

wood to be stained—a laboratory table top, for instance, is given a coating of the first solution, and after it is absorbed one of the second solution. Let dry, and repeat the operation. Three coats of each will be sufficient for any wood. After the last coat has become quite dry, go over the wood with good boiled linseed oil and rub well. Better still is a mixture of linseed oil 5 parts, wax 5 parts, and oil of turpentine sufficient to make a pasty mass. This preparation gives a deep and everlasting black that most closely resembles, on hard wood, a good article of ebony, and it gives druggists who want to finish up their fixtures in ebony a splendid medium with which to do it.—*National Druggist*.

Photographic Notes

Photography for Chemists.

BLACK AND WHITE.

One or two queries that have been sent by correspondents, on the subject of failures in successfully reproducing black and white subjects, such as line diagrams or printed matter, either as prints or lantern slides, suggest that primarily the cause of failure lies in the making of the negative, and that this point is deserving of treatment at some length.

First, as to the lens. Almost any lens may be used, even a single or landscape lens, because, as a rule, we do not use the whole of the field, merely the centre, and there distortion of marginal lines does not become apparent; on the other hand, a doublet is preferable, and undoubtedly the newer lenses, such as the Concentric, Collinear, Zeiss, Goetz, or Cooke, give superior results, because of their flatter fields and greater freedom from astigmatism. The focus of the lens is immaterial, provided always it is not so long that it will not allow of a sharp image being obtained when copying full size, or nearly so; because it must be remembered that the nearer you get to your object, so the focal length for the time increases, and, if you have two or more lenses, the necessary distances should be calculated out so that you do not get into a difficulty by using a lens of too long focus, or one too short. The rule to find these distances is, divide the longer base of original by longer base of plate, add one, and multiply by the focus of lens; for copying, this gives the distance between lens and object. To find the distance between lens and sensitive plate, divide the distance between lens and object by the number expressing the ratio of image to object. We want to copy a diagram or page of a book measuring 9x5 ins. so that we can make a lantern slide by contact; the lantern plate measures $3\frac{3}{4} \times 3\frac{3}{4}$ ins.; $\therefore 9 \div 3\frac{3}{4}$ = the amount of reduction, or ratio of image to object. Using an 8-inch focus lens, we have a very simple sum:

$$[(9 \div 3\frac{3}{4}) + 1] \times 8 = 4\frac{8}{11} \times 8 = 30\frac{2}{11} \text{ ins.}$$

This is the distance from lens to object; then:

$$30\frac{2}{11} \div [9 \div 3\frac{3}{4}] = 10\frac{8}{11} \text{ ins.,}$$

which is the distance between lens and plate. It may be added that in doublet lenses these distances should practically be measured from the diaphragm slot, and with single lenses from the front surface of the lens. There is one important point which must not be forgotten; taking the above case, we find that the focus is increased to 11 ins. practically, but our diaphragms or stops, which have an important bearing on exposure, are calculated out on a basis of 8 in. facts. The result will be that they are reduced in value, and, therefore, the exposure should be proportionately lengthened; for instance, the diameter of F/8 with an 8-in. lens is obviously 1 in.; therefore, with 11 in. focus it is no longer F/8, but F/11; and as the exposures with these two apertures are as 8² : 11², or practically as 1 : 2, it is obvious we must take this into consideration.

Now for the treatment of the object. Suppose we have a page of a book, a diagram, or engraving to copy, and it is impossible to tear it out of the book, what is the best way to go to work? As a rule, one does not care to tear up one's own books, though we may not be so careful of other people's; but even they would object, probably, to have, perhaps, a valuable book mutilated merely because you want to copy something. Obtain two pieces of plate glass, or even old negative glasses will do, so long as they are quite clean, some stout india-rubber bands or American wooden clips. Place your book flat on the table, open at the particular leaf. Hold this leaf up straight, place one glass behind it and one in front, slip two india-rubber bands over the glasses and leaf, one near the centre of the book, the other at the edge of page, and you will have a perfectly flat surface, and only need place a box or pile of books behind to keep this upright and in a position for copying.

The next point is, where is it to be opened? Naturally, we have a totally different subject to a living subject. We want no half-tones, no modelling, no thing but black and white, consequently as flat and even a lighting as possible. This does not seem a very difficult thing to obtain; but it is far more difficult than one would suppose. Placing the book exactly opposite the window of the room is satisfactory as long as too short a focus lens is not used, or else the camera casts a shadow, and photography is far more sensitive to varying lighting than our eyes. If it is not possible to do this or to copy the book out of doors, then place it as nearly as possible at an angle of 45° with the window; and, to equalize matters, use a good-sized bedroom mirror to reflect the light on to the side further from the window. Now set up your camera approximately at the distance found by above rule, and focus sharply with full aperture of the lens. And now

look out for reflections; if you can on the ground glass see the slightest reflection you may be quite sure that it will appear in the negative and spoil your results. If you cannot get rid of them in any other way—and it will be found that it generally is possible to do it by a slight shifting of the book and camera—then you must erect a framework of tissue paper all round the book, for this breaks up the light, so that no distinct reflections are visible.

Before leaving the question of the subject, it must be distinctly understood that the camera must be parallel to the object, or parallel lines in a diagram will appear to be convergent. This is particularly important when making negatives for lantern slide work.

One of the principal advantages of rapid plates is their power of reproducing correctly the varying tones or gradations which exist in nature, but in copying black and white this very power is a great drawback, because we want no tones, no gradations, merely black and white; and, therefore, rapid plates possess a quality we do not want. The only plates to use for this work are the so-called photo-mechanical or process plates, which are specially made for the purpose, and have but little or no scale of gradation, but merely two tones.

With regard to exposure, but little help can be given. The only thing to do is to make a trial as follows: Pull out the shutter of your dark slide, and uncaps the lens for thirty seconds, cap the lens, push sliding shutter in about one-fourth, give fifteen seconds more; repeat this operation till the whole plate has been exposed in strips with thirty, forty-five, sixty, and seventy-five seconds exposure; on development, a good guide will be obtained as to something like the correct exposure. Practical trial alone can teach this.

The particular method of development is not of much moment—pyro, hydroquinone, glycine, or even metol and hydroquinone.

A very good pyro formula is:

Pyro.....	4 grains.
Metabisulphite of potash.....	4 "
Potassium bromide.....	4 "
Distilled water.....	1 oz.
Sodium tribasic phosphate.....	40 grs.

or hydroquinone—

Hydroquinone.....	4 grs.
Metabisulphite.....	4 "
Bromide.....	2 "
Citric acid.....	2 "
Distilled water.....	1 oz.
Sodium tribasic phosphate.....	40 grs.

Glycine may be used instead of the hydroquinone in the last formula, and equally good results obtained. For beginners pyro should be avoided.

In developing, the main point to be observed is clear lines; density is quite of secondary importance, though if the two can be obtained in one operation, so much the better. Continue development as long as you can, but on the slightest sign of the lines veiling wash and fix. When thoroughly fixed, rinse and take