

Feb. 2, 1932.

R. A. GLASER

1,843,872

PROCESS OF MAKING PRINTING PLATES

Filed June 13, 1929

2 Sheets-Sheet 1

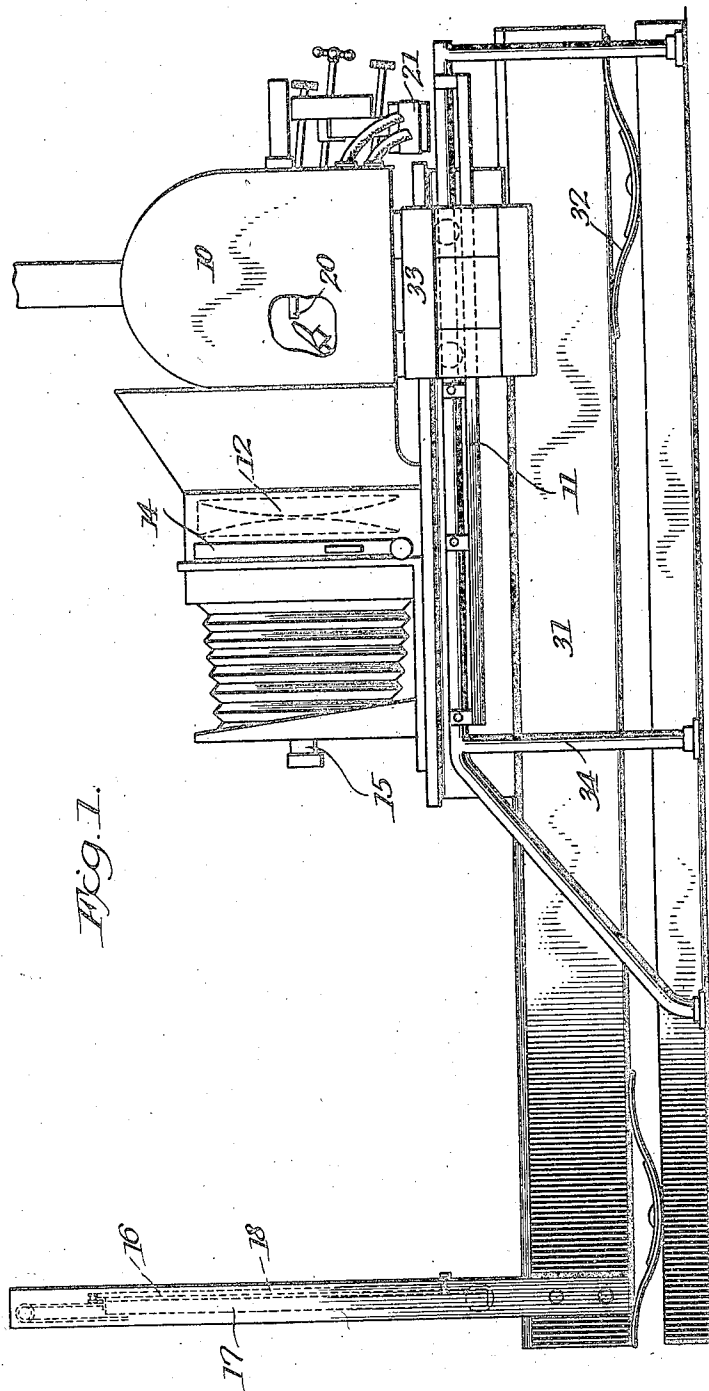


Fig. 1.

Inventor

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his Attorneys

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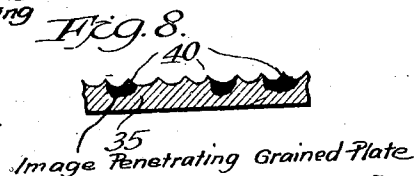
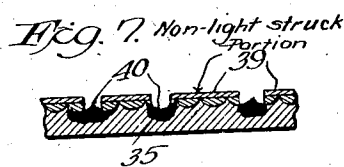
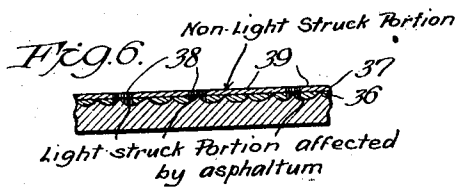
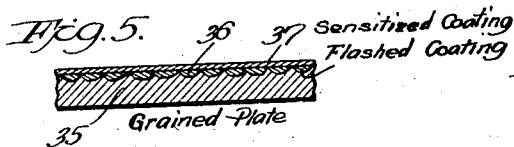
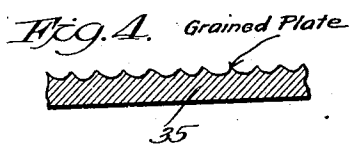
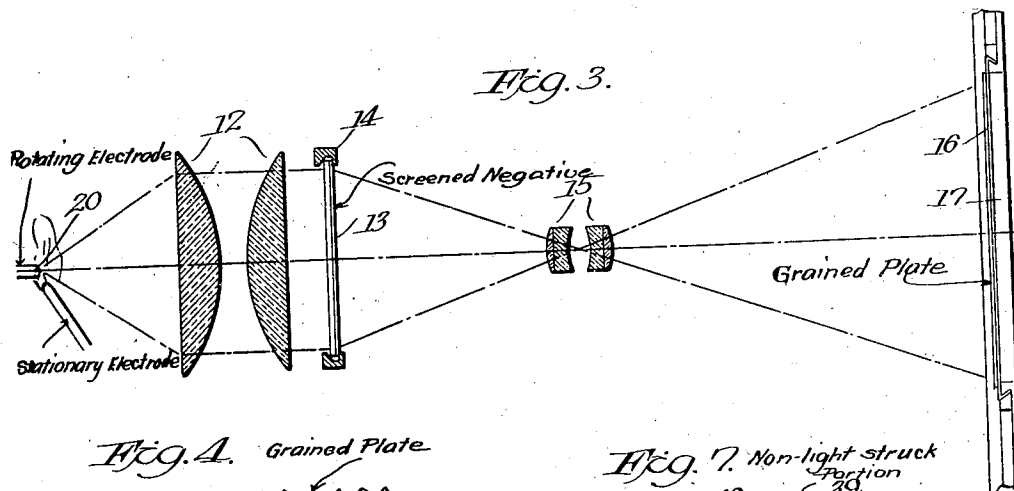
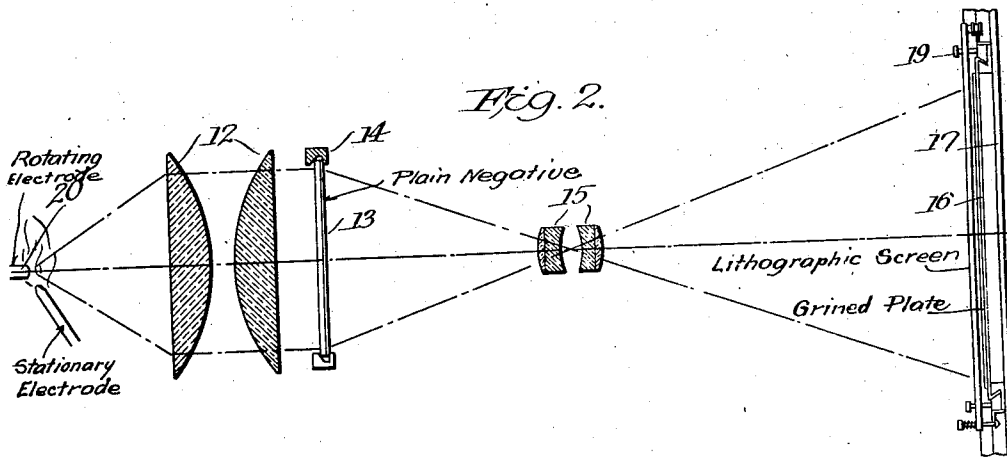
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2 Sheets-Sheet 2



Inventor

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UNITED STATES PATENT OFFICE

RUDOLPH A. GLASER, OF CLEVELAND, OHIO, ASSIGNOR TO POSTERGRAPH, INC., OF CLEVELAND, OHIO, A CORPORATION OF OHIO

PROCESS OF MAKING PRINTING PLATES

Application filed June 13, 1929. Serial No. 370,629.

This invention relates to printing plates and to processes of making printing plates generally, but is particularly advantageous as applied to printing plates made by the photographic projection method. The application is a continuation in part of my prior applications Ser. No. 235,351, filed November 23, 1927, and Ser. No. 295,266, filed July 25, 1928.

The invention, although adaptable to printing generally, is especially adaptable for pictorial multi-color work and is applicable to printing any number of colors desired, and aims to secure wholly by mechanical means the sharp detail and truthful representation of the colors of the original copy, and to improve the brilliancy and tone values of the printed copies as compared with those made by existing commercial processes and plates; to very materially shorten the time heretofore required to make a set of color printing plates, and to eliminate the hand work heretofore required for retouching and etching and correct the plates for color and tone values.

The invention further aims to enable large size plates, such as for posters and other display purposes, to be produced quickly and cheaply from small photographic plates or films, either negatives or positives, for either offset or direct printing as desired; and to enable printing plates of any size to be made direct from suitable photographic plates or films of the original copy, preferably taken through color separation filters of commercial type.

A further aim is to produce a durable printing surface that will give a large number of impressions before losing its sharp detail, and that may be readily restored for further printing by mechanical means.

Other objects and advantages of the invention will appear in connection with the following description of illustrative modes, and methods of procedure in making a set of large size printing plates suitable for multi-colored poster.

Briefly described, for all modes the process preferably starts with the artist's original painting, colored drawing, or any other conv.

which may be of any size, and comprises the following steps: making a set of color separation negatives or positives, for either offset or direct printing, which photographic plates may be either screen produced as by half-tone, mezzograph or other screens, or clear, depending upon whether or not a half-tone, mezzograph or other lithographic screen is to be used in the projection apparatus, then projecting the images of the color separation negatives or positives, directly upon the sensitized grained surface of the printing plates by the action of actinic light rays of high intensity, in a suitable projection apparatus, followed by treatment of each printing plate with a developer to develop the printing image firmly ingrained in and penetrating the plate, and cleaning up or rolling up and inking in the plate if it is to be used as a lithographic plate, or etching if it is to be used for direct printing.

In the drawings the several views illustrate the construction and arrangement of apparatus and the steps (except the color separation) in carrying out the invention that admit of illustration in this manner.

Fig. 1 is a side view of projecting apparatus suitable for transferring the images from the color separation plates to the several color plates;

Fig. 2 is a diagram illustrating the operation of projecting an image from a photographic plate through a suitable screen upon a printing plate;

Fig. 3 is a similar diagram illustrating the operation of projecting an image from a photographic plate upon a printing plate but without the screen for breaking the image up into printing dots;

Figs. 4 to 8, inclusive, are diagrams of the successive stages in the manipulation of the printing plate showing the development of the image and the formation of the printing surface for lithographic offset printing.

For purposes of illustration, the invention will be described as applied to the production of a colored poster printed in three colors, red, yellow and blue, on an offset press, thus requiring a positive image in each color printing plate which may be produced by

direct projection through a suitable color separation photographic negative. The color separation negatives may be made by photographing the original through a set of color filters and a suitable screen for breaking up the image into dots, when the process illustrated in Fig. 3 is to be used; or the screen may be dispensed with in making the negatives, the image being broken up into dots upon the printing plate by projecting it through a suitable screen for that purpose, as will be described in the process illustrated in Figs. 1 and 2. Obviously if the original is a line drawing or other copy without tone values that does not require a dot formation in the printing image, no screen need be used either in the making of the negative or in the projection apparatus, as is well understood.

Preferably the color separation is made with three color filters only, red for the blue ink plate, green for the red ink plate, and blue for the yellow ink plate, the darker shades and blacks being obtained by printing these colors one on top of another, although an additional plate may be made with a yellow filter for printing black if desired. The color separations are preferably made upon standard dry plates, preferably the same kind of plate being used for all colors, and the exposure and treatment of all negatives being similar in order to preserve the proper tone values and avoid as far as possible the necessity for retouching and etching the printing plates later on. If correct color separation negatives have been made, color correction by an artist is not necessary. If, however, the color separation negatives require correcting, this can be done by well known existing methods.

The projection of the several color separation negatives upon the respective printing plates may be accomplished by means of any suitable enlarging camera. The apparatus represented in Fig. 1 has been found satisfactory for this purpose, consisting of an arc lamp 10 or other source of high intensity light containing a large proportion of actinic rays suitable for photographic purposes, slidably mounted on rails 11 independently of the camera support, and arranged in connection with a condensing lens 12 mounted in the camera to project a beam of light through the negative 13 (see Figs. 2 and 3) which is removably mounted in a suitable holder 14 in the camera and through the projecting lens 15, the objective of which has a wide aperture and is corrected for chromatic and spherical aberration over the entire field at the widest angle of use, the beam of light finally impinging upon the sensitized plate 16 mounted parallel to the negative in a suitable adjustable holder 17 for easy removal.

If the negative is a screen produced negative the manner of projecting the image upon

printing plates may be advantageously carried out as described above and as shown in Fig. 3; but instead, the negative may be clear and the image broken up into dot formation by projection through a half-tone, mezzograph or other lithographic screen 18 (as shown in Figs. 1 and 2) positioned in front of the printing plate 16, and so arranged that the distance between the screen 18 and plate 16 may be adjusted to produce a printing dot to suit the character of the print and the ink. Preferably the screen is adjustable toward and from the plate holder 17 by means of adjustable members 19, and may be removed and another screen substituted having a different texture of grain if desired.

A suitable source of light is an arc lamp such as is used for search lights and projecting motion pictures, and which has the horizontal carbon 20 constantly rotating, being driven through suitable gearing from the motor 21, so as to keep the arc steady in one place and permit of the rays from the crater being selected by the condenser, these rays being much more actinic than those from the exterior of the corona.

The rotation of the horizontal carbon of the arc causes the spot of light of highest intensity to move in a minute circle around the axis of rotation of the carbon, projecting each white dot in the negative or screen as the case may be, as a small pencil of light which impinges on the plate in a circle around the true projected position of the dot and thereby causes the disintegration of the light sensitive coating more or less, depending upon the intensity of the light action thereon.

The dots composing the projected image thus consist of a central area strongly acted upon by the pencil of light surrounded by a penumbra less strongly acted upon. By regulating the exposure and the screen separation the tone of the image may be controlled, and the high lights freed from dots and the shadows made solid, if desired. This permits the use of the same color separation negative for producing two color plates having similar characteristics, as for example, light and dark blue, although better results may usually be obtained by making a separate color separation negative for each plate.

The photographic negative holder 14 and printing plate holder 17 must be so constructed as to hold the negatives and plates in exact alinement parallel to each other and at exactly the proper distances, respectively, from the objective 15, in order that the several negative projections shall register properly upon the plates. It is important that the negative holder be free from vibration in its own plane, as otherwise the dots in the image will not be sharp. Improved apparatus for this purpose, permitting of rapid and exact removal and replacement of the negatives, screens and plates, has been devised by me

and is clearly described in my parent application above referred to and my copending applications Ser. No. 230,133, filed October 31, 1927, and Ser. No. 371,002 filed June 4, 1929.

Preferably the photographic negative and printing plate holders, the projection lens 15 and other camera parts are securely mounted on a bed consisting of I-beams or other suitable rigid supports 31 supported by springs 32, so as to reduce vibration from movement of the building. The rails 11 which carry the base or platform 33 for the arc lamp 10 are advantageously supported by framework 34 arranged alongside the bed 31 of the camera to prevent any vibration in the lamp from affecting the negative and plate.

The negative may be any convenient size, preferably not too large for convenient handling in the usual camera and developing trays, and if a screen produced negative, it is prepared according to any desired method for making line or half tone, mezzograph or other type of photo reproduction, using a fine screen for breaking up the image into printing dots so that upon enlargement in the projection apparatus the dots will be a size suitable for printing.

The printing plate is an important element of the invention and is prepared as follows:

A metal sheet 35 (see Fig. 4) which may be of zinc or other suitable metal or alloy for use in lithographic printing, is lightly grained on its printing side to improve its affinity for water but not enough to form a printing pattern, as is well understood in the art, and is then given a very thin coating 36 of light sensitive material (see Fig. 5) which is dried by heat and motion. The slightly sensitized coating 36 is then "flushed" or exposed to light for a short interval, to harden it, whereupon it is wetted and coated again with sensitized gelatine or albumen, the second coating 37 being spread uniformly thin throughout and dried by heat and motion. The light sensitive coatings 36 and 37 should be of such character as will be penetrated and disintegrated by the intense light from the rotating carbon lamp 10, as indicated in Fig. 6, where the light struck portions 38 and the non-light struck portions 39 are clearly indicated. For this purpose the well-known bichromated gelatine or albumen coatings are satisfactory, but may be improved by treatment as hereinafter described.

In order to bring out the printing image in sharp detail in the printing plate and retain therein the tone values of the original, it is desirable that the effect of the light rays upon the sensitized surface of the plate be as monochromatic as possible, thus avoiding the corona effect due to the different foci of the several kinds of rays emanating from the light source and consequent haziness in the printed copies. To this end I find that good

results are obtained by incorporating certain dyes in the light sensitive coatings 36 and 37 in sufficient quantities to filter out and stop the undesirable light rays. Preferably I add to the coating 36, while in solution a small quantity of blue dye, which may be about 1½ oz. to 96 oz. of solution, and to the coating solution 37 I add 1½ oz. of diluted red dyes and ½ oz. of blue dye.

The length of exposure should be timed to suit the density of the negative and the amount of enlargement, and may vary from a few seconds to a longer period. The exposure of the plates for printing the lighter shades is shorter than those for printing the darker ones, due to the stronger light action.

Instead of first washing away the non-light struck portions of the coating and then rolling up the printing plate in lithographic ink, as has been the usual practice heretofore in making ordinary half tone plates and gelatine plates for offset printing, the exposed plates are flowed with a developing and penetrating composition containing a water repelling substance, preferably an asphaltum mixture containing a greasy ink, which composition is spread evenly and allowed to dry. The particular ingredients and proportions of each in the composition may be determined by experience to suit the nature of the plate, but should be sufficiently fluid to flow readily. A composition suitable for the purpose is as follows:

	Oz.	
Lithographic transfer ink.....	5	100
Lavender oil.....	4	
Asphaltum.....	12	
Benzol.....	12	
Turpentine.....	6	

The effect of the asphaltum mixture on the light struck portions 38 is to sink through and penetrate where there are printing dots in the image, leaving the non-light struck portions 39 unaffected to form water dots which do not take ink, as indicated in Fig. 7, where patches of asphaltum mixture 40 are deposited upon and firmly ingrained in the metal except when the latter is protected by the non-light struck portions 39. The asphaltum mixture adheres to the plate and penetrates its grained surface, forming what may be termed a sunken or intaglio-planographic image composed of dots corresponding to those of the negative or lithographic screen, as the case may be. The chemical action, if any, of the asphaltum on the plate is not clearly understood at this time, but it seems to have an effect upon the metal, changing its character, giving it a selective affinity for lithographic ink, so as to fix the image therein, as it has been found possible to recover the printing image after it has apparently been completely lost, without resorting to re-exposure to the master copy.

As soon as the plate is sufficiently dry after

flowing it with the asphaltum mixture, it is developed in warm water with the aid of cotton, whereupon the light sensitive coatings 36 and 37 are entirely washed away, leaving the grayish sunken image formed by the dots 40 of asphaltum mixture, as shown in Fig. 8.

The plate is then powdered with soapstone and cleaned with tannic acid and resin, or other suitable cleaning composition, following which it may be treated again with asphaltum mixed with benzol, or asphaltum varnish, to strengthen the image, and any touching up needed may be given to it in any manner known in the lithographic art before rolling it up or etching with acid to make it ready for the press in the usual way. Both lithographic and deep etched plates may be produced in this manner for offset and dry printing.

The effect of the printing is more brilliant than that produced by ordinary lithographic plates wherein the ink is carried on the surface produced by transferring an ink image to the plate, because the image is sunk into the grained surface of the plate and the latter takes a thicker body of ink for transfer to the print.

Printing plates produced as above described are more faithful reproductions of the original copy than those produced by means of paper transfers, which are subject to distortion of the image both by stretching of the paper and squeezing of the transfer ink on the surface of the paper by the heavy pressure of the transfer press.

By using a very fine screen for the negatives a suitable size dot for poster and display printing may be obtained. This has not been possible commercially heretofore with half tone enlargements because very large and correspondingly expensive color separation negatives and screens were required. The tone values and color effects of half tone plates, and plates made by the mezzograph or other processes, are thus made possible for large prints with a minimum amount of hand etching and filling in and at a reasonable cost because of the small size of the photographic plates used in this process.

Moreover, the process is very rapid, requiring but a few hours for the completion of a set of plates for printing in three or more colors, and is correspondingly cheap on account of the operations being mostly such as can be performed by ordinary workmen without repeated etching and special treatment by artists to correct the color and tone values.

What I claim and desire to secure by Letters Patent is as follows:

1. The method of making lithographic printing plates photographically which consists in projecting a suitable photographic

image upon the sensitized surface of a printing plate by concentrating the actinic rays of a beam of light of high intensity selected from the crater of a rotating arc through a suitable photographic negative, and through a projecting lens directly upon said sensitized surface of said plate, and developing the image thus produced upon said plate to receive ink.

2. The method of making lithographic printing plates photographically which consists in projecting a suitable photographic image upon a sensitized surface of a printing plate by concentrating the actinic rays of a beam of light of high intensity selected from the crater of a rotating arc through a suitable screen produced photographic negative, through a projecting lens directly upon said sensitized surface of said plate, and developing the image thus produced upon said plate to receive ink.

3. The method of making lithographic printing plates according to claim 1 characterized by the beam of light being of sufficient intensity to destroy the continuity of the sensitized surface of the printing plate to give it a selective affinity for the developing medium.

4. The method of making lithographic printing plates as defined in claim 2 characterized by the image on said photographic negative produced through a half tone screen.

5. The process of making printing plates by photographic reproduction from copies which comprises projecting a suitable image by an unobstructed light source through a lithographic screen directly upon a sensitized lithographic plate and developing the image thus produced on said plate to receive lithographic ink.

6. The process of making printing plates for multi-color work by photographic reproduction from copies which comprises making photographic reproductions through respective color filters, and projecting said reproductions by an unobstructed light source through a lithographic screen directly upon a sensitized lithographic plate and developing the image thus produced on said plate to receive lithographic ink.

7. The process of making printing plates for multi-color work by photographic reproduction from copies which comprises making photographic reproductions through respective color filters, and projecting said reproductions through a lithographic screen directly upon a sensitized lithographic plate and developing the image thus produced on said plate to receive lithographic ink, said screen being manipulated to produce different size printing dots for different colors to suit the character of ink.

8. The process of making intaglio-planographic printing plates by photographic reproduction from negatives or positives which

comprises projecting the image by a powerful beam of light through a lithographic screen directly upon a sensitized lithographic plate and developing the image thus produced on said plate to receive lithographic ink.

9. The process of making printing plates by photographic reproduction from negatives or positives which comprises projecting the image through a lithographic screen having an irregular grain effect directly upon a sensitized lithographic plate and developing the image thus produced on said plate to receive lithographic ink.

10. The process of making printing plates by photographic reproduction from copies which comprises selecting the actinic rays produced at the crater of a rotating arc lamp and projecting a suitable image through a lithographic screen directly upon a sensitized lithographic plate and developing the image thus produced on said plate to receive lithographic ink.

11. The process of making multi-color printing plates which comprises making a series of color separation negatives or positives by photographing the original subject through color filters, and projecting the color separation images by an unobstructed beam of light through a lithographic screen directly upon suitably prepared light sensitive printing plates.

12. The process of making multi-color printing plates which comprises making a series of color separation negatives or positives through color filters, one for each primary color, and projecting the color separation images each through a selected lithographic screen for the particular shade of color desired, directly upon suitably prepared light sensitive printing plates.

13. The process of making multi-color printing plates which comprises preparing the color separation negatives or positives through color filters corresponding to the primary colors, and projecting the respective images upon a series of light sensitive printing plates, one for each color of ink desired, the projection being made through the primary color separation image corresponding to the color and the one of a series of lithograph screens of graduated grain corresponding to the ink to be used on the particular plate, and the exposure being made to suit the shade or tint, substantially as described.

14. The process of making printing plates from photographic copies which comprises projecting a transparent image through a lithographic screen directly upon a sensitized grained printing plate by the action of a beam of light of sufficiently high intensity to disintegrate the sensitized coating of said plate and treating the image thus produced to affix the image firmly ingrained in said plate, thereby producing a printing surface.

15. In the method of making printing plates as set forth in claim 1 characterized by the use of dyes embodied in the sensitized coating of the plate for filtering out undesirable rays emanating from the light source.

16. The method set forth in claim 1 wherein the sensitized coating for the printing plate is sensitive to the most actinic of the rays of said light and is insensitive to all other rays.

17. The step of the method of forming enlarged intaglio-planographic printing members characterized by minute printing dots from smaller photographic plates which consists in projecting the image of a screen produced photographic plate through a suitable lens directly upon the light sensitive surface of a printing plate by a beam of light of sufficient intensity to disintegrate the light sensitive surface of said plate according to the photographic image.

18. The step of the method of forming enlarged photographic printing members characterized by minute printing dots from smaller photographic plates which consists in projecting a beam of light from a light source moving in a closed path transversely of the axis of said beam through a screen produced photographic plate and a suitable projecting lens directly upon a light sensitive surface of a printing plate to change the character of said light sensitive surface according to the image of the photographic plate.

19. The method of transferring photographic images upon the light sensitive surface of a printing member which consists in making a screen produced photographic reproduction of the image upon a transparent plate, mounting said plate and sensitized printing member in parallelism in an enlarging camera with a projection lens between them, collecting actinic rays from a powerful light source and passing them through the transparent plate in a parallel beam to project the image thus produced directly upon the sensitized printing member while maintaining said plate and printing member immovable for a predetermined time such that the cumulative effect of the rays renders the light struck portion of the sensitized surface penetrable by a water-repelling fluid.

20. The method of transferring photographic images upon the light sensitive surface of the printing member which consists in making a screen produced photographic reproduction of the image upon a transparent plate, mounting said plate and sensitized printing member in parallelism in an enlarging camera with a projection lens between them, collecting actinic rays from a powerful light source and passing through the transparent plate in a parallel beam, moving the light source in a closed path transversely of the axis of the beam, and project-

ing the image thus produced upon the sensitized printing member for a predetermined time while maintaining said plate and printing member immovable.

5 21. The method of transferring a series of photographic images of a subject made through color filters upon the light sensitive surface of a series of printing members which consists in making a separate screen produced
10 photographic reproduction of each image upon a series of transparent plates, mounting said plates and printing members taken one of each at a time in parallelism in an enlarging camera with a projection lens between them, collecting actinic rays from a powerful light source and passing them through the successive transparent plates in a parallel beam and projecting the images thus produced upon the respective sensitized
15 printing members for a predetermined time, while maintaining the successive sets of said plates and printing members immovable in the same relative location with respect to the lens for the entire series.

22. A printing plate of the type produced by the graduated tone process having a characteristic arrangement of ink-receiving areas with sharp outline conforming to a photographic image having a characteristic screen formation projected upon the printing plate by the action of high intensity light, such that the ink-receiving areas penetrate said plate and have a graduated intensity of penetration greatest in the center.

23. A printing plate of the type produced by the graduated tone process having the characteristic arrangement of ink-receiving areas with sharp outline conforming to a photographic image projected from a screened negative directly upon said plate by the action of high intensity light, such that the ink-receiving areas penetrate said plate and have a graduated intensity of penetration greatest in the center.

24. The step in the production of printing plates that comprises projecting a photographic reproduction taken through a screen, directly onto a sensitized grained printing surface by means of rays of actinic light emanating from a regularly moving source rotating about the axis of projection, substantially as described.

25. The step in the production of printing plates which comprises projecting a photographic reproduction directly onto a sensitized surface by means of rays of actinic light emanating from a regular moving source rotating about the axis of projection and of sufficient intensity to disintegrate said sensitized surface according to the characteristics of the projected image.

26. The step in the projection of an image having printing areas of graduated intensity from a photographic plate upon a printing plate which comprises selecting rays of light

from the crater of an arc lamp having a rotating electrode and passing them through said photographic plate for a predetermined time sufficient to affect exposed portions with graduated intensity diminishing toward their edges.

27. The process of producing a large lithographic printing plate by direct projection from a smaller screen produced photographic image which comprises concentrating a powerful beam of light through said image upon the sensitized coated plate of sufficient duration and intensity to cause the exposed areas of said sensitized coating to become permeable to a developing medium substantially as described.

In testimony whereof, I have signed my name to this specification.

RUDOLPH A. GLASER.

7

CERTIFICATE OF CORRECTION.

Patent No. 1,843,872.

Granted February 2, 1932, to

RUDOLPH A. GLASER.

It is hereby certified that the above numbered patent was erroneously issued to "Postergraph, Inc., of Cleveland, Ohio, a corporation of Ohio", whereas said patent should have been issued to Gardner Abbott, as Trustee, as assignee by mesne assignments of the entire interest in said invention, as shown by the records of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 22nd day of March, A. D. 1932.

(Seal)

**M. J. Moore,
Acting Commissioner of Patents.**