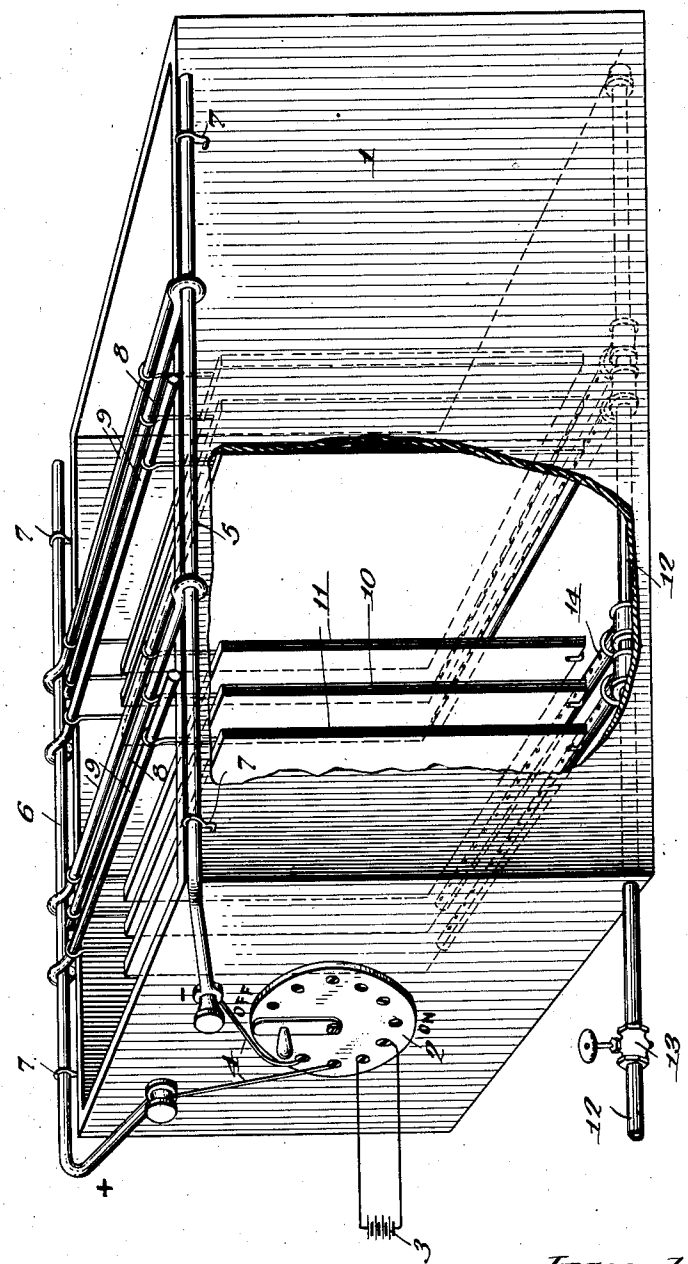
E. G. SCHWUCHOW & G. F. JOHNSTON.

PROCESS OF ETCHING PLATES BY ELECTRICITY.

APPLICATION FILED MAR. 9, 1910.

1,047,995. Patented Dec. 24, 1912.



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PROCESS OF ETCHING PLATES BY ELECTRICITY.

1,047,995. Specification of Letters Patent. Patented Dec. 24, 1912.

Application filed March 9, 1910. Serial No. 548,237.

To all whom it may concern:

Be it known that we, EDWARD G. SCHWUCHOW and GEORGE F. JOHNSTON, citizens of the United States of America, and residents of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Processes of Etching Plates by Electricity, of which the following is a specification, and which are illustrated in the accompanying drawings, forming a part thereof.

The invention relates to an improved process for preparing metallic printing plates by etching; and the objects of the invention are to reduce the time required for the etching of such plates and to produce metallic plates for printing, and like purposes, of improved quality.

The process provided by the invention is particularly adapted to the production of zinc printing plates similar to those commonly known in the art as zinc etchings, but we have found that other metals may be treated for the production of printing plates, in accordance with our invention; for example, copper.

The invention contemplates the etching of plates by electricity, and the application to the surface of the plate of the image to be printed in material capable of resisting the etching action of the electric current, whereby those parts of the plate desired for making an impression during the printing operation are completely protected, while the surrounding parts of the plate are etched out by the electric current, the former thus standing out in relief upon the finished plate.

The accompanying drawing shows in perspective a tank equipped with electrical connections and apparatus for agitating its liquid contents, which may be employed in practising the process provided by our invention.

Preferably, the image applied to the surface of the plate to be etched for protecting those parts of the plate from the etching action which are desired to stand out in relief upon the finished plate, is produced in part by photographic means. To this end the plate 11 to be etched, commonly of zinc, is coated upon one side with a soluble film sensitive to the action of light, such, for example, as the well-known bichromated gelatin. This film is then exposed to light behind a photographic negative of the image to be printed.

After the exposure of the film, but preferably before development of the photographic image produced therein by the action of light, the entire coated surface of the plate is inked. For this purpose the tallow ink commonly known to engravers as transfer ink, but preferably thickened, as by incorporating therewith about 30% of its bulk of molders' graphite and preferably having also added thereto a small proportion, 10 to 25% of butter of antimony,—*i. e.*, antimony trichlorid,—is well adapted.

The photographic image is developed by washing in the usual way, and after drying the entire surface of the plate is dashed over with a powdered resin (dragon's blood). The powdered resin having been removed from those parts of the surface of the zinc plate left uncovered by developing the image, to which it does not adhere, as by being blown off with an air blast, the plate is heated to fuse the resin adhering to the inked surface of the remaining gelatin image. The plate is now ready for etching.

In the practice of our invention the etching is effected by electricity, as in an electrolytic tank 1, like that shown in the accompanying drawing, plates 11 to be etched, preferably prepared in the manner heretofore described, being made the anode terminals of a galvanic circuit in the electrolytic bath. A rheostat, designated by the numeral 2, is conveniently mounted upon an end wall of the tank, and this is connected in the usual way to a source of electric energy capable of supplying current at a pressure of preferably ten volts, such as the battery 3. From the rheostat 2, conductors 4 lead to negative and positive terminal bars, designated 5 and 6, respectively, these bars, as shown, being mounted in insulated brackets 7, to extend along a side wall of the tank 1. Cross-bars 8 and 9 extend over the top of the tank in a convenient position for supporting objects within the tank.

In order that a considerable number of plates may be etched simultaneously in the tank 1, a plurality of sets of bars 8 and 9 are preferably provided, each set, as shown, comprising a single bar 8 connected to the negative terminal bar 5 of the electric circuit, and two bars 9, one extending along each side of the bar 8, the bars 9 of each set

being connected to the positive terminal bar 6 of the electric circuit. A suitable liquid is contained within the tank 1, a nearly saturated solution of common salt and sal ammoniac in water being desirably employed for this purpose when either zinc or copper plates are to be etched.

A cathode plate 10, preferably at least as great in extent as the plates to be etched, is hung in the solution contained in the tank 1 from the cross-bar 8 of each set. The plates 11 to be etched, preferably having their edges and backs protected as by a coating of shellac, are then hung from the cross-bars 9, the prepared surfaces of such plates being directed toward the cathode plate 10 and separated therefrom, preferably an equal distance throughout their entire extent. Copper is most desirably employed as the material for the cathode plates 10, when the plates 11 to be etched are of zinc, and iron plates are preferably employed as cathodes when copper plates are to be etched. The etching proceeds evenly and rapidly if a current of about ten volts be used and the surfaces of the plates to be etched be separated from the surfaces of the cathode plates a distance not greater than one inch.

The rate of etching may be increased if the liquid contents of the tank 1 be vigorously agitated during the application of the electric current. For this purpose an air blast may be introduced into the tank. As shown, an air pipe 12, controlled by a valve 13, enters the tank 1 adjacent its bottom through an end wall thereof. Within the tank perforated branch outlet pipes 14 are connected to the air pipe 12, two of these branch outlet pipes being preferably arranged to extend across the tank beneath the cathode plate 10 of each set.

Zinc half-tone plates may be etched according to the improved process described, by a single continued application of an electric current of about ten volts of from one to two minutes' duration. Zinc plates intended to print solid figures on a clear ground are preferably etched somewhat longer, though an application of the electric current for about five minutes is usually sufficient. To prevent undercutting of the image in etching the plates last mentioned, the etching may be interrupted from time to time and the margins of the unetched image banked with dragon's blood in a manner well known in the art of preparing zinc etchings, as heretofore practised. When deep etching is required it is sometimes desirable to make a second application of ink to the face of the image in addition to banking the margins of the image with dragon's blood.

The application of ink, as described, to the photographic image formed upon the plate, materially assists in protecting the metallic surface from the etching action. It is deemed probable that this results from the property of the ink, particularly when having butter of antimony incorporated therewith, of repelling water whereby the insulating properties of the film are maintained when the plates are immersed in the liquid contents of the tank 1. The gelatin image, ink and fused resin produce together a protective enamel upon those parts of the surface of the plate where etching is not desired.

While the process is herein described and particularly claimed as applicable to the production of printing plates, it is obviously equally applicable to the production of etched name plates and etched plates for ornamental purposes.

In practising the process herein described for etching zinc plates, the material removed from the plate by the etching action is precipitated in the bath as a flocculent, white substance, which collects as a sludge at the bottom of the tank and may, if desired, be removed from time to time. The bath may thus be used repeatedly without becoming charged with the etched material.

We claim as our invention:

1. The process of preparing metallic printing plates and the like which consists in applying a resist image to the surface of the plate, and in then etching the plate in an electrolytic bath, the plate being the anode and the electrolyte being a solution of common salt and sal ammoniac in water.

2. The process of preparing metallic printing plates and the like which consists in applying a resist image to the surface of the plate and in then etching the plate in an electrolytic bath, the plate being the anode and the character of the bath being such that the material of the plate removed by the etching is at all times deposited as a precipitate in it.

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