

etching without acid

The full text of the original patent granted to Spencer and Wilson in 1840 for "Engraving on metal by means of Voltaic Electricity" the process that became known a little later as Electro-Etching. Extract from [GREEN PRINTS](#) by Cedric Green published by Ecotech Design, Sheffield, UK. - a handbook on new methods for non-toxic intaglio etching and metal plate printmaking, featuring the technique of [Galv-Etch](#), a modern development of the 19th century electrolytic technique of [Electro-Etching](#), and introducing [Fractint](#) and other new alternative methods avoiding the use of solvents and chemicals harmful to health and to the environment.

APPENDIX B: ENGRAVING METALS BY VOLTAIC ELECTRICITY

Copy of the original patent granted in 1840 to Thomas Spencer and John Wilson



A.D. 1840 N° 8656.

Engraving Metals by means of Voltaic Electricity.

SPENCER AND WILSON'S SPECIFICATION

TO ALL TO WHOM THESE PRESENTS SHALL COME, we, THOMAS SPENCER, of Liverpool, in the County of Lancaster, Carver and Gilder, and JOHN WILSON, of Liverpool aforesaid, Lecturer on Chemistry, send greeting.

WHEREAS Her present Majesty Queen Victoria, by Her Letters Patent 5 under the Great Seal of the United Kingdom of Great Britain and Ireland, bearing date at Westminster, the Seventh day of October now last past, did give, and grant unto us, the said Thomas Spencer and John Wilson, Her especial licence, full power, sole privilege and authority, that we, the said Thomas Spencer and John Wilson, our executors, administrators, and assigns, or such others as we, the

said Thomas Spencer and John Wilson, our executors, administrators, or assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term of years therein expressed, should and lawfully might make use, exercise, and vend, within England, Wales, and the Town of Berwick-upon-Tweed, our Invention of "**CERTAIN IMPROVEMENTS IN THE PROCESS OF ENGRAVING ON METALS BY MEANS OF VOLTAIC ELECTRICITY;**" in which said Letters Patent there is contained a proviso, obliging us, the said Thomas Spencer and John Wilson, by an instrument in writing under our hands and seals, or under the hand and seal of one of us, particularly to describe and ascertain the nature of our said Invention, and in what manner the same is to be performed, and to cause the same to be inrolled in Her said Majesty's High Court of Chancery within six calendar months next and immediately after the date of the said Letters Patent, as in and by the same, reference being thereunto had, will more fully and at large appear .

A.D. 1840.-N° 8656.

Spencer and Wilson's Impts. in Engraving on Metals by Voltaic Electricity.

NOW KNOW YE, that in compliance with the said proviso, we, the said Thomas Spencer and John Wilson, do hereby declare that the nature of our said Invention, and the manner in which the same is to be performed, is particularly described and ascertained in and by the Drawings hereunto annexed, and as follows, that is to say :-

Metallic surfaces are generally engraved either by means of a graving tool, or etched by acids. We claim the application of voltaic electricity for the purpose of engraving metallic surfaces generally. When the metallic surface to be engraved is copper, it must receive a coating of varnish or other projecting substance. We prefer the composition usually termed etching-ground. The required drawing or design is then made with a pointed instrument, care being taken that the metallic surface be fully exposed where the lines or points are required. The surface thus prepared must now be put into communication with the copper or negative end of a voltaic arrangement, by means of a wire or a slip of metal, and then placed in a vessel containing a solution of sulphate of copper. Another copper plate or piece of copper wire must, in like manner, be made to communicate with the positive end of the voltaic apparatus, and must then be placed in the same vessel with the plate to be engraved. The circle being thus completed, the electric current will remove or bite out the metal from those parts of the plate which are not covered by the etching ground or varnish. When the surface to be engraved is in the form of a cylinder we place it within a hollow cylindrical piece of metal, which latter serves as the surface C in vessel B, No 1 in the Drawing. The distance of the two plates regulates the depth and width of the lines or points ; these are also influenced by the quantity and intensity of the electricity employed, and of the time allowed for action. The electric apparatus employed may consist either of a single pair of plates, or of a greater number. The size of the plates of the voltaic apparatus employed depends on the size of the plate or other surface to be engraved. In general we find that it is convenient to have the surface of the copper plate of the voltaic apparatus about the size of the plate to be engraved, and the plate C in vessel B, N° I, in the Drawing hereunto annexed must have a surface about equal to the surface exposed in the metallic surface D. In general we find that the plates or other surfaces C and D may be conveniently placed two or three inches apart; when placed at greater distances more time is required for the action. During the process the engraved plate may be withdrawn and examined to see whether the lines are of the required depth ; if not sufficiently deep, the plate can again be placed in the apparatus and a greater depth be obtained. When some of the lines are

required to be fainter than others, such parts of the design may be stopped out in the same manner as in the common process of etching.

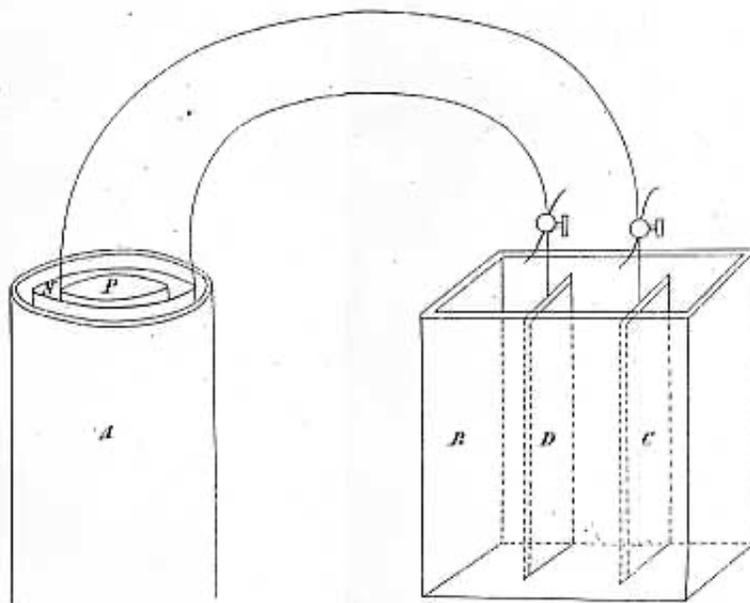
In the Drawing hereunto annexed, No I, A represents a vessel containing the plates of a voltaic arrangement, which may be excited by any of the methods at present in use. B, a separate vessel, containing the solution of sulphate of copper, or other salt, and the surfaces C and D ; C being the conducting surface, which is placed opposite the metallic surface to be engraved, and which communicates with the zinc or positive end of the voltaic apparatus. A, D, contained in the same vessel, is the surface to be engraved, and which communicates with the negative end of the voltaic battery . In No I, P represents the zinc or positive plate, and N the copper or negative end. Another and simple form of the apparatus is represented in Drawing No 2 ; A, a vessel containing a solution of any neutral, or acidulous, or non-metallic salt, into which the metallic surface B to be engraved is immersed, and which must be connected by a conductor, such as a slip of metal with a surface electro negative in regard to the surface to be engraved. In general platinum may be employed for this purpose. A prepared metallic surface may be engraved even without the metallic contact with the voltaic battery , as described above, by placing it in a solution between the plates forming the poles or ends of the voltaic apparatus. When a surface of steel is to be engraved, we prepare it with the etching ground, and proceed in the same manner as when copper is engraved, but in the vessel B, No I, into which the steel is introduced, we place a solution of common salt, and substitute a plate or wire, of steel, or iron, or any conducting substance, in place of the copper plate employed in the former process. Instead of the solution of common salt, other solutions of alkaline, earthy, or metallic salts may be used. When we engrave a silver surface, we place a silver plate by preference, or wire, in the vessel B, along with a solution of sulphate of soda, or of sulphate of silver. When we engrave a surface of gold we employ a solution of hydrochloric acid, or a solution of a soluble chloride, and place along with it in the vessel B a plate or wire of gold. The other metallic surfaces may be engraved by processes in every respect similar to those described above. We do not claim the use of any particular form of voltaic or galvanic apparatus, nor of the particular solutions specified above. But we claim the use or application of voltaic electricity for the purpose of engraving metallic surfaces generally.

In witness whereof, we, the said Thomas Spencer and John Wilson,
have hereunto set our hands and seals, this Sixth day of April, in the
year of our Lord One thousand eight hundred and forty-one.

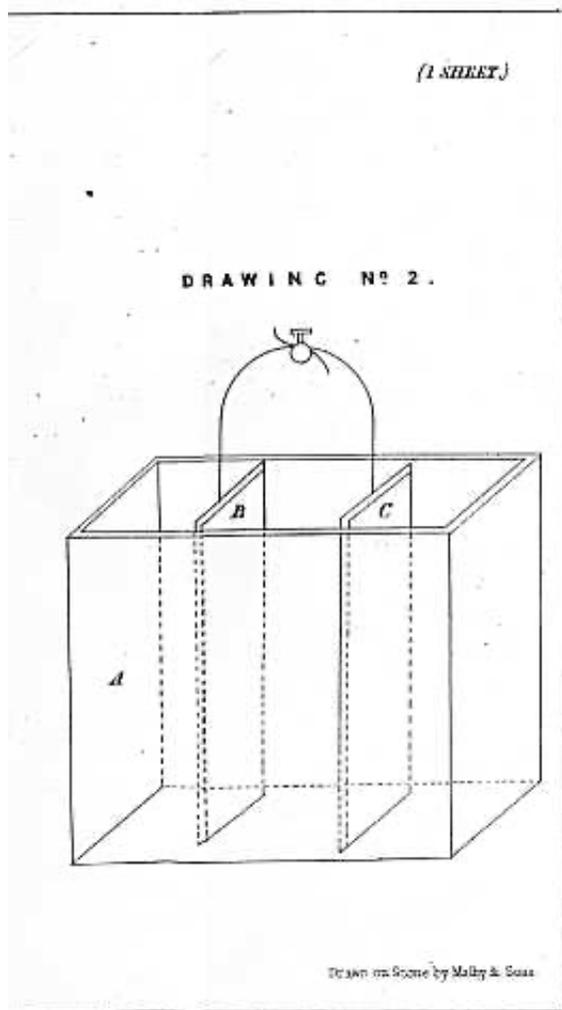
THOMAS SPENCER. (L.S.)

JOHN WILSON. (L.S.)

DRAWING N°. 1.



The enclosed drawing is colored.



Comments on Patent Specification

This 1840 patent is the first one for the use of an electrolytic process for 'engraving', that is, etching or removing metal from the unprotected parts of the plate. But there is a slight ambiguity in the wording of the patent. The specification states that the plate to be treated should be connected to the "...copper or negative end of a voltaic arrangement...". This is confirmed by the arrangements shown in the diagram. In the methods described in this site and in the booklet "Green Prints" , the plate to be etched should be connected to the *positive* output of the direct current source. But this does not represent an error in the patent specification, but represents the way that in the 1840's that they thought of the polarity of the electric current produced by a battery of the type described. If you reproduce a battery of that time (as I did) and you test the current at the zinc end and at the copper end, you will find that we now call the polarity at the copper, positive, and the zinc, negative. By the time that [Walker \(see Appendix A\)](#) came to write about the process in 1855, the modern method of naming the polarity was in place.

Note also that this patent covers another simple arrangement where the plate to be engraved is immersed in an "acidulous, or non-metallic" salt, and the other plate is electro negative with respect to the first plate (platinum is suggested) then the first plate is engraved without any contact with a voltaic battery. This is the basis of the method I have developed to eliminate the deposit produce by Bordeaux Etch and which is described in an article published in **Printmaking Today**, entitled "[Galv-etching without Electicity](#)". The content of this article is expanded in the booklet and a new page on this site.



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