

Dec. 18, 1923.

1,477,866

H. C. J. DEEKS

PRODUCING PRINTING SURFACES

Original Filed March 6, 1920

2 Sheets-Sheet 1

*Fig. 1*



*Fig. 2*

*Fig. 3*

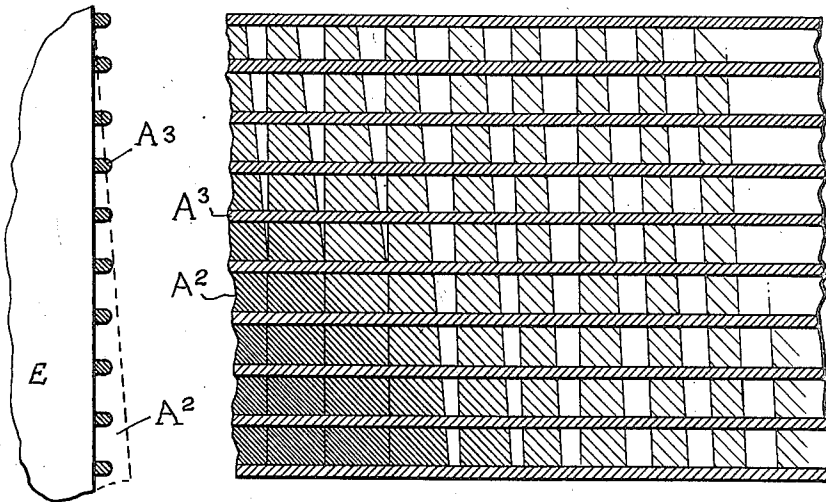
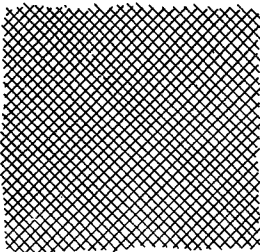


*Fig. 4*



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2 Sheets-Sheet 2

*Fig. 5*

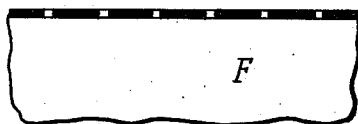


*Fig. 6*

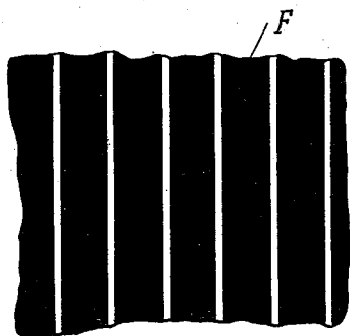


*Fig. 7*



*Fig. 8*

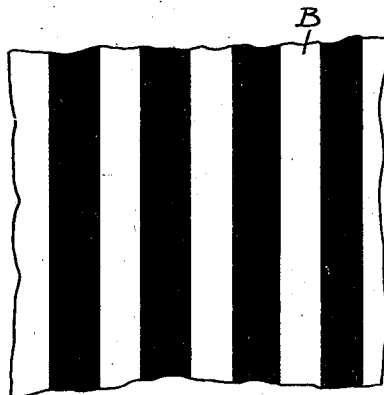
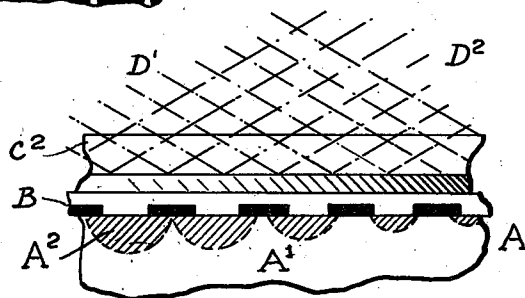


*Fig. 9*



Hiram C. J. Deeks, Inventor  
By his Attorneys  
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## UNITED STATES PATENT OFFICE.

HIRAM C. J. DEEKS, OF SEA CLIFF, NEW YORK.

## PRODUCING PRINTING SURFACES.

Application filed March 6, 1920, Serial No. 363,855. Renewed May 9, 1923.

*To all whom it may concern:*

Be it known that I, HIRAM C. J. DEEKS, a citizen of the United States, residing in Sea Cliff, county of Nassau, and State of New York, have invented an Improvement in Producing Printing Surfaces, of which the following is a specification.

My invention relates to the production of etched intaglio printing surfaces for the rotary printing process commonly called "rotogravure." More particularly, it relates to the formation of the acid resist and has for its object the better control of the action exerted by the etching fluid upon the printing surface so that accurate tone values may be rendered in all parts of the picture.

It is well known that, although rotogravure printing has been increasingly used for several years and vast quantities of pictures are now produced daily by this method, yet there is a distinct loss of the middle tones and shadow detail in all such pictures. They appear too "hard" and do not faithfully represent the tone value and delicate detail of the photographic positive from which they were made. Notwithstanding this defect the appearance of these pictures more nearly approaches that of actual photographs than it is possible to obtain by the "half-tone plate," "offset," or other cheap printing method.

The object of my invention is to remedy the defect pointed out above and thus to make possible reproductions having all the charm of the original photograph without increasing the cost of producing the printing roll or of altering the printing method in any way and putting, also, more control of the etching into the hands of the etcher.

In more particular explanation of my invention, I will refer to the accompanying drawings, which are all, necessarily, much enlarged and of which—

Figure 1 represents a sectional view, taken at right angles to the length of the roll, showing a portion of my improved resist upon the surface of the roll.

Figure 2 is a section, taken parallel to the length of the roll, showing the same.

Figure 3 is a plan view of the same.

Figure 4 shows the lines of the screen pattern running diagonally instead of parallel and at right angles to the length of the roll.

Figure 5 is a section view of a ruled grat-

ing upon glass for forming the doctor support.

Figure 6 is a plan view of same.

Figure 7 is a section view of a grating upon a thin transparent support such as celluloid.

Figure 8 is a plan view of same.

Figure 9 is a section view illustrating the action of light upon chromated gelatine when controlled by the interposition of a thin grating between the sensitive surface and a photographic plate.

The principle upon which the intaglio etching of a metal printing surface, by the photogravure method, is based, depends upon the resistance of the etching fluid by a layer of gelatine which has been temporarily (and for this specific purpose) applied to such metal surface. The gelatine layer is of different thicknesses obtained photographically which thicknesses vary proportionately to the light and shadows of the photographic positive image from which they were reproduced. The gelatine retards the biting action of the etching fluid upon the metal, in proportion to its thickness at the point of action.

Where the term "acid resist" is used in this specification, it is intended to designate the hardened gelatine applied to the metal surface, which however, as explained above, only retards the action of the etching fluid. Thus the "acid" is usually perchloride of iron and the "resist" more properly a retarder.

Owing to the complicated chemical nature of gelatine and its sensitiveness to atmospheric and other not easily controllable conditions and also to the wide variation of contrast which may readily occur between one photograph and another it becomes a matter of extreme difficulty to accomplish the etching with any degree of certainty.

It usually happens that those portions of the surface which are to print the darkest become etched too deeply before the biting action has started in those portions which are to print the lightest. This results in the "hardness" of the picture and the loss of detail in the shadows, above referred to. To lessen this defect, resort is had to stopping the etching action in those portions, before it has proceeded too deep, by painting over them with an acid resisting substance and then allowing the action to continue in the

remaining portions. This is necessarily a tiresome and expensive proceeding and does not effect a real correction of tone value.

As far as I am aware, the only other means which has heretofore been practiced for controlling the etching, has been by varying the strength of the etching fluid, it being well known that a concentrated solution acts more gradually than a weaker one. This means however, is not sufficient to make any considerable correction possible and is, moreover, both inconvenient and requiring of skill in manipulation.

In my improved method of forming the gelatine acid resist I use the above principle only partially and in conjunction with another which I have discovered and which, as far as I know, has not been applied to this art before.

I refer to the fact that chromated gelatine, when exposed to light behind, and in contact with, a grating composed of transparent and opaque lines, becomes affected, in proportion to the amount of light action exerted upon it, not only as to depth but also sideways. So that if such a grating, made upon very thin transparent material, such as celluloid, be interposed between a photographic plate and sensitized carbon tissue, in close contact therewith and exposed to light, it will be found that, upon transferring the carbon tissue to a suitable support and washing away the unaltered gelatine together with the paper back in the usual manner, the photograph will be reproduced, not only in lines of varying depth or thickness but of varying width also.

This effect can be enhanced, when making the exposure, by using two lights, separated from each other, and placed at certain angles in relation to the sensitive surface and the direction of the lines of the grating.

This arrangement is illustrated in Figure 9, which is a section view taken at right angles in the direction of the grating lines, wherein A is the carbon tissue, B is the grating upon their support, C<sup>1</sup> is the photographic film showing varying degrees of density and C<sup>2</sup> is the glass support thereof. The dotted lines D<sup>1</sup> and D<sup>2</sup> represent rays of light proceeding from two separated sources, not shown, but whose position is indicated by the angle of these dotted lines. The shaded portions A<sup>2</sup> of the carbon tissue represent the altered condition of the gelatine as effected by the light rays D<sup>1</sup> and D<sup>2</sup> passing through the transparent portions of the grating B and further show how this alteration has proceeded sideways as well as in depth in proportion to the amount of light transmitted by the positive C<sup>1</sup>.

In practicing my invention, I first sensitize a piece of carbon tissue in the usual manner and expose it to light through a parallel lined screen commonly called a grating.

This provides for very thin and uniform lines of gelatine all over the surface irrespective of the varying amounts of gelatine which are formed above and around them, from the positive image, in the next step. In the etching process, these lines cause the etching to proceed in the form of grooves so that little walls are left between, which serve to prevent the doctor or ink scraper, during the printing, from dipping into the etched portions, and, therefore, insures the etching to carry the correct amount of ink.

So far the proceeding is the same as ordinarily practiced except that I use a grating to accomplish this purpose whereas a cross-lined screen is now used. In both cases, the result is the same so far as preserving the surface height against the doctor is concerned, provided that when a grating is used it is so arranged that the direction of the lines on the printing roll is contra-parallel, or nearly so, to the edge of the doctor blade.

Figure 5 represents a sectional view of a portion of such a grating ruled upon a thick glass support. The number of rulings should be about 150 to 1 inch. It will be seen that the opaque lines are much wider than the transparent spaces between them. This proportion should preferably be about 5 to 1. The thickness of the glass support is unimportant but usually is about  $\frac{1}{16}$  of an inch.

Figure 6 is a plan view of same.

The next step, after having exposed the sensitized carbon tissue to light through the grating is to remove the grating and expose the carbon tissue through the photographic positive image which it is desired to reproduce. Herein lies the principal difference of procedure. In the ordinary course the positive is placed in contact with the tissue, which has been previously exposed through a cross-lined screen, and exposed to light for a sufficient period.

In my method, I here interpose between the positive and the carbon tissue, a grating on thin celluloid support, which I so arrange that the direction of the lines of the same will be at right angles to that of the grating through which the carbon tissue has previously been exposed. Having brought the positive, thin grating and carbon tissue into close contact by means of an ordinary printing frame, I now expose it to the combined action of two separated light sources so arranged in relation to the sensitive surface and the direction of the grating lines, as to enhance the sideways light action, from the edges of the grating lines, upon the gelatine, as illustrated in Figure 9.

Figure 7 is a sectional view of a portion of such a grating showing the opaque rulings upon the thin transparent support.

Figure 8 is a plan view of same.

The number of rulings should preferably be the same as the grating used to form the doctor support, that is, about 150 to 1 inch. The proportion of the width of the opaque lines to the transparent spaces I prefer to have 1 to 1 or equal, but this may be varied, as may also the number of rulings, without interfering with the scope of this invention. The transparent support should be as thin as possible. I prefer to use celluloid of .005 of an inch in thickness, for this grating.

Since this grating will transmit fifty per cent of the light impinged upon it, I can, by using two lights, the combined intensity of which is double that ordinarily used, effect the exposure without substantially increasing the time period.

After exposure, the subsequent steps of transferring the carbon tissue to the printing roll and washing away the paper back and unaltered gelatine, are the same as usual.

The novel form of acid resist, obtained in the manner explained above, represents the photograph in lines of hardened gelatine, varying, not only in depth but also in width, both correspondingly, to the light and shadows of the photograph, the direction of said lines being at right angles to other, very narrow, lines of hardened gelatine, of uniform width and thickness produced over the whole surface.

This formation is illustrated in Figures 1, 2 and 3. The shaded portions A<sup>2</sup> represent the hardened gelatine as affected by the light rays D<sup>1</sup> and D<sup>2</sup> after passing through the positive C<sup>1</sup> and grating B, Figure 9. The uniformly thin shaded lines A<sup>3</sup> represent the hardened gelatine as affected by exposure to light through the grating F, Figures 5 and 6. E represents a portion of the metal printing roll.

It will be seen that, instead of having, as in the usual method, an unbroken layer of gelatine (with the crossed thin lines uniformly covering the metal surface) very thick in the high lights, very thin in the shadows and graduated accordingly for the various shades between, and depending solely upon their different thicknesses and the variable nature of the gelatine, to retard the biting action of the etching fluid in the exact proportion desired, I have produced an acid resist comprised of minute parallel lines of gelatine, varying both as to thickness and width in proportion to the various tone values of the positive, and crossed at right angles by other, uniformly thin lines designed to preserve the surface height of the etching. The picture forming lines may be completely joined together in the high light and almost washed away in the deepest shadows, yet both these extremes and all the various shades between, will be repre-

sented by proportionate amounts of gelatine, broken up in the form of lines which proportionately vary in both depth and width, so that the etching fluid will have easy access to the metal in all parts of the picture, but at the same time, will be met with the requisite and proportionate amount of resistance to accurately produce all the tone values represented.

In the minute interstices of the gelatine pattern, represented in Figure 3 by the unshaded portions, it will be seen that the metal is bare to the etching fluid, and that the size of these minute bared places varies according to the lights and shadows of the picture. So that it will be understood that I produce my novel acid resist by forming a gelatine relief and at the same time breaking it up into lines having proportionately varying covering power and use both the varying depth and varying width of these lines to better introduce the etching fluid to the metal and to more proportionately retard its action, thus producing accurate tone values in all parts of the picture.

In most of the accompanying drawings, the lines of the pattern are shown as running parallel with or at right angles to the length of the roll. In practice, however, I prefer to have them run diagonally as illustrated in Figure 4.

Having now thoroughly explained my invention so that anyone familiar with the art could practice it, what I claim as novel and desire to protect by Letters Patent is:

I claim:

1. A metal printing roll for etching purposes comprising a photographic plate coated with an acid resist having picture-forming lines running in one direction, and surface-height-preserving lines running in another direction.

2. A metal printing roll for etching purposes comprising a photographic plate coated with an acid resist having parallel picture-forming lines running in one direction, and parallel surface-height-preserving lines running in another direction.

3. A metal printing roll for etching purposes comprising a photographic plate coated with an acid resist composed of parallel picture-forming lines running in one direction, and parallel surface-height-preserving lines running at right angles thereto.

4. A metal printing roll for etching purposes comprising a photographic plate coated with an acid resist composed of parallel gelatine picture-forming lines running in one direction, and parallel gelatine surface-height-preserving lines running at right angles thereto.

5. A metal printing roll for etching purposes comprising a photographic plate coated with an acid resist composed of parallel gelatine lines of proportionately vary-

ing depth and width running in one direction, and narrow parallel gelatine lines of uniform depth and width running in the opposite direction.

5 6. A metal printing roll for etching purposes comprising a photographic plate coated with an acid resist composed of parallel gelatine lines of proportionately varying depth and width crossed by other narrow  
10 parallel gelatine lines of uniform depth and width.

7. A metal printing roll for etching purposes comprising a photographic plate coated with an acid resist composed of a gelatine  
15 relief broken up into lines of proportionately varying width.

8. A metal printing roll for etching purposes comprising a photographic plate coated with an acid resist composed of gelatine  
20 lines of proportionately varying depth and width.

9. A metal printing roll for etching purposes comprising a photographic plate coated with an acid resist formed by inter-  
25 posing a thin screen having minute opaque and transparent portions, between the photographic plate and the sensitive surface.

10. A metal printing roll for etching purposes comprising a photographic plate  
30 coated with an acid resist produced by interposing a thin screen having minute opaque and transparent portions, between the photographic image and the sensitized material, and in close contact therewith.

35 11. A metal printing roll for etching pur-

poses comprising a photographic plate coated with an acid resist produced by interposing a thin screen having minute opaque and transparent portions, between the positive image and the carbon tissue, and exposing  
40 to light rays having an acute angled direction in relation to the sensitive surface.

12. A metal printing roll for etching purposes comprising a photographic plate coated with an acid resist produced by inter-  
45 posing a thin transparent material, having minute opaque rulings thereon, between the positive image and the carbon tissue, during exposure to acute angled light rays.

13. A metal printing roll for etching purposes comprising a photographic plate  
50 coated with a reticulated gelatine acid resist, composed of a series of narrow uniform lines running in one direction, crossing a series of lines of varying depth and width  
55 running in an opposite direction.

14. A metal printing roll for etching purposes comprising a photographic plate coated with a reticulated gelatine acid resist, composed of a series of narrow uniform  
60 lines, to form the surface-height-preserving walls, running in one direction, crossing and intermingling with a series of lines of proportionately varying depth and width, to form the tone values of the picture, running  
65 in the opposite direction.

In testimony whereof, I have signed my name to this specification this 5th day of March, 1920.

HIRAM C. J. DEEKS.