

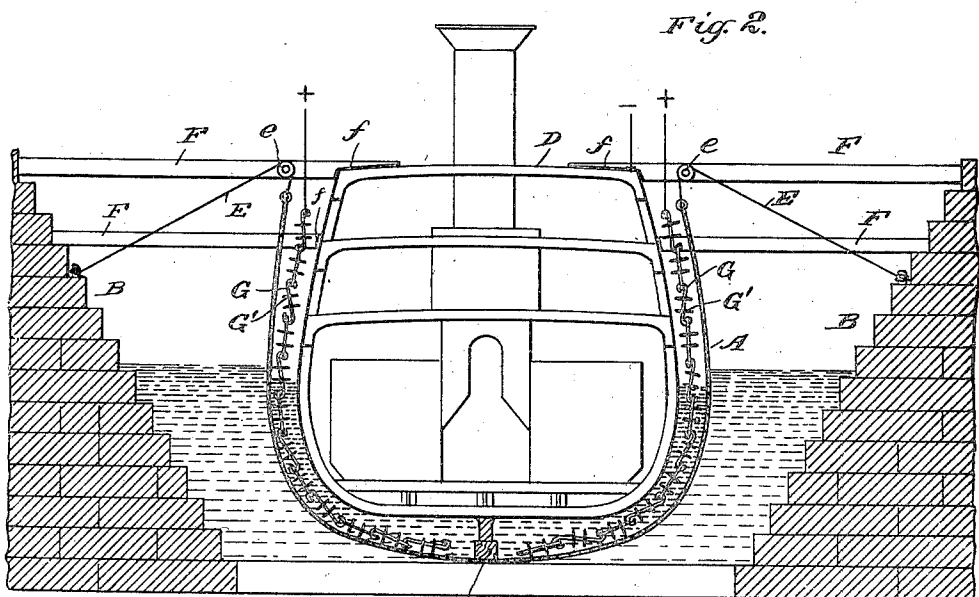
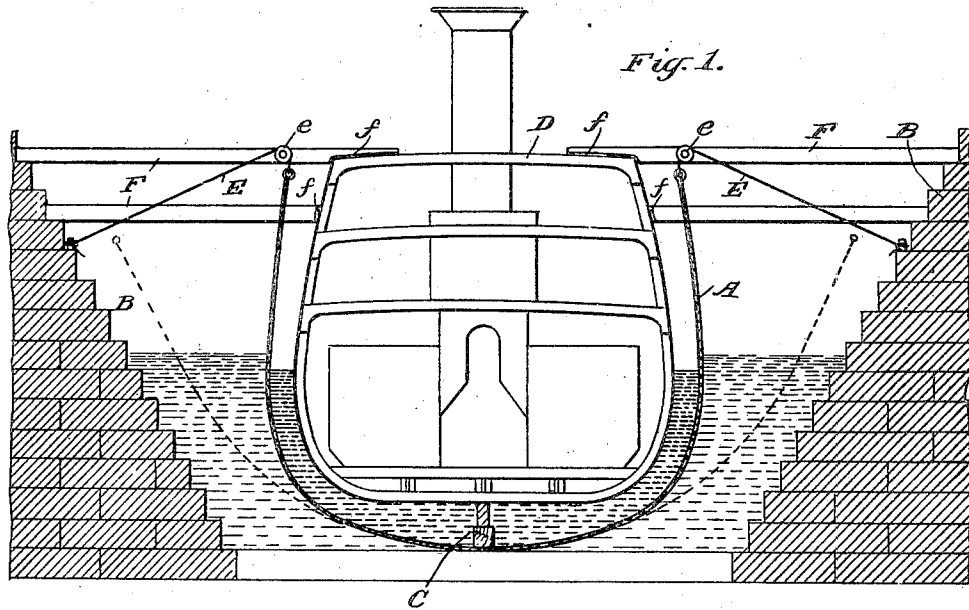
(No Model.)

A. D. BUCHANAN.

PROCESS OF AND APPARATUS FOR ELECTROPLATING THE HULLS
OF VESSELS.

No. 469,538.

Patented Feb. 23, 1892.



WITNESSES:

W. H. Russell
C. Sedgwick

Fig. 3.

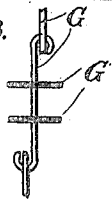
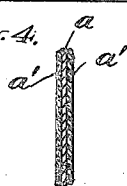


Fig. 4.



INVENTOR:

A. D. Buchanan
BY *Munn & Co*

ATTORNEYS

UNITED STATES PATENT OFFICE.

ALEXANDER D. BUCHANAN, OF LONG ISLAND CITY, NEW YORK.

PROCESS OF AND APPARATUS FOR ELECTROPLATING THE HULLS OF VESSELS.

SPECIFICATION forming part of Letters Patent No. 469,538, dated February 23, 1892.

Application filed February 20, 1891. Serial No. 382,157. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER D. BUCHANAN, of Long Island City, in the county of Queens and State of New York, have invented a new and Improved Process of and Apparatus for Electroplating the Hulls of Vessels, of which the following is a full, clear, and exact description.

My invention relates to improvements in a process of and apparatus for electroplating the hulls of vessels; and the object of my invention is to provide a simple means of making a metallic deposition on the hulls of vessels, so that they may be enabled to resist the corrosive action of the water.

To this end my invention consists in a process and apparatus which will be hereinafter fully described, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a vertical cross-section of a vessel placed in a dock and held in an envelope embodying a part of my invention. Fig. 2 is the same view, but with the anodes in position between the envelope and hull of the vessel. Fig. 3 is a broken enlarged detail view of the anodes, and Fig. 4 is a broken enlarged detail section of the envelope.

The vessel to be plated is sailed into a lower lock similar to the lock of a canal, and is then placed in an upper lock or dock, so that the bottom of the vessel will be at about high-water mark and where the vessel is to be incased in an envelope A, which envelope is held to the bottom of the dock B by means of a timber C, which extends longitudinally through the envelope and which is firmly fastened to the dock-bottom, the timber being suitably insulated so as to prevent grounding of the circuit. The envelope may be also held to the dock-bottom by any other suitable means, although the edges must be free, so that the envelope may be conveniently raised when necessary.

The envelope A is made up of the central section *a*, of canvas or other strong material, which is flexible and which is preferably provided with a wire warp to make it sufficiently strong, and of an outer and inner coating *a'*

of insulating material. The envelope is made to approximately fit the largest-sized vessels, and it may then be used for smaller vessels as well, as it is intended to be raised up around the sides of the vessel, so as to leave a small space between it and the hull, and at the ends the envelope may be closed up, so as not to leave too much space, by means of clamps, cross-beams, or any suitable devices. The envelope may be made of plain closely-woven cloth, such as is used in making cotton or linen hose, and it may be insulated on the outside only, or the insulation may be dispensed with entirely, although it is better to use it.

The vessel D is sailed into the dock B above the envelope and is lowered so that its keel will rest on the timber C, and it is held in place by cross-timbers F, extending from the hull of the vessel to the sides of the dock. These timbers are provided at their inner ends with thick cushions *f* of insulating material, preferably of rubber, which thus prevent the vessel from being strained and also prevent the grounding of the circuit. The envelope is held in a raised position and is raised and lowered by means of rope E, extending over suitable guide-pulleys, although any other convenient means may be used for raising it.

In electroplating a vessel the negative pole of the dynamo is connected to the hull of the vessel, as shown in Fig. 2, and the anodes are immersed in the bath which is placed in the envelope. The anodes are made up of a series of large copper links G, which are hinged together at the ends, as shown in Fig. 3, so that they will readily conform to the shape of the vessel, and at frequent intervals upon the links are insulating-washers G', which prevent the anodes from contacting with the hull of the vessel or with the envelope.

The apparatus is used and the vessel electroplated in the following manner: The vessel is floated into the dock and lowered by letting out the water, so that her keel will rest upon the timber C. The cross-timbers are adjusted, and, if necessary, the vessel may be further supported by insulated bilge-blocks. The vessel is then thoroughly scrubbed and cleaned by workmen let down from the vessel's sides on planks in the usual manner, and

the hull should be almost polished by means of emery disks, wire brushes, or other suitable devices. The envelope is then raised around the hull of the vessel, the water is siphoned off or otherwise withdrawn from it, and the envelope is then filled with a pickle, which is preferably a solution made up of water and sulphuric acid, there being about one-half a pound of acid to a gallon of water. The water is let into the dock at the same time that the pickle is pumped into the envelope, so that the pressure of the water will make the envelope conform to the shape of the vessel, and very little pickle will then answer to fill the space between the envelope and the hull; and in carrying out this idea it is better that the water be kept slightly in advance of the pickle, as shown in Fig. 1, so that it will not be necessary to use too large a quantity of the pickle. The envelope is then alternately pulled taut and relaxed, so as to keep the acid in motion, and after a thorough agitation the sides of the envelope are pulled out, as indicated by dotted lines in Fig. 1, so that the sides of the vessel may be scrubbed by workmen, who may be lowered upon planks in the usual way. The pickle is then withdrawn and clean water supplied in its stead to thoroughly wash the vessel's hull, and the hull should be scrubbed while the clean water is being withdrawn in the manner described above, and the envelope is pulled aside far enough so that all parts of the hull, including the propeller-shaft and the propeller, may be thoroughly cleaned. The water from the envelope and dock is then withdrawn and a copper solution, which is preferably alkaline, is let into the envelope, and water is let into the dock so that the envelope and dock will fill up together, as already described, and the anodes are placed in the solution and are made long enough so that they will extend nearly to the keel of the vessel. The hull of the vessel is connected with the negative pole of a dynamo, and if the hull is of metal but few connections will be needed; but if it is of wood it will be necessary to make numerous connections, in order that the current may traverse efficiently through the entire hull. The anodes are placed in position and the current is turned on while the envelope is being filled with the solution, and the sides of the envelope are pulled away in the manner already described, so that the surface of the hull may be scraped by the workmen, the scraping being done at the surface of the solution as it flows into the envelope, and this scraping causes a deposit to be made rapidly upon the hull. The current of electricity which is turned on is weak at first and is gradually increased in strength, and after a few hours the vessel should be sufficiently coated to resist the corrosive action of the ordinary sulphate bath, and after a while the alkaline solution is withdrawn and the hull examined, and if it is found that there are places not sufficiently coated the

envelope is again filled with the alkaline solution, these spots are scraped or scratched, and a current of electricity is maintained until the spots are sufficiently coated. After this the alkaline solution is withdrawn, the envelope is flushed with clean water, which in turn is withdrawn, and the envelope is then filled with the ordinary sulphate solution. The solution is flowed in in the same manner that the pickle and alkaline solution have been, the workmen scraping the vessel at the upper surface of the solution as it flows in, and an energetic current is maintained until the hull is thoroughly plated. When the envelope is emptied of pickle or water, the worthless material may be run to waste; but the envelope may be provided with a suction or draw pipe extending to its lowest part, so that after the vessel is plated the solution may be drawn back to the tanks from which it was originally taken.

As a general thing, copper would be used in plating a vessel; but it is obvious that it might be plated with other metals without departing from the principle of my invention. After the vessel is plated the envelope is lowered and the vessel is floated from the dock.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The herein-described process of electroplating vessels, which consists in docking the vessel, incasing its hull in a flexible envelope, filling the envelope with a metallic solution, and making electric connections between the solution and the hull of the vessel, substantially as described.

2. The herein-described process of electroplating vessels, which consists in docking the vessel, incasing its hull in a flexible insulated envelope, filling the envelope with a metallic solution and the dock with water, and electrically connecting the solution and the hull of the vessel, substantially as described.

3. The herein-described process of electroplating vessels, which consists in docking the vessel, incasing it in a flexible insulated envelope, filling the envelope with an alkaline metallic solution and the dock with water, passing an electric current through the solution and the hull of the vessel, removing the alkaline solution and filling the envelope with a sulphate solution, and in passing a current through the latter and the vessel's hull, substantially as described.

4. The herein-described process of electroplating vessels, which consists in docking the vessel, thoroughly cleaning its hull, incasing its hull in a flexible insulated envelope, filling the envelope with an alkaline metallic solution and the dock with water, passing an electric current through the solution and through the hull of the vessel, removing the solution and substituting a sulphate solution, and passing a current through the latter and the hull, substantially as described.

5. In an apparatus of the character de-

scribed, the combination, with a dock, of a flexible insulated envelope shaped to fit a vessel and having its central bottom portion secured to the dock, and means for raising the
5 envelope, substantially as described.

6. In an apparatus of the character described, the combination, with a dock, of a flexible insulated envelope shaped to fit a ves-

sel, a timber extending longitudinally through the envelope and secured to the dock-bottom, and means for raising the envelope, substantially as described.

ALEXANDER D. BUCHANAN.

Witnesses:

WARREN B. HUTCHINSON,
E. M. CLARK.