Nov. 17, 1925. 1,562,324

W. GRASS

LITHOGRAPHIC PLATE AND METHOD OF MAKING THE SAME

Original Filed May 14, 1920

Fig. 1

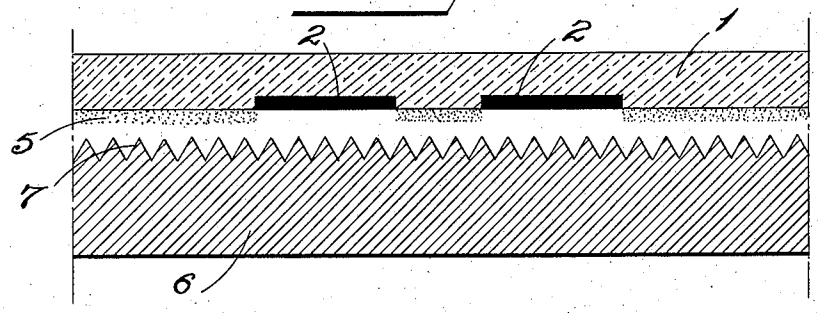


Fig. 2

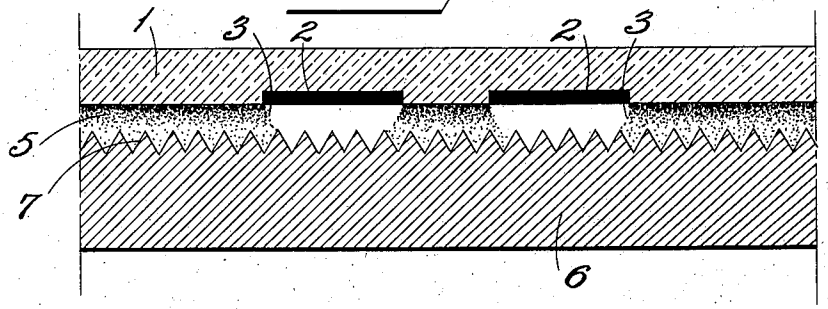
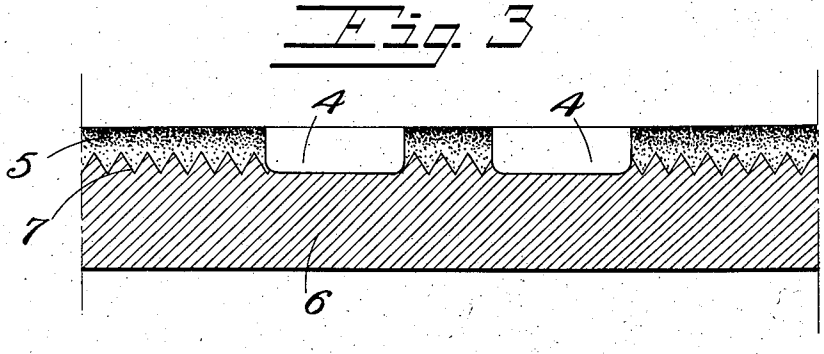


Fig. 3



Inventor

William Grass,

Witness

Russel N. Low

By H N Low

Attorney

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UNITED STATES PATENT OFFICE.

WILLIAM GRASS, OF WEEHAWKEN, NEW JERSEY, ASSIGNOR TO GRASS PATENTS CORPORATION, OF NEW YORK, N. Y.

LITHOGRAPHIC PLATE AND METHOD OF MAKING THE SAME.

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To all whom it may concern:

Be it known that WILLIAM GRASS, citizen of the United States, residing at 722 Park Avenue, Weehawken, in the county of Hudson and State of New Jersey, has invented certain new and useful Improvements in Lithographic Plates and Methods of Making the Same, of which the following is a specification.

My invention relates to lithographic plates for printing by either the offset or direct method, and to an improved method or process of producing such plates by which the action of the etching agent is limited and prevented from spreading through the grain of the plate beyond the parts of said grain which are designed to be removed.

This process and the result thereof has relation to that described in the Patent No. 1,155,352 granted to Jacob Grass, October 5, 1915, but it is to be understood that my present invention can be used in connection with such patented process or variations thereof and also in connection with or as a part of other processes in which it is adaptable.

The main idea and feature of said patented process is the production of a lithographic printing plate in which the greasy ink-holding lines and dots are not laid upon the extreme top surface of the grain of the plate but are in etched recesses slightly below the top surface.

This has been described as intaglio but such description is misleading because said etched plate is quite different from a true intaglio, such as a copper plate, and could not be printed from in the same way.

The etched plate produced according to the present improvement is cut away, where it is to take ink, to the slightest possible depth, which may in practice be only to such extent as to destroy or remove the water holding and ink repelling grain.

By the present improvement the etching action is modified and controlled so as not to go beyond the intended boundary and not to an undesirable depth and so as not to work laterally into the grain and colloid coating which is not to be removed.

This last mentioned beneficial result prevents the degrading of the outlines and leaves the boundaries between the etched and grained parts very sharply defined, and the sharpness of the printing as well as the durability of the plate are enhanced.

To more easily comprehend the invention herein disclosed I have appended herewith three diagrammatic views to help illustrate just the action taking place in the carrying out of this process.

Fig. 1 represents a sectional enlargement of a plate having a grained surface and coated with a colloidal film, a transparency having a design thereon is placed over the film and the whole subjected to light action to harden the film wherever the light penetrates.

On account of the appreciable thickness of the colloidal film there is a slight diffusion of the light rays at the defined edges of the design causing what is known as halation.

This halation effect produces a variable hardening of the film by slightly undercutting the edges of the design, a graphic representation of this action would be like Fig. 2 wherein the stipple effect represents the maximum and minimum hardness produced in the film by the light. It is seen that the halation produces a slight hardening just under the edge of the design or dot.

Fig. 3 shows how this partial halation hardening is removed by the properly balanced etching fluid.

In carrying out the improved process there is first produced a grained plate covered by a colloidal film that is acid and etch resisting after exposure to light. This colloidal film when exposed to light through a transparency acquires varying degrees of hardness, beginning first on the fully exposed surfaces and by continued exposure the light penetrating through the clear and semi-opaque portions of the transparency produces the halo mentioned around the edges of the design and causes a mild hardening of the colloid in these areas.

This semi-hardened colloid can be removed by adjusting the physical density of the etching fluid and the time in which the etching fluid is permitted to act on the plate.

There must also be a coordinating action between the light time, the colloidal hard-

ness, density of etching fluid, and time of etch so that the acid will eat away the halation hardened colloid and the metal under it until the boundary of the etched design corresponds to the boundary of the transparency design.

An etching fluid having the characteristics to produce the results desired is made by preparing a solution of ferric chloride in water at 43 Baumé, reduced to a neutral condition by the addition of a suitable alkali, such as soda bicarbonate, to produce a non-etching solution. To this neutral solution are added nitric and hydrochloric acids in the proportions of about one and one-quarter ounces of each to a gallon of the solution, thereby producing the etching bath.

In this bath the plate is immersed for from two to three minutes, or thereabouts, or for a sufficient time to etch away the water holding grain of the plate and the halation hardened colloid and produce ink-holding recesses of almost imperceptible depth.

When using ordinary etching fluids on zinc plates a galvanic and heating action is set up resulting in a deposition of metallic salts in the bottoms of the etched areas which deposits greatly diminish the ink-receptive qualities of the plates. But by neutralizing the ferric chloride the galvanic action and heating are almost entirely counteracted and the deposition of foreign matter in the etched areas is greatly reduced, and thereby markedly superior results are obtained in the uniformity of the good printing quality of the plate and the durability of the same, due to the properly balanced etching fluid and the accurate etching to just the required depth and area and to the greatly lessened deposits of metallic salts in the bottoms of the etchings which leaves the pure metal exposed for the reception of the ink.

The solution need not be strong enough to etch the solid metal but is sufficiently strong to destroy the grain of the plate where it is desired to remove it.

The density of the solution is to be such that it will not soak or spread into the grain which is not to be etched, and it should be just acid enough to remove the exposed grain, as to which the usual etchers precautions are to be observed; and these results I have successively accomplished with the proportions of ingredients above described. But somewhat varied proportions may give good results under conditions which I have not enumerated or encountered.

A particular feature of this invention resides in so balancing the density and rapidity of the etching fluid in relation to the hardness of the film, time of etch, etc., that the halation hardened portions of the film are removed during the time of etching to thereby bring the boundaries of the etched design exactly coincident with the design on the transparency.

It will be better understood just what I mean if reference be had to the drawings herewith.

Fig. 1 shows greatly enlarged a zinc plate having a colloid film thereon and a transparency over the film with two large opaque areas to represent dots of a half-tone screen. 1 represents the transparency, 2 the half-tone dots, 5 the colloidal film, 6 the zinc plate and 7 the grained surface of the plate. For purpose of illustration consider that the dots 2 are each one inch in diameter, the light passing through the transparency 1 gradually hardens the colloid to the full degree desired on all portions around the dots 2 but while passing by the edges of the dots 2 there is a slight diffusion of light under the edge of the dots causing the slight halo 3 Fig. 2 represented by the stipple just under the edges of the dots. Fig. 2 shows the full hardening of the film over the exposed areas represented by the heavy stipple and the partial hardening just under the edges of the dots by the lighter stipple which is caused by the halation referred to. If, now, the etching fluid did not remove the semi-hardened colloid directly under the edge of the dot 2, the etched dot on the plate would be slightly less than one inch in diameter, which in a half-tone print would change the tone value of the light effects by showing too much light around the dots.

The balancing of my eching fluid is such that during the time period this semi-hardened portion of the colloid directly under the edges of the dots will be eaten away as well as the grained surface of the metal plate directly under it so that the finished etched dot on the plate will be of the same diameter as the dot on the transparency.

This is represented in Fig. 3 wherein is shown the area, 4 representing that covered by the dot 2, after etching and is seen to be the same size as the dot 2 on the transparency.

This halation hardening always exists in every sensitive film or emulsion and gives a false translation of the copy unless it is removed. The etching acid is given a Baumé density and a physical etching quality that in a given time will remove this partial hardened colloid and always produce dots and other shapes exactly the same size as the positive copy.

After the etching is finished the etched surface is treated with dilute hydrochloric acid or other means and the loosened foreign matter left by the etching is removed with wool, and the plate dried, after which lithographic ink is rubbed, worked or rolled into the etched parts of the plate. Before inking the plate the film may be dyed, not as a necessary step but to enable the design to be

more easily inspected as to its perfection before proceeding further, so that time and labor may not be wasted on a plate which shows an imperfect result of any of the previous operations. The dyeing may be omitted, especially where experience shows practically uniform and good results in these respects. An ink-receptive varnish or its equivalent may be applied in the etchings before the ink is applied. The film is then washed away in water and the plate dried after which the plate may be gummed over with a film of gum arabic or the like to prevent oxidation, and the plate is then ready to be used in the printing machine.

In this machine the normal grained surface of the plate is dampened with water so that it will reject ink, the water being rejected by the ink or equivalent material in the etchings; then an inked roller is passed over the plate so as to ink the etchings ready for printing, the ink being repelled by and not taken on the dampened high surface; and then the paper, tin or other material on which the printing is to be done is impressed on the plate. In the case of off-set printing the impression is first made on a rubber blanket in a known manner and thence transferred to the material to be printed.

When a lithographic plate is produced according to the said patent, or when it has been produced by the use of the improved etching bath above described, I do or may proceed as follows for the removal of the deposited salts in the first case or for the more complete removal of any remains of said salts in the second case, the purpose being in either case to expose as fully as possible the solid metal of the plate in the etchings: I prepare a bath consisting of about eight ounces of water in which are dissolved one and one-half ounces of hydrochloric acid, and I immerse in this bath the etched plate from which the film has not been cleaned away. The plate is subjected to the action of the last mentioned bath for from three-quarters of a minute to one minute. This bath acts in the etched recesses so as to partly dissolve and loosen the metallic or other deposits.

These can then be easily removed with cotton wool, and turpentine or the like, after which the plate is dried when it will be found that the etched surfaces show an exposure of pure zinc which is 100 per cent receptive and retentive of grease (ink). The important part in printing on the press is the true retentive qualities of grease on the pure and clean metal, when a degree of impurity exists; that degree of impurity reduces the 100 per cent grease sensitiveness in a like amount, and the parts receive ink in varying quantities. The deposits may be removed after drying but at a greater risk of injury to the etched surface as more friction and effort is required to remove the material.

It is usually or often desirable to give to the normal grained or high surface of the plate a strong surface etch with phosphoric and chromic acid, in a known manner. This is not strictly an etching, though it is usually so described, but causes the normal surface to be strongly receptive of water so as to be thoroughly repellant to ink. The last mentioned bath and cleaning of the plate will prevent said surface etch from creeping around under the ink through the deposited salts which would otherwise be in the etchings, which would undermine the ink and would render the etchings less receptive of the ink, so that after a number of impressions the print would gradually become gray and not of the desired full and distinct color.

This would be because the proper amount of sensitive color (ink) cannot be applied, by the inking of the plate, to be transferred to the material to be printed, or to the blanket.

In printing, a little chromic acid is added to the dampening water which is applied to the grained surface of the plate in order to continually renew the grease-repelling action of said surface, and this acid excepting for the above cleaning, would continually act to undermine the ink and result in the want of sufficient ink and color in the printing. When the said deposits are not cleaned out from the etchings the latter may become so little ink-receptive as to fail to take ink or to print as is required.

I have hereinbefore described the best method and means known to me for successfully carrying out my improvements, but it will be understood that variations can be made therein without departing from the spirit of the invention.

What is claimed is:

1. In a method of producing a printing surface on a metal lithographic plate, etching the plate and removing the surface thereof in exposed and defined places by subjecting it, while partly protected by a film, to the action of an etching bath containing a neutralized acid, and containing in addition an etching acid.

2. In a method of producing a printing surface on a metal lithographic plate, etching the plate and removing the surface thereof in exposed and defined places by subjecting it, while partly protected by a film, to the action of an etching bath containing ferric chloride and a neutralizing agent, and made acid by nitric and hydrochloric acids.

3. In a method of producing a printing surface on a metal lithographic plate, etching the plate and removing the surface thereof in exposed and defined places by subjecting it, while partly protected by a film,

to the action of an etching bath containing ferric chloride neutralized by soda bicarbonate and made acid by nitric and hydrochloric acids.

4. In a method of producing a printing surface on a metal lithographic plate, etching the plate, while partly protected by a film, in an acid bath, and removing the surface thereof in exposed and defined places, then removing said film, then loosening and more or less dissolving the deposits in the etchings produced by said etching bath, and then removing said deposits.

5. In a method of producing a printing surface on a metal lithographic plate, etching the plate, while partly protected by a film, in an acid bath, and removing the surface thereof in exposed and defined places, then removing said film, then loosening and more or less dissolving the deposits in the etchings produced by said etching bath, and then rubbing the plate with a cleaning material.

6. In a method of producing a printing surface on a metal lithographic plate, etching the plate, while partly protected by a film, in an acid bath, and removing the surface thereof in exposed and defined places, then removing said film, then loosening and more or less dissolving the deposits in the etchings produced by said etching bath, and then rubbing the plate with turpentine.

7. A lithographic printing plate having a top or normal ink-repelling surface and ink-receiving etchings slightly below said surface, in which etchings the pure metal of the plate is exposed, whereby the undermining of the ink is prevented.

8. A lithographic printing plate having a top or normal ink-repelling surface and ink-receiving etchings slightly below said surface, in which etchings the pure metal of the plate is exposed by removal of deposits left by the etching action.

9. A lithographic printing plate having a top or normal ink-repelling surface and ink-receiving etchings slightly below said surface, in which etchings the pure metal of the plate is exposed by an acid bath and subsequent cleaning.

10. In a method of producing a printing surface on a metal lithographic plate, coating the plate with a sensitized emulsion, exposing it to light under a transparency, to harden portions of the film, removing the unhardened parts of the film from the plate surface, subjecting the exposed plate surfaces to the action of an etching fluid to remove the exposed surface, said fluid being so balanced that during the given time of etching the uncovered areas of the plate, the fluid will also remove certain semi-hardened portions of the emulsion lying around the edge of the design being etched to thus produce an etched area from which the surface of the plate has been removed exactly coinciding with the design on the transparency.

In testimony whereof I affix my signature.

WILLIAM GRASS.