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A. R. JOHNSON
PROCESS FOR PRINTING
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2,149,846

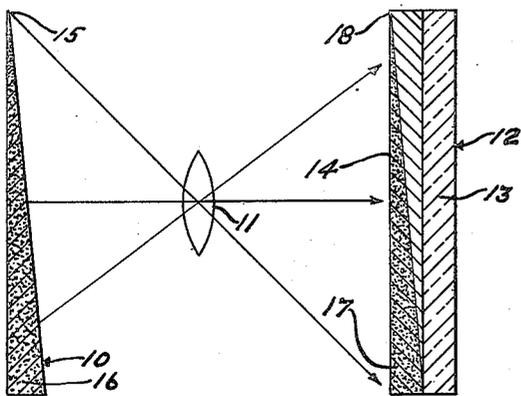


FIG. 1

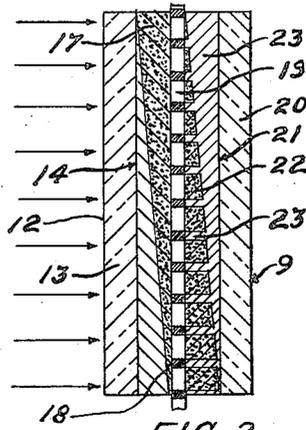


FIG. 2

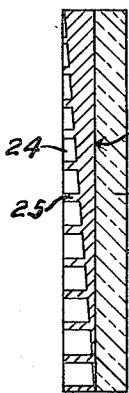


FIG. 3

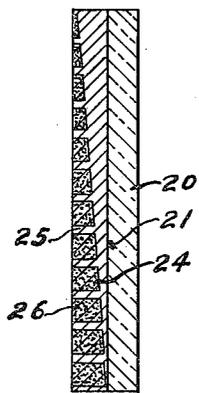


FIG. 4

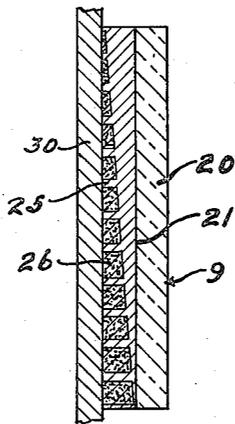


FIG. 5

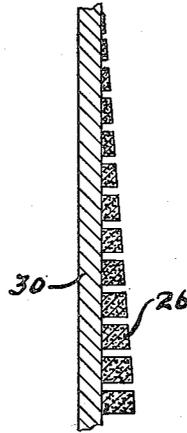


FIG. 6

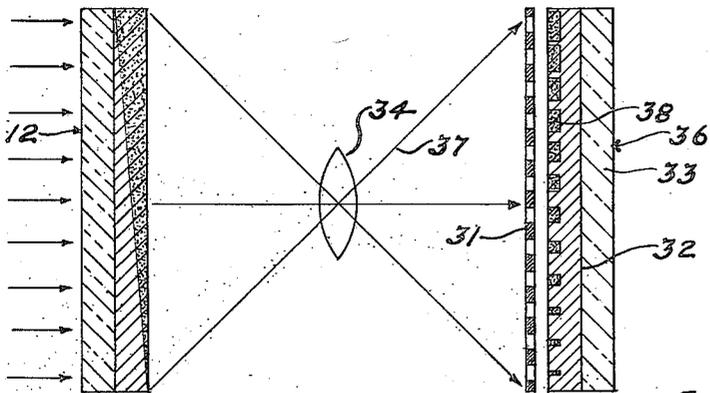


FIG. 7

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PROCESS FOR PRINTING

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8 Claims. (Cl. 95—5.6)

This invention relates to improved processes for printing, and particularly to processes for printing or duplicating photographic pictures. It has for its object producing a process or method by means of which a large number of prints may be taken very quickly, conveniently and cheaply; and the process is such that the prints may be of any color or any combination of colors that may be desired. My improvement is directed mainly towards the method of making the printing plate or matrix by means of which the printing is done.

In general my process consists in using so-called dry plates, or plates having a coating of photographic sensitive material thereon, the coating being such that, after exposure, the light affected portions may be dissolved out or removed from the coating by suitable means. In this manner the matrix is produced, the matrix being merely the original dry plate after it has been suitably exposed and developed and the light affected portions removed.

However, in order to print with the plate thus operated on, I provide over the entire surface of the coating thereon, before the exposure, a system of opaque lines or dots or other figures which cast shadows on the sensitized coating of the plate. Where these shadows fall the coating is not affected by the light and such portions are not dissolved out during the process. As a consequence, after the plate is developed and the affected portions dissolved out, these shaded lines or figures will project out from the bottoms of the depressions formed by the dissolving out of the light affected portions, and the outer surfaces of these figures will be flush with the original surface of the coating.

In this way projecting walls are formed in the depressions, and this net work of walls provide means for holding the ink in place in the depressions. When the matrix thus produced is used for printing, the depressions are filled with ink desired to be used, the ink being pressed into the minute cells produced by the figures by the use of a ductor much like a safety razor blade drawn backward. This action also removes the excess ink from the surface of the coating, leaving the unexposed portions free from ink.

In the accompanying drawing the figures are all sectional and are merely diagrammatical, and are greatly exaggerated in thickness; but they illustrate the method in general of producing the objects of my invention. Fig. 1 illustrates the method of producing a suitable transparent negative of the object that is to be printed; Fig. 2 illustrates the method of producing an

image of the object, with the net work of figures, on the plate that is to form the matrix; Fig. 3 illustrates the matrix complete; Fig. 4 illustrates the inked matrix; Fig. 5 illustrates the method of printing the image on a sheet of paper; Fig. 6 illustrates the final print; and Fig. 7 illustrates a modified method of producing a modified matrix.

In carrying out my method an ordinary negative of the object the image of which is to be made is provided in an ordinary manner. In Fig. 1 I illustrate this step. The object 10 has its image formed by a lens 11 on a dry plate 12. The dry plate consists of the supporting plate 13 and the sensitized photographic coating 14. For convenience the intensity of light passing from the various portions of the object 10 is indicated by the thickness of the object at the particular points, the intensity being inversely proportional to the thickness. Thus the end 15 is assumed to be the brightest portion and the end 16 is assumed to be substantially black. Hence the end 17 of the coating 14 will receive the maximum light effect and the end 18 the minimum; and hence in the negative thus formed the degree of light effect indicated is directly proportional to the light intensity received on the coating 14.

In Fig. 2 I illustrate the manner of producing on the coating of the matrix 9 a positive image effect of the object together with the net work of figures. The negative 12 has its coated side placed in contact with the screen 19, such as a metal or fabric screen of very fine filaments and mesh, or a perforated pellicle, or other suitable means. The screen is placed in contact with the coating of an ordinary dry plate 9. This dry plate consists of the plate 20 and the coating 21. The various elements are preferably clamped together in an ordinary printing frame.

The plate is then exposed to light passing through the negative and the screen, as indicated by the arrows, for a suitable length of time. In this manner there will be produced in the dry plate coating 21 an image of the original object and simultaneously shadow images of the screen filaments. The various portions of the dry plate coating thus will be exposed to the light inversely proportional to the amount of light passing from the original object 10, except as affected by the screen filaments. In the figure the magnitude of the light effect on the coating 21 is indicated by the thickness of the affected portions 22, the portions 23 being unaffected by the light.

The plate is then removed from the printing frame, and is then developed, fixed and washed in an ordinary manner. Either before or after the exposure of the plate 9 the coating is hardened in a suitable manner, such as by soaking it in an alum or a formaldehyde solution. The plate is then placed in a dissolving solution and the light exposed portions of the coating 21 are dissolved out. In case the coating comprises a silver halide gelatin emulsion, the exposed portions are dissolved out in proportion to the amount of silver present in those parts. In this manner an intaglio matrix is formed from the dry plate 9, as indicated in Fig. 3, and this matrix is to be used in printing or producing pictures of the object originally photographed. This matrix consists of the plate 20 with the depressions 24 in the coating 21, and, dividing these depressions up into minute cells, are the walls 25 of the net work of figures produced by the screen 19.

Before printing, these depressions, or the cells thereof, in the coating are filled with the desired ink or dye 26; the ink is scraped off from the remaining original surface of the coating, and the picture is made by the ink in the depressions. As illustrated in Fig. 4, the ink 26 fills the depressions or cells 24.

As illustrated in Fig. 5, in printing, the sheet 30 on which the print is to be made is placed against the outer surface of the coating 21, and the sheet and coating are pressed together in any suitable manner. The ink adheres to the sheet or is absorbed by it and is drawn out of the cells of the depressions. The print is thus formed, and the intensity of the light which then passes from the sheet will be inversely proportional to the depth of the ink. As stated above these diagrams exaggerate greatly the thickness of the various elements and the size of the depressions or cells and the net work walls. For instance the ink 26. In Fig. 6, which illustrates the final print, would project from the sheet only a few ten-thousandths of an inch, or it might soak into the porous structure of the sheet.

However, instead of making prints with the matrix, a transparency picture may be formed by having the plate 20 of the matrix composed of any transparent or translucent material, such as glass, celluloid or resin, and filling the cells of the depressions in the colloid layer with any pigment, dye or colored matter. If this material is allowed to dry or congeal, or otherwise to become fixed, and the surface is cleaned and polished and finished as desired, a transparent picture of the original object is thus produced, and the image may be viewed by means of light transmitted through the plate to the eye. Fig. 4 illustrates this.

Or a reflected picture may be produced by taking the transparency just described and backing it up with a sheet of white paper, or with a reflecting coating on the back of the plate. The picture may then be viewed by reflected light from the paper or reflecting coating, just as in case of an ordinary paper print. In case of a translucent plate the backing may be omitted and the image seen by the reflection from the translucent plate.

From the foregoing it will be seen that my matrix differs from the ordinary photoengraving plate in that the image is formed by the ink in the depressions instead of the ink on the elevations, as in photoengraving. Also, it may

be pointed out that my printing matrix is formed in the gelatin coating itself instead of in the copper plate as is the case in ordinary photogravure printing.

It is to be understood that variations may be made by those familiar with the art in the illustrative process hereinabove or hereinafter set forth, without departing from the spirit of my invention as set forth in the claims hereinafter. For instance, any ordinary or suitable light sensitive coating may be used on the plate, such as a colloid or resin coating, provided only that the light exposed portions of the coating can be dissolved off from the coating, leaving the unexposed portions intact.

For instance, instead of the silver halide gelatin emulsion referred to, a coating can be used consisting of a colloid, say of gelatin or albumen, containing a light sensitive ferric salt, say ferric chloride, which has the power to harden gelatin and make it quite insoluble in water. However, after the gelatin, thus hardened and dried in darkness, is exposed to light, and the ferric salt is thus reduced to ferrous salt, the gelatin becomes soluble in water in proportion to the reduction of the iron salt by light. With the use of such a plate the development is carried out by simply bathing the coating in water, which dissolves out the light exposed portions.

Also instead of a continuous screen, such as the screen 19, opaque particles may be used by attaching them either to the negative coating 14 or to the surface of the gelatin coating 21. This can be done by the use of any tacky medium. These shadow casting particles, after the exposure, are dissolved off from the coating 21 either in a separate suitable bath or in the colloid dissolving solution; or they may be removed in any other manner, leaving the general surface of the matrix smooth for inking purposes. Or spots or particles may be used that actually penetrate the surface of the coating 21 to some extent, and because of their color or chemical activity, or both, prevent photo-chemical action in the sensitive layer in which they are embedded. These particles would not necessarily have to be removed in the subsequent treatment of the matrix.

Another method of producing the ink supporting walls is the following; which is illustrated in Fig. 7: An ordinary photoengraving screen 31, or a half tone screen, of suitable dimensions may be used in place of the screen 19, but preferably spaced somewhat from the coating 32 of the plate 33. An image of the negative 12 is projected by the lens 34 through the screen 31 and onto the coating 32 of the dry plate 36 which is to form the matrix. The function of the screen is to break up the image formed in the coating 32 into small areas or dots, the size of these affected areas being roughly proportional to the brightness of the corresponding unit areas in the original object projected. Thus the areas provide the ink receiving portions and the walls thereof provide the ink supporting means.

In this case the screen 31 is spaced from the coating 32 and from the negative, and the light is transmitted through the lens 34, as indicated by the lines 37. Hence the relative distance of the various members from each other must be suitable for the purpose. But with matrices made in this manner the coating and the developing may be the same as with the screen 19; and the light exposed portions are dissolved

out in the same manner. The printing also may be carried out in the same manner as with the matrices produced by the screen 19.

I find, however, that with the method of Fig. 7, the screen 31 distributes the light on the sensitive coating 32 so that the intensity thereof per unit area is substantially uniform, but that the sizes of the areas affected vary proportionally with the light intensity at corresponding points of the negative 12. Hence, as indicated, the depressions 38 formed in the matrix are all of the same depth, but the areas of the cells of the depressions vary with the light intensity passing from the negative from corresponding points.

I claim as my invention:

1. A process for forming printing plates consisting in exposing a photographic light sensitive coating on a plate to a beam of light corresponding inversely in intensity to the light originally passing from the object the image of which is to be printed and simultaneously casting fine shadows on the coating throughout its surface, in then developing the coating, and in then dissolving out therefrom the light exposed portions thereof, whereby the plate with its intaglio surface thus formed may be used for printing.

2. A process for forming printing plates consisting in passing light through a negative of the object the image of which is to be printed and simultaneously passing the light through a net work series of minute shadow casting elements onto a photographically sensitive coating mounted on a plate, in then developing the coating, and in then etching out from the coating the light affected portions thereof.

3. A method as claimed in claim 2 in which the said coating is a gelatin silver halide emulsion.

4. A process as claimed in claim 2 in which the said net work series comprises a photoengraving screen and in which the light is passed simultaneously through the negative, the lens and the net work series.

5. A process for forming printing plates consisting in passing light through a negative of the object the image of which is to be printed, and simultaneously passing the light through a net work series of minute shadow casting elements onto a photographic dry plate, in then developing the plate coating to a metallic silver image, and in then etching out the gelatin and silver in situ of exposed areas, whereby an intaglio printing plate is produced.

6. A process for forming printing plates consisting in passing light through a negative of the object the image of which is to be printed, and simultaneously passing the light through a net work series of minute shadow casting bodies onto a photo-sensitive colloid coating on a plate, in then developing the coating to a metallic silver image, and in then etching out the light exposed portions.

7. A process for forming printing plates consisting in passing light through a negative of the object the image of which is to be printed, and simultaneously passing the light through a net work series of minute shadow casting elements onto a photographic colloid coating on a plate, in then developing the coating to a noble metal base, and in then etching out the light exposed areas, whereby an intaglio printing plate is produced.

8. A method as claimed in claim 2 in which the said coating is a colloid of gelatin containing a light sensitive ferric salt.

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