

(No Model.)

N. C. DUNCOMBE.
METHOD OF DECORATING METAL SURFACES.

No. 406,999.

Patented July 16, 1889.

Fig. 1.

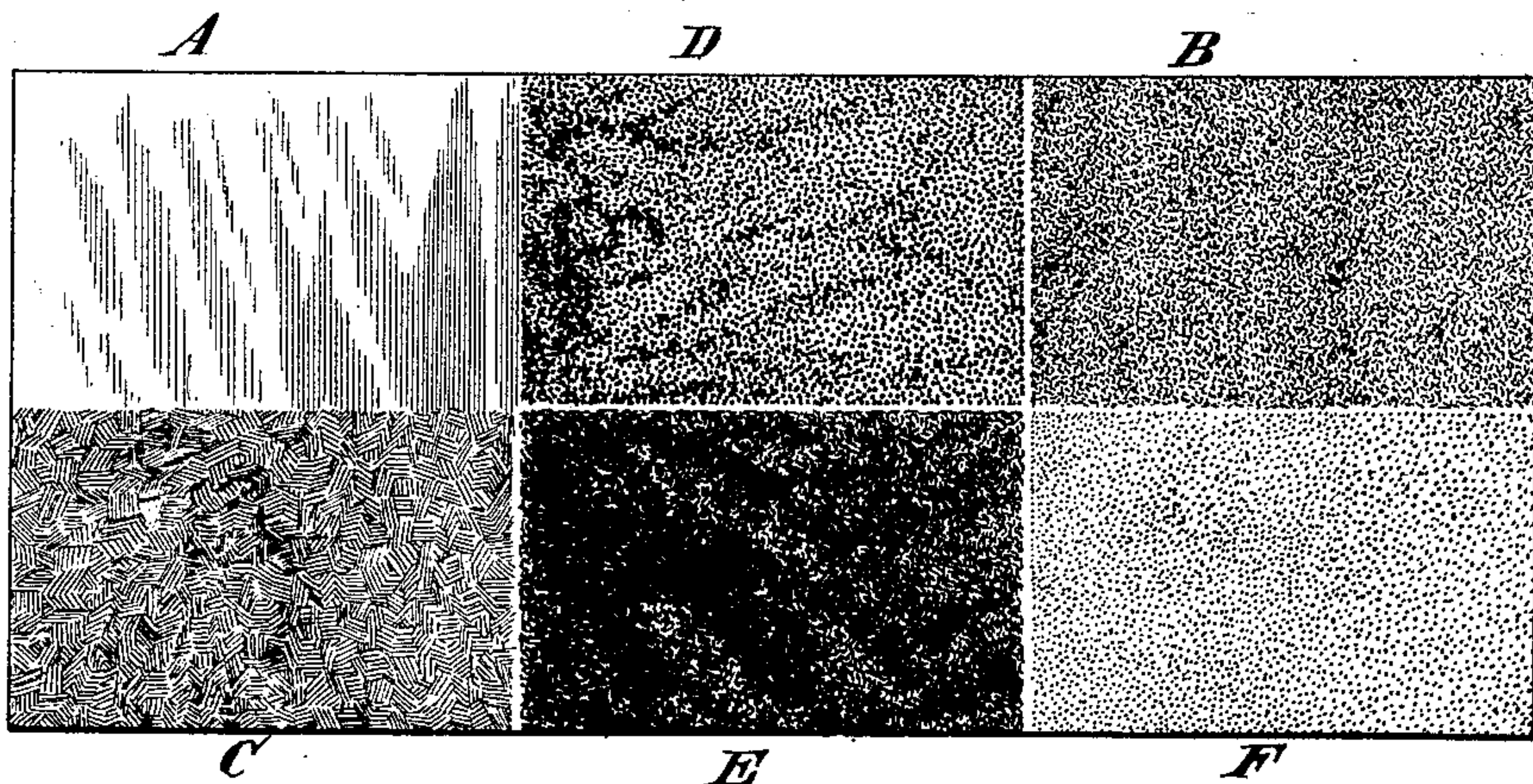


Fig. 2.

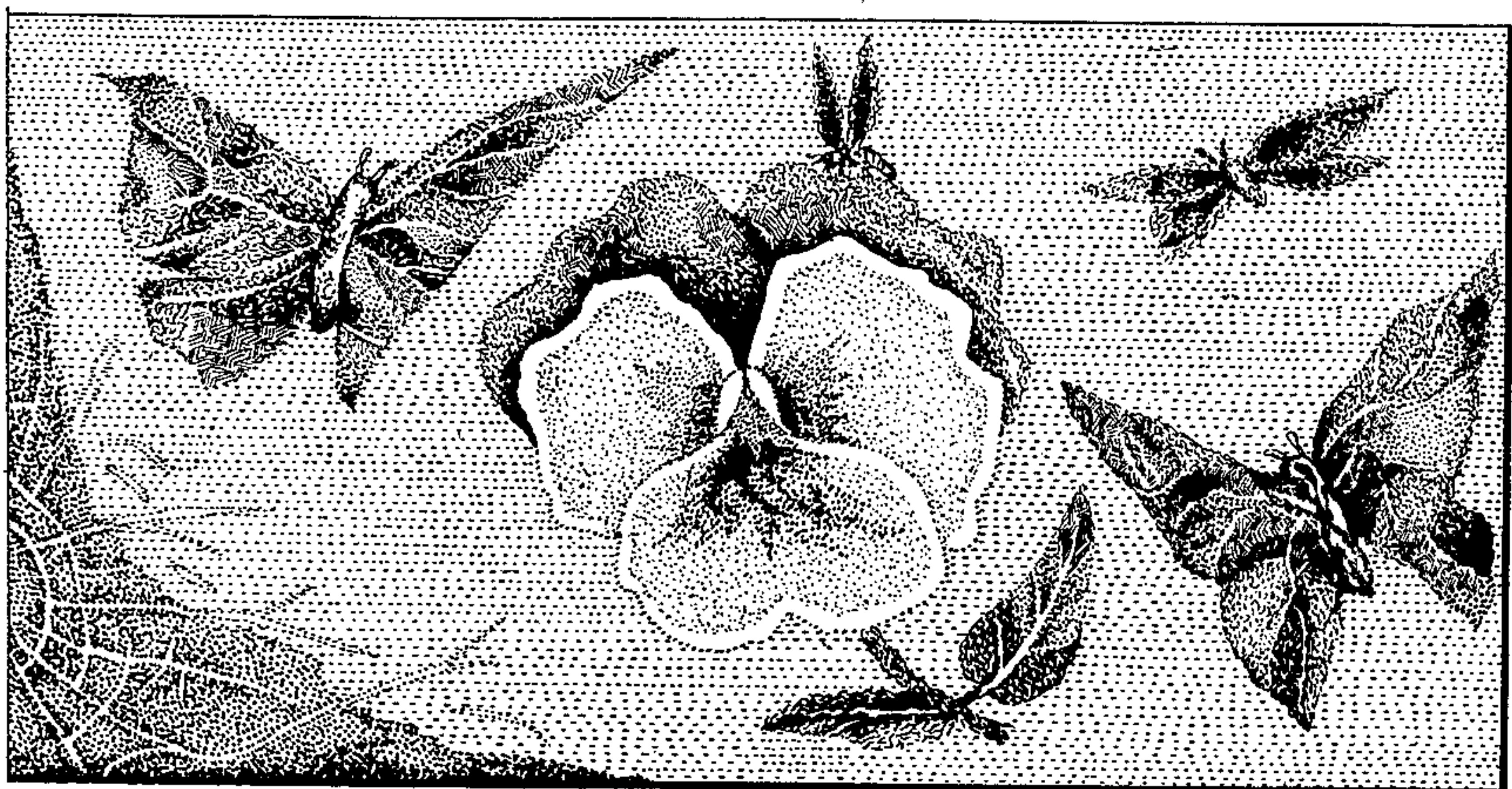
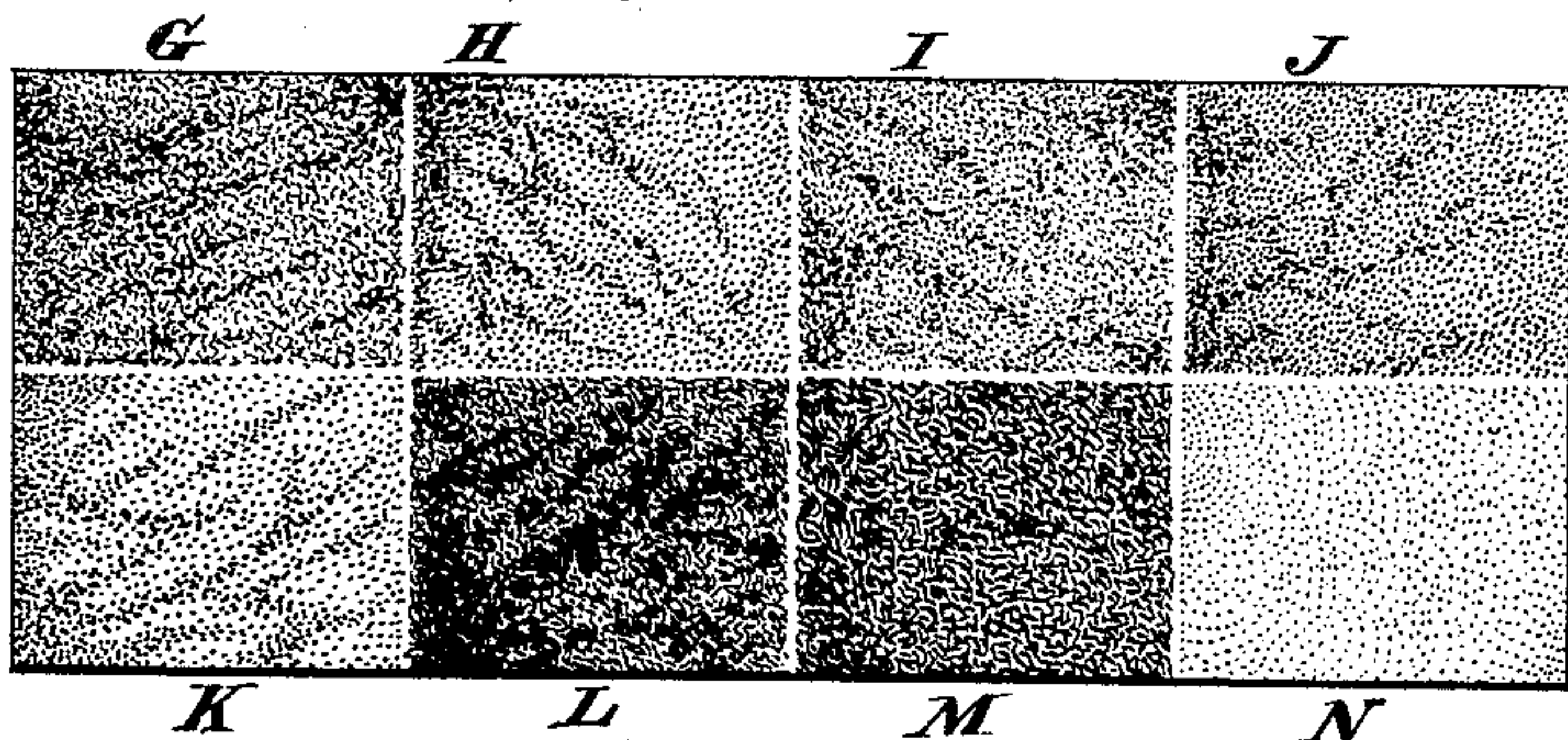


Fig. 3.



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UNITED STATES PATENT OFFICE.

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METHOD OF DECORATING METAL SURFACES.

SPECIFICATION forming part of Letters Patent No. 406,999, dated July 16, 1889.

Application filed June 1, 1888. Serial No. 275,730. (No model.)

To all whom it may concern:

Be it known that I, NELLIE CLARK DUNCOMBE, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and Useful Improvements in the Method of Decorating Metal Surfaces, of which the following is a specification.

My invention relates to the decoration of the surface of plates or other articles of copper, brass, German silver, silver, and other similar metals.

According to my invention I form the decorative design upon the metallic surface by means of etching and oxidation of the metal, whereby novel and beautiful effects are produced.

Metallic surfaces decorated according to my invention are characterized by the production of the design by means of the contrast of dull discolored oxidized portions with either bright polished or bright etched or frosted portions, or both; also, by the contrast of oxidized portions of different colors, or tones, or degrees of oxidation or discoloration of the metallic surface. By preference I employ bright polished metal for the high lights of the design, and otherwise develop the design by means of the employment for the different portions thereof of etched surfaces to produce a frosted effect and of oxidized or discolored surfaces of various colors or shades to produce the dull portions of the design. These oxidized or discolored surfaces may be of various colors, according to the oxidizing or discoloring agents employed, and may be of different depths of tone, according to the degree of exposure to the action of such agents. For example, a design may be produced having a frosted or etched ground, with the figures thereon appearing in dull oxidized masses, the different portions thereof being oxidized in different colors or in different shades or tones, while the high lights of the figures are formed by brilliant polished portions of the metal; or, to take another example, the ground of the design may be a dark oxidized surface, and the design may be formed partly of the etched or frosted surface, partly of the polished metal, and partly of lighter oxidized surfaces; or a light oxidized ground may be

employed with a design produced by a frosted or etched surface shaded by darker oxidation, and outlined, if desired, by the polished metal; or the polished metal may be used as a ground, and the design be produced by means wholly of etched and oxidized surfaces. These different effects are merely examples of the numerous ways in which my invention may be utilized for the decoration of metallic surfaces.

Figure 1 of the accompanying drawings shows a metal plate divided into six parts, the surface of each of which is differently prepared after the manner of my invention, the six different surfaces being examples of the decorative elements employed in the development of a design. Fig. 2 represents a plate decorated according to my invention by means of a combination of the decorative elements represented, for example, in Fig. 1, or by other decorative elements. Fig. 3 shows a plate divided into eight portions which are prepared according to other methods and for the production of other effects, which may be utilized to greater or less extent in the development of designs according to my invention.

In order that my invention may be well understood and may be readily applied by others, I will proceed to describe one process or method for producing a decorated plate, selecting, for example, a plate the design on which is produced by combinations of six different kinds of surfaces or decorative elements, which, for convenience, I will assume to be the same as those of the six divisions of the plate in Fig. 1. The plate that is decorated may be assumed to be such a one as is shown in Fig. 2. This particular plate may be supposed to have a frosted or etched ground and to be decorated with designs of flowers, butterflies, and a spider's web, produced on the ground by a combination of polished and oxidized surfaces.

I will assume that the metallic article to be decorated is a plate of sheet-brass. The surface of this plate is first highly polished. The white portions of the plates in Figs. 1 and 2 may be understood to be the polished portions. I take this polished plate and paint on it with a brush dipped in a suitable varnish or medium all those portions of the design which are finally to appear as polished

surfaces, and which will be ordinarily the high lights or perhaps the outlines of the design. By being thus varnished over these portions of the polished plate are covered and protected during the subsequent operations of etching and oxidizing. This varnish is permitted to dry. I then immerse the plate in a bath of nitric acid somewhat diluted with water, in which bath has been placed a small piece of copper. During this immersion the surface of the plate is simultaneously etched by the acid and discolored by the action of the copper which has been dissolved by the acid. After a few moments immersion the plate is removed and rinsed with water, and is then left to dry in the air. During this drying the color becomes darker. In this manner the entire exposed surface of the plate is colored a dull brown, similar to old bronze. This surface is designated by the letter B in Fig. 1. I then paint over all the portions of the plate which are to be retained of this brown oxidation, using the same varnish or medium as before, and then dip the plate in a very weak acidulous solution of copper salt, using for the purpose water in which the plates have been washed on coming out of the nitric acid bath, in which copper is biting. This weak solution brightens the surface of the plate and gives it a cloudy appearance. The plate has then to be quickly dried, which is preferably done by rubbing it with boxwood-sawdust. The result is a clouded or mottled yellowish or light-brown oxidation, (designated by the letter C in Fig. 1.) It is to be noted that when this oxidation is to be produced, without having immediately before produced the brown oxidation B, as may sometimes be desirable in order to produce this effect at some different stage of the work, the plate must first be treated as for the production of the brown oxidation B, and then subsequently for the production of the yellow oxidation C.

The portions of the design which are to be retained of the yellow oxidation C are then covered up and protected by painting over them with varnish, and the plate is then immersed in the same or a similar acid bath, and when its surface has been sufficiently etched to remove the previous oxidation it is removed from the bath, rinsed in water, and placed (either side up) over a tray containing nitric acid and water, and in which pieces of copper and sheet-brass have been placed. The fumes arising from this bath are permitted to oxidize the surface of the plate for a few moments, whereupon the plate is quickly dried, preferably by means of boxwood-sawdust. The result is an orange oxidation, somewhat clouded or mottled, and which is represented at D in Fig. 1. Those parts of the design requiring this orange tint are now painted over, and the plate is again etched by immersion in an acid bath, as before, and then again exposed over the fumes arising from an acid bath in which copper and brass have been placed, as already described, except that the

plate is left exposed to the fumes for a considerably longer time, and until a deep brilliant green oxidation, somewhat streaked or mottled, is produced, whereupon the plate is quickly dried, as before, by rubbing with hot boxwood-sawdust. This green oxidation is indicated at E in Fig. 1. The portions of the design which require this green color are then painted over and the plate is etched to produce a frosted effect by dipping it quickly in a bath of nitric and sulphuric acids and water, after which it is rinsed in water and then dried quickly by means of hot boxwood-sawdust. This being the last stage of the acid treatment, I rub off the varnish or medium which has been painted on the different portions of the design by using a suitable solvent—such, for example, as turpentine, if the varnish which I shall hereinafter describe is used. For cleaning off the varnish it is preferable to rub with soft pieces of old cotton cloth. The entire design is thus exposed, and the plate is completed.

It is preferable, after first painting over the high lights on the polished metal, (which must in any case be the first step of the process in order to preserve the polished surface of the plate,) to produce the oxidation which is required for the finer or more delicate portions of the design, to then employ the oxidation which is required for the portions of the design which are less minute, following with the oxidations in such succession as will require the painting out of larger or coarser portions or masses of the design after each oxidation, and finishing with the ground etching or oxidation, as the case may be. This method may readily be followed, since it is quite immaterial in what order the several kinds of oxidation are applied.

The depth of the successive etchings is of no consequence, being quite immaterial to the effect produced. In fact it is preferable to expose the plate to the action of the acid at each etching for as brief a time as will produce the proper effect, in order to avoid etching away too much of the surface of the plate. It is obvious that with the method described the portion of the plate which is last treated has been exposed to several successive etchings. This, however, is immaterial, and is done solely for convenience, as otherwise the entire plate might be covered with wax or varnish, and those portions requiring a certain oxidation could be scraped off or uncovered to receive that oxidation and then covered up again, after which the portions to receive the next successive oxidation would be uncovered, and so on; but this method would entail considerably more labor without producing any better effect.

Varnish.—The varnish or medium which I prefer is composed of asphaltum, two ounces; white wax, one and a half ounce; Burgundy pitch, one ounce; turpentine. I melt the asphaltum over a stove-fire in an earthenware glazed saucepan, and when it is melted I add

the wax gradually, stirring with a glass rod. I then add the Burgundy pitch in the same way, and continue stirring the fluid mass, letting it boil up two or three times, but taking care not to let it boil over. Then I take the saucepan from the fire and stir in enough turpentine to make the mixture of the consistency of tube-oil paints. If by exposure to the air the varnish becomes too stiff more turpentine should be added.

Acid baths.—First. The etching and oxidizing bath employed for producing surfaces B, C, D, and E consists simply of nitric acid and water, the proportions of which may vary between fifty parts acid to fifty parts water and twenty-five parts acid to seventy-five parts water. It should be strongest in cold weather and weakest in hot weather, or for use in a room that is kept heated. The bath should be strong enough so that when the plate is immersed in it a white cloud will quickly form above the plate. The same bath is used for producing the oxidizing-fumes, a small piece of the metal (such as copper or brass, &c.,) the fumes of which are required, being placed in the bath. Second. The etching-bath for producing the frosted effect F is the same as the above, except that a little sulphuric acid is added, the precise proportion being immaterial.

Other oxidations.—My invention is by no means confined to the use of the oxidations already described, as the plate may be oxidized by other agents and in other colors, as may be required for any particular design. In Fig. 3 I have indicated a number of other oxidations by way of example. I will proceed now, with reference to this figure, to describe the methods for producing the several oxidations represented in the sections G, H, I, J, K, L, and M, in each of which the surface of the plate is first etched in acid, and is subsequently exposed to the fumes rising from an acid bath in which some metal or metallic alloy is dissolved.

G designates an oxidation of dark purple and orange color produced by first dipping the plate of brass in the nitric-acid bath to etch it, then rinsing in water, and then exposing face downward over a nitric-acid bath in which is placed a piece of bismuth, whereupon the plate is dried with sawdust.

H designates a brilliant red and green oxidation produced by the same process, except that the bath has a piece of silver dissolving in it.

I designates a green bronze and light-green oxidation produced in the same manner, except that the metal in the bath is tin.

J designates an oxidation of bright green and red produced in the same manner, except that the plate is exposed to the fumes evolved from a piece of solder in the bath.

K designates a red and purple oxidation produced by the fumes of zinc dissolving in the bath.

L designates an iridescent purple derived

from the fumes evolved by dissolving German silver.

M designates a purple oxidation produced in the same manner, except that a piece of iron or steel is dissolving in the bath.

By dissolving two or more different metals at the same time a different shade of color is produced.

The section N is produced by taking the surface oxidized by any of the metallic fumes herein mentioned and immersing it in acidulated water, which turns the surface a bright pink.

I have herein described the operations and the resulting oxidations when brass is the metal being decorated. If other metals are used, the colors of the oxidations will be somewhat different, and with some metals the etching or oxidizing baths may require to be varied. In any case the etching-bath must be prepared with an acid or combination of acids that will etch the metal to be decorated, and the oxidizing-bath must also be capable of dissolving the metal the fumes of which are to be used. The baths described are suitable for brass, copper, silver, and German silver.

I am well aware of the aquatint process of etching, which consists in flowing a granular ground over a plate so as to leave interstices through which in the subsequent etching the acid may penetrate and bite numerous indentations therein, the design being produced by stopping out at intervals as the etching proceeds, in order that the indentations for the light tints shall be minute dots and those for the heavy tints shall be enlarged by the etching both in depth and laterally, so that in printing they shall hold more ink and involve a larger proportion of surface. The aquatint process is employed only for the production of plates for printing from and is not designed nor adapted for the decoration of metal surfaces, properly speaking. The plate produced by the aquatint process is distinguished from my improved decorated plate in that it is nowhere frosted, there being no contrast between bright frosted or etched portions and dark discolored portions. The plate exhibits merely the original smooth or polished surface covered with a stippling of minute indentations etched into it and graduated to form the different tones or shades. Furthermore, my improved decorated plate, when formed with polished high lights, is distinguished from an aquatint plate by the high lights being in distinct, although low, relief by reason of the etching down to a lower level of the remaining portions of the surface.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is the following-defined novel features, substantially as hereinbefore specified—namely:

1. A metal surface decorated with etched and oxidized portions in two or more different colors, whereby a design is produced by the contrast of such metallic colors.

2. A metal surface decorated with bright lustrous or frosted etched portions and with dull etched and discolored oxidized portions of two or more different colors, whereby a design is produced by the contrast of such metallic colors with each other and with the frosted portions.

3. A metal surface having an etched ground and decorated with etched and oxidized portions of different colors or tones, and with high lights of bright polished metal, whereby a design is produced by the contrast of the polished metal and the metallic colors with the etched ground.

4. A decorated metal surface having an etched ground, and a design produced by different colors or tones of oxidation with the high lights of bright polished metal.

5. The improvement in the art of decorating metal surfaces, consisting in covering the surface to be preserved, immersing in an acid bath in which a metal or alloy is dissolved to etch and prepare the uncovered portions, and subsequently exposing the latter to the air to oxidize the etched surface.

6. The improvement in the art of decorating metal surfaces, consisting in covering the

surface to be preserved, immersing in acid to etch the uncovered portions, and then exposing them to the fumes of an acid bath in which a metal or alloy is dissolved.

7. The improvement in the art of decorating metal surfaces, consisting in successive alternations of etching and oxidizing, the portions of the surface to be retained after each oxidation being covered over, and the successive oxidations being effected in different colors or shades.

8. The improvement in the art of decorating polished metal surfaces, consisting in covering the portions to be retained polished in the design, oxidizing the uncovered portions by exposure to an acid bath in which a metal or alloy is dissolved, then covering the oxidized portions to be preserved, etching the uncovered surface, and finally removing the covering medium.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

NELLIE C. DUNCOMBE.

Witnesses:

ARTHUR C. FRASER,

WALTER GILLISS.