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3,265,504

SURFACE TREATED LITHOGRAPHIC PLATES AND THEIR PRODUCTION

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The present invention relates to the art of lithography and more particularly to metal surfaced sheets or plates useful for lithographic platemaking and wherein at least one side of the metal sheet or plate is mechanically grained and simultaneously provided with a thin, tightly bonded, permanent, durable, hydrophilic surface. The invention is applicable both to the production of base supports useful for lithographic platemaking and for presensitized lithographic plates.

It has been found that the simultaneous mechanical and chemical treatment of metal sheets with an abrasive in combination with an aqueous solution composed of a water-soluble bichromate salt and a water-dispersible organic polymer makes it possible to produce a grained metal sheet having a thin, tightly bonded, hydrophilic surface or coating. The thus treated metal sheet is ideally suited as a base support for lithographic platemaking and particularly in those processes using light-sensitive diazo compounds.

A treated metal sheet in accordance with the invention has numerous advantages over conventional lithographic plates made in the standard way from either zinc or aluminum sheets. Such conventional lithographic plates have the serious disadvantage that they undergo oxidation and thus the chemical properties of their surfaces undergo continual changes so that there is a storage problem when the plates are kept under normal storage conditions. Lithographic plates produced according to this invention do not oxidize under normal storage conditions and are characterized by a uniform hydrophilic surface.

Another disadvantage of conventional lithographic plates is that they must be counteretched before the light-sensitive coating is applied. Counteretching removes dirt or graining mud residues, excess oxide and places the plate surfaces in condition to receive the light-sensitive coating. In producing lithographic plates according to the present invention no counteretching is necessary since the metal surfaces are clean, free of oxide and hydrophilic.

It is also known that conventional zinc and aluminum lithographic plates are incapable of being used for diazo platemaking since the light-sensitive diazo compounds rapidly decompose or break down upon contact with the metal surfaces which exert a reducing action on the diazo compounds. In the past, it has been suggested that this problem could be overcome by using hydrophilic plastic-paper laminates as a support material for diazo platemaking but these laminates do not have the necessary dimensional stability. In contrast, applicants treated metal sheets are perfectly suited for diazo platemaking since the hydrophilic metal sheets do not act to decompose the light-sensitive diazo compounds and yet they retain the desirable physical properties of zinc and aluminum.

Treated metal sheets of the present invention have an excellent surface which is permanent, durable and hydrophilic and, hence, there is no tendency to scum due to the non-image areas of the printing plate becoming ink receptive on a printing press. The present invention greatly reduces or substantially entirely eliminates scumming during printing.

It is also recognized that during lithographic platemaking bichromated casein or like sensitizer is occasionally left on the non-image areas; and when this occurs scumming takes place on such areas due to a tendency to pick up ink during use of the plates on a printing press.

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This is extremely undesirable and results in defective prints even though chemical sensitizers are used which are intended to remove residual sensitizer from the non-image areas. In addition, these untreated plates have a definite tendency to accumulate sensitizer scum or to tone up during use. Treated metal sheets of the present invention are free from all traces of casein, albumin, etc., which are positively removed from the plate surface in the first instance without dependence upon any separate or special chemical desensitizing step.

The new treated metal sheets are utilizable for all four types of lithographic processes, namely, the Deep Etch Process, the Surface Process, the Wipe-On Process and the Presensitized Process. In a Deep Etch Process a bichromated-gum arabic solution is dried onto a plate surface, exposed through a photographic positive to a light source, developed with an acidic aqueous salt solution to wash away unexposed sensitizer, etched with an acidic ferric chloride solution, plated with electroless copper solution, lacquered and inked. The light-hardened stencil is then removed from the plate by washing with warm water and the areas of the plate which contained the stencil are now the non-printing areas, while the areas which have been developed, etched, copperized, lacquered and inked are the printing areas. In a Surface Process a bichromated casein solution is dried onto the plate surface, exposed through a photographic negative to a light source, coated with a layer of lacquer and then inked and developed with a slightly ammoniacal solution. The plate areas which contained the unexposed, developed (washed away) sensitizer become the non-printing areas, whereas the light exposed, lacquered and inked areas become the printing areas. In the Wipe-On Process a diazo resin solution or a diazo resin combined with a polymer solution is hand coated onto the plate surface, the plate is exposed through a photographic negative, coated with a layer of ink and developed with an acidic gum arabic solution or the exposed plate may be lacquered and developed in a single operation with the use of a lacquer-developer emulsion described in United States Patent No. 2,865,873. The unexposed plate areas which were developed and washed away become the non-printing areas of the plate, while the exposed plate areas which were lacquered or inked become the printing areas of the plate. In a Presensitized Process a plate surface is precoated with a diazo resin solution or a diazo resin combined with a polymer solution of the type described in United States Patent No. 2,826,501. The precoated plate is processed in the same manner as in the Wipe-On Process, the essential difference between a Wipe-On plate and a Presensitized plate being that the Presensitized plate is manufactured in such a way that it can be stored for a period of up to several months from the time the Presensitized plate is coated until the time it is processed. A Wipe-On plate must be processed within a few hours after being coated.

While a silicated metal lithographic plate can be used for Wipe-On, Surface and Presensitized platemaking, its surface cannot be penetrated by the etches conventionally employed in Deep Etch platemaking and thus silicated metal lithographic plates are unsuitable for Deep Etch platemaking. Metal sheets treated in accordance with the present invention are, however, eminently suitable for Deep Etch platemaking inasmuch as they can be etched with conventional Deep Etch etches. It will thus be clear that the treated metal sheets of the invention are suitable for use in all lithographic platemaking processes and, hence, a lithographic plant can, if desired, use and store a single type of lithographic printing plate for the Deep Etch, Surface and Wipe-On Processes by using treated metal sheets according to the invention and wherein the metal sheets are made of aluminum, zinc, chromium,

stainless steel and magnesium and their laminates and electroplates so long as a metal surface is available for the treatment. Consequently, the new treated metal sheets can be precoated with light-sensitive diazo resins or other light-sensitive organic materials and can be stored for periods up to several months without loss of photographic sensitivity so as to produce a presensitized plate.

It has also been found to be essential that both the bichromate salt and the organic polymer be present in the simultaneous chemical and mechanical process for producing grained, hydrophilic metal sheets capable of use in all types of lithographic platemaking. If either the bichromate salt or the organic polymer only is used in the present system a hydrophilic surface is produced on the grained metal sheet, but the sheet is then not sufficiently passivated to prevent decomposition of light-sensitive diazo compounds upon contact with the incompletely treated metal sheet, it being well known that when a light-sensitive material such as a light-sensitive diazo compound comes into direct contact with a metal surface decomposition unavoidably occurs. An incompletely treated metal sheet can obviously not be used for either Wipe-On or Presensitized lithographic platemaking.

The bichromate salt utilizable in the present invention may be any water-soluble polychromate formed by acidifying an aqueous solution of a chromate salt and the preferred salts are sodium, potassium and ammonium bichromates.

Organic polymers useful and operative in the present invention must be water soluble or at least water dispersible and hydrophilic in nature. The following organic polymers have been found to be suitable and satisfactory, namely, gum arabic, dextran, carboxymethyl cellulose, the sodium salt of carboxymethyl hydroxymethyl cellulose, polyacrylamide, polyvinyl alcohol, polyvinylpyrrolidone, dimethylol urea, dimethyl hydantoin formaldehyde resins, water-soluble urea formaldehyde resins, gelatin, polyvinyl methyl ether-maleic anhydride copolymer, propylene glycol ester of alginic acid, sodium, potassium or ammonium alginate, polyvinylpyrrolidone-vinyl acetate copolymer, polyvinyl acetate emulsion and arabinogalactin.

It has further been found that the optimum weight ratio of water-soluble bichromate salt to water-soluble or water-dispersible polymer is 3:1 but the practical range of weight ratios of bichromate salt to polymer are from 10:1 to 1:3. The concentration of water-soluble bichromate salt must be at least 0.03% by weight of the aqueous solution and the maximum concentration is determined by the solubility of the particular bichromate salt. The concentration of the water-soluble or water-dispersible organic polymer must be at least 0.01% by weight of the aqueous solution and the maximum practical concentration is determined by the solubility of the particular organic polymer employed and the viscosity of the solution. The maximum viscosity is about 500 centipoises.

Metal sheets, plates or surfaces which are ideally suited for conversion into a hydrophilic lithographic plate according to the present invention are aluminum, zinc, chromium, 302 stainless steel and magnesium, but it is understood that laminates or electroplates of these metals are just as suitable as solid metal sheets or plates.

In carrying out graining two different types of plate graining machines were used and found to be entirely satisfactory. One machine consisted of a horizontally mounted conveyor belt which supported the metal sheet as it was fed under a set of revolving bristle brushes which were positioned on the perimeter of a horizontally mounted ring-shaped support. This type of plate graining machine is described in United States Patent No. 2,948,087. The other type of plate graining machine consisted of a horizontally mounted conveyor belt which supported the metal sheets as they passed under sets of revolving cylindrical brushes mounted horizontally with the axes of the brushes set at right angles to the path of the conveyor belt. The mechanical abrading of the metal sheet results

from the brushes scraping an abrasive over the surface of the plate. The abrasive is fed to the plate just prior to contact of the plate with the revolving brushes. The abrasive is in the form of an aqueous slurry which contains in addition to the abrasive the selected water-soluble bichromate salt and the water-soluble or water-dispersible polymer.

It is well recognized that some water-soluble or water-dispersible organic polymers react under the influence of ultraviolet and near ultraviolet electromagnetic radiation with water-soluble bichromate salts to produce a hydrophilic film former with reduced water solubility. Such films can be easily removed from a lithographic plate surface by immersion in water or by gentle abrasion. Such films therefore cannot be considered as durable or permanent hydrophilic surfaces, whereas the hydrophilic surfaces imparted to the metal sheets in accordance with this invention are extremely durable and thus permanent. It can be assumed that the major difference in the resulting hydrophilic films is due to the chemical nature of the metal surface when it comes in contact with a bichromated water-soluble polymer. Under prior practice the metal surface consists of somewhat passivated oxides but in the present invention there is exposure of freshly abraded metal surfaces which are free or very substantially free from oxides and it is these freshly abraded metal surfaces which are exposed to the aqueous solution of bichromate salt and water-soluble or water-dispersible organic polymer.

The invention is illustrated by the following non-limitative examples.

Example I

A 19 $\frac{3}{4}$ " x 23" x .012" sheet of 1100 (formerly known as 2S) aluminum was degreased by immersion in a tank of hot trichloroethylene. The plate was air dried, then grained and treated by passing the aluminum sheet in a horizontal plane under a set of revolving brass bristle brushes which were located on the perimeter of a horizontally positioned rotating ring support.

During the graining operation the plate is covered with a slurry of a composition made up of the following ingredients in approximately the following proportions:

Distilled water	-----ml---	1000
Polyvinyl alcohol (99% hydrolyzed)	----grams--	10
Ammonium bichromate	-----do----	30
Pumice powder	-----do----	227
Silicon carbide powder	-----do----	227

The plate was washed thoroughly with a water spray and forced air dried.

Example II

Example I was followed except that a polyvinylpyrrolidone resin with a molecular weight of 360,000 was substituted for the polyvinyl alcohol resin.

Example III

Example I was followed except that the slurry composition had the following ingredients and approximate proportions:

Distilled water	-----ml---	1000
Potassium bichromate	-----grams--	75
Gum arabic	-----do----	15
Pumice powder	-----do----	227
Silicon carbide powder	-----do----	227

Example IV

Example I was followed except that the slurry composition had the following ingredients and approximate proportions:

Distilled water	-----ml---	1000
Dimethylol urea	-----grams--	10
Sodium bichromate	-----do----	30
Pumice powder	-----do----	454

Example V

A 19 $\frac{3}{4}$ " x 23" x .012" sheet of 1100 (formerly known as 2S) aluminum was degreased by immersion at 68° F. for fifteen minutes in the following:

Water	liters	4.8
Ethylene glycol monomethyl ether	do	3.2
Sodium carbonate	grams	86
Sodium phosphate (tribasic)	do	28.4

The plate was rinsed thoroughly with tap water then air dried. The plate was grained and treated by passing the aluminum sheet in a horizontal plane under a set of revolving, cylindrical, nylon bristle brushes which were mounted horizontally with their axes positioned at right angles to the direction of motion of the aluminum sheet.

During the graining operation the plate was covered with a slurry made up of the following ingredients in approximately the following proportions:

Water	liters	151.4
Dimethylol urea	kilograms	1.25
Ammonium bichromate	do	3.77
Silicon carbide powder	do	18

The plate was washed thoroughly with a water spray and dried under infrared heater bars.

Example VI

Example V was followed except that the metal sheet was of 302 stainless steel instead of aluminum.

Example VII

Example V was followed except that a polymethyl vinyl ether-maleic anhydride interpolymers with a specific viscosity of 0.1 to 0.5 was substituted for the dimethylol urea.

Example VIII

Example VII was followed except that a zinc metal sheet was substituted for the aluminum sheet.

What is claimed is:

1. A dimensionally stable base support utilizable for lithographic platemaking comprising a metal sheet which is grained and provided on at least one side thereof with a thin tightly bonded durable hydrophilic surface obtained by the simultaneous subjection of said metal sheet to mechanical and chemical treatment with an abrasive and with an aqueous solution of a water-soluble bichromate salt and a water dispersible hydrophilic organic polymer followed by drying.

2. A dimensionally stable base support utilizable for lithographic platemaking comprising a metal sheet which is grained and provided on at least one side thereof with a thin tightly bonded durable hydrophilic surface obtained by the simultaneous subjection of said metal sheet to mechanical and chemical treatment with an abrasive and with an aqueous solution of a water-soluble bichromate salt and a water dispersible hydrophilic organic polymer followed by drying, said polymer being selected from the group consisting of gum arabic, dextran, carboxymethyl-cellulose, the sodium salt of carboxymethyl hydroxyethyl cellulose, polyacrylamide, polyvinyl alcohol, polyvinylpyrrolidone, dimethylol urea, dimethyl hydantoin formaldehyde resins, water-soluble urea formaldehyde resins, gelatin, polyvinyl methyl ether-maleic anhydride copolymer, propylene glycol ester of alginic acid, sodium alginate, potassium alginate, ammonium alginate, polyvinylpyrrolidone-vinyl acetate copolymer, polyvinyl acetate emulsion and arabinogalactin.

3. A dimensionally stable base support utilizable for lithographic platemaking comprising a metal sheet which is grained and provided on at least one side thereof with a thin tightly bonded durable hydrophilic surface obtained by the simultaneous subjection of said metal sheet to mechanical and chemical treatment with an abrasive and with an aqueous solution of a water-soluble bichromate

salt and a water dispersible hydrophilic organic polymer followed by drying, the metal sheet being selected from the group consisting of aluminum, zinc, stainless steel, magnesium and the laminates and electroplates thereof.

4. A dimensionally stable base support utilizable for lithographic platemaking comprising a metal sheet which is grained and provided on at least one side thereof with a thin tightly bonded durable hydrophilic surface obtained by the simultaneous subjection of said metal sheet to mechanical and chemical treatment with an abrasive and with an aqueous solution of a water-soluble bichromate salt and a water dispersible hydrophilic organic polymer followed by drying, the water-soluble bichromate salt being selected from the group consisting of sodium, potassium and ammonium bichromates.

5. A dimensionally stable base support utilizable for lithographic platemaking comprising a metal sheet which is grained and provided on at least one side thereof with a thin tightly bonded durable hydrophilic surface obtained by the simultaneous subjection of said metal sheet to mechanical and chemical treatment with an abrasive and with an aqueous solution of a water-soluble bichromate salt and a water dispersible hydrophilic organic polymer followed by drying, said polymer being selected from the group consisting of gum arabic, dextran, carboxymethyl-cellulose, the sodium salt of carboxymethyl hydroxyethyl cellulose, polyacrylamide, polyvinyl alcohol, polyvinylpyrrolidone, dimethylol urea, dimethyl hydantoin formaldehyde resins, water-soluble urea formaldehyde resins, gelatin, polyvinyl methyl ether-maleic anhydride copolymer, propylene glycol ester of alginic acid, sodium alginate, potassium alginate, ammonium alginate, polyvinylpyrrolidone-vinyl acetate copolymer, polyvinyl acetate emulsion and arabinogalactin, the metal sheet being selected from the group consisting of aluminum, zinc, stainless steel, magnesium and the laminates and electroplates thereof, the water-soluble bichromate salt being selected from the group consisting of sodium, potassium and ammonium bichromates.

6. A dimensionally stable base support utilizable for lithographic platemaking comprising a metal sheet which is grained and provided on at least one side thereof with a thin tightly bonded durable hydrophilic surface obtained by the simultaneous subjection of said metal sheet to mechanical and chemical treatment with an abrasive and with an aqueous solution of a water-soluble bichromate salt and a water dispersible hydrophilic organic polymer followed by drying in which the weight ratio of bichromate to polymer in the aqueous solution is from 10:1 to 1:3.

7. A dimensionally stable base support utilizable for lithographic platemaking comprising a metal sheet which is grained and provided on at least one side thereof with a thin tightly bonded durable hydrophilic surface obtained by the simultaneous subjection of said metal sheet to mechanical and chemical treatment with an abrasive and with an aqueous solution of a water-soluble bichromate salt and a water dispersible hydrophilic organic polymer followed by drying in which the weight ratio of bichromate to polymer in the aqueous solution is 3:1.

8. A dimensionally stable base support utilizable for lithographic platemaking comprising a metal sheet which is grained and provided on at least one side thereof with a thin tightly bonded durable hydrophilic surface obtained by the simultaneous subjection of said metal sheet to mechanical and chemical treatment with an abrasive and with an aqueous solution of a water-soluble bichromate salt and a water dispersible hydrophilic organic polymer followed by drying in which the weight ratio of bichromate to polymer in the aqueous solution is from 10:1 to 1:3 and the concentration of bichromate is not less than a minimum of 0.03% and the concentration of polymer is not less than a minimum of 0.01%, based on the weight of the aqueous solution, the maximum amounts of bichromate and polymer being governed by their water solubility and an optimal solution viscosity not in excess of about 500 centipoises.

9. A base support utilizable for lithographic platemaking comprising an aluminum sheet which is grained and provided on at least one side thereof with a thin tightly bonded durable hydrophilic surface obtained by the simultaneous subjection of such sheet to mechanical graining and chemical treatment with a slurry composed of the following ingredients in approximately the following proportions:

Distilled water	ml	1000
Polyvinyl alcohol (99% hydrolyzed)	grams	10
Ammonium bichromate	do	30
Pumice powder	do	227
Silicon carbide powder	do	227

followed by washing and air drying.

10. A base support utilizable for lithographic platemaking comprising an aluminum sheet which is grained and provided on at least one side thereof with a thin tightly bonded durable hydrophilic surface obtained by the simultaneous subjection of such sheet to mechanical graining and chemical treatment with a slurry composed of the following ingredients in approximately the following proportions:

Distilled water	ml	1000
Polyvinylpyrrolidone resin of a molecular weight of 360,000	grams	10
Ammonium bichromate	do	30
Pumice powder	do	227
Silicon carbide powder	do	227

followed by washing and air drying.

11. A base support utilizable for lithographic platemaking comprising an aluminum sheet which is grained and provided on at least one side thereof with a thin tightly bonded durable hydrophilic surface obtained by the simultaneous subjection of such sheet to mechanical graining and chemical treatment with a slurry composed of the following ingredients in approximately the following proportions:

Distilled water	ml	1000
Potassium bichromate	grams	75
Gum arabic	do	15
Pumice powder	do	227
Silicon carbide powder	do	227

followed by washing and air drying.

12. A base support utilizable for lithographic platemaking comprising an aluminum sheet which is grained and provided on at least one side thereof with a thin tightly bonded durable hydrophilic surface obtained by the simultaneous subjection of such sheet to mechanical graining and chemical treatment with a slurry composed of the following ingredients in approximately the following proportions:

Distilled water	ml	1000
Dimethylol urea	grams	10
Sodium bichromate	do	30
Pumice powder	do	454

followed by washing and air drying.

13. A base support utilizable for lithographic platemaking comprising an aluminum sheet which is grained and provided on at least one side thereof with a thin tightly bonded durable hydrophilic surface obtained by the simultaneous subjection of such sheet to mechanical graining and chemical treatment with a slurry composed of the following ingredients in approximately the following proportions:

Water	liters	151.4
Dimethylol urea	kilograms	1.25
Ammonium bichromate	do	3.77
Silicon carbide powder	do	18

followed by washing and air drying.

14. A base support utilizable for lithographic platemaking comprising a stainless steel sheet which is grained

and provided on at least one side thereof with a thin tightly bonded durable hydrophilic surface obtained by the simultaneous subjection of such sheet to mechanical graining and chemical treatment with a slurry composed of the following ingredients in approximately the following proportions:

Water	liters	151.4
Dimethylol urea	kilograms	1.25
Ammonium bichromate	do	3.77
Silicon carbide powder	do	18

followed by washing and air drying.

15. A base support utilizable for lithographic platemaking comprising an aluminum sheet which is grained and provided on at least one side thereof with a thin tightly bonded durable hydrophilic surface obtained by the simultaneous subjection of such sheet to mechanical graining and chemical treatment with a slurry composed of the following ingredients in approximately the following proportions:

Water	liters	151.4
Polymethyl vinyl ether-maleic anhydride inter-polymer of specific viscosity of 0.1 to 0.5		
Ammonium bichromate	kilograms	1.25
Silicon carbide powder	do	3.77
	do	18

followed by washing and air drying.

16. A base support utilizable for lithographic platemaking comprising a zinc sheet which is grained and provided on at least one side thereof with a thin tightly bonded durable hydrophilic surface obtained by the simultaneous subjection of such sheet to mechanical graining and chemical treatment with a slurry composed of the following ingredients in approximately the following proportions:

Water	liters	151.4
Polymethyl vinyl ether-maleic anhydride inter-polymer of specific viscosity of 0.1 to 0.5		
Ammonium bichromate	kilograms	1.25
Silicon carbide powder	do	3.77
	do	18

followed by washing and air drying.

17. A presensitized lithographic plate capable of being stored for periods up to several months without loss of photographic sensitivity which comprises a mechanically grained and chemically treated sheet according to claim 1 having thereon a coating of a light-sensitive organic material.

18. A presensitized lithographic plate capable of being stored for periods up to several months without loss of photographic sensitivity which comprises a mechanically grained and chemically treated sheet according to claim 1 having thereon a coating of a light-sensitive diazo resin.

19. A presensitized lithographic plate capable of being stored for periods up to several months without loss of photographic sensitivity which comprises a mechanically grained and chemically treated sheet according to claim 5 having thereon a coating of a light-sensitive diazo resin.

20. A presensitized lithographic plate capable of being stored for periods up to several months without loss of photographic sensitivity which comprises a mechanically grained and chemically treated sheet according to claim 9 having thereon a coating of a light-sensitive diazo resin.

21. A presensitized lithographic plate capable of being stored for periods up to several months without loss of photographic sensitivity which comprises a mechanically grained and chemically treated sheet according to claim 10 having thereon a coating of a light-sensitive diazo resin.

22. In a process for producing a lithographic plate, the steps of simultaneously surface treating at least one side of a metal sheet with an abrasive and with an aqueous

solution of a water-soluble bichromate salt and a water dispersible hydrophilic organic polymer and washing and air drying the thus treated metal sheet.

23. A process according to claim 22, in which the polymer is selected from the group consisting of gum arabic, dextran, carboxymethylcellulose, the sodium salt of carboxymethyl hydroxyethyl cellulose, polyacrylamide, polyvinyl alcohol, polyvinylpyrrolidone, dimethylol urea, dimethyl hydantoin formaldehyde resins, water-soluble urea formaldehyde resins, gelatin, polyvinyl methyl ether-maleic anhydride copolymer, propylene glycol ester of alginic acid, sodium alginate, potassium alginate, ammonium alginate, polyvinylpyrrolidone-vinyl acetate copolymer, polyvinyl acetate emulsion and arabinogalactin.

24. A process according to claim 22, in which the metal sheet is selected from the group consisting of aluminum, zinc, stainless steel, magnesium and the laminates and electroplates thereof.

25. A process according to claim 22, in which the bichromate salt is selected from the group consisting of sodium, potassium and ammonium bichromates.

26. In a process for producing a lithographic plate, the steps of passing a metal sheet in a horizontal plane under revolving bristle brushes while the sheet is covered with a slurry made up of the following ingredients in approximately the following proportions:

Distilled water	ml.	1000
Polyvinyl alcohol (99% hydrolyzed)	grams	10
Ammonium bichromate	do.	30
Pumice powder	do.	227
Silicon carbide powder	do.	227

27. In a process for producing a lithographic plate, the steps of passing a metal sheet in a horizontal plane under revolving bristle brushes while the sheet is covered with a slurry made up of the following ingredients in approximately the following proportions:

Distilled water	ml.	1000
A polyvinylpyrrolidone resin with a molecular weight of 360,000	grams	10
Ammonium bichromate	do.	30
Pumice powder	do.	227
Silicon carbide powder	do.	227

28. In a process for producing a lithographic plate, the steps of passing a metal sheet in a horizontal plane under revolving bristle brushes while the sheet is covered with a slurry made up of the following ingredients in approximately the following proportions:

Distilled water	ml.	1000
Potassium bichromate	grams	75
Gum arabic	do.	15
Pumice powder	do.	227
Silicon carbide powder	do.	227

29. In a process for producing a lithographic plate, the steps of passing a metal sheet in a horizontal plane under revolving bristle brushes while the sheet is covered with a slurry made up of the following ingredients in approximately the following proportions:

Distilled water	ml.	1000
Dimethylol urea	grams	10

Sodium bichromate	do.	30
Pumice powder	do.	454

30. In a process for producing a lithographic plate, the steps of passing a metal sheet in a horizontal plane under revolving bristle brushes while the sheet is covered with a slurry made up of the following ingredients in approximately the following proportions:

Water	liters	151.4
Dimethylol urea	kilograms	1.25
Ammonium bichromate	do.	3.77
Silicon carbide powder	do.	18

31. In a process for producing a lithographic plate, the steps of passing an aluminum sheet in a horizontal plane under revolving bristle brushes while the sheet is covered with a slurry made up of the following ingredients in approximately the following proportions:

Distilled water	ml.	1000
Polyvinyl alcohol (99% hydrolyzed)	grams	10
Ammonium bichromate	do.	30
Pumice powder	do.	227
Silicon carbide powder	do.	227

32. In a process for producing a lithographic plate, the steps of passing a stainless steel sheet in a horizontal plane under revolving bristle brushes while the sheet is covered with a slurry made up of the following ingredients in approximately the following proportions:

Distilled water	ml.	1000
Polyvinyl alcohol (99% hydrolyzed)	grams	10
Ammonium bichromate	do.	30
Pumice powder	do.	227
Silicon carbide powder	do.	227

33. In a process for producing a lithographic plate, the steps of passing a metal sheet in a horizontal plane under revolving bristle brushes while the sheet is covered with a slurry made up of the following ingredients in approximately the following proportions:

Distilled water	ml.	1000
A polymethyl vinyl ether-maleic anhydride interpolymer having a specific viscosity of 0.1 to 0.5	grams	10
Sodium bichromate	do.	30
Pumice powder	do.	454

34. In a process for producing a lithographic plate, the steps of passing a zinc sheet in a horizontal plane under revolving bristle brushes while the sheet is covered with slurry made up of the following ingredients in approximately the following proportions:

Water	liters	151.4
Dimethyl urea	kilograms	1.25
Ammonium bichromate	do.	3.77
Silicon carbide powder	do.	18

No references cited.

60 NORMAN G. TORCHIN, *Primary Examiner*.
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