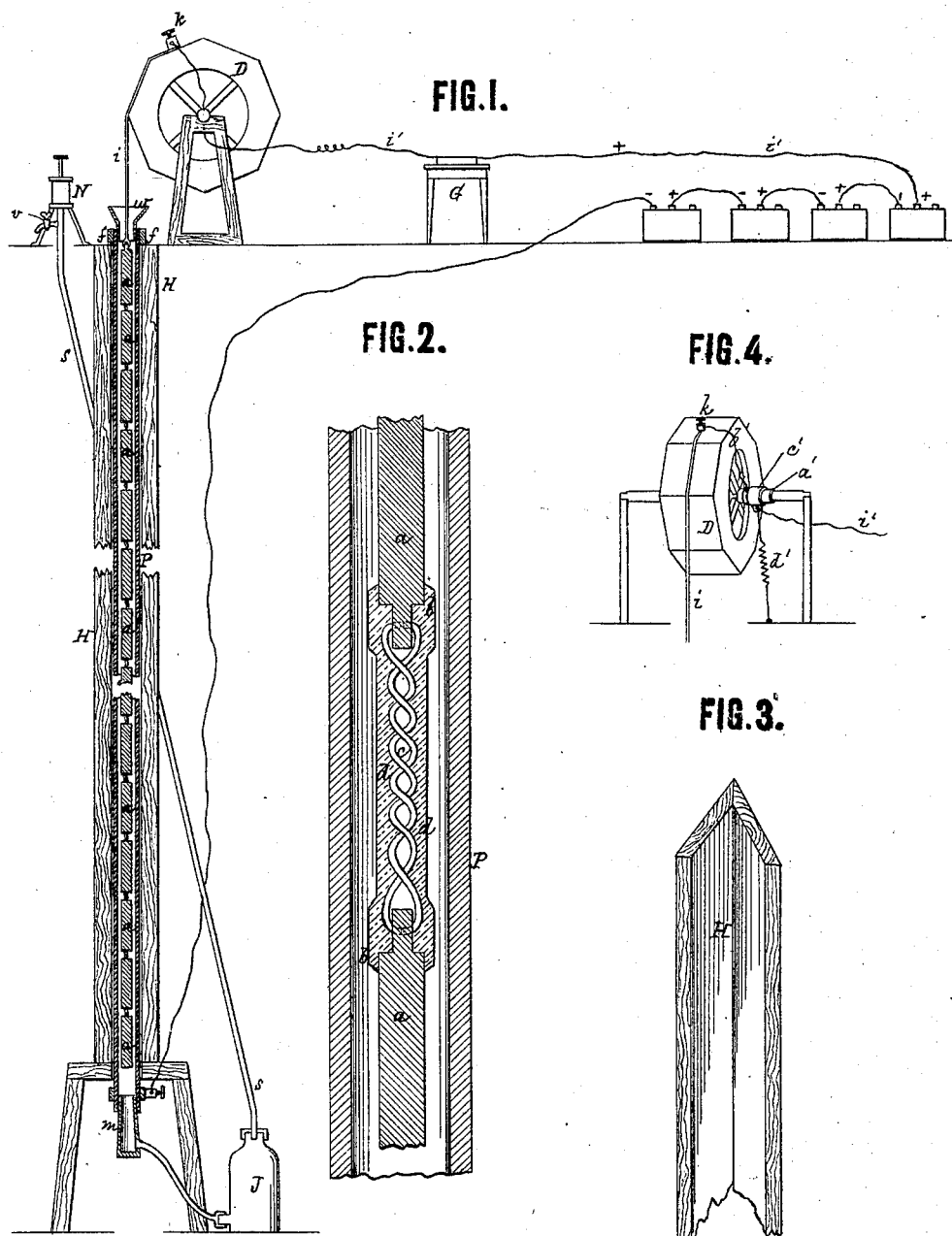


D. D. PARMELEE.  
ELECTROPLATING THE INTERIOR OF PIPES AND TUBES WITH  
SILVER, NICKEL, &c.



Dubois D. Parmelee  
by his attorney

A. H. R.

WITNESSES.

G. B. Nottingham.

# United States Patent Office.

DUBOIS D. PARMELEE, OF NEW YORK, N. Y.

Letters Patent No. 114,191, dated April 25, 1871.

## IMPROVEMENT IN ELECTROPLATING THE INTERIOR OF PIPES AND TUBES WITH SILVER, NICKEL, &c.

The Schedule referred to in these Letters Patent and making part of the same.

### *To whom it may concern:*

Be it known that I, DUBOIS D. PARMELEE, of the city, county, and State of New York, have invented an Improvement in Electroplating the Interior of Pipes or Tubes with Silver, Nickel, and other metals, of which the following is a specification.

The invention herein described relates to and is an improvement on the process for coating the interior of pipes, tubes, &c., with silver or other metal, for which Letters Patent of the United States, No. 108,510, were granted to me on the 18th October, 1870.

One of the principal features of the invention set forth in said Letters Patent is the employment of an anode placed within the pipe, but kept from contact with the interior of the same by means of suitable insulating devices, and moved gradually throughout the whole length of the pipe, so that every part of its interior surface shall in turn be coated with the metal which by electrical action is deposited thereon from the solution of the metallic salt with which the pipe is filled.

While this process is possessed of many advantages, it is, however, to be remarked that, as the anode is short compared with the length of pipe to be coated, considerable time is consumed in moving it opposite to each portion of the pipe and allowing it to remain there until a sufficient deposit or coating has been formed, and where the pipe is of great length—say thirty feet long—the operation is necessarily tedious.

The invention which I will now proceed to describe obviates this difficulty, and in other respects is an improvement on the apparatus which I have described in my former patent.

The accompanying drawing represents the apparatus which I now use in carrying my process into effect.

Figure 1 is a diagram of the apparatus complete.

Figure 2 is a sectional view on an enlarged scale of the pipe and anode, illustrative of the mode of uniting or jointing together the anodes which are suspended within the pipe to be lined or plated.

Figure 3 is a view of a portion of the vertical trough in which the pipe is suspended.

Figure 4 is a view of the drum on which the anode is wound, illustrating one mode in which the connection with the battery may be made.

In carrying out my present invention I make use of an anode which extends the length or nearly the length of the pipe to be lined, so that but a very slight movement of the anode will be necessary in the operation of plating.

This anode I prefer to make jointed, both to facil-

itate the operation of putting it in and drawing it out from the pipe, and to allow it to adapt itself to whatever slight irregularities there may be in the pipe, which, when of any length, is frequently a little bent at one or more points.

The difficulty with a jointed anode, however, is to keep each of the different parts or sections of which it is composed from contact with the pipe, so as to insure perfect insulation; and to this end, I provide each section or part with two or more gutta-percha or other non-conducting washers, which fit around the section and project far enough beyond the surface of the same to prevent it from ever being brought in contact with the surface of the pipe; and as it is necessary to have a metallic connection between the anodes or sections I surround with gutta-percha or other non-conducting material the links which are used to make this connection, and thus entirely insulate them from the acid solution in the pipe.

A straight and unjointed metallic rod of a length equal or approximating to that of the pipe to be lined might be employed as an anode by insulating it at intervals of two feet, more or less, by means of washer of non-conducting material. But such an anode would be extremely inconvenient to use, as it would have to be first elevated above the pipe and then lowered into it, and, besides, it would be almost impracticable, and at the best extremely troublesome and difficult, to get a perfectly straight pipe and to make and keep straight the anode when of such length.

A flexible anode for some solutions may be prepared by using a long bag filled with metal, and used like the jointed anode above mentioned.

I prefer, however, on many accounts, to use the jointed anode in carrying my invention into effect, and I will, therefore, confine myself to a description of such an anode in connection with the apparatus and process now to be described.

The anode consists of a number of metal rods, *a*—say twelve, more or less—depending upon the length of the pipe to be lined.

A good length for each rod is two feet, so that an anode composed of twelve of such rods placed two inches apart would be twenty-five feet ten inches long, and well adapted to be used with a pipe twenty-six feet or more in length.

The diameter of the rods will depend in a measure upon the caliber of the pipe. A rod, say, three-eighths of an inch in diameter, is adapted to a pipe of five or six-eighths of an inch caliber.

At or near each end of every rod *a* is a washer or ring, *b*, of gutta-percha or other non-conducting substance, which surrounds and fits upon the rod.

These washers are smaller in diameter than the bore of the pipe, so that a space will be left between them and the interior surface of the pipe for the passage of the solution.

It is not at all necessary that these washers should fit the bore of the pipe. Their only function is to present a non-conducting or insulating ridge which will keep the metallic anode from contact with the pipe, and they need, therefore, project from the surface of the anode only sufficiently for this purpose. They may, however, be constructed as described in the Letters Patent above referred to, or in any other suitable manner.

The adjoining ends of the rods are united by copper or other suitable links or connecting-wires, *c*, preferably about two inches long, and these links are insulated and kept from contact with the solution by means of a gutta-percha or other suitable covering or coating, *d*, applied to them in any appropriate manner.

In this manner a jointed anode is formed which can be placed in a pipe without danger of being brought into direct contact therewith.

The anode is operated by means of a drum, *D*, or wheel of polygonal shape on its periphery, each side of the polygon being of a length corresponding to the length of one rod of the anode, while there is a space left at the points where the contiguous ends of the sides meet equal to the length of the links between the rods, so that the anode may be wound upon the drum with facility and may lie smoothly thereon.

The upper end of the anode is attached to and suspended from the drum by suitable means.

As the weight of the anode is but slight, I use the connecting-wire *i* for the purpose.

The wire is connected with a binding-screw, *k*, on the drum, to which is led the wire *i* from the positive pole of a battery composed of four cells. I prefer to use a Smee's carbon battery, with plates ten by twelve inches in size.

The positive wire is connected with a galvanometer, *G*, placed between the drum and the battery, which is useful to indicate when insulation has been obtained and when the pipe is coated or lined, and for other purposes.

One way in which the connection of the wire *i* and *k* may be effected is represented in fig. 4.

A copper sleeve, *a'*, is mounted on and revolves with the axle of the drum.

To this sleeve is united a copper wire or strip, *b'*, which is united at the other end to the binding-screw *k* on the periphery of the drum, and communicates with the wire or strip *i*.

On the sleeve *a'* is loosely mounted an outer sleeve, *c'*, which does not revolve with the drum, but is kept in contact with the inner sleeve by means of an India-rubber spring, *d'*.

The wire *i* is connected with the outer sleeve, and is thus put in communication with the wire *k*.

Beneath the point where the anode drops from the drum is arranged a vertical, or nearly vertical, trough, *H*, triangular in cross-section, into the angle of which the pipe *P* to be lined is placed.

The pipe is there held by means of a clamp or collar, *f*, faced or lined with India rubber, which is clasped tightly around the upper end of the pipe and rests on the top of the triangular trough.

The object of this trough is to get the lead pipe as nearly straight as possible, which is accomplished by suspending the pipe from the top of and so that it will rest in the angle of the trough. The trough when thus constructed is adapted to all sizes of pipes.

The bottom of the pipe is closed by a stopper, *m*, of metal or other suitable material, which communi-

cates with a tube leading from a large and strong jar, *J*, holding the solution to be used.

To the top of the jar is attached a small pipe, *s*, which passes upward to where the drum is located, and is there conducted to an air-force or compressing-pump, *N*.

Immediately below the pump, on the pipe, is a faucet or stop-cock, *v*.

The mode of operation is as follows:

The battery being arranged and the galvanometer placed within the connection with the anode, the anode is lowered within the pipe, (which has been previously suspended in the trough and put in communication with the reservoir or jar *J*, as above explained,) and the connection of the negative wire of the battery with the lower end of the pipe is effected, the galvanometer indicating whether or not the insulation is perfect.

This being ascertained, the workman above puts the air-pump in motion and forces air down upon the solution contained in the jar *J*.

This solution, which is a solution of the metal with which the pipe is to be lined, is thereby forced out from the lower part of the jar through the connecting-pipe and stopper into the pipe, and the workman continues to force the air until the liquid is elevated to the top of the pipe and appears in the funnel *w* applied to the same.

The stop-cock *v* is then closed and the deposition of metal upon the inner surface of the pipe commences, and is continued until a sufficient coat has been deposited, the galvanometer indicating the degree of perfection of the process.

The pipe is thus plated simultaneously throughout its whole length, except at the points where it is opposite the insulated links and non-conducting washers.

In order, therefore, to coat these portions of the pipe equally with the rest, the workman in the upper story revolves the drum so as to lift and lower the anode about four inches every few moments.

When the operation is closed the stop-cock *v* is opened and the air will then escape from the jar *J*, into which the solution in the pipe will consequently immediately return, ready to be used again, as described.

The bottom plug or stopper can then be removed and the pipe and anode washed, if desired, by pouring water down the pipe.

The apparatus requires but two men to operate it—one to make the necessary connections at the top and to operate that portion of the apparatus there located; the other to make the connections and to take charge of such portions of the apparatus as are at the bottom.

The apparatus is of such height that when the lower part is on the first floor of the house the upper part will be on the third or fourth floor, and the workmen, therefore, necessarily communicate by signals or through a speaking-tube.

The galvanometer may or may not be used with the apparatus; and in lieu of the special devices herein described for supplying the solution to the tube other suitable means for filling and emptying the tube may be employed.

Having now described my invention, and the manner in which the same is or may be carried into effect,

What I claim, and desire to secure by Letters Patent, is as follows:

1. In the process of electroplating the interior of tubes by means of a movable anode, substantially as herein described, the employment of an anode placed within and extending the length or nearly the length of the pipe, and provided at intervals with non-conducting washers which insulate it therefrom, substantially as and for the purposes set forth.

2. A jointed anode composed of sections, each surrounded at or near its top and bottom by a non-conducting washer or ring, and connected with the sections adjoining by means of insulated links or wires, substantially as and for the purposes herein shown and described.

3. The general arrangement of apparatus for elec-

troplating the interior of pipes and tubes, substantially as herein shown and described.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

Witnesses: DUBOIS D. PARMELEE.

M. BAILEY,

EDM. F. BROWN.