UNITED STATES PATENT OFFICE.

EDMUND MOREWOOD AND GEORGE ROGERS, OF ENFIELD, ENGLAND.

IMPROVEMENT IN COATED METAL PLATES.

Specification forming part of Letters Patent No. **19,866**, dated April 6, 1858.

To all whom it may concern:

Be it known that we, EDMUND MOREWOOD and GEORGE ROGERS, of Enfield, in the county of Middlesex and Kingdom of Great Britain, have invented a new and useful article of manufacture, which we term "Coated Metal Plates;" and we do hereby declare that the following is a full, clear, and exact description of our said invention and of the manner of producing the same.

In the manufacture of japanners' ware, painted work, and for a great variety of purposes large quantities of tin plates and of sheets of iron coated with alloys of tin, and of what is commonly called "galvanized iron," are used, because the surfaces of such plates do not readily rust and can be readily united by the process of soldering; and in the manufacture of such plates or sheets it has been customary to dip the iron into the melted metal, by which process the iron becomes coated with a much larger proportion of the coating-metal than is practically necessary to enable it to be soldered with ease and to permit it to be used with advantage for a great variety of purposes, but which is required to protect the sheet metal from oxidation, so that it may be in a suitable condition for soldering when it falls into the hands of the workmen, who convert it into finished articles. Hence the cost of manufacture is increased by the use of a larger quantity of the coating-metal than is necessary, and the iron, by being dipped in the melted metal, which is necessarily at a high temperature, is more or less injured in toughness, and is rendered less flat and even on its surface. In some cases it has been the practice to deposit upon the iron a thin coating of tin from solutions of that metal; but this coating has always been followed by the dipping of the iron into melted metals, so that the article produced in this manner is as objectionable as that manufactured by dipping alone.

Now, the object of our invention is to produce an article of manufacture having a proper surface for soldering, which can be afforded at a less price than that produced by dipping the sheets into melted metals, and which may be used as a substitute for them for a great variety of purposes.

In order to produce our new article of manufacture, which we term "coated metal plates," we prefer to form a new metallic surface upon sheets of iron or other metal which forms the basis of the manufacture by depositing the metal which is to form the surface from its chemical solutions by the galvanic process; and we then finish the article by coating the sheets with a non-metallic material, composition, or varnish which is repellent of moisture, which may be used at so low a temperature as to leave the sheet metal as nearly as possible with its original form and toughness, and which protects the surfaces of the sheets from oxidation, so that they are in a suitable condition to be united by soldering; and we prefer for this purpose a resinous or such like material as will not interfere with, but will rather aid, the process of soldering the article.

In manufacturing our new article the sheet metal which forms its basis must first be thoroughly cleaned, so as to remove any adhering dirt and oxide. This may be done in any efficient manner; but we use for the purpose sulphuric or muriatic acids diluted in the proportion of a gallon of acid to twenty-five of water. The cleaned sheets are then immersed in a metallic solution, from which the metal held in solution is precipitated upon the sheet, so as to produce a new metallic surface upon them. The chemical solution of many different metals may be employed for this purpose, and we shall proceed to describe those which we have used with success.

In coating sheet-iron with copper we prefer to produce the copper surface by immersing the cleaned sheets in a solution of cyanide of copper contained in a wooden tank. The sheets are connected by metallic contact with a galvanic battery—say Wollaston's of five or six cells—and the temperature of the solution is to be maintained at 150° to 200° of Fahrenheit. A very short immersion in this solution—say from eight to fifteen minutes—will produce a copper surface sufficient for the purpose; and if on withdrawing the sheets from the solution it be found that any portion or portions are bare of copper, these portions are scoured with muriatic acid, diluted as before mentioned, and the sheets are returned to the solution until the required copper surface is procured.

In order to make up for the evaporation of the metallic solution during the process, we add from time to time water with a small quan-

tity of the cyanide of potassium dissolved in it—say in the proportion of four ounces of the latter to a gallon of water. The copper solution is prepared by adding a solution of the ferrocyanide of potassium to a solution of the sulphate of copper so long as precipitation takes place. The precipitate is thoroughly washed to remove all traces of the sulphate of potash produced in the operation, and is then dissolved in a solution of the cyanide of potassium. This solution may be used at once for producing the copper surface, or the ferrocyanide of potassium may be first removed from this solution by evaporating the latter until crystallization takes place and collecting the crystals.

In producing a zinc surface upon sheets of iron or copper we employ a solution of the sulphate of zinc in the tank and connect the sheet metal, as before, with a galvanic battery—say a Wollasion battery of two cells.

In producing a nickel surface upon sheets of iron we use a solution of the cyanide of nickel, and proceed as before. The cyanide of nickel is prepared by dissolving the metal in nitric acid. The metal is precipitated from the acid solution by carbonate of potash, and the precipitate is dissolved in cyanide of potassium. In subjecting the sheet metal to this solution a Wollaston battery of two cells is used.

In order to produce a lead surface, we place the sheets of iron or of copper in a solution of the acetate of lead. This solution may be contained in a wooden tank, and the sheets of metal may be placed in it in contact with pieces of zinc, also in the solution; or we use a separate battery—say a Wollaston battery of one or two cells—for depositing the lead from this solution, or from a solution made by means of caustic potash or of the cyanide of potassium.

In producing a tin surface we proceed in the same manner as with lead, substituting a solution of the protochloride of tin in place of the acetate of lead.

In producing a cadmium surface we proceed in the same manner as with lead, substituting a solution of the chloride of cadmium in place of acetate of lead; but as a general rule we do not use a separate battery in producing the cadmium and tin surfaces.

In producing an antimony surface we use a solution of the bitartrate of antimony and a separate galvanic battery—say Wollaston's of one or two cells.

In producing a bismuth surface we use a solution of the supernitrate of bismuth, or of the bitartrate of potash and bismuth, in place of the bitartrate of antimony, as above; or we deposit the bismuth from its solution in the cyanide of potassium; or the surface may be produced from solutions of antimony and bismuth by the porous-cell process. When the desired metallic surface is thus produced the sheets are thoroughly washed in water, either hot or cold. On taking the sheets of metal with their surfaces still wet from being washed we dry them by placing them over a clean coke fire or in an oven, and afterward apply to them a coating of melted resinous, gummy, oily, greasy, or bituminous matters, such matters being preferred as will aid in soldering, and being applied either in a melted state or in solutions—as, for example, the resins dissolved in wood-naphtha or coal-naphtha, or alcohol, or melted mixtures of rosin and tallow; but the coating we prefer is obtained by dipping the sheets previously so dried, and at the ordinary temperature of the atmosphere, into a solution of the above-mentioned materials in their well-known solvents—as, for example, a solution formed of two ounces of grease, or tallow, or oil, and ten ounces rosin or twenty ounces of turpentine dissolved in a gallon of good and clean coal-naphtha; or it may be ten ounces of rosin or twenty ounces of turpentine dissolved in one gallon of good and clear alcohol or methylated spirit, and after withdrawing them we set them on their edges to dry. After they are dried we usually give them a further coating, consisting of three ounces of rosin and four ounces shellac dissolved in a gallon of spirit—such as alcohol—which we apply by dipping the sheets into a solution of those matters, as before described.

When it is desired to coat sheet-iron without first obtaining to the surface thereof a covering of one of the metals above mentioned, we proceed in like manner—that is, we take the clean sheets of iron suitably dried, and by dipping them in the coating matters referred to we obtain the desired coating or coatings, as above described. When we use a solution of gums, gelatinous or bituminous matter, we usually make it in the proportion of two ounces to three ounces of the solid matter to one gallon of the solvent, and we take care to free the solution from all insoluble matter by allowing it to settle, and by afterward filtering it before use. After coating the sheets we dry them by setting them on edge over a coke fire or in a warm oven.

The preservative materials may also be applied to the sheets of metal after they are washed and before drying them, although we do not deem this method as advantageous as that previously described. In this latter case the sheets are taken from the water and are dipped at once, without permitting them to dry or rust, into the coating composition, which may be a mixture of the above-mentioned preservative materials. The mixture we prefer to use consists of two parts of rosin and one part of grease, oil, or tallow; or a mixture of three parts of turpentine to one of grease or tallow may be employed with advantage. This mixture we keep at a temperature of 250° Fahrenheit, in order that the heat may be sufficient to effect at one operation both the drying of the plates without exposure to air and the application of the preservative coating. When the water has had time to boil off the surface of the sheets, we withdraw them from the hot mixture above mentioned, and as we prefer that the coating should be thin we re-

duce it by rubbing in bran or sawdust kept hot in a flat-bottomed pan of galvanized iron or other suitable material placed in a bath of boiling water. After the plates have been thus treated we prefer to coat them further, as before mentioned, with three ounces of rosin and four ounces of shellac dissolved in a gallon of spirit—such as alcohol—or a mixture of wood-spirit and alcohol, now called "methylated spirit," allowing the solution to stand to settle for some time before using it. We then decant the clear portion and filter the remainder of the solution through fine calico or filter-paper, or otherwise, when the solution will be ready for use. Into this solution or mixture we dip the plates, and on withdrawing them we set them on edge for a time to allow them to drain and dry.

The coated metal thus produced is well adapted for the manufacture of articles whose parts are united by means of solder, and in manufacturing such articles the solder may be applied in the ordinary manner in connection with the well-known fluxes—as, for example, rosin or chloride of zinc, as may be found expedient.

Having thus described the best methods with which we are acquainted for producing our new article of manufacture, what we claim as new, and desire to secure by Letters Patent, is—

The new article of manufacture herein described, termed "coated metal plates," consisting of sheet metal prepared and coated with a moisture-repellent and preservative coating, substantially as herein set forth, the said coated sheet being intended as a substitute for many purposes for tin plates, galvanized iron, or other articles of that description produced by dipping sheets of metal into melted metals.

In testimony whereof we have hereunto subscribed our names.

Consulate U. S. A., London, 26th June, 1857.

EDMUND MOREWOOD.
GEORGE ROGERS.

Witnesses:
JOHN R. DARKER,
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