June 11, 1940. A. R. TRIST 2,203,849

PRINTING PLATE

Filed May 13, 1937

Fig. 1.

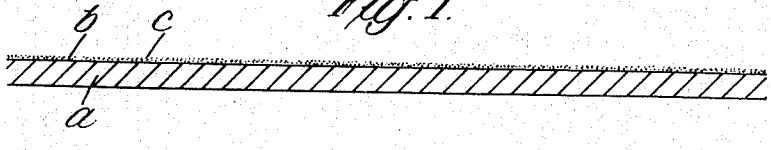


Fig. 2.

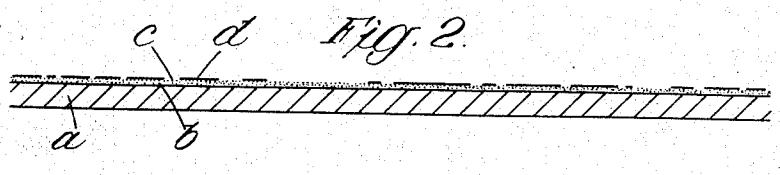


Fig. 3.

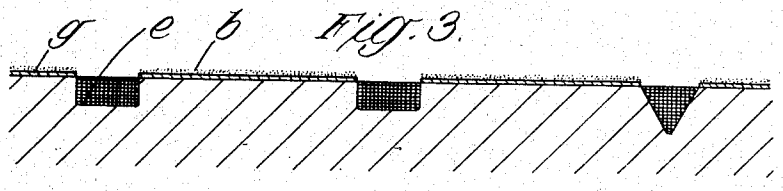


Fig. 4.

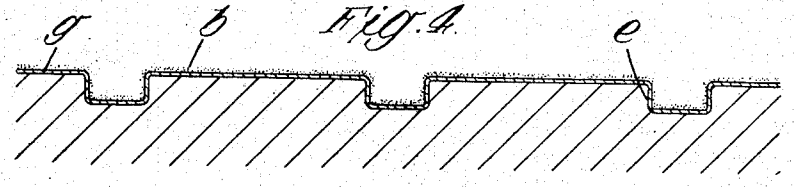
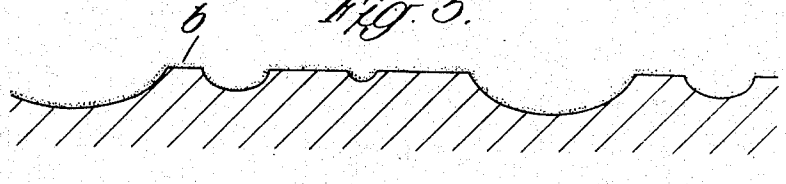


Fig. 5.



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UNITED STATES PATENT OFFICE

2,203,849

PRINTING PLATE

Arthur Ronald Trist, Chipstead, England

Application May 13, 1937, Serial No. 142,376
In Great Britain May 29, 1936

8 Claims. (Cl. 41—41.5)

This invention relates to improvements in printing plates and has for its principal object to produce a metallic printing surface in such a condition that the nonprinting areas will reject the ink applied during the printing operation, which shall be more resistant to wear and which will be capable of a greater number of impressions in a given time than is usual with known printing plates of the same kind or type.

The invention is applicable to plates which can be used in so called lithographic offset printing or for lithographic printing direct without offset blankets and by its use the cost of printing is reduced because the plate can be used repeatedly after cleaning and without expensive regraining.

A further object of the invention is to produce a lithographic printing surface in metal capable of giving not only greater depth of colour, range of tone, and finer printing impressions in colour printing than is possible with known plates when used on a lithographic press, but which will enable colour printing in absolute register to be effected when used on a typographic press with provisions for supply of moisture inasmuch as the transfer produced printing images are undistorted by the heat effects which prevent the successful use of stereos for that purpose.

The invention also is applicable to intaglio printing plates and by its use not only is a considerable saving in ink obtained but the wear and tear on the plate is reduced and the printing press can be simplified.

Further the invention is applicable to relief printing surfaces such as half tone plates or typographic plates and by its use it is possible to maintain a given standard of printed representation over a long run without difficulty and without that loss of time which usually is necessary for "washing up" the plate to remove accumulated dust and superfluous ink.

A layer of chromium when freshly deposited electrolytically with an adsorbent matt surface is found to be activated during formation to exhibit an extraordinary attraction to grease and capable of being passivated locally to exhibit remarkable repulsion to grease in the presence of moisture and requires no further treatment, but in general, if the unpolished adsorbent matt surface of chromium will not attract grease, it can be activated so to do by the application thereto of acids such as hydrochloric acid or hydrobromic acid, or by arranging the surface as a cathode during electrolytic treatment in an acid bath, subsequent passivation of said activated surface being possible at any time and to any extent by treatment with certain kinds of oxygenating or oxidising agents; further it has been found that it is possible to effect these changes repeatedly.

By the application of the phenomena forming the basis of the invention it is possible to produce a lithographic printing surface of great durability by applying a greasy image to the unpolished adsorbent matt surface of a layer of chromium either freshly deposited electrolytically or rejuvenated as explained above to attract grease and then treating the uncoated surface with an oxygenating or oxidising agent to passivate it so that it will repel grease in the presence of moisture.

Such a lithographic printing surface can be used either direct or "offset" with a greasy ink or a nongreasy or water ink as may be required and suitable to the printing image.

By the application of the phenomena referred to above to intaglio and to relief printing plates, it is possible to restrict the area inked to that from which ink is applied to produce the impression.

In its broadest sense the invention resides in the deposition of a layer of chromium with an adsorbent matt surface on a printing plate so that the surface is activated to attract grease and can be passivated locally to repel grease in the presence of moisture it being possible again to activate the passivated surface, or local areas of it.

Although a convenient method of effecting the required deposition is by electrolytic means owing to the control over the nature of the deposit that can be exercised easily the invention is not limited thereto.

In the drawing:

Figure 1 is a cross section through a lithographic printing plate constituted according to this invention;

Figure 2 is a cross section through the plate shown in Figure 1 with a printing image thereon;

Figure 3 is a cross section through an intaglio printing plate showing the invention applied thereto;

Figure 4 is a cross section through an intaglio printing plate showing the invention applied thereto in a modified way; and

Figure 5 is a cross section through a relief printing plate improved according to this invention.

In the formation of the improved lithographic plate it is most convenient and simple to take a

carefully flattened and chemically clean sheet *a* of copper of suitable size and thickness and apply a firmly adherent and coherent layer *b* of chromium thereto with an adsorbent matt surface by electrolysis in a bath containing about 50% to 60% chromic acid and sulphuric acid as usual at a temperature between about 5°–10° C. with a current density of about 200–300 amperes per square foot of surface.

When a layer *b* of chromium about .00004 to .0003 of an inch thick has been deposited, the plate is removed from the bath and washed quickly to remove the chromic acid, then the surface *c* is cleaned to remove any nonmetallic deposit and finally the plate is dried.

Electro deposition under the above recited conditions not only results in a layer of chromium with an adsorbent matt surface but provides for control of deposition by variation in temperature, current density and electrolyte concentration so that it is possible to obtain a grain of suitable fineness or coarseness for the work in hand and suitable for the exercise of the fundamental principles upon which the invention is based.

By this invention, owing to the durability of chromium, it is possible commercially to make use of a much finer or smoother surface for the printing image than has been available in commerce hitherto and a surface having such characteristics as will enable a greater depth of tone and colour to be achieved than has been possible with the comparatively rough surfaces available hitherto.

Instead of using copper for the sheet *a* any other sheet material, rigid or flexible, capable of supporting a practical printing plate surface and suitable for use on a printing press (flat bed or cylinder) may be employed for the base provided that it is suitable for receiving and retaining a firmly adherent and coherent layer of chromium which may be applied to said base in any way possible provided that the layer of chromium has the requisite texture, porosity and adsorbent matt surface.

The sheet *a* may have a smooth surface, such for example as occurs with rolled sheet metal, or the surface may be etched anodically or sandblasted, or the surface may be grained mechanically by means that are in common use with known zinc and other metal lithographic plates or the surface may have a firmly adherent metallic coating with a nonpolished surface obtained for example by the controlled electro deposition thereon of zinc, nickel or the like.

With electro deposition the base may be a sheet of electrical non-conducting material such as paper, cellulose derivative, artificial resin or the like with a conducting surface sprayed on, rolled on, or otherwise applied, or the base may be a sheet of metal such as zinc, tinplate, terneplate, iron or the like, with or without a coating of copper.

In practice printing plate stock freshly prepared according to this invention is activated by manufacture but if the stock is stale or has become passivated to grease for any reason it is treated with an aqueous solution of hydrochloric acid, hydrobromic acid or the like to which may be added a wetting or penetrating agent for example a suitable treatment fluid may consist of about 2% cyclohexanone, about 1½% of alkylnaphthalene sulphonic acid known commercially as Invadine "C" or sodium lorol sulphate known commercially in Great Britain as Gardinol, and about 2% to 3% hydrochloric acid solution to activate the unpolished adsorbent surface to attract grease, an ink image *d* is transferred to the surface *c* by direct pressure or applied photographically by the albumen process or by processes employing diapositives and fish glue or colloids or is applied by hand crayon drawing, then the background is laved or otherwise treated with solutions containing nitric acid, peroxide of hydrogen, tannic acid, chromic acid, potassium chlorate, potassium permanganate, perchloric acid, sulphuric acid severally or in selected combination or with other chemical (with or without gum arabic) to passivate the parts not inked so that such parts shall repel printing ink, and finally the plate is washed with water.

A solution of tannic acid, sulphuric acid, nitric acid, and gum arabic has been found to operate in an effective and reliable manner if freshly prepared from the following stock solution viz: water, tannic acid B. P. about 4%, pure sulphuric acid, by weight about 2%, and pure nitric acid, by weight about 1%. In use a quantity of this solution is mixed with an equal quantity of mucilage of gum arabic to form the passivating liquid.

Alternatively the stock may be coated with photographic silver bromide emulsion, be exposed and developed with a "tanning" developer to produce a negative and be worked up into a printing plate by activating and inking the bare metal surface which results from "washing out" or dissolving the unexposed gelatine areas, removing the exposed gelatine areas and then passivating the background.

As is known in the art owing to the wear resisting properties of chromium the unpolished adsorbent matt surface is undamaged by printing so that an exceptionally long printing life is obtained. Therefore according to this invention, it is possible at any time to remove the image by suitable solvents and cleaning agents such as cyclohexanone and to apply a new image without regraining the surface.

Although reference has been made to the application of greasy ink to the activated areas to form a printing image using printer's ink in those cases when a water or nongreasy ink is to be used any nonprinting wax or grease is applied to the activated areas and the passivated areas constitute the printing image.

When dealing with an intaglio printing surface according to this invention the incised pattern *e* in the plate *f* may be filled up with bitumen cellulose derivative or the like level with the nonprinting part, cleaning the nonprinting part, depositing a very thin layer *g* of copper electrolytically on said nonprinting part if necessary, and then applying an electrolytic deposit *b* of chromium with an unpolished adsorbent matt surface to the nonprinting part or to the copper layer thereon, as the case may be, from an electrolyte containing about 50%–60% chromic acid and sulphuric acid as usual at a temperature between about 5°–10° C. with a current density of about 200–300 amperes per square foot of surface.

The plated surface *b* is then laved or otherwise treated with an oxygenating or oxidising agent as described in relation to the lithographic surface.

The bitumen or cellulose is now removed from the incised parts *e* without the use of heat and after moistening the passivated surface *b* the incised parts *e* are filled with ink and the block is ready for printing from repeatedly (when mois-

tened and fed with ink) without it being necessary to wipe off any superfluous ink.

To overcome the difficulties which in practice arise with the use of bitumen and the localised plating referred to above the invention may be applied to such an intaglio plate *f* without filling the incised pattern *e* with bitumen by first copper-plating (if necessary) the surfaces of the incised pattern as well as the surfaces of the nonprinting parts as shown in Figure 4 and then applying to the whole an electrolytic deposit *b* of chromium with an adsorbent matt surface from the electrolyte and under the conditions already described.

Such a layer *b* of chromium should not need activation relatively to grease but if it does it can be activated by the application thereto of hydrochloric acid or the activating liquid described above and to passivate the nonprinting part after drying, a thin layer of the passivating liquid described hereinbefore is applied by transfer or roller with such care as will prevent the admission of any passivator to the surfaces of the incised parts *e* which latter are filled with ink and the intaglio plate is ready for printing from under the conditions specified previously.

The application of the invention to typographic printing plates or individual type should be obvious from the above description and comprises either applying a layer of chromium with an unpolished adsorbent matt surface to the whole of the plate or type and activating the printing face to attract grease and passivating the nonprinting part to repel grease in the presence of moisture or applying a layer of chromium with an unpolished adsorbent matt surface to the nonprinting part only and passivating it to repel grease in the presence of moisture.

Thus it will be seen that by the use of this invention it is possible to utilise the lithographic function of differential ink adherence and rejection in the presence of moisture with nonplanographic printing plates and by restricting the application of ink precisely to those parts from which an impression is to be obtained to overcome the disadvantages which have arisen in the past with indiscriminate application of ink.

I claim:

1. A method of treatment for nonplanographic printing plates comprising the etching of the nonprinting areas to expose the metal in crystalline form and the application of a thin layer of chromium to said etched surface to form an unpolished chromium coated adsorbent surface which can be passivated locally by the application of an agent to the background to passivate said background to repel grease in the presence of moisture.

2. A method of treatment for nonplanographic printing surfaces comprising the application of a layer of chromium with an unpolished adsorbent matt surface activated to attract grease to the printing and nonprinting areas of said plate and the application of a liquid mixture of tannic acid, sulphuric acid, nitric acid, water and a colloid to the nonprinting areas of said plate to passivate said areas to repel grease in the presence of moisture.

3. A method of treatment for nonplanographic printing surfaces comprising the application of a layer of chromium with an unpolished adsorbent matt surface activated to attract grease to the printing and nonprinting areas of said plate and the application of a passivating liquid to the nonprinting areas of said plate to cause said areas to repel grease in the presence of moisture.

4. A method of treatment for planographic printing surfaces comprising the application of a layer of chromium with an unpolished adsorbent matt surface activated to attract grease to said surface, the application of a greasy image to said surface and the application of a passivating liquid to the nonprinting areas of said surface to cause said areas to repel grease in the presence of moisture.

5. A method of treatment for planographic printing surfaces comprising the application of a layer of chromium with an unpolished adsorbent matt surface activated to attract grease to said surface, the application of a greasy image to said surface and the application of a liquid mixture to the nonprinting areas of said surface to passivate the nonprinting areas to repel grease in the presence of moisture.

6. A method of treatment for planographic printing surfaces comprising the application of a layer of chromium with an unpolished adsorbent matt surface activated to attract grease to said surface, the application of a greasy image to said surface and the application of a liquid mixture of tannic acid, sulphuric acid, nitric acid, water and a colloid to the nonprinting areas of said surface to passivate said areas to repel grease in the presence of moisture.

7. A method of treatment for printing surfaces comprising the electrolytic deposition of a layer of chromium with an unpolished adsorbent matt surface activated to attract grease to said surface, and the application of a liquid mixture of tannic acid, sulphuric acid, nitric acid, water and a colloid to the nonprinting areas of said surface to passivate said areas to repel grease in the presence of moisture.

8. A method of treatment for printing surfaces comprising the application of a layer of chromium with an unpolished adsorbent matt surface activated to attract grease to said surface, the application of a greasy image to said surface and the application of a passivating liquid to the nonprinting areas of said surface to cause said areas to repel grease in the presence of moisture.

ARTHUR RONALD TRIST.