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PRINTING PLATE AND PROCESS OF MAKING SAME

John J. Murray, Arlington, Mass.

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This invention relates to printing plates and the process of making the same.

One object of the invention is to provide a thin film of chromium deposited by electrolysis on the back of the printing plate, thus dispensing with the materials now usually used in backing the plate while the printing characters are being etched on the opposite side thereof.

Another object of the invention is the provision of means whereby the sides of the printing characters may have deposited thereon by electrolysis a thin film of chromium.

A further object of the invention is the production of a printing plate of this character which may be safer to handle, more quickly made and manufactured at a less cost.

These objects are attained by the process fully described in the following specification.

One preferred form of printing plate is fully described in the specification, this form having been found to give satisfactory and reliable results, although it is to be understood that the various elements may be varied and the invention is not limited to the precise construction and the precise steps in the process as herein described except as required by the scope of the appended claims.

In making the improved printing plates, a plate of zinc such as now in general use for this purpose is utilized.

Such zinc plates as are now used in making printing plates must have a backing applied thereto while the etching operation on the front face thereof is taking place to form characters to be used in printing.

The present practice is to apply asphaltum, lacquer or some similar material to the back of the zinc plate in the printing office prior to the formation of the printing characters on the opposite face thereof.

After the etching process has been concluded this asphaltum or other material must be washed off the plate in a solvent bath which is inflammable and a fire hazard.

Moreover, the applying of this material to the back of a printing plate prior to the etching process and the removal of this material from the plate at the conclusion of the etching process consumes considerable time and thus causes delay and increases the amount of labor.

To eliminate this delay and dispense with the application of materials to the back of the plate, and a subsequent washing off of these materials, is one of the principal features of the present invention.

In carrying out the invention an ordinary zinc plate has its back surface thoroughly cleansed by means of an aqueous solution containing monochloracetic acid (about eight ounces to a gallon of water) to which, if desired, pumice may be added.

An acid resisting film first begins to form in the cleaning solution from contact with the monochloracetic acid. This film then acts as a catalyst when oxidization takes place as is the result when the film is brought in contact with chromic acid, and then when the electrical energy is put through the chromic acid solution the film takes on the nature of a permanent catalyst.

The monochloracetic acid is derived from methyl alcohol (methanol) by the replacement of one hydrogen atom by a carboxyl group and halogenated. When mixed with water it is transformed into a primary alcohol group (CH_2OH) and a carboxyl group (COOH). It is thus an alcohol and an acid and in its behavior it shows the characteristic properties of both classes of compounds.

$$CH_2Cl—COOH+H_2O=CH_2—OH—COOH+HCl$$

While the compound possesses many of the chemical properties of methyl alcohol, the replacement of hydrogen by a carboxyl group (strongly negative) is modified in chemical action. In the same way the replacement of hydrogen in acetic acid by the negative hydroxyl group renders the radical linked to the carboxyl group more negative, and as a consequence, hydroxylacetic acid is a stronger acid than acetic acid; that is, it is more highly disassociated in water solution.

The solution containing the methyl hydroxylacetic compound derived from the mixing of water and monochloracetic acid that adheres to the zinc is further changed by oxidation from chromic acid and by electrolysis.

The regulation of the process as in the method herein described produces oxidation products, intermediate between the alcohol and carbondioxide, which may be obtained by the methyl hydroxylacetic compound.

The aqueous cleaning solution is heated to a temperature of about 100° F. and when heated the plate is submerged therein about three minutes.

In other words, it is desirable to have the back surface perfectly clean and all grease, perspiration and dirt removed therefrom.

After this cleansing operation has been completed, the plate is submerged in a lead-lined wooden tank containing a suitable bath contain-

ing as its principal ingredient chromic acid, this bath previously having been raised to a desired temperature, as for instance, about 140° F.

The plate is used as a cathode and adjacent to the plate is a suitable anode. In some cases the lead-lining may be used as an anode.

When the bath has been raised to the desired temperature and the zinc plate submerged therein, an electric current of about 7 volts and 390 amperes is turned on so that the current will pass from the anode through the bath and to the plate acting as a cathode.

By doing this electrolysis takes place and a thin film of chromium is deposited on one face only of the zinc plate, and that is the back face, this film of chromium being in thickness almost infinitesimal, as for instance, less than ten-thousandths of an inch.

It is, however, of sufficient thickness to prevent any action thereon of an acid coming in contact therewith during the etching operation.

By producing zinc plates in this manner, the manufacturer of the zinc plates may in his factory apply the film of chromium to the back face thereof and ship said plates in this condition to the printing office or other place where the printing characters are to be etched on the front face thereof.

When received in this condition, the application of other materials to the back face of the zinc plate is unnecessary.

When it is desired to form printing characters on the front face of the zinc plate thus coated with chromium on its back face, the upper face thereof is coated with some material capable of having characters printed thereon and which will not be acted upon by acid.

In other words, on this coated surface is printed in reverse the characters which it is desired to print in a newspaper or other publication, and this printing of the characters may be done through a negative.

The printed characters on the coated surface are then treated in such a manner as to cause them to harden and adhere to the front face of the zinc plate.

The portion of the coating not hardened in this manner and surrounding the outline of the various characters is then washed away with water or an appropriate solvent, leaving the sides of the printing characters exposed for a short distance below the face of said characters.

The plate is then submerged in a bath of nitric acid for about three minutes and then the plate is removed from the tank and the nitric acid washed off with water.

The plate is then suspended in another tank containing a bath, the principal ingredient of which is chromic acid, this bath having been previously heated to about 140° F.

The plate is used as a cathode and at a desired distance from said plate is disposed an anode.

The cathode and the anode are connected to an electric generator and when the electric current of about 7 volts and 390 amperes is turned on it will pass from the anode through the bath onto the cathode.

In doing this it will deposit a thin film of chromium upon the sides of the printing characters, thereby insuring a sharp outline thereto when the plate is used in printing.

During the depositing of the chromium the electric current is turned on for a predetermined time (say, about one minute) and then cut off, after which the plate is removed from the tank and placed in another receptacle containing nitric acid or similar material which will cut into the zinc to a greater depth.

The operation in both baths is repeated about four times until the desired depth of characters is obtained.

After the plates have been subjected to the action of the several baths the etching process has been completed and the printing characters will be left upstanding with a sharp unbroken outline to the upper ends thereof which are used in printing and with their sides coated with a film of chromium which will harden and stiffen them.

Heretofore, in etching zinc plates the acid very often eats into the printing characters and leaves ragged edges which obviously is of great disadvantage as it weakens them and the printing therefrom is imperfect.

This objection is wholly overcome by producing the printing plates by applicant's process, as heretofore described.

Likewise in the present practice, sometimes the acid passes through the asphaltum and into the zinc plate, thus spoiling the plate and making it useless.

This objection is overcome by coating the back face with the film of chromium or some similar material impervious to acid.

Preferably the bath used in the tank for depositing the chromium upon the zinc plate is composed of the following ingredients and in substantially the proportions given:

Chromic acid, two and one half pounds to every gallon of water; ammonium persulphate, about three ounces; phenol, about two ounces; and glycerine, about eight ounces; these ingredients being thoroughly mixed together and heated to a temperature of about 140° F.

The same bath is used in depositing chromium on either the back or front face of the plate, but when the chromium is being deposited on the back surface of the plate it is subjected to the action of the bath two minutes, or twice as long as when the chromium is being deposited on the front face.

The ammonium persulphate furnishes the sulphate element that is necessary to get the chromium to adhere to the zinc plate.

The phenol is oxidized by the combination of chromic acid (which is in excess there) and glycerine, into an acid resisting substance.

It must be understood that the phenol and glycerine combine to produce the necessary resistance to the action of chromic acid on the zinc plate during the electrolyzing operation.

It has been found in practice that excellent results are obtained by having the current on for about one minute when depositing the chromium on the front face and about two minutes when the film is being applied to the back surface.

In the bath containing the chromic acid solution a plurality of plates may be submerged with anodes between every pair of plates, thereby providing means whereby the chromium film may be deposited on oppositely disposed faces of every pair of plates, one anode serving for two cathodes consisting of said zinc plates.

When the chromium is being deposited on the back of the zinc plate a scum is formed thereon which is not washed off but enters any crevices or scratches which may possibly exist in the plate and is allowed to dry therein.

The chromium bath may be heated by electric heating units submerged therein.

When the printing characters have been formed on the zinc plate, stereotypes or electrotypes may be formed therefrom in the usual manner.

The present process dispenses with the use of dragon's blood and toluol which heretofore have been in general use in preparing printing plates.

This invention is a great advance in the art of forming printing characters as it saves time and labor and the characters are more perfectly formed so that when used in printing a sharper outline is produced.

In the formation of the printing characters on the front face of the plate, it will be understood that these are formed by successive baths of nitric acid.

When the plate is submerged in the first bath of nitric acid, the acid will remove a portion of the unhardened material around the printing characters, the plate is then removed and the nitric acid washed off the plate, and subsequently the plate is submerged in the chromic acid solution and the necessary current applied to cause electrolysis to take place and form a film or coating upon the sides of the recessed parts which protects the sides of these recessed portions from the action of any subsequent bath of nitric acid.

The bottoms of the recessed portions are protected from receiving this protective coating or film by the peculiar action of this coating or film adhering to the nearest portions of the exposed plate, which in this case are the sides of the recessed portions and by using a timing element the adherent action is stopped before the protective film reaches the bottom of said recessed portions, thereby leaving the bottoms free to the action of the nitric acid solution when the plate is again subjected thereto.

It will be understood that in the formation of these printing characters they are subjected several times for a short period to the action of the nitric acid, and each time the nitric acid is washed from the plate before the plate is submerged again in the chromic acid bath.

In other words, the nitric acid takes several bites on the plate eating away a small portion thereof at a time, and between these bites by the nitric acid the plate is freed from nitric acid and subjected to the cromic acid bath which will form the coatings or films at different levels on the printing characters.

It is believed that the operation and many advantages of the invention will be thoroughly understood from the foregoing description.

Having thus described my invention, I claim:

1. As a new article of manufacture, an imperforate flat printing plate for use in the graphic arts formed of zinc having on one face raised printing characters the outer ends of which are protected by the hardened material previously used in obtaining a photograph from a negative, said characters having only on the vertical sides thereof a thin continuous layer of chromium permanently deposited thereon by electrolysis, said chromium deposit giving rigidity to said characters.

2. The process of making an imperforate flat zinc plate for use in the graphic arts and of equal thickness throughout and having oppositely disposed flat and unbroken surfaces, consisting in suspending said plate having thereon an adhering film of acid resisting material derived from a monochloracetic acid solution in a bath of chromic acid and then by electrolysis permanently depositing on the back side thereof a continuous layer of chromium of infinitesimal and equal thickness.

3. The process of making an imperforate flat zinc plate for use in the graphic arts and of equal thickness throughout, consisting in cleaning the back face of said plate by an aqueous solution containing monochloric acetic acid, then suspending said plate in a bath containing an excessive amount of chromic acid and then by electrolysis permanently depositing on the back face of said plate a layer of chromium of infinitesimal and equal thickness.

4. The process of making an imperforate flat zinc plate for use in the graphic arts and of equal thickness throughout with its opposite sides having flat and unbroken surfaces, consisting in cleaning the back face of said plate by an aqueous solution containing monochloracetic acid, then suspending said plate in a bath consisting of about one and a half pounds of chromic acid to a gallon of water, 12 ounces of glycerine, 2 ounces of phenol and 3 ounces of ammonium persulphate, and then utilizing the excess of chromic acid to permanently deposit by electrolysis on said back face a layer of chromium of infinitesimal and equal thickness.

5. The process of making an imperforate flat zinc plate for use in the graphic arts and of equal thickness throughout with its opposite sides having flat and unbroken surfaces, consisting in cleaning the back face of said plate by an aqueous solution containing monochloracetic acid, then suspending said plate in a bath containing an excessive amount of chromic acid and then permanently depositing a thin layer of chromium on only the back face thereof by transmitting through said bath for about two minutes an electric current of about seven volts and about 390 amperes, said layer being of equal thickness throughout.

6. The process of making an imperforate flat zinc plate for use in the graphic arts and of equal thickness throughout with its opposite sides having flat unbroken surfaces consisting in cleaning the back face of said plate by an aqueous solution containing monochloracetic acid, and then suspending said plate for about two minutes in a bath containing an excessive amount of chromic acid and by electrolysis permanently depositing on said back face a layer of chromium of infinitesimal and equal thickness.

7. The process of making an imperforate flat zinc plate for use in the graphic arts and of equal thickness throughout with its opposite sides having flat unbroken surfaces consisting in cleaning the back face of said plate by an aqueous solution containing monochloracetic acid, and then suspending said plate in a bath containing an excessive amount of chromic acid at a temperature of about 140° F. and by electrolysis permanently depositing on said back face a thin layer of chromium, said layer being of equal thickness throughout.

8. The process of making an imperforate zinc plate for use in the graphic arts and of equal thickness throughout with its opposite sides having flat unbroken surfaces consisting in suspending said plate as a cathode in a bath consisting of chromic acid, about one and a half pounds to a gallon of water, about 12 ounces of glycerine, about 2 ounces of phenol, and about 3 ounces of ammonium persulphate, passing an electric current through said bath, said cathode and an

anode, and utilizing the excess of chromic acid to permanently deposit by electrolysis on the back face of said plate a layer of chromium of infinitesimal and equal thickness.

9. The process of making an imperforate zinc plate for use in the graphic arts and to be used in printing and of equal thickness throughout with its opposite sides having flat and unbroken surfaces consisting in suspending said plate as a cathode in a bath consisting of chromic acid, about one and a half pounds to a gallon of water, about 12 ounces of glycerine, about 2 ounces of phenol, and about 3 ounces of ammonium persulphate, passing an electric current through said bath, said cathode and an anode, permitting the ingredients of said bath to chemically combine, and subsequently utilizing the excess of chromic acid to permanently deposit by electrolysis on the back face of said plate a layer of chromium of infinitesimal thickness.

10. The process of making an imperforate zinc plate for use in the graphic arts and of equal thickness throughout with its opposite sides having flat and unbroken surfaces consisting in suspending said plate having thereon an adhering film of acid resisting material derived from a monochloracetic acid solution, as a cathode in a bath containing an excessive amount of chromic acid preheated to a temperature of 140° F. and containing an anode, passing an electric current of about 7 volts and 390 amperes through said bath, said cathode and an anode, utilizing the excess of chromic acid to permanently deposit by electrolysis on the back face of said plate a layer of chromium of infinitesimal and equal thickness, said layer being of equal thickness throughout.

11. The process of making imperforate zinc plate for use in the graphic arts and of equal thickness throughout with its opposite sides having flat and unbroken surfaces consisting in suspending said plate having thereon an adhering film of acid resisting material derived from a monochloracetic acid solution, as a cathode in a bath containing an excessive amount of chromic acid, and passing an electric current for about two minutes through said bath, said cathode and an anode, utilizing the excess of chromic acid to permanently deposit by electrolysis on the back face of said plate a layer of chromium of infinitesimal thickness.

12. The process of making an imperforate zinc plate for use in the graphic arts and to be used in printing and of equal thickness throughout with its opposite sides having flat and unbroken surfaces consisting in suspending said plate having thereon an adhering film of acid resisting material derived from a monochloracetic acid solution, as a cathode in a bath containing an excessive amount of chromic acid, and subsequently passing an electric current for about two minutes through said bath, said cathode and an anode, utilizing the excess of chromic acid to permanently deposit by electrolysis on the back face of said plate a layer of chromium of infinitesimal thickness, said layer being of equal thickness throughout.

13. The process of making an imperforate zinc plate for use in the graphic arts and of equal thickness throughout with its opposite sides having flat and unbroken surfaces consisting in suspending said plate having thereon an adhering film of said acid resisting material derived from a monochloracetic acid solution, as a cathode in a bath containing an excessive amount of chromic acid containing an anode, and passing an electric current of about 7 volts and 390 amperes through said bath, said cathode and anode, utilizing the excess of chromic acid to permanently deposit on the back face of said plate by electrolysis a layer of chromium of infinitesimal thickness, said layer being of equal thickness throughout.

14. The process of making an imperforate zinc plate for use in the graphic arts and to be used in printing and of equal thickness throughout with its opposite sides having flat and unbroken surfaces consisting in suspending said plate having thereon an adhering film of acid resisting material derived from a monochloracetic acid solution, as a cathode in a bath containing an excessive amount of chromic acid containing an anode, and subsequently passing an electric current of about 7 volts and 390 amperes through said bath, said cathode and anode, utilizing the excess of chromic acid to permanently deposit on the back face of said plate by electrolysis a layer of chromium of infinitesimal thickness, said layer being of equal thickness throughout.

15. The process of making an imperforate zinc plate for use in the graphic arts and of equal thickness throughout with its opposite sides having flat and unbroken surfaces consisting in depositing by electrolysis a layer of chromium of equal thickness throughout on the back face thereof, then forming raised printing characters on the front face of said plate by first applying to the entire front face a coating of material, hardening portions of the same by means of a photographic negative in the form of the upper faces of the printing characters to be used, said hardened portions being impervious to acid, then removing unhardened portions of said coating and plate by nitric acid, then washing off the nitric acid, then suspending said plate in a bath of chromic acid, and then for about one minute passing an electric current through the bath and by electrolysis permanently depositing on the sides of said characters a film of chromium, the duration of the depositing being insufficient to permit complete plating in the bottom of the depressions between said printing characters.

16. The process of making an imperforate zinc plate for use in the graphic arts and of equal thickness throughout with its opposite sides having flat and unbroken surfaces consisting in depositing by electrolysis an extremely thin layer of chromium of equal thickness throughout on the back face thereof, then forming raised printing characters on the front face of the entire plate by successive bites of nitric acid on unhardened portions of said plate, then after each bite washing off the nitric acid, then after each immersion in nitric acid and washing, suspending said washed plate in a bath of chromic acid, and then for about one minute passing an electric current through the bath and by electrolysis permanently depositing on the sides of said characters successive films of chromium, the electrolytic depositing in each case being insufficient to permit complete plating of the depressions between said printing characters.

17. The process of making an imperforate zinc plate for use in the graphic arts and of equal thickness throughout with its opposite sides having flat and unbroken surfaces consisting in depositing a layer of acid resisting substance of equal thickness throughout on the back face thereof, then forming raised printing characters on the front face of the entire plate by first ap-

plying a coating of material to the entire front face of the plate, then by means of a photographic negative hardening portions of said coating conforming to the upper faces of said characters to make said hardened portions impervious to acid, immersing said plate in nitric acid for about three minutes and removing the material around said characters, then suspending said plate in a bath of chromic acid, and then for about one minute passing an electric current through the bath and by electrolysis permanently depositing on the sides of said characters a film of chromium, the duration of the depositing being insufficient to permit complete plating in the bottom of the depressions between said printing characters, then repeating the immersion in nitric acid and the washing off of the same, and then permanently depositing another film of chromium on the sides of said characters at a lower level.

18. The process of making an imperforate zinc plate for use in the graphic arts and of equal thickness throughout with its opposite sides having flat and unbroken surfaces consisting in depositing a layer of acid resisting substance of equal thickness throughout on the back face thereof, then forming raised printing characters on the front face of the entire plate by successive bites of nitric acid on unhardened portions of said plate, then after each bite washing off the nitric acid, then after each immersion in nitric acid and washing, suspending said washed plate in a bath of chromic acid, and then for about one minute passing an electric current through the bath and by electrolysis permanently depositing on the sides of said characters successive films of chromium, the electrolytic depositing in each case being insufficient to permit complete plating of the depressions between said printing characters.

19. The process of making an imperforate zinc plate for use in the graphic arts and of equal thickness throughout with its opposite sides having flat and unbroken surfaces consisting in depositing a layer of acid resisting substance of equal thickness throughout on the back face thereof, then forming raised printing characters on the front face of the entire plate by first applying to said front face a coating of material, hardening portions of the same by means of a photographic negative in the form of the upper faces of the printing characters to be used, said hardened portions being impervious to acid, then removing unhardened portions of said coating and plate by nitric acid, then washing off the nitric acid, then suspending said plate in a bath of chromic acid, and then for about one minute passing an electric current through the bath and by electrolysis permanently depositing on the sides of said characters a film of chromium, the duration of the depositing being insufficient to permit complete plating in the bottom of the depressions between said printing characters.

20. The process of making an imperforate zinc plate for use in the graphic arts and of equal thickness throughout with its opposite sides having flat and unbroken surfaces consisting in depositing a layer of acid resisting substance of equal thickness throughout on the back face thereof, then forming raised printing characters on the front face of said plate by first applying a coating to the entire front face of the plate and hardening portions thereof in the form of the upper faces of the printing characters to be used, said hardened portions being impervious to acid, then removing unhardened portions of the said coating and plate by nitric acid for about three minutes, then washing off the nitric acid, then suspending said plate in a bath of chromic acid, and then for about one minute passing an electric current through the bath and by electrolysis permanently depositing on the sides of said characters a film of chromium, the duration of the depositing being insufficient to permit complete plating in the bottom of the depressions between said printing characters.

JOHN J. MURRAY.