No. 610,954. Patented Sept. 20, 1898.

E. T. THOMAS.

METHOD OF FORMING INTEGRAL METALLIC COATINGS UPON SURFACES.

(Application filed Apr. 3, 1897.)

(No Model.)

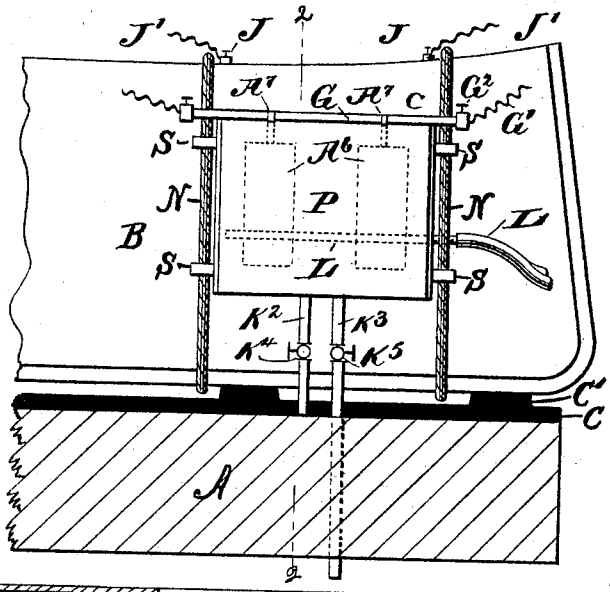


Fig. 1.

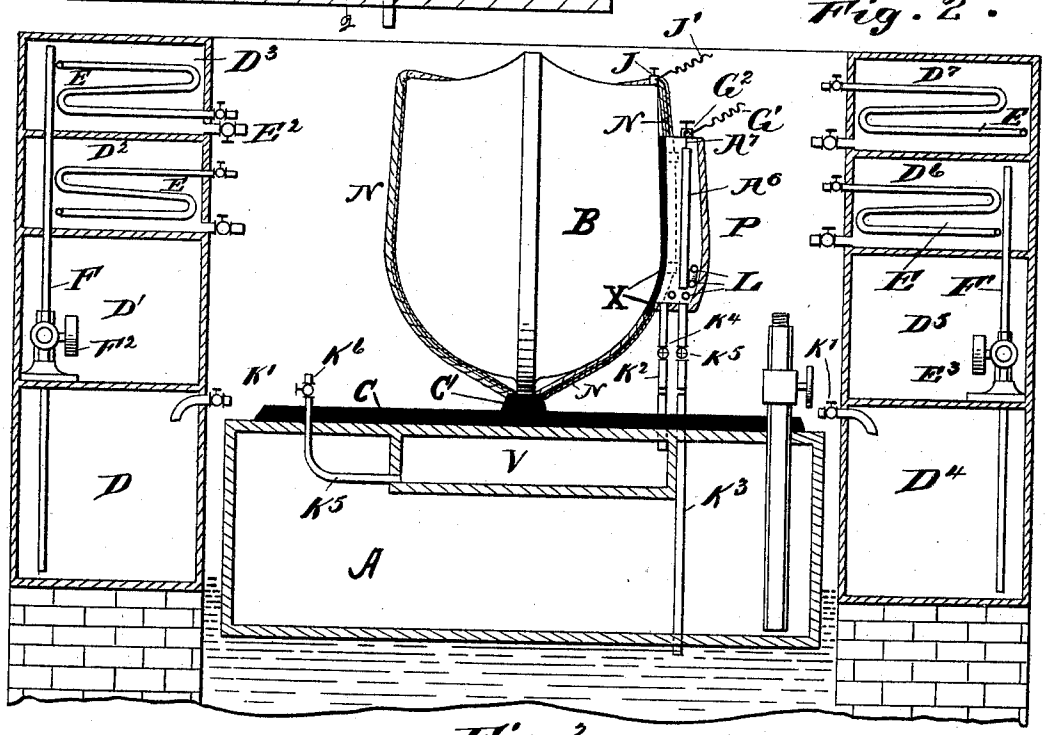


Fig. 2.



Fig. 3.

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UNITED STATES PATENT OFFICE.

EDDY T. THOMAS, OF NEW YORK, N. Y., ASSIGNOR TO HAROLD BINNEY, TRUSTEE, OF SAME PLACE.

METHOD OF FORMING INTEGRAL METALLIC COATINGS UPON SURFACES.

SPECIFICATION forming part of Letters Patent No. 610,954, dated September 20, 1898.

Original application filed April 27, 1892, Serial No. 430,876. Divided and this application filed April 3, 1897. Serial No. 630,583. (No specimens.)

To all whom it may concern:

Be it known that I, EDDY T. THOMAS, of the city and State of New York, have invented a new and useful Improvement in and Relating to Methods of Forming Integral Metallic Coatings Upon Surfaces, of which the following is a description, referring to the accompanying drawings, which form a part of this specification.

This invention is especially applicable to marine use, as for ships, the metal forming one continuous integral coat of electrically deposited and united material. As applied to ships the ultimate objects of this invention are to effect economy, to save painting, to reduce cost and facilitate repairs, to preserve the ship, to prevent barnacles and vegetation from growing thereon, and to increase the speed of the ship, because a smooth and polished surface is presented to the water.

The invention contemplates the electrical deposition of metal upon an extended surface in sections overlapped in a definite and regular manner to form a united and continuous coating.

This application is a division of an application for Letters Patent for electrodeposition of copper filed by me April 27, 1892, Serial No. 430,876, and is for the process.

The nature of the present invention will be clear from a description of the accompanying drawings, wherein—

Figure 1 is a side view of apparatus for carrying out the process as it is applied to ships. Fig. 2 is an end view of Fig. 1, showing the hull in full and the tank and also the dock and float in section on the plane 2 2 of Fig. 1. Fig. 3 is a section of a ship's plates as plated by my invention.

The apparatus for carrying out the process forms the subject-matter of my application, Serial No. 538,520, filed February 15, 1895.

A in the figures represents a dry-dock float, which is sunk by allowing it to fill with water. The ship B is then floated onto it and the water forced out, raising the ship with the float, as shown in the figures.

B indicates the ship's hull, supported on the insulating-blocks C', which preferably rest upon the insulated floor C of the dock or float A.

P is my solution tank or holder, which constitutes a receptacle having a bottom, two ends, and one side, the ship B or other cathode forming the other side, as shown in Fig. 2. This receptacle P, as shown, is secured to the ship's side by the cables N, which are passed through the staples S S and then around the ship and suitably made taut. When the packing at X, Fig. 2, (which will presently be described in detail,) is suitably compressed by the cables against the sides of the ship, all liability of leaking is avoided. This packing X consists of rubber or other suitable yielding material extending along the edges of the tank, between the tank and the ship. The edges of the tank conform but roughly to the exact outlines of the ship's plates for which they are intended, but the yielding packing, when suitably compressed, conforms to all the irregularities in the ship's surface, making the joint quite tight, which is particularly difficult at points where the edge of the tank crosses the overlapped joints of the ship's plating. At such points the edge of the tank is stepped or cut to roughly fit the lap-joint, the yielding packing being relied upon for more accurate fit.

The pipe K^2 may lead from the bottom of the tank P into the storage-tank V within the float A, which is used to store one of the solutions. Pipe K^3 leads from the bottom of the tank P into the sea, extending either through or around the float A, for the purpose of drawing off the wash-water after washing the surface to be treated. Plugs, stop-cocks, or other suitable controlling devices may be used to open and close and to connect and disconnect the pipes K^2 and K^3 as desired. In the drawings stop-cocks K^4 and K^5 are shown.

Tanks D, D^2, D^3, D^4, D^6, and D^7 may be located at the sides of the float A, as shown in Fig. 2, for storing and heating the liquids used in treating the ship. To facilitate handling of the liquids, these tanks are preferably at such height as to permit the liquids to be readily run by gravity into the plating-tank. The cleaning solution, as an instance, may be

stored in tank D^2 at such height as to be readily run into the plating-tank P through suitable piping connections from E^2. It is then after using discharged by gravity through connection K^2 to the tank V, whence it may be pumped by pipe K^5 and connection K^6 back to tank D^2. Similarly the water for washing and the cyanid and sulfate solutions for plating may be stored in the other raised tanks D^7, D^6, and D^3. The wash-water may run freely off through pipe K^3 into the sea. The plating solutions may be run off from plating-tank P into the respective tanks D and D^4, connections for hose or other pipes being provided at K'. From these tanks D and D^4 the solutions may be pumped back to the tanks D^5 and D^6 by pumps F^2 F^3 and pipes F F'.

Steam heating-pipes may be provided for the solution-tanks to raise the solutions to the best working temperature and to prevent freezing.

At A^6 are shown the two anode-plates, of copper, suspended from the rod G by the conductors A^7. Current is supplied to the anode by means of the connections G^2 and current-conducting wires G'. Where several anodes are used, they are placed at intervals to produce the best results in forming an even coat of metal. The plating-current may be conducted from the hull of the ship, so as to make the hull the cathode, by means of the connectors J and the conductors J'. The wires G' and J' may be connected to a plating-dynamo or the other suitable source of electricity used.

The use and operation of my open-sided tank in plating a ship in sections are as follows: The iron surface of the ship, if the ship is of iron, is cleaned either mechanically or by the use of suitable cleaning solutions, such as lye or any other well-known cleaner. The cleaning solution may be applied by means of the tank P before it is used for plating. After the surface of the ship or other cathode has been so cleaned and the tank and cathode washed, if cleansing solutions have been used, then the plating solution is run into the tank, the anode adjusted, the conductors suitably connected, and the current turned on. I prefer to use first a cyanid solution, as it forms more intimate union with the iron or steel and does not scale or peel off. After a thin coating of copper has been so deposited I run off the cyanid solution and continue the plating by means of the more rapidly depositing sulfate-of-copper solution. I may even plate the whole ship in sections by means of the cyanid solution and then use the sulfate solution, taking care to clean the copper surface of any oxid. In any case, however, after one section of the cathode has been satisfactorily plated with the section of copper corresponding in size to the open side of the tank the tank is moved along in order to plate the next section. For this second section the tank will be so placed that the packing rests in part upon the previously-deposited copper section, so that the plating solution will cover and deposit upon the edge of the previously-deposited copper section. In this manner by carefully placing the tank the several sections may be thoroughly knit or united at the edges with but slight overlapping.

In order to expedite the plating of a ship and decrease the period during which it is necessary for the ship to be in dry-dock, I may use a number of plating-tanks P simultaneously, finally joining the several adjacent sections together by depositing other metallic sections between and upon the edges of the previously-deposited sections, so as to form an unbroken integral coating over the whole hull or to the water-line. After plating I preferably grind, hammer, or otherwise smooth the surface of the deposited plating throughout and grind or hammer down the overlapped and united edges of deposited sections, so as to remove all elevations and roughness.

In order to enable me to perform my plating operations out of doors and in all sorts of weather, I suitably warm the plating solution in any desired manner, as by steam-pipes L. The solutions may be heated before introduction into the tanks P, as already described, or may be warmed and kept warm while in the plating-tanks.

The amount of current which it may be desirable to use will depend on the size of the section deposited at each operation and the rate at which it is to be deposited. These details, as well as the strength of solutions and thickness to which it is desirable to plate the vessel, will depend upon the purposes for which the ship is used and upon considerations well understood by those skilled in the art of electroplating, and therefore I make no further mention of them here.

In plating wooden surfaces the surface should be first treated with plumbago or otherwise adapted to receive electrolytic deposit. In such cases I usually prefer to use sulfate-of-copper solution throughout the process, though I do not mean to limit myself to the use of any particular solution.

When a coppered ship has been injured and the copper plating destroyed in places, these places may be readily patched by the application of my plating-tanks after the surface has been suitably cleaned. It is also clear that my tanks may be used on interior as well as exterior surfaces and for plating any metals.

Having now fully described my invention and in what manner the same may be used, I claim, and desire to secure by these Letters Patent, the following new and useful features or points:

1. The method of forming an integral coating upon a surface, which consists in depositing a layer of metal upon a portion of such surface of predetermined size and shape, and thereafter depositing upon the edge of such previously-deposited section and upon the ad-

joining uncoated portion of the surface, another section of predetermined size and shape, forming a plurality of sections overlapped in a definite and regular manner, substantially as set forth.

2. The method of forming an integral metallic coating upon a vertical or inclined surface, which consists in confining a body of liquid electrolyte laterally against a limited portion of such surface of predetermined size and shape, passing a current from an anode not in contact with the said surface through the electrolyte to the said surface, thereby depositing a section of plate, and thereafter confining liquid electrolyte against a limited unplated portion of the said surface and a portion of the edge of the previously-deposited section, both of predetermined size and shape and passing the current, as aforesaid, from the electrolyte partly into such unplated portion and partly into the edge of the previously-deposited section, thereby forming a continuous plating overlapping in definite and regular manner, substantially as set forth.

In testimony whereof I have hereunto set my hand this 18th day of February, A. D. 1897.

EDDY T. THOMAS.

Witnesses:
P. P. CASEY,
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