

May 22, 1945.

O. R. HUGGINS

2,376,596

METHOD AND MEANS FOR PRODUCING INTAGLIO PRINTING ELEMENTS

Filed Jan. 22, 1937

2 Sheets-Sheet 1

Fig. 1.

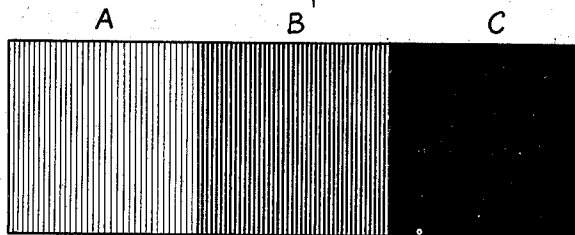


Fig. 2.

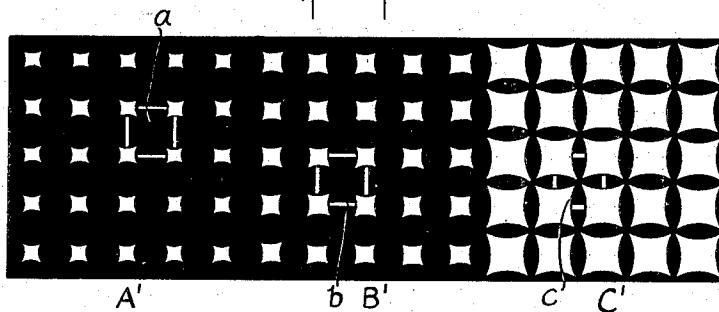
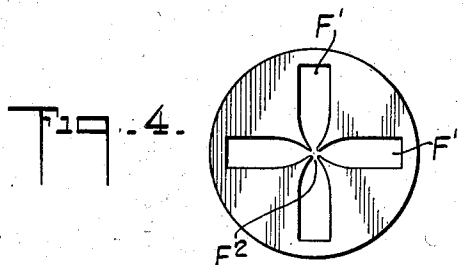
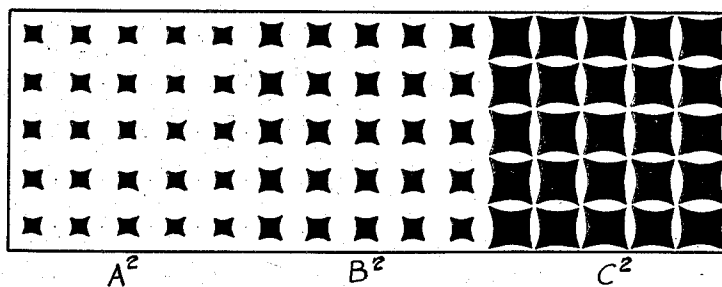


Fig. 3.



INVENTOR
OWEN R. HUGGINS.

BY

Morrison, Kennedy & Campbell
ATTORNEYS

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2 Sheets-Sheet 2

Fig. 5.

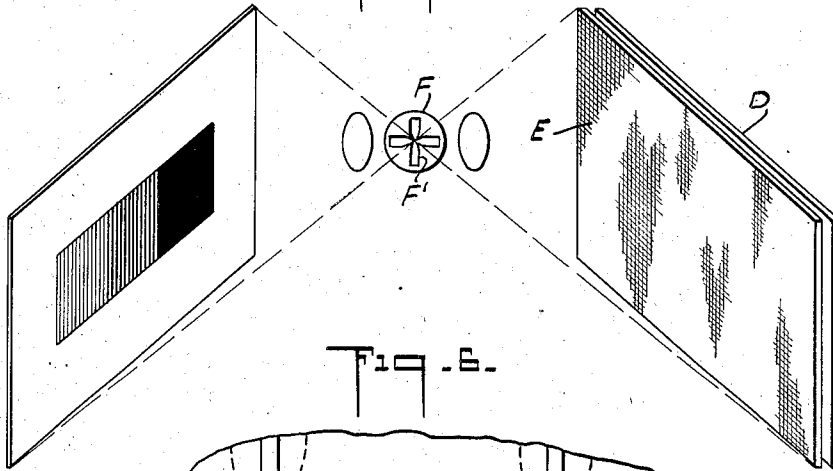


Fig. 6.

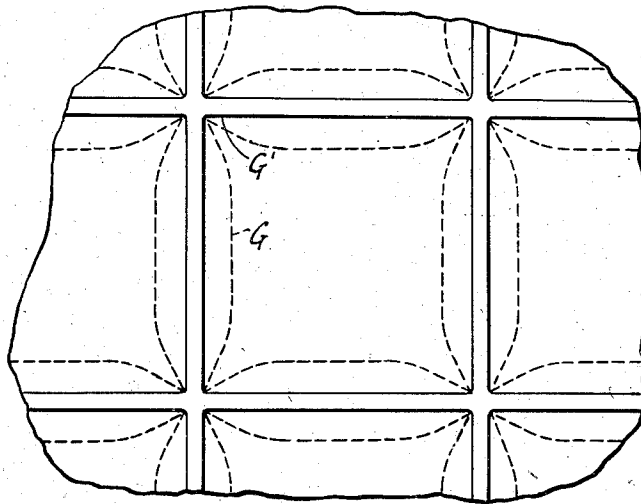


Fig. 7.

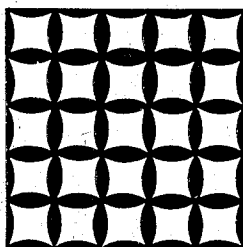
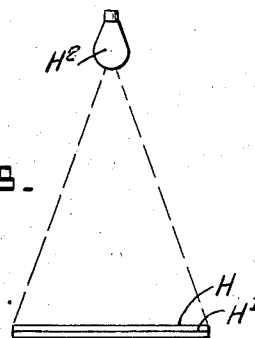


Fig. 8.



INVENTOR
OWEN R. HUGGINS.

BY

Morrison, Kennedy & Campbell
ATTORNEYS

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METHOD AND MEANS FOR PRODUCING INTAGLIO PRINTING ELEMENTS

Owen R. Huggins, South Norwalk, Conn., assignor to Linotone Corporation, a corporation of New York

Application January 22, 1937, Serial No. 121,836

12 Claims. (Cl. 95—5.7)

This invention relates to improvements in method and means for producing intaglio printing elements.

Intaglio printing elements of the character herein referred have printing surfaces formed with ink retaining wells defined by upstanding walls or resists that support a doctor blade during inking. One method of producing the printing elements is the well known carbon tissue process, which results in a printing surface having its ink retaining wells uniform in area but varying as to depth to produce the different tonal effects, and wherein the resists are substantially uniform in thickness throughout. In my copending application, Serial No. 105,662, filed October 15, 1936, I have described another process for preparing intaglio printing elements utilizing half-tone screen photography. My process however, produces a printing surface having its ink retaining wells substantially uniform in depth but varying as to printing area from the largest representing the solids to the smallest representing the lightest tones, the area of the doctor blade supports in the different tones being in the inverse ratio. Regardless of the steps followed in the early stages of the process, the ultimate step is the etching, by means of a suitable fluid, of the cells in the printing surface, without allowing the fluid to attack the portions that constitute the resists, these latter portions being of a screen configuration superimposed upon the subject at one stage or another in the process either by a Rembrandt screen or a half-tone screen, depending upon the process employed.

For maximum efficiency in tonal rendering, the configuration of the resists in the finished printing element should conform exactly with the superimposed screen configuration, but so far as I know, this has been impossible of attainment in practice, apparently due to the fact that the etching fluid in attacking the metal does not replenish itself with the same rapidity in the corners of the cells as it does along the edges, with the result that in the corners where intersecting resists meet, undesirable fillets remain. Not only is this detrimental insofar as tonal rendering is concerned, but indeed gives ragged outlines where the design is sharp, particularly when the screen configuration is somewhat coarse, as in the case of textile printing.

In accordance with the present invention, the screen configuration superimposed upon the unetched printing element, whether by means of the carbon tissue process or by previously sensitizing the surface and exposing it to light through a film or plate bearing the screen configuration, is not of the usual character, wherein the acid resist portions intersecting at right angles are uniform in width (throughout the surface in the case of the carbon tissue process, or throughout the portions adapted to print the same tones in my own

process previously alluded to), but instead consists of lines with symmetrically scalloped edges, i. e., each portion of a line between any two adjacent lines intersecting therewith at right angles, is thickest at the center of such portion and narrows or tapers toward both ends until it meets the lines with which it intersects. In other words, with such a screen configuration, the portions to be attacked by the etching fluid to form the ink retaining wells belly inwardly at the sides and extend outwardly into sharp acute angles at the corners. Consequently, when the printing element is immersed in the etching bath, the sides of the wells will be etched to a greater extent than the corners because, as previously stated, the fluid has less power to replenish or renew itself in the corners than along the sides. As a result, when the etching is completed, the sides of the wells will be substantially straight, and the corners substantially right angles, thus eliminating the undesirable fillet effect previously referred to.

One method of producing the screen configuration on the printing element is similar to that disclosed in my copending application, previously referred to, except that instead of using a plain cross slotted diaphragm, a diaphragm is used, wherein the cross slots, adjacent their region of intersection, are formed with converging edges in order to block off a portion of the light at this point. The subject to be reproduced on the printing element is photographed through a half tone screen and through a diaphragm of the character just alluded to, to produce on the exposed negative, a series of crosses, the arms of which intersect at the same angle as the slots in the diaphragm and, by properly regulating the time of exposure, the arms of the crosses can be made to meet with the corresponding arms of adjacent crosses. The arms of these crosses however, instead of being of uniform width throughout, narrow or taper as they approach the region of intersection. The width of the cross arms or exposed portions in any given region will be proportional to the amount of light reflected from the corresponding regions of the subject, i. e., in the regions of solid where the light reflected is comparatively small, the intersecting exposed portions will be comparatively narrow in width, whereas in the high light regions where the light reflected is much greater, the intersecting exposed portions will be proportionately greater in width to the extent even of overlapping completely in some instances, so as to leave no unexposed portions.

A positive is then made from the negative and in turn used to make a metal print on the printing element by first coating the element with a light sensitive material, as for instance, sensitized fish glue or photoengravers' enamel, and thereafter exposing the element to light through the positive which, for this purpose, is placed

in contact with the light sensitive surface. The sensitized coating becomes fixed or insoluble in those regions affected by the light; so that when the member is developed and etched, those portions corresponding to the exposed portions of the original negative will constitute resists, whereas those portions corresponding to the unexposed portions of the negative constitute recesses for containing the printing ink. As previously stated however, the ink retaining wells, after etching, will not conform exactly with the unexposed portions defined by the crosses on the original negative because in the negative the sides of such unexposed portions belly inwardly, while the corners extend outwardly in sharp acute angles. In the etched plate however, the sides of the ink retaining wells are straightened out in the manner previously described, presenting a printing element wherein the corners are sharply defined, so that the ultimate in efficiency of tonal rendering results.

Another method of practicing the invention, where the subject to be reproduced consists merely of solids and high lights with no intermediate half tones, is to prepare a screen with scalloped transparent lines and superimpose this upon a negative previously exposed to the subject to be reproduced, or if desired, these steps can be reversed, i. e., the screen configuration can first be superimposed upon the negative, which later is exposed to the subject to be reproduced. A positive is made of the negative thus produced and then a negative metal print on the printing surface will be etched as in the manner previously mentioned. When this method of practicing the invention is employed, the screen is placed in direct contact with the negative during exposure. The screen can be made by a process similar to that previously described. That is, a sensitized plate or film is exposed to a uniform source of reflected light through a half tone screen and a slotted diaphragm, the cross slots of which converge at the region of intersection. A positive made from the film or plate thus exposed will give a screen of the desired character.

A similar screen can be used in place of the Rembrandt screen in the well known carbon tissue process of producing intaglio printing elements. This process is well understood and need not be described in detail here. Suffice it to say, when the printing element is etched through the carbon tissue upon which the novel screen configuration has been superimposed, the ink retaining wells will have sharply defined right angle corners for the reasons heretofore set forth.

Referring to the drawings:

Fig. 1 illustrates a subject having a series of different tones and which it is desired to reproduce on a printing element;

Fig. 2 illustrates a somewhat enlarged negative of the subject shown in Fig. 1, made from a single exposure through a half tone screen and a cross slotted diaphragm, the slots of which converge at the region of intersection;

Fig. 3 is a positive made from the negative shown in Fig. 2;

Fig. 4 illustrates a cross slotted diaphragm of the novel character used in practicing the instant invention;

Fig. 5 is a diagrammatic view, showing the relation of the subject, the slotted diaphragm, the half tone screen and the negative during the exposure of the latter according to one method of practicing the invention;

Fig. 6 is a greatly enlarged plan view of a small portion of a printing plate made in accordance with the instant invention, the shape of the resists prior to etching being shown in dotted lines, and the shape of the printing wells after etching being shown in solid lines;

Fig. 7 is a screen which can be used for the superimposing of a screen configuration upon a negative which is also exposed to the subject to be reproduced according to one method of practicing the invention, or which can be used in place of a Rembrandt screen in the carbon tissue process of preparing an intaglio printing member; and

Fig. 8 illustrates diagrammatically the direct transfer of the screen configuration shown in Fig. 7 directly to a negative which is also exposed to the subject and which constitutes one of the steps in preparing an intaglio printing element in accordance with the present invention.

Referring to Fig. 1, it will be observed that the design selected for illustration has a plurality of different tones A, B and C, ranging from say, light grey to black. A film or plate D (see Fig. 5) is then exposed to the design through a half tone screen E and a diaphragm F provided with a pair of crossed or intersecting slots F¹. As shown in Fig. 4, the slots F¹, at the region of intersection, converge inwardly, as at F², in order to block off a certain amount of light at this point for a purpose which will be evident as the description of the invention proceeds.

The design is properly illuminated by means not shown, and the exposure is of sufficient duration to produce an effect on the negative D, such as that illustrated in Fig. 2. That is, for each aperture of the half tone screen which, as is well known, acts as a pin hole lens photographing the shape of the aperture, an opaque cross is produced which is allowed to grow until it meets the crosses produced by the adjacent apertures in the half tone screen. In Fig. 2, the regions of the negative A¹, B¹ and C¹ correspond respectively to regions A, B and C of the subject illustrated in Fig. 1. In each region, a cross a, b and c, respectively, has been blocked out more clearly to illustrate just what takes place during the exposure of the negative. It will be noted most clearly from the region C¹ of the negative in Fig. 2 that the crosses c when united one with another, produce a series of cross lines, the edges of which are symmetrically scalloped, i. e., each portion of a line between a pair of adjacent lines running at right angles thereto bellies at the center and tapers or narrows gradually toward the ends. In the regions A¹ and B¹, similar scalloped lines are produced in the regions A¹ and B¹, but here the scalloped portions are much thicker because of the relatively greater amount of light that has been transmitted to the negative as a result of the lighter tones A and B of the subject. The manner in which the lines are produced however, is the same as in the region C¹, that is, the crosses a and b are allowed to grow until they unite or meet with the corresponding legs of the adjacent crosses. The scalloped nature of the lines is the result of the novel shape of the diaphragm illustrated in Fig. 4.

In Fig. 3, there is illustrated a positive made from the negative shown in Fig. 2, and which has portions A², B² and C², wherein the blocks correspond to the whites of the negative and vice versa. This positive is used to transfer the screened design to a metal printing element, the surface of which has previously been prepared by coating

with sensitized fish glue or photoengravers' enamel. The design of the positive is transferred to the sensitized surface of the printing element by placing the positive in direct contact with said surface and exposing the surface to light passing through the positive. Where the light is allowed to affect the plate, the light sensitive material becomes insoluble, the remaining unaffected portions remaining soluble so that when the printing element is developed those portions, which have become insoluble, will act as a resist to the etching fluid, whereas the other portions will be etched out to produce the ink retaining wells. It will be noted from Fig. 3 that the blacks or opaque portions, because of the shape of the diaphragm used, belly inwardly and are narrowest at the center, whereas the corners extend outwardly forming an acute angle.

For purposes of illustration, the shape of the acid resists G on the developed plate have been shown in dotted lines and greatly enlarged in Fig. 6. When the plate is immersed in the etching bath however, the etching does not follow the configuration of the resists exactly, proceeding more rapidly along the sides of the portions constituting the wells than in the corners, since in the corners the etching fluid can not flow freely and replenish itself to the extent that it can at the sides. The result is that even though the fluid does not etch all the way into the corners, it does, because of the configuration of the resists, eat in deeper than it otherwise would if the resists were straight, and actually does produce a sharp right angle G¹ at the corners, as shown in solid lines in Fig. 6. Along the sides of the wells, the fluid actually eats beneath the resists, with the result that when the plate is fully etched, the wells are substantially square with the corners sharply defined.

Where the design to be transferred to the printing element consists solely of solids and high lights with no intermediate half tones, a screen configuration of the character herein dealt with can be superimposed on a film for transfer to the printing element (for example by means of a screen H, such as that shown in Fig. 7, which can be placed in direct contact with a negative H¹ (Fig. 8) and exposed to a source of light H², the negative either before or after such exposure through the screen being exposed to the subject to be reproduced), or direct on the metal by any of the usual methods, as will be understood. The etching step follows, and proceeds along the lines already described in connection with Fig. 6, so that when etching is completed, the resists in the portions adapted to print solids will be substantially straight and sharp at the corners. No etching, of course, takes place in the regions of the printing elements corresponding to the whites of the original subject.

The screen shown in Fig. 7 is produced by exposing a film through a half tone screen and a slotted diaphragm, such as that illustrated in Fig. 4, the period of exposure being regulated so as to produce lines of the desired thickness, and then making a positive of the negative thus produced.

The screen shown in Fig. 7 may also be used in place of a Rembrandt screen in the well known carbon tissue process, the application of which will be well understood. Suffice it to say, the screened resists on the carbon tissue will partake of the shape shown in Fig. 6, and etching will proceed substantially in the manner previously described, that is, insofar as etching along

the sides and in the corners of the ink retaining wells is concerned.

It will be understood that many changes may be made in the manner of carrying out the process of the invention, which, however, will still be included within its spirit. For instance, the lines of the screen configurations employed, instead of being truly scalloped at the edges, could taper along straight lines from the widest portion between the points of intersection to the points of intersection. In other words, each screen line could consist of a series of elongated diamond-shaped elements arranged end to end. Then, again, the lines could have a constant width for a short distance between the points of intersection before starting to taper inwardly as they approach the points of intersection, as indicated more clearly in Fig. 6. Such lines, it will be understood, are intended to be included within the term "scalloped," as well as other lines of similar character which will produce the result herein described. The invention, therefore, is to be limited only by the prior art and the scope of the appended claims.

Having thus described my invention, what I claim is:

1. The method of preparing a screened negative for use in producing etched intaglio printing elements, which method comprises exposing a photographic plate or film through a half tone screen, and by means of a slotted diaphragm having a light aperture with edges converging toward a common central point, manipulating the light allowed to affect the plate or film in a manner to produce on the negative two series of continuous intersecting exposed portions symmetrically disposed each about a median line and being relatively narrower where they intersect than between the intersections.

2. The method of preparing a screened photographic transparency for use in producing etched intaglio printing elements, which method comprises preparing a negative by exposing a photographic plate or film through a half tone screen, and by means of a slotted diaphragm having a light aperture with edges converging toward a common central point, manipulating the light allowed to affect the plate or film in a manner to produce on the negative two series of continuous intersecting exposed portions symmetrically disposed each about a median line and being relatively narrower where they intersect than between the intersections, and making a positive of the negative thus produced.

3. The method of preparing a screened negative for use in producing etched intaglio printing elements, which method comprises exposing a photographic plate or film through a half tone screen and through a diaphragm having crossed slots tapering into a common intersection to produce on the negative continuous intersecting exposed portions symmetrically disposed each about a median line and being relatively narrower where they intersect than between the intersections.

4. The method of preparing a screened photographic transparency for use in producing etched intaglio printing elements, which method comprises preparing a negative by exposing a photographic plate or film through a half tone screen and through a diaphragm having crossed slots tapering into a common intersection to produce on the negative continuous intersecting exposed portions symmetrically disposed each about a median line and being relatively narrower where

they intersect than between the intersections, and making a positive of the negative thus produced.

5. The method of preparing a screened negative for use in producing an etched intaglio printing element adapted to reproduce a subject having different gradations of tone, which method comprises exposing to the subject, a photographic plate or film through a half tone screen, and by means of a slotted diaphragm having a light aperture with edges converging toward a common central point, manipulating the light allowed to affect the plate or film in a manner to produce on the negative two series of continuous intersecting exposed portions symmetrically disposed each about a median line and being relatively narrower where they intersect than between the intersections and substantially proportional in width in any given region to the amount of light reflected from the corresponding regions of the subject.

6. The method of preparing a screened negative for use in producing an etched intaglio printing element adapted to reproduce a subject having different gradations of tone, which method comprises exposing to the subject, a photographic plate or film through a half tone screen and through a diaphragm having crossed slots tapering into a common intersection to produce on the negative continuous intersecting exposed portions symmetrically disposed each about a median line and being relatively narrower where they intersect than between the intersections and substantially proportional in width in any given region to the amount of light reflected from the corresponding regions of the subject.

7. The method of preparing a screened photographic transparency for use in producing an etched intaglio printing element adapted to reproduce a subject having different gradations of tone, which method comprises preparing a negative by exposing to the subject, a photographic plate or film through a half tone screen, and by means of a slotted diaphragm having a light aperture with edges converging toward a common central point, manipulating the light allowed to affect the plate or film in a manner to produce on the negative two series of continuous intersecting exposed portions symmetrically disposed each about a median line and being relatively narrower where they intersect than between the intersections and substantially proportional in width in any given region to the amount of light reflected from the corresponding regions of the subject, and making a positive of the negative thus produced.

8. The method of preparing a screened photographic transparency for use in producing an etched intaglio printing element adapted to reproduce a subject having different gradations of tone, which method comprises preparing a negative by exposing to the subject, a photographic plate or film through a half tone screen and through a diaphragm having crossed slots tapering into a common intersection to produce on the negative two series of continuous intersecting exposed portions symmetrically disposed each about a median line and being relatively narrower where they intersect than between the intersections and substantially proportional in width in any given region to the amount of light reflected from the corresponding regions of the subject, and making a positive of the negative thus produced.

9. The method of producing an intaglio print-

ing member having doctor blade supporting portions throughout the entire surface, which method comprises preparing a negative by exposing a photographic plate or film to the subject through a half-tone screen and a diaphragm having a pair of crossed or intersecting slots which at the region of intersection converge inwardly to produce on the negative continuous intersecting exposed portions substantially proportional in width in any given region to the amount of light reflected from the corresponding regions of the subject, making a positive from the negative, making a negative metal print of the positive on the sensitized surface of a printing member, and developing and etching the latter to produce the intaglio surface.

10. The method of producing an intaglio printing member having doctor blade supporting portions throughout the entire surface, which method comprises preparing a negative by exposing a photographic plate or film to the subject through a half-tone screen and a diaphragm having a pair of slots crossing or intersecting at right angles, which slots at the region of intersection converge inwardly to produce on the negative continuous intersecting exposed portions substantially proportional in width in any given region to the amount of light reflected from the corresponding regions of the subject, making a positive from the negative, making a negative metal print of the positive on the sensitized surface of a printing member, and developing and etching the latter to produce the intaglio surface.

11. The method of producing an intaglio printing member having doctor blade supporting portions throughout the entire surface, which method comprises preparing a negative by exposing a photographic plate or film to the subject through a half-tone screen and a diaphragm having a pair of crossed or intersecting slots which at the region of intersection converge inwardly to produce on the negative continuous intersecting exposed portions substantially proportional in width in any given region to the amount of light reflected from the corresponding regions of the subject, the slots during the exposure of the plate therethrough being parallel each to one series of lines of the half-tone screen, making a positive from the negative, making a negative metal print of the positive on the sensitized surface of a printing member, and developing and etching the latter to produce the intaglio surface.

12. The method of producing an intaglio printing member having doctor blade supporting portions throughout the entire surface, which method comprises preparing a negative by exposing a photographic plate or film to the subject through a half-tone screen the lines of which intersect at right angles and a diaphragm having a pair of crossed slots likewise intersecting at right angles and which at the region of intersection converge inwardly to produce on the negative continuous exposed portions intersecting at right angles and substantially proportional in width in any given region to the amount of light reflected from the corresponding regions of the subject, the slots during the exposure of the plate therethrough being parallel each to one series of lines of the half-tone screen, making a positive from the negative, making a negative metal print of the positive on the sensitized surface of a printing member, and developing and etching the latter to produce the intaglio surface.