

UNITED STATES PATENT OFFICE.

JOHN FORST, OF HOBOKEN, NEW JERSEY, ASSIGNOR OF ONE-HALF HIS
RIGHT TO LOUIS W. KIPP, OF SAME PLACE.

IMPROVEMENT IN THE PROCESSES OF PRODUCING SUNK DESIGNS ON STONE, &c., AND FOR
PRINTING AND EMBOSSING SHEET METAL.

Specification forming part of Letters Patent No. **151,375**, dated May 26, 1874; application filed
April 1, 1874.

To all whom it may concern:

Be it known that I, JOHN FORST, of Hoboken, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Printing and Embossing Metal or other Material; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it pertains to make and use the same.

The nature of my invention relates to a new and improved process or method of embossing and printing upon sheet metal, and is designed particularly to furnish a cheap and efficient means of manufacturing show-cards, advertising-cards, and the like, although it may be applied with advantage to the decoration and ornamentation of metal, as will be hereinafter more fully specified.

My invention consists, first, in a new and improved process or method of forming designs, figures, or characters in relief or in intaglio upon sheet metal or other similar material, and printing the same in colors at one operation; second, in a new and improved process of forming a matrix or die in intaglio for the purpose of printing and embossing metal and similar materials from an ordinary sketch or drawing in lithographic ink or other "resist," which may be made directly upon the stone by an artist, or otherwise produced. This I accomplish by first "biting out" or etching the stone or other material around the designs or characters thus produced by means of nitric or other acid, carrying the process further than in their ordinary method of preparing lithographic stones, so as to leave the portions covered by ink or resist slightly but perceptibly raised above the remaining portions of the stone or other material. I afterward bite out or etch the portions thus raised until they are sunk or lowered into the stone sufficiently deep to form the desired design in relief upon the sheet to be embossed, as will be fully hereinafter set forth.

In carrying out my invention, I first construct a matrix or die, having the intended designs, figures, or characters sunk or lowered

in the same, or raised thereon, as the nature of the finished embossed and printed article to be produced therefrom may require; or the matrix or die may be produced with designs or characters both in relief and in intaglio, so as to transfer said designs to the sheet in a corresponding manner. The designs, characters, and figures thus produced are to be reversed, of course, so that they will be transferred in proper position to the sheet to be embossed and printed. The matrix or die may be made of metal, stone, or any other suitable material. I prefer, however, to use an ordinary lithographic stone for the purpose, and to etch or bite in the designs, figures, or characters by means of acid, in the manner well known to engravers, lithographers, and other skilled persons, carrying the process further, however, until the designs or characters are perceptibly sunk or lowered into the stone.

Having prepared the matrix or die in the proper manner, I take a sheet of metal or similar material capable of being embossed, and, after inking the matrix or die in the ordinary manner, I place the said sheet upon the face of the matrix or die, applying some yielding substance to the back of the same, such as paper, rubber, &c., building up those portions that will come opposite the sunk or lowered parts of the stone, and making the backing thicker in such places, in the manner well known to printers of engravings, wood-cuts, &c.; or, where greater relief is required, I use a counter-die, which may be produced from the prepared stone by any of the ordinary processes of forming counter-dies from engraved surfaces. The yielding material alone is generally sufficient to produce the designs slightly in relief upon the sheets to be embossed and printed; but when said designs are to be highly in relief and sharply stamped, I employ counter-dies, as before stated. I then run the two through a powerful press of any kind suited to the purpose, by means of which the sheet to be embossed will be forced into those portions of the matrix or die which have been etched or bitten out, and at the same time the ink or color from the remaining portions of the

matrix or die will be transferred to said sheets, thus forming the designs in relief or intaglio upon said sheet on a black or colored ground.

It is evident that the yielding material, whether built up or not, or the counter-die, may be secured to the platen of the press, so as to strike the metal sheet during the operation of printing, and thus avoid the necessity of fitting the two together before placing them in the press, thus saving time and facilitating the printing and embossing.

The sheets to be embossed and printed may, if desired, before being subjected to the operation of printing and embossing, be colored by means of lacquer or varnish, in which case the finished article will be in two colors, viz., the color imparted by the lacquer and the color transferred from the matrix or die.

It is evident that designs in relief may be produced upon the stone by simply making a sketch or drawing of the same in lithographic ink or other resist directly upon its face and etching around the covered portion, this, in fact, being common and well known to lithographers; but no means, to my knowledge, have hitherto been known by which designs in intaglio may be produced directly from an ordinary drawing upon stone. I have discovered, however, a method or process by which such designs in intaglio can be produced from an ordinary drawing made directly upon the stone by the artist, in lithographic ink or other resist, or transferred thereto from lithographic paper, or by means of the photolithographic or other process. This I accomplish as follows: I sketch, draw, or otherwise produce upon the face of the stone or other material the intended characters, figures, or designs, reversing the same, of course, so that they will be transferred in proper position upon the sheet to be embossed and printed. This drawing I make in lithographic ink or other equivalent resist, and when dry I sink or lower the surrounding portions of the stone, by etching with nitric or other suitable acid, until the portions covered with the ink or resist are slightly but perceptibly raised above the portions thus etched or bitten out. I thus produce the designs in relief upon the stone. I then wash the stone with acetic acid or vinegar, which dissolves out the nitric acid and restores the portions of the stone which have been subjected to its action to their original condition, so that they will again receive and hold the ink or resist. After drying I cover the stone with asphaltum or its equivalent, after which I remove the same from the portions in relief by scraping the stone with a

suitable tool, by grinding or rubbing with a flat stone, or in any other convenient manner, leaving the sunk or lowered portions well covered with the asphaltum. When the asphaltum has been thoroughly removed from the portions in relief, leaving the same perfectly bare, I proceed to etch again with acid. The acid first dissolves off the portions in relief, and then eats or bites into the stone; and I continue the process until the designs or characters are sunk to a sufficient depth to form corresponding designs in proper relief upon the sheet metal to be embossed. The depth to which such designs may be sunk into the stone is only limited by the tendency of the acid to cut under the edges of the same, as it bites into the stone, which would result in the destruction of the stone, if made too deep, when subjected to the action of the embossing-press. No difficulty is experienced, however, in sinking the designs sufficiently to transfer the same, in proper relief, to the sheets, which may vary from the smallest fraction of an inch up to the eighth of an inch or more, depending somewhat upon the careful manipulation of the operator. The asphaltum or other resist may be removed, if desired, in any convenient manner, leaving the matrix or die with the designs, characters, or figures in intaglio.

It is evident that any design may thus be produced upon the matrix or die and afterward transferred in relief or intaglio, and in colors, to a sheet of metal; and although, as I have stated, my invention is principally designed for the manufacture of show-cards and the like, it will be seen that, by its use, other metal articles may be elaborately and beautifully ornamented at a small cost.

What I claim is—

1. The process hereinbefore described of producing sunk designs upon lithographic stone or other suitable printing-surface from an ordinary sketch or drawing, drawn in an acid-resisting material, placed or transferred directly upon the stone by first producing the design in relief, and afterward sinking the same to sufficient depth, substantially as and for the purpose set forth.

2. A sheet-metal show-card, advertising-card, or sign-plate printed and embossed at one and the same operation, by the process and means substantially as hereinbefore described.

JOHN FORST.

Witnesses:

JOS. L. COOMBS,
CHAS. L. COOMBS.