(No Model.) 2 Sheets—Sheet 1.

J. H. GEORGE.

SYSTEM FOR ELECTROPLATING VESSELS.

No. 565,975. Patented Aug. 18, 1896.

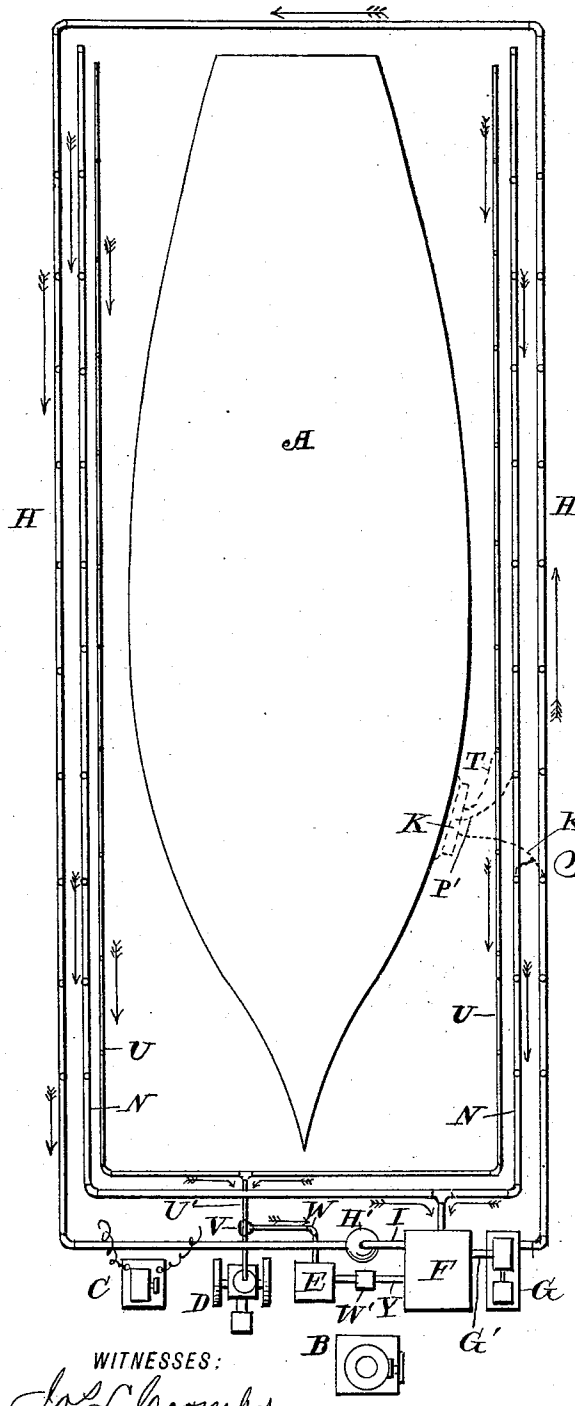

Fig. 1.

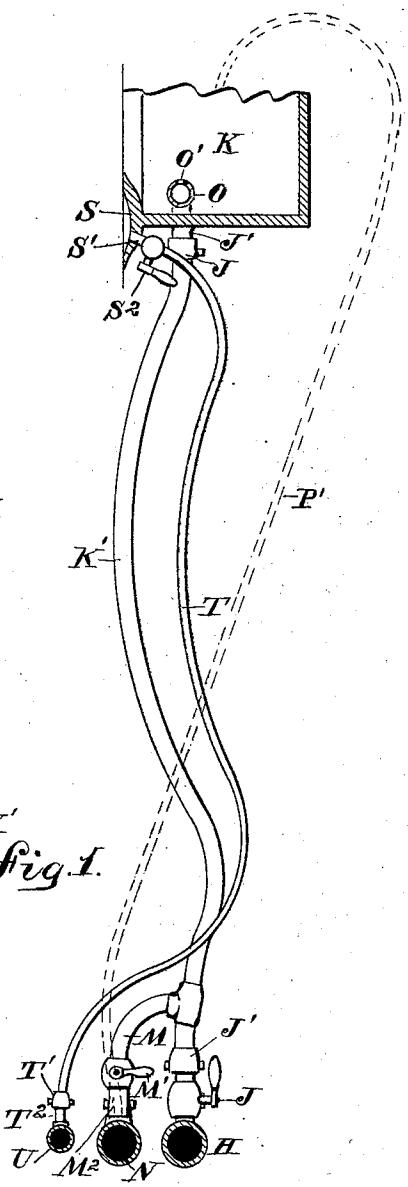

Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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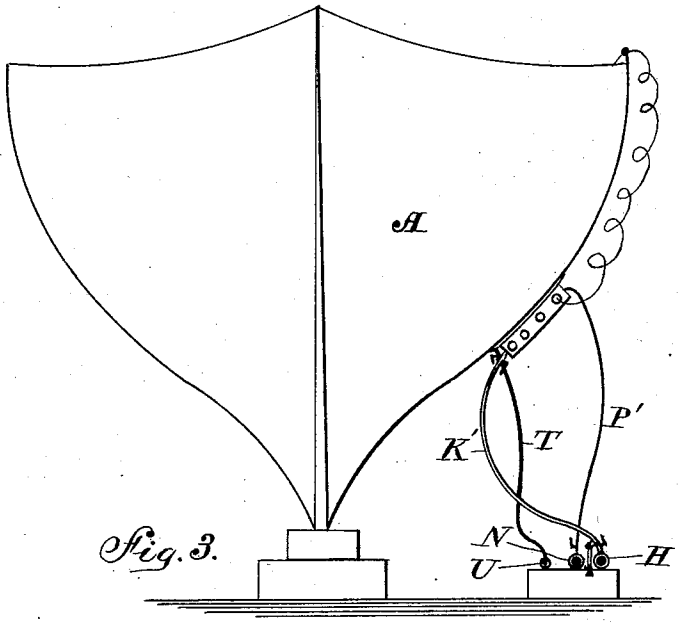

Fig. 3.

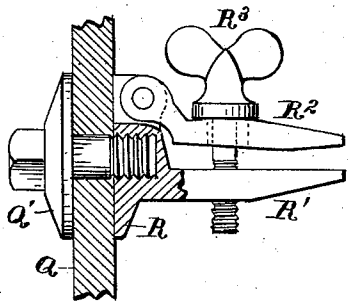

Fig. 6.

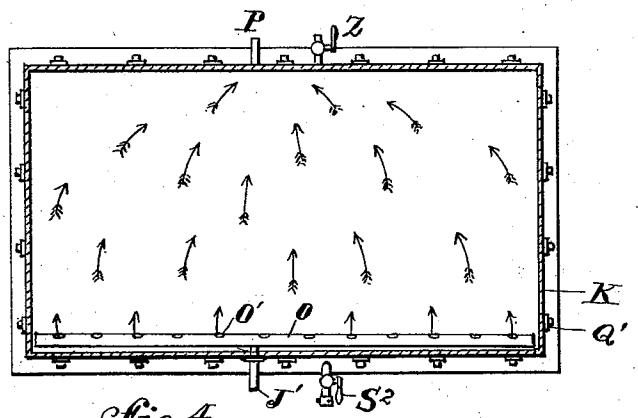

Fig. 4.

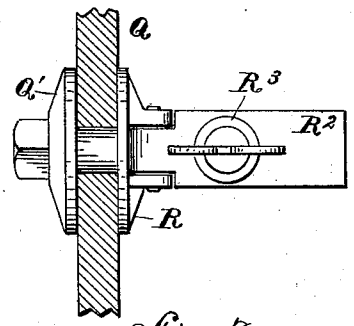

Fig. 7.

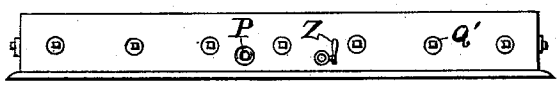

Fig. 5.

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UNITED STATES PATENT OFFICE.

JAMES H. GEORGE, OF NEW YORK, N. Y.

SYSTEM FOR ELECTROPLATING VESSELS.

SPECIFICATION forming part of Letters Patent No. 565,975, dated August 18, 1896.

Application filed August 21, 1895. Serial No. 560,031. (No model.)

To all whom it may concern:

Be it known that I, JAMES H. GEORGE, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Systems for Electroplating Vessels, of which the following is a specification.

The object of my present invention is to provide a cheap, simple, and efficient system for electroplating the hulls of vessels; and it consists, primarily, of a plant composed of a solution-reservoir, a pump for exhausting same, a drain-tank, and an air-exhauster or vacuum-pump, in connection with pipes for conducting the solution to the electroplating-baths, and a stand-pipe in the line of said piping, return drain-pipes for discharging the baths, pipes for connecting the baths with the vacuum-pump, and a trap in the air-pipe line for intercepting the fugitive solution and discharging same into the drain-tank.

The invention also provides for equipping the bath with suitable connections and intermediate flexible tubing, the whole being so connected up that the operation of electroplating large surfaces can be conducted with great facility.

In the process of electroplating, as, for instance, the hull of a vessel, I have found by practice that it is not only a difficult but a costly piece of work. It is important to perform this work expeditiously, because dockage fees, detention of the vessel, and costs incidental to time are very onerous. On the other hand, if a sufficient number of baths and connections are made to cover a very large area of the vessel the cost of the baths is an expensive item, to say nothing of the capacity of the electroplating plant.

The system herein set forth provides for the following advanced features: first, a means for holding the baths in contact with the vessels without the use of shoring or staying appliances; second, a means for automatically supplying the plating solution in a constant volume to the baths; third, a means for maintaining a constant pressure of the solution in the baths; fourth, a means for keeping a constant circulation through the bath; fifth, a means for maintaining a positive movement of the liquid in an opposite direction to the gravitating force of the saturated solution; sixth, a means whereby any bath in the series can be discharged without disconnecting the line-pipe from the pump or distributing the pressure or flow of the others in the series; seventh, a means for supplying all the baths in the series from a single reservoir through a single main by means of a pump; eighth, a means for catching all fugitive solution from the baths and conveying same to a sealed drain and a pump connection from said drain to the main supply-reservoir; ninth, a system of rigid tubing with connecting-nipples at intervals around the entire vessel, whereby the solution supply, the drainage, and the exhaust apparatus are all brought within reach of the baths wherever they may be located; tenth, a system fully connected up with the operating mechanism composed of a dynamo, vacuum and supply pumps, and reservoirs, concentrated for ease of manipulation.

In the accompanying drawings, Figure 1 is a plan outline view of a vessel, showing as a whole the location of the various mechanical devices required in my new system for electroplating, together with the pipe connections; Fig. 2, a lower end of a bath in section, showing the manner of connecting the flexible tubes with the rigid pipes below; Fig. 3, an end view of a vessel with a bath in position and the series of pipes in the bottom of the dock and the intermediate flexible tubes; Fig. 4, a side view of a bath, partly in section, showing the tubular connections and the ends of the anode-holders; Fig. 5, an edge view of same; Fig. 6, a side view, partly in section, of the anode-holder secured to the side wall of the bath; and Fig. 7, a top view of anode-holder with the bath-wall, to which it is attached, in section.

In order to understand the particular reasons for the various details of construction, it would be well to point out certain requirements which are essential in this class of work.

As the hull of a vessel has a surface with a varying contour, it is necessary to make a bath which is flexible or yielding throughout or one which has its body rigid and its contact edges flexible. The first of these classes is covered by an application, Serial No. 527,916, and the second by Crane's patent, No. 498,707. The present invention, as a whole, is adapted specially for use in connection with my own

flexible bath or with any bath which is held in contact with the vessel by means of atmospheric pressure. It is obvious, however, that the system, aside from the vacuum-pump and connections, (shown herein,) is adapted for use with the second class of baths, or with any form of sectional bath which may be employed, and I do not confine myself to any specified form of bath in the use of this invention.

Fig. 1 shows the plan outline of a vessel A, at one end of which is located the source of power, as, for instance, a boiler and engine B, and contiguous thereto a dynamo C, an exhaust or vacuum pump D, a drain-tank E, a solution-reservoir F, and a pump G. The dynamo and pumps are suitably connected with the engine to perform the required work, and the pump G, which is preferably located by the side of the reservoir F, is connected therewith by means of a feed-pipe G'. The other side of the pump has a drain-pipe H leading therefrom, which extends, preferably, around the vessel, and is brought to a point contiguous to the reservoir F, where it terminates in the base of a stand-pipe H'. The upper end of this stand-pipe has an overflow-pipe I, through which it discharges back into the reservoir F.

The pipe H is located on the floor of the dock and has at intervals short nipples provided with cocks J and means for connecting a union J' therewith. This pipe H is designed to supply the electrolytic solution to the bath K through the flexible tube K', the latter having a union L at its upper end, which connects it to the bath through the medium of the nipple L', secured in the side wall of the bath K. Near the lower end of this flexible tube K' is a short branch connection M, provided with a cock M', and a union M^2 for attaching the same to the nipples along the line of the pipe N. This pipe N branches out from the solution-reservoir F, so that when the bath K is filled with the solution and it is desired to withdraw the same cock J is closed and cock M' is opened, and the liquid in the bath will then pass down through the branch tube M and back to the reservoir through the pipe N.

As it is an important matter to keep the metallic saturation of the solution constant in the bath, and equable in all of the baths at the same time, and, further, that the entire surface of the vessel's hull, which is in process of treatment within the area of the bath, should have a uniform exposure or contact of this solution, it is necessary to cause an upward movement of the solution through the bath, such movement being opposite to the gravitating tendency of the saturated solution, and, instead of having the solution enter at one point below and escape through a single pipe above, I have provided the means shown in Figs. 2 and 4. In Fig. 4, near the base, within the bath, a horizontal pipe O is connected centrally with the inlet-nipple J'. This pipe is closed at both ends and has on its upper side a line of small orifices O', through which the solution enters the bath and passes thence up to the nipple P and down through the flexible tube P' to the drain-pipe N.

It will thus be seen that the pump G forces the solution from the reservoir, through the line-pipe H to the flexible tube K', thence into the bath, and overflows from the pipes P' and N back into the reservoir, thereby keeping a constant movement of the solution through the bath. As the capacity of the pump should be greater than is required by all the combined baths in the series, the residue travels around the supply-pipe H and is forced up into the stand-pipe H', which by its height determines the pressure of the solution in the various baths.

Each bath has in its side walls anode-holders. (Shown in detail in Figs. 6 and 7.) Through the side wall Q of the bath is placed a screw-plug Q', having a head Q^2 on its outer end. The inner end screws into a head R, which has one rigid finger R' and a hinged finger R^2, adapted to clamp the anode between them by means of a thumb-screw R^3. These anode-holders are placed at suitable intervals along the side walls of the bath, and, as they are equidistant from the side of the vessel when the bath is in position, however much the bath may be curved, (to conform to the curvature of the vessel,) the electrodeposition will be uniform on the cathode. Otherwise the electrolytic action would be greater over the zone where the anode approached close to the cathode-surface.

The flexible structure of the bath herein shown is the subject of a separate application for a patent, previously referred to, and need not be specifically pointed out herein, but the mechanical means of holding the bath in position is an important feature herein.

The bath having a concaved flexible web S, as shown, is provided on the lower side or the bottom web with a nipple S', having a cock S^2 attached. A flexible tube T leads therefrom and is provided at its lower end with a union T', which connects with a nipple T^2, projecting from the air-pipe U. These nipples T^2 are placed at suitable intervals along this pipe, and I prefer to run the pipes along each side of the vessel and join them together at a pipe U', which is connected up with the vacuum-pump D. A trap V is interposed in this line of pipe to catch any fugitive solution which may find its way from the interior of the bath to the hollow of the web S, and this moisture will thus be diverted through pipe W into the drain-tank E, located a short distance from the main solution-reservoir F. Obviously this tank E must be hermetically sealed, as it is connected up with the vacuum-pump D, and in order to be able to empty this tank at intervals, as required, a hand-pump W' is placed in the line of the pipe Y, which connects the tank E and reservoir F.

In operation the bath K is first equipped with its anodes, and pressed against the side of the vessel so as to cover the desired area.

The vacuum-pump being constantly in action, the moment the cock S^2 is turned, so that air is exhausted from the concaved portion, the atmospheric action will hold the bath in position. The air-cock Z on the upper side of the bath is then opened, the cock M′, Fig. 2, closed, and the cock J opened and the solution allowed to flow in and fill the bath. When filled, the vent-cock is closed and the overflow of liquid, which should be constant through the bath, passes back into the reservoir. I prefer to have the overflow-tube P′ much smaller than the supply-tube K′, so that the inflow and the movement of the solution through the bath will be moderate, but at the same time positive and constant.

A plant constructed in the manner herein shown will be largely automatic in its operation, as the stand-pipe will regulate the pressure of the solution in the bath, the pump will pump a constant inflow, and the vacuum air-pump will, when properly adjusted and regulated, produce a suction of from two to five pounds per square inch on the web, and will thus perform all the operations required by the old plan of shoring at much less expense and at a great saving of time.

Any number of baths may be employed, and as the action of the pump is constant and the solution is in continuous motion it will stand a greater degree of saturation than if in a quiescent state.

As it is frequently necessary to heat the solution preparation can be made for applying the heat under the solution-tank, but I prefer to pass the solution through a heated coil after it leaves the pump and before it reaches the baths, or both methods may be adopted in practice.

What I claim as new is—

1. In a system for electroplating vessels, the combination of one or more portable baths, a pump for providing a continuous supply of solution thereto, and an air-exhauster for producing suction against said bath, substantially as set forth.

2. In a system for electroplating vessels, one or more baths having concaved webs, an air-exhauster and a line of pipes connecting said baths and exhauster, in combination with a trap and drain-tank in the line of said pipe for trapping the solution which escapes from said baths, substantially as set forth.

3. In a system for electroplating vessels the combination of a solution-supply pump, a main supply-pipe, a main reservoir and a main supply-pipe from the reservoir to the pump, said pipe extending thence entirely around the vessel, terminating in the top of said reservoir, an air-exhauster and a single pipe leading to a trap and drain-tank, a branch pipe extending along each side of the vessel from said trap, each of said branch pipes having at intervals nipples and valves for attaching supply-pipes to the lower side of the baths, with said baths and the main supply-pipes having at intervals nipples and valves for attaching branch pipes to the baths, substantially as set forth.

4. In a system for electroplating vessels, the combination, with portable baths, of a pump and main reservoir contiguous to the vessel, for supplying the electrolyte, having a main supply-pipe passing entirely around the vessel, said supply-pipe having at intervals branch nipples for connecting up with the baths, whereby the electrolyte from said pump can be kept in a continuous motion through the supply-pipe and the baths constantly replenished, substantially as set forth.

5. In a system for electroplating vessels the combination with portable baths, of an exhaust-pump, conduits leading therefrom, and a trap in the line of said conduits which exhausts air from the baths to receive the fugitive solution from said baths, a drain-tank and a connection between said drain-tank and main reservoir, and a pump for forcing the solution from the drain-tank to the main reservoir, substantially as set forth.

6. In a system for electroplating vessels the combination of a continuous line of conduits from the reservoir around the vessel and back again to the reservoir, for furnishing a constant supply of electrolyte to the baths, and a pump to keep said electrolyte in continuous motion from the supply-reservoir to the baths and back to the reservoir, substantially as set forth.

7. The herein-described system of providing a constant supply and an equable pressure in the plating-baths, which consists in providing a series of portable baths on the vessel, in combination with a stand-pipe, a pump, a continuous conduit from the pump along said series of baths and into said stand-pipe, a main reservoir, and an overflow-pipe from said stand-pipe to the main reservoir, substantially as set forth.

8. A bath having a suction-flange around its edges, provided with a nipple connecting with the interior of the bath on its lower side, a vent-cock on the upper side, and a nipple and cock connecting with the suction-flange on the lower side, substantially as set forth.

9. A bath provided with a suction-flange around its edges, in combination with a nipple communicating with the interior of the bath on its lower side, a vent-cock on the upper side, a nipple and a cock connecting with the suction-flange on its lower side, and a series of anode-holders in the side walls of the bath, substantially as set forth.

10. A bath having a nipple in its lower side connecting with a flexible supply-pipe, in combination with said flexible conduits, a main supply-conduit, and a pump for supplying said electrolyte through said conduit, the lower end of said flexible supply-pipe having a short supplementary or drain pipe, union and valve, and a return-conduit connecting

with said drain-pipe, substantially as set forth.

11. A bath provided with a nipple in its lower side, in combination with a flexible supply-pipe leading from the lower side of the bath to a supply-conduit, having a short supplementary drain-pipe, union and valve near its lower end leading to a return-conduit, a flexible overflow-pipe from the upper side of the bath, also leading to said return-conduit, and in combination therewith, substantially as set forth.

12. In a system for electroplating vessels a series of plating-baths each having a suction-flange, in combination with an air-exhauster suitably located at one end of the vessel, a conduit extending from said pump along each side of the vessel, a trap and drain-tank in the line of said conduits, adjacent to the pump, and flexible pipes between the suction-flanges of the bath and said conduits, substantially as set forth.

13. In a system for electroplating vessels a bath having an inlet-tube at its lower side, and a horizontal perforated tube within the bath connected therewith and located between the anode and the cathode surfaces, in combination with an overflow-pipe at its upper side, substantially as set forth.

14. In a system for electroplating vessels, a main reservoir, a supply-conduit leading therefrom, and extending entirely around the vessel and terminating in the same reservoir, said conduit having a pump for forcing the solution therethrough, in combination with portable baths on the vessel, each having a flexible conduit from its lower side to the main conduit, a discharge-conduit which extends alongside the vessel and terminates in the reservoir, and a flexible conduit between the upper end of the bath and the discharge-conduit, whereby a constant current of solution is moved upwardly over the surface treated, substantially as set forth.

15. In combination with a bath for electroplating external surfaces, a horizontal pipe in its lower side, with a series of orifices, and an overflow at the upper side of said horizontal pipe and overflow-orifices being between the anode and cathode surfaces, a pump for supplying a constant volume of solution to said baths, and drain-pipes to convey the overflow back to the main reservoir, substantially as set forth.

16. A bath having a suction-flange around its edges, provided with a nipple connecting with the interior of the bath of the lower side, a vent-cock, and an overflow connection on the upper side, and a nipple and cock connected with the suction-flange on the lower side, substantially as set forth.

Signed at New York, in the county of New York and State of New York, this 12th day of August, A. D. 1895.

JAMES H. GEORGE.

Witnesses:

CAROLINE E. DAVIDSON,

J. C. CUMMINGS.