

UNITED STATES PATENT OFFICE.

WILLIAM J. WILKINSON, OF NEW YORK, N. Y.

PROCESS FOR PRODUCING HALF-TONE RELIEF PRINTING-PLATES.

1,054,790.

Specification of Letters Patent.

Patented Mar. 4, 1913.

No Drawing.

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To all whom it may concern:

Be it known that I, WILLIAM J. WILKINSON, a citizen of the United States, and a resident of New York, county of New York, and State of New York, have invented certain new and useful Improvements in Processes for Producing Half-Tone Relief Printing-Plates, of which the following is a specification.

My invention relates to the producing of relief plates for printing pictures in half-tone. It is applicable either to color or monotone work.

The object of my invention, generally speaking, is to largely decrease the cost of producing high grade half-tone pictures while maintaining a high quality of work and obtaining more accurate and uniform results than have heretofore been possible.

In order to obtain a clearly defined picture with a satisfactory tone range (and in color work with the desired color value) it has heretofore been necessary to depend upon a large amount of skilled hand work upon the printing plates and a number of successive etchings of different portions of the plate. The expense of this hand work and successive etchings make up the greater part of the expense of reproducing pictures in half-tone. While this hand staging has been in some cases done away with by a sort of differential etching known as machine etching, yet this is only possible on certain classes of work and produces relatively inferior results. The necessity for a differential etching or the successive etchings following the hand staging is well understood in the art, but will be explained hereinafter in the course of the detailed description.

By my invention I eliminate, wholly or in the greater part, the necessity for hand staging by providing a differential etching which is carried on in accurate conformity with the tone depths of the original picture. By such a differential etching the amount of etching to which the different portions of the plate are subjected varies in accordance with the depth of tone of the corresponding portions of the original picture. I control the differential etching action on the different parts of the plate by photographic means so that no matter how slightly the different portions of the plate may vary in tone there will be a corresponding variance in the amount of etching which they receive.

My invention therefore consists in a novel

process for producing half-tone printing plates.

I have not provided any drawings to accompany this specification because the process and the product can be fully understood from a written description alone, whereas drawings would not suitably show any feature of my invention or assist in understanding it because it is impossible to adequately show the character of good half-tone pictures in such drawings as are required by the rules of the Patent Office and the methods of reproduction of drawings used by the Patent Office are inadequate to properly illustrate half-tone pictures.

My invention may best be understood by first briefly describing the method now ordinarily used for producing half-tones by which the necessity of etching different portions of the printing plate a different length of time will be understood. The ordinary practice of the art is to first produce a half-tone negative of the picture or object to be reproduced. This is effected by photographing the picture or object upon a sensitized plate, there being a screen interposed between the lens of the camera and the plate. This screen is a glass plate with a screen formed upon it by fine lines or irregular grain or otherwise. In making this exposure the time is such and the diaphragm or diaphragms of the lens used are such as to produce upon the negative opaque and transparent spots all over the same, but these spots vary relatively to each other in size according to the tone depths of the different portions of the picture or object to be reproduced in half-tone. In making this negative it is necessary to control the time of exposure so that an added depth of tone is introduced, that is, in the negative the area of transparent spots will be larger than it would be if a positive to be printed from it were to have the original tone range of the picture or object to be reproduced. The reason for thus deepening the tone will presently appear. This negative thus photographed through a screen will hereafter be referred to as the half-tone negative. From this half-tone negative a positive is produced upon a metal plate by any of a number of known processes, the picture being in the form of raised spots of material capable of resisting the action of the etching fluid to be used. The plate is then given an etching, the more usual etching fluid used

being a perchlorid of iron solution, where copper or brass plates are used and nitric acid where zinc plates are used. This etching is what is known as a flat etching, and I will hereinafter refer to the half-tone printing plate as it is after this etching as the flat-etched plate. I have previously stated that in taking the original half-tone negative the exposure has been under such conditions as to introduce a deepening of tone over the entire picture. The reason for doing this is that if only the required tone is given the dark spots on the high lights of the picture will be so small that before a sufficient depth of etching for printing can be obtained the side walls of these spots will be entirely eaten away. On the other hand a single flat etching to the necessary depth for proper printing will not produce the proper tone range even though the extra tone has been added to the plate, because the flat etching that will continue long enough to produce the proper effect in the high lights will have etched away too much of the walls of the recesses in the darker portions of the picture and so the darker portions of the picture will be too light. The result of the flat etch is therefore to bring the darkest portions of the picture to substantially the proper tone, while all the lighter portions of the picture are still of too deep a tone. Therefore, in the better class of work the practice is to take the flat-etched plate and paint over by hand with a material that will resist the etching fluid such portions of the plate as have been brought to the proper tone by the flat etch. Having done this the remaining portions of the plate are given a second etching until the next darker portions of the plate have been reduced to the proper tone. These portions are now painted over in the same manner by hand and a further etching given. Several of such successive paintings and etchings are ordinarily given. This part of the work requires highly skilled labor and the uniformity and accuracy of the results depends upon the skill and the judgment of the individual hand stager. Moreover, it is not possible to give a different staging to each of the numerous tones of the picture. The result is that portions of somewhat different tone strength are given exactly the same etching, whereas they should have somewhat different periods of etching. For some cheaper classes of work what has been known as a machine etching has been employed. This is a sort of differential etching produced by such agitation of the fluid with reference to the plate as would tend to make the circulation of the etching fluid vary in rapidity with the size of the flat-etched recesses. A high grade of work with full tone range cannot be produced by this method.

By my process I give to the flat-etched plate a differential etching during which the lightest portions of the picture are first brought into contact with the etching fluid, then the next lighter portions, and so on through every depth of tone. I effect this result by coating the plate after it has been flat-etched with a film which is penetrable by or permeable to the etching fluid in inverse proportion to the depth of tone of the original picture or object to be reproduced. I produce this coating photographically so that each point thereof will have a permeability for the etching fluid corresponding to the depth of tone of that portion of the original picture or object to be reproduced by photographic means.

Just before or just after I take the half-tone negative of the picture or object to be reproduced I take a second picture of the same object or picture in the same camera and at the same focus, introducing between the lens and the sensitive plate a glass similar to the glass carrying the screen but itself unprovided with a screen. The negative thus obtained is developed. The flat etched plate is resensitized with a film of such a character that it, when exposed to the light will be slowly penetrable by the etching fluid used and be more slowly penetrable the more it has been exposed. Good materials for this purpose are the bichromated glue films of the art. Having thus resensitized the flat-etched plate I expose it to the light through the ordinary or non-screen negative. I may then wash the plate with the exposed film in water to remove the portions that have not been exposed, that is the strong whites of the original picture being the strong blacks of the negative, but for some types of work I prefer not to have this preliminary washing. The film is a coating which covers the etched away portions as well as the unetched portions at all parts of the plate. This exposed film will have the varying degrees of permeability to the etching fluid previously described. The plate is then etched. The character of the film being as I have explained, the etching fluid will first attack the high lights of the plate which were thoroughly protected by the opaque portions of the non-screen negative, but the walls of the darker portions of all parts of the plate which are covered by the film are protected from the etching fluid. Gradually as different portions of the film are penetrated by the etching fluid one portion after the other of the plate becomes subject to the action of the fluid so that each successively darker portion of the picture or object to be reproduced will successively begin to be etched. Instead, therefore, of having a few different periods of etching for a few different portions of the plate I am able to provide a single differential etch-

ing which will give different portions of the plate as many different periods of etchings as there are differences of tone in the picture or object to be reproduced. Moreover, instead of the various periods of etching being determined by the judgment of the operator and the proper portions to be included in the different periods being governed both by his judgment and by his skill, the different portions by my invention are accurately determined by photographic methods and the different periods of etching are also determined by photographic means. For certain classes of work I may vary the process by substituting for the flat-etched plate previously described an even flat-etched plate, that is, a plate which is not produced from a half-tone negative of the picture or object to be reproduced, but is produced from a screened negative equally exposed to light at all points. This flat-etched plate will give the necessary depth for printing but if it were printed from without the differential etch would simply show uniform sized black dots throughout. By re-sensitizing such a plate and exposing it through an ordinary negative of the picture or object to be reproduced and then treating it as previously described to a differential etching, which will result from the fact that it is placed into the etching bath with a coating which at its different portions varies in permeability in accordance with the tone of the original picture, a printing plate will be produced which can be satisfactorily used and show the different tones of the picture. I prefer, however, in most classes of work to get such difference of tone as is possible in the flat etching in the manner previously described before giving the plate the differential etching which I have devised.

In some cases it may be desirable to supplement my invention by some use of hand staging or machine etching and I do not wish to limit myself to a process wherein my novel differential etching is the only differential etching given.

In the printing of half-tone color pictures three or four printing plates are ordinarily employed, three for different colors and one for black, the picture being produced by superimposing the impressions from the three or four plates upon a single sheet. The applicability of my invention is exactly the same to color work as to monotone work, the differential etching above described being given to the printing plate for each color after it has been flat-etched.

In employing my invention in color work certain distinct advantages are obtained. The most important matters in color work are the obtaining of a true color separation in the negatives of the picture or object to be reproduced and the proper development

of the color values during the etching of the printing plate. Prior to my process the color separation for the different printing plates had been obtained by taking half-tone negatives through color screens, different sensitive materials being used for the different colored negatives. In taking the picture, under these circumstances, the screen renders the separation of the colors incomplete. On the other hand, by the employment of my process separation is effected much more accurately by the non-screen negative taken through a color screen and thereafter exposed upon the sensitized flat-etched plate as previously described. In the matter of so etching the printing plates as to develop the proper color values the difficulty in the old process is that the hand stager for each of the printing plates must select the portions to be protected from the etching fluid at each successive staging in accordance with the color of the original picture or object to be reproduced and this, even with the highest skill, can only be approximated. As the color value is a resultant of the combined tone depth of the different color photographs and as my process etches in accurate conformity with each tone depth, the color values are correctly reproduced in the resultant picture because the tone depths of each printing plate have been accurately reproduced.

By practicing my process as above described I produce a new printing plate having distinctive characteristics as compared with any half-tone printing plates heretofore made. It is characterized by the fact that portions of the plate corresponding to different tone strengths have been etched for different periods of time even though the difference in tone strength is slight. In the hand staging the different periods of etching each include portions of the plate that correspond to different tone depths because the hand staging is at best an approximation. If there are four stagings there must in some or all of these stagings be an equal etching of portions of the plate that vary more or less in tone depth. My new plate is also characterized by the fact that there are not a definite number of depths of etch on the plate, but that the lower etched surface gradually and smoothly varies from the greatest depth to the least.

I have described my improved process in considerable detail as well as the process heretofore employed for high grade work in order that I might disclose the best form of practicing my invention now known to me, but I do not desire to be limited to the particular details set forth in the foregoing description but only to the substantial features of my invention as set forth in the appended claims.

Having thus described my invention, 130

what I claim as new and desire to secure by Letters Patent is:

1. In the art of producing half-tone relief printing plates, treating a plate to obtain a half-tone surface, applying to such surface a coating which, at different portions of the plate, is differently permeable to or penetrable by the etching fluid, and etching the plate while thus differentially protected.

2. In the art of producing half-tone relief printing plates, the method of controlling the tone range which consists in treating a plate to obtain a half-tone surface, etching the same while protected by a coating that at different parts of the plate is differently permeable to, or penetrable by, the etching fluid.

3. In the art of producing half-tone relief printing plates, the method which consists in etching a half-tone printing plate, coating said plate with a film having different degrees of permeability to an etching fluid, and again etching the plate while thus coated.

4. In the art of producing half-tone relief printing plates, the method which consists in producing a flat etched half-tone plate, photographing the picture or object to be reproduced, sensitizing the flat etched plate, exposing the same to light through a negative of the picture or object to be reproduced, and etching the plate through the exposed coating.

5. In the art of producing half-tone relief printing plates, the method which consists in treating a plate to obtain a half-tone surface and then differentially etching said plate by subjecting it to an etching bath while its surface is coated with a film adapted to differentially retard the etching in accordance with the different shades of the picture or object to be reproduced.

6. In the art of producing half-tone relief printing plates, the method of producing a printing plate which includes treating a plate to obtain a half-tone surface and then etching said plate while protected by a coating photographically rendered differentially permeable to or penetrable by the etching fluid in accordance with the tone strengths in the picture or object to be reproduced.

7. The method of producing a half-tone relief printing plate, which consists in treating a plate to give it a half-tone surface and then giving an etching to such surface during which the etching fluid is first brought into action on the high lights and is then gradually brought into action successively upon other portions in inverse order to the depth of tone at such portions.

8. The method of producing a half-tone relief printing plate, which consists in treating a plate to give it a half-tone surface and then giving an etching to said plate during

which the etching fluid is caused to act for different times on different parts of the plate, such different times being measured photographically in accordance with the tones of the different parts of the original picture or object.

9. In the art of producing half-tone relief printing plates, the method which includes the production of a printing plate by two etchings, the first being carried on while the plate is covered with a fixed half-tone film, and the second while it is protected with a film photographically made differentially permeable to the etching fluid.

10. In the art of producing half-tone relief printing plates, the method which consists in producing a half-tone flat-etched plate, sensitizing the etched surface thereof with a film adapted to have a varying permeability to an etching fluid with varying light exposure, exposing said sensitized etched plate through a negative of the picture or object to be reproduced, and etching the printing surface through said exposed film.

11. In the art of producing half-tone relief printing plates, the method which consists in producing a half-tone flat-etched plate, sensitizing the etched surface thereof with a film soluble in water when unexposed to light and adapted to have a varying permeability to an etching fluid with varying light exposure, exposing said sensitized etched plate through a negative of the picture or object to be reproduced, washing the plate in water, and etching the printing surface through said exposed and washed film.

12. The method of producing half-tone relief printing plates which consists in preparing a half-tone negative, exposing a sensitized plate through the same, removing the unexposed and fixing the exposed portions of the film upon the plate, etching the plate, resensitizing the etched surface, exposing the same through a negative of the picture or object to be produced, and etching the plate while protected by the exposed film.

13. The method of making half-tone relief printing plates consisting in making a half-tone negative and an ordinary negative of the picture or object to be reproduced, producing a positive from the half-tone negative upon a sensitized plate, treating the same to produce an etched half-tone plate, resensitizing the plate, exposing the resensitized plate through said ordinary negative, and etching the plate while different parts of the same are differently protected from the etching fluid by the exposed film.

14. In the art of producing half-tone relief printing plates, the method which consists in taking a half-tone negative and an ordinary negative of the picture or object to be portrayed, exposing a sensitized plate

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through the half-tone negative, fixing the exposed portions of the film, etching the plate, resensitizing the plate over its entire etched surface, exposing the plate through the ordinary negative, and re-etching the plate while differentially protected by the differentially exposed film.

15. In the art of producing half-tone relief printing plates, the method which consists in taking a half-tone negative and an ordinary negative of the picture or object to be portrayed, exposing a sensitized plate through the half-tone negative, fixing the exposed portions of the film, etching the plate, resensitizing the plate over its entire etched surface, exposing the plate through the ordinary negative, dissolving the unexposed portions of the film, and re-etching the plate while differentially protected by the differentially exposed film.

16. The method of making half-tone relief printing plates consisting in making a half-tone negative and an ordinary negative of the picture or object to be reproduced, the ordinary negative being taken at the same focus and through a glass plate, producing a positive from the half-tone negative upon a sensitized plate, treating the same to produce an etched half-tone plate, resensitizing the plate, exposing the resensitized plate through said ordinary negative, and etching the plate while different parts of the same are differently protected from the etching fluid by the exposed film.

17. The method of making half-tone relief printing plates consisting in making a half-tone negative and an ordinary negative of the picture or object to be reproduced, producing a positive from the half-tone negative upon a sensitized plate, treating the same to produce an etched half-tone plate, resensitizing the plate, exposing the resensitized plate through said ordinary negative, washing the exposed plate in water, and then etching said plate while protected by the parts of the film insoluble in water.

18. In the art of producing half-tone relief printing plates, the method which consists in first preparing a printing plate having the half-tone picture thereon as a film insoluble in etching fluid, said picture being over-shaded throughout, etching the plate,

sensitizing the etched portions of the picture surface, treating this sensitive coating to give it a resistivity to the etching fluid varying with the shades of the picture to be produced, and then etching said plate while protected with the coating thus treated.

19. The method of producing half-tone relief printing plates, which consists in preparing a half-tone negative by photographing through a glass plate carrying a screen and an ordinary negative by photographing at the same focus through a glass plate having no screen, producing a half-tone etched plate from the half-tone negative, sensitizing the etched surface, exposing the same through the non-screen negative, and etching the plate while differentially protected by the exposed film.

20. A method of producing half-tone relief printing plates, which consists in preparing a flat-etched plate, sensitizing the etched surface with a bichromated film, exposing the film through a negative of the picture or object to be reproduced, and placing the plate with the exposed portions of the film in an etching bath.

21. The method of producing half-tone relief printing plates, which consists in preparing a half-tone etched plate, then etching said plate while the outer portions of the etched surface are covered with a coating impervious to the etching fluid and the depressions in said surface are covered with a coating having a varying penetrability or permeability to the etching fluid.

22. The method of producing half-tone relief printing plates, which consists in preparing a plate having a finely divided surface with numerous portions thereof in the same plane, and then etching said plate while said portions are covered with a coating impervious to the etching fluid and the remaining portions of said surface are covered with a coating having a varying penetrability or permeability to the etching fluid.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

WILLIAM J. WILKINSON.

Witnesses:

HENRY B. STYLAN,
EDWIN SEGER.