the reduction will proceed rapidly. If certain parts only of the negative are too dense, apply the reducing solution to those parts, while wet, with a pencil brush. Wash the plate thoroughly after this treatment.

Lainer's Reducer.

Potassium Iodide	10 grs.
Sodium Hyposulphite	½ oz.
Distilled Water	2½ oz.

If the negative has been dried it must first be thoroughly soaked as when intensifying, but if still wet the reducer may at once be applied by flowing over it in a tray but the plate should not be allowed to reduce too far but rather removed before it has reached the apparently right reduction and washed in water. If not reduced sufficiently it can again be inserted.

Belitzki's Reducer.

Potassium Ferri Oxalate	½ oz.
Sodium Sulphite	180 grs.
Water	10 oz.

When this has dissolved add:

Oxalic Acid, Crystals	30 grs.

Now measure out

Sodium Hyposulphite	2½ oz.
Water	5 oz.

And when dissolved add this to the above. Before the oxalic acid is added to the first solution it will be an ox-blood red but after the addition will turn green. It should then be poured off carefully and added to the hypo solution. This solution is applied either to a wet plate or one which has been soaked, by flowing over it. Plates that need local reduction only may be treated with any of the above reducers by applying it with a camel's hair brush the same as directed for intensification.

Reduction by means of alcohol is very efficient and convenient under some conditions as it requires no chemicals aside from the alcohol. It is mostly confined, however, to negatives that require local reduction only. The negative should be laid, film up, upon a flat surface like a table or a piece of plate glass and the portions to be reduced are rubbed vigorously with a piece of chamois leather wet with alcohol. The finger of an old kid glove when turned inside out will do very well, but care must be exercised not to let the seam in the glove come in contact with the film. It should be turned inside out because the alcohol might make the dye in the glove "run" and stain the negative. Do not be afraid of hurting the film, provided the negative is thoroughly dry, for instead of softening the alcohol hardens the film, and after it has been rubbed for a while the film will shine like a piece of polished steel, and all the dull, downy appearance that is often seen on over developed negatives will be entirely removed. Keep the leather wet with the alcohol or you will effect little. On examining the leather you will see that you have removed some of the silver from the film as the leather has been blackened thereby. One of the advantages of this process of reduction is that you can stop at any time and take a proof and if not satisfactory you can proceed with the reduction. We should imagine that a negative rubbed with alcohol would wear much better than one which has not and be less liable to be scratched and finger marked, for the surface of the film appears to be as hard as sole leather. This is an excellent process for treating halation. Aside from being too dense or too thin negatives often have other faults prominent among which are the following:

YELLOW NEGATIVES. This is occasioned by prolonged development, by a decomposed Pyro Solution or by an insufficient quantity of or decomposed sulphite of sodium. in the developer. Sometimes the yellow merges into a red-brown, depending somewhat on the developer. This may be remedied by using a clearing solution consisting of

Water	20 oz.	Sulphuric Acid	1 dram.
Pulverized Alum	1/8 oz.		

Always pour the acid into the water; never pour water into acid. The negative should remain in the clearing bath for about ten minutes and should then be well washed.

YELLOW AND BROWN STAINS. These stains are usually accompanied by an iridescence on the surface of the negative. It is caused by using too warm a developer, by strengthening developer while plate is in the tray, or by using a developer stronger in alkali than the plate will stand. Never strengthen the developer by pouring the solution directly into the tray which has a plate in it. Remove the plate, add new developer, pour it into a graduate, replace plate and flow developer over it. These stains are also sometimes caused by using a plain hypo bath which has been used too long and which has become dark in color. These stains may usually be removed by local application of a reducing solution.

WEAK OR THIN NEGATIVES. This may result from several causes. The film on the negative may be too thin. If it has clear shadows it is the result of under development. If it has plenty of detail in the shadows it is a case of over exposure or too weak developer. This may be remedied by intensification.

GREEN FOG. The plate is covered with a green fog or film when hypo has been allowed to get into the developer.

TRANSPARENT LINES. This is sometimes found on plates after development and is caused by scratching the film by dusting with a coarse brush.

MOTTLED NEGATIVES. These are caused by the precipitation from the fixing bath which contains alum, if the solution is old or dirty. Negatives cannot be remedied when in this condition but it can be guarded against by preparing a new fixing bath.

CRYSTALLIZATION ON NEGATIVES. This is caused by insufficient washing after fixing. If the salt is just beginning to appear and the film of the negative has not been destroyed the plate may be saved by a thorough washing for two hours followed by a bath composed of 50 grs. of Persulphate of Potash, sometimes known as Anthion, to 16 oz. of Water. They should be soaked for ten minutes, washed and examined, and this operation repeated three or four times. If the hypo crystals disappear after this but the yellow stain remains, treat with the cleaning solution. If, however, the hypo has eaten into the film you might just as well throw away the negative.

Frilling. This consists of the film separating from the glass at the edges of the plate and wrinkling up. This sometimes occurs in the development in hot weather. Remedy, keep developer cool with ice. It also occurs in the fixing bath and when washing. This occurs when using too concentrated or too old a fixing bath or washing in too warm water. Alum in the fixing bath prevents frilling.

Blisters on Negatives. The same causes that produce frilling sometimes produce blisters in the middle of the plate. Plates made in the hot summer months by manufacturers who have no ice plants in connection with their factories, for keeping down the temperature, often have minute blisters over their entire surface, and these blisters are so small as not to be perceived until after the plate is dried. As a usual thing they do not effect the printing qualities of the negatives and do not show except in the case of a clear sky. In such a case the sky can be blanked out by covering with a piece of paper and the sky of another negative printed in as described in the next chapter. Too much acid in the fixing bath will also produce blisters.

ROUND TRANSPARENT SPOTS. These are caused by bubbles in the developer. Break the bubbles with the finger as rapidly as they appear. The negative can be saved by skilful touching up, which will be explained later on.

IRREGULAR TRANSPARENT SPOTS. These are caused by dust on the film of the plate before it was exposed. They can be filled in as will be described later on.

SMALL DARK SPOTS. Small dark spots sometimes appear all over the negative. This is sometimes caused by old plates that have deteriorated but more often from faulty fixing, especially where negatives are fixed in a tray and lay in a horizontal position. Small pieces of film and dirt settle on the face of the negative and particles of the bromide of silver are not fixed out on this account. Dirt also settles and imbeds itself in the film. There is no remedy. It can be avoided by fixing in a bath where plates are held in a vertical position and all dirt sinks to the bottom.

STREAKS. These are sometimes caused by excess of acid in fixing bath, particularly if the streaks run the same way that the plate was inserted in bath. They sometimes occur from slight leakage of light in plate holder or bellows, but then show when plate is developed and before fixing. There is no way of saving such plates. Prepare new fixing bath or hunt up leaks in camera or holders as the case may be.

Fog. Fog is a deposit of silver which has the appearance of a grey veil all over the plate. It deepens the shadows and gives the entire negative a flat, dirty appearance without sharp lines. There are many causes for fog, among them being over exposure of the plate, leakage of light through a defect in the plate holder, or camera, or the admission of white light into the dark room. Fog may be produced by an unsafe lamp in the dark room, either at the time the plates are loaded or during development. A developer which is too strong in alkali will also produce fog. If the plate has been exposed to light before development the fog will make its appearance before the image does. Very old plates also have a tendency to fog. If the fog was caused by over exposure or light leakage in camera it can be verified by examining the edges of the plate where it was held in the holder. If the protected edges remained white then the latter was the case, but if the entire surface of the plate is fogged then it is probably a case of unsafe light in the dark room. Fogged spots at one side or one corner of the plate are attributable to carelessness in inserting the slide in the plate holder after exposure, allowing the white light to creep in by inserting one corner of the slide first. As a general rule if the fog is not too dense and the contrasts are good the plate can be saved by reducing it until all signs of fog have disappeared, and then after giving it a thorough washing the plate can be intensified to the required shade. Local reduction can be used where portions only are fogged followed by local intensification. Small fog spots may sometimes be successfully removed by allowing the film to dry thoroughly and then reducing by means of the alcohol rubbing process as above described. If it is suspected that the fog is owing to leakage of light through the camera or holder careful examination must be made until the source is discovered and the fault remedied. If the dark room lamp is suspected it should be carefully tested by exposing a fresh plate to the rays of the lantern for several minutes and then developing it. If the developer produces fog and yet is not too strong in alkali then we know that the lamp is at fault and steps must be taken to procure another ruby glass or to fit an orange glass or paper over the ruby.

CHAPTER IX.

When a negative has small transparent spots on it caused by dust on the plate or air bubbles in the developer, they may be successfully treated by what is known as the spotting-out process. The negative is placed at an angle of 45° and a piece of card board or white paper is placed back of it in such a way as to reflect the light through the negative, or better still, it is placed on a retouching stand. The spotting is usually done with water colors, although India ink is sometimes used. Gum water or the white of an egg should be used with the color in order to make it adhere firmly and it also prevents it running. The gum water is prepared by putting a few pieces of gum Arabic in a small vial and covering it with warm water. Shake the vial occasionally and when the gum is dissolved it is ready for use. One or two sable brushes with very fine points should be secured. A little color should be mixed with the gum water or albumen and care must be taken to match the color of the film on the negative as nearly as possible. The best water colors for the purpose are what are known as moist colors, which are put up in small china pans. Sepia, vandyke brown, burnt umber, black and dark blue are the principal colors used. Mix a little of the color to the right shade by means of a large brush, but be careful not to thin the color too much. Now take your fine pointed brush, wet it in the gum water and draw it to a fine point between the fingers and by turning it around and around on the pallette or saucer. Now lift a small quantity of the color on the extreme end of the brush and apply it to the transparent spot. You must not attempt to fill in the entire spot with one daub but rather apply the extreme point of the brush to one side of the spot, making a very small stipple, about the size of the point of a pin. Allow it to dry for a minute and then make another stipple and so on, until the spot is entirely filled in. Be careful not to use too dark a color or to apply too much of it, so the spot will be darker than the surrounding film, or when you come to print you will leave a white, instead of a black mark on your paper. If you match the color of the negative carefully and do not apply too much color, when you come to make your print you cannot find the spot, because the light has penetrated through it to just the extent that it penetrated the film. The dots need not touch one another exactly and the spot need not be entirely filled in. Very small spaces between the dots do not show on the print.

Negative spotting may also be done by means of a medium hard lead pencil, sharpened to a fine point but when a pencil is used, it is first necessary to apply a small quantity of retouching varnish to the spot or the pencil will not act. Retouching varnish can be purchased at very small expense from any photographic supply house, or the following will answer:

Gum damar	60 grs.
Turpentine	1 oz.

A very small quantity of the varnish should be taken on the end of the forefinger and applied to the spot by rubbing it lightly. Allow the varnish to dry, which it will do in a few minutes and then proceed to stipple in the spot with the extreme point of the pencil, making as it were minute commas. These can lap one over the other until the spot is entirely filled in. Sometimes the photographer prefers to fill in the spot with one or two daubs of black varnish or Gihon's opaque, which will leave a white spot on the print and then spot out the print with water color that matches the color of the print. Spotting out on negatives must not be confounded with spotting out on prints.

It sometimes happens that a negative prints too dark in spots or one part prints more rapidly than another. This is often found in landscapes that have a heavy foreground and also sky effects. If we print long enough to bring out the details of the foreground we find we have over-printed the sky. Sometimes we find the reverse, the top of the negative prints slower than the foreground. This can be remedied in several ways. If the dividing line between is straight, we can cover the portion which prints too quickly with tissue paper or matt varnish. Matt varnish is prepared as follows:

Sandarac	140 grs.	Ether	7 ozs.
Gum Mastic	30 grs.	Benzole	1½ ozs.

Dissolve the sandarac and mastic in the ether and then add the benzole. Filter through muslin before using. This preparation should not be used close to a lamp or gas flame, as it is highly combustible. The matt varnish is never applied to the film, but always to the glass side of the negative. The plate should be held in the left hand in a horizontal position, glass side up and the varnish poured in the center of the plate. Then tilt the plate from one side to the other until the varnish runs to all sides of it but do not allow it to drip over the sides.

When the plate has been covered entirely, turn it on end, in a vertical position, putting one corner of the plate in the mouth of the bottle so that all surplus varnish will run into the bottle. When the plate has been well drained, allow the varnish to dry and it can then be scraped away from that portion of the negative which prints slowly and allowed to cover the back of that portion which prints too rapidly.

It sometimes happens, that an otherwise good negative has a poor sky or that that portion of the negative has met with some accident. In such an event the sky can be blanked out entirely as mentioned in the last chapter in the case of blisters and the sky from another negative printed in. This would be easy to accomplish with a piece of black paper if the sky line was a straight one, but it often happens that trees, houses and church steeples encroach into the sky, thus making the line irregular. To blank out in such a case, use a fine pointed pen (those known as crow quills and sold by artists' supply houses, are best) and black varnish or India ink, mixed with white of egg. The negative should be placed on the retouching stand with the sky downward and the film side towards you. Charge the pen by means of a brush and go carefully around the outlines of the picture where it merges into the sky. Care must be exercised not to run the line over the picture but this can easily be avoided. When the outline has been completed with the pen, take a small, fine-pointed brush and follow this line but not lapping it and you will then have a broad line separating the picture from the sky. You can now use a larger brush and blank out the balance of the sky. When dry the negative is ready to print and when printed the resulting picture will have a perfectly plain white sky, on which can be printed any sky effect desired with another negative.

Retouching is seldom practiced by amateur photographers and as a rule when they have work of this class they usually give it out to the professional. In fact, retouching is an art in itself and it is not every professional who can do it properly. To be a good retoucher you must be something more than a good photographer, you must be an artist. It is the act by which, as a rule, the photographer flatters his patron. By its means he removes the wrinkles, freckles, crows' feet, moles and other distinguishing marks but at the same time unfortunately destroys the likeness. Retouching is almost wholly applied to portraits, although now and then a marine or landscape negative may be improved in some of its details by judicious retouching. It is an art which can only be acquired by assiduous practice and no amount of cut and dried rules will make a first class retoucher. When working on portraits great care must be exercised not to overdo it or the result will be a failure so far as the likeness is concerned. In portraits of elderly people the retouching should be confined to the shadows on the face and no attempt should be made to remove the wrinkles and crows' feet at the corners of the eyes.

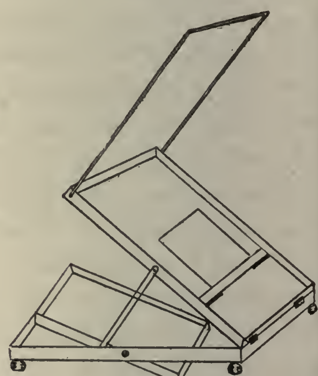


Fig. 29.

The first requisite is a retouching stand of some kind. This can be purchased from a photographic supply house or the amateur can make one himself if he is at all ingenious and handy with tools. Fig. 29 illustrates a home-made retouching stand which is very easily made. It consists of three small, cheap frames. Two of these frames are hinged together at the front and the third, which is smaller than the others, is pivoted to the horizontal one. The smaller frame holds a mirror, or a piece of white cardboard will do. The horizontal frame has four feet to raise it from the table to give room for the mirror to swing. The other large frame is placed at an angle of about 45° but the angle may be varied by means of the adjustable foot at the side. In this upper frame is placed a piece of ground glass on which the negative lies. A piece of plain glass could be used instead of ground glass and it could be covered on the back with matt varnish. Just below the negative is a flat wooden support which holds the negative in position and the support may be raised or lowered according to the size or part of the negative that is being worked upon. This adjustment is made easy by boring a number of small holes in each side of the front and holding the support in position by means of wooden pins which fit in these holes. Attached to the upper frame is still another one, made of heavy wire and pivoted, so it can be raised or lowered. This wire frame acts as a support for the focusing cloth or a piece of black cambric which shuts out all light except that which comes in through the ground glass.

The stand being ready, the film side of the negative is lightly rubbed with retouching varnish as explained when spotting out. When the varnish is dry the plate is placed on the ground glass with the film side out and the support adjusted so the negative is about central. Two or three hard pencils should be purchased, preferably H, HH and HHH. These should be sharpened to a long taper point and the final point should be put on them by means of a piece of fine emery paper. The emery paper should be glued to a small piece of board and kept on the table close to the retouching stand, for the points of the pencils must be kept needle sharp and constant application to the emery paper must be made. In sharpening, keep the pencil turning in the fingers and the fine point is easily secured Take a piece of black paper, such as plates are packed in in their boxes and trimming it to the size of your negative or a little larger, cut a round hole in it near the center and about three-quarters of an inch in diameter. Place the screen over your negative so the circular hole will come over that portion which you are about to retouch. This screen has two uses, one to cut off all light except at the point at which you wish to work and the other to keep the fingers and hand from coming in contact with the film. The latter is quite necessary, particularly in summer when the hands are liable to perspire. The angle of the mirror or the frame may be shifted so as to throw the light directly on the ground glass. Retouching may be done at night by means of artificial light by placing the stand so that the mirror will reflect the light. If done in the daytime the operator should face a window, a north light being preferable. A strong reading glass will be of great assistance in retouching, as the lines and dots should be very fine and the work is very fatiguing on the eyes.

Another very simple retouching stand is shown in Fig. 30 and it can easily be made by any one. Its general shape is that of a truncated pyramid. The top A should be made of tin or zinc and the sides B and C can be made of light wood, tar board or any other suitable material. Four pieces of tar board, joined at the edges by gluing on strips of black muslin, will answer very well. In one side should be cut an opening, say 5 x 8 inches, as shown at B and in the opening should be fitted a piece of ground glass. In the center is placed a small lamp which will illuminate the negative. A small projection should be glued on just under the ground glass, on which to rest the negative.

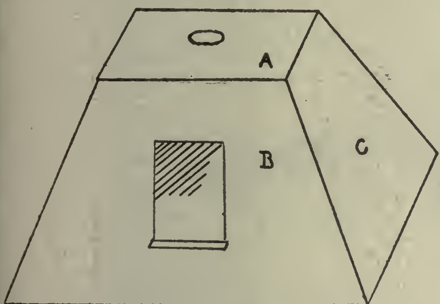


Fig 30.

As we said before, retouching can only be acquired by practice but a few hints may be of value to the amateur who proposes to try his hand on this work. Each retoucher has his favorite method of working. Some use small stipples and commas, others use wavy hair-like lines and others employ both on one negative.

Fig. 31 is an illustration made from a photograph before it was retouched, Fig. 33 was made from a print

Fig. 31.

from the same negative after it was retouched, and Fig. 32 gives a general idea of where the retouching was done. Fig. 32 is only a reproduction of the retouching lines as near as an artist could follow them with pen and

Fig. 32.

ink and in the original of course the lines were much finer and blended into one another. In nearly all instances the retoucher works with the extreme point of the pencil, holding it at right angles to the plate.

Fig. 33.

This negative was retouched by a professional and you will note that comparatively little retouching has been done, in fact just enough to even up the lighting of the face. In Fig. 31 you will note that a straggling lock of hair has escaped from the hat and the retoucher has removed it, so that it does not show in Fig. 33. These illustrations being made by the half-tone process much of the detail is lost and the difference in the illustrations is not so marked as it is in the photographs. Sometimes the retoucher applies the plumbago by means of the finger tip or with a stump, such as is used in crayon and pastel work. This is only done where larger surfaces require lighting up. It is well for the amateur to work slowly, taking a proof of his negative now and then to see what effect his work has produced. If the retouching shows in the print or is not satisfactory, it can be removed by means of a soft rag dipped in turpentine. Above all, avoid doing too much retouching; soften down the harsh lines usually found on each side of the nose and soften up the dark side of the face (the side that is light in the negative) just enough to bring the two sides in harmony. After the retouching is to your satisfaction, it is well to varnish the negative in order that the retouching shall not become blurred through handling. The varnishing and general care of negatives will be described later on.

CHAPTER X.

Having passed through the various stages and exposed, developed, fixed and washed our negative and remedied any slight imperfections in it, we are now ready to consider one of the most important stages of picture making, that of printing and toning. It is one of the most important because, although we may have succeeded in securing a most admirable negative, that is no guarantee that we shall have a beautiful picture, as much depends on the paper used, the quality of the printing and the success in toning.

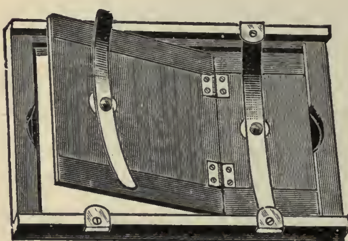


Fig. 34.

Before starting our printing, we must have a suitable device for holding the paper and plate in close contact. Such a device is known as a printing frame and is illustrated in Fig. 34. These frames are comparatively cheap and the amateur should have at least four of them, for it is not every day that you can print and as the average amateur will have to do his printing on holidays or outside of business hours, it will be found advantageous to keep four frames going at one time. If your plates are 4x5 we should advise the purchase of three frames of this size and the fourth one say 8x10. Our reason for so advising is that you may desire to put a 4x5 view in the middle of an 8x10 sheet and to do this you must have an 8x10 frame.

The negative is laid in the printing frame film side up, the printing paper is laid upon it film or sensitive side down, so that the sensitive side of the paper shall come in contact with the film side of the plate. There will be no difficulty in determining which is the sensitive side of the paper. The cover of the printing frame is then laid upon the paper, the springs depressed and moved from right to left as the case may be, until they come under the metal catches on the edge of the frame, thus holding the paper in perfect contact with the negative. Before placing the paper in position however, it is absolutely necessary that all dust be removed from the face of the negative. This may be done by means of a camel's hair brush, as we did when we loaded our plate holders, but as in that instance, we must also here be careful not to brush the film too vigorously, or we will electrofy the plate and thus cause the small particles of dust which are ever floating in the atmosphere to be attracted to it. In order to overcome this obstacle, some photographers undertake to free the plate from dust by blowing upon it with their mouth. This is a dangerous practice, either when loading plate holders or when preparing to print, for small particles of saliva are very apt to accompany the breath and bespatter the face of the negative, which will cause the film on the paper to be cemented to the face of the plate. A far better practice in dusting plates is to use a bulb similar to those which operate the shutter in hand cameras, though those a little larger in size will be found preferable.

Fig. 35 illustrates such a bulb fitted with a short pipe made of lead. This pipe being heavy, prevents the bulb from rolling around when laid down. By compressing the bulb a strong current of air can be directed all over the plate, effectually removing all particles which may be resting upon it. This bulb will also be found useful for cleaning the plate holders and the camera, for the current of air can be directed into corners and out of the way places which cannot be reached by the brush.

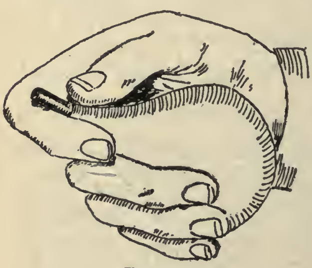


Fig. 35.

Having placed the paper in the frame we now turn the latter upside down and by means of a handkerchief or a piece of clean cloth, we proceed to clean the glass side of the negative. This is done most effectively by breathing upon the glass and then rubbing it vigorously. Sometimes the emulsion gets spattered on the glass side of the negatixe and this will have to be removed with a knife, as it adheres very firmly.

Printing, as a rule, should always be done in the shade, although it is often done in the bright sunlight. Prints made in the shade have more vigor and contrast than those made in the sun and the film on the paper is less liable to become brittle and crack when handled in the subsequent operations of washing, toning and fixing. As a rule printing should be done in the open air and a small platform on the window sill can very easily be fitted for this purpose. During bright weather a north window should be used but if the day be cloudy a south exposure is preferable. The frame should be placed with the negative turned towards the sky and care must be exercised that no shadow from the roof or trees fall upon the glass. The print may be examined from time to time by releasing one spring and half of the cover and raising the print from the negative. The depth to which we shall print must be governed entirely by the paper we are using.

Printing papers are divided into two separate and distinct kinds, known as "printing out" and "developing papers." In the former the image is visible on the paper in a very short time after it has been exposed to the light but in the latter the image is either very faint indeed, or is not visible at all until after development. Plain silver papers, blue prints, albumen, gelatine and collodion papers belong to the first type and they are are printed until the image is fully as strong or stronger than required in the finished print. Bromide, Velox, and other papers of this type belong to the second class and no image appears on them until after development. Bromide papers must only be handled in the red light of the dark room as they are very sensitive. They are usually printed by artificial light, although printing may be affected by a very short exposure to subdued natural light. Even printing out papers should not be exposed except in subdued light until after they have been placed in the printing frame.

Printing frames should never be placed inside a window until after the glass, both inside and outside has been thoroughly cleaned, for any splashes of dirt upon the window glass will shade the light from that portion of the print and the result will be a light patch on the print.

There is an old adage which says, "Cleanliness is next to godliness" and equally true is it in photography that cleanliness is next to success. One of the most important things to be clean with in photography is the trays used in the toning room. Trays can be bought of any size and of all kinds, from your dealer, at reasonable prices and there is no excuse for having bad trays. Bad trays are very expensive things and cause the loss of many dollars worth of time and stock. Trays should always be large enough to enable one to wash prints without tearing. All trays should be thoroughly cleaned before using, by scouring with bicarbonate of soda and rinsing well with clear water.

Aristo Papers.

The various printing out papers manufactured by the American Aristotype Company, Jamestown, N. Y. and generally known as Aristo, are pure collodion papers. Papers of this class have a tendency to curl as soon as they are placed in water and a hint as to how to prevent this may be timely at this juncture.

A large, smooth-bottomed tray is used and about one-half inch of water placed in it. The prints are now taken and placed in this water one at a time by sliding them in, one on top of the other and keeping them flat on the bottom. Be sure a print is thoroughly wet before another is placed on top of it. The prints should not be placed in the tray in a regular pile, as this allows the edges to curl over each other but should be piled irregularly well over the bottom of tray, partially covering one another. After all prints are in, pour off water and put on fresh water; keep prints flat and rock the tray for five minutes (this will prevent red streaks). Pour off water and press them down with the flat of the hand, allowing all the water to drain out. Now, stand the tray on edge and allow the prints to drain for five minutes. Then pour plenty of water over them and proceed to wash by separating the prints and handling them over and over.

The reason why collodion paper curls toward the film in the water is because the paper which is coated swells as soon as it is wet and the film does not. If the print, when first placed in the water, is held flat, then the paper swells in thickness only and if the print is kept flat until the paper is thoroughly soaked in this position, it will remain flat during the entire manipulation. Therefore it is important to keep the prints flat in the first water. In summer use tap water and in winter temper water, so it will be pleasant for the hands to work in, say, 65 to 70 degrees.

Toning Blue Label and Junior Aristo.

Print about two shades darker than desired when finished. Flatten the prints as directed for collodion paper and then wash through six changes of clear water, handling the prints over each time, then tone in the following bath:

Water	60 oz.	Sat. Solution Acetate Soda	½ oz.
Salt	60 gr.	Chloride of Gold	1 dram.

Sal Soda or Borax, enough to turn red litmus paper blue in 4 or 5 minutes.

Make this bath up from one to two hours before use. Add gold enough to keep speed of bath six or eight minutes. Tone in this bath to any point you desire prints when finished. After toning, place in clear water. When ready to fix, rinse thoroughly through two clear waters. Fix in plain hypo, fifteen grains hydrometer test, for fifteen minutes, wash one hour in running water. Mount with any good fresh paste and lay out to dry quickly. In cold weather always temper all water to

A NOVEMBER SUNSET. Fred'k K, Lawrence, Chicago.

about sixty-five or seventy degrees. The salt in the toning bath restrains the high lights from overtoning and brings the high lights and shadows up clear at the same time, also saving the fine detail in white drapery. If you are not using it, try it and you will not be without it. Acetate of soda is a neutral salt and you need not be afraid that it will make bath alkaline. Muddy shadows and yellow whites and lack of brilliancy mean that your bath is too alkaline. Blue edges to the vignettes and bleaching in toning bath, signify an acid bath. Remedy, add a few drops of alkali.

Double Toning.

Aristo platino paper should be printed plain, as a general thing. Print until the high lights are well tinted. Pay no attention to the shadows, no matter how much they bronze. Wash through six changes of clear water, handling prints over each time. In washing paper, there are two things we must eliminate, the free silver and the keeping chemicals and unless prints are thoroughly prepared for toning, they will not tone thoroughly and evenly.

When prints are thoroughly washed, tone in the following bath, to a purple, not a blue:

Water	60 oz.	Chloride of Gold	1 dram.
Salt	60 gr.	Borax enough to turn red litmus paper blue in 3 or 4 minutes.	

The gold toning bath should be made up from one to two hours before use. Add enough gold so the bath will tone in from six to eight minutes. Do not run the bath too strong, as the print will tone before the whites clear up. If prints show bleaching in the whites, add a little more alkali. An acid toning bath bleaches out the detail in the whites and also makes pink whites in the finished print. If the bath is too strong in alkali it gives yellow whites.

The character of platinum tones is controlled in the gold bath. If prints are taken from the gold bath a chocolate brown, they will make beautiful olive tones. Prints toned to a purple will make black tones and prints toned to a blue will make blue-black tones. By bearing this in mind, it is possible to get any tone desired. Always, in every case, tone far enough in the gold bath to thoroughly clear the whites. After toning, throw prints into the clear water until all are toned.

Wash prints in three changes of clear water by handling them over. Do not try to wash by placing in running water. It will not do it. It is very important to wash prints thoroughly after they come from the gold bath, to remove any free gold that may be on the prints, as gold precipitates platinum and unless prints are well washed, the platinum will be precipitated on the bottom of the tray and not on the print. Again, never use the regular gold toning tray for platinum bath, as all such trays have more or less gold deposited on bottom and sides and this will precipitate your platinum also. It will not only waste platinum but prints toned through both baths in the same tray will tone down to a muddy blue-black and if kept in long enough, the whites turn yellow.

The Platinum Toning.

When prints are washed, tone in the following bath: Water, sixty ounces; platinum, three to five drams. Add platinum enough to keep speed of bath from eight to fifteen minutes. The great mistake that photographers have made in toning Aristo-Platino with platinum is, they have not toned long enough in the platinum bath. When prints first go into this bath, the whites become muddy but in a short time the whites commence to clear up and by keeping prints in this bath until the whites are thoroughly clear and every trace of brown or purple is out of the deepest shadows, by looking through the print you will get most beautiful effects. Do not be afraid of leaving them in the platinum bath until the desired color and richness you wish is obtained.

When prints come out of the platinum bath, it is very important to wash them thoroughly through three changes of water before fixing, because the platinum bath is extremely acid and it is absolutely necessary to wash it out of the prints. If you do not, you carry it into the hypo and produce sulphuration and yellow whites. This is the reason that all hypo baths containing lots of alum or acid hardeners are dangerous, as this acid releases the sulphur in the hypo and produces sulphuration in the print that will ruin them sooner or later.

After prints are washed, fix in plain hypo, eighteen grains strong, hydrometer test, for fifteen minutes and then wash by hand through two or three changes of water before placing them in running water one hour. Always mount with good fresh paste and lay out to dry quickly. When dry run through a cold roll burnisher, if you have one, to straighten mount. One-half the old platinum bath with one-half fresh bath added and used over the next time, makes richer tones than a new bath.

Any red spots on platino paper can be removed by rubbing some of the stock platinum solution on the spot with the finger as the print goes in the platinum bath. The spot darkens and the rest of print tones up to it. There is no necessity for losing prints from red spots.

Sepia Tones on Platino.

No. 1. To make sepia tones, print about two shades darker than desired when finished. Wash through two changes of clear water. Then place prints in a strong salt solution, two ounces of salt to a gallon of water. Keep in salt water for five minutes until they redden up. Then wash through two more changes of clear water and tone in the following bath:

Water	60 oz.
Chloride of Gold	½ dram.

Sal Soda enough to make red litmus paper turn blue in ten minutes.

Work this bath just slightly alkaline. Just clear the whites and place in stop solution of salt water and fix in ten grain hypo bath (to which add a handful of salt) for fifteen minutes. If prints look yellow in fixing bath, they will come out all right in the washing and drying.

No. 2. Print about two shades darker than desired when toned. Wash through five changes of clear water and tone in a plain gold bath.

Water	60 oz.
Chloride of Gold	½ dram.

Work this bath just slightly acid. Keep prints in the bath just long enough to clear the whites, then place in clear water and wash through one water. To the same gold bath, add another half dram of gold. Now add alkali enough to turn red litmus paper blue in a couple of minutes. Place prints back in this bath and tone the shadows to the point you desire when finished. When toned, place in clear water and fix in a plain hypo bath twelve grains strong for fifteen minutes. All paper for sepia tones should be at least 30 days old.

Double Toning Troubles.

Pink whites are caused by not having the gold bath alkaline enough. Yellow whites may come from prints not being toned far enough in the gold bath. Yellow whites may come from trying to wash prints in running water, between gold and platinum baths or between platinum bath and hypo. This will not do. Prints must be washed by hand and the water changed.

Weak looking prints very often come from not printing dark enough. Try three prints, one as you have been printing, the second a shade darker, the third darker still; tone them all out, select the best and you have the depth to print. Weak looking prints more often come from improper toning in the gold bath than any other cause. Always tone in the gold bath until the shadows are a warm brown (for olive tones). If your whites have cleared and are in danger of bleaching, add more alkali to hold back the whites until the shadows tone. Never take them out a brick red in the shadows. If you do, you are in danger of having weak, muddy shadows and a dirty olive tone out of the platinum bath. If you desire rich, strong shadows out of the platinum bath, you must have rich, strong shadows out of the gold bath. Weak shadows are also caused by not using the salt in the gold bath.

Slow toning in platinum bath is often caused by not using the proper kind of phosphoric acid in making up the platinum toning solution. Only use 50 per cent or U. S. P. phosphoric acid. You cannot be too careful. Too slow toning in the platinum bath is very often caused by the water which you use, for very alkaline water precipitates the platinum. See remarks on the water on page 129. Rubbed places on the face of the prints which do not show until the prints are dried, are caused by rubbing the face of the prints on the bottom of the tray during washing and toning. When you have this trouble, handle the prints face up.

Single Toning.

Many photographers, thinking that the single toner is a combined bath, in which prints are fixed and toned at the same time, have condemned it without a trial. This is a mistake, as prints are toned first and then fixed. We will try and briefly explain the simplest and easiest manner of working Aristo Platino and Junior in the single toner.

The printing should be fully as dark as for double toning; print until the high lights are well tinted. Pay no attention to the shadows, no matter how much they bronze. Too light printing gives weak and bleached looking prints when finished. Prints should be washed in eight changes of clear water before toning, to thoroughly remove all free silver. Handle prints over in each wash water; letting prints lie in the ruuing water for half an hour without handling is not so good, as some prints will not thoroughly wash.

Toning Bath.

After washing tone in the following bath:

Water	32 oz.
Single Toner	2 drams.
Platinum	1 dram.

Prints should be toned in this bath until all trace of of red has disappeared from the deepest shadows. If the toning is not carried fully this far, you will not get pure whites, or clear shadows but prints will come out after fixing a dirty, muddy, green color, with no brilliancy. Throw prints from toning bath into clear water until all are toned. Then wash in four changes of clear water, handling prints over in each wash water to thoroughly eliminate all acid before fixing. Then fix in a plain hyposulphite of soda bath, eighteen grains strong to the ounce, hydrometer test, for twenty minutes, handling prints during fixing to insure perfect results. After fixing, wash in ten to fifteen changes of clear water, or one hour in running water, handling prints over occasionally to insure thorough washing.

In toning Aristo Junior in the single toner for olive-black tones, it is handled just the same as Aristo Platino, with the one exception, flattening the prints in the first wash water, as described on page 111. In handling Aristo Junior and toning in the single toner, print fully as dark as for Aristo Platino. The prints will tone some slower than Platino, owing to the heavier gloss surface but when finished and burnished with a hot burnisher, will turn a beautiful, rich, olive-black print, equal to any gloss carbon made, fully as permanent and much finer than any gold tone print.

Some Things to Remember.

1. In many places the water is impure and red spots make their appearance. In trouble of this kind, add to every gallon of the first wash water, three ounces of a saturated solution of sal soda. Handle prints over in

this water five minutes. It will do very little good in any but the first wash water.

2. If prints when put into the toning bath bleach or cut out the high lights, spoiling the delicate half tones, the addition of from one to two drams of platinum solution to the toning bath will remedy the trouble.

3. Your toning bath can be strengthened by adding two drams of platinum solution and one dram single toner, always watching your bath to see that it is working right.

4. When bronzing shows in the shadows after prints are finished, the best remedy found is the sal soda in the first wash water. It softens the emulsion enough to allow the silver to wash out more freely in the heavy shadows, as well as allowing the toning bath to penetrate the same and thus remove the trouble.

5. The best results are obtained by using fresh toning bath every time. In no case, ever use more than one-third old bath over.

6. To remove red spots on prints toned with single toner, dilute the stock single toner solution with equal parts of water and apply to spot, but not until print is fully toned.

7. Prints should be thoroughly washed in four changes of water after toning, before fixing, as the toning bath is very acid and if this is carried into the fixing bath it is liable to cause muddy whites and prints with no brilliancy.

8. Never use the platinum tray for anything but single toner and platinum toning.

9. All wash waters and toning baths should be kept in a temperature of 65 or 70 degrees during cold weather.

10. Last but not least, use judgment in all your work and do not condemn toning solutions, paper, etc., just because you do not have success at first; remember that others are working them successfully and you should be able to do the same.

Gold Toning Baths.

In toning in the gold bath, it is important to watch several points. One is to see that the high lights and shadows are both toning equally. It is a good plan to look through the print by transmitted light and if you find the same tone as appears on the surface, you are toning down in the emulsion and your tones will hold in the hypo bath; but if the print looks purple on the face and when you look through it, the shadows look red, you can depend upon it you are getting a surface tone and when the print goes into the hypo the surface tone will cut off and you will have the tone you are looking through. The reason is, you have not washed all the free silver off your print. Your gold is depositing in this free silver and when the print goes in the hypo bath, the free silver cuts off and takes your tone with it. By the use of salt in your gold bath, you avoid this. The salt also restrains the high lights from over-toning and enables the shadows to tone up at the same time. The salt also saves the fine detail in white drapery.

Should you find, in toning, your whites are bleaching, it is because your bath is not alkaline enough, so add a few drops of alkali. On the other hand, if your prints refuse to clear up and tone out dead and flat, it is because your bath is too alkaline, in which case add a little acid gold or a drop of citric acid. In toning Aristo Platino paper, if you do not have your gold bath alkaline enough, you will get pink whites in the platinum bath. Always remember that pink whites mean that your gold bath was not alkaline enough.

It is impossible to give the exact amount of alkali to use. Almost all waters are alkaline. The litmus paper test must guide you in this. Study and test the water you work with and you will not have any trouble making nice prints. All gold baths should be made up from one to two hours before use and a good plan is to make up a fresh bath for next time, after you get through toning, only adding about a grain of gold and then when ready to tone, adding the gold to tone with. A ripened bath will work much smoother than a fresh one. Many printers like to use one-half old and one-half new bath. Acetate of soda will not have any effect on a toning bath, unless added one hour before use. Acetate of soda will always keep your tone rich and brilliant. In making up a gold bath, remember that neutralizing with sal soda gives warm tones, borax gives brown tones, and bi carbonate soda gives purple tones. Borax is generally used because it is the weakest alkali and a few drops more or less will not get one into trouble as quickly as the stronger sodas do. In some waters it is best to use sal soda as an alkali for the gold bath, as borax may give muddy shadows. If borax is found to give this result, you should try sal soda; but remember that sal soda is a very strong alkali and should be used very cautiously. When the water you use is alkaline it is best to use a very acid gold and acidify your toning bath first. Then add borax or sal soda to bring it up to alkaline. The reason for this is, that the alkali found in the water is a lime alkali and is not the proper kind of alkali to use and will not give you satisfactory tones.

Platinum Toning Bath.

The formula gives sixty ounces of water and three to five drams platinum solution. Of course, it depends on how many prints there are to tone. So the best formula to follow will be to place enough water in the tray you expect to use and add about three drams of platinum solution to start on. The speed of this bath should be from eight to fifteen minutes. If necessary add more platinum until you get it, for it is platinum and not water that tones. A print slightly toned in the gold bath will take more time and platinum to tone in the platinum bath. If a print be left very warm in the gold bath and toned hard in a strong platinum bath, it will be a strong olive, as overtoning with platinum gives greenish or olive-black. If you tone to purple and deposit a good lot of gold on the print, it takes less platinum and time to tone and will remain a pure black. Too slow toning in the platinum bath flattens the whites and has a tendency to muddy the shadows. The platinum bath is very acid. Only use one-half to two-thirds old bath over. If you use all the old bath over and all the acid is left in the old bath and you keep adding fresh platinum solution, you will get it too acid and are in danger of cutting out your prints.

Hypo Bath.

In making up the hypo bath, always use the hydrometer to test it. For Junior and Blue Label use fifteen grains hypo and fix fifteen minutes. For Platino paper, use eighteen grains hypo bath. If you wish to fix Junior and Platino together, make the hypo bath fifteen grains strong and fix fifteen minutes. A thoroughly fixed print is easily washed; but too long fixing is as bad as too little, as it bleaches your prints and destroys their brilliancy.

Washing Prints.

After all prints come from the hypo bath, it is necessary to handle them through at least two waters by hand, before putting them in running water or the washing box. By doing this you wash off the surface hypo and also little air bubbles that sometimes fasten themselves on the print and hold the hypo under them, allowing it to go on bleaching, thereby getting little white spots on the prints when they came from the wash water, that were not there when they were fixed. After two waters by hand, one hour in running water, or ten to twelve changes by hand, is sufficient washing.

Red spots on paper can come from a number of causes. The most common forms are finger marks, bubbles and preservative chemicals still in the paper. When from finger marks, they can be easily recognized. When the spots are round or oblong and have defined edges, they are from bubbles and can be avoided by sliding prints in the first water and knocking them off. If the red spots are uneven and scattered over the paper, or if the prints act as though they were greasy when they are in the washing water, the trouble comes from oil or grease, which may come from the hands, trays, or water. This trouble can be overcome in both Platino and Junior paper by adding three ounces saturated solution of sal soda to the first water prints are placed in (3 oz. saturated solution of sal soda to each gallon of water), handling prints over in this water for five minutes. This alkali cuts off all oil or grease on the prints and neutralizes the acid preservative chemicals in the paper, the six changes of clear water afterwards washing out all traces of the alkali and bringing your prints up to the gold bath in a perfectly neutral condition. If you find 3 oz. saturated solution of sal soda is not enough, put in a couple more or enough to do the work.

When paper prints brown or muddy-looking in the winter, the paper is too fresh and should be put in a warm place (near a radiator) for a few days. Paper treated in this way will soon print a rich red color. Fresh paper must be printed darker than old paper. When paper prints a weak red color in the shadows during cold weather, it is because it is chilled and the chemical action does not take place freely. Always print in a warm temperature if you wish the best results. In the winter, paper thirty days old is much better than very fresh, older paper giving stronger and richer prints than fresh paper. Bronzing in the shadows is generally caused by not toning the shadows properly in the gold bath first and not far enough in the platinum bath afterwards. Blisters are caused by a change of temperature in the baths or water and they usually come in the hypo or afterwards. Adding fresh hypo will reduce the temperature of the water. Putting the prints in cold hypo bath and from there into warmer water again is what brings on blisters. It can be helped by throwing prints in a salt water bath after hypo, but the best plan is to temper the hypo or keep it in a saturated form and reduce it as you need it. Another plan is to gradually reduce the hypo bath by pouring off part of it and adding water, repeating until down to clear water.

When sodas come from chemical works in crystal form, they contain a very large percentage of water of crystalization and the conditions under which they are kept have a great deal to do with their strength. If they are kept in a warm dry place, the water of crystalization dries out and they become much stronger. When sodas are weighed by scales, you can never tell anything about them. Always test all sodas in solution by hydrometer. It is well to often test your hydrometer by washing thoroughly and filling with plain water. If the stem stands at zero in the water, it is O. K. If it sinks below and tests stronger, it is "off;" to remedy, tap the small end of the hydrometer on a board and jar the paper in the stem down. Keep testing it until it is at the right point.

One of the most important things in a toning room is litmus paper. Only buy the best, put up in glass tubes. Never allow any one to sell you a litmus paper that has a hard, solid body. Always use a soft litmus paper that the solution can take hold of at once. Use red litmus paper to test for alkali and blue litmus paper to test for acid. The length of time it takes to turn red litmus paper blue, or blue litmus paper red, will denote how strongly alkali or acid the solution is. Always keep in well stoppered bottles, as light or air will affect the sensitiveness of the litmus paper; and never mix the blue and red.

Water.

The water we use is of the greatest importance and there is entirely too little attention given to it. After having tried the water over the larger part of the United States, we find lime, magnesia, plaster paris, sulphur, iron and many other things contained in the water we use. When we remember that toning and developing are very delicate chemical operations, it is a source of wonder that the results obtained are as good as they are. When a gold bath is made with water that is strongly alkaline the prints will be muddy and flat and lack brilliancy and in the platinum bath the results are even worse, precipitating the platinum, causing slow toning and a waste of materials. In the hypo bath it is often the cause of yellow whites. It is very important that we clear the water of these chemicals as far as possible, if we desire to obtain the best results. A very simple and easy way to do this is to get an empty whiskey or alcohol barrel, remove the head, clean thoroughly and fill with water. Dissolve a teaspoonful of ground alum in a cup of hot water and pour in the barrel of water. Stir thoroughly and allow to settle for 24 hours. Use this water for first washing, for baths and all washing between baths until after the prints come from the hypo, when they may be washed in the regular tap water. There is very little water west of the Mississippi River that could not be improved by this treatment, especially where it comes from artesian wells. When water is heavily charged with magnesia or iron, it is best to use other water until prints are out of the hypo. Any trouble you may go to in your efforts to obtain pure water will pay you a hundredfold in time, material and results and this means money.

Kirkland's Lithium Paper.

This is a glossy gelatine printing-out paper, which is extensively used both by amateurs and professionals. Print it quite dark. This paper, like most of the printing out varieties, may be toned either in a combined or a separate toning bath. A combined bath is one in which the print is toned and fixed in one bath. We advise all amateurs to shun combined baths. Most combined baths contain acetate of lead and the results are not permanent and in a few months or a year or perhaps several years, your pictures begin to turn yellow in the high lights and gradually fade until nothing is left of them. We strongly recommend the use of a separate bath for all printing-out papers and the general directions given under the head of Aristo papers, in regard to thorough fixing and long and careful washing, applies to nearly all of this class of papers. Lithium paper should be thoroughly washed and then toned in any alkaline toning bath. It may seem superfluous to many to describe how to test a bath, but on investigation we find that many amateurs do not understand what an acid or alkaline bath is, or how to ascertain what your bath is. Procure some red litmus paper from your dealer. It is put up in glass tubes or vials. Take a small strip and dip it in the solution. If the red litmus paper turns blue immediately, then your bath is very alkaline; if it remains red, then your bath is acid. If it turns blue slightly and the blue can only be seen after the paper is dry, then it is only slightly alkaline. To make it alkaline, gradually add sal soda or borax to the bath until the litmus paper shows, by turning blue, that it has become alkaline. Never guess at it and do not add too much alkali. Acid or neutral baths produce red or sepia tones, while alkaline baths produce darker tones, depending on the amount of alkali and gold used and the length of time the toning is continued. The manufacturers of Lithium papers recommend the following

Toning Bath:

Borax	½ oz.
Distilled Water	16 oz.

To tone, take one ounce of this stock solution to two grains of chloride of gold and sixty ounces of water.

This bath should be prepared one hour before using. Sulphate of soda may be used in the same proportion as borax for making the stock solution. Test the bath by toning one picture. If the result is a red or undesirable tone, add the alkaline stock solution and let the bath stand a few minutes longer. Keep the prints in constant motion in the toning bath, taking those from the bottom and placing them on top. If you allow prints to remain one on top of the other, the result will be red streaks.

The length of time that prints are toned depends largely on the tone desired. If a dark tone, bluish-black in shade is desired, allow the prints to tone until the high lights turn just a trifle blue. Now fix for ten minutes in

Fixing Bath.

Water .... 64 oz.	Powdered Alum .... ¼ oz
Hypo .... 2 oz.	Salt .... ½ oz.

Keep your prints well separated in the fixing bath and turn them often, as you do in the toning bath. Now wash your prints thoroughly in running water for about one hour and they are ready to finish.

In hot weather the following hardening solution is recommended:

Hardener.

Warm Water .... 64 oz.	Sulphate of Soda .... 8 oz.
Borax .... 6 oz.	Powdered Alum .... 16 oz.

This hardener is used prior to toning and washing. Use one ounce of the hardening solution to ten ounces of water and immerse the prints and keep them in motion for about five minutes. This paper is made by the Kirkland Lithium Paper Company, Denver, Colo.

Delta Matt.

This is a collodion paper, manufactured by the New Jersey Aristotype Company, Bloomfield, N. J. With this paper you print very deep, or until the high lights are considerably tinted. The prints are then washed in about four changes of water to remove the free silver. The prints are then placed in the following toning bath:

Toning Bath.

Water	60 oz.
Chloride of Gold	2 gr.

The toning bath is then made slightly alkaline. For olive black effects continue to tone until the high lights are clear, allowing the shadows to remain warm. For black and white effects extend the toning a little further, but be careful not to overtone or the result will be a blue or gray picture. Now wash the prints in two changes of water and tone in

Platinum Bath.

Platinum Solution	2 drs.
Water	60 oz.

This bath should be made up two or three hours before it is required for use. Continue in this bath until the desired tone is reached and then transfer directly to a

Short Stop.

Carbonate Potassium Saturated Solution	2 drs.
Water	64 oz.

Now wash prints slightly and transfer to

Fixing Bath.

Hypo, Sat. Solution	1 oz.
Water	12 oz.

Wash thoroughly in running water for say one hour, and your prints are ready.

There are so many printing-out papers now on the market that it would be impracticable to give directions for printing and toning all of them* and as the various gelatine and collodion papers require the same or nearly

*Progressive Lessons in Photography, Part III, describes all the Printing Papers on the market and how to work them.

the same treatment, it would simply be a repetition of what we have already said. We will therefore call the attention of the amateur to another class of printing-out papers known as

Blue Prints.

Although this is the simplest paper to work it should not by any means be despised, as with a good landscape or marine negative very beautiful effects may be secured and if a good article is purchased the resulting prints are permanent.

No chemicals of any kind are used for toning these prints. The paper is usually a light green on the sensitized side and should be handled as above described. With this paper the printing should be done in direct sunlight, as the paper is not particularly sensitive and printing in the shade would take considerable time. Print until the high lights of the picture begin to appear somewhat muddy, then remove from the printing frame and place the print in a tray or bowl of water face downward and allow it to remain there until the white portions of the picture are quite clear. The prints should be in slowly running water about ten minutes and may then be taken out and laid face upward on a piece of glass or ferrotype plate until dry. The result will be a beautiful deep blue picture on a pure white ground.

Blue prints are improved by the addition of a liberal white margin around the negative. This can be effected as follows:

Take an 8 x 10 printing frame and in it place an 8 x 10 clear glass which has been thoroughly cleaned on both sides. Such a glass can be secured at any supply house, or some friend who uses 8 x 10 plates can doubtless furnish you with one or two old negatives from which the emulsion can be cleaned off by means of hot water and a nail brush. Place this glass in the printing frame and cut a piece of red express or black paper, 8 x 10 inches, that will just fit in the frame. Select the negative that you propose to print, examine it carefully and determine just what portion of it you wish to show in the finished print. A 4 x 5 negative will generally make a 3¾ x 4½ print. Find the center of your black paper and cut in it an opening 3¾ x 4½ inches. Place your 4 x 5 negative on the plain glass in the center of the printing frame in such a way that when the black matt is laid over it the portion of the negative which you wish to print will show through the opening. When you have placed your negative in the correct position it may be held there by two narrow strips of gum paper. Having placed your black paper over your negative you now lay a sheet of 8 x 10 blue print paper upon it. Put on the cover of the printing frame and expose in sunlight. It is evident that the light will only affect those portions of the paper which show through the opening in the black paper and the result will be a 3¾ x 4½ blue paint in the center of an 8 x 10 sheet, and if the negative was a good one the result will be worthy of a frame. Blue prints are not suitable for portraits, or interiors or exteriors of houses and as before stated your work on this paper should be confined to marines and landscapes.

A great many formulas and processes have been suggested for toning or changing the color of a blue print to a dark brown or black but many of them produce unsatisfactory results and stain the whites in the high lights and we can only advise the following: Take a dampened blue print and float it printed side down on 2 per cent solution of nitrate of silver. This will cause the image to almost entirely disappear and the print should then be thoroughly washed for a few minutes in running water and then toned or developed in the following bath:

No. 1.		No. 2.	
Neutral Oxalate of Potash	1 lb.	Ferrous Sulphate	¼ lb.
Distilled Water to	3 pints	Sulphuric Acid	10 drops
		Distilled Water	to 10 ounces

Of this take 1½ ounces of No. 1, ¼ ounce of No. 2, and about ten drops of a ten per cent solution of Bromide Potassium. Be sure and add No. 2 to No. 1, but do not pour No. 1 into No. 2, or you will spoil the solution. The image will now gradually turn black and when it has reached the desired color wash it again in running water for a few minutes and then put it into a bath composed of

Hydrochloric Acid	1 dram
Water	10 ounces

and after allowing it to remain there a few minutes remove and again thoroughly wash it in running water, when it can be dried.

In the above formula we spoke of a 2 per cent solution of nitrate of silver and such expressions are often found in books on photography without any accompanying explanation and this makes it very confusing to the amateur, as it may be understood by him in various ways. Ordinarily among photographers, a 10 per cent solution of bromide is understood to consist of 9 ounces of water and 1 ounce of bromide. This from a chemist's standpoint is all wrong and is not a ten per cent solution by any means. Soluble salts are taken up by water without increasing the bulk and we might take 10 ounces of water and stir into it 1 ounce of bromide without perceptibly elevating the level of the water. Suppose we want to make a 2 per cent nitrate of silver solution and the total amount of solution required is 10 ounces, then we will proceed as follows: One ounce contains 480 grains and 10 ounces will contain 480 multiplied by 10, or 4,800 grains. Two per cent of 4,800 grains is 96 grains and we would therefore weigh out 96 grains of silver and dissolve it in 10 ounces of water.

Blue print paper can be purchased very cheaply on the market but it does not keep well for any great length of time and the amateur might like to experiment in making his own paper, which he can easily do as follows: Secure some sheets of good wove linen paper, or any other paper having a smooth surface which is fairly heavy. Any good writing paper without the lines, or what is known as laid water marks in it, will be found fit for the purpose. This paper should be held firmly to a drawing board and the surface coated with the following solution:

No. 1.		No. 2.	
Citrate of Iron and Ammonia	50 grs.	Red Prussiate Potash	32 grs.
Water	4 drams.	Water	4 drams

Red prussiate of potash is also known as ferricyanide of potassium, and these chemicals should all be what is known as C. P., or chemically pure. Now pour into a graduate the 4 drams of No. 2 and filter into a bottle by placing a plug of cotton in the bottom of the funnel or by means of filter paper. As soon as this is filtered immediately follow it with the 4 drams of No. 1, and add a small quantity of bromide of potassium from the stock solution. This bromide is added in order to make the paper keep but if it is to be used at once the bromide may be left out. The solution is applied to the face of the paper by means of a very soft sponge or what is known as a Blanchard brush. This brush is easily made by taking a small strip of glass or wood, say two inches wide by six long, and fastening over the end of it several thicknesses of cotton flannel holding it in position by means of a rubber band. If a sponge is used a small stick should be tied to it for a handle, or it may be mounted by securing a small piece of glass tubing, say four inches long by one inch in diameter. Loop a piece of hard twine around the sponge and pull the two ends of the string up through the glass tube and fastening them there. A small quantity of the solution should be taken on the brush or sponge and the paper lightly brushed from left to right, starting at the top, until you have reached the bottom of the sheet. Now turn the board around so that the lines we are about to make will cross the others at a right angle and proceed to go over the sheet in the opposite direction. In this way you avoid streaks on your paper by filling in places in the second application that were missed in the first. Your paper can now be pinned up or hung up in the dark room to dry. The operation of sensitizing blue print paper can be done by lamp light but if performed in the day time the operation would have to be confined to the dark room or some place devoid of daylight. As soon as the paper is dry it can be cut up in sizes to suit and packed away carefully in strong light-tight envelopes.

In sensitizing for blue prints you will have to prepare your solutions somewhat differently for different papers, as a less amount of iron and ammonia will be required on soft than a hard paper. Very beautiful effects may be secured with blue prints by sensitizing light blue writing paper, the result being a dark blue print on a light blue ground. Other shades of paper may be selected but care must be exercised that the colors of the paper are permanent and will not wash out when we come to wash our prints.

Blue prints may be used advantageously for sketch-ing with India ink for making book illustrations, decorating menus, etc. A blue print is first made from a negative of the article which you wish to illustrate. This print is washed in water and dried. Now with waterproof India ink, Higgins', or any other, proceed to draw in over the blue lines and when the drawing is finished bathe it carefully in a weak solution of potash and water. A weak solution of condensed lye and water will answer very well. Under the action of the potash solution the blue will be dissolved and run away, leaving the waterproof lines behind. The print should then be washed carefully in several changes of water and dried and you will have a clean-cut black drawing on a white ground, which will reproduce nicely in the zinc etching process. Fig. 35, and other illustrations in these pages, are produced in this manner.

Ferrogallic Paper.

This paper gives a black print but is not so easily prepared as blue print paper. Paper similar to that for blue prints is secured and coated the same as blue prints but with the following solution:

Gelatine	15 grs.	Ferric Sulphate	15 grs.
Distilled Water	1 oz.	Ferric Chloride	30 grs.
Tartaric Acid	15 grs.		

Cut up the gelatine in small pieces and soak in the water for three hours. It is then heated until the gelatine assumes a liquid form and the acid, sulphate and chloride added in the order named and the whole filtered while still hot. The coating is applied hot by lamp light but the paper should be dried in the dark. It is printed in sunlight until the image appears and is then toned or developed in a solution consisting of

Water	2 ozs.
Oxalic Acid	1 gr.
Gallic Acid	4 grs.

The paper should be placed in a tray and this solution poured upon it and rocked as in developing a plate. The image will change gradually to black and the paper is then removed and washed and given a bath of water slightly acidulated with sulphuric acid, again washed and the superfluous water removed with blotting paper.

Monocrome Paper.

Immerse a good quality of paper in a solution consisting of

Bichromate of Potash	75 grs.
Distilled Water	2½ ozs.

This should be done by lamplight. Dry the paper thoroughly and then print for about ten to fifteen minutes in direct sunlight and then wash the print thoroughly in running water. To obtain a rich red print, now place the print in a solution of chloride of tin, wash and then place in a solution of hypernic wood. If a black tone is desired substitute a solution of ferrous sulphate for the tin, wash and place in a solution of tannic acid. If an orange shade is wanted use first a solution of nitrate of lead, wash and then place in a weak solution of caustic potash. The prints must be thoroughly washed between treatment by the various chemicals but if the stream of the water is allowed to strike directly on the print it may wash off the pigment entirely.

Uranium Paper.

Select a good paper and float it for a minute on the surface of the following solution:

Uranium Nitrate	25 grs.
Distilled Water	1 oz.

Curl the sheet of paper when floating, to expel the air and avoid air bubbles. This should be done by lamp light. The paper is now quickly dried in subdued lamp light or in the dark room and it is ready for printing. The coating is a weak brown in color and the printing will appear as a chocolate brown. After printing, the paper should be washed in running water but not in the stream. If it is now sponged with a solution of

Chloride of Gold	2 grs.
Distilled Water	1 oz.

the result will be a deep violet print.

If, after printing and washing, it is put into a two per cent solution of red prussiate of potash a fine red print will be the result. If printed and washed and immersed for a minute in a five per cent solution of cobalt nitrate the result will be a green print and it should then be put in the following solution, washed and dried:

Distilled Water	1 oz.
Sulphate of Iron	20 grs.
Sulphuric Acid	16 drops.

Of course in all instances the print must finally be washed thoroughly before drying.

There are numerous other simple papers which the amateur can prepare but we will not devote our attention to some of the staple goods on the market. Most of the papers just described come under the class of "printing out papers," generally known as P. O. P.

Let us now consider some of the papers of the second class, or "developing papers."

Bromide Paper.

These papers are made in various qualities, as thin, thick and very thick and with various surfaces, as smooth, rough and very rough. The artistic results of the finished prints on bromide paper depend largely on the negative selected for use and the particular paper used on that negative. Negatives having a great mass of detail will look better on the smooth than the rough bromide, while open scenes, moonlights and marines look better on the matt surface papers, according to our idea. These papers are very sensitive and should always be printed in the dark room. For this reason they are favorites with amateurs who have little time to print during the daylight hours. Light your ruby lamp and handle the paper as you would a negative. The negative is placed in the frame and the coated side of the paper in contact with the negative. Put away the remaining paper carefully in the package.

Measure off about 12 or 15 inches from your lamp on the table and draw a line. The exact distance from the lamp depends largely on its size, or the size of the burner. Stand the printing frame upon the table with the glass side of frame on this line. Hang your watch up on a convenient hook or nail where you can see the dial plainly by the red light. If it is an ordinary negative it will require from 10 to 15 seconds exposure with a small burner in the dark room lantern. The best way to test this is to cut a sheet in quarters and test a small piece. When you have the time just right run over your negatives and select out those of about the same density and give them the same exposure. When you have found the right time for each negative, mark it on the negative envelope and you will always have it as a guide for future bromide printings. When the second hand on your watch has reached the required point, print by removing the ruby glass and then place the printing frame face downward on your table or bench and close the ruby lamp. If we now examine the face of the paper we will find nothing on it any more than we will on a negative after it is exposed.

The picture must be brought out by development just as we bring out the image on a negative. The solution on the paper is the same as that on a negative, though less sensitive. The print is now placed in a clean tray and the developer poured over it and the image will gradually appear as it does on a negative but in very much less time. We have not experimented with factors in bromide development but have no doubt that by a little experiment they can be worked out, for the conditions are almost identical with the negative development.

Tolidol makes a good developer for bromide paper, as it is almost colorless and does not stain the papers as some of the developers will. Generally speaking a solution of Tolidol for plates may be strengthened fifty per cent for use as a bromide developer. The Nepera Chemical Company and the Eastman Company, the two largest manufacturers of bromide papers in this country both recommend the use of the following developer:

No. 1.		No. 2.	
Neutral Oxalate of Potash	16 ozs.	Proto-Sulphate of Iron	8 ozs
Hot Water	48 ozs.	Hot Water	24 ozs.
		Citric Acid	15 grs.

Let both solutions cool and then put them in separate bottles, well corked and they will keep for months. To use, measure out four ounces of No. 1 and one ounce of No. 2. The print should first be soaked in water for a minute or two until quite limp and it is then placed in a tray, flooded with the developer and rocked as in developing a negative. A few drops of bromide, in the proportion of one ounce of bromide potassium to one quart of water may be used where it is found necessary to restrain the developer. As soon as the print has reached the desired strength and all the details have developed out, take it from the developer and without washing, place it in the following:

Clearing Solution.

Acetic Acid	1 dram.
Water	32 ozs.

The print should be thoronghly rocked in the solution and turned over often so the solution can act on both sides of the paper and thus prevent the iron in the developer from precipitating on the paper. Pour off clearing solution and apply fresh and repeat. Now rinse the print in clean water and use the following:

Fixing Bath.

Hyposulphite of Soda	8 ozs.
Water	64 ozs.

After fixing thoroughly, the print should be washed for two hours and then dried. Blisters may be avoided by using a little common salt in the first washing water after fixing. To avoid yellow prints the developer must be acid, the clearing solution must be used as directed, fresh hypo solution should be used on each batch of prints and the final washing must be thorough, though the prints should not be washed over two hours.

The prints may be given a high finish if the smooth surface paper be used, by squegeeing the prints on a ferrotype plate but in our estimation this takes from the print all its artistic qualities. A proof may be taken from a negative which has just been fixed and washed, before it is dried, as follows: Wet a piece of smooth bromide paper and place it directly in contact with the wet film of the negative. Expose to the lamp as directed above, remove from the plate, develop, fix and wash and you have a proof which will not fade and is made in less than thirty minutes from the time the plate was developed.

Sepia Tones.

To change bromide prints from blue-black to sepia tones they must first be thoroughly washed to free them from all traces of hypo or developer. Then tone them by rocking in a tray containing the following:

Uranium Toning Solution.

Potassium Ferricyanide (not Ferrocyanide)	36 grs.
Uranium Nitrate	32 grs.
Acetic Acid	25 drams.
Water	84 ozs.

Dissolve the ferricyanide in the water and let in stand for a few minutes, add the acid and then the nitrate and filter.

Should any precipitate form during the toning, filter the solution again, wash out tray and proceed once more. If the precipitate is allowed to remain it will discolor the print. Do not use iron or enameled trays while using this solution. Use glass or porcelain and keep trays clean. Let the toning proceed a little deeper than desired in the finished print and wash in running water until the print is free from the yellow color, which will be about twenty minutes. This solution will not keep and only enough should be made up for immediate use. If the highlights are still discolored immerse the prints in a solution of one drop of strong ammonia to 12 ounces of water but allow the print to stay in this solution but a few seconds and then wash.

Bromide paper may be manipulated to such an extent that a print need rarely be thrown away as poor or useless. The print may be green from over-exposure or have a muddy background and may still be converted into a fairly good print. If it is over-exposed it may be toned in Uranium as given above and if over-exposed and over-developed it should first be reduced in a solution of

Red Prussiate of Potash	2 drams.
Hypo	1 oz.
Water	16 ozs.

The print should be reduced a little more than the density required in the finished result and then washed thoroughly. This is applicable to prints which have been under-exposed and over-developed in an effort to bring out details, which resulted in a print with muddy background. The reducer may be applied locally with a brush as suggested for negatives, allowing the reducer to run away from those parts which do not need reduction and frequently splashing the print with water. When unsatisfactory tones are produced they can be changed or modified to almost any extent by the use of gold, uranium, copper or iron. Gold produces a rich blue-black, uranium we have explained, copper gives various colors from a purple black to a red and iron various shades of blue, depending on the length of development. The print after washing should, for a blue-black tone, be immersed in

Ammonium Sulpho-Cyanide	30 grs.
Water to	10 ozs.
Gold Chloride	2 grs.

The sulpho-cyanide is first dissolved in water and then the gold is added. Toning will proceed rapidly and may be performed in subdued daylight. When the proper tone is reached wash in several changes of water and fix for a quarter of an hour.

For red tones make a one per cent solution of copper sulphate and add to this a saturated solution of carbonate of ammonia until the first formed precipitate is re-dissolved. To this add three grains of potassium ferricyanide to each ounce of the above. The toning takes place somewhat slowly and starts with a blue-black but if continued it changes to a brilliant red. If a blue tone is desired use

Potassium Ferricyanide	5 grs.
Ferric Oxalate	5 grs.
Water to	20 ozs.

Various colors of blue may be secured according to lenth of toning.

An unsatisfactory print can be bleached out in the following bath and when well washed may be re-developed to any desired shade:

Potassium Bichromate	15 grs.
Alum	75 grs.
Hydrochloric Acid	1 dram.
Water	4 ozs.

After a thorough washing the prints must be fixed and again washed.

Velox Paper.

This is a form of bromide developing paper which is not as sensitive as the ordinary bromide papers and the paper may be placed in the printing frame by means of gas or subdued daylight. It may be printed by electric light or will print in from one to eight seconds by diffused daylight, say a few feet from a window having a north exposure. It may also be printed by means of gaslight or a kerosene burner at a distance of three or four inches from the negative in one or two minutes. Six forms of this paper are put upon the market by the manufacturers and are known respectively as "Carbon," a matt paper; "Glossy," an enameled paper; "Rough," a slightly pebbled surface; "Special Portrait," a half matt; "Special Glossy," with enameled surface and "Special Rough." The "Special" papers require less exposure than the ordinary.

After exposure, develop with either of the following developers:

Metol Quinol.

Water	10 ozs.
Metol	7 grs.
Sodium Sulphite, crystals pure	½ oz.
Hydroquinone	30 grs.
Sodium Carbonate, desiccated	200 grs.
(Or 400 grs. of crystallized carbonate.)	
10 per cent Bromide of Potassium solution, about	10 drops

Amidol.

Water	4 ozs
Sodium Sulphite, crystals pure	200 grs.
Amidol, about	20 grs.
10 per cent Bromide of Potassium solution, about	5 drops.

If blacks are greenish, add more amidol; if whites are grayish, add more bromide of potassium.

Be sure to have your chemicals pure, especially your sulphite and not to let your developer become spoiled by oxidation; therefore, keep it in small, well-stoppered bottles filled to the neck. Rubber stoppers are recommended. Too weak a developer, or one that is oxidized or contains too much bromide, will give greenish or brownish blacks.

It is almost invariably necessary in order to prevent foggy or stained whites in prints, to add a small quantity of a ten per cent bromide of potassium solution to the developer. This quantity will vary according to purity of chemicals and water and according to the age or the condition of dryness of the paper. "Special Velox" can stand more bromide in developer and further dilution of same than ordinary Velox without giving greenish blacks.

The developing can be done a few feet from the open ruby lamp but we prefer to be safe and use red light Develop as directed for bromide papers, wash slightly and fix in the following bath:

Hypo	16 oz.
Water	64 oz.

Then add the following hardening solution:

Water	5 ozs.
Sodium Sulphite Crystals	½ oz.
Acetic Acid No. 8 (or 4½ deg. B.)	3 ozs.
Powdered Alum	½ oz.

This hardening solution can be left out but the surface of the prints may then remain rather soft and the hypo bath will soon discolor and is then liable to stain the prints. With the hardening solution this mixture keeps perfectly clear and can be made up at any time in advance. It can be used as long as it is strong enough. It is also an excellent fixing bath for dry plates.

Rodinal and Tolidol also make good developers for all kinds of Velox and Bromide papers and especially fine results are to be obtained with Tolidol. With the latter, which is a comparatively new developing agent, used for dry plates, films and developing papers, special formulas and directions are given for developing the various kinds of papers.

Platinotypes.

There are two kinds of platinotype paper on the market, one made by Willis & Clements, Philadelphia, and the other made by John Bradley, Philadelphia. Both papers are good.

There is an indescribable soft and pure tone about a platinotype picture which is not found in other papers, but which is somewhat approached in Aristo-Platina, Velox and Carbon papers. This paper must be kept dry and at the same time cool and comes in prepared tubes. These tubes should be kept in the ice box when not in use.

Printing.

This paper requires about one-third the exposure of ordinary printing-out paper and a properly printed sheet will show only a faint brown image on the yellow surface of the paper. The printing frame must be thoroughly dry and a sheet of thin vulcanized rubber should be placed on top of the paper in the printing frame before placing the back in position. Dampness of the back of the printing frame or in the paper, will cause muddy-looking prints and impure whites. The paper should be printed until all parts of the picture are visible except the high lights and the printing must be examined by subdued light only.

Developing.

The manufacturers of these papers provide developing salts and these are dissolved according to the accompanying directions and kept as a stock solution. The prints should be developed as soon as convenient after printing and if for any reason the developing cannot be proceeded with at once then the prints should be returned and kept in the tube until such time as it is convenient. These papers are developed either in hot or cold developer but in either event the work of development should be performed in the dark room, or by gas light. The solution being ready, the print is floated upon it, exposed side down, for about thirty seconds. Dishes made of porcelain or agate ware should be used for development. After the print has floated upon the bath for fifteen seconds, face down, it may be turned over in order that you may the more readily note the development as it progresses. When the print has developed to the right degree action is stopped by plunging it into the acid clearing bath, which will be described. Before developing the next print, stir the bath in order to break up any scum which might be left by the first print.

The developing bath should never have a lower temperature than 60° F. or it may be warmed by means of an oil or gas stove to 100° F. but never above this point. A warm developer, as a rule, gives warmer tones and under exposed prints may often be saved by using the developer at 100° F. The developer is not to be thrown away after use but should be poured in a separate bottle and marked "old platinotype developer" and with the addition of about ten per cent of fresh developer can be used on the next batch of prints. The developer should not be filtered but should be kept in a dark corner in the dark room. A little cloudy matter in the developer does not affect its use and it clears up materially while standing. You should always have at least a half inch of developer in your tray when developing.

Clearing and Washing Prints.

There should be at least three acid baths, consisting of one part muriatic acid to sixty parts of water and the acid should be chemically pure. The print is placed face downwards in the first bath for five minutes, then removed to the second, where it should remain for ten minutes and then to the third, where it should remain for fifteen. Fresh acid baths should be prepared for each batch of prints and the old baths thrown away. The prints should now be washed in three changes of water, turning them carefully, so as not to rub their faces and to neutralize the effect of the acid a few grains of sal soda should be placed in the second washing water. One-half hour is sufficient time for washing and the prints can be blotted off and placed away to dry, or they can be mounted while still damp. The Bradley paper requires but one acid bath, in which it should be left for ten minutes.

The Willis & Clements paper is made in three grades, known as A A, or "thin smooth;" B B, or "heavy smooth" and C C, or "heavy rough." It is also made to produce black or sepia tones. In working the sepia paper the same general directions are to be observed as for black but the sepia paper is more sensitive to light, the temperature of the solution increased to 150° to 160° F. and sepia tablets are added to the developing solution. The Bradley paper is made in two grades, known as J, or smooth surface, and B, or heavy, slightly rough.

Carbon or Pigment Prints.

Carbon prints are not made by the average amateur, on account of the somewhat tedious processes involved but those amateurs who have once mastered the process and noted the beautiful results are well satisfied to put up with the extra trouble. Prints made by this process possess the property, which cannot be attributed to all other varieties, that of being absolutely permanent and the black or carbon prints proper, possess a purity of tone found only in platinotypes. If pure blacks and whites are admired, we may say that in this respect they even surpass platinotypes. Carbon prints are not made on prepared paper, as are other prints and we cannot therefore speak of "carbon paper" in a strict sense. In order that the amateur may thoroughly understand the carbon process, let us explain the underlying principles. The carbon process is founded on a peculiar faculty which gelatine has. If gelatine be impregnated with bichromate of potash and then exposed to light under a negative, those portions which have received the light's rays become insoluble in hot water. The gelatine is not applied to the regular paper, for reasons which we will explain later but is applied to thin tough paper and is technically known as "carbon tissue." Carbon tissue may be purchased from all the large photographic supply stores, though the smaller dealers do not keep it as a rule. It is generally to be had in black, which is the true carbon and in browns, greens and reds. It is usually carried in

England in two forms, known as sensitized and plain but we know of no dealer in the United States who carries the tissue senitized but the amateur can easily sensitize it before use, by immersing in the following bath for thirty or forty seconds:

Bichromate of Potash	½ oz.
Distilled Water	12 oz.
Aqua Ammonia	2 drops.

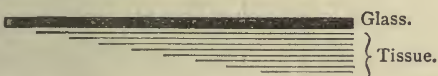
It must be hung up to dry in the dark room for several hours. If the sensitized variety was on the market this trouble might be avoided but the plain paper will keep indefinitely and the sensitized is limited in its keeping qualities.

The great drawback which carbon prints have had in the eyes of the amateur photographers is that the progress of the printing cannot be observed from time to time, as with printing-out papers and the fact that carbon prints have to be transferred. Let us try and explain why the transfer becomes necessary. As pointed out above the gelatine when treated with bichromate of potash and exposed to the light, becomes insoluble in hot water. It then follows that if we expose a piece of the tissue under a negative in the printing frame, that the light will act upon it as it does on other printing paper and that those portions which lie under clear glass in the negative receive the greatest amount of light, those under the half-tones next and those under the black portions of the negative no light. In the case of the portions of the tissue directly under the clear glass the light strikes clear through the gelatine on the surface of the tissue and if we were to place the exposed tissue in hot water those portions would be unaffected, while those parts which were under the black portions of the negative and received no light, would be dissolved and run away. How about the half-tone, or those parts which received but a portion of the light? The light not having free access to those portions, the surface of the sensitive film only has been affected, and if we were to place the tissue in hot water the unaffected portions underneath would be dissolved and the entire half-tone portions be washed away with it. Now it is obvious that in order to avoid this we must transfer the film before developing, or, in other words, turn it upside down and this is done by what is known as transferring to a temporary support and removing the tissue which previously held it in place. We can now see why, in the carbon process, it is impossible to print and develop the picture without removing it from the paper on which the sensitive ground was originally laid, as in printing out papers.

Now if the film on the paper is black, how are we to know when it has been printed sufficiently? There are two ways of determining: one as we did in the case of bromide, or velox paper, by experiment, i. e., by printing a small portion and then developing it and two by means of an actinometer, or by comparison.

There are several actinometers on the market as

Burton's, Sawyer's and Johnston's, or the amateur can make a simple actinometer, with very little trouble, as follows: Procure a piece of ordinary glass, say four inches long and a half inch wide and a piece of thin wood, (cigar box will do) of the same dimensions. Cut up some white tissue paper into strips a half inch wide and four inches long. Make some starch paste and paste the face of the glass lightly and press on one of the tissue strips. Paste again and put on another strip, letting it recede about three-eighths of an inch and proceed in this manner until you have say eight or nine tissues pasted one over the other, with three-eighths inch steps between them thus



Each tissue added is to be three-eighths of an inch shorter than the one previously pasted in position. With a lead pencil number the tissue steps from 1 to 9. Cut up a piece of ordinary printing out paper into strips four inches long and a half inch wide. When the tissue strips are dried hard you are all ready for a trial of the actinometer. Place one of the sensitized slips with its face against the tissue paper, cover it with the wood strip and hold all in position by means of two small rubber bands, one at each end. We now select a negative, put it in the printing frame and place the carbon tissue over it, as in making ordinary prints. The printing frame and actinometer are placed side by side in a good bright light but not sunlight and examine the actinometer (by removing one of the rubber bands so you can see the printing paper) from time to time. The length of time which will be required to print, depends on the negative, as in other processes but when the sensitized strip under step six shows a decided color you will be safe to remove and develop your first print. If the development proves that your judgment was correct, then you will do well to mark the envelope belonging to this negative "Carbon 6" and you will know exactly what exposure it will require in the future for carbon printing. You can also make comparisons between this and other negatives and mark all those of a similar density and thus save much experimental printing. Carbon tissue prints in about the same time that the ordinary gelatine and collodion papers do. The next step is to develop your print and see if your exposure has been correct, for it would be folly to continue printing until you know you are right.

There are two methods of making carbon prints, known respectively as the "single" and "double transfer process." We will first describe the development of the single transfer process, since it is the simpler of the two. To start with, we shall require four separate trays or dishes, some single transfer paper, a piece of glass or zinc, a print roller or squeegee and a good supply of hot water. A small glass thermometer will also be handy, especially to the novice. Of the dishes, three might be the ordinary trays used in development and for the fourth you should have an enameled iron dish. In the first tray put cold water, in the second hot water, 110° F., in the third cold water and in the fourth the fixing solution, which consists of one ounce of common alum to twenty ounces of water. Cut off a piece of single transfer paper a little larger than your print, put it in the first tray and allow it to soak for three or four minutes until it feels slippery to the touch. This transfer paper you purchase from the photo supply house at the same time you purchase the carbon tissue. You place the exposed carbon tissue also in this tray and you will note that it immediately begins to curl, the film side being in. In a few minutes it will again begin to straighten out and just before it straightens bring it in contact with the single transfer paper under the water, the film side of the tissue being next to the slippery side of the transfer. Now slip under both of them the piece of glass or zinc spoken of, remove from the water and adjust the tissue until it is about central on the transfer paper. Hold it in position with the fingers on one end and pass the print roller over the tissue, pressing it firmly down into position. Now remove the fingers and press down the other half, working from the center. Now remove the zinc or glass from the back and substitute a few pieces of blotting paper. Place two or three pieces of blotting paper over the tissue and then put on a flat board and weight to hold the print flat and in position. At the end of a quarter of an hour we are ready to proceed. Of course it will be understood that if we were working a dozen or more prints, we could pile them on top of one another, with two or three sheets of blotting between each sheet and thus save time.

We are now ready for the development and we now fill the second dish with the hot water. In this dish we place the carbon tissue still adhering to the single transfer paper and turn the sheet over and over again as you would in toning. In a few moments you will note that the colored gelatine is beginning to run out from between the two sheets. About this time, take the print from the water and taking one corner of the tissue paper between the thumb and forefinger of the right hand, proceed to strip it from the colored gelatine. In some cases the tissue will stick and it must then be allowed to soak for a few minutes longer and it will generally come off without trouble. The remaining gelatine does not look very attractive, being a dirty mass of sticky matter but as we begin to bathe it with the hot water the superfluous gelatine melts and runs away, leaving the image behind it in the form of a pure black print. When the development has proceeded far enough, the print is transferred to the third dish containing the cold water, where it should remain for about five minutes and is then placed in the fourth dish, or hardening solution, where it should remain for fifteen or twenty minutes. After removing, it should be washed thoroughly in clean water and laid away or hung up to dry. To keep prints flat we advise laying them on a ferrotype plate to dry, film side up.

Now it may happen that the first print is either too dark or too light. If it is too dark, then we exposed it too long in the printing and if too light, then it is under exposed or printed. If we find that the print is not coming up as black as we should desire, being under printed, then place it in cooler water and it will sometimes save it and if over printed increase the temperature of the water. Under no circumstances should the film of the picture be handled until it is quite dry. On examination of the finished print you will see that it is reversed, i. e., those portions of the picture which were on the right in nature are now on the left and vice versa. Now in very many cases this will make no difference, particularly in landscapes but if the scene is a familiar one, or if it is a well-known public building, it would appear ridiculous and we should therefore have to employ what is known as the double transfer process in order to have the picture appear as the scene does in nature.

The manipulation for the double transfer process is similar to the single but the printed carbon tissue, instead of being squeegeed to a permanent support is first attached to what is known as a temporary support, then developed and again changed to its permanent support. The temporary support may consist of paper, metal or glass but in any event it must be coated with the following waxing compound, which can be purchased from the photo supply house or made at home:

Yellow Beeswax	25 grs.
Powdered Resin	15 grs.
Turpentine	2 oz.

The beeswax should be cut into small pieces and placed in a bottle, the turpentine added and then dissolve by placing the bottle in a water bath. When the wax is all dissolved, add the resin and keep it in the bath until thoroughly dissolved. Take a small quantity of the compound on a clean linen rag and apply it to the surface of the temporary support and polish with a clean linen rag. The temporary support should be prepared before you start your printing. The final support, in the shape of paper, may be purchased from your photo supply house, or it may be glass, mica, wood or any substance that will stand washing in water. The final support should be soaked for about a quarter of an hour in a solution composed of

Powdered Alum	4 drs.
Water	20 ozs.

The printed carbon tissue is soaked in water until soft and then transferred to the temporary support, which has previously been coated with the wax solution. This, of course, is done under water, as described in the single transfer process. It is now squeegeed, dried and developed, soaked in water and hardened as previously explained. After it is thoroughly washed it is brought into contact with the prepared surface of the final support and is then squegeed down firmly to it and allowed to dry. When thoroughly dry insert the end of your penknife under one corner of the temporary support and it will come away leaving the print in its final resting place. Where the final support is glass, polished metal or wood, there is a liability of the print not adhering well unless the surface is prepared for its reception. It is therefore well to coat the surface of the article. This coating is prepared by soaking 200 grains of gelatine in 16 ounces of water for three or four hours and then dissolving it in a water bath. Now dissolve 15 grains of chrome alum in four ounces of water and add it very gradually to the gelatine solution. Should the gelatine thicken too much add a few drops of acetic acid, shaking the bottle thoroughly. This should be applied in a thin coating to the wood or glass, which is to act as a final support and allowed to dry. The solution should always be applied warm. The final support should be soaked in water for a few minutes before the carbon print is applied. If the final print, after drying, be coated with this waxing compound mentioned for coating the temporary support, it will be waterproof and can be cleaned with a moist sponge or cloth when soiled.

There are occasions when the amateur would like to print a portrait, landscape, or marine upon a handkerchief, tidy or piece of satin or silk for a sofa pillow. This can be done readily by sensitizing the surface of the material and printing and developing the same in the ordinary way. Recently there has been placed upon the market an article known as "Sensitol" which the amateur will find very convenient for this purpose. It is a sensitizing fluid and gives a good photographic surface to any material that is sufficiently absorbent to retain a small quantity of it in its pores. The materials best adapted to this purpose are plain, unsized linen note paper, Whatman's hot pressed and other similar grades of waterproof drawing paper, postal cards and silk, satin, linen and cotton fabrics. Its manipulations are so simple that the merest beginner can get perfect results by following the directions.

The solution is to be applied to the surface with a camel's hair brush set in quill, or still better, set in hard rubber but never under any circumstance, with a brush set in metal, as the solution is decomposed by free metals. It can be applied by ordinary gas or lamp light, or by very weak daylight but the sensitized material must be dried and kept in the dark and in a place that is free from moisture.

Fabrics should be sensitized and printed on glass by laying the fabric over it. Full directions for preparing the work, printing and toning accompany each bottle.

A Meritorious Freak.

CHAPTER XI.

Ridiculous and seemingly impossible results are sometimes achieved by means of the camera and the manipulation of the subject or plate. Every amateur is doubtless familiar with the class of pictures which show the subject with distorted feet but it is not every photo of this class which is a success and it is seldom that we see an example in which the entire picture is in focus. To take even a good "freak" picture one must thoroughly understand the underlying principles and must have the proper apparatus. The accompanying illustration was made from a photograph of considerable merit which was taken by Mr. L. L. Northup, South Haven, Mich. It will be noted that every portion of this picture is in focus, from the heels of the rubber boots to the magazine which the boy is reading. This photo was made by placing the subject on an incline. The lens used was a short focus, wide angle one, stopped down to *f* 16, with an exposure of ten seconds, under a skylight. The plate used was a 26x Seed.

Very curious and ridiculous effects may be produced by taking a photograph in the usual way, developing, fixing and washing and then while the film of the plate is still wet, heating it before the fire or gas burner until the coating is ready to run in any direction. Now by tilting the negative one way and another and thus distorting the image, most ridiculous results follow. Portraits, groups and street scenes are particularly applicable for this form of freak. In portraits the faces can be distorted in every conceivable manner while well-known public buildings can be made to assume the appearance of having passed through a terrible earthquake. So-called ghost photographs are easily made. A person wrapped in a sheet is placed in front of the camera for a second or two, the exposure made, the lens capped, the person walks away and the lens is again uncapped and the balance of the exposure made. The result will be an indistinct shadowy image of the "ghost," through which the drapery or furniture of the room can be seen, giving the transparent effect which is attributed to ghosts. Comical effects may be produced by showing two persons playing cards at a table, while the ghost is seen standing behind or beside one of the figures, holding up a warning finger. In photographing in this way it is essential that the figures do not change position between the first and second exposures, except the person who is impersonating the ghost.

Very good imitations of oil paintings may be made in a similar manner. The person whose portrait is to be made is placed behind a large sized gold frame, one large enough to show the head and shoulders of the sitter. A piece of coarse canvas is secured and is painted brown or a neutral color with distemper, or you can purchase a piece of brown canvas at almost any dry-goods store, the variety of goods which ladies use for outing skirts and known as duck. The canvas is stretched on a rough wooden frame and placed immediately behind the sitter. You now focus the sitter sharply, expose the plate in the usual manner, close the lense and plate holder and remove the latter, being careful to note which is the side of the plate holder used. The sitter is now removed and you re-focus so that the grain of the canvas comes up sharply on the ground glass. Again insert the plate holder and finish the exposure. The result will be a negative which will very closely resemble an oil painting which has been photographed, for the grain of the canvas will appear all over that portion of the picture which appears inside the frame, even showing on the light portions of the face.

It is sometimes desirable to show two views of a person on one negative, as a full face and a profile and yet show no dividing mark where the two exposures meet. This can easily be effected by means of the duplicator which is shown in Fig. 36. The duplicator can easily be made as follows: Select a cardboard pill box or a small tin box which will fit over the front of your lens. With a pair of compasses draw a circle on the bottom of it about the size of the lens and cut away a section about equal to one-fourth of the

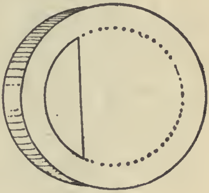


Fig. 36.

circle. Use this as a cap for your lens and note the effect when viewing a scene on the ground glass. If the scene just covers one-half of the ground glass then the aperture is correct but if it covers less than a half you may have to cut away a third or gradually increase the opening. The size of the opening depends on the distance between the ground glass and the lens. If a figure, the person will have to be posed a little to one side of the camera. You focus and the exposure is then made in the ordinary way. The lens is then capped or the shutter closed and the plate holder removed. The duplicator is now turned so that the opening comes opposite the other half of the lens and by means of the ground glass you can see that it is in the right position. The plate holder is again inserted and the exposure made on the other half of the plate, the person in the meantime posing a little to the other side of the camera. To do the work nicely, the ground glass should be divided exactly in the center by means of a pencil mark, so that you know that the two pictures just meet in the center. The duplicator can be turned so as to throw the image on any part of the plate and many humorous pictures can be made in this way. For example two persons, who have never met in life, can be made to appear as sitting opposite one another at a table playing cards, or a person can be made to appear as though he were playing cards with his double.

The same effect can be secured by dividing the camera at the back, close to the grooves in which the plate holders slide, by means of a piece of tin, just half the size of the plate but this is not easily done with hand cameras. The tin is held in place at the bottom by two thumb tacks and at the top by a swivel button. The exposure is made on one half the plate, the tin shifted over and the other half is then exposed. Another method is to cover half the dry plate with a piece of black paper or cardboard, make an exposure and then shift the paper so the other half of the plate is exposed. The Ideal Duplicator is an instrument built on the principle of the one first described, being a metal box with a section of a circle cut away. It is very inexpensive, costing but twenty-five cents. Fig. 37 illustrates the Multiplex Device which is furnished with the Adlake Cameras, for making two or four views on one plate. One of the most ridiculous pictures of this class that we have ever seen depicted is a man in the act of viewing his own head which was stuck on a

Fig. 37.

candlestick on the table before him. Those who are familiar with stage tricks will readily recognize that such a photo and many others of its class are readily made by the employment of a mirror and the above described duplicator.

By taking advantage of the well-known law that the nearer an object is to the lens the larger it appears, some very ridiculous effects may be produced by means of a short focus lens and photographs. A reproduction of a portrait if viewed from one side distorts the length of the face while if viewed from the bottom or chin side the face will broaden out at the chin. The same effects are thus produced as one sees in convex mirrors.

While it is possible to take photographs by moonlight, by prolonged exposure, most of the so-called moonlight photographs that we see are simply day views. Many of these so-called moonlight views are the result of accident and overexposure but some are purposely taken for such effects. Views on lakes and rivers with the moonlight coming from behind a bank of fine clouds and the moonbeams shining across the water are favorite ones. These views are usually taken late in the afternoon when the sun is low and is just hidden behind a bank of clouds. The lens is pointed directly at the sun and the shortest possible exposure made. The result is a night view to all intents and purposes. Very pretty effects may be secured in moonlit wood views at

An Imitation Moonlight.

A Genuine Moonlight.

about sun-down by slight overexposures. Select a piece of woods with open ground to the west for free admission of the sunlight, which will cast long dark shadows. The camera should be faced to the north or south so that the shadows appear and the exposure is prolonged so that the contrasts are considerable.

The accompanying illustration is made from a genuine moonlight view taken with a five dollar camera on a winter evening. The camera was placed in position on the end of a long pier, extending out into Lake Michigan, at 7:45 and was left there until 9:45. The moon was full and about two hours from the zenith, being nearly in front of the camera but not enough so to allow the rays to enter the lens. The moon did not shine brightly, the atmosphere being somewhat hazy. This view was taken as an experiment by Mr. L. L. Northup, of South Haven, Mich.

Perhaps one of the most difficult tasks in photography is to get a first-class negative of a room showing not only the windows but also the landscape out of doors. While non-halation plates produce wonderful results in a way, there are cases in which even with their aid it is impossible to get a negative, the resulting print from which does not show a blur, which entirely destroys the beauty of the picture. The reader is invited to carefully study the accompanying illustration and guess how it was done. It was taken on a Cramer Crown plate, unbacked, by Mr. Chas. E. Jacoby, Sioux Rapids, Ia. Mr. Jacoby describes the taking of this picture as follows: I set up my camera and focused it for inside and out and stopped it down so everything would be sharp. I then went to my gallery and got a large piece of black felt with which I covered the two windows to be taken on the outside and then over this still spread another thick piece, which shut out all light, having the dead black next to the glass. Thus it would make no exposure on the dry plate where the outside view should come. I then went inside, drew my slide and made a thirteen minute exposure of the room, closed the shutter (I avoided putting the slide in the plate holder at this time for fear the camera would be moved a little before the second exposure, thus spoiling the outline of the window), went outside, took down the dark cloths, arranged the subjects out of doors and made another exposure on the same plate through the window. The second was a short exposure, which on account of the size of the stop was about one and one-half second in length and thus had no effect on the exposure of the room which was thirteen minutes. The plate was then developed in the ordinary manner.

During the long evenings of fall and winter and even during summer evenings the amateur can devote his time to photography if he so desires. Aside from toning and mounting, making of Bromide, Velox and other developing paper prints, he can devote his time profitably. Even a stormy evening is not devoid of all interest to the amateur photographer, for if the conditions

LIGHTNING. G. F. Sterling, Detroit.

are right he can secure one or more lightning negatives. Select a window facing that portion of the sky in which the lightning is appearing. Set your focus for the point 100 feet or more away. Put in your plate holder, draw the slide, open the shutter and wait for the flash. As soon as the flash has appeared close your shutter at once, as a second flash might destroy the effect. Select a position where as little artificial light as possible is visible and use the largest stop. The accompanying illustration was made from a photograph taken at Island Lake, Mich., by Mr. George F. Sterling of Detroit and is wonderfully clear. Note the reflection of the lightning on the top of the shed and between the railroad tracks.

CHAPTER XII.

Conditions govern night as well as day photography, although the same rules do not apply in both cases. Halation and reflection are, however, prime factors in night photography and must under all conditions be considered if we wish an artistic picture. This will perhaps be made clearer by a study of the accompanying night views. These views were both taken on State street, Chicago, during the Peace Jubilee, when the street was lighted by means of incandescent lights strung from one side to the other. It will be noted in the first picture that the foreground is absolutely devoid of all detail. The night was clear and dry and the consequence was there was no reflection from the sidewalks or pavement. The streak of light at the right hand side of the picture was caused by the headlights of the cable cars which passed regularly every three minutes. The halation around the electric lights is considerable, showing clearly that a non-halation plate should have been used. This picture was taken on a medium isochromatic plate, stop *f* 45, time 35 minutes. If you will now turn to the next picture a marked difference will be noted. This was taken on a rainy night and the wet side walks and stone paving blocks reflected the light so that the details of the foreground are nearly as good as though tne picture was

A PERFECT NIGHT SCENE. Copyrighted by J. W. McCaslin, 1898.
Effect of Rain on Street and Sidewalks and the Use of a Non-Halation Plate.

taken in the daytime. The negative was taken by Mr. J. W. McCaslin, Chicago, on a non-halation plate, *f* 22 stop and 1¼ hours exposure. Development 50 minutes. The cable cars were constantly passing and it was necessary to shut off the light repeatedly while they passed. In this way the streak of light which appears in the other view was avoided and the only indication of it that we can see is the reflection on the windows on the right. About half way down the block, on the fourth story of the building, was a large sign made of red, white and blue incandescent lights, which read, A. M. Rothschild & Co. The A. O. S. I. and & were in red lights and these are entirely lost in the picture, while the white and blue letters come out distinctly.

The next illustration was made from a photograph of one of the Peace Jubilee arches taken at 9 o'clock in the evening. This also shows great halation and the want of a non-halation plate, although the small portraits of the army officers come out nearly as distinctly as in the day view directly under it. The latter is a splendid negative taken by a Chicago amateur, Henry G. Mohr, on a Cramer Crown plate, *f* 32 stop, time 1 second. The night scene of the arch was taken on a medium isochromatic plate, with *f* 32 stop, in 15 minutes. It is somewhat difficult to give more than a rough approximation of the time required for night photography, much depending on the number and power of the lights but the following exposures may be a clue to approximate exposure:

NIGHT.	LIGHTS.	STOP.	PLATE.	TIME.
Moonlight.	Gas.	*f* 8	Rapid Iso.	30 min,
Moonlight.	Gas & Elec.	*f* 8	Rapid Iso.	20 min.
Fair—no Moon.	Electric.	*f* 8	Seed 26 x.	12 min.
Wet.	Electric.	*f* 8	Rapid Iso.	10 min.
Wet.	Electric.	*f* 8	Non-Halation.	2 min.

Interiors, portraits, etc., may also be taken in the evening by the aid of oil and gas light, with very artistic results. For a portrait the subjcct will have to be posed in a very comfortable position, for the exposure required is lengthy, for it will vary from three to seven minutes, depending on the amount of light. A lamp with a silk shade may be introduced and adds materially to the effectiveness of portraits taken at night. The lamp should be turned down low in order not to fog the plate and the shade should cover the flame. The figure should be so lighted that all the light apparently comes from the lamp in view, while in reality it comes from one or two lamps placed outside the angle of view of the lens. Care must be exercised, however, to have the light face in such a way that there will be no cross lights. Should it be thought necessary to have a naked light appear in the picture, as a candle, fire in the grate, etc., the actual exposure should first be made before the candle or fire is lighted and the lens capped. The lighting can then be done and a second or two seconds further

The Arch By Night.

The Arch by Day.

exposure will be sufficient to introduce the light. Welsbach lights will be found very useful for night photography and owing to the intense white light, they materially shorten the exposure.

CHAPTER XIII.

Stereoscopic photography does not seem to be popular with amateurs although it is the most perfect manner in which a scene can be reproduced. It has doubtless been unpopular solely on account of the extra work involved. As a rule the amateur is looking for good results by the shortest methods. It is hardly necessary here to explain the theory of stereoscopic photography but suffice it to say, that comparatively speaking, an ordinary photograph is flat and wanting in detail when compared with an equally good stereoscopic view. The latter view gives a roundness and natural effect to all the objects in the scene and particularly those objects in the immediate foreground. This characteristic is what makes the stereoscopic picture the very closest thing to nature. The rocks, the grass, the trees, all stand out boldly as they do when viewed in nature. Scenes and objects with minute detail, which would be entirely lost in an ordinary photograph, are the very choicest subjects for stereoscopic views. Snow scenes, apple and cherry trees in full bloom and similar subjects in which the close detail is lost on printing paper, show their full beauty under the stereoscope.

Stereoscopic cameras are built by many of the leading manufacturers but are usually intended for tripod use.

The Vive Stereoscopic Camera, which is shown in Fig. 38 is applicable either for hand or tripod use. This camera takes two pictures of the same scene, 3¼ x 3¼ inches on the same plate at one exposure. The camera

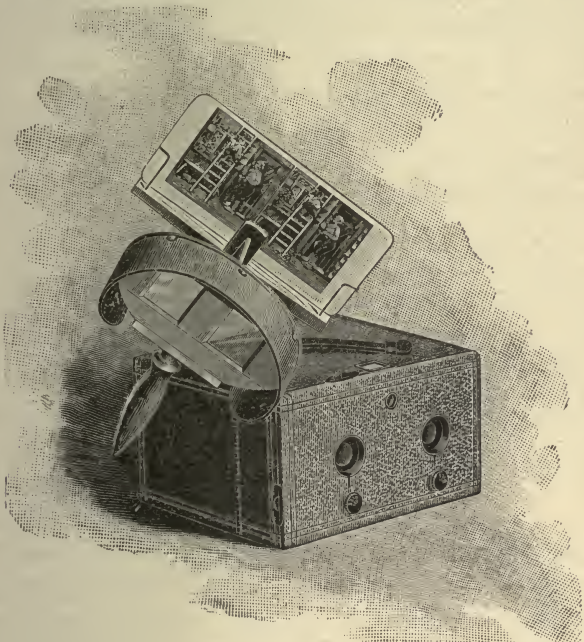


Fig. 38.

is fitted to use either cut films or glass plates and the size of the plate is 3½ x 6½. If desired each lens can be worked separately, so that two entirely different subjects can be taken on the same plate.

In all stereoscopic cameras the two lenses are of course matched and they are usually about three inches apart, from center to center, this being the distance that the average eyes are apart. The lenses might be as near as two and a half or as far apart as four inches and still produce stereoscopic pictures but much depends on the lenses. Stereoscopic pictures may also be taken with ordinary hand cameras by constructing a very simple mechanism but the scenes must be limited to still life Any amateur who is handy with carpenter's tools can make the attachment or your carpenter will make it for you for a small sum. To start with let us assume that you have a box camera whose base is say 5½ x 7½ in. Select a piece of well-seasoned white wood, pine or cherry lumber, a half inch thick and 5½x7½ inches in dimensions. This will act as the base for the camera. A hole which will just take the camera screw is bored in the exact center and a small frame whose outside dimensions are 4 x 6 inches is nailed in the center, so as to leave a ¾ inch margin all around. You now have a piece similar to that shown in Fig. 39. The frame may be either mitered or square as taste dictates. Now select another piece of board 5½ x 10½ inches and nail to this a frame of the same

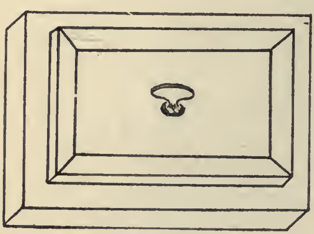


Fig. 39.

dimensions made of ¾ inch square stuff and you will have a piece similar to Fig. 40. Bore a hole in this and in this hole insert a tripod screw nut, the same as is fitted in the bottom of your camera. An extra tripod screw will have to be purchased for use in the piece shown at Fig. 39. The piece shown at Fig. 40 is now fastened by means of the tripod screw to the head of the tripod, where the camera usually rests. The smaller piece or slide, shown in Fig. 39 is fastened to the bottom of the camera by means of the extra tripod screw, the smooth side of the board to the bottom of the camera. When the slide is placed on top of the large base board it presents an appearance similar to Fig. 41. It can be shifted back and forth, from right to left, just three inches, the frame on the small sliding piece acting as a stop at both ends and as guides at the side.

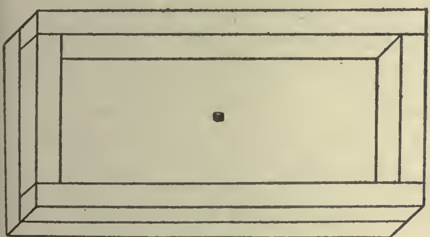


Fig. 40.

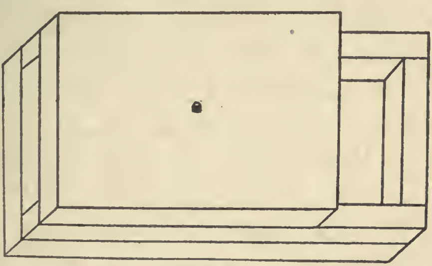


Fig. 41.

It is quite evident that if we screw the camera to the top slide, move it over to the right and expose a plate, then move it three inches to the left and immediately expose another, that the result will be two negatives, similar to those produced by a stereoscopic camera, except that in the latter the two views are on one plate. Care will have to be exercised to either mark the plate holders "right" and "left" or to keep a record of them, for it is absolutely necessary to know which is which when we come to mount the prints as will be explained later. In taking views for stereoscopic purposes with a single lens camera there are several points which will have to be guarded carefully. Motion of all kinds will have to be excluded; moving figures, leaves, etc. This is not the case with the regular stereoscopic camera for with it we can take snap shots or time exposures. Again with the single lens we must carefully watch the light and give exact exposures to both plates or the result will be an imperfect picture. Should a cloud pass over the sun after we have taken the first picture we will have to wait until the sun comes out again or the negatives would not be mates.

The exposure for stereoscopic negatives is done as with ordinary scenes except that a little over rather than a little under-exposure is better. The development should be carried on as with ordinary exposures. Any ordinary printing out paper will make good stereoscopic views but silver paper and collodion and gelatine papers produce better results than bromides and platinotypes. A smooth paper with a brownish tone will give better results than a rougher paper or a blacker tone. Brilliant prints are not a necessity and in fact are a detriment, for when viewed through the stereoscope they look fuzzy and glaring instead of soft. In printing from a regular stereoscopic camera negative, a special printing frame is necessary, as the plate is longer and narrower than the average, or a large printing frame may be used with a plain glass in it and the stereo-negative placed on the plain glass. When printing from two negatives made from a single lens it will be found desirable also to use a large frame with plain glass, so that both negatives may be printed at the same time and the color kept uniform thereby. The prints should be numbered and marked on the back with a lead pencil so that they can be sorted out in pairs after toning and washing, otherwise you will get into trouble. After printing mark the backs 1-R, 1-L, 2-R, 2-L, etc. and you will have no trouble in sorting them out.

If you are printing from a single plate made in a stereo-camera you will note that the view taken by the right hand lens is on the left hand side of the plate and vice versa. This being the case you will have to cut the views apart, after toning, washing and drying and transpose them, so that the view taken by the right hand lens will be opposite the right eye when viewed through the stereoscope and vice versa. The trimming of stereoscopic prints is of prime importance for if they are not properly trimmed and mounted all the effect is lost. Some prominent object as a stump, stone or fence should be selected in the foreground as a guide point and the print trimmed from it. We will suppose in our example that there is a stump in the foreground. In trimming the two prints this stump must be the same distance from the bottom edge of print and the two prints the same size in height. In trimming the sides, however, we take another course. We again take the stump as a base mark and in trimming the right-hand print we allow a quarter of an inch more to show on the left of the stump than shows on the left of the other print and in trimming the two prints to the same size we naturally have a quarter inch more space showing on the right-hand side of the stump than appeared on the right-hand print. This will be made clear after you have trimmed and mounted your first prints and viewed them in the stereoscope or you will perhaps grasp the idea better by examining a ready-made stereo-picture. In mounting, about a quarter of an inch should be left between the two pictures on the card and a dark mount is preferable to a light colored one.

During the last few years considerable attention has been paid to panoramic views by amateurs. These views are usually made by means of the ordinary box camera by shifting it on the tripod from left to right. Two, three and sometimes four exposures are made from the same point by simply turning the camera slightly on the tripod screw. It is important to study the scene before you carefully, so as to determine where the joining shall take place. As a rule, it is better to join at the edge of a building, tall tree, or some such object which cuts well into the sky, as the joining is less liable to be noticed. Starting at the center, the view is carefully focused and if it is intended to make a three-piece panorama, the prominent objects to the right or left are indicated by vertical pencil marks on the ground glass. The camera is then swung to the left and placed in such a position that the image on the ground glass shows that the tree or prominent object whose location was noted by means of the pencil line on the left of the ground glass, just overlaps that line. The exposure is then made, the camera moved to the center, the next exposure made and then swung to the right. In each instance the subject should lap, say three-eighths of an inch for safety and even a half-inch is better, then in case of any frilling at the edge of the plate you are still safe. A special printing frame, long enough to take a sheet of paper which will cover all three negatives, is procured. Special frames for panoramic printing are now to be had on the market. The backs are arranged to open in three and four compartments. The center negative is placed in position and the balance of the opening in the printing frame is blocked out by means of black cardboard. The sides of the center negative are also blocked out up to the point where you wish the joining. The center is then printed, the center negative removed and the left hand negative placed in position to the left in the printing frme. The right hand side of the negative is now blocked out up to the line where it joins the center one, the balance of the frame blocked with black cardboard and the printing proceeded with. The right hand negative is treated in similar manner and the print is then ready for toning.

All this, of course, means work and for this reason a special camera has been placed on the market, which is known as the "Al-Vista." It is a panoramic camera which makes negatives 4 x 12 inches in size. This camera enables the operator to take in a scope of nearly 180 degrees, or half a circle. The size of the camera is 5 x 5¾ x 10½ inches and it weighs but a little over 2 lbs. when ready to operate.

Fig. 42 shows a front view of the camera before exposure. You will note that the lens is pointing towards the right as we look at the camera from the front. The exposures are made on a roll film and the film passes from one side of the box to the other, not in a straight line, as in ordinary roll film cameras but in a half circle. The back of the box has a semi-circular groove and the film follows this circle, as you will see by consulting Fig. 43. You will see why, when you understand the action of the camera. When all is ready you start the mechanism and the lens sweeps from right to left, as you view it from the front. In making this sweep the film must necessarily be on a half circle in order that the lens be the same distance from the film at every stage of

Fig. 42.

its turning. When the sweep is completed the lens points to the left, or opposite to where it started, as

Fig. 43.

shown in Fig. 44. When the exposure is made the film is wound up for another exposure, there being an indicator which shows when enough film has been brought into position. The film is perforated by a punch, which shows where it is to be cut off, then you are ready to develop in the dark room.

The mechanism operating the lens is so constructed that you can change the speed, fast or slow, according to the light. The light coming through the lens does

Fig. 44.

not strike the film in a circle as in other cameras and you can readily see that the angle of the most narrow angle lens would be so wide as to produce a blur on account of a double impression in some places. This is obviated by means of a funnel-shaped tube extending back from the lens about 3½ inches but the end of the funnel is not round but a rectangular slit, which allows only a streak of light to strike the film at one time. Any four-inch daylight loading film may be used in this camera.

Time 1-50 CLOUD EFFECTS. Henry G. Abbott

CHAPTER XIV.

In Chapter III the attention of the reader was called to the fact that light is made up of several colors, red, yellow, orange, green, blue, indigo and violet and that blue, indigo, violet and green rays act more quickly than do the red, yellow and orange ones. It was also explained that if we expose a plate just long enough for the blue and violet rays, then we will probably under expose it for the red and yellow ones and that to have a perfect negative we must in some way correct the color value by reducing all to a common value, or as nearly so as possible. This correction is partially effected in two ways, either by the use of Isochromatic or Orthochromatic plates and color screens, or by the use of color screens in conjunction with ordinary plates. These color sensitive plates in conjunction with color screens, or ray filters, as they are sometimes known, are very useful in photographing flowers, clouds and other objects and scenes where it is advisable to have the proper relative color values. In these days of quick-working lenses, shutters and plates, we find a greater percentage of cloud effects than formerly.

The photographing of clouds, by themselves or in conjunction with a marine or landscape, is highly interesting and the addition of clouds to the ordinary view adds to it at least fifty per cent in value from an artistic standpoint. Almost any lens will answer for photographing clouds by themselves but it is not every lens which will bring them out in conjunction with a landscape. It is not absolutely necessary to use either color sensitive plates or color screens in order to insure the production of clouds in your landscape, for a proper lens and fast plates will very often result in first-class cloud effects, as the accompanying illustration proves; but the cloud effects will certainly be enhanced by the use of color sensitive plates alone and a greater improvement made by the use of such plates in conjunction with color screens.

Color screens or ray filters are made in several ways. The coloring matters usually employed are Auramine, Bichromate of Potash and Picrate of Ammonium for color values on sky negatives and subjects whose tones incline to blue, indigo, violet and green. These coloring matters are employed in several different ways. Some color screens are made of mica, colored with one of the above ingredients, others consist of glass cells containing the coloring matter in solution and others consist of glass plates. The great objection to the color screens on the market is that as a rule they are too deep or strong in color. This strength not only prolongs exposures from twenty to forty times but the results are unnatural pictures. We have seen color screens in the form of cells containing a saturated solution of bichromate of potash. Such cells make necessary an exposure forty times the length of the normal and the result is an intensely black sky with white clouds, a thing never seen in nature. The manufacturers claim that the screen is built on scientific principles and tested by the spectroscope and found correct. This may be true and if it is, then we do not want scientific effects, for they are certainly unnatural. While the clouds stand out beautifully the background is certainly unlike anything in nature. For this reason care must be exercised in the selection of color. A saturated solution of picrate of ammonia produces a light yellow which requires but very little further reduction if used with lacquer or gelatine but if used as a solution in a glass cell it can be slightly reduced. We have used a bichromate solution which consisted of one dram of saturated solution to 4 drams of lacquer and found that that was fully strong enough for the darkest screen. Our best results have been from screens made of lantern slide cover glasses, coated with lacquer which was colored with picrate of ammonium. A saturated solution of the picrate was made by mixing with the lacquer. Three different screens were all made very light in tone and where a darker tone was desired one glass was placed in front of the other. Fig. 45 illustrates a front and top view of the holder for these screens. The body of the holder is made of hard rubber, turned from one piece, it being square in front and turned down at the back, leaving a cap to fit over the front of the lens. This cap is lined with a piece of chamois leather. The front has a frame made of light brass with the top quarter of the frame removed. This frame sets out far enough from the rubber body to admit of the insertion of two screens, one in front of the other, with a bar between them. The solution side of the color screen is, after testing and being found correct, to be covered with another cover glass and the two held together by means of a binding of tin foil. A wire loop is fastened to the top, so the screens can be easily removed. Instead of lacquer, gelatine may be used. A saturated solution of the picrate is made and to each ounce of this solution 15 grains of gelatine are added and then alcohol enough to bring it to the required shade. Before using either the picrate or any other solution, it should first be filtered through a clean piece of fine linen to remove any lumps or grains. If preferred, the various density of plates may be secured by first starting with a very light color, darkening by additional applications of the lacquer or gelatine but our experience is that a light film is better than a heavy one. Another method is to put unexposed lantern slides into a hypo bath, clear them up thoroughly, wash and then apply the solution to the film. The plates must be fresh to accomplish good results in this way.

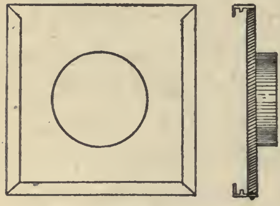


Fig. 45.

The Government Weather Bureau at Washington employ the solutions in glass cells. Fig. 46 gives an idea of how these cells are made. The frame is made of coık, although wood or hard rubber might be substituted. A ring of glass cut from a tube about the circumference of a lens and with the sides ground perfectly flat with emery is cemented between two thin pieces of plate glass. This ring has a small hole at the top for the insertion and removal of the solution and this hole is stopped with a small metal plug. The illustration to the left shows the completed screen in place on the lens. The glass ring is cemented to the square glasses by means of Canada balsam. If alcohol is used as a base for the solution much difficulty will be encountered in preventing the cell from leaking and silicate of soda or soluble glass will then be found better as a cement. The cell is filled and then fits, friction tight into the square in the cork frame. It is much easier to make the cell in this form than where round glasses are fitted into a metal cylinder and less chance for leakage. Its other good points are that several different densities of cells can be used in the one frame and one can be pushed out and a new one inserted without trouble. The ring of glass must be the same width all around, other-

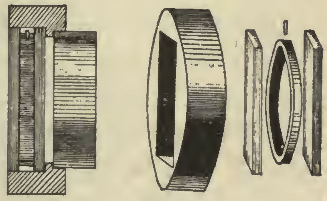


Fig. 46.

wise the screen would be denser in one place than another on account of the excess of fluid. The Weather Bureau people employ a saturated solution of bichromate of potash. They secure thereby very showy but very unnatural negatives and prints. If they were to reduce the density much more natural effects would follow.

Other colors can be used with equal advantages on certain kinds of color work. Emerald green can be made into a solution and used in the liquid form or to coat the plate by means of lacquer. Methyl violet may also be used to advantage. These screens are useful in copying water color and oil paintings. In order that the action of screens may be fully understood by the amateur let us put it in a little different form.

A YELLOW SCREEN cuts out in the negative the blues and indigoes, leaving clear glass in their place.

A GREEN SCREEN cuts out in the negative the reds and leaves clear glass in their place.

A VIOLET SCREEN cuts out in the negative the yellows and leaves clear glass in their place.

The above refers to screens of dense color and lighter screens of course have similar effects, though in a less marked degree. From this it will be seen that if a yellow-orange screen of considerable density be used there will be clear glass where the blue of the sky would be and the consequence is that the resulting print would appear as white clouds on a black background.

Flash Light. A BACHELOR'S REVERIE. J. E. Green, Chester, Pa.

CHAPTER XV.

Flash light photography is extensively practiced by amateur photographers with varying success. The majority of these photographs are failures, owing to the fact that the person or group is left in total darkness or nearly so and the sudden lighting produces a startled appearance on the faces of the subjects. Again the lighting is nearly always on one side, leaving the other side of the faces in deep shadow. In many of these pictures the effects are highly ridiculous, as some persons close their eyes when they catch the first glimpse of the flash while in others the pupils are so dilated as to have a very startling effect. To get good effects the room should be as brilliantly lighted as possible by means of gas or oil and the lights so placed as to soften the effect of the flash.

There are so many good flash lamps on the market that it would be presumptuous to say that this or that one is the best. Any of the modern lamps are good and when handled with care there is little or no danger. Accidents with flash lights are usually attributable to two causes, carelessness in the location of the lamp or the use of cheap or inferior flash light powders. When placing the lamp in position see that there are no lace curtains or other inflammable matter in close proximity to the lamp. As a rule the lamp should be somewhat higher than the lens. The person or group should be posed away from the wall as far as the room will admit in order to avoid deep shadows. A screen covered with white cloth and placed at an angle on the side opposite to the flash lamp but so it will not show on the ground glass, will tend to do away greatly with the harshness by reflecting light on the dark side of the faces. The gas or other artificial lights in the room should not be allowed to shine directly into the lens.

The posing being to your satisfaction proceed to focus on the ground glass. To do this you will have to place a lamp or candle close to the face of one of the persons in the center of the group. Use the largest stop, providing it will give you fair definition. The plate-holder is now placed in position, the slide removed and you are ready for the flash. We prefer the loose powder but the prepared cartridges now on the market give very good results. These cartridges are provided with fuses ready for lighting. Most of the modern flash lamps ignite the powder by means of an ordinary match. By pulling a trigger the match is ignited and forced through an opening in the back of the lamp by means of a spring, thus igniting the powder. At all times keep your face away from the powder. Never be in a hurry when taking a flash light picture. Do not be afraid of the light in the room fogging the plate but at the same time it is well not to draw the slide until you are ready to ignite the powder.

Sometimes a frame covered with tissue paper or cheese cloth is placed between the sitter and the lamp in order to diffuse the light but if such a screen is used a larger charge of powder is necessary. Flash lights are not only useful for night photographs but may also be used to advantage in the day time in making exposures of interiors, especially in large buildings and poorly lighted rooms. If judiciously used they are also a great help in portraiture during the day time, the effect being much softer than when used at night.

Silhouette pictures may also be made by means of the flash light. A screen of cheese cloth or sheeting is placed in the center of the room and the person or persons posed in front of it. The camera is then focused by placing a lamp or candle close to the face of the sitter, the shutter opened and slide removed. All lights are then turned low or entirely out. A flash lamp is placed on the opposite side of the screen from the subject or subjects and the flash made. The result will be a silhouette picture or black on white. These pictures may also be made by placing the screen close to a window and cutting off all light except that which comes through the screen. The person is then posed in front of the screen and the focusing and exposure done in the ordinary manner. As all the light comes through the screen, that side of the person next the camera will be in the dark and the result will be a silhouette. The largest stop will have to be used and when daylight is utilized a time exposure will be necessary, the time depending on the size of the screen and window.

CHAPTER XVI.

The making of lantern slides and transparencies although a comparatively simple operation, requires care and more or less skill and experience in order to get good results. A lantern slide or transparency is really a print on glass, being a positive and presents the picture exactly as viewed in nature. They are made in two ways, by contact and by means of the camera. Slides made by contact reproduce the view shown by the negative in exactly the same size as the negative does, while those made in the camera are on a smaller scale, that is, the view shown on a larger plate is reduced in size to go on a lantern slide plate. Special plates are made for the purpose and American lantern slide plates are 3¼x4 inches in size. English lantern slide plates are made 3¼x3¼ inches. The glass in these plates is very thin and of the best quality and the coating or emulsion is also thin, so much so that it is sometimes extremely difficult in the dark room to distinguish the coated from the glass side of the plate. In such an event the sensitive side can readily be determined by breathing upon the plate; the breath will condense upon the glass side but will have no visible effect on the coating.

The negative from which the contact slide is to be made is placed in a printing frame with the film side up, exactly the same as in making a print. The lantern slide is then placed in position upon the negative so that the two plates rest film to film. This is of course done in the dark room by means of the red light from the dark room lantern. Care must be exercised to see that all dust is removed from the film sides of both the negative and lantern plate and that the glass side of the negative is clean, for the smallest defect is exaggerated when the slide is placed in the lantern and the enlarged view thrown upon the screen. The negative with the lantern plate on it is held up before the red light of the dark room lamp in order to place the lantern plate in position.

Move the lantern plate around until it includes that portion of the negative which you wish to show and then place the back of the printing frame in position and clamp it down. The printing frame is now turned face down on the bench or table and the ruby lamp opened. The printing frame is then held in a vertical position in front of the lamp and about eighteen inches from it for about ten seconds, the length of exposure and the distance from the light being governed by the size and quality of the light and the density of the negative. If the negative is a medium one, eighteen inches will be about the right distance from the light; if thin, remove more distant from and if dense bring it closer to the light.

Should the negative be a very thin one it will be well to place a piece of ground glass in front of the light and lengthen the exposure. With an ordinary gas burner and medium negative, from two to five seconds exposure will be ample but with an oil light the exposure will vary from ten to fifteen seconds. A few experiments will teach you what is the proper exposure for a given negative and others can be judged from it just as you use your judgment in making Bromide or Velox prints or negatives.

The all important point in making lantern slides is to have clear glass in the highlights or sky, providing the latter is not intended to show clouds. When you have made the exposure the printing frame is again turned face down on the bench and the dark room lantern closed. The back of the frame is then opened and the lantern plate removed and developed. No special developer is required and the work is performed the same as developing a plate with the exception that care must be exercised not to carry the development too far. If the negative was one having a plain white sky, then we must stop development as soon as we see that the sky is changing in the slightest degree to a dark shade, for the object is to have clear glass in the sky, when the slide comes out of the hypo bath. When the image has developed up clear and distinct and just before the sky changes, remove the plate from the developer, rinse in water and place in the hypo bath. The ordinary bath used for negatives will answer, though a diluted bath will be better. When the plate has cleared up in the fixing, wash it for thirty or forty-five minutes and put it in the rack to dry.

It will not be necessary to develop each plate as soon as printed after you have familiarized yourself with the process and the length of exposure. Five or six exposures can be made one after the other and the plates put in a box and all the development and fixing done at one time. When the plate has dried thoroughly it is ready for the finishing touches in the way of cover glass, mat and binder. The covers consist of thin crystal glasses which are sold for the purpose. The mats are frames cut from black paper with various sizes and shapes of openings, most of them being oblong with rounded corners. The lantern slide is laid on the table, film side up, the mat placed on the film, and the cover glass, previously cleaned, is then placed on the mat. The three are then held together and removed from the table and the binding strip applied to the edges so as to hold them in place. Binding strips consist of narrow slips of tough black paper, gummed on one side. The Ideal Lantern Slide Vise, shown at Fig. 47 will be found very convenient when applying

Fig. 47.

these binding strips, as the lantern slide, mat and cover glass are held firmly in position, leaving both hands free to apply the binding strips. The slide is clamped between rubber discs which do not scratch the glasses and the slide is readily revolved. A mat should always be selected which will cut out that portion of the picture which is not desirable to show upon the screen and it adds a finish to the view just as a frame does to a picture.

We will now call the reader's attention to the second way of making lantern slides, that is, by the reduction method

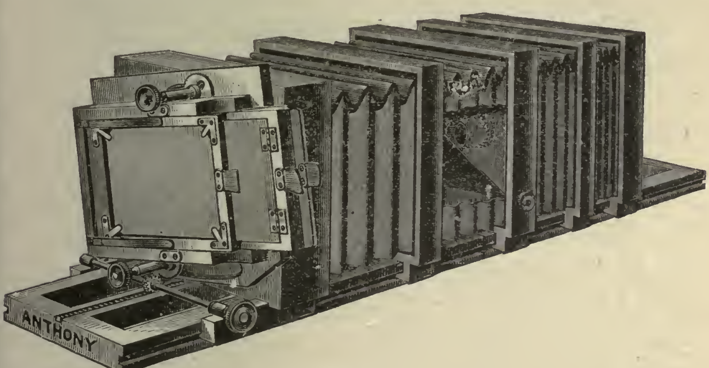


Fig. 48.

and right here it is well to state that slides made in this way are vastly superior to those made by contact. Fig. 48 illustrates the Anthony Lantern Slide Camera, which has an oscillating frame carriage for the ground glass and plate holder, which facilitates the adjustment of the picture on the plate. It will be noted that the lens is situated about the center of the bellows but this center board and lens can be used also at the end of the bellows, thereby converting it into an extra long copying camera. This camera is made for copying 4 x 5 or smaller negatives on 3¼ x 4 or 3¼ x 4¼ lantern slide plates. The negative is placed in one end of the camera, film side toward the lens, where it is held by means of springs and the camera placed in front of a window or light in order to focus the scene to the right size on the ground glass. When the focus is satisfactory the plate holder containing the lantern plate is placed in position, the focusing cloth is thrown over the end where the negative is held and the camera is taken out of doors to a spot where the sky can be viewed uninterruptedly. Here the camera is pointed towards the sky and an exposure made, the length of time depending on the brightness of the day and the denseness of the negative. The development is then proceeded with, the same as with a contact negative. If the slides are made at night the lighting can be done by gas or flash light but in that event a ground glass should be held a few inches in front of the negative in order to diffuse the light. Of course the exposure can also be made in the day time from any window where an uninterrupted view of the sky is to be had but the sun must not shine on the negative. A piece of white cardboard can be placed at an angle outside the window to cut off any trees that shade the light and to reflect the light through the negative. Should the negative be larger than will fit in the front of the camera, then we shall have to employ a little different method. We can take a starch or soap box, remove the lid, and cut an opening in the center of the bottom of the box which will just take the large negative. The negative can be fastened in this opening by means of thumb tacks or two wooden cleats can be tacked on in which the negative can be

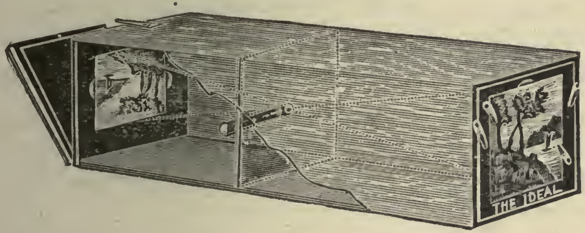


Fig. 49.

held. The film side of the negative should face the inside of the box and the inside of the box should be next the camera front. The camera can then be brought into position until the image on the ground glass is of the right dimensions and the focusing cloth can be spread over the intervening space between the camera and box, thus shutting off all light except that which comes through the negative. Fig. 49 illustrates the Ideal Lantern Slide Camera which is a very simple arrangement, being a wooden box with lens in the center partition, kits for the reception of the negative in one end and the lantern slide in the other. The kit for the reception of the negative is reversible so that vertical or horizontal negatives can be used. The lens being a fixed focus one the negative is always in focus. This camera is built for 4 x 5 negatives only.

If any difficulty is had in focusing the negative on the ground glass and it often happens, then the following method may be resorted to: Divide the length of the negative in inches by the length of the lantern slide, to the result add 1 and multiply the sum by the focal length of the lens and the result will be the distance that the lens should be from the negative. We will assume we have a 6½ x 8 negative, a 3¼ x 4 lantern plate and a lens of 6 inch focus. The process will be as follows:

$$8 \div 4 = 2 + 1 = 3 \times 6 = 18.$$

Now we have the distance from negative to lens which is 18 inches, we must know the distance from lens to lantern plate. We proceed to divide the result, 18, by the first quotient or 2 and the result will be 9 ins. or the distance from the lens to the lantern slide.

If we desire clouds in the sky of our lantern slide and the negative has none we can secure them by printing the clouds in on a separate lantern slide plate and using this plate as a cover glass for the lantern slide. Great care will have to be exercised, however, to see that the two slides blend well together at the horizon line and also that we are not putting clouds which are lighted from the right into a scene which is lighted from the left and that in all other respects the clouds match the scene and above all be careful not to get the clouds upside down.

CHAPTER XVII.

Transparencies are treated in a similar manner to lantern slides. They may be made on any ordinary plate, or special plates are made for the purpose, having ground glass or opal backings. There is also on the market a special plate for lantern slides and transparencies, known as G. B. P. R., which by special development produce either green, blue, purple or red, or the intermediate shades. Special directions accompany these plates. The transparency should be developed a little stronger than lantern slides. After fixing and washing, the transparency should be backed with a piece of ground glass, the film, of course, being protected by the glass.

Should the amateur so elect he can make blue transparency plates by giving a previously well cleaned glass a thin coating of gelatine and when this is dry sensitizing it with the solution described on page 138, for making blue print paper. The sensitizing liquid is not applied with a brush but is poured on the center of the plate, allowed to spread to the edges and the surplus then poured off from one corner. The plate is then printed under the negative and developed the same as you would blue print paper. The depth to which to print may be judged by making a plue print from the negative first and giving the transparency the same time that you did the blue print, or the negative can be wedged into the corner of the frame and the transparency plate placed in the same corner exactly. It can then be removed and examined and replaced in the same place. If it be desirable to place it in any other position than the corner, guides made of cardboard can be fastened to the frame, so that the negative can always be replaced in the same position. It is always desirable to have a frame or border of white glass around the transparency and this can be effected by cutting the film with a sharp knife and removing the surplus from the glass while it is still damp.

Transparency frames, made of metal, with rings to hang them up by, may be purchased from photo supply houses. These frames are made for both horizontal and upright pictures, in all the regular sizes in which dry plates are made, from 4 x 5 to 11 x 14.

There will come a time when the amateur who possesses a 4 x 5 camera and who is perfectly satisfied with the quality of his negatives, will feel a longing for a larger size. As stated on page 12, the larger the camera the greater the expense for plates, trays, paper, etc. and not only this, but the greater becomes the burden when you go out for an outing with a dozen plates. A 4 x 5 negative will always make an 8 x 10 bromide print and if there is plenty of detail, it will even stand enlarging to 11 x 14 on Royal Bromide.

When enlargements are spoken of they usually mean bromide prints larger than the original negative but enlargements in the way of negatives may also be made within the limits of the largest plate which your camera will take. For example, an enlarged positive or transparency can be made in the camera as lantern slides are made. Special cameras are made for enlargements but they may also be made with the regular camera, by the use of a box and focusing cloth, as described for making lantern slides. These special cameras are similar in construction to the lantern slide camera shown in Fig. 47, except that they are made to take larger plates and the bellows is therefore not only larger, but longer. To make the matter sure, let us imagine that the camera shown in Fig. 47 is five feet long and will take plates up to 11 x 14. If now we desire to copy a photograph in the same size, our lens having a focal length of 4 inches, we would then place it in one of the kits in the front of the camera and draw back the center partition, which holds the lens, twice the focal length of the lens, or 8 inches and slide the ground glass until it was the same distance from the center of the lens. If we wished to double the enlargement we would make the distance from the center of lens to negative 6 inches, and from center of lens to ground glass 12 inches. The annexed table of enlargements is from the "British Journal Almanac" and will be found valuable when making enlargements and reductions:

TABLE FOR ENLARGEMENTS.

Focus of Lens.	Times of Enlargement and Reduction.							
Inches.	1 In.	2 In.	3 In.	4 In.	5 In.	6 In.	7 In.	8 In.
2	4 4	6 3	8 2¾	10 2½	12 2 2/5	14 2⅓	16 2 2/7	18 2¼
2½	5 5	7½ 3¾	10 3⅓	12½ 3⅛	15 3	17½ 2 11/12	20 2 6/7	22½ 2 13/16
3	6 6	9 4½	12 4	15 3¾	18 3 3/5	21 3½	24 3 3/7	27 3⅜
3½	7 7	10½ 5¼	14 4⅔	17½ 4¾	21 4 1/5	24½ 4 1/12	28 4	31½ 3 15/16
4	8 8	12 6	16 5¼	20 5	24 4 4/5	28 4⅔	32 4 4/7	36 4½
4½	9 9	13½ 6¾	18 6	22½ 5⅝	27 5 2/5	31½ 5¼	36 5 1/7	40½ 5 1/16
5	10 10	15 7½	20 6⅔	25 6¼	30 6	35 5 5/6	40 5 5/7	45 5⅝
5½	11 11	16½ 8¼	22 7⅛	27½ 6⅞	33 6½	38½ 6 5/12	44 6 2/7	49½ 6 3/16
6	12 12	18 9	24 8	30 7½	36 7⅙	42 7	48 6 6/7	54 6¾
7	14 14	21 10½	28 9⅓	35 8¾	42 8 2/5	49 8⅙	56 8	63 7⅞
8	16 16	24 12	32 10⅔	40 10	48 9 3/5	56 9⅓	64 9 1/7	72 9
9	18 18	27 13½	36 12	45 11¼	54 10 4/5	63 10½	72 10 2/7	81 10⅛

The proper use of this table can be understood from the examples given on the annexed page where the amateur desired to make a negative in the same and double the size, with a lens of 4 inch focal length. Let us take the last as an example: He consults the head of the table under "Times of Enlargement," and as he wants a double size he looks at the column headed 2. He then consults the left hand column, running his eye down it until it strikes the focal length of his lens or 4. Where these two lines meet he finds the figures 12 and 6, the former being the distance from center of lens to sensitive plate and the latter from center of lens to negative. In reducing any given number of times the same operation is repeated but in this case the larger number will represent the distance from the center of lens to the negative or picture to be copied and the lesser number represents the distance in inches from the center of lens to sensitive plate.

Now we have several times made use of the expression, focal length, when speaking of lenses and it may be possible that the amateur does not know the focal length of his lens, or how to determine it. For this reason we will endeavor to explain in simple language, how to determine the focal length of any lens. With a rule measure off on a piece of white paper 12 inches exactly, making two distinct black marks just 12 inches apart. Take your camera, paper and rule out into the yard or lawn. Pin the paper upon the side of the house or on the fence, choosing a place where you can set your camera at some considerable distance from it. With the aid of the rule mark off three inches on your ground glass, drawing two lines on the rough side of the glass with your lead pencil. Using the largest stop, proceed to bring your camera nearer to or farther from the sheet of paper on the wall until the two lines on the ground glass register, or come exactly over the two lines on the paper when viewed through the ground glass. With the aid of the rule, or a tape measure, proceed to measure the exact distance from the ground glass to the wall on which the paper is pinned. Having found this distance to be 25 feet, we proceed as follows: We divide the 12 inches marked on the paper by the space marked on the ground glass, or three inches. This gives us as a quotient 4, which is the proportion existing between the subject and the image. To this quotient we add 1, making it 5, and then square it, or in other words multiply it by itself and the result is 25. We now multiply the distance from ground glass to paper, or 25 feet, by the proportion, or 4, which gives us the product, 100. This we divide by the 25 secured by adding 1 to the proportion 4 and squaring it and the result will be the focal length of the lens, or 4 inches. To be sure we have made it clear, let us repeat:

12 ins., size of paper; 3 ins., size of image; 25 feet, distance from wall; 4, the proportion.

$12 \div 3 = 4$; $25 \times 4 = 100$; $4 + 1 = 5$; $5 \times 5 = 25$.

$100 \div 25 = 4$, the focal length of lens.

Enlarged bromide prints can be made by the amateur by means of any ordinary camera which focuses from the front and the necessary adjuncts are very inexpensive. These enlargements can be made in the daytime or during the evening, the source of light being the only difference. If they are made in the daytime, a room having but one window and that one facing the north, should be selected. Procure a few sheets of heavy red express paper, the kind used for doing up large packages. Measure the size of the window, including two inches on each side and the top and bottom. Glue two or three sheets of this paper together until you have a sheet which is large enough and then trim it to the required size. Put this sheet up in the window casing and hold it in position by means of thumb tacks. Draw a kitchen table close up to the window and place upon it a box which will hold your camera. Now place your camera on the box, the lens pointing into the room. With a lead pencil, mark an oblong on the paper the exact size of your negative, cut a piece from the paper this size, so that when the camera is backed up to the window all the light will come in through the camera and lens. Now glue some wooden strips around this opening, on each side and the bottom and push three thumb tacks into the wood, so that the negative can be dropped in from the top and will be held in position by the thumb tacks, as shown in Fig. 50. All the preliminary arrangements can of course be made by gaslight. A drawing board, a baking board or any other smooth piece of lumber, should now be selected for holding the bromide paper. This can be held in a vertical position by means of triangles or brackets screwed to the back, as shown in Fig. 51, or by making a groove in a piece of 2 x 4 lumber and inserting the board in the groove, as shown in Fig. 52. The board may also be held in position by tying it with a piece of string to a soap box. To this board fasten a large sheet of white paper and place the negative in the groove in the window. The ground glass is now removed from the back of the camera and that instrument drawn close up to the opening. Select the

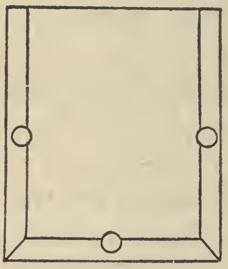


Fig. 50.

Fig. 51.

largest stop or diaphragm and open the shutter and you will find an image on the white paper when you turn out the gas. Push the drawing board to and fro until you get the enlargement of the proper size and in the center of the sheet. Now by racking the camera bellows in and out, proceed to sharpen up the image just as you would focus on the ground glass. If the negative was turned upside down and with the film towards the light, you will have an image just as the scene appeared in nature. You can now continue further operations by means of the dark room lantern. If any light leaks in around the camera where it joins the window, shut it out by means of the focusing cloth, for there must be no white light in the room aside from that which comes in through the negative and lens. With a lead pencil indicate the image on the white paper so you will know just where to locate the bromide sheet. You now close the shutter or cap the lens and opening the envelope containing the bromide paper, you proceed to place a sheet in the proper position by means of the marks made and hold it flat, avoiding all wrinkles, by means of four thumb tacks. You are now ready to make the exposure but before doing it, it would be wise to first try a small piece of the paper in order that you may make sure of the time. There is no rule that can be laid down as to time, any more than we could do in making a negative. The sensi-

Fig. 52.

tiveness of the paper, the density of the negative and the brightness of the light are all factors on which the exposure depends. We can only determine the proper exposure by experiment but it is not necessary to spoil full sheets in order to determine the correct exposure. The best way to do this is to cut a narrow strip from one of the sheets and pinning it in position proceed to expose it as follows: Pin a sheet of paper, white or colored, over the bromide strip so as to cover three-quarters of it and then opening the shutter give it a half minute exposure; close the shutter and pin the sheet so it covers one-half of the bromide slip and again expose for half a minute and so on until the last quarter of the sheet is exposed. It will be evident that we now have a strip of bromide paper with four separate exposures on it, one of a half minute, one of a minute, one of a minute and a half and one of two minutes. By developing this strip we can readily determine which is the best exposure for our negative and govern ourselves accordingly. The larger we make the bromide picture, the longer will be the exposure required. Now, before making the exposure on the large sheet, proceed to stop down to say *f* 16, as this will sharpen up the image considerably but will increase the length of time of exposure, the stops working just as they do in making a negative.

What we said in regard to the camera facing the sky when making lantern slides, holds equally good in making bromide enlargements. If your window will not admit of an uninterrupted view of the sky, then you will have to place a sheet of white cardboard just outside your window, on an angle of 45°, so as to reflect the light from the sky through the negative. Fig. 53 will give you a general idea of the arrangement of the camera, table and bromide paper when making enlargements by daylight. You will observe that it is necessary to elevate the camera above the general level of the table if we expect to make any material enlargement, so that the lens will come opposite the center of the bromide sheet.

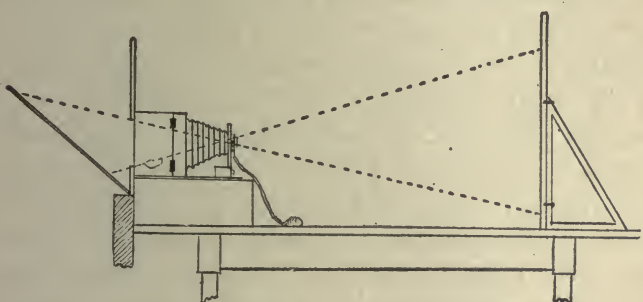


Fig. 53.

We will now consider the method of making bromide enlargements at night, using an inexpensive, home-made contrivance, not very handsome but fully as capable of good results as the best enlarging apparatus. Procure a good, sound box, say 14 inches square and another smaller box, say 10 inches square. Remove the cover from the large box and cleating it together put on two small hinges, so it will act as a door for this box. In about the center of the bottom a pair of condensing lenses should be fastened. These lenses are used to distribute the light evenly all over the negative, otherwise you would have a bright spot in the middle, with a gradual diminution of light towards the edges. Cut the second, or smaller box, down to say 10 x 10 x 3 and cut a hole in the bottom of this a little smaller than your negative. On the outside of this fasten three strips, with thumb tacks projecting over the edge for the reception of your negatives, as described when making enlargements by daylight, or grooved pieces can be used and the negative slide in the grooves. This smaller box should be fastened to the larger one so that the negative will come opposite the center of the condensing lenses and about three inches from them. Procure an elbow of speaking tube, about four inches long and cut a hole in the top of the large box so this tube will fit into it friction tight. Turn the opening of the tube towards the door in the box. In the box place a gas stand with a Welsbach burner, or what is better if you have it, an acetylene gas bicycle lamp. Any good oil bicycle lamp will answer but the purer and stronger the light the shorter the exposure will be. The flame of the lamp should be in line with the center of the condensing lenses.

Remove the ground glass from your camera and back the camera up to the small box holding the negative.

Prop up the camera on a small box so that the opening which was occupied by the condensing lenses will be exactly opposite the negative. Make two wooden triangles and screw them to the back of a drawing board, to hold it in a vertical position, as explained when making enlargements by daylight. Make everything light-tight by pasting red express paper over any cracks in the boxes, or where the two boxes join one another. Throw the

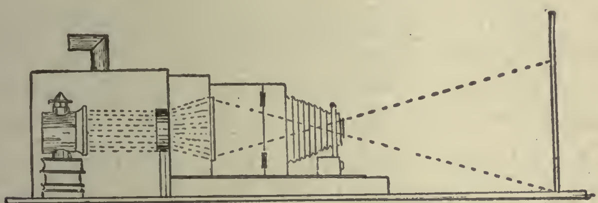


Fig. 54.

focusing cloth over the joint between the camera and box, to shut in any light which might escape. When all is ready, light the lamp and proceed to focus on a piece of white paper on the drawing board, as previously explained. Fig. 54 may help the amateur to understand more readily the above description. Enlarging by means of artificial light is more reliable than by daylight, for the source of light, as a usual thing, is constant, while with nature the light varies considerably every few minutes, owing to passing clouds.

Should we wish to enlarge say a 4 x 5 negative to 8 x 10 in size and leave a white margin around the print, we can readily do so by pasting a strip of black paper all around our 4 x 5 negative on the glass side, or we can do so by cutting a mask and placing it over the bromide paper when we get it in position. We can also vignette very nicely on bromide paper by taking a large sheet of cardboard, cutting a hole of the right size and shape in the center and moving it back and forth between the lens and the image on the bromide paper. A little thought will show you that the nearer you bring this vignetter to the bromide paper the smaller the circle of light and the closer you bring it to the lens the larger the circle of light which will fall on the paper. It is evident, therefore, that to vignette softly from the center to the edges that the screen or vignetter must be kept constantly in motion from the lens to the paper during the entire exposure. To get good, soft effects it will be found better to stop down the lens pretty well so as to prolong the exposure somewhat, say to f 32. Cut masks of various shapes may be purchased from most of the large photo supply houses and these may be employed successfully by placing them over the negative when making bromide enlargements. The development, fixing and washing is the same as for bromide prints made by contact, as described on pages 145 and 146 but enlargements should be placed in a tray of clear water for a few minutes prior to development. The mounting can be done on a card, or on a piece of linen which has previously been mounted on a stretcher. If a white margin is left around the enlargement, a line, about a quarter or half inch from the edge of the print, drawn with a ruling pen and India ink, will enhance its general appearance and make it equal, when framed, to the finest steel or copper plate engraving.

Once the amateur has familiarized himself with the process of enlarging on bromide paper and sees the beautiful results that may be secured in so simple and inexpensive a manner, he may wish to own something better than the crude camera of home-made construction. In this event we should advise the purchase of an Anthony Enlarging Lantern. It is very simple in construction and is capable of making the very best styles of enlargements. It may also be used as a copying camera for making lantern slides. The grooves in the interior admit of changing the relative positions of the negative and the condensing lenses and it occupies a space of only 8x15x18 inches.

CHAPTER XVIII.

The last process, that of trimming and mounting the print, is a simple one and yet how often do we see an otherwise beautiful photograph handicapped by poor trimming and an unappropriate mount. One of the first considerations is that the print be trimmed perfectly

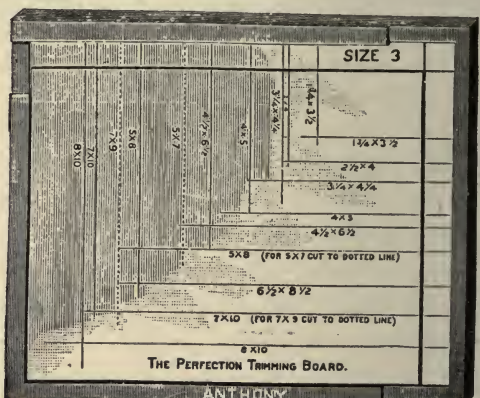


Fig. 55.

square. This we cannot expect to do by means of a pair of shears, using the eye only as a guide. The Perfection Trimming Board, shown in Fig. 55, is an effective method of securing square prints. It consists of a solid wooden tablet with raised edges, containing a card on which are printed diagrams of all the different sizes in general use, from $1\frac{3}{4} \times 3\frac{1}{2}$ to 8×10. This diagram is covered with a stationary thick glass on which a movable glass pattern is placed. The print to be trimmed is laid in place under the glass pattern, which is held firmly against the raised edge of the board, to prevent its slipping and with a sharp knife two of the sides are trimmed. The print is then reversed and the other two sides are cut. There are also many excellent trimmers on the market in the form of bench shears and rotary cutters.

If the amateur has a large number of prints to mount, or should he be so located that he cannot reach a photo supply house readily, it may pay him to make his own mounting paste but as a rule it can be purchased so cheaply in tubes and jars and is so convenient that it will only be in emergency cases that he will want to make it. A good, all-round mounting paste can be made by boiling starch to a very thick paste and then straining it by forcing it through a fine cambric bag. The paste should be so heavy that it will not go through the cambric unless the bag is twisted, thereby forcing it. A little ground alum, dissolved in hot water and mixed with the paste, will prevent it from turning sour. The prints should be laid one on top of the other, face down, on the pasting board and the paste applied by means of a broad, flat brush. It is a mistake to use a small brush, for the print is dry on one end before the other is fairly pasted.

As to the style and color of the mounting cards, taste alone must dictate, as there are so many colors and finishes on the market and as the subjects of prints differ so materially, no hard and fast rules can be applied but by all means select mounts which have a liberal margin, for nothing looks so mean as a good sized print on a card with a skimpy margin. Our preference is for dark rather than for light mounts and for plain rather than glossy finish on the cardboard. You can make mounts which are highly artistic and different from those usually found on the market. Take a piece of Whatman's, or any other rough drawing paper, a little larger than the mount you require. Cut a piece of zinc, say a half inch larger than your usual prints, or about the size of the dry plate you are using. This zinc you can leave with a plain square corner, or you can round off the corners, as fancy dictates. Place the drawing paper on a smooth piece of board, put the zinc sheet in the center of it and apply pressure, either by putting it in a copying press, or placing a board and heavy weights on the zinc. If sufficient pressure has been applied, the result will be a smooth center in which to mount the print, with a rough border all around it. The smooth sunk surface should be at least a quarter of an inch larger all around than the print. Should you want a mount heavier than the drawing paper alone will give you, then you can paste the drawing paper upon a piece of pulp board but in this event the zinc should not be applied until after the paper is pasted in position.

There are a number of rough papers on the market in white and various tints, which are used as covers for pamphlets and any of them, when backed by a piece of straw board or pulp board and a sunk panel made in them, will make very artistic mounts. Even the common straw paper, such as used by grocers and butchers for tying up packages, if properly treated, makes a very artistic mount by backing it with board, pressing a shape into it and drawing a simple line around the shape with India ink and a ruling pen.

Don't be afraid to sacrifice a half or even two-thirds of a print in order to secure that which is of interest and the least that you show of the uninteresting the more you accentuate that which is picturesque or artistic. It would be far better to cut down a print to 4 x 4 and thus have an interesting one, than to have the same occupy the center of a 5 x 7 print and the balance of the picture consist of uninteresting foreground of grass and the sides of a like character. Do not cut and slash your print recklessly, otherwise you may cut it down too much. Go at it systematically. Take four pieces of colored cardboard or paper and lay them over your print so as to form a frame, cutting out that which you think of least interest. Now, by drawing in and extending out the four limbs of the frame, you can judge very accurately how your print will look when cut to a certain size.

When your prints are mounted, if a glacé finish is desired, they should he passed through a burnisher. The burnishing roller should be kept bright and clean and should never be used cold. The prints should be burnished within a few hours after they are mounted, or while they are still slightly damp. The prints should be lightly rubbed over with a piece of flannel and white castile soap. A very small quantity of soap is all that is required, otherwise you will gum up the burnisher. Should you desire a glacé finish and you cannot afford the luxury of a burnisher, you can secure it in the following manner. When your prints are all thoroughly washed, lay them out on blotting paper sheets, face up, to dry. When they are thoroughly dry dip the face of the print again in cold water and place them, face down, on a sheet of plate glass or a ferrotype plate and press them into close contact with the face of the plate by passing a squegee roller over the back of the print. An ordinary ferrotype plate will take eight 4 x 5 prints. When you have them all squegeed down, take up the surplus moisture from the backs with a sheet of blotting paper and stand the plate on edge until the prints are thoroughly dry. With most papers, the prints will have a tendency to stick to the plate and to obviate this, the ferrotype plate should first be treated by rubbing it with a piece of flannel and paraffine solution. This solution can be purchased from your dealer, or it can be made by dissolving paraffine in benzine. The paraffine should be shredded and placed in a bottle and the benzine added to it. Shake thoroughly, cork the bottle well and place it in a warm place and the paraffine will gradually be dissolved. The ferrotype plate should be rubbed with this solution before each new batch of prints is applied. A very slight film is all that is required on the plate. If your printing paper is heavy you can mount your prints without affecting this finish in the slightest, providing you are not too lavish with your mounting paste. If, however, your printing paper is thin you will have to proceed differently After you have squegeed the prints down upon the plate, paste the backs of them and squegee a piece of thin paper to the back and allow all to dry. This extra piece of paper will prevent the paste striking through the print and destroying the finish. Do not force the drying of prints which are squegeed to a ferrotype plate by placing them on the stove, or you will melt the gelatine on the face and make the print stick harder than ever. The surface of these prints sometimes has a higher finish than can be secured by means of the burnisher.

On page 58 we mentioned the scrap book and this, by the way, is a very important thing and no dark-room should be considered complete without one. In this book should be preserved the printed directions which accompany the various makes of plates, developers, papers, etc. and in it you can preserve clippings from trade papers, etc. The book should have an index and should be paged, so that when you want a certain receipt or formula, or are at a loss how to proceed, you can consult the index and find the formula or directions instantly. If you take one or more photographic journals and have a number of annuals and books on photography, you can put in a rainy Saturday afternoon to good advantage by preparing an alphabetical index which will show you at a glance just where you can find an article on a given subject, or any particular directions or formula. Index your periodicals by volume and number, or by year and number, also giving the page and it will save you a world of time and trouble when you wish to read up on any particular subject.

CHAPTER XIX.*

The early fathers of photography soon discovered, when they worked with glass plates, that if it was necessary to set the camera in a subdued light and point it towards a bright light, the outline surrounding the bright light, instead of being sharp and distinct, was invisible and in its place there was a blurred appearance, a halo, like that sometimes seen around the moon, or the heads of holy personages in the pictures by the old masters. This disagreeable photographic effect is very noticeable in interiors where windows have to be taken and no little trouble and anxiety are sometimes the lot of the professional photographer, who has to make the picture from whatever point of view his client demands. Many a very beautiful photograph of a forest scene too is spoiled by the halation around the leaves of the trees.

Halation is supposed to be produced, when the plate is exposed in the camera, by the rays of light from the window through the trees, or from any highly polished surface, such as silver, passing through the film and being reflected from the back surface of the plate. In all probability the refraction of the light, caused by passing through the glass, plays a very considerable part also. This theory is supported by the fact that very little halation is seen in celluloid negatives, commonly called

*By Geo. J. M. Ashby, Chicago.

"films" where the celluloid support for the sensitive film is comparatively thin and the surface of the celluloid is not so bright as that of glass.

It has long been known that halation could be reduced or entirely presented by painting the back of the plate with a suitable preparation, but all the methods recommended were so objectionable, for one reason or another, mostly for their messiness, that few photographers cared to adopt them. The effective preparations for backing plates were found to be asphaltum varnish or a solution of burnt sugar, to which some powdered color, preferably sienna earth, was added. This did not appear to satisfy every one, for so recently as in last year's Photographic Journal Almanac, there was a description of a process for backing plates with asphaltum. The author of the paper vaunted this method as being the best of all and stated that "the backing could be very easily removed with a carpenter's chisel."

The same publication contained a paper by another author recommending a solution of burnt sugar for backing plates without the admixture of sienna earth or any other coloring matter. The directions for preparing the backing solution were formidable, inasmuch as heating the sugar was said to produce first, caramelane, then carameline and lastly, caramelin. The temperatures were given at which the various substances were formed. Caramelane was not wanted as it had too little coloring property and was hygroscopic, while the product of the highest temperature, caramelin, was insoluble, so a separation had to be made by means of alcohol in which the carameline was precipitated. Notwithstanding these and more complications I was tempted to try it, partly because of the very sensible plan being recommended of applying a thin sheet of paper to the back of the plate upon which the caramel solution had been painted.

I tried the backing with carameline and found the result in a negative made with a backed plate so much superior to an unbacked one that I determined to back all plates in future. My first solution was made in strict accordance with the directions, carefully observing the temperatures, separating with alcohol, then adding a proportion of carmelane to prevent the backing becoming too hard, etc., but when the next lot of backing solution had to be prepared I attempted to simplify the operation and succeeded perfectly. The way I now do it is as follows:

A pound of the ordinary crystalized sugar, the kind we sweeten our tea with, is put in a frying pan, which is placed upon the kitchen gas stove. The sugar is stirred with an iron spoon—a stick would do as well—this stirring is continued the whole time so that the sugar becomes heated equally throughout. In a few minutes it melts, then changes color, becoming yellow, light brown, dark brown, then very dark. At this moment I pour a few drops of water in from a jug of boiling water that has been placed ready to hand. The frying operation is continued, a few drops of water being added from time to time to prevent the sugar from becoming too hard, until it is almost black; then, while it is still hot, I add hot water a little at a time, stirring the while, until the solution is of the thickness of ordinary mucilage and a very dark brown or reddish black color. I pour this into a bottle, whereupon it is ready for use. To about six ounces of the solution I add an ounce of wood alcohol, though I am doubtful of the value of it and the next quantity of backing will have the alcohol omitted. The whole operation does not take more than a quarter of an hour and a pound of sugar will make backing solution to coat two gross of 8 x 10 plates.

The next point is the coating or backing of the plates. I like to buy my plates by the gross, then I know that, so long as they last, there is no trouble with variation in the speed of the emulsion. The most convenient time to back plates is when all the family has gone to bed and the gas can be turned out or the electric light switched off everywhere. On a large table I set out four plate-drying racks, these will hold six dozen or more plates. In front of me is the ruby lamp and a saucer with backing solution and in this is a flat varnish-brush, two inches wide. On my right is a pile of black or brown tissue paper, cut to the size for covering the back of a plate nearly to the edge; if I am backing 8 x 10 plates my paper is 7½ x 9½ and this size cut into four is rignt for 4 x 5 plates. All lights being out, except the ruby lamp, a box is opened and a pair of plates taken out and held just as they are packed with their films together, the back of one plate is painted with the solution of caramel, upon this a piece of the tissue paper is laid. The pair is then turned over and the other plate is painted, a piece of tissue paper is spread upon this and the pair of plates is put in the rack to dry. As the two plates are not separated the film surface is not exposed at any time. Another couple of plates is taken out and treated in a similar manner, until all are done, whereupon another box of plates is opened. It will be found that before six dozen plates are backed the first dozen will be found to be dry enough to put back again in the carton or plate box. Even when the backing was not absolutely dry before returning them to the box I have not found any harm result to the plates, though I do not recommend repacking in a moist state.

The next thing is the removal of the backing when developing and this is the simplest operation of all; no carpenter's chisel is needed for this. The removal may be said to be automatic, for as the caramel has no effect upon the developer, except, perhaps, that of making its action slightly slower, the plate, with its backing, can be dropped into the developer without further ceremony and in a few seconds the paper is detached from the plate and the caramel is dissolved. As my favorite developer is Tolidol whicn I use over and over again until it is exhausted, I prefer to remove the backing and the paper before putting the plate in the developer. This is done with the greatest ease by a few strokes with a small wet sponge.

The power that caramel has of preventing halation is very remarkable. It occurred to me that a solution of Spanish licorice, being of much the same color as caramel, might answer the purpose as well and dispense with the use of the family fry-pan. I tried this, putting black or brown tissue paper on the back of the plate as in the other case, but the result was a complete disappointment; in fact the halation seemed rather worse in a plate backed with licorice than with a plain unbacked plate.

The two illustrations are of an interior from backed and unbacked plates that received exactly similar treatment, both in exposing and developing. The test was sufficiently severe, as the sun was shining upon the window at 4 in the afternoon of a fine, clear day, early in September.

The subject of halation should not be treated without a reference to the non-halation plates invented, about eight or nine years ago, by Dr. Sandell, in which halation is prevented by the constitution of the film and not by backing. I want to say here that I think it would be a graceful act on the part of our plate manufacturers who use this invention to, at least, give credit to the inventor.

TAKEN ON AN ORDINARY PLATE

TAKEN ON THE SAME BRAND OF PLATES BACKED.

The Sandell non-halation plate is coated with two or three films of different degrees of sensitiveness, the one film being much more sensitive than another. It is

Fig. 56.

probable that where the surfaces of two films unite they form gradations equivalent to having a number of films, each of a different degree of sensitiveness. This very largely increases the latitude of exposure, for if one of the sensitive planes is over and another is under exposed there will be one in between them that will be right; at the same time—in the triple coated plate—halation is effectually prevented.

The triple coated plate has remarkable properties and a print from a negative, that a friend sent me from the other side, shows this. The photograph is of a powerful flash light or magnesium torch in front of the lens. There is such a complete absence of halation that all the details of the background are distinctly seen and a man sitting near the magnesium light (I think my friend said this is Dr. Sandell) is perfectly distinct.

Before I took to backing plates I used the double coated plates for about two years, but found they were not always to be relied upon and halation would frequently appear. There is much less pleasure in developing a double or triple coated plate as the details are not so distinctly seen. These plates should be left at least four times as long in the fixing bath. I may say here, that in an acid, chrome-alum and sulphite fixing bath, a plate may remain for a long while without suffering. I once overlooked one of a set of 8 x 10 negatives, leaving it in the fixing box for twelve days and it was not in the least degree the worse; it is not possible now to pick out this plate from the others of the set. It should be noted that the plate was on its edge in a grooved fixing box, the only way in which fixing should be done.

The triple-coated plate is too expensive for ordinary use and I do not consider the double-coated plate quite so good as that with a carmalene backing. Another advantage the photographer has in doing his own backing, in addition to the excellent result and the low cost, is that he can use any plate on the market; for my part I always use one of the low-priced plates and shall continue to do so until some one else does better work on the expensive plates than I can on the cheaper ones.

CHAPTER XX.*

The aim of all photographers, whether professional or amateur, is to make a negative which will produce a bright clear picture, (for with a poor negative this is impossible) and to attain this two things are necessary namely, correct exposure of the plate to the action of light through the lens, and correct development.

The first of these is the more important, though if the exposure is not correct it is sometimes possible to vary the development so as to make a fairly good negative from a very badly timed plate.

I find the main difficulty to all beginners is in not having a clear idea of the simple principles of what governs the timing of a plate correctly, and I shall therefore endeavor to give a few of the more important factors which come into consideration every time a picture is taken.

All plates of a certain make and sensitiveness require a certain amount of light admitted to them through the lens in order to effect the proper chemical change to make a good negative. Either more or less than this certain quantity will remove the quality of the resultant negative just so far from perfection. Our object then must be to learn just how much light to admit to the plate. No absolute rule can be laid down for this but

* By R. D. Cleveland, Chicago.

each must learn by experience and careful observation after knowing the main principles.

Now suppose that instead of a camera and lens you have a tin box with a water tap running into it. You are told to let a pint of water into the box as quickly as you can. Of course you open the tap as wide as you can and let it in with a rush and then shut it off. If you are told however to let it in slowly you open the tap only a little way and leave it open much longer. And this is just what should be done with the light on a negative. The amount of light admitted is governed in two ways; by the length of time the lens is opened and by the size of the opening through which the light is admitted and the two must be considered together.

The stops or diaphragms to a lens are for the purpose of sharpening or equalizing the focus but they also limit the admission of light according to the areas of their openings.

The areas of circles are to each other as the squares of their diameters. The stops to the best lenses now are usually marked with the diameter of the circle proportionate to the focal length of the lens. That is, suppose your lens has an eight inch focus, then a stop of one inch in diameter would be marked *f* 8, and of half an inch in diameter *f* 16.

Now, no matter what the focal length of your lens, stops of similar marks bear the same relative size to their individual lenses and to each other. To illustrate, if you have one stop marked *f* 4, and another *f* 8, their areas would be as 16 to 64 or the larger one would be four times greater than the smaller, would admit four times as much light and therefore would require only one quarter as long exposure in the same light. Other size openings of course would be in proportion and the relative areas and times of exposure very easily calculated.

Suppose now for instance you know (or think you do,) that you could get a good negative in the 1-100th of a second with an *f* 4 stop; then with an *f* 32 stop you would get the same quality negative or admit the same amount of light to the plate in $\frac{64}{100}$ of a second. This is one reason why time exposures with small stops are more likely to give good results than instantaneous with large stops. With the large stop just mentioned if you had given the plate $\frac{2}{100}$ exposure, you would have doubled the time and might have spoiled your negative, while with the small stop to double the exposure you must give about 1¼ seconds. Thus with the small stop your latitude of exposure is vastly increased and your chances of spoiling a plate from either over or under exposure are correspondingly diminished.

Thus you see the time necessary for a correct exposure so far as the stops are concerned is always in proportion to their size and this you can calculate exactly by knowing their relative diameters. It will be found the least confusing in practice to confine yourself generally to the use of but two stops; the largest one that will cut the plate sharp all over for instantaneous, and one of the smaller for time. The relative areas of these two can be learned and applied quickly at any time, while more will simply be confusing. For those who do not fully understand the marks on their stops I will say the relative times of exposure are as follows:

Assuming *f* 4 to be represented by 1.

f 4	*f* 8	*f* 16	*f* 32	*f* 64
1	4	16	64	256

That is *f* 64 would require 256 times the exposure that *f* 4 would in the same light.

The variations of intensity of the light at different times of day and different seasons of the year have also to be taken into consideration, but this too may be learned quite easily and carried in the head or the memorandum book.

You all know that the light of the sun is strongest in July and that it is much more intense at noon than at nine or four o'clock, and by learning just what this difference is it will help you very materially in correct timing. From the table in the American Annual for 1893 page 329 I quote a few figures, and any of you who care to can get more of them.

At noon in July with a given stop, if you require an exposure of $\frac{2}{10}$ of a second, at 3 o'clock you require 1 $\frac{2}{10}$ seconds and at 6 o'clock 4 seconds.

In January under similar conditions it would take 1 $\frac{7}{10}$ seconds at noon, 4 $\frac{5}{10}$ at 3 o'clock and 9 at 4 o'clock.

Now we come to the point of how much we may vary over or under the correct time of exposure and still have a fairly good negative.

In order to test this roughly I exposed a number of plates on the same object, one after the other, with the same stop timing them from 1 to 40 as nearly as possible, and developed them all together.

They were made on Seed 26 plates on a cloudy day with a single combination Darlot lens with about an *f* 32 stop and developed with Hydrochinone developer. I numbered them in regular order, and assuming No. 3 as 10 they were timed as follows: No. 1, - 2; No. 2, - 5; No. 3, - 10; No. 4, - 20; No. 5, - 30; No. 6, - 40. No. 3 proved the best negative though No. 2 with $\frac{5}{10}$ less exposure and No. 4 with double the exposure of No. 3 were also pretty good and with slight care in the development might easily have been made very good. From this I conclude roughly that we may have a latitude of exposure from one half below the best point to one half above and still be reasonably sure of a good negative.

If you take this latitude with a small stop and long time it is pretty great, but when you have got to measure it in the hundredths or fiftieths of a second as you have to with snap shots it is getting it down pretty fine for most amateurs and they need not wonder when they spoil plates with their kodaks.

In short it resolves itself into this. When you can get a good negative in the 1-100th of a second, if you give it

$\frac{1}{200}$ or $\frac{2}{100}$ you may spoil your negative entirely. As a consequence of this knowledge no experienced photographer will take an instantaneous picture when he can possibly get anything else.

Now having exposed your plates you must develope them. If you have timed them right this will give you no trouble as they will almost develop themselves with any good developer.

Of developers there are so many good formulas any of which work well that I refrain from giving any.

I have gotten equally good negatives with oxalate, pyro, hydro., eiko., Rodinal and Amidol and all I can say is, get one that has been well tested by good judges, learn its peculiarites and stick to it.

On the continent the best photographers still stick to their first love–Oxalate of potassium and iron; while in England I believe the most popular is pyrogallic acid and ammonia. We Americans try every new patent medicine that the dealers advertise as "better than all others" and make ourselves sick if we were not before.

All plates have full directions for development contained in the box with them and they can generally be followed with good results. If you are uncertain about the correctness of your timing it is best to put the plate first into old or diluted developer and see how it acts. If it blackens all over quickly it is probably over exposed and should be taken out and washed and a different developer used. If it is a long time in showing the image it is under exposed and should be treated accordingly.

If very much either over or under exposed and it is something that you can take again, my advice would be, don't waste time on it but throw it away and take another. However, it may be your picture cannot be taken again in which case it is worth a little labor.

If it is under exposed weaken your developer and let there be an excess of alkali in it; cover your tray from all light and let it remain until all the detail is out that will come. Then to strengthen add the normal amount of pyro or hydro solution until the negative is quite black and then put in the hypo. If the plate is over exposed the simplest method is to add a few drops of a 10 per cent. solution of bromide of potassium or ammonium and this will generally correct any but an excessively over timed exposure.

Practice of exposure with careful note of the time and the resultant negative will soon make you almost certain of your time in any light, and then the development will be very plain sailing.

INDEX

244473

THE UNIVERSITY LIBRARY
UNIVERSITY OF CALIFORNIA, SANTA CRUZ

This book is due on the last **DATE** stamped below.
To renew by phone, call **429-2756**
Books not returned or renewed within 14 days
after due date are subject to billing.

Series 2373

UC-SANTA CRUZ
3 2106 00738 2648
The University Library
UNIVERSITY OF CALIFORNIA/SANTA CRUZ