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L. FREUDER

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INTAGLIO PRINTING METHOD

Filed June 3, 1925

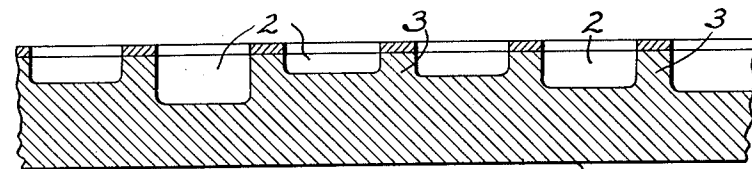


Fig. 6.

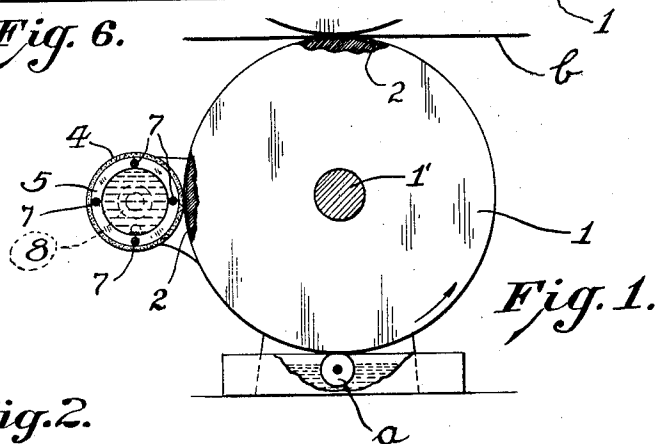


Fig. 1.

Fig. 2.

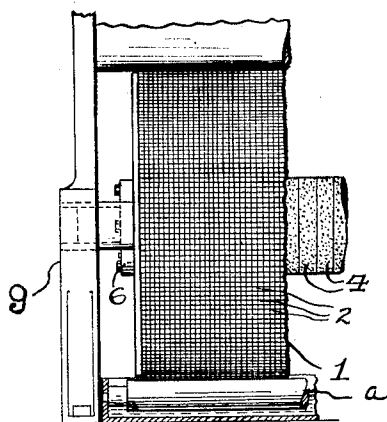


Fig. 3.

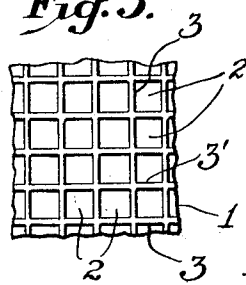


Fig. 4.

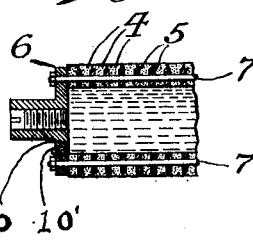
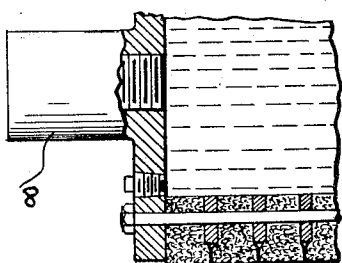


Fig. 5.



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UNITED STATES PATENT OFFICE

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INTAGLIO PRINTING METHOD

Application filed June 3, 1925. Serial No. 34,539.

This invention relates to the art of intaglio printing and particularly photogravure and rotary photogravure printing and has for its particular objects the more economical and expeditious printing, as well as the provision of an apparatus which not only affords a printing cylinder that is capable of yielding a greater number of impressions than is otherwise ordinarily obtainable from printing cylinders employed in ordinary processes, but which apparatus is also capable of producing impressions of much higher quality than heretofore obtainable besides other advantages hereinafter set forth.

As is well known in the ordinary intaglio printing methods, for example, what is commonly termed the rotary photogravure method, the cylinder has a copper screen in relief formed thereon, such for example as illustrated in a highly magnified fragment of the printing surface of a printing cylinder shown in Fig. 3. Such screen is formed by a plurality of guides or ribs, certain of which extend transversely and others of which extend longitudinally of the roll. The image or illustration is reproduced intaglio on said cylinder in the portions of such surface intermediate such intersecting lines of such screen. In practice, it is customary to employ a metal knife, termed a doctor blade, which engages the metal guides, forming such screen and not only is intended to remove from the contacting portions of such guides any adhering ink, but also serves to force any surplus ink into and to fill the intermediate etched cavities or cups which reproduce the impressions. Such doctor blade not only imperfectly cleans the guides, but seriously wears the guides of the relatively soft screen and gradually destroys the same. Obviously with the destruction of the screen the etched portions of the surface will be rapidly mutilated and the printing surface of the cylinder then becomes useless.

My investigations have led to the discovery that through the utilization of a supply of water and a screen having guide lines which have an affinity therefor, it is possible to entirely dispense with the metal doctor blades now employed and in lieu thereof

utilize an elastic or yielding surface as a medium for supplying water to the screen lines. Such a method, herein termed the "hydrogravure" method is capable of producing a vastly greater number of impressions or prints than now obtainable from a printing cylinder, owing to the virtually complete elimination of wear on the screen lines, but the screen lines themselves are kept entirely free from ink, thus rendering it possible to produce far clearer and superior impressions.

My invention is fully set forth in the following detailed description and the accompanying drawings forming a part thereof in which

Figure 1 is a diagrammatic elevation partially in section of my improved "hydrogravure" press;

Fig. 2 is a fragmentary front elevation of said press;

Fig. 3 is an enlarged developed plan view of the surface of the fragmentary print cylinder;

Fig. 4 is a fragmentary vertical section of my improved moistening roll showing the reservoir filled with water;

Fig. 5 is an enlarged fragmentary vertical section of the moistening roll shown in Fig. 4, the journal being shown partly in elevation.

Fig. 6 is an enlarged fragmentary vertical section of the impression cylinder showing the cell formation thereof and the plating of the guide lines.

Referring to the drawings and the construction shown therein, the reference numeral 1 designates a copper printing cylinder partially galvanized, as hereinafter set forth, the same being mounted on a shaft 1' and adapted to rotate therewith. The etched and cupped portions of the copper surface of said cylinder are protected by continuous intersecting galvanized guides or ribs 3, 3', the same constituting a screen in relief thereon. An ink roll or fountain device *a* serves to supply ink to the printing surface and the impression is taken off on a sheet or web *b*.

In lieu of the customary doctor blade now employed in the art as hereinbefore stated,

I provide a laminated roller comprising alternate rings 4, preferably composed of highly absorbent fibrous material of high capillarity which is capable of absorbing and retaining aqueous solutions, and also spacing rings or members 5 preferably composed of relatively stiff and non-absorbent material which serves as a skeleton or frame for said roller. End plates 6 are secured to each end of the roller by means of rods 7 which, as shown, extend completely through all of the laminated rings or members 4 and 5 of said roller, which latter is provided with hub members or axles 8 that are journaled in end brackets 9, which latter are so positioned as to hold the respective surfaces of the cylinder 1 and the aforesaid laminated roller in intimate contact during the revolution of the roller 1.

Moisture is adapted to be continuously supplied to the hollow interior of the roller through an opening 10 closed by a plug 10'.

The construction of the flesh and skeleton rings of my roller, which is not only employed in the above described lithographic press, but also has many other useful applications in the graphic art, is as follows:—

The rings 4 are prepared from selected paper stock fibre preferably for example that prepared from cotton rags in the usual manner, the same being thoroughly washed free of impurities, as particularly mineral matters and oxidizing or cementitious compounds, and are then intimately mixed with a glutinous sizing material as gelatin, glue, casein or the like in the proportions of about 2% to 20% depending on the character of the fibre employed, the larger the cotton content the smaller the percentage of glutinous size that is required. The sized material is then treated with a solution preferably containing about 10% of calcium chloride which serves to render the same more susceptible to expansion when moistened and increases the capillarity thereof. The mixture is then washed to remove the surplus sizing and calcium chloride and formed into gasket rings or what I have herein termed "flesh" rings in the manner customary in the manufacture of shapes from fibre.

The spacer or "skeleton" rings are formed of ordinary hard fibre such as commonly used for gears, radio panels, etc., and as shown, are of somewhat smaller diameter, preferably about $\frac{1}{16}$ " smaller than that of said flesh rings.

In order to control the capillarity of the supply of moisture or ink through such laminated roll, it is merely necessary to tighten or loosen the stay bolts or rods, thereby modifying the pressure as desired of the respective layers on each other and permitting greater or less ease of penetration by capillary attraction from the interior reservoir to the surface of such roll.

Owing to the fact that the moisture is drawn through my moistening roll by capillary attraction and the affinity of zinc for water, and also owing to the yielding nature of the surface of such roll, the amount of pressure required to moisten the desired portions of the printing surface and to effect the proper distribution of water thereover is considerably less than now commonly employed.

The layers 4 when treated in the above described manner have their properties substantially unaffected by cold water or cold ink carrying water soluble coloring matters so that the gelatin content of the finished layer remains substantially permanent. When a roll is produced in the manner herein described in which it has been found that even if the same is stored away after having been used and allowed to thoroughly dry out, they will at once resume functioning and their original properties will be restored, including the high capillarity when the reservoir is filled with moisture, or an ink containing water-soluble coloring matters.

In order to galvanize the screen lines only, of my improved printing cylinder, the usual rotary photogravure cylinder is first produced in the manner now customary in the art with the matter to be reproduced etched therein. For example:—

The usual rotary photogravure ink is applied to the printing surface and the lines are scraped clear either with a doctor blade or otherwise. The entire cylinder is then first rotated in a cleansing bath of potassium cyanide of about 8° Bé. KCN content, and then is rotated in an electrolytic galvanizing bath comprising a suitable zinc electrolyte as zinc sulphate. Since the screen lines only are unprotected by the ink previously applied, such unprotected lines will become galvanized by the electro-deposit of zinc thereon and the inked intaglio portions of the printing cylinder will, of course, not be affected by the galvanized treatment, as no zinc will be deposited thereon.

Following the galvanizing of the screen, lines, the printing cylinder is inserted in the press and the same is caused to rotate in contact so that the guides come into contact with the rotating surface of the moistening roll, through which water is supplied to the guides thereof by capillary attraction, as the latter engage with the surface of the members 4. The inking roll *a* is then adjusted so as to continuously engage the surface of the rotating printing cylinder 1, thereby the rotary photogravure ink in the fountain or reservoir in which such ink roll is mounted will be transferred in the usual manner to the etched portions of the surface of the printing cylinder, but the moistened galvanized guides will repel such ink and therefore will not be coated therewith. As the printing

cylinder 1 now continues its operation, impressions may be continuously taken off therefrom by webs or sheets *b* in the customary manner and during each revolution of such cylinder the guides will be moistened by the moistening roll and the etched intaglio portions of the surface will be inked by the inking roll.

While I prefer to employ the above described moistening roll in my improved hydrogravure process, it is evident that other means for maintaining galvanized guides of such roll in a moist condition may be employed without dispensing with the benefits which flow from the employment of my moistened galvanized guides.

While I preferably galvanize the guides with zinc, the guides may be formed from other metals having an affinity for water, such for example as aluminum but one of the decided advantages of zinc over other metals is that the same may be electro-deposited upon the guides.

Among the advantages of my invention, in addition to those above stated, may be mentioned the extreme economy of operation, due to the fact that the electro-deposits on the printing cylinder do not have to be frequently renewed as is now essential in the operation of so-called rotary photogravure or photogravure printing methods, while at the same time prints of far superior quality are obtainable.

Among the advantages of electro-depositing zinc or other metal upon the guides is the fact that if the impression obtained is too faint, due to the fact that the intaglio portions are not sufficiently etched so as to take the requisite amount of ink necessary to effectively reproduce the image on the work selected, it is merely necessary, instead of re-etching, to deposit more metal on the guides, as thereby the relative amount of ink in the cups or cavities, which, of course, will be of irregular depth in respect to each other, is correspondingly increased depending upon the additional height to which the guides are built up. This feature of supplementing the height of the guides by electro-deposition of metal thereon is equally applicable to the present rotary photogravure or photogravure methods, wherein the guides are of copper, as in such cases it is merely necessary to deposit additional amounts of copper on the guides after first protecting the etched portions by inking the same and preferably, of course, suitably cleaning the guides with potassium cyanide or other suitable agent before subjecting the same to an electrolytic bath.

It is preferable, in order to increase the affinity of the zinc guides for water, to subject the same immediately following the galvanizing operation to the action of a gum arabic-phosphoric acid bath in order to slightly

roughen and coat the surface of same with a thin film of gum arabic. The guides when so treated are much more receptive to water, i. e. have a greater affinity for the same and furthermore, the ink repellent properties of same is increased. A suitable bath for such purpose may advantageously comprise a thin aqueous solution of gum arabic of about the consistency and appearance of milk to which has been added about 2% by weight of phosphoric acid.

Having thus described my invention, what I claim and desire to obtain by United States Letters Patent is:

1. The method of making an intaglio printing surface which consists in applying a light exposed film having the desired impression and a fine-lined screen photographically reproduced thereon to the surface of a metal support, etching the surface to form the desired impression in intaglio and a screen composed of intersecting line guides of substantially uniform width in relief thereon, covering the intaglio portions with a water-repellant ink, cleansing the screen lines to render the same susceptible to electroplating and then galvanizing such screen lines without galvanizing the balance of such surface.

2. The method of making an intaglio metal printing surface, which consists in subjecting an etched intaglio printing surface having in relief thereon a fine-lined metal screen to the action of a galvanizing bath, while protecting the intaglio portions of such surface against such galvanizing action and thereby producing fine galvanized guide lines of substantially uniform width in relief on such surface.

3. The method of increasing the depths of color producible from an intaglio printing plate having a fine-lined metal screen in relief thereon, the raised lines of said screen forming guides of substantially uniform width, which consists in protecting the intaglio portions of such surface from the deposit of metal from a bath and depositing metal to the desired thickness on said screen lines.

4. The method of increasing the depths of the ink receptacles of a metallic intaglio printing surface having fine metal screen lines in relief integral with such surface, the raised lines of said screen forming guides of substantially uniform width, which consists in galvanizing the screen lines while protecting the ink receptacles from the deposit of zinc, such galvanizing operation being continued until the screen lines are built up to the desired height.

5. The method of restoring etched intaglio printing plates having screen lines of substantially uniform width in relief thereon which have become worn, which consists in protecting the ink receptacles which are in-

intermediate and formed by such screen lines against the deposit of metal and depositing metal on the screen lines to the desired depth.

5 6. A printing cylinder having an etched intaglio printing surface, and fine screen lines of metal of substantially uniform width formed in relief thereon, the latter having an affinity for water and being interposed between the etched ink-receiving cavities of
10 such surface.

7. A metal intaglio printing surface having a multitude of minute ink receptacles and a fine screen formed in relief on such surface, such screen lines being of substantially uniform width and being zinc coated.
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8. An impression cylinder having an etched intaglio printing surface, and fine screen lines of metal of substantially uniform width in relief thereon, the portions of the metal in relief being grained and the same having an affinity for water and being interposed between the etched ink-receiving cavities of such surface.
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9. The method of making an intaglio impression surface which consists in applying a light exposed film having the desired impression and a fine-lined screen photographically reproduced thereon to the surface of a metal support, etching the surface to form
25 the desired impression in intaglio and continuous guide lines of substantially uniform width and corresponding to the lines of said screen in relief thereon, covering the intaglio portions with a water-repellant ink, cleansing
30 the screen lines to render the same susceptible to receiving a metal plating medium different from that of the metal support and then plating said screen lines without plating the balance of such surface with a metal having a greasy feel and having an affinity for
35 water.
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Signed at New York, in the county and State of New York, this 2nd day of June, 1925.

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LEO FREUDER.

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