G. ROGERS.

BATH FOR COATING METAL WITH OTHER METAL.

No. 10,914. **Patented May 16, 1854.**

Fig. 2.

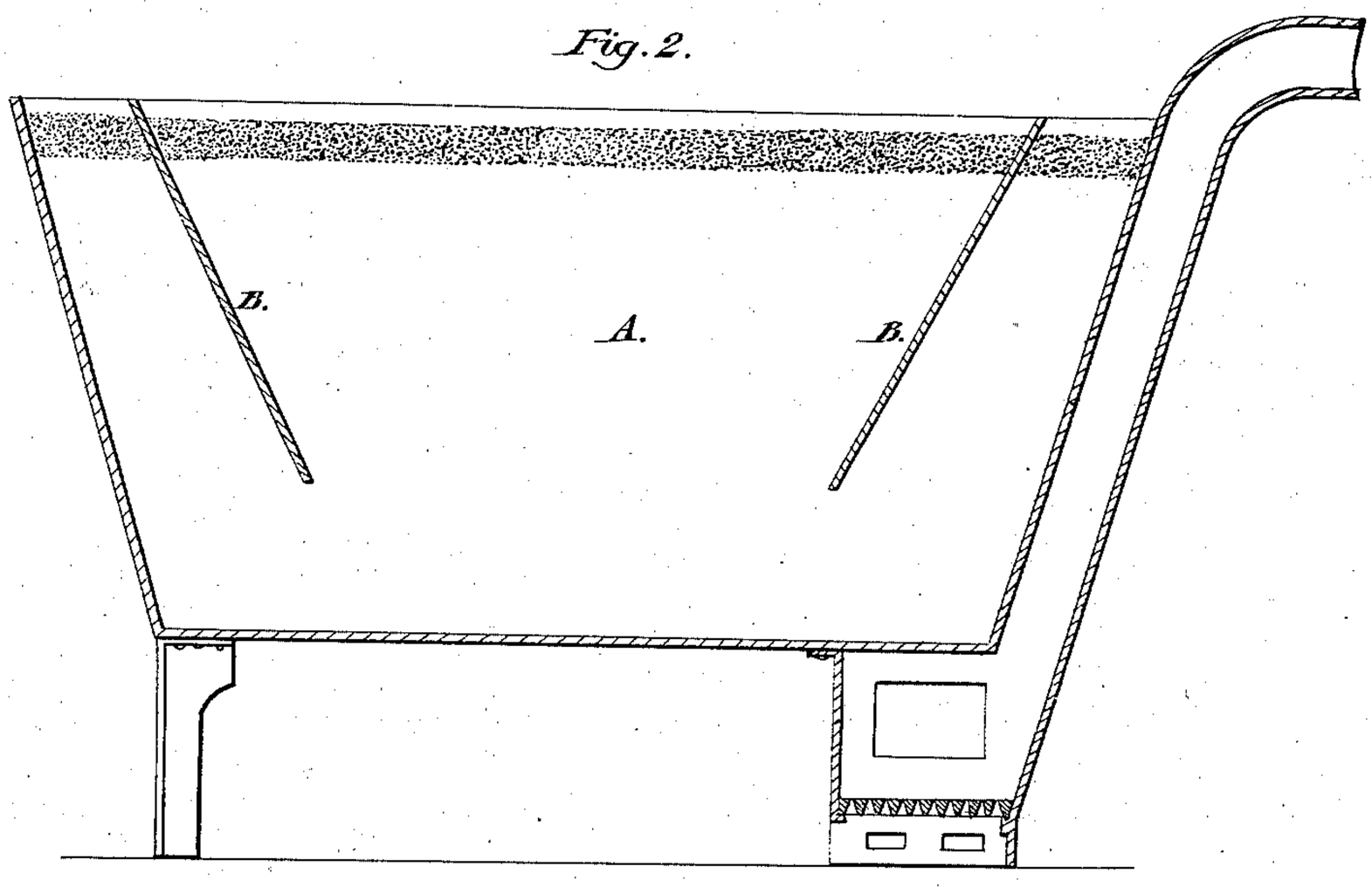
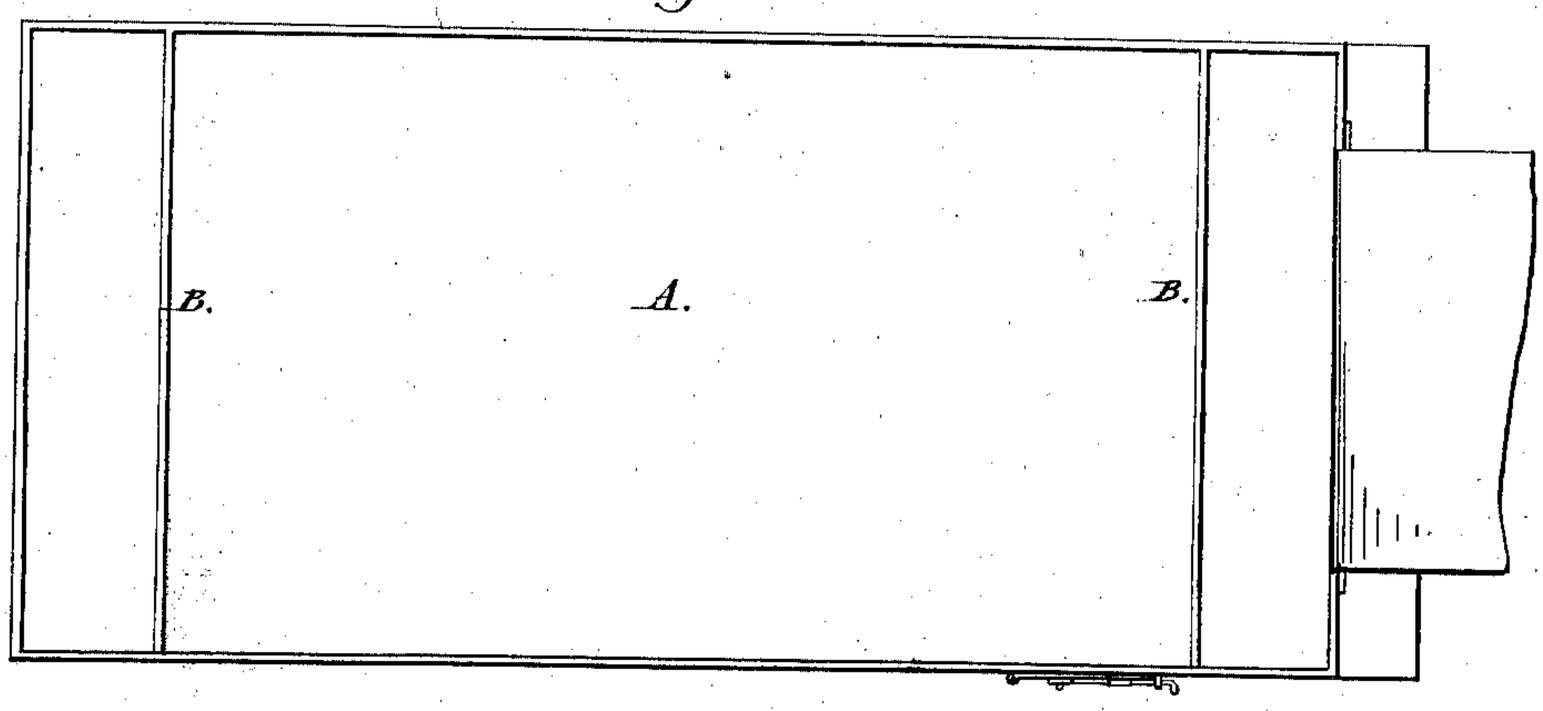


Fig. 1.



UNITED STATES PATENT OFFICE.

GEORGE ROGERS, OF ENFIELD, ENGLAND.

BATH FOR COATING METALS WITH OTHER METALS.

Specification of Letters Patent No. 10,914, dated May 16, 1854.

To all whom it may concern:

Be it known that I, GEORGE ROGERS, of Enfield, in the county of Middlesex, England, have invented certain new and useful Improvements in Coating Metals with other Metals, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form part of this specification, and in which—

Figure 1 represents a plan of a bath embracing my improvements, Fig. 2 a longitudinal section of the same.

This invention of improvements in coating metals with other metals refers to improvements made on an invention for which I, in connection with Edmund Morewood obtained Letters Patent in England bearing date the 4th May 1843. In the specification of that patent an improvement in the bath for containing the molten metal which is to form the coating for the metallic articles required to be coated, is shown and described. By this improvement we were enabled to insure the proper immersion in the molten metal of the sheet iron or other article under treatment. This object was attained by causing the sheet iron to pass under a bar stretching from end to end of the bath and placed below the surface of the molten metal. When operating after this manner our practice has been to cover the surface of the molten metal with a body of flux, so that, supposing sheet iron to be under treatment, the sheet as it is passed into the bath is prepared to receive the coating of metal by first being brought into contact with the flux. When the bath is uniformly heated to a temperature which is found to insure the best adhesion of the coating to the metal being operated on, it is so hot that it discolors the flux, which in turn stains the coated metal, as it emerges from the bath. In addition to this injury to its appearance, the high degree of heat at which the coated metal is withdrawn from the bath induces brittleness of the coating, thereby greatly impairing its durability. After many experiments I discovered that the conditions necessary to coating metals by means of the bath, so as to insure the best results are a high degree of heat in the bath of molten coating metal at the point at which the metal to be coated enters, and as low a temperature as will keep the bath fluid at the point at which the coated metal emerges from the bath, the hot and cold portions of the mass of metal being so divided that neither they nor the flux on their surfaces will be mixed. By this means the highly fluid metal at the hot end of the bath insures the coating of every part of the immersed sheet, and the comparative coolness of the opposite end of the bath insures great tenacity of the coating and prevents the burning and greatly diminishes the tendency of the flux to discoloration, and thus prevents the staining of the coated metal. I found it exceedingly difficult to construct a bath that would fulfil these conditions, and deemed it impossible to do so until I discovered that in metal rendered fluid by heat, a circulation is established by the heat, as in the case of other fluids, while its power of conduction during fluidity is greatly diminished. As water in one limb of an inverted siphon may be boiled while that in the other is at the freezing point so I found by actual experiment, the metal in one end or limb of a bath, resembling an inverted siphon in construction may readily be kept highly heated, while that in the other limb is barely hot enough to remain fluid. This discovery enabled me at once to construct my bath so as to fulfil in practice the conditions required by theory. All that I had to do was to divide by one or more partitions the upper part of the bath, leaving it undivided below, so that that part of the surface of the bath of molten metal at which the plate or other article to be coated is immersed, may be kept separate from that at which it emerges.

In the drawings A denotes the bath vessel, and B the partition bars or plates. Where two bars or plates are used, they are arranged as represented at Figs. 1 and 2. The employment of two partition plates, admits of the contraction of the surface of the immersion and emerging orifices of the bath to a width barely sufficient for the free entrance and egress of the articles to be coated. This arrangement admits of a further improvement in the bath by which a great saving of flux is effected, and this improvement consists in covering that portion of the surface of the bath between the partition plates with powdered charcoal, sand, or other pulverulent matter which is cheap and a bad conductor of heat, instead of the more costly fluxes heretofore used to cover the entire surface of the molten metal, to protect it from oxidation, and loss of its

heat by radiation. Thus by the substitution of cheap pulverulent matter for expensive flux to cover a large part of the surface of the bath, and the lowering of the temperature of one end of the bath, the volatilization and consequent waste of flux is materially diminished, with a corresponding diminution of the annoyance to the workmen, produced by the noxious fumes evolved from hot flux.

To prepare the bath for operation it is first charged with the proper quantity of zinc or other coating metal say sufficient to fill it within six inches of the top. Fire is then applied to the end or side, at which the immersion orifice is situate until the metal is melted. The dross is then skimmed off, and the immersion and emerging surfaces covered with a layer of sal-ammoniac or other flux, and in the trough-like space between the partitions a layer of several inches of sand or other suitable pulverulent matter is placed; as soon as the bath has reached the proper temperature, it is ready for the work of coating to commence by dipping the article to be covered, already prepared in the usual manner, into the hottest end or orifice of the bath, passing it beneath the surface of the melted metal, under the partition and out at the cooler end of the bath, as the flux is consumed with a degree of rapidity corresponding to the heat to which it is subjected, other things being equal, much more is used at the immersing than at the emerging orifice, the fresh flux however is first placed in the latter orifice until it begins to burn and get discolored, when it is transferred to the former orifice, and replaced by a quantity of the clean fresh material, in this way the partition enables me to produce coated articles of uniform and good color. In case of wire and a few other similar articles, the hot end only of the bath is fluxed, the opposite end being covered by the pulverulent matter alone, and this method of operation in all cases in which it will answer, effects a still further saving of flux and consequent economy in the operation of coating.

Sheets of iron are the only things I have coated so far that require the fluxing of both orifices of the bath.

What I claim as my invention and desire to secure by Letters Patent is—

Constructing the bath in such manner that the upper portion of the molten metal at which the article to be coated enters, is separated by a partition from that portion of the upper part of the molten metal at which the coated article emerges, whereby the flux at the two ends of the bath may be kept separate, and the metal at one end of the bath kept at a much higher heat than at the other substantially as specified, whereby also, pulverulent matter not a good conductor of heat, may with important advantages be employed to cover a portion of the surface of the molten metal, the remainder being covered by flux as herein set forth.

In testimony whereof I have hereunto subscribed my name.

GEORGE ROGERS.

Witnesses:
WILLIAM EARNY,
JOHN R. BARKER.