W. H. WINSLOW.

METHOD OF PLATING TUBES, &c.

APPLICATION FILED FEB. 6, 1908.

950,777. Patented Mar. 1, 1910.

Fig. 1.

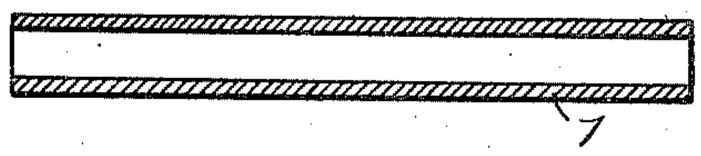


Fig. 2.

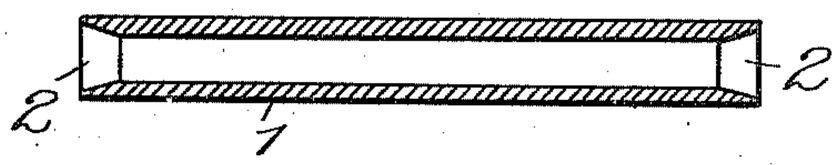
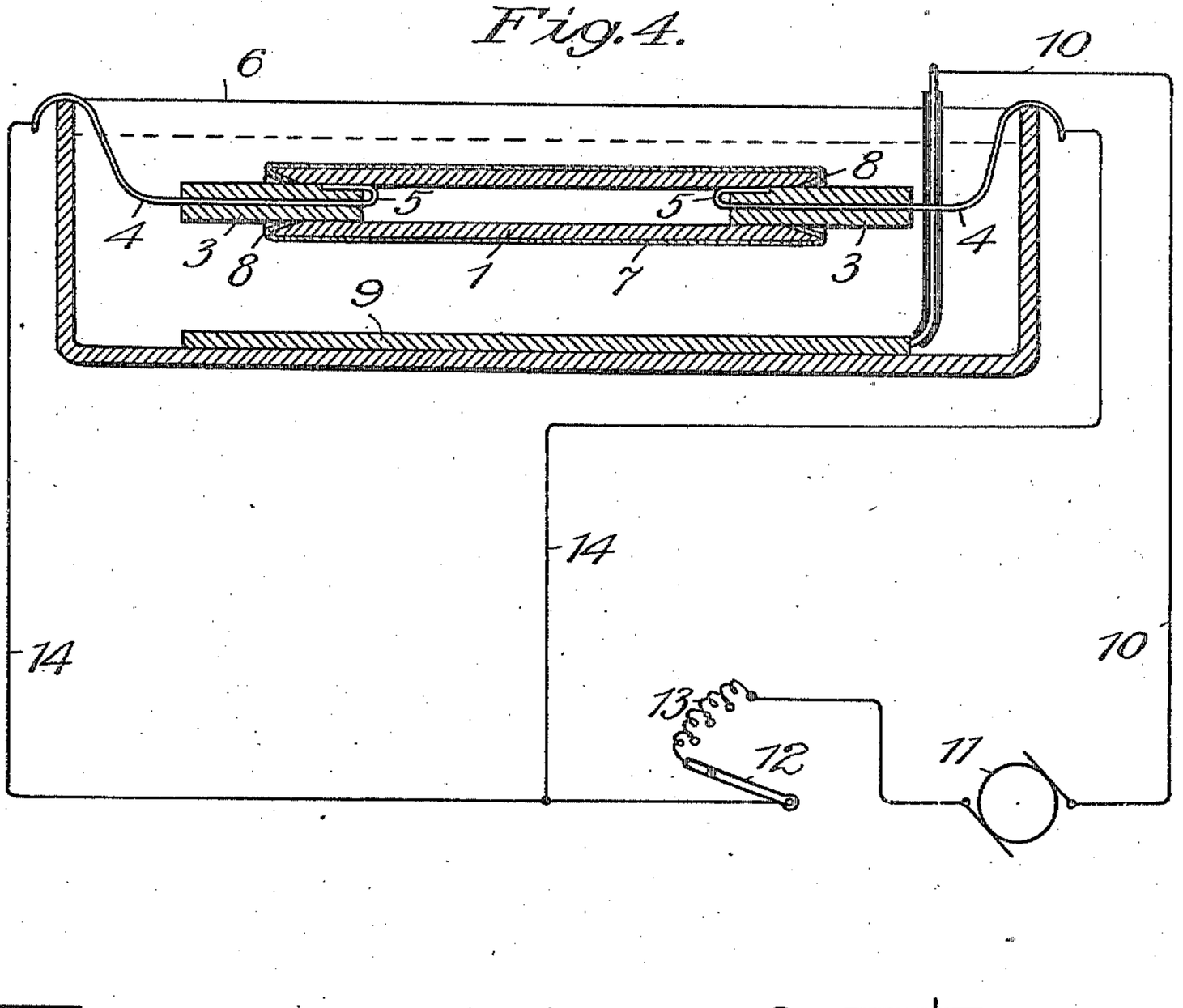


Fig. 3.

Fig. 4.



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METHOD OF PLATING TUBES, &c.

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To all whom it may concern:

Be it known that I, WILLIAM HERMAN WINSLOW, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Methods of Plating Tubes, &c., of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to an improved process for electroplating metallic tubes, etc., and has for its object to deposit upon steel or iron tubing and similar articles a more uniform electrodeposit than has been accomplished in the past, and also to deposit this plating in such a manner that the adhesion between it and the article plated shall be much stronger than has heretofore been accomplished.

My invention is particularly applicable to constructing tubes for small boilers, such as automobile boilers, in order to produce a tube that shall at once be strong enough to stand the tensional strains and yet be so thoroughly protected by the plating as to not be subject to the corrosive action of the water and cleaning compounds used in the boiler. Since copper has been found to answer admirably as a metal for use in this connection, I practically limit myself to the use of this material for plating the tubes, which usually are of soft steel. By my process, I am enabled to deposit a sufficient thickness of metal upon the steel tube and also to secure a deposit of such density and uniformity that the resulting plated tube is practically a double tube, that is, a steel tube surrounded by a copper tube, the two in such intimate contact as to be practically one piece. In this manner it will be seen I have provided a boiler tube of sufficient strength to replace the stay bolts heretofore used in conjunction with copper tubes, and at the same time I have produced a tube much stronger and stiffer to resist accidental deformation as well as being proof against corrosion.

The several drawings illustrating my invention are as follows:

Figure 1 is a longitudinal section through a length of tubing before it is plated; Fig. 2 is a view similar to that shown in Fig. 1, in which the tube is slightly countersunk at each end; Fig. 3 is a longitudinal section of the tube shown in Fig. 2 in which the tube is arranged ready for plating; Fig. 4 is a longitudinal sectional view through the center of the plating tank, and shows the tube in place in the plating solution, as well as diagrammatically the electrical connections used for the plating process.

Referring to the drawings, in my process a tube 1 of suitable material, as soft steel, is first cut to the length to be used, as shown in Fig. 1. Then it is slightly countersunk at the ends, as shown at 2, 2; then plugs 3, 3 of wood or similar material are tightly driven into the ends of the tube 1 but before being driven in, conductors 4 are inserted in the center of these tubes and folded over on the inner ends, as shown at 5, 5 so as to make contact with the inside of the tube. The plugs are driven in sufficiently to carry the inner ends of the conductors 4 well within the inner corners of the countersinks at the ends of the tube. In this condition the tube is subjected to a thorough sand blasting, which results in completely removing all of the scale and oxid from the outside of the tube and leaving exposed the pure iron or steel. The effect of the sand blasting is also to leave the surface of the tube in a slightly roughened condition. Immediately after the tube is cleaned by means of the sand blast, it is at once dipped into a dilute solution of copper sulfate, with the result that a thin film of copper is immediately deposited upon the clean surface by chemical action, and this film is of sufficient thickness to protect the tube from oxidation in the air and permit it to be removed to the next plating operation. If it were not for dipping in the copper sulfate solution, even in the short time elapsing between the sand blasting operation and placing the tube in the plating tank, slight oxidation would occur which would prevent securing intimate contact between the plating and the tube. After removing from the dilute copper sulfate solution, the tube is next placed in an alkaline plating solution, in which the conditions are as illustrated in Fig. 4. The tube is suspended in the solution contained in the tank 6, preferably of insulating material and containing in the bottom the copper electrode 9. Connection is made by wire

10 from the electrode 9 to a generator 11 and therethrough to a resistance 13, regulating switch 12, and thence by wires 14, 14 to the conductors 4, 4 contained within the plugs 3, 3. The tube is subjected to the plating action in this alkaline solution for a sufficient length of time to deposit a copper coat thick enough to withstand the corrosive action of the acid to be subsequently used in the acid plating bath. It is impracticable to attain any great thickness of coat in the alkaline bath, and in this process the alkaline bath is used as a supplemental process to the dipping in the copper sulfate solution to completely protect the steel or iron of the tube from the attack of the acid contained in the acid plating bath. After a satisfactory coating has been deposited in the alkaline bath, the tube is removed to an acid plating bath which is substantially the same as that shown in Fig. 4, the only difference in the alkaline and acid baths being the nature of the solution. The deposit of the copper upon the tube continues rapidly in the acid bath and can be carried to any point desired, practically, as a result of which a considerable coating 7 is formed around the tube 1, and this coating 7 extends as shown at 8, 8 around the ends of the tube and into the countersunk portions, from which it is apparent that by my process I have provided a means for plating the outside of the tube and also the ends of the tube with a uniform coating of considerable thickness, at the same operation.

The advantages of the tubes made by my process are many, as have been described above, and in this connection I wish to point out that the usual uneven deposit produced at the point of juncture of the conducting wires to the article plated is entirely done away with in my process, since the point of electrical contact is entirely within the tube and there are no uneven distribution paths between the surface of the tube and the electrode, as a result of which the deposit upon the tube is evenly distributed over its entire surface.

After the tubes are plated in the acid plating bath they are preferably buffed and polished, although they may be used without being so finished. The advantage of buffing and polishing the tubes is two-fold: 1st, the action of the buffing upon the copper has a tendency to spin and draw it somewhat, and thereby make it denser on the surface and afford a more effective protection against the chance attack of the steel of the tubes through occasional pinholes or imperfections; 2nd, the smooth, polished surface of the tubes permits the water in the boiler to circulate more readily, and since the space between the tubes is often small in actual practice, this factor forms a large part of the boiler efficiency. The polished surface also assists in the conduction of the heat of the tubes to the water in the boiler.

After depositing upon the tubes the desired thickness of copper plating, I find it desirable in some cases to provide against pinholes in the plating and resulting galvanic action at these points when the tubes are in use, by covering the tubes with a thin coating of solder. This I accomplish by dipping the tubes into suitable flux and then dipping them in a preferably warm condition into a melted bath of solder, which may consist of tin or an alloy of tin and lead, or of tin, lead and zinc in suitable proportions. By this means I find an even coating of solder is applied that perfectly covers any slight imperfections in the plating that might have resulted from the presence of dust or dirt on the tubes during plating.

While I have shown my invention in the particular embodiment above described, I do not, however, limit myself to this modification, but wish to claim any equivalent process for producing the results I have described above.

What I claim is:

1. The method of plating tubes, etc., which consists in first preparing the tubes by closing the ends with non-conducting closing members provided with conductors leading to the inside of the tubes, sand blasting the tubes, dipping the tubes in a weak copper salt solution, copper-plating the tubes electrically in an alkaline plating solution by a circuit closed through such conductors, and then copper-plating the tubes electrically in an acid-plating solution by a similar circuit.

2. The method of plating tubes, etc., which consists in first preparing the tubes by closing the ends with non-conducting closing members provided with conductors leading to the inside of the tubes, sand blasting the tubes, dipping the tubes in a weak copper sulfate solution, copper-plating the tubes electrically in an alkaline plating solution by a circuit closed through such conductors, and then copper-plating the tubes electrically in an acid-plating solution by a similar circuit.

3. The method of plating tubes, etc., which consists in first preparing the tubes by plugging the ends with non-conducting plugs containing conductors leading therethrough to the inside of the tubes, sand blasting the tubes, dipping the tubes in a weak copper sulfate solution, copper-plating the tubes electrically in an alkaline plating solution by a circuit closed through such conductors, and then copper-plating the tubes electrically in an acid plating solution by a similar circuit.

4. The method of plating tubes, etc.,

which consists in sand blasting the tubes, immediately dipping the tubes in a weak copper sulfate solution, copper-plating the tubes electrically in an alkaline plating solution, copper plating the tubes electrically in an acid-plating solution, cleaning the copper surface by means of solder flux, and then dipping the tubes in a hot solder bath.

In witness whereof, I hereunto subscribe my name this fourth day of February, A. D. 1908.

WILLIAM HERMAN WINSLOW.

Witnesses:
LEONARD W. NOVANDER,
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