

UNITED STATES PATENT OFFICE.

ALFRED DAWSON AND HENRY T. DAWSON, OF CEDARS CHISWICK, ASSIGNORS TO GEORGE WILLIAM PETTER AND THOMAS DIXON GALPIN, OF LONDON, ENGLAND.

IMPROVEMENT IN THE METHODS OF ETCHING PLATES FOR ELECTROTYPING.

Specification forming part of Letters Patent No. **140,995**, dated July 22, 1873; application filed January 24, 1873.

To all whom it may concern:

Be it known that we, ALFRED DAWSON and HENRY THOMAS DAWSON, both of the Cedars Chiswick, in the county of Middlesex, England, subjects of the Queen of Great Britain, have invented or discovered new and useful Improvements in Typographic Etching and Engraving, and in apparatus employed therein; and we, the said ALFRED DAWSON and HENRY THOMAS DAWSON, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof; that is to say—

This invention has for its object improvements in typographic etching and engraving, and in apparatus employed therein. The invention is designed to produce surface-printing blocks, in which the printing parts are in exact fac-simile of the lines and marks made by the artist while drawing the design, and in which also there are deep curved hollows between the raised lines and marks, which the paper in printing cannot enter, and which hollow spaces are so formed as to leave the lines so completely and perfectly buttressed up that no amount of printing-strain can crush or batter them down. In securing these ends we proceed as follows: We take a metal plate, by preference brass, and after cleaning it we darken and abrade or color the whole surface; this we prefer to do by means of a solution of a metallic salt, which acts on the metal plate so as both to remove the polish and darken the surface. In practice, we use a weak solution of nitrate of silver, containing, say, twenty grains to the pint of water. The plate, which should be quite smooth, is washed and rubbed clean with a piece of pumice-stone; while still wet it is placed upon a level grating and the silver solution poured upon it. It is distributed and moved over the plate with a soft brush until the surface has become dark all over, more solution being poured onto the plate if the first quantity is found to be insufficient. A few minutes at the most is sufficient to complete this operation. The plate is then washed with water and dried by

warming it over a flame. When the plate is sufficiently warm we cover it with an opaque, white, or light-colored ground; the plate is touched with the end of a thin cake of the grounding composition, which is rapidly moved from place to place on the plate, so as to leave a number of melted streaks distributed pretty regularly all over the plate. The ground is then spread by means of a warm or moderately-hot rake-like tool, consisting of a short rectangular brass bar, say two or three inches long, with a wire or stem fixed at right-angles to it and set in a handle. This tool is so applied to the plate as to touch it along one of its edges; and in this edge of the tool a number of V-formed notches are filed at about a tenth of an inch apart, so as to leave between them blunt-pointed teeth, between which the melted composition is able to flow freely. This tool spreads the ground evenly when it is drawn to and fro over the surface of the plate. The ground is afterward caused to flow slightly over the plate by inclining it to and fro, which removes any marks left by the teeth of the spreading-tool; the plate is then placed upon a level support, and in a short time the ground sets firm. The thickness of the ground should be about one-eightieth of an inch, more or less. We use a ground composition for the above purpose which is prepared from solid paraffine by grinding or mixing with it white or opaque color. We employ for this purpose the best paraffine, and we melt it and grind the pigment with it. The best pigment for the purpose we believe to be tungstate of lead, and this we grind with the paraffine in the proportion of three parts, by weight, of paraffine to about one of pigment. Or, if preferred, a tinted ground may be used, or even a black ground, but less conveniently. The drawing is now made upon the plate by means of etching-points; and if repairs or alterations are needed they can be made by means of a heated tool. In drawing, we use several tools, some broad for clean cutting, like chisels or turning-tools; others have a fine point cut into several facets for neatly turning the shavings away from the work in two or more directions, according to the motion the point

receives. The shavings are removed by means of a badger-hair brush. Other tools are again constructed for stamping or impressing the ground, common type being frequently thus used. The points for cutting the ground are used when the plate is cold; but when type or type-like tools are used, the plate should be made warm to the temperature of 100° to 110° Fahrenheit, by holding it over a flame, or by laying it upon a plate with warm water beneath, taking care not to melt the composition.

We repair parts which are misdrawn by means of a small tool or wire, which is heated to the vaporizing-point of the paraffine (which adheres to it) in a smokeless flame, and applied to the plate so as to melt the ground and cause it to flow over the false lines. If a large surface requires to be thus mended, little pieces of the ground composition may be laid on the place, and melted by means of the repairing-tool. A slight warmth in the plate is advantageous. Sometimes we purposely cut away the ground, and afterward use a similar tool, but with a divided point, like a mathematical pen, for containing a little melted ground, with which we then draw on the bare or nearly bare part of the plate, and lines and marks so made appear white in the print. In this way we are able to lay on lights, and produce an effect much admired by artists and draftsmen.

Supposing, now, that the design required has been drawn upon the plate, and the artistic work complete, it will, on examination, be found that the grooves or spaces in the ground will vary much in sectional form, and in some cases there will be an overhanging of the grounding material, and in other parts a burr or ridge of unremoved ground beside the line. To remove these irregularities, and to give an equal and similar form to the sides of all the grooves or spaces in the ground, is the object of the next process, and it will always be found that if this is not effected the printing-block made from the plate will give way after a few hundred impressions have been taken from it. We apply heat in such a manner as to fuse the entire surface of the unremoved ground, and so we remove all these irregularities and obtain the forms required. The form of fusion is always convex, and therefore always causes small arches in the printing-block, and thus forms of great strength are given to the printing parts. We effect this fusion by, as it were, brushing over the surface of the plate with a gas-flame. The burner used is a plain perforation in the end of a closed metal tube attached to an India-rubber gas-pipe. The plate is laid on the hand, so that the degree of warmth can be appreciated, and the flame is brushed to and fro many times over it while the plate is slightly warm, and until it is seen that the surface has changed its form. If this operation be carefully performed, there is no fear of the ground running over the lines. We then build up the interspaces between the

lines by applying a further quantity of paraffine by means of a heated tool. This tool is made on a capillary principle, so that it will hold the melted paraffine as a pen does ink, and discharge it when its point is brought in contact with the work. We use a tool composed of a narrow coil of stout copper wire, through which pass two fine steel wires side by side, to form a hard point, and other wires or wedges for fastening the steel wires in the tool, as well as to form a number of capillary channels to hold and conduct the melted paraffine in the manner of a wick. The material we use is paraffine of a lower quality, and melting at a lower temperature than that for the ground, and it need contain no pigment. It is made up for use into small sticks, with which the hot tool is touched from time to time. Every particle of ground remaining on the plate exceeding a few hundredths of an inch in length and width, is touched with the building-up tool, and a small quantity of melted paraffine deposited upon it.

Where the work is fine, care should be taken that the building-up tool is not too full, or the paraffine may run out and injure the drawing. This having been done, in order more perfectly to unite the paraffine thus laid on with the ground beneath, and also to cause it to run up to the edges of the lines and take forms of fusion, the plate is again brushed over with the flame, in the manner already described. This building-up process is repeated once or twice, until the open parts of the drawing have been built up to a considerable height.

The plate having been thus completed, we lather it with yellow soap, applied with a badger-hair brush, and we then brush onto it, with a similar brush, water which is rendered sour by the addition of muriatic acid. This treatment causes a thin film of grease to be deposited on the surface of the ground. In this state, when dry, we send the plate to the electrotypier, who first black-leads the surface with a soft brush, then places it in his copper-bath and starts the current immediately, having first taken the usual precautions to expel air from the hollows. The copper plate produced is mounted in the usual way, for printing. The drawing being, by this process, (without any transfer or destructive operation,) made the foundation of a mold, the perfection of the work tells up afterward in all its integrity. The opaque matter being ground into the grounding material, the effect of it remains, however thin or small are the particles of ground left on the plate. All parts of the drawing being worked over, and the blackest parts being most worked upon, the small irregularities of surface which such work produces all print in the press, and this gives a great fullness and meaning to the deepest shadows, none of which advantages can be obtained unless the printing-face is an exact reproduction of a surface which has been entirely produced by the drawing or etching point. The lines being produced by the point

and not afterward altered have great smoothness and freedom from granulation, or any other roughness. When a fine point is used, great refinement of the work is obtained, so that the softest possible grays may be faithfully printed in immediate contrast with the strongest work.

Alterations can be made on the plate after an electrotype has been removed from it, in which case a new electrotype may be taken, embodying the said alterations.

The invention can be applied to many purposes in which engraving is expensive or difficult, or imperfect, or slow, whether in art or manufacture.

Having thus described the nature of our said invention, and the manner of performing the same, we would have it understood that we claim—

1. The improvement in the art of producing a coated metallic design-plate for electrotyping, consisting of the following operations, viz: The application of a fusible grounding composition to a metallic plate; the melting of the composition on the plate by heat, and the spreading of it while hot, so as to form a

ground, which is permitted to harden; the removal of portions of the ground by tools, so as to form the design or drawing; the building up of the interspaces by the application of melted material; the remelting of the grounding composition by flame, to produce the rounding of the edges, all substantially as before set forth.

2. The improvement in the art of producing a coated metallic design-plate for electrotyping, consisting of the following operations, viz: The application of a fusible grounding composition to the metallic plate; the melting of the composition upon the plate by heat, and the spreading of it by heat, so as to form a ground, which is permitted to harden; the removal of portions of the ground by tools, so as to produce the design or drawing; and the subsequent remelting of the ground by flame, all substantially as before set forth.

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