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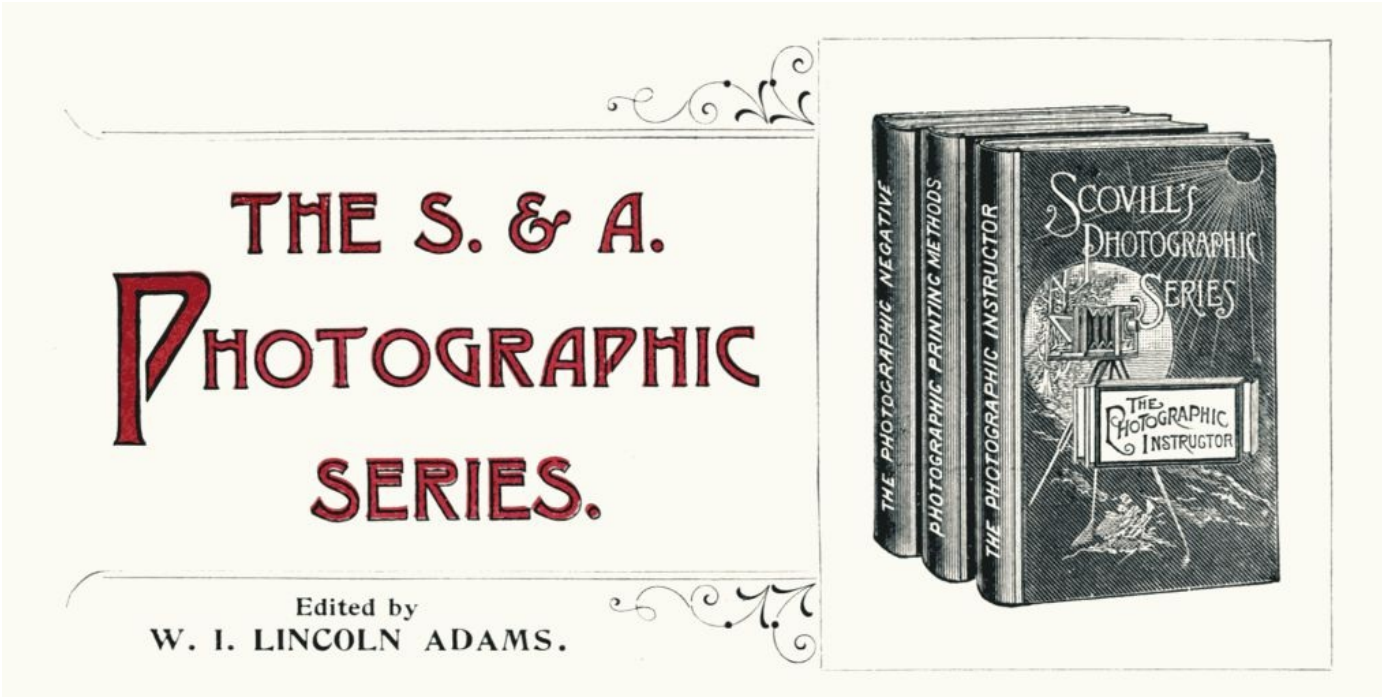

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BY

HENRY R. BLANEY.

With Introduction and Additions by the Editor.

NEW YORK:
THE SCOVILL & ADAMS COMPANY.
1895.

[Pg 2]

[Pg 3]

CONTENTS.

[Pg 4]

[Pg 5]

INTRODUCTION.

About the year 1820 Nicéphore Niepce made the discovery that bitumen, under certain conditions, was sensitive to light. He dissolved it in oil of lavender, and spread a thin layer of the solution thus obtained upon stone. This he exposed under a drawing (making the paper transparent by waxing), and after sufficient exposure, oil of lavender was poured on. Those portions of the bitumen which had been exposed to the action of the light had become insoluble, and so remained while the lines which had been protected by the drawing were dissolved away. By treating the stone with an acid these lines were bitten or eroded, and could be printed from. Niepce afterward employed metal plates instead of the stone.

Here we have the foundation for a number of printing processes of the present day, including photogravure.

For many years, however, progress in processes for intaglio printing was very slow. In 1852 Talbot introduced a process termed photoglyphy, and in 1854 Paul Pretsch, of Vienna, patented a process which he termed photogalvanography. In 1870 the late Walter B. Woodbury, inventor of the Woodburytype process, suggested to M. Rousselon, of M. M. Goupil & Co.,[A] a process which he had discovered, and which he describes[B] as follows:

"The method, as perhaps many of your readers know, is based on the fact that some pigments used in carbon printing have an unpleasant habit of granulating when mixed with gelatine and bichromate, [Pg 6] destructive to their use in carbon printing and Woodburytype, but bearing the essence of success in an engraving process where grain is necessary. The origin of this method was simply owing to my getting some bad reliefs, in which this effect was first noticed. Out of this arose the photo-engraving process which, as I said before, is now claimed as the invention of a Frenchman. But I am digressing.

"This relief, possessing a suitable grain, could, by hydraulic pressure, be made to transfer its minutest details to metal without any loss to fineness, so giving a plate possessing all the properties of a mezzotint. The methods hitherto used of electrotyping would have proved useless, as all detail would have been lost. The same thing applies to the new method I am now about to bring before your readers. The latter process of getting the grain transferred to a hard metal remains the same; but the novelty is in the method of producing the grained plate. To those who have practiced the process of enameling, as used by Geymet and Alker, and others, my description will be better understood.

"I first coat a thin, polished steel plate (zinc will answer) with a very thin coating of gum, glucose, and bichromate as used for enameling. This I dry rapidly, and, while still warm and desiccated, expose under a glass positive. On removal from the frame after exposure the plate is made to take up a slight amount of moisture by breathing on it.

"During this stage I brush or dust over it any hard powder, such as emery, powdered glass, etc, but these I keep of different degrees of fineness or coarseness. No. 1, is of a coarse quality, and is used first; No. 2 is finer; and No. 3 is of the finest grain obtainable. These are obtained by passing through muslin of different degrees of fineness. Having in the first stage of moisture used the No. 1, or coarsest, powder, after a time No. [Pg 7] 2 is dusted over and adheres to the middle tints, while the very finest tones, which have almost lost their sticky qualities by the exposure to light, are treated to No. 3.

"Now we possess a granular picture having all the true qualities required in a photo-engraved plate, or, rather, such as will give a reverse in metal having these qualities. The steel or zinc plate is then to be exposed to light to completely harden the mixture all over, and is then treated exactly as in my other engraving process; that is, pressed into soft metal by hydraulic pressure, electrotyped, and then the surface is aciercised or coated with steel. The dark parts are thus represented by a coarse grain, the middle tints by a medium grain, and the finest shades by the most infinitesimal particles, thus meeting all requirements necessary to a successful photo engraving process."

This process was taken up by a Frenchman and claimed by him as his own invention. The chief difficulty with it was that the plates before being perfect require the work of a skillful engraver, sometimes for weeks. They were therefore very costly, six dollars per square inch being charged for the making of the plate alone.

Klic's process, 1886, was the next important improvement in photogravure or intaglio printing, and since then many other processes and improvements have been introduced by Obernetter, Waterhouse, Colls, Zuccato, Sawyer and others.

In the following chapters Mr. H. R. Blaney gives a working description of the process as practiced to-day by many of the leading firms in this and other countries. This originally appeared in the columns of The Photographic Times, but I have made many additions that I have imagined may be of value to the student. A dividing line will be found between Mr. Blaney's writings and my own additions.

THE EDITOR.

[Pg 8]

[Pg 9]

CHAPTER I.

The Negative.

Any negative may be used for photogravure, that is, taken from nature, or from a painting or engraving, provided it is reversed, and, in the case of paintings, should, in addition, be on an orthochromatic plate. The negative should be soft and brilliant, well exposed, and not hard or under-exposed. A reversed negative is always necessary if the print from the copper plate is required to be similar in regard to right and left, or if no other means are to be taken, to reverse the image upon the copper plate. Professionals use stripping plates especially made for this purpose for small work, or the reversed negative may be made in the copying camera. A fairly good reversed negative can be made by contact in the printing frame from an albumen print from the original negative, the print made transparent with white wax by being placed on a piece of warm, clean metal and the wax rubbed over the face. To have the negative reversed, the print should first be placed, face out, against the glass of the printing frame, with its back against the sensitive surface of the transparency plate, the back closed in and exposed to a large lamp for about five seconds. Every care must be taken that you use the best of negatives, carefully retouched if necessary, as the professional photographic etchers have informed me that (from their standpoint) the success of the whole process depends on the quality of the original negative and the care taken in artistic retouching.

It will often happen in commercial photogravure work that plates have to be made from all kinds of original negatives. In cases where these are flat from over-exposure it is well to make a carbon transparency; [Pg 10] intensifying the image with a strong solution of permanganate of potash, and from this make a fresh negative upon a slow or Carbutt transparency plate.

Mr. Horace Wilmer says: "The class of negative most suitable is such as gives a good result by any of the printing processes. A bright sparkling negative will always give a good plate, but I do not find that any satisfactory results can be got from a soft flat negative. The negative should be as perfect as possible. It is absolutely useless to work from a faulty negative. Contrasts on it may be increased by retouching. Such contrasts are desirable because the tendency of the etching is to reduce them somewhat."

Perhaps the simplest way of obtaining a reversed negative is by placing the dry plate in the slide film inside and exposing through the glass, of course after allowing in focusing for the thickness of the glass plate. With the wet-collodion process, usually the method employed by large photomechanical printers, this method can be used because it is a simple matter to carefully examine the glass plate to be employed, but it will be obvious that with the ordinary dry plate all the imperfections of the glass, such as dirt, scratches, air-bubbles, etc., will be clearly reproduced in the image.

Another method largely employed to produce reversed negatives direct, is by means of a mirror or prism placed either before or behind the lens. The prism is the more convenient, but if large sizes are used it becomes a costly piece of apparatus. The mirror, which should be a plane of glass silvered on its surface, is a less expensive affair. By either of these means the reversed negatives can be made direct without suffering the least in quality.

With celluloid or other flexible films, printing can, of course, be done from either side. Practical men, however, say that, except with the very thinnest films, there is an undoubted loss of sharpness in the grain [Pg 11] when these films are reversed and with some mechanical processes.

Against this, however, it may be said that better contact can be obtained in printing than if the film were upon a piece of uneven glass, as is often the case, for by backing it with a piece of plate-glass perfect contact is ensured everywhere.

We come now to the method of stripping the film from the glass. If the negative is made by the collodion process the matter is a simple one. The glass is treated with French chalk previous to collodionizing. After the negative is made and dried it is laid on a leveling stand and a solution of gelatine poured on it. When dry, it is readily stripped by running a knife all round. With ordinary dry-plates the method usually recommended is to immerse them in dilute hydrofluoric acid. The difficulty often experienced here is in the lateral expansion of the film. This will largely depend upon the plate, or rather the quality of the gelatine used. There are, however, two methods of securing the films to some medium unaffected by moisture, and so prevent expansion or distortion. The first is that recommended by Mr. A. Pumphrey and the second by Mr. H. J. Burton, modified descriptions of which are given in a recent number of *The British Journal of Photography*. If the negative is varnished this is removed. A thin film of gelatine is moistened in a dilute solution of hydrofluoric acid, one part of acid to sixty of water. This gelatine film is secured on paper by a coating of india-rubber.

The action of the dilute acid is to soften the gelatine, making it very adhesive. It can, in this state, be readily attached to the negative by squeegeeing. The acid in the film passes through the negative, and releases it from the glass. It can then be lifted off and pinned to a flat surface to dry. The paper can afterward be [Pg 12] stripped off, when dry, by moistening the back with a little benzole to dissolve the india-rubber. In this manner we get the stripped negative in exactly the same size as when on the glass, to which it can be restored at any time desired.

Burton, in his method, employs collodion in place of paper as the support. The negative is first coated with a thick collodion, and this is allowed ten minutes or so to set. It is then immersed in plain water until the film loses all appearance of greasiness. A few drops of hydrofluoric acid are added to the water, and the dish gently rocked. The film will soon detach itself, when the plate should be at once rinsed. Another plate previously coated with gelatine, and dried, is placed in the dish, and the released film, after reversing, is floated upon it, the two removed together, and allowed to dry.

So far we have only treated upon reverse negatives, either obtained at once or reversed afterward. It often happens, however, that we have an ordinary negative, which is required to be reversed. This negative may be a valuable one, and the risk involved in stripping it be too great.

Another simple method of obtaining a reversed negative is by means of the powder process. Although this process is an old one, it appears to be but little known, for what reason we have never been able to define. It is by no means difficult, and by its means a negative can be obtained direct from a negative without the intermediate positive transparency.

The principle of the process is this: An organic tacky substance is sensitized with potassium dichromate,

and exposed under a reversed positive to the action of light. All those parts acted upon become hard, the stickiness disappearing according to the strength of the light action, while those parts protected by the darker parts of the positive retain their adhesiveness. If a colored powder be dusted over, it will be understood that it will adhere to the sticky parts only, forming a visible image, the same being a reproduction of the positive printed from. The process is very useful for the production of lantern slides and transparencies, or for the reproduction of negatives. Any of the following formulæ may be employed for the manufacture of the organic substance:— [Pg 13]

Solution A.

Gum arabic	25 grammes
Grape sugar	60 grammes
Purified honey	15 grammes
Alcohol, 40 deg	15 c.c.
Water	60 c.c.

Solution B.

Saturated solution of ammonium dichromate.

Two solutions to be mixed together before using in proportions 15 A, 25 B, 50 water.

Woodbury's Formula.

Gum arabic	60 grains
Glucose	45 grains
Glycerine	10 minims
Potassium dichromate	30 grains
Distilled water	2 ounces

Obernetter Process.

Dextrine	60 grains
White sugar	75 grains
Ammonium dichromate	30 grains
Glycerine	2 to 8 minims
Distilled water	3 ounces

The gum is first dissolved and the remainder of the ingredients added. It may be necessary to warm the solution in a hot water bath to dissolve it. It is then filtered through flannel or clean muslin, and preserved for use in well-stoppered bottles. With this solution clear glass plates are coated and dried by a gentle heat over a small spirit lamp. The plate while still warm is exposed under a reversed positive[C] for from two to five minutes in sunlight, and from 10 to 20 minutes in diffused light. The image is then but slightly visible. On removing from the printing frame the plate is laid in the air (protected from light) for a few minutes to absorb a little moisture from it. The next process is the "dusting on." If the image is required to be black, fine Siberian graphite is spread over it with a soft flat brush. This will adhere to the parts unaffected by light, giving an image of the positive. Any colored fine powder maybe used, giving images in various colors. When fully developed the excess of powder is dusted off and the film coated with collodion. After this it is well washed to remove the unaltered gum and dichromate salt. The film may, if desired, be detached from the plate and used for enamels, ivory, wood, textile fabrics, opals, etc. [Pg 14]

[Pg 15]

CHAPTER II.

The Transparency.

Regular transparency gelatine dry plates are the handiest for making positives, especially for amateurs, if one does not care if the subject is in reverse, or if one has a reversed negative to work from. There is a "special" carbon tissue, price $4.00 per roll of 2 × 12 feet, made by the Autotype Company, of London, England, with full instructions appended; by a system of double transfer, reversed negatives may be obtained with this tissue. The "special" tissue is only to be used for the transparency. A safe edge of black paper is required on the transparency, pasted up exactly to the edge of the picture, on the glass side; it comes, sold in strips, gummed, ready for use, about ¼ inch wide; this is required, as the tissue used for the negative resist on the copper plate, which is printed from the transparency, must have a safe edge, shielded from the light, or it will not attach itself to the copper plate, the tissue coming inside half way. The screw pressure printing frame should have a piece of heavy felt for backing the transparency.

The following instructions for making carbon transparencies will no doubt be found useful:

The carbon tissue prepared for this process consists of paper coated with gelatine containing carbon, lamp-black, or other pigments.

The Autotype Company, of London, manufacture a special "transparency" tissue.

Cutting up the Tissue is performed by unrolling it gently upon a zinc cutting plate, cut square and true, with the inches marked at the bottom and right-hand side. By using a T square and observing the numbered inches [Pg 16] marked on the plate, it will not be difficult to cut the tissue to any dimension. If the tissue is very curly and unmanageable it should be kept down with convenient weights. After cutting it up to the required sizes, which should be conveniently smaller than the dish to be used for sensitizing, it should be kept flat under a metal plate.

Sensitizing the Tissue is the next operation. This is performed in a solution of potassium dichromate rendered alkaline with ammonia. Tie over the mouth of a two-gallon jug a piece of muslin, to form a kind of bag, into which place fifteen ounces of potassium dichromate, then fill up the jug with water and allow it to stand until the dichromate is dissolved and the solution becomes cold. It is sometimes advisable to regulate the quantity of dichromate. In hot weather, or for very thin negatives, the proportion of water should be doubled, while for very hard negatives only half the quantity should be used. In very hot weather it is often advantageous to replace about 30 per cent. of the water with the same quantity of alcohol.

The operation of sensitizing the tissue must be carried on in a room lighted by a window covered with a yellow blind. A flat dish of porcelain, glass, or *papier maché*, a squeegee, and a sheet of glass or zinc larger than the tissue, will be required.

The solution is poured into the dish, and should be at least two inches deep. The tissue is then immersed in it, and the air-bells that form immediately brush away from both sides with a broad camel's-hair brush. The temperature of the bath should not be higher than 60 deg. Fahr.; and the time of immersion should be from three to five minutes. After the tissue has remained in the solution for the allotted time it is gently removed and laid face downward upon the glass or zinc plate, and the back squeegeed, removing all superfluous [Pg 17] solution. The tissue is removed from the glass and laid over a sheet of cardboard, bent into the form of an arch, to dry.

Another method (H. J. Burton's) of sensitizing carbon tissue is to lay it flat on a sheet of clean blotting paper, and sponge on the back a very strong sensitizing solution composed as follows:

Potassium dichromate	4 ounces
Liquid ammonia fort	1 ounce
Water	20 ounces

First mix the ammonia with the water, then grind up and add the dichromate.

Drying the Tissue should be accomplished in a room perfectly free from the noxious fumes of other chemicals, and lighted only by non-actinic light. Tissues sensitized during the evening should be dry on the following morning. It should then be cut to the sizes required and kept flat in a pressure frame, or other similar contrivance.

Exposing the Tissue.—The tissue can be exposed behind the negative in an ordinary printing frame, or in special frames having no joint in the back, as no image is visible. The negative must be furnished with a safe edge, made by painting an edge about one-eighth of an inch round the negative with black varnish, or by pasting on strips of red or black paper. Exposure must be judged by an actinometer. A very suitable instrument for timing the exposure of carbon tissue is Sawyer's actinometer. It consists of a rectangular tin box with a glass lid, bearing twelve tints graduated from slight discoloration to a degree of opacity, representing the extreme amount of deposit upon the lights of the densest negatives, each division of this screen of tints bearing a number in opaque pigments; and a roll of sensitive paper is placed in the box, and the end pulled forward so as to pass under the tints. When this arrangement is placed in the light, the silver paper commences to discolor underneath the graduated screen, beginning of course at the lightest, but the [Pg 18] number on the tint being in an opaque pigment is preserved white, and serves to register the progress of printing; for if, when the lid is opened, the number one, for instance, shows clearly on a tinted ground, the instrument is said to have registered one tint; by that time the number two will have begun to make its appearance, and, if sufficient exposure be given, the light will print through the whole scale by successive steps, and show up the numbers, one to twelve. With an instrument of this kind it is evident that, by exposing alongside the carbon tissue and determining the number of tints required for the proper exposure of that negative, the same number of tints with the same negative will always prove right. A little practice will enable one to judge the number of tints required for every class of negative.

It will be well to remark here that freshly sensitized tissue will produce inferior pictures to that used a day or two after; the pictures are not so hard, and there is less danger of the high-lights being washed away.

Continuing Action of Light.—If the carbon tissue after exposure to the light, be kept in the dark for a little time the effect on the print will be precisely the same as if the exposure to light had been prolonged. This continuing action of light may often be utilized to advantage. Pictures known to be under-exposed will, if kept till morning, by that time have acquired the same force as if they had received the proper exposure.

Development consists simply in dissolving the gelatine unaffected by light, with hot water as the solvent.

Immerse the exposed tissue in a bath containing cold water. It will first of all curl up, but afterward lay flat and limp. It is then placed in another bath containing cold water together with a sheet of glass which has previously been coated with a 5 per cent. solution of gelatine. Bring them together face to face, draw them [Pg 19] out, and force into close contact with a large squeegee; then place between blotting paper for five or ten minutes. In squeegeeing, the tissue should be uppermost, and a sheet of American cloth laid over it to prevent the squeegee from damaging it.

Development should not be attempted for at least twenty minutes, during which time the glass, with the tissue on it, should be placed between sheets of blotting paper, and kept under pressure to insure its adherence to the glass support. After that time it is placed in a dish, and water heated to a temperature of 100 deg. F. added. The colored pigment will at once commence to ooze out of the edges, and after a little time the paper originally holding the carbon film may be removed with the hand. Then, by gently leveling the picture with the hand, the superfluous gelatine will be washed away, and if the exposure has been correct a perfect image should remain. A certain amount of control can be kept over an autotype picture. An over-exposed print will show itself by insolubility of the gelatine, and the high light refusing to be washed clear. The temperature should be raised considerably, and hot water poured over with a jug. If this fails to reduce the intensity, add a little ammonia to the water as a last resource, though the better plan is to make another print, giving less exposure. Under-exposure results in over-solubility of the gelatine. The half-tones will be washed clean away. It is rarely an under-exposed print can be saved. All that can be done is to reduce the temperature of the water. Development should never be hurried; the slower it is the better the gradation of tone in the results.

After development is complete the bichromate salt is discharged, and the image rendered perfectly insoluble by well washing in cold water and placing in a dish containing a 5 per cent. solution of potash alum, after which it is again washed and dried. [Pg 20]

Another method of making a transparency and one that involves less trouble is by means of the transparency plates which are now in the market. Of these we have tried Carbutt's with the greatest success. For these the following instructions are given:

The requisites are, a deep printing-frame a size larger than the negative to be used, with a flat glass bottom clear and free from scratches (crystal plate is best), a dark-room Lantern, or other artificial light, and Keystone Gelatino-Albumen Plates. Transparencies can be made same size of negative by contact and exposure to artificial light, or enlarged or reduced in the camera by daylight, with equal perfection in result. To make transparencies by contact place one of the Keystone thin crystal glass transparency plates over the negative in printing-frame, lay piece of dark soft material over it, close down the back, and expose to the light of the lantern or to a gas flame or other artificial light, for 10 to 30 seconds, according to density of negative, at a distance of 20 inches from the flame. Use the following developer:

Eikonogen and Hydrochinon Developer.

A.

Metric Weight.		**Avoirdupois Weight.**
600 c.c.m	Distilled Water	20 ounces
120 grammes	Sulphite of Soda Crystals	4 ounces
22 grammes	Eikonogen	330 grains
10½ grammes	Hydrochinon	160 grains
960 c.c.m	Water to make up to	32 ounces

B.

Metric Weight.		**Avoirdupois Weight.**
600 c.c.m	Distilled Water	20 ounces
60 grammes	Carbonate of Potash	2 ounces
60 grammes	Carbonate Soda Crystals	2 ounces
960 c.c.m	Water to make up to	32 ounces

For use take 1 ounce (30 c.c.) of A, ¾ ounce (25 c.c.) of B, with 4 ounces (120 c.c.) of water. [Pg 21]

More of A will increase density, more of B will increase detail and softness. Temperature of developer should not vary much below 65 deg. nor above 75 deg. The after treatment is same as with any other developer.

Let the development continue until the blacks look quite strong, and detail showing in the high-lights; wash off developer, then immerse in

Carbutt's New Acid Fixing and Clearing Bath.

4 c.c.m	Sulphuric Acid	1 drachm
480 grammes	Hyposulphite of Soda	16 ounces
60 grammes	Sulphite of Soda	2 ounces
30 grammes	[D]Chrome Alum	1 ounce
1920 c.c.m	Warm Water	64 ounces

Dissolve the hyposulphite of soda in 48 ounces (1440 c.c.m.) of water, the sulphite of soda in 6 ounces (180 c.c.m.) of water; mix the sulphuric acid with two ounces (60 c.c.m.) of water, and pour slowly into the sulphite soda solution, and add to the hyposulphite; then dissolve the chrome alum in 8 ounces (240 c.c.m.) of water

and add to the bulk of solution, and the bath is ready. This fixing bath will not discolor until after long usage, and both clears up the shadows of the negative and hardens the film at the same time.

Let remain two or three minutes after transparency is cleared of all appearance of silver bromide. Then wash in running water for not less than half an hour to free from any trace of hypo solution. Swab the surface with wad of wet cotton, rinse, and place in rack to dry spontaneously. Then varnish with plain collodion.

[Pg 22]

CHAPTER III.

The Carbon Tissue—(Sensitizing and Exposure).

The carbon tissue used as a resist, which is mounted on the copper plate, is made by the Autotype Company, London, England. No. 100 Standard Brown is the right grade to use, though I have reached good results with No. 103. The No. 100 is a heavier grade than No. 103, and requires two or three minutes longer exposure than the latter. Use a deep printing frame with a screw pressure to secure absolute contact, which is known by iridescent markings appearing on the glass of the printing frame. A Johnson's actinometer is very useful to time the exposure. From 4 to 6 tints are necessary. Experience here is the only guide, as the light varies as well as the density of the negative and the sensitiveness of the tissue. If one does not have an actinometer, a slip of albumen paper may be used; as soon as the paper has reached the darkest point, which is then called one tint, extend it so that a fresh portion comes out to the light, and so on for the different tints. In September, for instance, the darkest tint is reached in about 3 to 4 minutes; two tints and a half or 8 minutes in the shade at midday on a clear day in September is about right,—this is understood to be with medium negatives and No. 103 tissue sensitized within three days.

You should over-expose rather than under-expose, allowance being made when the acid is used. Print deeply, so that, on development, the negative tissue on the copper plate shows all the detail clearly in the shadows. The tissue should not appear very dark on the plate. The copper should show up through the gelatine clearly and brightly. The thinner the negative tissue, the quicker the biting of the acid.

[Pg 23]

Sensitizing the Tissue.

The carbon tissue comes only in rolls of 2½ feet by 12 feet, price $3.00, not cut. It is not sold in a sensitive condition. Full instructions with each roll for sensitizing. Tap water will do, but I would suggest distilled water for making the sensitizing solution of bichromate of potassium.

Bichromate of potassium	1 ounce
Water	16 ounces
Alcohol	½ drachm
Ammonia	12 drops

The best way to sensitize the tissue, is to place the tissue face up, keeping it flat so that the solution reaches all parts at once, removing all air bubbles, and rubbing in the solution with the fingers until pliant; the time of immersion is three minutes in winter, two minutes in summer. The hands should be washed directly after handling the solution, and care must be taken that there are no cuts on the fingers, as the solution is very harmful, but if due care is exercised and the hands well washed immediately with soap, little, if any, trouble will be experienced; use rubber finger tips as much as possible. Keep the temperature of the solution at 70 deg. both in summer and winter. Take a piece of glass free from scratches (an inch larger all round than the tissue); have the glass ready cleaned with ammonia and talcum powder of fine whiting, squeegee the sensitized carbon tissue directly from the solution on to the glass and place to dry at night in a light-tight box; it will be dry in the morning.

The tissue is in the best condition for three days after sensitizing; it can be used up to seven days; it gradually increases in sensitiveness from day to day. After a week or ten days has elapsed, it is hard to manage and becomes unreliable. When the tissue is dry take a sharp knife and cut inside the edge, and strip off one corner. Fairly good results can be reached by simply drying over a curved piece of pulp board, which [Pg 24] is tied with string on each end, but squeegeeing on glass gives a sharper result. The addition of ammonia and alcohol to the sensitizing solution makes it easier to strip the paper from the copper plate, after the carbon tissue is mounted on the plate, and enables one to develop the resist in the water at a lower temperature than without it, thus avoiding pits in the darker portions and white specks or bubbles in the lights, should the water reach too high a temperature.

[Pg 25]

CHAPTER IV.

The Cleaning and Graining of the Copper Plate, and Grade of Copper Necessary, and Where and How to Buy It at Reasonable Prices.

The best copper is recognized by its rosy lustre. Pure copper only should be used. It can be purchased ready polished and beveled from several firms in New York. The best way, if large quantities of plates are required, is to buy the copper in the rough of one firm and have it polished by another, and bevel it yourself if necessary with a file and burnish it by hand, or the firm who polish it will do the beveling for you.

The Scovill & Adams Co. supply copper-plates of the finest quality, ready polished, for photogravure work.

Total cost by this method about one-third less than by purchasing ready made. It makes a copper plate 1/16 grade, 9 × 11, cost about $1.10. Order your copper 1/16 in. grade up to 10 × 12; larger sizes 1/8 in. grade. If you use 1/16 in. grade above this size, the plate is liable to buckle. Be sure the plate is free from pits and scratches and with a high polish. Have what the polishers and engravers call a rouge polish. If they do not supply it, rouge it yourself with powdered rouge and turpentine, using a ball of absorbent cotton over a large piece of smooth cork. A good way to buy rouge is in the stick; it is more economical. Rub the wet cotton on it and the right quantity is assured. Pits in the copper may be taken out by tapping upon the back with a nail set, using a small piece of polished steel to lay the face of the plate on, and localizing the spot with a pair of calipers. The part raised by the tapping, cut away with the scraper, then rub the spot with Scotch stone and [Pg 26] water, then a piece of engraver's charcoal (cut to a pencil point), with machine oil; then burnish with the regular engraver's burnisher and sperm oil, finishing with rouge and refined turpentine.

When the plate is well polished, make a strong solution of caustic potash (C.P.), which comes in sticks, as strong as possible, as long as it does not stain the copper. It should register about 40 deg. with an actinometer used to test silver solutions.

Take a piece of absorbent cotton and clean the copper with potash (by the way, use finger tips); rinse under tap for five minutes, then a fresh piece of cotton with alcohol at 95 per cent., rinse again with water, and place in warm water for final rinsing; stand up on corner, or place in drying frame usually used for negatives; allow to drain. Should any stains appear, it must be recleaned and all the operations repeated until it drains off without streaks, for these streaks and spots of stain are caused by the caustic potassa, which is difficult to remove. It is as hard to get rid of from the copper as hyposulphite is from a negative. These streaks retard the acid on the copper wherever they appear, and cause defects in the recording of the original tones of the negative.

The plate is then ready for graining.

II.—Graining the Copper Plate.

A grain is required on the copper plate so that the tones will be reproduced, as copper has not a sufficient grain of its own. The grain is given to the copper plate by dusting it with powdered Syrian asphaltum or resin. Have a paste-board box made 18 inches high, 12 inches wide and 8 inches deep, perfectly air-tight, with a small door running the whole length on the widest side, an inch or two from the bottom. Have the inside of the box perfectly smooth; place within the box 4 ounces finely powdered Syrian asphaltum (sold by Messrs. [Pg 27] Theodore Metcalf & Co., Tremont Street, Boston, Mass.); it is difficult to find in New York. Shake the box vigorously, place on table, insert a piece of wood an inch high made in shape of cross (or open square, or have netting of wire raised an inch from the bottom of the box); the copper plate, previously cleaned, is at once placed face up upon it. Instead of shaking the box it can be arranged upon supports (see fig. 1), and revolved.

Fig. 1.

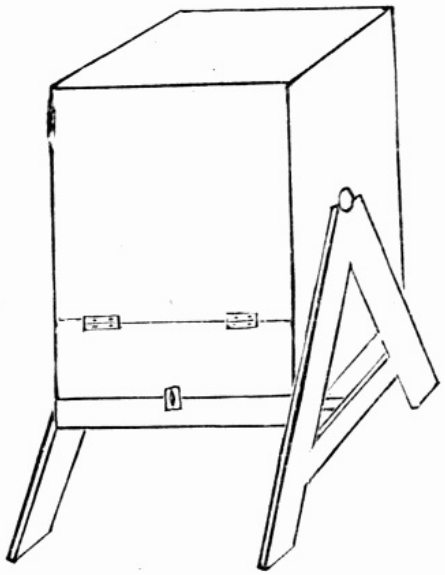


FIG. 1.

Close the door instantly, and let the plate remain about two minutes; carefully remove the plate and place it on a Florence oil lamp, holding the plate with a hand vise, watch carefully until the powder disappears from the surface and the plate slightly smokes, then stand aside to cool. Do not keep the plate too long on the heater, or the particles of dust will run together, forming an impenetrable varnish over the plate. This part of the process is not difficult, but requires practice. Preserve each atom of dust as much as possible, examine with magnifying glass and, when cool, test with finger nail; if it rubs off easily, it has not been heated enough; then the plate must be re-cleaned and again powdered. To get a good all-round working grain, suitable for [Pg 28] medium subjects, the plate should be placed at once in the box after shaking; thus the coarser particles that fall first, and the finer, which gradually settle, will combine after two or three minutes.

Many combinations will be suggested to the student by practice to suit the subject; for instance, waiting for two minutes and then inserting the plate, gives a fine grain for delicate subjects. Powdered dragon's blood (resin) in combination with asphaltum makes a beautiful grain; a separate box may be used for the dragon's blood; the asphaltum first dusted on the plate, then inserted in the dragon's blood box for twenty or thirty seconds, then melted together. The dragon's blood melts first, then the asphaltum.

The air brush is also used by professionals; it throws a resinous spirit varnish, coarse or fine, as required.

[Pg 29]

CHAPTER V.

DEVELOPMENT OF NEGATIVE RESIST ON THE COPPER PLATE, AND PREPARATION FOR BITING WITH ACID THROUGH THE GELATINE.

Have a wooden box made 24 inches long, by 12 inches high, 12 inches wide, with door 6 inches high on side, fastened with hinges, top and bottom of box open; cover top with sheet zinc. Place inside Florence oil lamp; the door is valuable to regulate the heat. On top of box place deep porcelain tray, 11 × 14, fill with water half full; in the water place two pieces of plate glass ½ inch high and 4 inches long, on which to place copper to keep it from the bottom of the tray. Slide the copper plate into the water, removing all air bubbles, keeping the fingers off the surface of the plate. Take the sensitized and exposed tissue and place face down in the cold water (65 deg.) sliding it gradually in at further end of the paper so as to avoid air bubbles; the instant the paper curls backward, place it over the copper plate and remove it quickly from the water. This has to be done with celerity or it will be found difficult to mount the tissue with the squeegee on the copper, and also it should be exactly placed with reference to the top and sides of the copper; all this, of course, to be done under water, never allow it to slip up out of it. Place plate on table and squeegee into place, stroking firmly from the centre, each way. Place face down on clean blotting paper, under heavy weight for fifteen

minutes. While plate is under pressure (which is necessary to enable the gelatine to expand and attach itself to the plate), start the lamp gradually, and by the time the paper is ready the water should register on the thermometer 75 deg. Slide the plate under water removing air bubbles as they appear, with a ball of [Pg 30] absorbent cotton; when the heat of the water reaches 90 deg. Fahr., the gelatine commences to ooze from all around the edges of the paper, and after the plate has remained in the water about ten minutes after the showing up of the gelatine (at the temperature from 90 to 95 deg.), take a pin and carefully raise the paper at the corner, gradually pulling away the paper toward the opposite corner, keeping the hand close to the water; should the gelatine which adheres to the plate appear to lift, wait a few minutes longer and start another corner. After the paper is stripped from the plate, gently develop the negative resist with a piece of fresh absorbent cotton, delicately rubbing the surface, edges first, and lave the plate up and down in the water, keeping the temperature steadily at 90 to 95 deg., by raising or lowering the lamp. (Should the paper be under-exposed and appear very black on the copper, develop at 100 to 110 deg., not over. If over-exposed it will appear very thin, and the heat of the water must not go over 90 deg.; it will strip at 88 to 90 deg.) Then the negative image gradually appears, the darks first, which are of course the brightest portions; when all detail appears in the shadows and the negative stands out clear and bright, take it out of the dark-room (which is lighted with an ordinary lamp), and gently wash under the tap with clean and cold water at 65 to 70 deg.

Dry the resist with alcohol, pouring it over the plate from one end, starting with half alcohol and half water, gradually adding more alcohol and eliminating the water, until a final flooding with absolute alcohol is reached; use fresh solutions of alcohol and water for each copper; don't use old alcohol for anything except cleaning the copper at the end, and for removing the spirit varnish. Stand up to dry against the wall, face out, and standing square on the bottom of the plate, in the same position as you flooded it with alcohol; it will be [Pg 31] dry in twenty minutes if rightly flooded. The bare copper should now be protected by a strong varnish in alcohol (it must flow freely off the brush); a good varnish for this purpose, and the best I know of, is an etcher's asphaltum stopping-out varnish, sold by Messrs. Devoe & Co., New York; price 50 cents per bottle. Should it get thick as you come to the bottom of the bottle, add a little spirits of lavender until it flows again freely. Take an architect's ruling pen and carefully rule a line with the varnish up to the edge of the picture, making it exactly true with the sides of the plate and the space on each side of the work the same with the top, the bottom space slightly larger; make sure that it slightly comes inside the picture. Keep the rule away from the surface of the gelatine, as it is very delicate. Then cover all the rest of the copper, protecting the bare parts and bevel, and bringing the varnish up to the line. Allow to dry hard; about twenty minutes will do. Form a wall about the resist, with walling wax, about an inch high; make a lip at one corner, the further left hand one, for instance; see that there are no leaks. There are several grades of wax, but Liedel & Co.'s is the best; when ordering you should give the name as modeling wax; gray is a good color. Pans can be used made of tin and varnished, or porcelain trays, protecting the back and edges of the plate with varnish, but I find the wax very helpful, especially on large plates.

[Pg 32]

CHAPTER VI.

The Acid Baths.—How to Make Them and Method of Biting through the Gelatine.

Perchloride of iron C.P. is the acid generally used for this purpose; it is a still acid, and if the room is well ventilated no harm to health results, but care must be taken to air the baths after making to get rid of the surplus chlorine.

Four baths are used, each of different strengths, the strongest is used first, the weakest last. I quote from the catalogue of the Boston Art Museum, of the exhibition illustrating the technical methods of the Reproductive Arts and Photo-Mechanical Processes, held January 8, 1892: "Photo-aquatint (photogravure) for the production of half-tone intaglio plates from photographs from nature, paintings, etc. A dry aquatint ground is laid on a metal plate, and over this is mounted a gelatine negative film, made by the pigment printing process. To obtain this negative film a *reversed* positive on glass has first to be made. The reason why this positive must be reversed will become clear when the nature of the manipulations in the pigment printing process, which involves the turning of the film, are considered. The film mounted on the plate is a washout relief, thickest in those parts which are to show white in the impressions from the plate, and gradually growing thinner toward the darkest parts, where it is thinnest. The film acts as a 'resist' to the mordant, allowing it to pass freely in the thinnest parts, and less freely as it increases in thickness. If, however, the film were mounted on the bare plate, and the biting then proceeded with, the result would be of no practical use, as the plate would present merely shallow hollows, incapable of holding the ink, and which [Pg 33] would therefore be wiped out in the attempt to clean the surface of the plate. This is, however, prevented by the aquatint ground, which allows the mordant to circulate only in the channels around the resinous particles of which it consists, and thus produces a grain precisely as in ordinary aquatinting. The mordant used in perchloride of iron, which is a 'still mordant,' *i.e.*, one which does not evolve bubbles of gas. An effervescent mordant cannot be used as the bubbles rising under the film would tear it up. In biting, successive baths of varying strength are made.

"A strong solution of perchloride of iron penetrates only the thinner parts of the film, whereas a weaker acts also through the thicker parts. The biting, therefore, begins with a strong solution, which acts only in the darkest parts, and followed up with weaker and weaker solutions, which continue the biting in the darks and at the same time carry it on gradually toward the lights. If necessary, the plate is worked over with the burnisher to brighten the lights, and with roulettes, etc., to strengthen the darks."

Purchase nine (9) pounds of perchloride of iron in crystals (45 cents per pound), take a wide-mouthed gallon jar, place within half a gallon of distilled water, add the iron until it tests 30 deg. by a Beaumé hydrometer, pour off enough to fill a one-litre glass stoppered bottle, after filtering through absorbent cotton. Keep adding the iron to the jar until the strength of each bath is reached. To the strongest solution add half a drachm of C. P. muriatic acid, and to the weakest half a drachm C. P. nitric acid; the nitric acid is added so that in the last biting a good final nip is given to the copper.

I here give my own formula, with those recommended by others.

The four (4) baths should be well aired for a day (in broad pans) in the open air before filtering.

[Pg 34]

Formula for Acid Baths.

(H. R. Blaney.)

No. 1	should	register	to	Beaumé's	scale	42 deg.
No. 2	"	"	"	"	"	37 deg.
No. 3	"	"	"	"	"	33 deg.
No. 4	"	"	"	"	"	30 deg.

The temperature of the bath to be at 63 deg. Fahr. when tested.

(Denison's.)

No. 1 should be made to register Beaumé's scale, 45 deg., the percentage of perchloride in this solution is 47, and the specific gravity 1.444.

No. 2,	40 deg.;	percentage,	41;	spec. grav.	1.375
No. 3,	38 "	"	38;	"	1.339
No. 4,	35 "	"	35;	"	1.313
No. 5,	27 "	"	27;	"	1.225

From an article in the *Photographic News* (English), Nov. 1, 1889, as practiced in India.

Biting Bath.

(Waterhouse.)

No. 1,	sp. grav.,	1.444;	ap. per ct. of	Fe_2, Cl_6 =	47
No. 2,	"	1.375;	"	"	41
No. 3,	"	1.339;	"	"	38
No. 4,	"	1.313;	"	"	35
No. 5,	"	1.225;	"	"	27

A stronger solution of 48 deg. has been tried (by the above) but has no penetrating power through even the thinnest film.

Another Formula.

For large plates, 20 lbs. perchloride of iron and distilled water, until weight amounts to 1.500 grammes per 1000 c.c. From this four (4) solutions are made, at

No. 1,	42 deg.	Beaumé;	spec. grav.	1.420
No. 2,	38 "	"	"	1.375
No. 3,	35 "	"	"	1.330
No. 4,	31 "	"	"	1.285

The plate is now ready for biting. Keep a record of the bitings, and length of time for each one, for after-study; also note the time of exposure of the tissue, age of same, etc., etc.

[Pg 35]

Pour the acid from a glass graduate with one sweep over the plate, removing all bubbles with a feather, noting the time of immersion so as to guide you. Start with 42 deg., having ready the 37 deg. in another graduate, watch carefully the action of the acid, and if the resist has been properly printed, the action of the acid will show after a minute; if longer it means a generally longer biting for each bath.

Average Bitings.

42 deg., No. 1	5 minutes
37 deg., No. 2	5 minutes
33 deg., No. 3	2 minutes
30 deg., No. 4	2 minutes

Temperature of bath at 70 deg. Fahr., with No. 103 tissue.

Total of different bitings, from 10 to 25 minutes, according to depth of printing. It always varies. There is no hard and fast rule; you must in time learn to judge by your eye alone. The acid will first attack the thinnest part of the film, wherever that may be, and when the darkening of the copper ceases to spread to the next thickest parts, instantly pour off the acid, and pour on the 37 deg. Do not allow the atmosphere to act on the gelatine while biting any longer than is necessary to pour off one bath and quickly pour on a new one. The 37 and 33 deg. baths are for the middle tones, the 30 deg. for the most delicate ones. The action of each bath is cumulative, the 37 deg. biting a little where the 42 deg. had bitten, the 33 deg. doing the same for those before it, besides taking care of itself, and the 30 deg. attacking all more or less. During the biting with the 30 deg. solution, it should be continued until the whites just turn color, and a minute beyond; that is, the copper should begin to show a very little under the thickest and darkest film.

(Note that in the carbon resist the shadows are transparent and the high lights are opaque.)

[Pg 36]

The length of the last biting very seldom is over two minutes. It is better to overbite your darks, and underbite your lights, if you vary any.

The amount of moisture in the air and the heat of the day influences the length of biting. In hot weather in summer it is very difficult to work the process, the walling wax being discarded and the copper (back and edges protected by varnish) placed in a porcelain tray, surrounded by ice-water and kept at 65 to 70 deg., and the acid pured over the plate to the depth of one inch.

[Pg 37]

CHAPTER VII.

Cleaning and Polishing the Plate, with Tools Necessary for Retouching.

When the biting is finished rapidly place the plate under the tap and rinse thoroughly, breaking away the film with your fingers; it seems to have rotted under the action of the acid and is easily removed.

Remove the walling wax, clean off the varnish with chloroform or turpentine, or alcohol first, and chloroform last. This leaves a dim picture on the plate, with a kind of scum over it; wet the plate with turpentine and start heavily with rouge, rubbing to and fro equally all over the plate with a ball of absorbent cotton; continue this treatment, using less and less rouge and more turpentine until you give the final polish to the high lights with a clean dry piece of cotton. Be very careful not to overdo in rouging; the scum (if the biting of the plate is of medium strength) should clear from the plate with hardly a touch, and with very little rouging. Some plates require a great deal of rouging; it then generally means that you must look to your sensitizer. I again draw your attention to the rouging; here is where any artistic feeling you may possess will come into play with taste and patience.

After the plate is rouged sufficiently, an engraver's burnisher is used to clean up the highest lights and to modify others. Two or three roulettes of different fineness are valuable to touch up any darks that need deepening; it matches very well with the grain, but I am always trying to dispense with the use of the roulettes; one ought to get it with the acid alone. A No. 6 sewing needle in a holder (dentist's pin-holder, [Pg 38] screw end) is necessary to touch out occasional white specks. You will have plenty of them at first unless you look out carefully for dust on the film; keep all your solutions constantly attended to by occasional filtering, and don't use your sensitizing solution more than half a dozen times; keep it well corked; if it gets old it scums the plate too much.

[Pg 39]

CHAPTER VIII.

Printing the Plate and Steel Facing.

Before final finishing by hand a working proof should be printed from the plate by an expert plate printer,

by which, what the plate needs can be determined before final proving.

Have the plate proved on different papers, and with different colored inks, so as to judge the effect. Imperial Japan is the best paper, besides etching paper, India, thin Chinese and Japanese papers. The cost of proving per single proof is 25 cents for a 4 × 6 plate on Imp. Japan, about $2.00 per doz. same paper; etching paper, about $5.00 per 100—less for large quantities.

A second-hand D press, suitable for printing large or small editions or for proving, can be bought in Boston or New York for from $75 to $100. For instructions in printing see Hamerton's "Etchers and Etching."

Steel Facing.

The life of a photogravure plate without steel facing does not last much beyond 75 impressions, so that if an edition is needed, send the plate to any good printer who will have it steel-faced for you; their charges are very moderate, about 50 cents for a 4 × 6 plate. The steel-facing is accomplished by first making the plate chemically clean, as before preparation for graining, only be very thorough in using an old tooth-brush to get out the dirt and in addition use chloroform before using potash. Then solder a copper wire on to the back. The negative wire is attached to the copper plate. To the positive pole of the quart Smee battery is fastened a bright steel plate same size of copper, in a gallon jar. The plates are hung from glass rods ½ inch apart, a sufficient quantity of the following solution to be poured into the jar: [Pg 40]

(Denison's.)

Warm water	20 ounces
Ammonium chloride	3 ounces
Sulphate of iron and ammonia	4 ounces

Filter, and let stand for 24 hours. Five (5) minutes will cover the plate with a thin film of steel.

(Obernetter's.)

"Place the copper plate in a porcelain tray on the bottom of which rests a brightly burnished copper wire, the negative pole.

"The anode on the positive pole, a bright steel plate, is suspended over the copper plate, and kept in motion while the circuit is closed. A precipitate of steel, resembling silver in appearance, must instantly occur upon the copper plate, any air-bells to be removed. Five minutes is sufficient to deposit a perfect steel coating." Grease the plate after steel facing, to keep off the rust. Formula:

(Obernetter's.)

Distilled water	1 litre
Chloride of ammonium	60 grammes
Proto sulphate of iron	30 grammes
Iron alum	30 grammes

[Pg 41]

CHAPTER IX.

Materials Necessary for Photogravure, and List of Firms Supplying them.

Materials.

Printing Frame (deep), 8 × 10, screw pressure, $8.
Roll Carbon Tissue, No. 100; Standard Brown, $3.
Johnson Actinometer, $1.25.
Beaumé Hydrometer, $1.25 (with glass).
Silver " (argentometer) 75c.
Engravers' Scraper, $1.75, best grade.
" Burnisher, $1.75, "
Powder Box for graining (paste-board), $1.
Powdered Syrian Asphaltum, $1 per pound.
Nine (9) pounds Perchloride of Iron (C. P. crystals), 45c. per pound.
Stick Rouge, 20c.

Turpentine, 20c. (refined).
Alcohol (95 per cent.).
Modeling Wax, $1.25.
One Ps. Scotch Stone, 25c.
One dozen Glass Blowers' Charcoal, $2.0c per dozen sticks (for polishing copper).
One pound Absorbent Cotton, 50c.
One pound Caustic Potash C. P. (sticks).
One Porcelain Tray, deep, 11 × 14, $3.50.
One Florence Hand Lamp, 75c.
One Squeegee.
Three Roulettes, $1.50 each.
Hand Vise, 75c.
Calipers, 50c. [Pg 42]
Dairy Thermometer, 25 c.
One bottle Etchers' Varnish, 50c.
One ounce Chloroform, 20c.
Six ounces Bichromate Potassium.
One pound Concentrated Ammonia.

List of Firms Supplying Materials for Photogravure.

The Scovill & Adams Co., 423 Broome Street. Photographic Materials and Photo-Engravers' Supplies.

Messrs. Bestgen & Co., 1001 Washington Street, Boston, Mass. Polishers of Copper Plates.

Mr. George Schard, 116 Wooster Street, New York. Polisher Copper Plates.

Mr. Jos. Wheeler, 299 Washington Street, Boston, Mass. Printer of Photogravures.

Messrs. J. H. Daniels & Co., Oliver Street, Boston, Mass. Printers of Photogravures.

Messrs. Frost & Adams, Cornhill, Boston, Mass. Engravers' and Etchers' Supplies.

Messrs. F. W. Devoe & Co., Fulton Street, New York. Engravers' and Etchers' Supplies.

Messrs. Fusch & Lang, 29 Warren Street, New York. Engravers' Supplies.

Mr. Alfred Sellers, 58 Fulton Street, New York. Engravers' Supplies (screw pressure printing frames).

Messrs. John Sellers & Sons, 17 Dey Street, New York. Engravers' Supplies.

Messrs. Eimer & Amend, 18th Street and 3d Avenue, New York. Chemists, Glassblowers Charcoal.

Messrs. Theodore Metcalf & Co., Tremont Street, Boston, Mass. Chemists.

Messrs. Kimmel & Voigt, 242 Canal Street, New York. Expert Photogravure Printers. [Pg 43]

Messrs. Whitely & Co., Centre Street, New York. Polisher of Copper Plates.

Messrs. Gilderslieve & Co., 18th Street, New York. Blankets for Press.

Mr. Charles Creedner, 19 South William Street, Room 4, New York. Japan Paper.

Mr. Geo. B. Sharp, 13 Baxter Street, New York. Copper Plates.

Messrs. F. A. Ringler, 21 Barclay Street, New York. Steel Facing Copper Plates, Printers of Photogravures.

Messrs. Leidel & Co., 901 6th Avenue, corner 51st Street, New York. Modeling Wax; Etchers' Supplies.

Thomas Hall (Electrician), Bromfield Street, Boston, Mass. Hydrometers (Smee's Battery), etc.

New York Steel and Copper Plate Co., 171 Wallabout Street, Brooklyn, N. Y.

Mr. Jas. Moffet, 159 Wooster Street, New York. Copper Plates in the Rough.

[Pg 44]

CHAPTER X.

Books and Articles on Photogravure. Published from 1888 to 1893.

La Photogravure facile et à bon marché. Par l'Abbé Ferret. Paris. 1889. Price, 1 fr. 25 cents.

Manuel d'Heliographie et de Photogravure en Relief. Par G. Bonnet. 1890. Paris. 2 fr. 50 cents.

Photogravure. By W. T. Wilkinson. 1890. London, E. C. Published by Messrs Iliffe & Son, 3 St. Bride Street. Price, 1*s.* 6*d.*

Photo-Engraving and Photo-Etching. By W. T. Wilkinson. Sold by The Scovill & Adams Co., New York. Price, $3.00.

Hamerton's "Etchers and Etching." Roberts Bros., Boston, Mass. Price, $4.00.

Photo-Etching in India. Article in *Photographic News* (English), November 1, 1889.

"Photogravure, or Photographic Etching on Copper." By Herbert Denison. A lecture delivered before the Photographic Society of Great Britain. Printed in The Photographic Times, April 21st, 1893, and following issues.

Photogravure or Photo-Etching. Article in *Wilson's Magazine*, 1890-1891.

Notes on Photo-Aquatint. Catalogue of Exhibition, Illustrating the Reproductive Arts and Photo-Mechanical Processes. Address S. R. Koehler, Boston Art Museum, Boston, Mass.

FOOTNOTES

[A] Now Boussod, Valadon et Cie.

[B] *British Journal Almanac*, 1874.

[C] Reversed as regards right and left.

[D] N. B.—During cold weather use only half the quantity of Chrome Alum in above.

Editor *American Amateur Photographer*.

"Merck's Pyrogallic Acid will be found a very superior article. Its purity is absolute, with quick crystallization and immaculate whiteness. In use, it produces the highest intensity that can be desired in the negatives. The detail in light and shade is perfect, producing printing qualities unsurpassed by any pyro we have ever used."

St. Louis and Canadian Photographer.

"Merck's pyro has undergone a severe test in my hands. I find it to possess many qualities which give it superiority over all other makes. Authorities place the solubility of pyro as one part in two of water. I found one ounce of Merck's to dissolve readily in 1:7 of water at 60°. It is extremely light, pure, and of a fine white color, giving rich negatives full of vigor and sparkling brilliancy."

Walter E. Woodbury,
Editor of *The Photographic Times*.

"I have used Merck's Pyrogallic Acid, and prefer it to all others."

B. W. Kilburn,
Official Photographer (Stereoscopic), at the Columbian World's Fair, and San Francisco Mid-Winter Exposition.

"I have tried Merck's pyro and must certainly say it is the best I ever used. The results I have obtained with it are remarkably fine."

W. B. Post,
Amateur Photographer, New York.

Moreno Studio, Fifth Ave., New York.

"I have been using Merck's pyro in my studio, and am very well pleased with it. It is clean, gives brilliant negatives, and is reliable, one day's work being exactly the same as another's."

A. Moreno.

"I have been using Merck's pyro, and am ready to indorse the high praise which you have found it entitled to: 'that it is superior in point of purity, lightness and solubility' to any like product that I have seen. In fact, 'the new and improved process' seems to reach in its result the point beyond which it is impossible to go—that is, perfection. This was my impression at first sight, and using serves only to confirm it.

In my opinion, pyro stands at the head of all developers of dry plates, and I am much mistaken if Merck's pyro, when known, does not lead all brands of pyro."

W. H. Sherman,
Professional Photographer, Milwaukee.

Scovill & Adams Photo-Engraving Materials,

Combined in a small outfit for Half-tone Photo-Engraving.

The articles contained in this outfit are all that is necessary for the Half-tone Process, except when the installation of large and expensive machinery is warranted.

1	10 x 12 American Optical Co. Enlarging, Reducing and Copying Camera, fitted with Patent Screen Plate Holder	$56 00
1	Camera Swing	20 00
1	Copy Board	2 00
1	Max Levy Screen, 133 lines to the inch, 10 x 12	80 00
1	Max Levy Screen, 150 lines to the inch, 10 x 12	95 00
1	Rectilinear Lens, Rapid Paragon, 10 x 12, w. D.	68 00
2	2-qt. Funnels, glass, 25c.	50
6	8-oz. " " 12c.	72
1	pkg. No. 33 Filtering Paper	75
2	Hydrometers, 50c.	1 00
2	11 x 14 Glass Baths in Studio Box, $7	14 00
1	Rubber Dipper	60
1	2-gall. Evap. Dish	3 00
2	10 x 12 Porcelain Trays, $1.66	3 32
2	10 x 12 Vulcanite Trays, $1.75	3 50
2	16-oz. Graduates, 75c.	1 50
4	4-oz. " 30c.	1 20
1	9 x 11 Printing Frame, 1-in. glass	9 50
1	8 x 10 Retouching Frame	3 75
2	large Neg. Racks	6 00

1 13-in. French Hand Roller	7 00
1 Composition Roller, 12-in.	4 00
2 Pincers	2 00
2 Acid Brushes	3 50
1 Ink Spatula	1 00
1 Hook for cutting Zinc Plates	1 50
Retouching Brushes	50
1 gal. Absolute Alcohol	4 00
3½ lbs. Ether	2 63
4 oz. Pary's Gun Cotton, 50c.	2 00
4 oz. Iodide Potass., 30c.	1 20
2 oz. Resubl. Iodine, 35c.	70
3 lbs. Nitrate Silver Crystal, $8.50	25 50
1 lb. Absorbent Cotton, 1 lb. packages	75
5 lbs. Protosulph. Iron, 10c.	50
1 lb. Citric Acid	70
1 " Bichloride Mercury	1 00
5 " Cyanide Potash	3 25
1 " Glycerine	30
5 b'ks Blue Litmus Paper, 5c.	25
1 lb. Aqua Ammonia fort.	32
½ lb. Nitric Acid, C. P.	45
1 gall. Benzole	1 50
1 lb. Bichromate Ammonia	75
1 " Caustic Potash	15
8 " Com'l Nitric Acid, 45c.	3 60
1 " Ferri Chloride, 1 bot.	30
1 " Rubber Cement, 1 can	30
1 " Nitrate Lead, 1 bot.	1 00
1 " Ferricyan. Potash, 1 bot.	1 00
½ " Transfer Ink	2 50
½ " Engraver's Charcoal	1 50
1 " Pumice Stone	10
5 " Sulphate Copper, 40c.	2 00
2 " ⅜-in. Brass Pins, 40c.	80
1 " Lith. Ink, black	3 50
2 galls. Le Page's Liquid Glue, $2.25	4 50
1 Shoot Board and Plane	25 00
1 set Engraving Tools	1 50
1 " Finishing "	2 50
1 ½-in. Flat File	50
1 1-in. "	85
1 set Ass'd Sable Pencils, Nos. 1 to 6	62
1 Darlot Focusing Glass	2 50
1 5-in. Engraver's Pad, filled	1 00
1 Egg Beater	30
1 set Roulettes	6 00
1 ream Proof Paper	10 00
1 16-oz. plain Collodion Vial	55
1 lb. best Dragon's Blood	85
Polished Zinc Plates, sq. in.	01
" Copper " "	01¼

SEND FOR THE PHOTO-ENGRAVERS' CATALOGUE to
THE SCOVILL & ADAMS CO., 423 Broome St., N.Y.

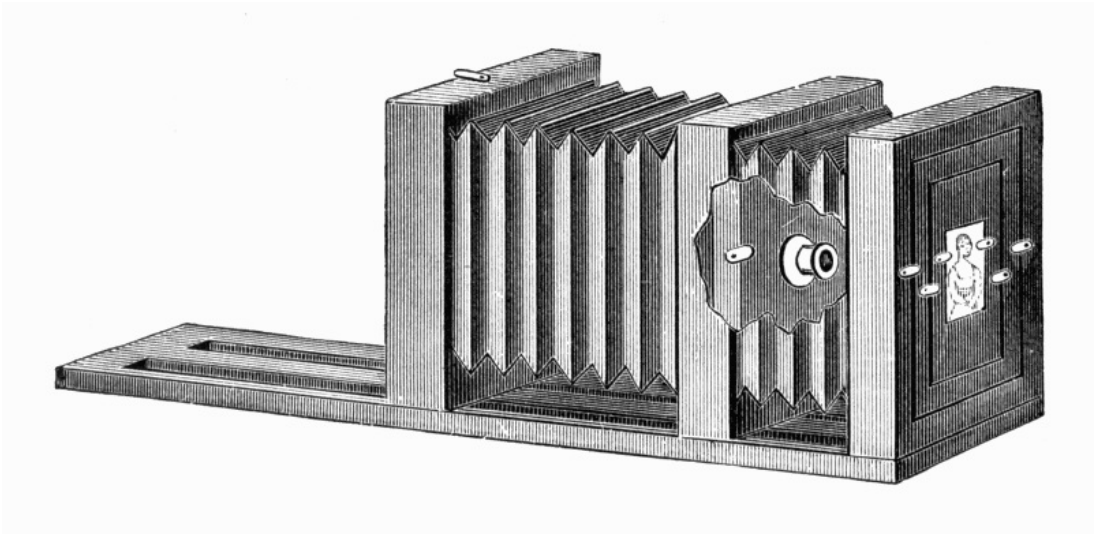
Copying Cameras

FOR

PHOTO-ENGRAVING.

The Scovill Enlarging, Reducing and Copying Cameras.

With S. & A. Photo-Engravers' Adjustable Screen Plate Holder.



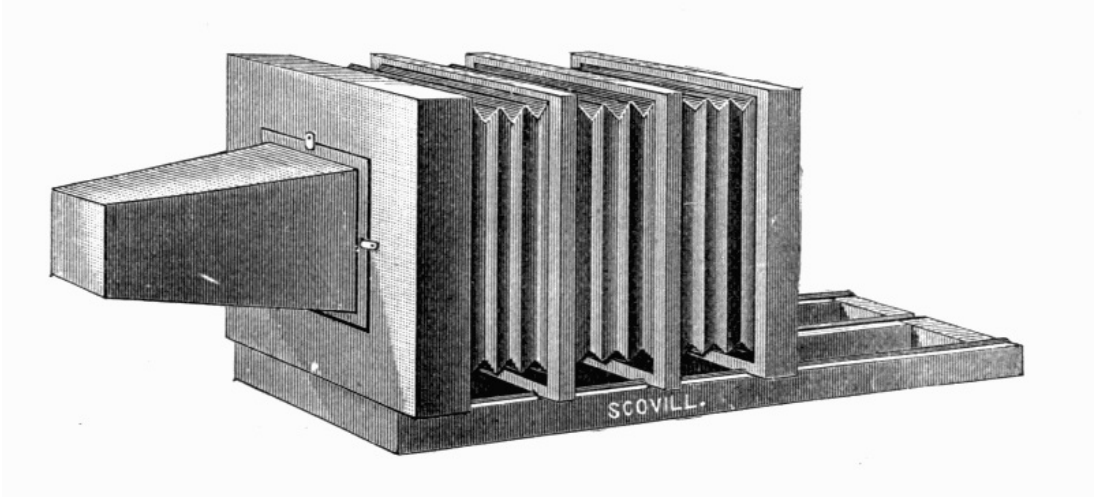
No. 61.	Size,	6½ × 8½,	4 ft. bed	Price,	$38 00
" 62.	"	8 × 10,	5 ft. bed	"	43 00
" 63.	"	10 × 12,	5 "	"	56 00
" 64.	"	11 × 14,	5 "	"	68 00
" 65.	"	14 × 17,	6 "	"	80 00
" 66.	"	17 × 20,	7 "	"	95 00
" 67.	"	20 × 24,	7 "	"	118 00

Special sizes and styles made to order.

The form of construction of this Camera is made apparent by the illustration here shown.

SCOVILL
COPYING CAMERAS.

With S. & A. Photo-Engravers' Adjustable Screen Plate Holder.



These Cameras are made of hardwood, shellacked, not varnished. Naturally they are without swing, but in every requisite they are complete; and for this particular service, as well as others, the American Optical Company's make is sought for before all others. Such varied lengths of bed are required and ordered, that we can only give a price list for Copying Cameras with the regulation length of bed. We make them to order of any length of platform desired, either rigid or detachable, and with either single or double bellows.

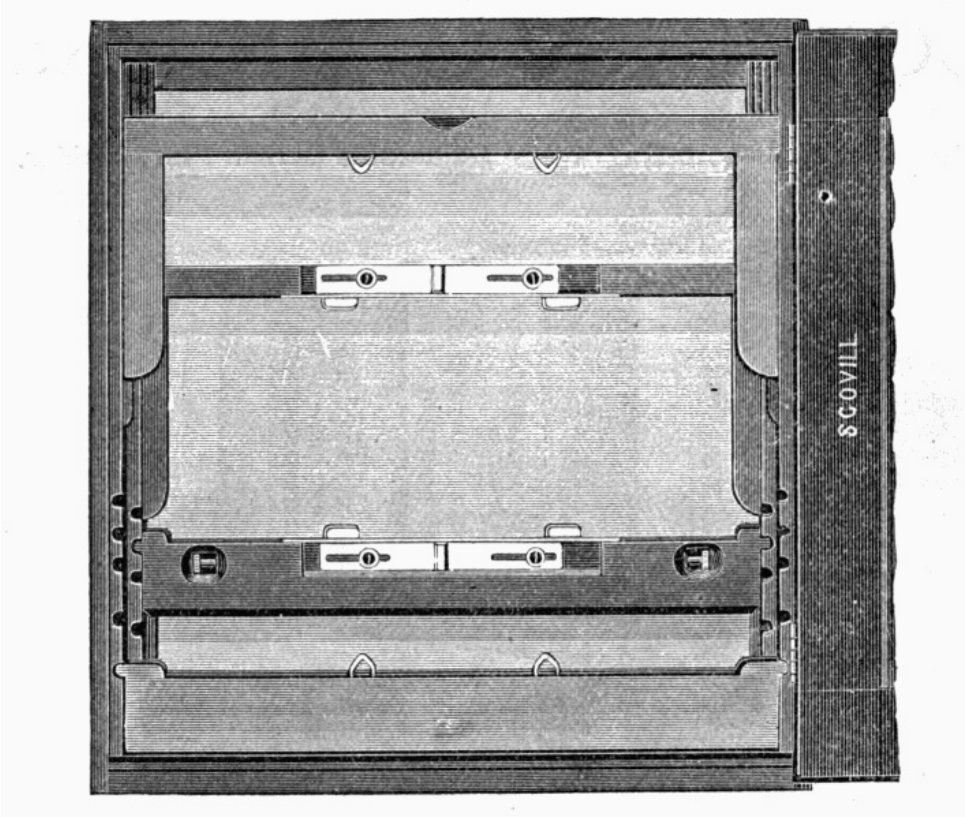
Estimates promptly and cheerfully furnished.

No. 70.	6½ × 8½,	with bed	3 feet in length	Price,	$33 00
" 71.	8 × 10,	"	3¾ "	"	38 00
" 72.	10 × 12,	"	4 "	"	46 00
" 73.	11 × 14,	"	4½ "	"	53 00
" 74.	14 × 17,	"	5 "	"	66 00
" 75.	17 × 20,	"	6 "	"	72 00
" 76.	20 × 24,	"	6 "	"	98 00

Larger sizes made to order.

When ordering Copying Camera, please give length of cone, if that is needed.

The S. & A. Photo-Engravers' Adjustable Screen Plate Holder.



(Patent applied for.)

This Holder, as is shown in the cut above, is a great improvement over any heretofore manufactured for photo-engraving purposes. Its principal points of superiority are, briefly:

First.—The ease with which it is adjusted for different size plates and screens, by a simple sliding movement of the two inside frames to or from the centre, and thus dispensing with the expensive and troublesome use of kit frames.

Second.—The convenience by which the screen plate is accurately adjusted to the sensitized plate by means of the metallic sliding adjusters. (Heretofore it has been necessary to do the adjusting by means of inserting different thicknesses of cardboard, paper, etc.)

Third.—Different thicknesses in the screen plates are allowed for by means of a spring which always holds the plate in accurate place, no matter what its thickness may be.

Fourth.—A graduated scale on each screen adjuster makes it easy to always insure absolute accuracy in determining the distance of the screen plate from the wet plate.

Fifth.—The simplicity of construction and excellent workmanship of the entire holder, being made, as it is, in the factory of the famous American Optical Company.

And, altogether, it is an ingeniously designed and beautifully constructed holder, which will be found of indispensable aid to the practical photographer.

These holders are thicker than the ordinary plate holders, and if it is desired to use them on a camera the ground glass of which is focused for the ordinary plate holder, a new ground glass frame is necessary in order to adjust the focus. When ordering a holder to fit a camera in use, send the old holder or the old ground glass frame, so that the new ones can be made to fit the camera. Also state the size of largest and smallest screen plate to be used in holder.

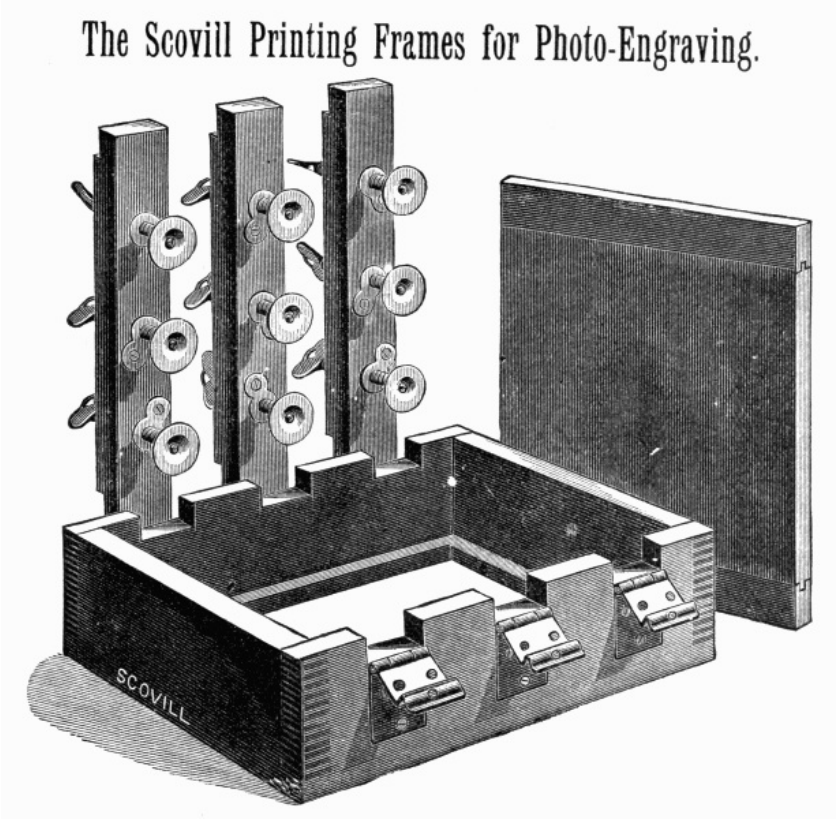
It is made in various sizes. Prices as follows:

		Frames *only*; for Ground Glass.
8 × 10 size	$15 50	$1 50
10 × 12 "	21 00	1 50
11 × 14 "	26 50	1 88
14 × 17 "	29 00	2 25
17 × 20 "	32 50	2 63
18 × 22 "	36 00	2 63
20 × 24 "	40 75	3 00

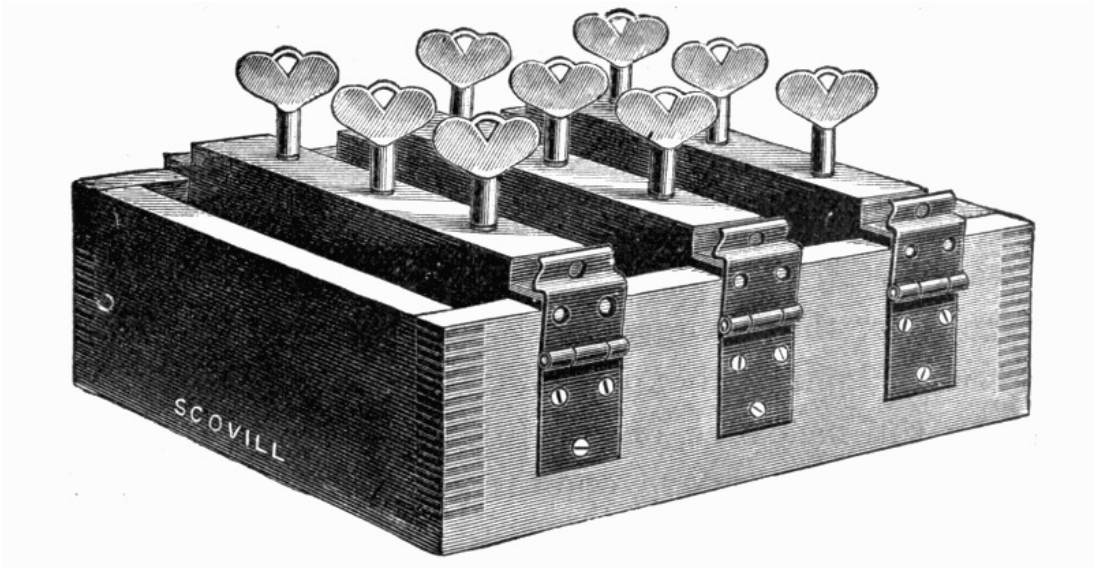
If adjustment from the outside of holder is desired, add $2.00 to above prices.

THE SCOVILL & ADAMS CO., 423 Broome St., New York City.

The Scovill Printing Frames for Photo-Engraving.



The Printing Frames made by the American Optical Co. for photo-engraving are like everything else manufactured by this factory, of the highest degree of perfection, and the utmost care was given to the comparative distance of screws so as to produce an even pressure. Many negatives have been either ruined or snapped by the use of imperfect Printing Frames.



The American Optical Co. Printing Frames for photo-engraving are the only safe ones on the market.

PRICES.

8 × 10,	including	one-inch	glass	$8 00
10 × 12,	"	"	"	11 02
9 × 11,	"	"	"	9 50
11 × 14,	"	"	"	13 00
14 × 17,	"	"	"	19 00

Larger and special sizes made to order.

To Photo Engravers:

Having systematically undertaken the improvement of photo engravers' appliances, we follow the S. & A. Photo Engravers' Adjustable Screen Plate Holder, and the S. & A. accurately adjusted Photo-Engraving Printing Frames, with the

Photo-Engraving Etching Tub,

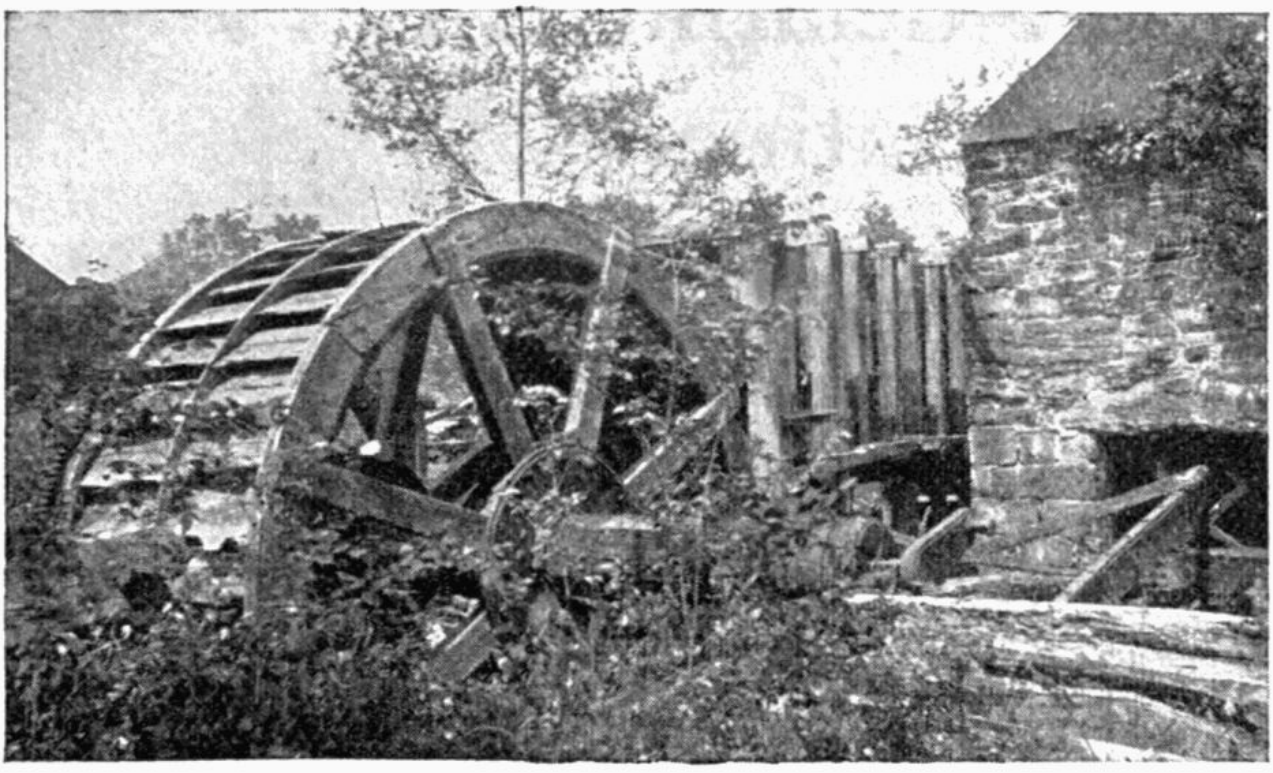
to which we call the attention of those interested in this business. We extend to them a cordial invitation to examine the same at our salesrooms.

These Photo-Engraving Etching Tubs will "fill a long felt want" with the photo engravers, as they are constructed so as to resist the strongest acids, and combine the features suggested by practical experience.

The tub measures, inside, 48½ inches long, 20¼ inches wide, and 7⅝ inches deep, and the price of same is $10.00.

Very truly yours,

The Scovill & Adams Co.



IN OLDEN TIMES

people were satisfied to worry along with whatever crude appliances came easiest to hand....

The material progress of the nineteenth century, however, has created a demand for a higher order of mechanical products than was formerly deemed essential, and this is peculiarly the case with ...

Process Engravers.

To meet this demand, the firm of JOHN ROYLE & SONS have devoted the best part of their time, for the past 25 years, to the improvement of the mechanical accessories to Process Engraving, and with what success is best testified to by the fact that their machinery is used exclusively by the *best* Process Engravers, both in the United States and abroad.

JOHN ROYLE & SONS,
Paterson, N. J., U. S. A.

Chrome=Gelatine and · · Photo=Gelatine.

Chrome-Gelatine is a perfected modification of the three-color printing process. It is so named from the Gelatine process of printing being used to produce the resulting pictures, which are allowed to be really wonderful, and which may be reproductions from original Oil Paintings, Water-colors, Views from Nature, Objects of Still Life, Textile Fabrics—indeed, all classes of work copied from originals in color. The results, in all cases, are produced from three-color negatives. Artists, whose works have been reproduced by this method, express their satisfaction of the results in the highest terms, without qualification.

N. Y. Photogravure Co.
137 West 23d Street,
New York.

Photogravure and Aquarelle

(*Photogravure in Colors.*)

Photogravures are of all classes of subjects.

An important modification of this process has recently been perfected (patent applied for), by which the delicacy of the gelatine print is maintained, at the same time that great strength and color is produced in the shadows. The plates thus made are very durable, and show but little wear after many thousands of impressions have been produced. Moreover, they require no finishing or handling after having been etched, and are quite easily printed.

Aquarelles are printed from photogravure plates, inked up locally in a variety of colors. When the whole of the plate has been so inked, the impression is pulled. The results are beautiful, but the process of printing is exceedingly slow—three or four impressions a day, only, being obtainable from a moderate sized plate.

N. Y. Photogravure Co.
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THE N. Y. PHOTOGRAVURE CO. has on hand thousands of subjects of all classes, available for the purposes of illustration, and at the service of its customers. The newest and best subjects are being continually added to this collection. Sets of illustrations selected with the greatest care and skill, for any desired purpose.

The N. Y. Photogravure Co.
137 West 23d Street,
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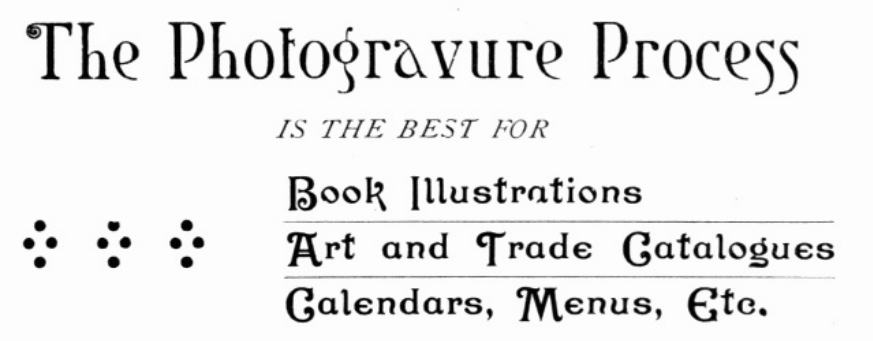

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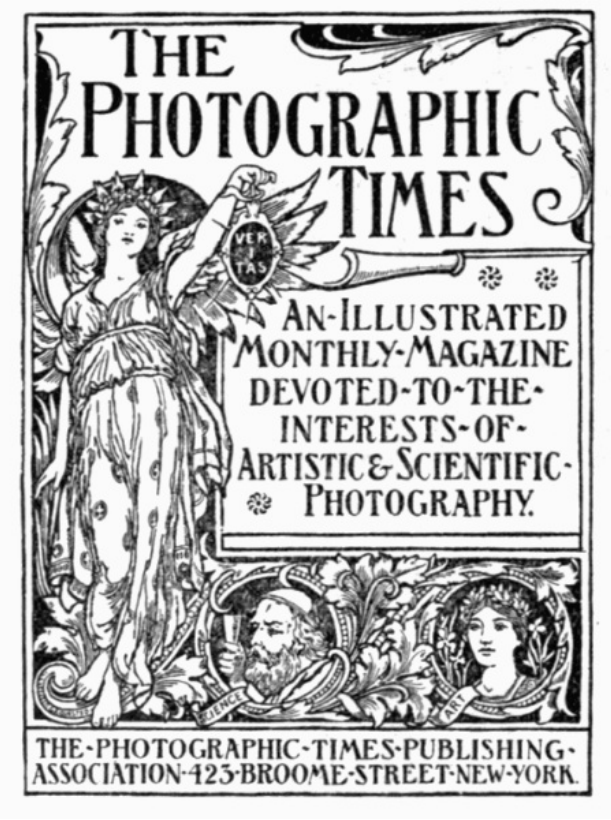

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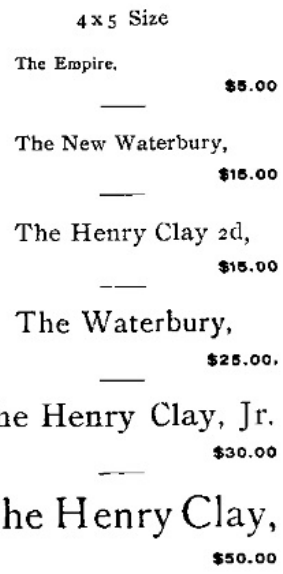

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a. The plate (13 × 18 centimetres—5 × 7 inches) or film, after fixing, is allowed to drain and then washed for about five minutes in a dish with about 600 cubic centimetres (20 fluid ounces) water; it is then again allowed to drain.

b. Afterward it is laid in a second dish with 200 c.c. (7 fluid ounces) **Anthion solution**, and again allowed to remain for five minutes with occasional stirring.

c. The plate is then once more laid in 600 c.c. (20 fluid ounces) fresh water, exactly according to direction *a.*

d. The operations *b* and *c* are repeated.

The plate is then **free from fixing soda**. (In order to determine this, proceed as follows:)

Test.

To be certain that all the fixing soda is completely destroyed, proceed as follows: Several c.c. (half to one teaspoonful) of the last washing water are poured into a test-tube, and three or four drops silver nitrate solution (1 to 20) added. A white precipitate generally forms. If this gradually acquires a **yellow** tint, fixing soda is still present.

In such a case operations *a* and *b* are to be repeated.

B. For Positive Paper Prints.

The operations are carried out as under A, but instead of one plate five fixed copies (13 × 18 c.c.—5 × 7 inches) are taken, allowed to drain one by one, then laid singly in water (vide *a*), afterward in **Anthion solution** (vide *b*), then again in water (vide *c*), again in **Anthion solution** (vide *d*), and finally in water.

It is important that the paper prints are frequently separated in the different baths. If the prints stick together, the solution does not penetrate and cannot act.

= IMPORTANT =

For large plates and prints it is not only necessary to use larger dishes, but also more liquid, both **Anthion solution** and water. An excess of **Anthion** or of water is decidedly useful, but less is disadvantageous.

The above directions for washing relate to those who have no continual flow of water at hand.

If a continual flow of water is obtainable, it is advisable to wash the plates or prints in flowing water for a quarter of an hour, and then dip in the **Anthion solution** and test the result as above.

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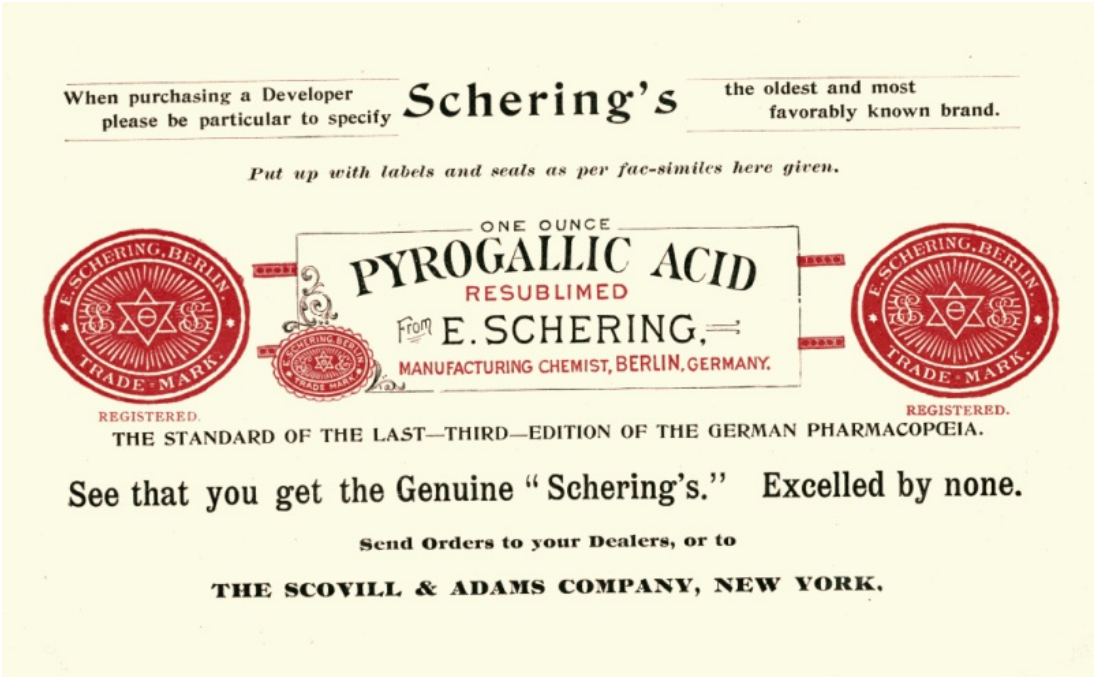

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