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MAKING THE PRINTED PICTURE

A TREATISE ON PHOTO-ENGRAVING METHODS

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## ACKNOWLEDGMENT

Deeming it unsafe to wander far from one's own practical experience in a treatise of this nature, the writer has handled in the main only such problems as have arisen in making the University Missourian an illustrated newspaper and in teaching the principles of photo-engraving and of illustrative art.

Acknowledgment for reading proof and for resulting suggestions is due R. B. Teachenor, president of the Teachenor-Bartberger Engraving Company, Kansas City, Mo., and to Roger Cunningham, secretary of the same company.

Much of the section on "Printing the Plate" is based on the thirty years' experience of P. J. Seley, pressman, of Columbia, Mo.

Students in the School of Journalism and fellow members of the Journalism faculty, who have by suggestions and practical work helped to enliven the Missourian's columns with pictures, are also entitled to the thanks of the author.

## MAKING THE PRINTED PICTURE

Few persons have had the opportunity of visiting a photo-engraving shop, compared with the number who have been able to see the workings of a printing establishment. This accounts to a great degree for the general lack of understanding of engraving processes. Merchants and others who have had business relations with a printing plant have some idea of the appearance of printing plates or "cuts"\* but have, in most cases, no conception of the difference between the various kinds of engravings.

The electrotype is familiar to the retail merchant because this kind of plate is generally supplied to him by the wholesale houses and manufacturers. Consequently he is



Fig. 1—Line copy. A pen drawing.

\*There formerly existed a confusion of usage regarding the word "cut." At a conference of engravers from forty cities held in Chicago, November 11, 1911, a code of technical trade terms was adopted in the interest of standardization. Later these terms were officially approved by the International Association of Manufacturing Photo-Engravers. No. 5 of these terms declared the word "cut" to be obsolete, inapplicable to photo-engraving, and "engraving" or "plate" was recommended for use instead. The dictionaries, it is claimed, indorsed the word "cut" as a proper definition for "an engraved block" at a time when such blocks were always wood-engravings, which were in reality a product made by cutting with sharp-edged tools. The present photo-engraved plates are produced by etching processes and are not "cut" in their manufacture.—R. B. Teachenor.

likely to designate every plate as an "electro." This misunderstanding has even extended in a few instances to the printer. It has resulted in the engraver's being asked to make an electro directly from a drawing or photograph and to do other impossible things.

Lack of close observation has prevented some from knowing that a halftone picture is made with dots, and that the dots are in straight rows that run across the picture at an oblique



Fig. 2—Line copy. A pen drawing with stipple shading.

angle. If not for the acumen of the reader, this condition speaks well for the halftone process, for the less obvious the dots, the better is the illustration. Dots represent tones and have no particular virtue in themselves—in fact, were some better means found for interpreting the original copy as cheaply and practicably as the halftone process, dots would not be used.

The photo-engraver has awakened to his share of responsibility in educating the public. Until recent years he worked behind closed doors and endeavored to keep his processes secret. The volume of his business has grown so that he has found it necessary to prepare campaigns of education in the form of circulars, house-organs and posters, to enable the customer to meet him on the ground of mutual understanding.

This literature in general is good, but is open to the criticism of being fragmentary and disconnected. An article giving a good description of the process of etching a halftone plate may leave its readers in the dark regarding the way in which the negative is made. Books on photo-mechanical subjects have been written, mostly technical manuals, for the workers in the craft, but not suitable for the layman.

Although lack of knowledge and interest in the mechanical side of the work is pronounced, interest in the subject matter is correspondingly great, else illustrated publications would not have

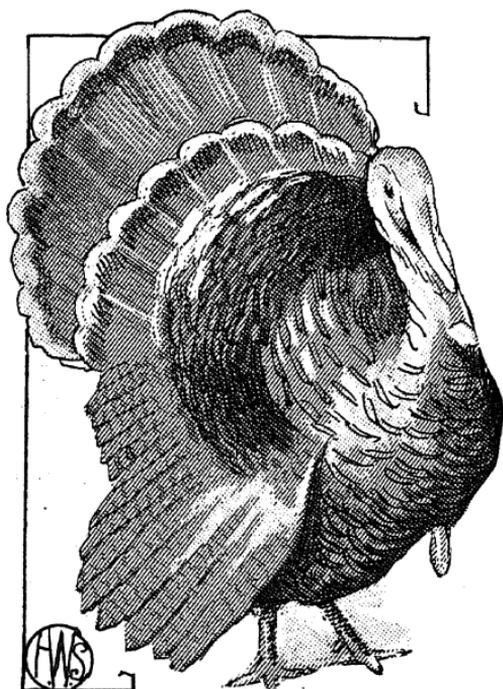


Fig. 3—*Line copy.*  
A *scraper-board drawing.*

today. Through the powerful aid of pictures to the imagination of the reader, news is visualized. So great is the demand for illustrated news that most metropolitan papers maintain staff photographers, who accompany reporters or go on special assignments for pictures. An art department to supplement and embellish the material thus gathered is often an adjunct. A photo-engraving plant completes the efficient daily.

The country newspaper office is generally the clearing-house for the engraving problems of the community. The editor in his capacity of advertising director, publisher and job-printer is asked regarding prices of plates, how to prepare copy for the engraver, what screens to use, how to figure reductions, what reproduction methods will best serve different kinds of copy and what kinds of photographs will make the best halftone copy. It is reasonable to consider him the local authority in these matters; his daily work brings him in contact with the engraver's products. If not he, then who else in the community?

Lack of knowledge of plate-making and its requirements upon the part of the engraver's customer causes no end of trouble and loss to both engraver and customer. The letter accompanying the order is often burdened with indefinite instructions; some-

times no instructions worthy of attention are given. It is to the credit of the engraving houses that, despite these drawbacks, efficient service is the rule.

Condition of copy comes in for a share of the blame. Photographs that are bedimmed with age or soiled, or that are flat and contrastless, or lacking in details, can scarcely be rectified in the engraving shop. Drawings that are yellow with age, bethumbed



Fig. 4—Line copy.  
A clipping of type-matter.

or made with other than jet black ink will undoubtedly give trouble. The fact that the engraver returns fair plates from this sort of copy is no proof that the customer is not losing in some way as a result of bad copy and unintelligent ordering. The loss may be in time—that occasion when the engraver was compelled to write for a more complete statement

of some point. In this case the loss is the customer's. The loss may be in money—a detail of instruction omitted or an error in the copy that is not noticed until the proof is returned from the engraver. As a result the corrected plate may be returned too late for the press. Copy is sometimes misplaced or lost in the engraving shop because of the lack of identification inscription. Indifferent photographic work may require expensive retouching in the engraving shop. These mistakes of carelessness or oversight cause financial loss to both engraver and customer.

The organization of an engraving house is rather complicated. The work is highly specialized. The main departments are the business office, including superintendent, solicitors, clerks, stenographers; the art department, wherein each worker is adept in only one line, such as lettering, retouching, etc.; the engraving department, which is another department of specialists: operators, etchers, finishers and routers; and the shipping department, wherein the finished product is prepared for shipment. Of course not every plant is so complicated, nor does it follow that the

largest houses make the best engravings. Good work and efficient service are to be found in the engraving business only by trial on the part of the customer.

Because of the number of hands through which the copy passes in the engraving plant, it is necessary that plain instructions and identification inscriptions be written on or attached to the copy. These will be considered later in this bulletin.

## THE LINE ENGRAVING

A plate that reproduces black-and-white copy with no gray tones\* is called a line plate. It is usually etched† on zinc. A line plate has these advantages for the printer: cheapness, and ready adaptibility to paper, ink and press. A line plate comes nearer to being "fool-proof" in the hands of the printer than any other engraving. It requires no "make-ready" or special grade of ink or paper. In fact, the cheaper and coarser grades of paper quite often yield the best results. In electrotyping, since the depth of etch is greater in the zinc line plate, better impressions are obtained than from the comparatively shallow-etched halftone.

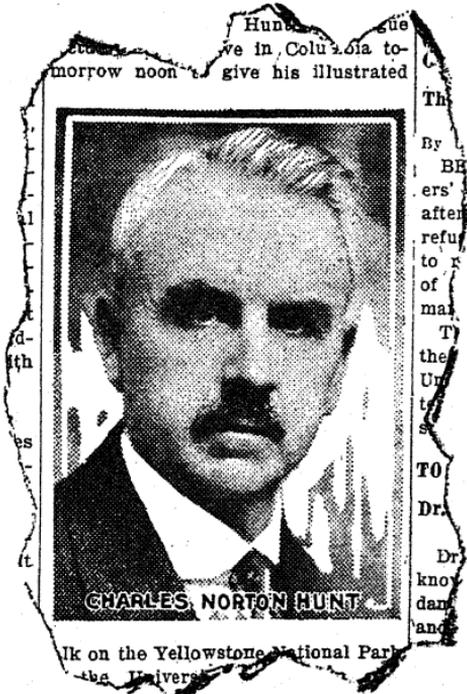


Fig. 5—Line copy.  
A halftone reprint.

\*Tone is the relative amount of light reflected by an object. In this discussion, the object is a photo or drawing. In other words, tone is the amount of shadow and light in the various parts of a picture. Color is a quality apart from tone and is not treated here.

†To *etch* is to obtain printing depth for the lines or dots on metal by corroding (or eating away) the metal with acid.

In these points the zinc line plate is inferior to the halftone: range in tones of copy to be reproduced and range in the varieties of copy. The copy that is to be reproduced by this process must have black lines or spaces on a white background or, reversed, white lines and spaces on a black background.

Under the heading of line-cut copy may be placed: (1) Pen drawings, Figs. 1 and 2; (2) pages of printed matter, Fig. 4; (3)

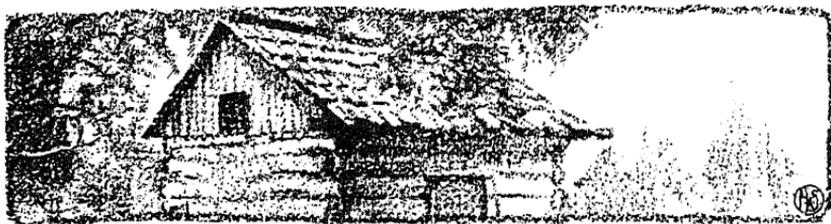


Fig. 6—*Line copy. A crayon drawing.*

black crayon and soft pencil drawings, Fig. 6; (4) halftone reprints (providing the ink is not gray and the screen used in making the original engraving from which the print is taken was coarse), Fig. 5; (5) scraper-board, Fig. 3. At first sight it would appear that copy of the third class would violate the basic rule that only black-and-white copy may be reproduced by the line process. The drawing, however, is made on a rough stock of paper—a surface with depressions and elevations. The elevations, or minute hills, catch the carbon from the pencil and form a cluster of dots of irregular shapes. Considering the black dot as the unit, the copy is resolved into black and white tones. It is the same in principle as the pen stipple drawing (Fig. 2), the shading of which is made of dots produced by the pen point. The dots are blended by the eye into tones. Again the dot is the unit of shading and fulfills the rule. The coarse screen halftone reprint (4) as copy for reproduction serves as the equivalent of the stipple drawing. Pages or clippings of printed matter are treated the same as original line drawings provided the printer's ink is not grayed or the stock of paper other than white. Scraper-board drawings (5) are made on especially prepared chalk surfaces, whose original patterns are parallel lines or stippled effects. A variety of tones are produced by scraping on the surface with

a knife blade, lightly for a gray tone and heavily for white. Dark tones can be laid on the surface with soft pencil or crayon.

### MAKING THE LINE NEGATIVE

The old wet plate process, now obsolete in photography, is used for negative making in photo-engraving. It gives the advantage of economy, as the glass can be used over and over, and also gives the maximum contrast of tones in the negative.

A piece of clean glass is flowed on one side with an albumen solution and allowed to dry. In the sensitizing operation, the dried albumen causes the collodion to adhere to all parts of the surface of the glass. The collodion in turn, becomes the foundation for silver nitrate, the sensitizing agent. Collodion is a solution of ether, alcohol and guncotton, with certain chemicals added to increase its affinity for silver nitrate. The collodionized glass,

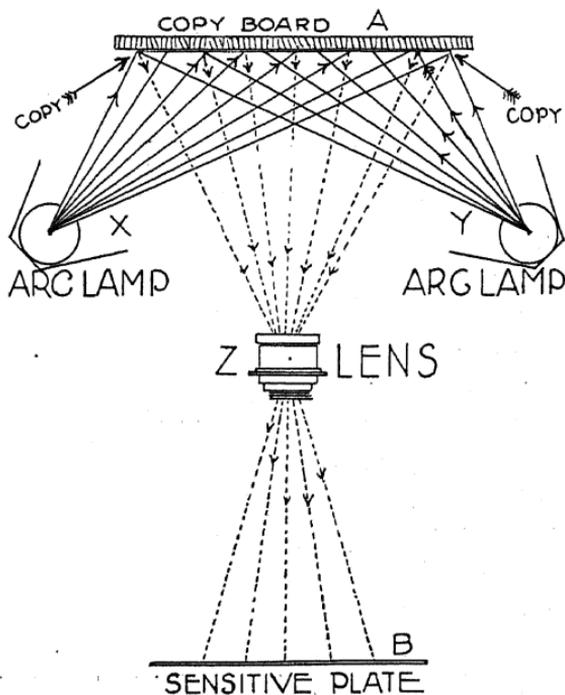


Fig. 7—Camera lighting arrangement.  
(Viewpoint, above.)

after being immersed for several minutes in the silver solution, is sensitive to light. It is now carried from the dark room in a light-proof plate holder to the camera. Here the plate is exposed to light reflected back from the copy, which has been previously tacked onto a vertical board in front of the lens and parallel to the plane of the sensitive plate. Wherever on the plate the strongest reflected light falls, the densest opacity of tone will be built.

In other words, on the copy A (Fig. 7) are certain black lines and spaces on a background of white paper. Two arc lamps, X and Y, in front of and on each side of the copy send forth rays of light which fall on the copy. The white background of the copy absorbs very little light but reflects most of it back through the lens Z, which focuses the rays and brings them into a perfect image on the plate B. The size of the image depends upon the distance between the copy and the lens. Thus when a great reduction of the copy is desired, the copyboard is removed farther from the lens. The size of the image is measured upon the ground glass before the sensitive plate is brought from the dark room.

Now with the exposure of the plate under way, the dense portions of the image are being built by the action of the strong light reflected from the white background of the copy. Since the black lines and spaces on the copy reflect no light, the silvered collodion on the sensitive plate in corresponding parts is unaffected by the light and hence will become transparent in the later developing and fixing operations. The parts corresponding to the white paper of the copy will be black and absolutely opaque in the completed negative plate. Thus the tones of the original copy are reversed, giving rise to the term "negative," which is applied to the glass plate. Observe that the word "glass" is used here with "plate" to prevent confusion with the metal plate in its final stage, which is also termed "plate", "printing-plate" or "engraving."

After the negative is finished and dried, it is "stripped." That is, the collodion film on the glass is treated with certain coatings which enable it to be peeled from the glass plate as a thin membrane and laid on another clean piece of glass, after being turned over. This is for the sake of a reversed image to make the final print from the finished engraving the same as the original copy.

Figures 8 and 9 represent the evolutions of the image with respect to position (right to left) and tone (positive and negative). Fig. 8 is the original copy—black lines and spaces drawn on a background of white paper. Fig. 9, No. 1, is the photographic

image obtained on glass by the wet plate process—reversed in both position and tone. In 2, the film has been stripped and reversed (in position only—the tones are the same as in 1). In 3, the image has been transferred to a piece of zinc by a photographic process. The metal has been etched, mounted and is now a completed engraving. The image in 3 has been changed into a reversed positive print. By 4 is represented the final appearance—a reproduction of the original copy, printed in ink on paper.



Fig. 8—*The copy.*

There is some danger that the film will tear or become distorted in stripping. This would be especially detrimental in certain kinds of color work or in reproduction of mechanical drawings, in which extreme accuracy is demanded. To obviate stripping, a prism is sometimes interposed between the copy and the lens, which automatically reverses the image.

The stripped negative is used as a light filter in transferring the image to the metal. A piece of polished sheet zinc is sensitized with a bichromate fish glue solution. The film side of the negative is placed directly against the sensitized side of the metal

*The negative  
(unstripped).*

*The negative  
(stripped).*

*The engraving. The final print.*

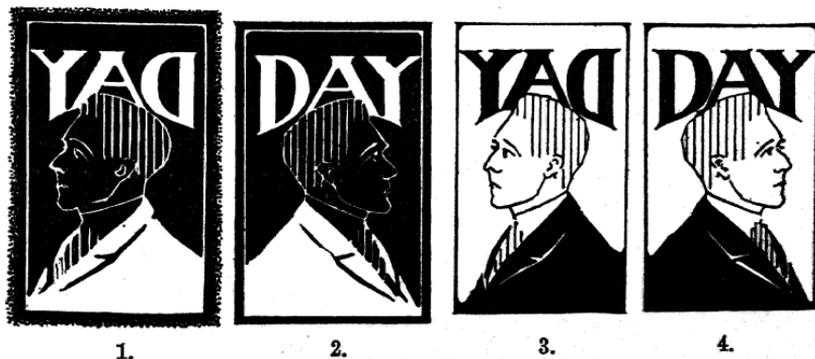


Fig. 9—*Evolution of the image with respect to tone and position (right to left).*

and then exposed in a printing frame to strong light. The black, opaque part of the film acts as a barrier to the rays of light, consequently the soluble sensitizing coat of the metal directly behind this curtain is unaffected; i. e., remains soluble. The transparent lines and spaces of the negative, corresponding to the black parts of the original copy, allow free passage of the rays of light to the sensitive coating of the metal. This is rendered insoluble.

After this printing process has been completed, the metal is removed from contact with the negative plate and is given a thin coating of etching ink on the exposed side. The zinc plate is then dropped into a basin of water, which instantly dissolves the parts of the sensitive coating beneath the ink that were not affected by the light. The ink also "lifts" from the plate in these parts, leaving the metal bare. The insoluble parts of the

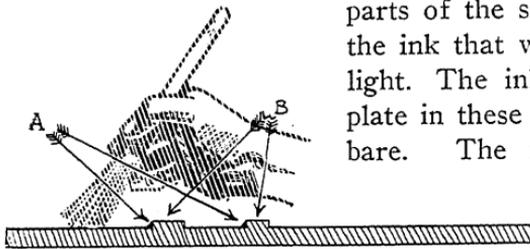


Fig. 10—Powdering the line plate (showing cross-section of zinc line etching). *A* represents dragon's blood embanked against edges of lines (*B*).

coating remain on the plate with their uppercoat of ink. The zinc plate is then dried and dusted with a resinous powder which, when heated slightly, amalgamates with the ink to serve as an acid-proof covering for those parts of the metal. The back of the plate is coated with asphaltum varnish.

A weakened bath of nitric acid is now given the plate in a rocking tub. When a slight depth of etch has been obtained—that is, when the unprotected surface of the metal has been eaten down slightly—the plate is dried and treated with a powdering of dragon's blood, a red, resinous powder. The powder is brushed lightly across the surface in four different directions. After brushing in each direction the plate is heated slightly to melt the powder. The object of the powdering is to protect the edges of the slightly raised lines from undercutting by the acid. The brushing embanks a small amount of powder against the edge of the line. The heat melts it and resolves it into an acid-proof-coating. The brushing is so conducted as to keep the open parts of the metal free from powder.

When the raised parts of the metal are thus freed from the danger of being undereaten by the acid, the plate is returned to the etching bath and given another "bite" in the acid. After a greater depth is reached and fresh surface of the edge of the lines is exposed, the plate is dried and repowdered in four directions as before. A third bite in the acid is now given. Usually three bites in the etching tub are sufficient to give ample printing depth to the raised lines. Sometimes more are given.

The larger open spaces on the metal plate are "routed," or deeply cut out with a high-powered drill. This gives additional freedom from the possible clogging of printer's ink in the press. The metal is nailed to a wooden block of such a thickness as to make the mounted engraving type-high. The edges are planed to bring the plate within the limits of the column rules. The use of a type-high planing machine is sometimes necessary if the wooden backing has absorbed moisture and has swelled. Since wood is very susceptible to atmospheric changes it often needs such attention, no matter how carefully the engraving has been made.

## THE HALFTONE

The halftone process is especially adapted to the reproduction of copy with middle tones—gray tones ranging between white and black. The purpose of the engraving is to secure a distribution of ink in the final print by means of dots of different size whose massed effect is tones.\*

\*The three kinds of printing surfaces are intaglio, plane and relief.

An intaglio engraving is one with sunken lines or spaces into which ink is rubbed; in the press-work the ink is lifted out by the paper. The original smooth surface of the plate yields no impression, since the ink is scraped off before the paper is brought into contact with the plate. Examples of this process are the etchings of such artists as Whistler, Pennell and Meryon, and the rotary photogravure process now coming into use as a method for newspaper pictorial sections. Intaglio plates can be printed only on special presses, entirely different in construction from the ordinary printing press.

On a planographic printing surface the lines of the design are neither raised nor sunken, but are on the same plane with the surface of the plate. The best example of this method is the lithographic process, requiring presses especially constructed, entirely different from the type presses.

The intaglio and planographic methods are capable of more refined gradation of tones than the relief method, as represented by the halftone, but are far more limited in application, owing to the fact that printing facilities different from the usual are required.

The dot is the unit of tone in the halftone process. A single dot as shown in 1, Fig. 11, is black; a field of similar dots in 2 gives the appearance of a gray tone. In this case the eye blends

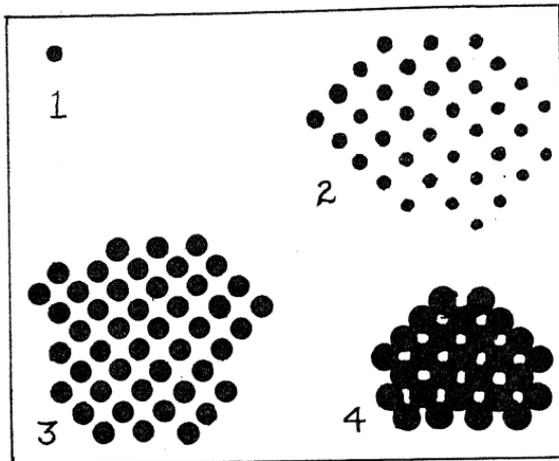


Fig. 11—How dots produce tones.

and receives the impression of a gray tone. Larger black dots, placed closer together, yield a tone of darker gray, as in 3. When the dots are so increased in size as to join, as in 4, and present a field of black, lightened by small white openings, the effect is a very dark gray tone, nearly black.

The problems of the halftone plate-maker in reproducing copy of several tones—for example a photograph—is to interpret the continuous and blended tones of the original by black dots of varying size. Necessarily some details of the original are sacrificed in this interpretation. The larger the scale of the dots, the greater is the loss of detail, and likewise the greater is the contrast of tones.

The screen is the new element introduced into negative making in the halftone process. It is a light filter used immediately in front of the plate of sensitive glass, to resolve the action of the light on the plate into a pattern of dots. The screen consists of two pieces of glass glued together and bound on the edges with an aluminum frame. Each piece of glass has on the inner surface a set of black parallel lines, either engraved (etched into

the surface) or photographed. These are represented in Fig. 12, 1 and 2. The lines are ruled at an angle of 45 degrees to the edges of the glass and so arranged on the two pieces as to cross at right angles on the screen (Fig. 12, No. 3).

It is easily seen in 3 that the pattern of the screen consists of a great number of small squares. The denomination of a screen is determined by the number of lines to the inch on each

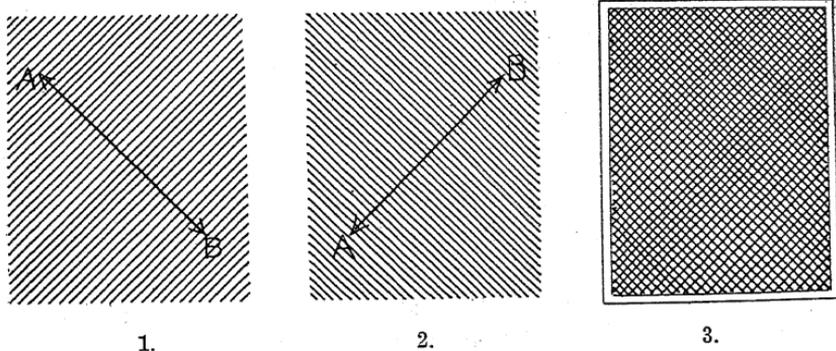


Fig. 12—The halftone screen. (Spacing of lines is exaggerated.)

part of the screen. The directions in which the lines are counted are represented by the arrow AB in Fig. 12, Numbers 1 and 2. In a 100-line screen, the denomination used for the University of Missouri's halftone plates, there are 100 x 100, or 10,000, squares in a square inch of surface. As each square of the screen is productive of a dot in the engraving, there are 10,000 dots in each square inch of the printed picture.\*

\*"When you realize that the whole scheme of halftone process is built around the halftone dot, of which there may be as many as 40,000 in a square inch, you can begin to appreciate the troubles of the halftone operator. . . . Keeping the dot intact is as essential to a good halftone as keeping the explosions of your auto-engine coming at regular intervals. When you missed one explosion, you knew there was likely to be trouble."—A. W. Morley, Jr., vice-president Electro-Light Engraving Company, in address before the T. P. A.

## HINTS ON SCREEN RULINGS\*

GENERAL—Coarse screens give most contrast; fine screens most detail.

## CHOICE OF SCREENS FOR DIFFERENT CLASSES OF WORK—

	Lines per inch.	
For large poster work.....	50	55
For rotary newspaper printing from stereo.....	55	60 65
For flat-bed quick newspaper printing.....	75	85 100
For photo-litho transfers.....	110	120
For commercial, book and periodical printing.....	125	133
For magazine and fine book printing.....	140	150
For fine catalogue engravings.....	150	175
For microscopic reproduction and fine detail.....	200	250
For photogravure, heliogravure, intaglio plates and finest letterpress .....	300	400

*Table compiled by William Gamble, F. R. P. S., published by A. W. Penrose & Co., Ltd., London.*

## MAKING THE HALFTONE

The copy is placed on the upright copyboard of the camera and brought to the right size and focus as in the case of the line copy. The plate is sensitized the same way as the line plate.

Considerable manipulation of camera appliances is necessary in halftone work. Only one exposure and one "stop" in the lens are used in line negative making; for a halftone plate two or three exposures and as many stops may be used. For those unacquainted with camera terms, it may be explained that an "exposure" is a time interval during which light is admitted through the lens to the sensitive plate. A "stop" is a diaphragm that regulates the amount of light that passes through the lens. It also gives shape to the dots that are built on the sensitive plate during successive exposures.

If the copy is well balanced in tones, there will be in it a large proportion of middle tones, with a small amount of deep shadows and high-lights. Such pictures give little or no trouble

\*Under the heading "Hints on Screen Rulings" there is given a list of screens that is apt to cause trouble to both buyer and engraver. In England there may be occasional uses for the many odd and especially fine rulings. In America there is rarely need for a screen coarser than 60 line and finer than 150 line. Therefore, the usual engraving concern is ordinarily equipped with screens as follows: 60, 65, 85, 100, 120, 133, 150 and possibly 175. (Anything finer than 150 line costs 25 per cent extra.)—R. B. Teachenor.



*100-line screen halftone.*



*150-line screen halftone.*



*85-line screen halftone.*



*120-line screen halftone.*



*60-line screen halftone.*

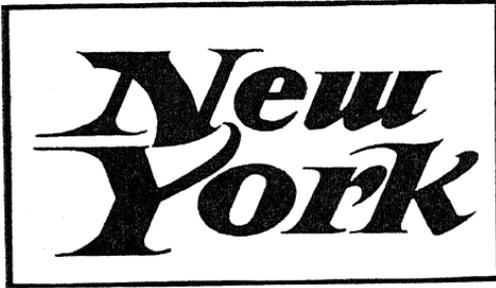


*Metzograph screen, No. 1*

WALT MASON IN SIX "REELS"

to the halftone operator. When gray tones prevail throughout and shadows are lacking, measures for increasing the contrast

1. *Line plate.*



2. *Halftone (60-line screen).*



Fig. 13—The same copy under two different treatments.

of tones may be necessary. If dark tones are prevalent they must be lightened in the final reproduction. The halftone process always makes for decreased contrast. For instance, a pen drawing with black letters on a background of white paper, although legitimately line copy, may be reproduced by the halftone process. The results are shown in the accompanying illustration. Fig. 13, No. 1, is the line reproduction; No. 2, the halftone. In No. 2 the background is a field of uniform small black dots, giving the impression to the eye of a light gray tone. The face of

the black letters is lightened by small white openings. From 1 to 2 there is a great diminution of contrast.

When the copy has black shadows a very small circular stop is used during the first exposure. A piece of white paper is pinned over the copy. White absorbs little light but reflects the most; the black shadows of the copy absorb nearly all of the rays of light and reflect few. The relative size of the dots that will be built on the sensitive plate during the triple exposure depends upon two factors: the diameter of the stop in the lens and the relative amount of light reflected back from the different parts of the copy. Consequently a black shadow in the original

copy would not furnish enough reflected light to build dots in the corresponding shadow parts of the negative. The function of these shadow dots in the negative will be explained later.

The exposure with the white paper over the copy builds up a field of small uniform dots on the sensitive plate. That is, if the plate were removed from the camera to the dark room and developed at this juncture so that the latent image would become visible, there would appear, not the reproduction of the picture on the copy board, but a field of uniform, disconnected, round dots.

Each dot is a picture of the opening in the lens and is placed behind the center of a square in the halftone screen. Each square in the halftone screen is a focusing area for the propagation of this image.

Fig 14, No. 1, represents the field of dots on the sensitive plate after the first exposure. During the second exposure (No. 2) certain dots in the field that was formed during the first exposure increase in size. The passages where the growth took

place correspond to the parts of the original picture that are light in tone. All the dots grew except those in the deepest shadows where the reflected light from the original copy was too

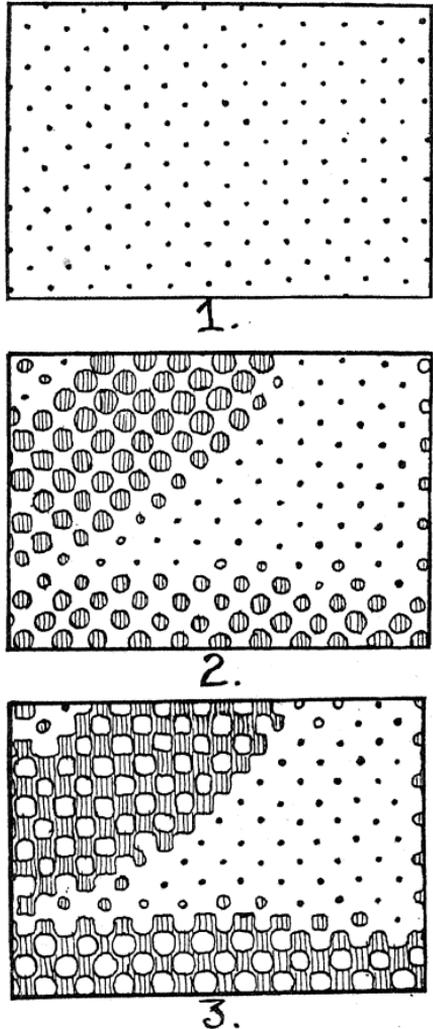


Fig. 14—Showing the growth of dots on the halftone negative during three successive exposures.

feeble to build up the dots of the first exposure. It is now apparent that the first exposure with the white paper pinned over the copy was for the purpose of creating dots in the shadow parts of the negative where there fell little or no light from corresponding parts of the original copy.

In the parts of the negative corresponding to the lightest parts of the copy, it is necessary to build the largest dots. The necessity for this will be shown later. The dots must be of such size as to enable them to join at the corners in a check-board formation. The third and last exposure, Fig. 14, No. 3, that is given to the negative is for the purpose of enlarging and joining the dots in the high-light passages.

Fig. 15, A, is a halftone reproduction of a photograph. Fig. 15, B, is a reproduction of the halftone negative from the same photograph.



A.



B.

Fig. 15—Showing 50-line halftone and negative made from the same copy. (Portrait of Col. B. B. Herbert, editor of the *National Printer-Journalist*.)

The lightest tone of A is the collar. This is the darkest in the negative, B. Observe the large, black dots joined at the corners. The coat, collar and necktie which are darkest in the photograph, are lightest in the negative, or rather have the greatest transparency. The black dots in this passage are small, round and isolated. The dots in the background of the negative are larger, approaching the square in shape, toward the upper right-hand corner, where they are connected as in the collar.

For the third exposure, specially shaped stops are often used in the lens.

Fig. 16, No. 1, a square stop with extended corners, is sometime called a Horgan stop after the originator, S. H. Horgan. Another name is the "eared" stop because of the fancied resemblance of the corners to ears. A square stop (Fig. 16, No. 2) is often used. Many halftone operators are partial to the round stop (Fig. 16, No. 3) because gradation of tone is best preserved by it use.

Since the dots are images of the stop, it is apparent that the extended corners of the eared stop (Fig. 16, No. 1) will assist their joining in the high lights.

In Fig. 17 is shown a group of high-light dots behind the squares of the halftone screen. The corners of the eared and square dots overlap behind the black lines of the screen. They do this because of the diffusion and bending of the rays of light around the black lines as they pass through the screen to the plate. The distance between the screen and the plate and the length of exposure regulate this diffusion.

When the square stop is used (Fig. 17, No. 2) the corners

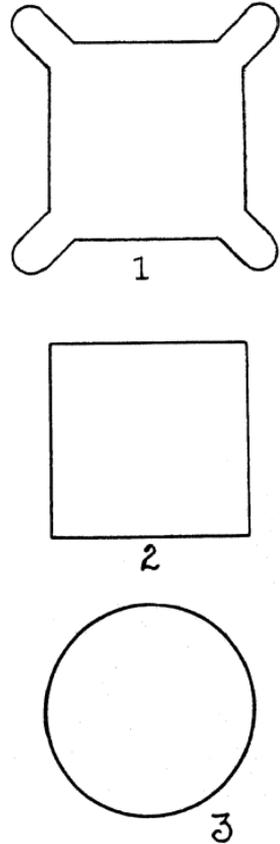
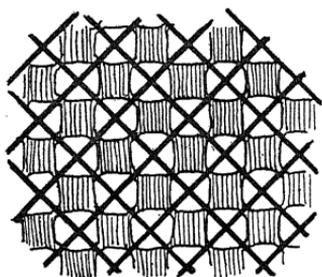


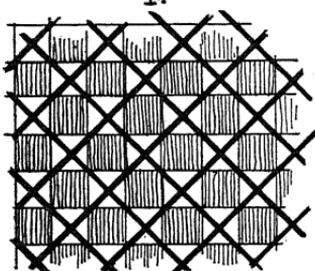
Fig. 16—Stops used during the third exposure.

join more reluctantly. The likelihood of failure of the dots to join is still greater when the round stop is used (No. 3).

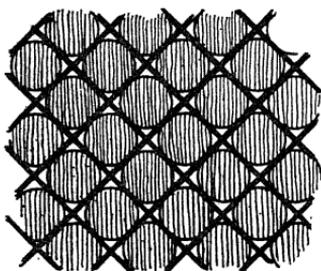
In other words, the operator has the greatest latitude in timing the exposure when No. 1 is used and the least when No. 3 is the stop.



1.



2.



3.

Fig. 17—High-light dots on the negative seen through the halftone screen (magnified).

When contrast is lacking in copy, the use of the eared stop insures more brilliancy of contrast but tends to lose details in the shadows. If the original copy is well balanced, so that there is no necessity for change in the relation of tones, the round stop is best.

The length of the exposure depends upon the condition of copy, the strength of the light and other factors. It is a matter of judgment for the operator. Poor copy often causes many unsuccessful trials, spoiled negatives and loss of time. The operator examines with an enlarging glass the condition of the dots after the negative is developed. If the shadow dots are too large and the high-light dots joined too closely, allowing insufficient transparency, he must reduce the size of the dots with a cutting solution. If the high-light dots have failed to join, there is no remedy—the negative must be remade.

A halftone negative requires far more skill and time in the making than the line negative. This is one factor that enters into the higher cost of halftone engraving.

The halftone negative, like the line negative, must be reversed before being used to transfer the image to the sensitized metal.

## SUMMARY—THE HALFTONE NEGATIVE

Dots interpreting the tones of a picture are built on a sensitive plate during its stay of several minutes in the camera. A filter, whose pattern is minute squares, is interposed between the lens and the sensitive plate. This filter, or screen, resolves the image of the picture that is on the copy board into dots on the plate. At intervals, while the glass plate is still in the camera, the opening in the lens is changed from small to larger diameters in order to create a relation of sizes in the dots that are being formed on the negative plate to correspond to the tone relations of the original picture, except that the tones of the negative plate image will be the reverse of those of the original.

Each dot on the negative plate is a replica in shape of the opening in the lens. The size of the dot depends (1) on the strength of light reflected from the corresponding part of the original picture and (2) upon the size of the opening in the lens.

The halftone negative is a light filter used in transferring the image to the surface of the metal preparatory to etching.

## ETCHING

Whether the metal is zinc or copper depends, in halftone work, upon the denomination of the screen, the quality desired and the intended use of the engraving. As a rule, when the screen is finer than 100 lines, copper is used. With a screen of 100 lines, or coarser, zinc may be employed. In newspaper work, economy demands the use of zinc. Copper is tougher and more durable, but considerably more expensive.

The difference in the handling of zinc and copper in halftone work is not materially great. The enamel process is used in sensitizing the surface of the metal when the screen is fine. A coarse screen negative permits the use of the inking process that is employed in zinc line etching. The enamel is a fish-glue bichromate solution similar to the sensitizing solution for line etchings, except that it is much thicker. An added amount of fish-glue gives it a body with which to resist acid.

A piece of metal of the correct size is coated with the enamel solution and dried. Its surface is now sensitive to strong light.

The film side of the stripped negative is placed against the enamel surface of the metal and both are locked in a printing frame. After several minutes' exposure to light, parts of the enamel are rendered insoluble. Other parts remain soluble. The parts made insoluble are those immediately behind the transparent parts of the negative. The enamel behind the dots receives no light, hence remains soluble. After the exposure, running water removes the soluble enamel, leaving the metal bare in those parts. The enamel dots that remain correspond to the transparent parts of the negative.

Fig. 19, No. 1, represents the high-light portion of a negative, densely spread with dots joined at the corners.

When the image is transferred to the metal, the transparent openings (clear glass) in the negative labeled A will constitute the area of the enamel dots. The bare surface of the metal will correspond to the parts of the negative labeled B. The enamel dots are those that will be left standing in relief in the finished engraving to yield their black impressions to the paper. The necessity for the junction of the dots in the negative is apparent after a study of Fig. 19. Should the dots B in 1 fail to join, the spaces A will be connected as in 2 and yield too dark a tone in the final print.

No. 2 of Fig. 19, represents a shadow part of a negative. Since the transparent ground A is continuous, the enamel on the metal will remain continuous with the exception of the tiny spots back of the dots labeled B. These spots on the metal will retain no enamel, hence will be subject to the corroding power of the acid. As a result they will appear as sunken places in the finished engraving. Their function is to introduce light into the shadows and gray them. Without them the printed halftone would be jet

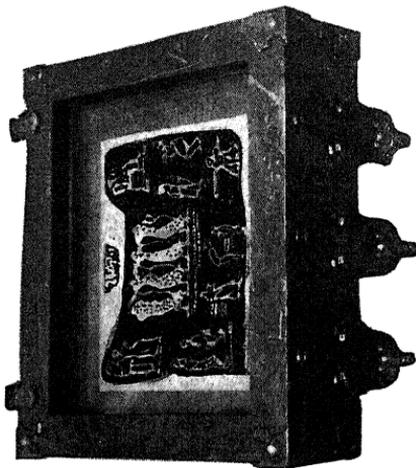
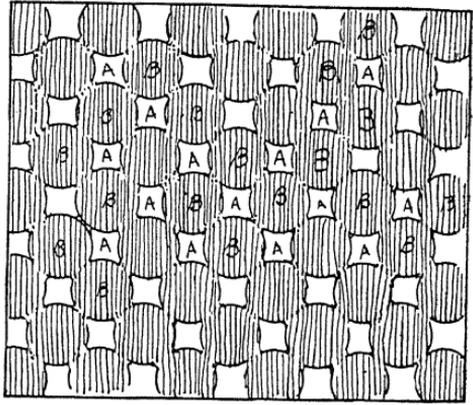


Fig. 18—The printing frame exposed to light.

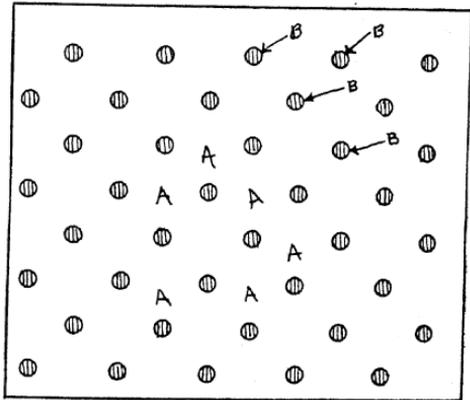
black in the shadows—a condition that might impair the balance of the tones on the printed page. Shadow dots are especially desirable when the plates are to be stereotyped.

If the shadow dots (B) on the negative, Fig. 19, No. 2, are too large, the print made from the completed engraving will be too gray in the shadows. They will result in a flat, contrastless half-tone picture.

In Fig. 20, is shown a picture under two treatments. In preparing the halftone negative for No. 1, the shadow dots were dispensed with entirely. The shadows in this picture yield a jet black tone entirely unrelieved by white dots. In No. 2, the shadow dots were made large on the negative. The resulting picture printed from the plate is gray in the shadows. A better reproduction of this picture would have shown the shadows



1.



2.

Fig. 19—Showing the relation of the dots on the negative to the enamel dots on the metal. The shaded dots (B) in 1 represent the high-light dots on the negative. Those in 2 represent the shadow dots (B) on the negative. The open spaces, labeled A in both 1 and 2, represent clear glass in the negative which gives way to enamel dots on the metal.

not so black as in No. 1, nor so gray as in No. 2. The engraver can regulate the amount of contrast to a considerable extent, although the tones of the original photograph limit him. For in-

stance, it may be possible for him to make a slight increase in contrast in reproducing an extremely gray photograph, but he may not be able to make it into an engraving that will print a picture with well-balanced tones.



Fig. 20—A halftone without and with shadow dots (60-line screen).

When the sensitized metal has been exposed in the printing frame sufficiently long, it is removed and held under running water. The soluble parts of the coating are washed away from the metal. Heat is then applied to harden the enamel, after which the plate is ready for the etching bath. Acid in a rocking tub is dashed back and forth across the face of the plate until the open parts of the metal are eaten down, leaving the enamel dots standing in relief.

The form and area of the dots undergo a change during the etch. Fig. 21, No. 1, represents in the upper-left corner (A), the enamel dots in the high-lights before the etch begins. As the etch progresses the acid eats *downward* and *laterally*. The lateral action of the acid decreases the diameter of the dots by undercutting the enamel-protected surface, leaving an umbrella-like fringe. When this fringe is broken off by brushing, the enamel dots (now in relief) have the appearance of the dots in Fig. 21, No. 2, upper left corner (A).

It is highly important that the enamel dots in No. 1, A, be as large as possible without being connected at the corners, else the dots would reduce in diameter and finally disappear before sufficient depth had been attained in the etch (No. 2, A).

In the lower right hand corner (B), No. 1, is represented the small openings of the enamel in the shadows. When the plate is etched (B), No. 2, these openings have an increased diameter as well as depth.

### RE-ETCHING

It frequently happens that after a halftone plate has been etched as far as the dots in certain places may stand, other parts of the surface may need further etching. This is often the case in reproducing a flat or an over-“contrasty” picture.

When the copy is flat and contrastless, re-etching will give brilliance to the highlights and shadows. Details in the shadows may be brought out by re-etching an over-“contrasty” plate.

Re-etching consists in painting out with acid-proof varnish the parts that are etched enough and in returning the plate to the etching bath. The plate may be removed from the acid and parts may be painted out again, preparatory to a third etch; and so on, until the relations of the tones on the plate are improved. Between etches the plate-maker may clean the surface

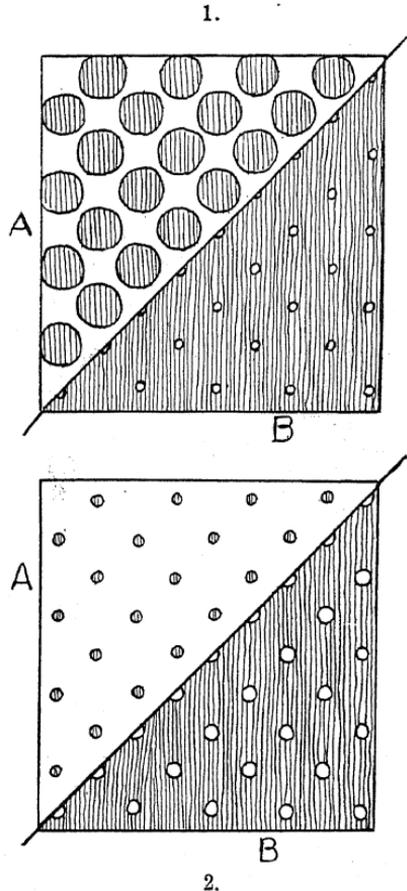


Fig. 21—How enamel dots on the metal plate change during the etch.

of the plate and rub a white powder (magnesia) into the crevices between the dots to determine the condition of the plate.



A.



B.

Fig. 22— A halftone “flat-etched” (A), and re-etched (B).  
(120-line screen)

After the final etch the edges of the plate are beveled or rabbeted by a power machine in order to provide space for nailing the metal to the wooden backing. The mounted plate is then planed on the edges and back (if more than type-high). It is now ready for the printer.

## A COMBINATION OF LINE AND HALFTONE

Combinations of the two methods are represented most frequently by the halftone news picture and its surrounding line border design. The photo is first taken to the art department, where a pen border design with silhouetted or blackened panels is drawn. The engraver makes a line negative from the drawing. Then he makes separate halftone negatives from the photographs. The line negative is then stripped and into its transparent

parts (corresponding to the silhouettes or black panels of the drawing) are inserted the halftone negative films, which are made of such a size as to fit exactly into the transparent parts of the line negative. The print is then made from the negative onto the metal and etched. When the halftone part of the plate is etched sufficiently deep, it is "stopped out" (painted over) with asphaltum or acid-proof varnish, and the remaining lines of the surrounding border are etched deeply after the manner of line plates.



A.

B.

Fig. 23—(A) Pen decoration with silhouette for halftone insert.  
(B) A combination line and halftone picture (85-line screen).

## HOW TO REPRODUCE VARIOUS KINDS OF COPY

Compiled by W. H. BAKER, Cleveland, Ohio

Copy	Halftone	Metzograph	Line
Wash drawing, water color, etc..... (1)	Good	Good	No
Line drawing (pen-and-ink) (2)	Good if re-engraved	Fair	Best
Crayon, charcoal or pen- cil drawing..... (2)	Good	Best	Good
Photograph..... (1)	Good	Good	No
Scraper board (lines, stipple, etc.).....	Poor	Good	Best
Reprint from wood engrav- ing..... (1)	Fair	Good	Good
Reprint from halftone ....	Not recommended	Best	Fair if coarse screen
Reprint from line.....	No	Fair	Best
Lithograph.....	Fair	Best	Only fair
Steel and copperplate en- graving..... (1)	Good	Good	Fair
Etchings (dry point, etc.)..	Fair	Best	Fair
Maps, intricate rule work etc..... (3)	No	No	Good if good copy
Combination wash and pen- and-ink.....	Good	Good	No
Oil paintings..... (1)	Good	Good	No
Type matter, writing, etc. (4)	No	No	Best

(1) May also be photographed on wood and engraved by hand; excellent for artistic results. (2) May also be drawn and photographed and cut on wood. (3) Wax engraving is preferable. (4) Wax engraving sometimes better adapted.

—Chart published by the *Eclipse Electrotype and Engraving Company, Cleveland, Ohio.*

## PHOTOGRAPHIC COPY FOR HALFTONES

A deep, reddish-brown photograph, on gelatine paper, smoothly burnished, with intense shadows and bright high-lights, will make the best halftone reproduction. Avoid dead, unburnished copies or photographs containing a bluish tone. It is almost impossible to make perfect work from the matt-finish or gray photograph. In selecting photographic prints for copies, consider well the following: Solio paper, properly toned and given a glacé finish by squeegeeing on paraffined glass or tintype plate, is the best of all. "Aristo Platino" and papers of similar surface do not reproduce well. Platinum paper (smooth surface) with good black color makes good copy. Sepia prints do not reproduce in true values, the darks coming too dark and the lights too light. Of the developing papers, Glossy Velox is one of the best. Carbon Velvet is also good, reproducing like a smooth platinum paper. Excellent results can be had from Azo Grade C, Azo Grade F and Glossy Aristo papers. Eastman News Bromide is made especially for halftone reproduction and gives fine black and white prints of high gloss surface. The glossiness of surface is essential for good halftone work. All rough papers are bad to work from. Negatives and tin-types should never be offered as copy. Unfixed photos or proofs should never be sent to the engraver, as they turn black when exposed to light. Remember that a good halftone cannot be made from bad copy, unless artist's time is added to the charge. It is seldom that a photograph cannot be improved—there is usually a necessity to strengthen outlines or shadows and retouch high-lights, to create a greater contrast between the different parts of the picture. Where extra work is necessary it is impossible to determine the cost without having the copy for inspection. A halftone reproduction from a halftone print is liable to show more or less "pattern" from interference of the two sets of cross lines.

*From The Journal of Engraving, published by the Teachener-Bartberger Engraving Company, Kansas City, Mo.*

## THE METZOGRAPH (MEZZOGRAPH) SCREEN

One of the chief objections to the halftone screen is the mechanical appearance of pictures made by it, especially when a coarse screen is used. To overcome this objection a screen has been devised with a pattern of irregular dots in a field of uniform density. The picture reproduced by this screen has a pebbled softness of tones admirably suited to the interpretation of certain subjects, such as the foliage of trees, a growing crop of grain or grass, fur-bearing animals, a rough stone wall. Commercially, the screen is coming into favor for the reproduction

of garments, textiles, furs, feathers, etc. When a subject demands a firm, "contrasty" treatment, the metzograph is not so good as the halftone. A metzograph plate is slightly more expensive than a halftone.

## PRINTING THE PLATE

Printing directly from the original plate on a flat-bed press gives better results in halftone work than stereotyping,\* inasmuch as details are often lost by the last named method. However, direct press-work is not without its problems for the printer. Lack of printing pressure, too great pressure, dirty plates, improper distribution of ink and shallow-etched plates are a few of the difficulties. Lack of pressure may yield a gray, unintelligible picture. The first thing to do is to see that the block is exactly type-high. Despite the fact that the engraver has already taken this precaution, atmospheric changes to which the block may be subjected in the printing shop or elsewhere will cause a shrinking, warping or expanding of the wooden base. Only plates with solid metal bases (which are expensive) are free from these tendencies.

Be sure that the block is absolutely flat. An engraving that rocks after being locked up in the form loosens surrounding quads and slugs, which work up and yield impressions on the paper.

To make the block absolutely type-high and flat use a type-high machine, of which many makes are now on the market.

"This is the best investment that a printer can make," says P. J. Seley, a veteran Columbia pressman. "It is a big matter of dollars and cents."

A cheap, hand-planing, type-high machine may answer the purpose for the small printing shop. Lay the block on the bed of the machine with the metallic face downward. Lay a thickness of several sheets of paper under the plate. Then plane the

\*Stereotypes—Plates made by casting metal on matrices (singular matrix). The matrix is a paper impression of type matter and engravings.

wooden back until every part of the wood has been scraped by the cutting edge. The block will now be absolutely flat, but will be lacking in type height to the approximate thickness of the sheets of paper that were beneath the plate during this operation. Paste the same number of sheets on the freshly planed surface of the wooden back. Determine thickness of block with a type-high gauge.

This work of rectifying the height of the block should be done immediately before locking it in the form. Further delay might involve a change in thickness.

The fact that a halftone block is perfectly type-high does not mean that it will yield a satisfactory impression on the paper. The edges of a plate have a tendency to print up more strongly than the center. The larger the plate, the more pronounced will be this tendency.

In the highest grades of printing, the pressman prepares a "make-ready" whereby the thickness of the block (already type-high) is gradually increased toward the center by concentric rings of paper pasted on the back of the wooden base. Other parts needing additional pressure may be located by proving.

The "make-ready" is impracticable for newspaper plates. The most that can be done for these is to add to the thickness of the block by pasting layers of paper on the back, without giving time to a local increase in thickness. Then, too, a proper overlay will secure the necessary stress in the press and give sufficient pressure from above in the correct areas.

In newspaper work, the overlay may be built by pasting on the cylinder bits of paper in parts corresponding to dim areas of the engraving. These may be located by first taking a proof of the engraving. As much care should be exercised as time will allow in attending to newspaper plates. Any attention to them whatever is an improvement on the tendency of many country pressmen to lock the block in the form without any preparation.

High-grade printing calls for more carefully prepared overlay. Several methods exist, all of which involve the use of a *raised* or *embossed* proof of the half-tone. The proof is placed on the cylinder in absolute register with the face of the engraving.

so that each dot of the overlay proof registers exactly on its corresponding raised dot of the plate. Unless this last named condition obtains, the overlay is worse than useless. Four kinds of overlay are most commonly used. One is a thin sheet of zinc on which a proof of the engraving is printed directly from the plate. A slight etch in nitric acid is given the sheet, producing a raised effect. Another is a chalk relief overlay. Two other methods are based on "pulling" a proof from the engraving and building an embossed effect from the inked proof on paper. This is done by dusting emery powder across the surface. The powder that adheres to the ink is incorporated with it by a slight heating of the paper. A smooth varnish is afterwards applied.

Too great pressure is as much an evil as insufficient. The edges of a halftone plate will print harshly and even threaten to break through the paper. The small raised dots in the highlights may break down, causing a dirty smudge in corresponding parts of the final print. A line engraving suffers especially from too great pressure. The "shoulders" of the metal left on the plate by the router drill may show up in the print.

The remedy is to decrease the thickness of the block. Sandpapering the wood base may be resorted to, although this crude method is not likely to produce uniform thickness. Here again, a type-high machine is of the utmost value to the printer.

Careful cleaning of the plate with gasoline and brush before starting the press will obviate the third evil, dirty plates. Brushes with fine metal bristles are now on the market for the purpose. Brushing at an angle of 45 degrees (coinciding with the direction of the rows of dots on the plate) removes the bits of lint, ink, and other matter that accumulate between the dots. Clean all plates before filing them away. If lye is used in cleaning forms containing type matter and engravings, it should be neutralized with diluted acetic acid or vinegar, because lye tends to corrode some metals, especially zinc. Never hold a paper wrapping of a plate, especially a copper plate, in place with a rubber band, since rubber has a corrosive effect. Fasten the wrapper with a gummed strip or piece of string.

Improper distribution of ink may be the result of using stiff ink in cool weather or soft ink in warm weather. Use seasonable rollers, free from holes and other defects. Never use soft ink on a hard roller.

Engravings that are etched too shallow will never give satisfactory results, no matter how careful the presswork. The printer may easily diagnose the trouble in the case of zinc line engravings, inasmuch as the raised parts of the printing surface are comparatively far apart. The depth of the etch is more easily discernible than in a halftone. Experience will soon teach one what to expect in a satisfactory line etching.

Gauging the depth of the dots in a halftone plate is not so easy. Some printers profess to do this by rubbing the tips of the fingers or the palm of the hand across the plate to get the "feel" of the dots. The use of an enlarging glass would be much better.

A more scientific method in gauging both kinds of engravings is the use of a micrometer instrument especially designed for the purpose.

Another instrument of value to printers is a gauge for determining the screen denomination of halftones. This information is of the greatest value in deciding the kind of paper and ink. The screen denomination of a halftone that has been newly made is known, but after an engraving has been stored away and later brought out for use, the screen numeral is probably forgotten. The printer would do well to mark the numeral on the plate before filing it away. If an old halftone of unknown denomination is brought in by a customer, the problem may be vexatious. At least one engraving firm, as a mark of service to the customer, has established the practice of stamping the screen numeral with a die on the beveled edge of the metal.

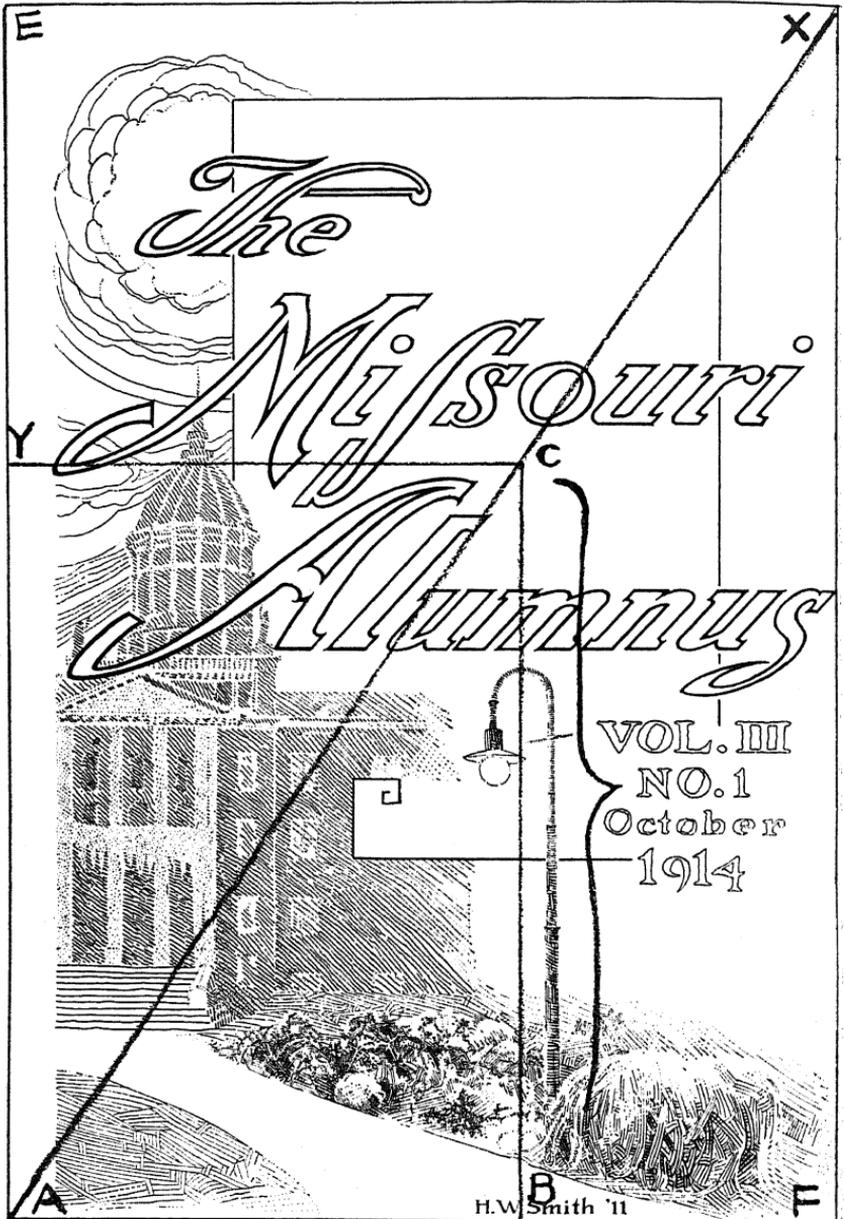


Fig. 24

## HOW TO DETERMINE PROPORTIONAL REDUCTION

In this specific example, the drawing AEXF is to be made into a plate  $2\frac{1}{2}$  inches wide. The printer wishes to know before the engraving is made what will be its height.

From the corner A of the drawing (Fig. 24) measure a distance AB ( $2\frac{1}{2}$  inches) on the base line AF. From B erect a perpendicular line BC to intersect the diagonal AX. The distance BC can be measured. Its length,  $3\frac{3}{4}$  inches, will be the height of the engraving.

These lines are to be made lightly with a pencil and are to be erased before the drawing or photograph is sent to the engraver. They should not be made a part of the instructions given to the engraver.

## HOW TO DETERMINE THE PROPORTIONS OF A DRAWING

In this problem the size of the engraving (not made as yet) is known. The draftsman wishes to know what must be the proportions of his drawing (also not made), so that it may be reduced to the proper size.

In Fig. 25, ABCD represents the desired size of the engraving. Extend indefinitely the lines AB and BC. Extend the diagonal BD indefinitely. Upon one of the two extended lines AB or BC (BC for example), lay out a width BX. This will be the width of the drawing. This distance BX represents an arbitrary decision of the artist. He can make it twice or thrice the desired width of the engraving. It is better to make it no greater than three times.

Erect the perpendicular line XY to intersect the extended diagonal BD. XY, measured in inches, represents the height that must be given to the drawing.

### THE MATHEMATICAL METHOD

If the figures representing the proportion of the copy and engraving are non-fractional, the problem may be calculated

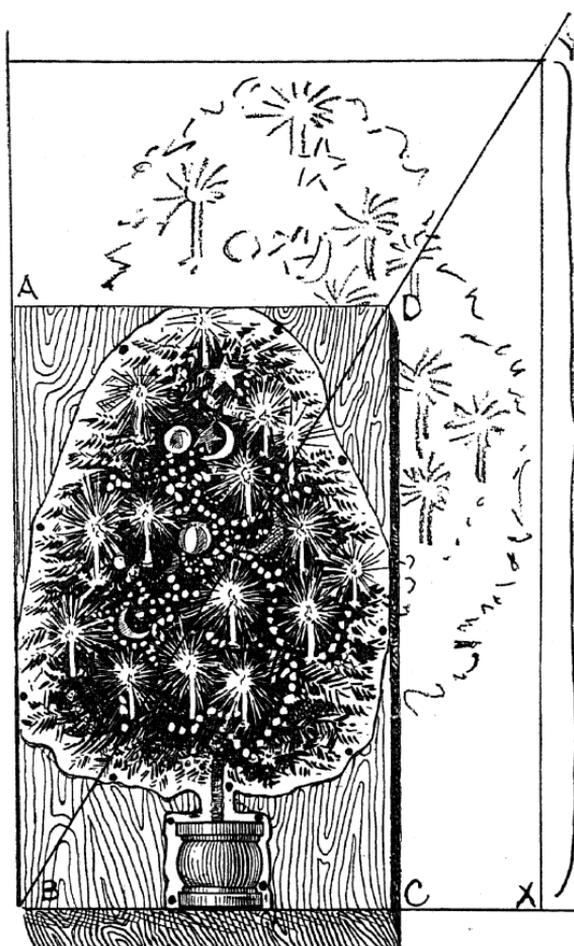
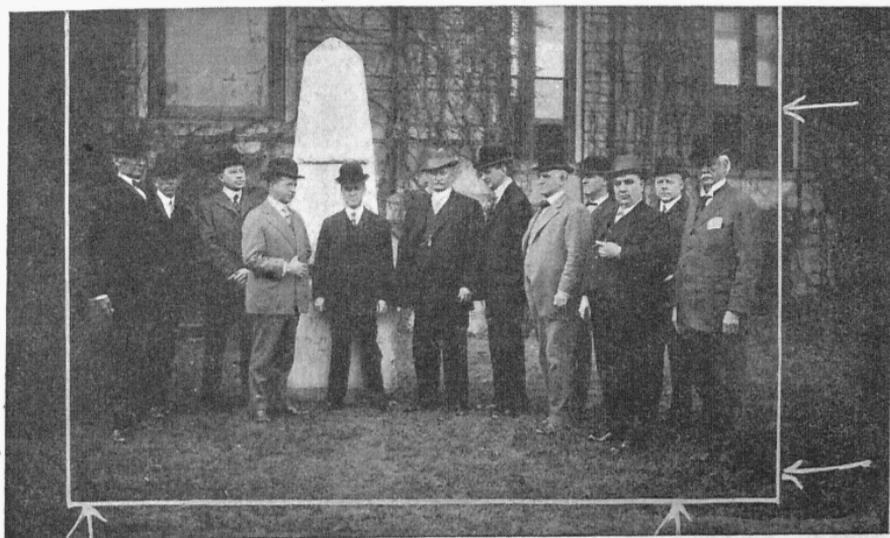


Fig. 25

15:?::9:18. The missing factor representing the height of the drawing will be found to be 30.

mathematically. If the original copy is 8 x 12 inches and the width of the plate is to be two inches, the height of the plate may be calculated thus: 8:12::2:?. The missing factor will be found to be 3.

If the engraving is to be 15x9 inches and the artist wishes to know how large to make the drawing, he must choose first some arbitrary or convenient scale of enlargement, say twice the dimensions of the plate. This would cause the drawing to be 18 inches wide (2 times 9). The ratio would be



Reduce to  
 $3\frac{1}{2}$ "

120-line half tone on copper,  
 Square finish without border.

Return by Apr. 2-'16  
 A. R. Hilderbush,  
 Columbia, Mo.

Fig. 26—Specimen copy for halftone with directions for the engraver.

## HOW TO ORDER ENGRAVINGS

### I. Halftones.

Paste a strip of paper on the upper or lower edge of photograph to be reproduced. Upon it write:

(a) Desired width of the engraving in inches. (Indicate specifically with arrow lines the outermost points to be included in the plate.)

(b) Kind of screen to be used.

(c) Kind of finish—square, outline, vignette or oval.

(d) Indicate if special work on photo or plate is desired—"retouching" of photo; mortising or "tooling-out" on plate; special border design.

(e) Name and address of sender.

(f) Specify time limit for return of engraving.

Mail with flat cardboard covering.

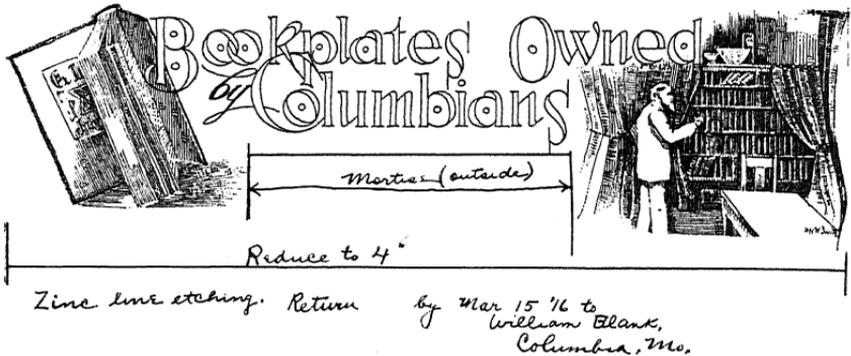


Fig. 27—Specimen copy for line plate with directions for engraver.

## II. Line engravings.

Leave sufficient margin around drawing. If copy is a page of printed matter, or clippings, mount it on white cardboard. Touch with black (india) ink any gray spots on letters. Mark on lower margin:

(a) Desired width of engraving in inches. (Indicate outermost points with horizontal arrows).

(b) Whether special work is desired (mortising, etc.).

(c) Name and address of sender (may be written on back of copy).

(d) Time for return of plate.

In ordering plates it is well to enclose in a separate envelope a general statement covering work desired, especially if there should be anything in doubt, which may be left to the judgment of the engraver.

## EXPLANATION OF TERMS

Halftone, square plate—A halftone in which the outside edges are rectangular and parallel; may be with or without single black border.

Halftone, outlined—A halftone with the background outside of the object entirely cut away, leaving a definite edge without shading or vignetting.

Halftone, vignettted—A halftone in which one or more of the edges of the object are shaded from dark tones to pure white.

Halftone, outlined and vignettted—A halftone in which part of the background is cut away and part vignettted.

Halftone, oval—one whose outer edges form an oval.

Retouching—brush work done by an artist on original photo copy.

Mortise—to cut out portions of a plate for insertion of type in the block.

Tooling-out—hand-chiseling on plate to lighten the tone or to produce a white space.

Special border design—any decorative surrounding of a picture other than straight lines.

### OTHER TRADE TERMS

Direct halftone—A halftone to produce which the screen negative is made by direct exposure of the article itself, and not from photograph or drawing.

High-light halftone—A halftone plate in which the elimination of the dots in the high-lights is accomplished by a photochemical process instead of by cutting them out with a tool.

News-tone—A name sometimes given to a coarse-screen halftone, always etched on zinc and used mostly for newspaper work. Also known as "quarter-tone."

Duograph—Two halftone plates made from one copy and usually printed in black and one tint, or two shades of the same color, the two plates made with different screen angles.

Duotype—Two halftone plates made from one copy, both from the same negative and etched differently.

Two-color halftone—Two halftone plates, either (or both) an etched plate containing parts or all of the design, to be printed in two contrasting colors.

Three or more color halftones—Same as definition of two-color halftone, using three or more etched halftone plates.

Three-color process plates—Printing plates produced from colored copy or objects to reproduce the picture or object in its original colors by a photo-chemical separation of the primary colors, and etched halftone plates to reproduce each separate color, usually printed in yellow, red and blue. An approximate result may be obtained from one-color copy by using the skill of the workmen in securing the color values on the etched plates.

Four-color process plates—Same as the three-color process, with the addition of a gray or black plate.

Combination plates, black only—Plates made by the use of a key plate and color plates, either halftone or line, to be printed in two or more colors.

Ben Day plates—Plates made by laying shaded tints on copper or zinc and etching them to produce colors or combination of colors when printed.

Deep etching—Additional etching made necessary to secure proper printing depth where this cannot be accomplished by routing, and usually caused by the use of dense black lines, or line negatives and halftone negatives being combined in one plate.

Positive etching—A plate from which the blacks of the original copy will print white and the whites will print black.

Embossing plate—A plate cut or etched below its surface for the purpose of raising the image of the printed surface.

Stamping die—A relief plate engraved on brass or zinc for stamping book covers or similar surfaces.

## ENGRAVINGS USED IN UNIVERSITY MISSOURIAN

Besides original halftones and line etchings, electrotypes, stereotypes and occasionally wood-engravings are used in the *Missourian*.

Electrotypes, or electros, are duplicates of original line and halftone engravings. A wax impression of the original plate or type is placed in an electrolysis bath, where it receives a deposit of copper. This thin facing of copper is then backed up with lead and mounted on wood to form a printing plate. The process offers the advantage of cheapness, being one-third to one-half the cost of the original plate, and convenience to the advertiser. A whole advertisement, including type and illustrative engraving

can be duplicated in one plate by electrotyping. The process offers a distinct advantage to an advertiser who wishes to run the same ad simultaneously in several publications.

Advertisers who order signature engravings and other plates that are to be repeatedly used in the press, should be advised to in-

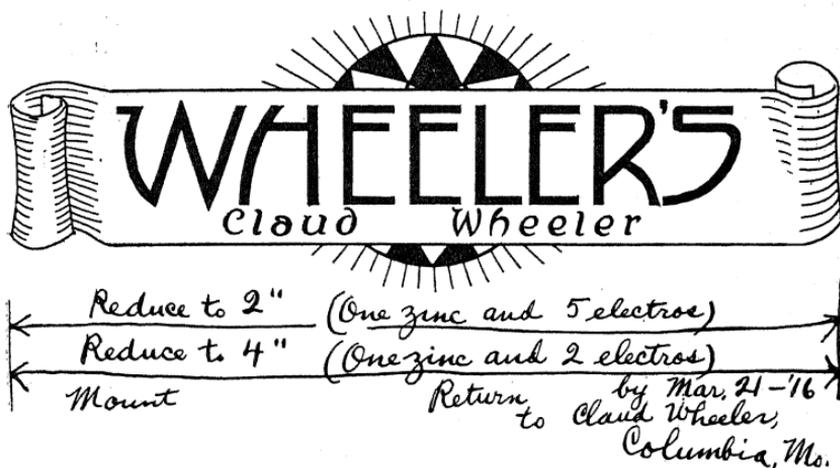


Fig. 28—Specimen copy for an order for electros.

clude an order for electros with the original order. After thousands of impressions are made from a plate, it begins to show signs of wear by blotting or yielding indistinct lines. For every desired size of electro an original engraving must be ordered, inasmuch as the electros are made from the original engraving and not directly from the copy. Most engraving houses have electrotyping departments or are able otherwise to handle the work for the customer.

Stereotypes may be used in any weekly or daily paper. There are several points to be remembered by the advertiser who furnishes this kind of plate to a medium. If the publication is printed on the perfecting press using curved stereotype plates, he may send the matrix. Casting may be done in the printing plant. If a flat-bed press is used and no stereotyping equipment exists in the plant, he should send the plate already cast and mounted.

Stereotyping as a method for duplicating plates and type matter is not so satisfactory as electrotyping, for a more porous, baser metal is used in casting stereotypes than is used in the printing surface of the electro. This sometimes causes the loss of details in a picture.

Wood cuts, the first method used in printing pictures, survive mainly in catalogue illustrations, although they are occasionally used in newspaper ad illustrations. A commercial wood cut print may be distinguished by the fine mechanical parallel lines of shading. For newspaper use, electros are generally made from the wood cut, to avoid the tendency of the original to split, warp and wear out quickly.

## ENGRAVING CHARGES

More specific information on this subject is offered in the advertising and educational literature prepared by various engraving houses than can be given in a treatise of this nature. A few general points that are applicable to the methods of determining charges may be treated.

A fixed charge is made on a halftone or line engraving below a certain number of square inches in area, no matter how small may be the plate. A plate coming under this rating is called a "minimum." Beyond the minimum size, a scale rate is charged up to a size containing 30 square inches, beyond which a square inch rate is charged. Extra work, such as mortising, applying Ben Day mechanical tints, special finishing on halftones, retouching on photographs, etc., is charged on the basis of the time of the skilled employee.

Care in preparing copy may result in a saving to the user of engravings. Avoid sprawling a drawing over a large area in which much white space appears. Make the drawing compact. It may be possible then to order the engraving made smaller and save charges, if it is beyond the minimum in size. The size of the drawing, otherwise, has nothing to do with the plate charges, except in the case of copy of unusual size or character which may give extra trouble to the plate-maker.

In a series of drawings or photos, if possible, make the copy of such relative proportions as to allow the same scale of reduction for each. Try to avoid having one twice the final size, another three times, etc. Make all twice or three times the reduction size, as the case may demand. The engraver may reproduce several pieces of copy on one negative when they are of similar character and are on the same reduction scale. This helps him to keep down expense and to add to his service. In figuring the area of a plate, preliminary to fixing charges, the engraver multiplies the greatest width by the greatest height (block measure). An L-shaped plate (one with a corner mortised out) would cost even more than if the block were left whole, because of the extra work of mortising.

The manufacturing photo-engravers are getting out of the rut in which the printing industry has been mired for years—fixing charges that have no relation to the cost of production. Through their organization, the International Association of Manufacturing Photo-Engravers, much has been done in the way of standardization of trade terms, trade methods and trade charges.

The standard scale of prices adopted by this body during the past year supersedes the old incorrect square inch method, which after years of cost-findings was found to have no relation to cost of production—thus being unfair to producer and consumer. Under the old method many of the small sizes of plates sold below cost, and the profit of larger sizes was absorbed in the loss, thus making it nearly impossible to secure a just and fair average profit. The new scale is based upon exact cost knowledge, and is claimed to be a scientific, correct and satisfactory gauge of values. The impelling cause for this adjustment and moderate increase of prices has been the enormous increase in the metal and chemical markets caused by the war, and following upon a steady increase in labor and general expense. The scale is a basis of values intended to be net, but, owing to fluctuations of costs, may have a percentage added or subtracted to secure market prices. It is a much simpler way to ascertain prices than by the old method of computation.

The two following pages reproduce this standard scale:

# Standard Scale of Prices For Halftones and Zinc Etchings

## STANDARD SCALE OF PRICES

Based on cost of production as adopted by the International Association of Manufacturing Photo Engravers.

### ENGRAVINGS

Zinc Etchings	Half-tones
Square Inches	
1.00	5 2.00
1.05	6 2.10
1.10	7 2.20
1.15	8 2.30
1.20	9 2.40
1.25	10 2.50
1.30	11 2.60
1.35	12 2.70
1.40	13 2.80
1.45	14 2.90
1.50	15 3.00
1.55	16 3.10
1.60	17 3.20
1.65	18 3.30
1.70	19 3.40
1.75	20 3.50
1.80	21 3.60
1.85	22 3.70
1.90	23 3.80
1.95	24 3.90
2.00	25 4.00
2.05	26 4.10
2.10	27 4.20
2.15	28 4.30
2.20	29 4.40
2.25	30 4.50
2.33	31 4.65
2.40	32 4.80
2.48	33 4.95
2.55	34 5.10
2.63	35 5.25
2.70	36 5.40
2.78	37 5.55
2.85	38 5.70
2.93	39 5.85
3.00	40 6.00
3.08	41 6.15
3.15	42 6.30
3.23	43 6.45
3.30	44 6.60
3.38	45 6.75
3.45	46 6.90
3.53	47 7.05
3.60	48 7.20
3.68	49 7.35
3.75	50 7.50
3.83	51 7.65
3.90	52 7.80
3.98	53 7.95
4.05	54 8.10
4.13	55 8.25
4.20	56 8.40
4.28	57 8.55
4.35	58 8.70
4.43	59 8.85
4.50	60 9.00
4.58	61 9.15
4.65	62 9.30
4.73	63 9.45
4.80	64 9.60
4.88	65 9.75
4.95	66 9.90
5.03	67 10.05
5.10	68 10.20
5.18	69 10.35
5.25	70 10.50
Over 70 sq. in.	
7½ cts.	15 cts.

IN EFFECT JANUARY 1, 1916. THIS SCALE SUPERSEDES ALL PREVIOUS SCALES

For plates less than 30 square inches the basis of charges is: for HALFTONES (square finished), a fixed charge of \$1.50, plus 10 cents for each square inch of size; and for ZINC ETCHINGS, a fixed charge of 75 cents, plus 5 cents for each square inch of size.

For plates over 30 square inches the basis of charges is: for HALFTONES, 15 cents per square inch, and for ZINC ETCHINGS, 7½ cents per square inch.

On long narrow plates, figure the width as one-fourth the length. (This is necessary because of waste on large negatives.)

All plates charged at block measure (not printing face). In estimating the size of halftones, add one-fourth inch to the length and width for bevel.

Unmounted plates same price as blocked.

Plates made from copy requiring a reduction to less than one-sixth its length or width, double Scale price.

- HALFTONES**—Prices are based upon reproductions made direct from photographs or wash-drawings furnished (without alterations or extra work on copy or plate), square finish, mounted on wood, block measure. **Metal base, 50% extra.**
- Halftones from paintings**, or direct from the object, charged extra, according to the extra time involved. (Where colored copy requires a separation negative in order to produce a suitable halftone, an additional charge is made on the basis of an isochromatic negative and print. Minimum, \$1.50.)
- Retouching**, altering or improving copies and grouping photographs, charged as time work.
- Vignetted or Outlined halftones** charged extra as time work—minimum 33½% extra. (Halftones from which all waste metal can be removed with a beveler only, are to be considered "Square" plates. All others are considered as "Outline" or "Vignette" plates.)
- Hand tooling, inside cutouts, re-etching and burnishing** charged extra as time work. Net.
- Halftones finer than 150 line**, 25% extra.
- Duplicate halftones**, square finish, ordered at same time as originals, 15% less.
- Extra negatives for halftone groups**, one-half Scale price. (Where extra negatives are made and inserted into a group or combination, they should be figured at one-half the Scale, based on the size of the negative after they are inserted.)
- Inserting negatives and double-printing** charged extra as time work. Net.
- Duotypes**, square finish, two plates made from same negative, each plate 50% extra. (Proofing extra.)
- Duographs**, square finish, each plate made from a separate negative, each plate double Scale price, minimum charge \$10.00. Minimum size 10 square inches.
- Two-color halftones**, square finish, requiring color separation negatives, each plate three times Scale price, minimum charge \$20.00. Minimum size 18½ square inches.
- Three-Color-Process halftones**, square finish, each plate three times Scale price, minimum charge \$40.00. Minimum size 29¼ square inches.

14. **Four-Color-Process halftones**, square finish, each plate three times Scale price, minimum charge \$50.00. Minimum size 27 square inches.  
To compute the prices of Color Process Plates rapidly, take the Halftone figures that correspond to the size of the job you are estimating:  
For Two-Color Halftone, square finish, multiply Halftone figures on Scale by 6; Outline or Vignette, multiply by  $6\frac{3}{4}$ .  
For Three-Color-Process Plates, square finish, multiply Halftone figures on Scale by 9; Outline or Vignette, multiply by 10.  
For Four-Color-Process Plates, square finish, multiply Halftone figures on Scale by 12; Outline or Vignette, multiply by  $13\frac{3}{4}$ .  
The charge for Outlining and Vignetting of Color Process Plates is computed exactly as the charge for the same work on black and white halftones, viz:  $33\frac{3}{4}\%$  on figures on Scale for each plate.
15. **Anchoring halftones on block**, 25c for first anchor, 10c for each additional anchor in same block. Net.
16. **Line etchings on copper** and combination line and halftone etching, double Scale price for halftones. Negatives and insert- ing charged extra.
17. **Zinc halftones**, 85 line screen or coarser, 25% less than copper halftones.
18. **ZINC ETCHINGS—Prices are based upon reproductions from black and white line-drawings or prints furnished (without alterations to copy or plate), mounted on wood. Mounting on solid metal: 75% of zinc scale extra. Minimum charge 40 cents, net.**
19. **Reproductions** from lithograph or steel plate copy, script, pen- manship, shorthand, scientific or other difficult copy, charged 50% extra.
20. **Extra line negatives**, one-half Scale price.
21. **Inserting negatives and double printing** charged extra as time work. Net.
22. **Etchings of tint plates to register**, each plate 50% extra.
23. **Laying tints** and painting-in color plates charged as time work. Net.
24. **All color plates** to be charged at the same price as for the largest plate of the set.
25. **Reverse etchings**, black to white, or white to black, mounted on wood, 50% extra. Reverse etchings on metal for **embossing**,  $2\frac{1}{2}$  times Scale price. Hand tooling extra. Net.
26. **Extra proofs and proofs in colors**, charged as time work. Net.
27. **Mortising on wood**, outside 10c, inside 15c; on metal, outside, 15c; inside 25c. Irregular mortises 5c per corner. Net.

## Supplementary Explanatory Notes

**High-Light Halftones**—Four times halftone figures on scale.

All original engravings by any process are invariably mounted on wood. Plates are never mounted upon metal base unless specifically ordered that way, and for which extra charge is always made.

**ARTICLE 7.** When duplicate outlined or vignettted halftones are ordered, the 15% discount applies only on the basis of a square finished plate. It does not apply to the  $33\frac{3}{4}\%$  charge for outlining and vignetting.

Example: One duplicate halftone, 5x8 in.....	\$6.00
Discount, 15%.....	.90
	<u>\$5.10</u>
Outlining, plus $33\frac{3}{4}\%$ of Scale price.....	2.00
	<u>\$7.10</u>

**Finishing halftones in oval or circular forms** costs extra as follows: 2x3 inches or smaller, 25 cents each; 3x4, 35 cents each; 4x5, 50 cents each; larger sizes in proportion.

**Mounting on Wood:** 20% of zinc etching figures on scale. Minimum charge, 25 cents, net.

Unusual service, or work required in less than four hours' working time, usually charged double.

**Art Work**—Sketches, drawings, retouching, grouping photographs or alterations to copy, charged on basis of time of artist.

No sketches submitted on a competitive basis unless paid for by the customer.

**Line Etchings on Zinc** heavier than 16-gauge, and up to 11 points thickness—Double zinc etching figures. Minimum, \$3.00.

To ascertain the size of a plate to be made from a larger copy, multiply the short dimension of the copy by the long dimension of the plate to be made, and divide that sum by the long dimension of the copy. **Example:** Copy is 9x12 inches, plate is to be 7 inches long— $9 \times 7 = 63 \div 12 = 5\frac{1}{4}$ . Answer: Plate will be  $5\frac{1}{4} \times 7$  inches.

## HINTS FOR USERS OF ENGRAVINGS

A halftone electrotype is successful for screen denominations up to 150 lines. It is never quite the equal of an original.

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The limit of screen fineness in a halftone that is to be stereotyped is 100 lines.

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A zinc halftone should yield at least 100,000 impressions before deteriorating. A halftone that is to be used continuously, in a standing ad, for example, should be made in copper if finer than 85 lines.

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Give the engraver as much time as you can possibly allow. If you would have him do his best work, don't rush him.

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An electrotype may usually be distinguished from an original copper or zinc plate by the greater thickness of its metal face.

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It is well to remember that engravings are no longer priced on any square-inch rate; that in estimating for halftone price, one-fourth inch is added to length and width of printing surface for bevel; also, that long, narrow plates of any kind are charged as if the width were one-quarter the length.