

# UNITED STATES PATENT OFFICE.

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## METHOD OF ETCHING RELIEF-PLATES FOR SURFACE-PRINTING.

Specification forming part of Letters Patent No. 84,187, dated November 17, 1868.

*To whom it may concern:*

Be it known that we, CHARLES HENRY, of the city of Brooklyn, county of Kings, JOHN McLOUGHLIN, of the town of Morrisania, Westchester county, and EDMUND McLOUGHLIN, of the city and county of New York, all of the State of New York, have invented a certain new and Improved Process for Making Relief-Plates of Metal and Stone, for printing, embossing, and other similar purposes.

Our invention consists, mainly, in the transforming of etched plates into bold relief, so that they can be used in ordinary printing and embossing presses.

The kind of metallic plates to be used is not essential to illustrate or practice our invention, as its operative features are equally applicable to all.

The essential features of our invention are equally adaptable to similar work upon stone suitable for such purposes. On the score of economy, however, we prefer the use of zinc plates to any other kind, and it is in connection therewith that we have prepared our description.

Relief-plates have heretofore been made in one of three ways: first, engraved by the hand of the engraver; second, bitten down by corrosive acids or menstrua, the lines desired in relief having first been protected with an oily ink or other desirable compound, applied with a brush by the hand of an artist; or, third, bitten down with acids or menstrua, as in instance second, and only differing from that in having the lines desired in relief protected by a similar compound, applied by an impression from an etched plate. This process is called "transferring."

These processes refer only to such plates as possess, in their raised surfaces or relief-lines, a continuation of the same metal composing the body of the plate, and not to an old, quite obsolete process, by which the etched lines were retained and produced in relief by flooding the surface of the plate with some soft negative metal in a melted state, and then, when cold, planed or ground off, leaving the lines previously etched filled, which obviously became raised as the surface of the original plate was bitten away by the action of corrosive acids or menstrua afterward applied.

In the second and third processes the lines are somewhat irregular, as the surface of the plate only has been protected. The expense attendant upon the necessary labor and requisite skill in applying the protecting compound by an artist, as well as its tediousness, renders that process highly objectionable.

In the third process referred to, the lines being transferred from the etched plate, there is less delicacy of outline than by the second process even, owing to the difficulty of obtaining a perfect impression, as well as by the action of the acids beneath the edges of the protecting-lines.

The old process last referred to has the objection of being tedious, laborious, and expensive.

Plates prepared by our process differ mainly from those already described either in the direct use of etched plates, compared with the second and third processes, or in the use of solid metal instead of the two distinct metals, as in the old process described. The expense of preparing plates by our process is much less than by any of the described methods.

The process of etching is too well understood to require any description. We will therefore proceed to explain so that persons skilled in the art may practice our invention and produce the required results.

A zinc plate, having been etched and carefully cleaned, is covered with a coat of varnish and dried. The varnish we have found to best answer the purpose is composed of bees-wax, two parts, shellac, forty-eight parts, and alcohol, fifty parts, its desirable properties resting in its hardness and tenacity when dry and its quality to resist the action of acid. Upon being well dried the varnish is scraped or ground from the surface of the plate, leaving the sunken or etched lines thoroughly filled with varnish. The plate, having its reverse side and edges protected with the varnish already described, is thoroughly cleansed on the etched surface, and dipped into a metallic solution of water and sulphate of copper until the exposed surface of the plate is of a deep black color. It is then immersed in sulphuric acid of the requisite biting strength, where it is allowed to remain until, by observation, the plane surface has been bitten away nearly to the depth of the etched lines. It is



then withdrawn and washed with cold water and a soft brush.

The effect of the metallic solution consists in the facility with which, by its use, the bubbles of hydrogen are freed when the plate is being acted upon by the acid.

The metallic solution may be varied according to the kind of metal composing the plates, but should in each case be of a solution of a metal higher in the electric scale—as, for instance, nitrate of silver for brass or copper, chloride of gold for silver plates, and chloride of platinum for gold plates.

The metallic solution should be weak enough not to make the black deposit in its metallic state. This solution is not requisite to any degree in the manufacture of steel plates or operations upon stone, for obvious reasons.

The use of the metallic solution is optional with the operator, and only essential to secure more rapid results and a somewhat higher degree of perfection in the plate than we have been able to attain without its use by the separate action of sulphuric acid or other menstrua. The plate, having been carefully washed with cold water and brush, is dried. At this stage of the process the surface of the plate has been eaten away nearly to the depth of the original etching, leaving a relief composed of the hardened varnish with which the lines in etching were originally filled. The plate is again dipped into the metallic solution and dried, then treated with a light solution of water and gum-arabic, immediately followed by printer's ink, diluted with turpentine to give it fluency, separate sponges being used for the solution and ink. Care should be taken to so rub the plate as to leave no portion of the raised lines untouched, and to incorporate the ink into them until they have been well blackened.

The ink is, by the gum solution, kept from the body of the plate, where ink is not needed; but it unites freely with and covers the varnish-lines, where its protection is required. The printer's ink combines in itself two properties of value in this connection, viz., a protective and an adhesive property. The value of the former is obvious. The latter can be better appreciated in connection with a part of the process hereafter described.

The gum solution and ink having been applied, the plate is then washed with the biting-acid and brush, and thoroughly dried by being subjected to a gentle heat. When cool, a finely-powdered compound is sprinkled or dusted freely over the plate. The application of a soft dry brush then removes nearly all of the powder, except such as adheres to the sides and surfaces of the raised lines, on account of the adhesive property in the ink already described.

The powdered compound used by us consists of common rosin, two pounds, good bees-wax, one and one-half ounce, and gum-shellac, one pound. We use and prefer it to any other, because it can be finely powdered, melted at a low

heat, is adhesive in its nature when melted, and capable of resisting to a great degree the action of corrosive acids.

The plate is then subjected to a gentle heat, which causes the powder to freely assimilate with the ink and varnish composing the raised lines. To a certain degree, also, the powder becomes attached to a portion of the surface of the plate to be bitten away.

It is to be remembered, however, that this surface has already been blackened by the deposit received in the metallic solution. Therefore any particles of powder remaining on that surface are readily removed as soon as the plate is again subjected to the action of the menstruum or corroding-acid, as hereafter described, on account of the facility offered by the black deposit for the menstruum in its action to undermine the particles of melted powder and admit of their being easily removed by the action of the brush used in washing.

The edges of the design having been protected, the plate is again immersed in the menstruum until the lines of metal stand in relief, care being taken to not attempt to gain too much at one operation. The plate is then washed with the metallic solution, applied with a soft brush, and dried. The powdered compound is again sprinkled over the surface of the plate, followed by the use of the soft brush, care being taken this time to move the brush in one direction only, so as to secure a perfect layer of the powder upon one side of each line to be preserved. The plate is again heated sufficiently to unite the powder with the varnish, as before, requiring a somewhat higher degree of heat. After being cooled the plate is again sprinkled with the powder and brushed in the opposite direction from the first, securing a layer of the compound upon the reverse side of the lines acted upon before, after which the plate will again be heated for the purpose described.

The powdered compound is thus applied from all directions to secure the requisite protective layer on both sides of every line in the design, after which the plate should be immersed in the menstruum, as before, with the repeated protective operation already described, until the required height of relief is obtained. That being accomplished, the plate is carefully cleansed and dried. It will then be observed that the summits of the raised lines were once the bottoms of the etched lines in the original plate, and comparatively rough from the action of the acid during the etching process. It is then only necessary to grind these faces upon a flat stone to render them adapted to ordinary press-work or embossing. Upon close observation the lines will be found clear and delicate, the sides or edges of each line sharp and well defined.

It is obvious that our process differs mainly from all others heretofore known and practiced in the protection of the original etched design as we proceed, thus preventing the destructive lateral action of the acids or men-



strua. The complete protection of the sides and edges of the lines depends upon the skillful use of the ink and powder compound, or such obvious equivalents as possess the peculiar properties herein described.

Being able to preserve by our process even the finest lines makes it practicable for us to transform etchings into plates of high and sharp relief, which we assert to be new and original with us.

It is to be distinctly understood that we do not claim as new the abstract use of varnishes, inks, gums, rosins, or metallic solutions, either separately or collectively, for each of them has or may have been used before for engraving upon metal and stone; but

We do claim as our own invention and desire to secure by Letters Patent—

1. The transforming of etched plates into relief-plates, in which the relief-lines shall be of

the same continuous material as that composing the body of the plates, by the process and in the manner substantially as herein described.

2. The filling of the etched lines upon the plate with varnish or other protecting gum or compound, in the manner and for the purpose specified.

3. As a new article of manufacture, relief-plates, of metal or stone, for printing and similar purposes, prepared direct from etching, and in which the raised surfaces shall be of the same continuous material as that composing the body of the plate.

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Witnesses:

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