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PLANOGRAPHIC PRINTING SURFACE

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Fig. 1.

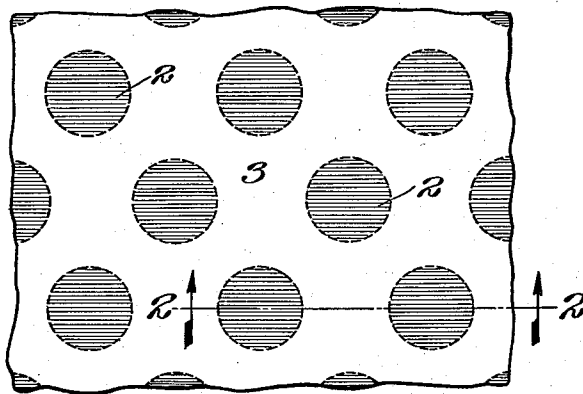
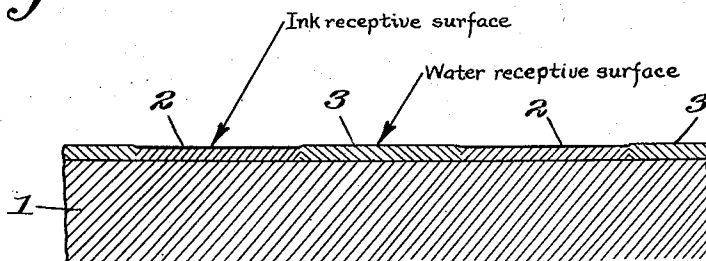


Fig. 2.



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PLANOGRAPHIC PRINTING SURFACE

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This application is a continuation of our application Serial No. 257,553, filed February 27, 1928, for "planographic printing surface".

5 This invention relates to a novel planographic printing surface and to a new process of preparing the water-receptive, non-printing areas of planographic printing surfaces.

The printing surfaces embraced within the scope of this invention are those adapted for use on the various types of lithographic and offset presses, these surfaces in general being characterized by the fact that certain portions, called the image or design, are receptive to grease, lithographic ink, etc., and repellent to water, and that the remaining portions are receptive to water and repellent to grease, lithographic ink, etc. when they are moistened with water. It has been the practice in the past to form the grease-attractive image or design on a supporting material such as a lithographic stone, metallic plates, or on celluloid by any one of a number of methods; for example:

25 (1) Writing or drawing directly on the stone or metal with a greasy ink, tusche, or crayon.

(2) Transferring a greasy design to the surface of stone or metal by methods known to the art.

30 (3) Coating the surface of stone or metal with a sensitized colloid and exposing it to light in contact with a negative of the design, or by projection, thereby forming a positive print on the surface, composed of insoluble colloid which is rendered grease-attractive for the purpose of printing.

40 (4) Coating the surface of stone or metal with a sensitized colloid and exposing to light in contact with a positive transparency of the design, thereby forming a negative print on the surface, composed of insoluble colloid; removing the soluble colloid from the areas protected against light exposure by the positive transparency, and replacing it with a greasy material, the light-hardened colloid acting as a stencil which is afterwards removed, leaving the greasy printing image.

50 Regardless of the method employed to produce the greasy printing image or design,

the remaining portions of the surface which are not desired to print have, in the past, been rendered water-receptive and grease-repellent by treatment with a so-called "etch" or desensitizer composed of an acid, salt, or mixture of both, either alone or in combination with a solution of gum arabic. This so-called etching operation is invariably followed by an application of gum arabic solution which is subsequently dried.

The present invention consists of improvements in methods of treating the non-printing areas of planographic printing plates to render them water-attractive and grease-repellent.

According to this invention the supporting material may be lithographic stone, zinc, aluminum, celluloid, rubber, or any material having the necessary mechanical properties and, preferably a surface grain or a porous structure. This invention comprises the formation of a durable hydrophilic film on the portions of the surface of such a supporting material which are desired not to print. The greasy printing image or design may be produced by any method known to the art.

The object of the invention is to produce non-printing areas on a planographic surface which bound the greasy printing image or design, which non-printing areas are water-receptive, and in addition are durable and resistant to abrasion, oxidation, and other actions which usually destroy the grease resistance of said non-printing areas produced by previous methods, and thus necessitate frequent etching and gumming of the surface during the printing operation.

Another object is to produce a planographic printing surface, the properties of which are practically independent of the supporting material.

Still another object is the preparation of a planographic printing surface in which the printing areas are not characterized by appreciable relief above the non-printing areas.

Other objects and further advantages will be more fully apparent from the description of the accompanying drawing, in which:

Figure 1 is a plan view.

Figure 2 is a section on line 2—2, Figure 1.

It must be understood that these views are both diagrammatic enlargements intending to show the general nature of the invention and the relative disposition of the materials used and are not intended to represent proportions and relative thicknesses with accuracy since the thinness of the actual films involved and the impossibility of measuring them accurately renders scale drawings impossible.

As disclosed, a support 1, preferably metallic, has deposited directly upon it two films, one of light hardened albumen constituting printing dots 2, the other of light hardened gum arabic constituting non-printing area 3. The light hardened film of albumen is an ink-receptive surface and the light hardened film of gum arabic is a water-receptive surface. These films are substantially flush with each other so that the printing surface is substantially without relief. The water-receptive surface protects the ink-receptive surface physically from wear and abrasion and also prevents these ink-receptive surfaces from being undermined chemically by the etching liquids. Moreover, the water-receptive surface is so absorbent to water that it permits the plates to be wet by a liquid devoid of etching acid so that this water-receptive film not only protects the ink-receptive surfaces, but obviates the use of a conventional etching material which is injurious to the ink-receptive surfaces.

While the above description is directed to the use of the preferred films, that is, light hardened albumen and light hardened gum arabic, the above disclosure must be read in relation to the remainder of the specification which more fully develops and explains the invention.

According to prior art, certain colloids, e. g. gelatin, glue, albumen, casein, etc., when mixed with chromic acid or a salt thereof become sensitive to light. When such a mixture is coated on a stone or metal surface and exposed to the action of light, it is rendered insoluble in water and caused to become grease- or ink-receptive in proportion as it becomes insoluble. This knowledge has been made use of in the various methods of photo-etching, photo-lithography and collotype.

Now what has not been known to prior art is that certain colloids, when properly sensitized and exposed to light, become physically stable, strong gels long before they attain the slightest grease-receptive properties. Such gel films when produced properly on planographic printing surfaces are water-receptive and grease-resistant to a high degree, and, in addition, possess great strength, durability, and resistance to abrasion and the action of dilute acids and alkalis. When produced on the non-printing areas of a planographic printing plate, they constitute a surface greatly superior to the surface produced

by known methods of etching or desensitizing said surface to grease. These hardened colloid films, because of their great strength and appreciable thickness, protect the grained surface of the planographic printing plate from wear due to abrasion by paper, inking and dampening rollers, and, in offset lithography, by the rubber offset blanket. In addition, these films prevent oxidation of metal plate surfaces and eliminate the bad effects on such surfaces of traces of chemicals existing in paper, rubber blankets, inks, and dampening waters.

The factors controlling the quality of such hydrophilic colloid films are:

1. Nature of the colloid.
2. Proportion of sensitizing agent to colloid.
3. Intensity of light to which it is exposed.
4. Time of exposure.
5. Thickness of the film.
6. Reflecting power of the material constituting the support.
7. Nature of the surface grain of the support.

Numerous colloidal substances are susceptible of use in forming such hydrophilic films. These include gum arabic, dextrine, modified starch, agar-agar, etc. For the purpose of disclosure, gum arabic is chosen, as it typifies the class of substances which can be made sensitive to the action of light by admixture with chromic acid or a salt thereof, and used to produce the desired results.

The planographic printing surface produced according to this specification differs from collotype and photo-gelatine printing surfaces in that the non-printing areas are produced by means of separate materials and in a separate and distinct operation from that used in preparing the image or design areas, whereas in the collotype process, both the design and non-design areas are composed of the same material, namely, gelatine, the design portions being formed by sensitization of the whole surface and selective exposure of the desired areas to light. In our process the image and non-image areas therefore are each composed of the most favorable materials, treated individually to produce the particular optimum conditions for durability and service of each area, whereas the weakness of the collotype and similar processes lies in the fact that no single colloid coating can be made to assume maximum ink preferring powers in one area, maximum water preferring powers in another area, and maximum durability of both areas at the same time.

As an example of the method used which yields satisfactory results, the following procedure will serve:

A solution composed of 1 part ammonium bichromate, 15 parts air dried gum arabic, 45 parts water, is coated on a grained planographic surface on which a greasy or grease-

receptive image or design has been produced by any of the methods known to the art. A grained surface is desirable because all films adhere to it much better than to a polished surface. For the purpose of this disclosure it makes no difference whether or not said surface has previously received the conventional lithographic etch, since the described treatment alone produces the improved ink-repellent surface. The coating operation is not limited to any one method, but includes coating by hand as in the well known operation of "gumming up", coating on a whirler, brushing, flowing, spraying, or dipping. After coating the surface, the coating is dried and exposed to the rays of an arc light or any other light source of sufficient intensity. A method yielding satisfactory results is to expose said coating to the rays of an arc light using $\frac{1}{2}$ " photographic white flame carbons operating under an arc potential of 32 volts, at 30 amperes, for one and one-half minutes at twenty inches distance from the arc. The time of exposure and distance are dependent on each other and on the intensity of radiation from the light source. Any one of these factors may be varied at will, provided the other factors are adjusted so that approximately the same total light energy is furnished to a unit area of the coating.

After exposure, the surface is thoroughly washed to remove unchanged ammonium bichromate. The surface may or may not be gummed in the conventional manner before proceeding with the printing operation, but gumming is recommended, as it makes possible greater hardening of the colloid without danger of it becoming grease-receptive than is the case if gumming is omitted.

This invention is not limited by this example, since a wide range of compositions of the colloid mixture may be used and a similar result obtained by properly adjusting the degree of exposure. For example, a solution containing the proportion of one part of ammonium bichromate to five parts of air dried gum arabic, coated and dried on an aluminum surface and exposed under the above described conditions for thirty seconds will produce a suitable hydrophilic film. A solution containing the proportion of one part of ammonium bichromate to thirty parts of gum arabic, coated on a similar surface, dried, and exposed under the same conditions for six minutes will also yield a suitable hydrophilic film. The latter proportion constitutes approximately the practical lower limit of bichromate concentration, since a proportion of less than 1-30 requires an exposure of impractical length and even then does not yield the best results. The upper limit of bichromate concentration is approximately the proportion at which the bichromate crystallizes visibly when the coating is dried before exposure. This description refers particularly

to ammonium bichromate but chromic acid or any of its salts may be substituted with certain modifications. In like manner the light exposure to be given a coating of any selected composition may be varied within certain limits and still produce the desired results but to a diminishing degree as the conditions vary from the optimum. An exposure of ten minutes or more is required to produce definite grease-receptive properties in a coating of the composition, and under the exposure conditions specified in above example.

The reflecting power of the support is a factor in determining the amount of exposure to be given in any case. The coating on a zinc surface requires a somewhat longer exposure than on aluminum. On a white opaque celluloid or pyroxylin surface the exposure should be shorter than in the case of aluminum.

The advantages gained by the above described invention are listed as follows:

1. The hydrophilic film produced is of appreciable thickness and is capable of imbibing and holding moisture. It therefore does not dry out as quickly as water-attractive surfaces produced by previous methods.

2. Since the hydrophilic film produced is relatively hard and resistant to abrasion, it practically eliminates the chemical nature of the solid support from the field of action. Any solid material of suitable mechanical properties may therefore be used as the support or printing plate. The hydrophilic film prevents wearing away of the grain of the supporting material.

3. Since said hydrophilic film prevents grease adhering permanently to the surface, little or no corrosive material need be used in the dampening solution during printing, with the result that the printing areas are not undermined and do not work sharp or diminish in size.

4. Said hydrophilic film protects metal printing surfaces from the oxidizing action of water and oxygen under ordinary printing conditions.

5. The hydrophilic film prepared by the proposed methods is of appreciable thickness, being of approximately the same magnitude as the thickness of the photo-lithographic printing image. This image therefore does not stand up in relief from the lithographic surface as in the previous process and is therefore not subject to the same extent to abrading forces which tend to destroy it. In other words, the printing and non-printing areas are now approximately at the same level in the case of photo-litho surfaces. Where crayon or pen drawings, air brush work, ink transfers, etc., form the printing areas, they are slightly depressed below the non-printing areas, and are therefore protected from ex-

cessive abrasion. In either case, the life of the printing image is greatly prolonged.

6. The high lights of the design to be printed lithographically are kept absolutely clean with less surface moisture than is required on surfaces produced by previous methods of etching. This is true even of the finest lights occurring in the shadows of a half tone or grained screen image, with the result that detail is preserved indefinitely, which formerly was lost after a few impressions.

7. The hydropophilic surface coating will stand much abuse, such as drying, abrasion, and treatment with chemicals, soap, solvents, oils, greases, inks, and asphaltum without additional protection, which would ruin planographic surfaces prepared by ordinary methods.

8. The proposed methods make possible the use of finer grains than are now possible. Finer grains make possible smoother, denser solids and the use of finer screens.

9. In case of damage to the hydrophilic surface film through accidents during printing or through excessive abrasion occurring during long editions, said hydrophilic film can easily be renewed while the plate is on the press by coating with the colloid mixture and hardening by proper light exposure.

10. Since less moisture is required to keep the non-printing areas of planographic surface ink-repellent, the ink impressions on the material being printed are brighter and more dense than ink impressions from plates prepared by previous methods.

11. The so-called processes of dry-lithography, in which inks containing a watery liquid or a deliquescent substance are printed without a separate dampening operation, are facilitated.

12. Both proving and machine printing can be done more rapidly and with less labor than heretofore.

13. Chromic acid etches with their recognized evils can be eliminated from the operations of transferring and printing.

14. Inks can be run softer, without danger of greasing or scumming, than on planographic plates prepared by previous methods. This means smoother printing and better lifting of inks, especially yellows. It also means less abrasion and wear of the design, since softer inks are better lubricants. The use of softer inks reduces the pull on the grippers, the danger of paper sticking to the plate or blanket, and "picking" of surface coating and lint from the paper.

15. Said hydrophilic surface film eliminates the necessity of frequent etching and gumming of the plate during the printing operation, and the consequent loss of fine work and vitality.

16. Printing surfaces are unaffected by traces of chemicals, such as alum or alkalis

in the paper being printed. Coated paper can be printed without danger of causing the plate to scum or tint.

Having described our invention, we claim:

1. The process of making a planographic printing surface which comprises depositing an ink-receptive image upon a support, and hardening a film of a colloidal material over the remaining areas of the support to render said remaining areas water-receptive.

2. The process of making a planographic printing surface, which comprises the step of coating a supporting surface with a colloidal material adapted to become ink-attractive when hardened to the point of physical stability, the step of so hardening a portion of said material to constitute an image, the step of removing the remainder of said material not hardened, the step of coating the portions of the plate other than the image with a colloidal material adapted to be water-receptive when hardened to the point of physical stability, and the step of so hardening said material.

3. A lithographic plate, the surface of which comprises printing and non-printing portions, the former, a grease-receptive film of hardened albumen, and the latter a hydrophilic film of hardened gum arabic.

4. The process of making a lithographic printing plate, comprising, depositing a grease-receptive printing film upon said plate, and hardening a film of gum arabic over the remainder of said plate to provide the water-receptive non-printing areas.

5. The process of making a lithographic printing plate, comprising, depositing a grease-receptive printing film upon said plate to constitute the printing design, depositing a greasy ink upon said printing film, and hardening a film of sensitized gum arabic over the remainder of said plate to provide the water-receptive non-printing areas.

6. In the process of making a planographic printing plate, the step of producing an ink-receptive design on a support, the step of depositing a greasy ink upon said design, the step of coating the non-design portions of the plate with a light sensitive colloid, the step of exposing the resultant coating to light to a degree sufficient to cause said coating to become insoluble in water, but insufficient to cause it to become grease-receptive when wet with water.

7. A lithographic plate, comprising, a support, and two organic colloidal films disposed side by side upon and adhering to said support, one of said films comprising a grease-receptive film, the other of said films being a hydrophilic film of hardened gum arabic of sufficient thickness to afford protection to the grease-receptive film.

8. The process of making a planographic printing surface, which comprises, depositing an ink-receptive image upon a support, and hardening a film of organic hydrophilic mate-

rial over the remaining areas of said support, said film of thickness sufficient to afford protection to the ink-receptive film.

5 9. A lithographic plate, comprising, a support upon which are disposed side by side two films of organic colloidal material adapted to adhere to said support, one of said films comprising grease-receptive light hardened albumen, the other of said films comprising
10 water-receptive light hardened gum arabic, said latter film of sufficient thickness to afford protection to said first film.

15 10. A metal lithographic plate adapted to be used without an etching dampening liquid, said plate, comprising, a metallic support, and two colloidal films deposited side by side upon said plate, said films adhering to said support directly, one of said films being grease-receptive, the other of said films being
20 water-receptive and sufficiently thick to protect the grease-receptive film and highly absorbent to water.

In witness whereof, we hereunto subscribe our names.

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