No. 891,361. PATENTED JUNE 23, 1908.

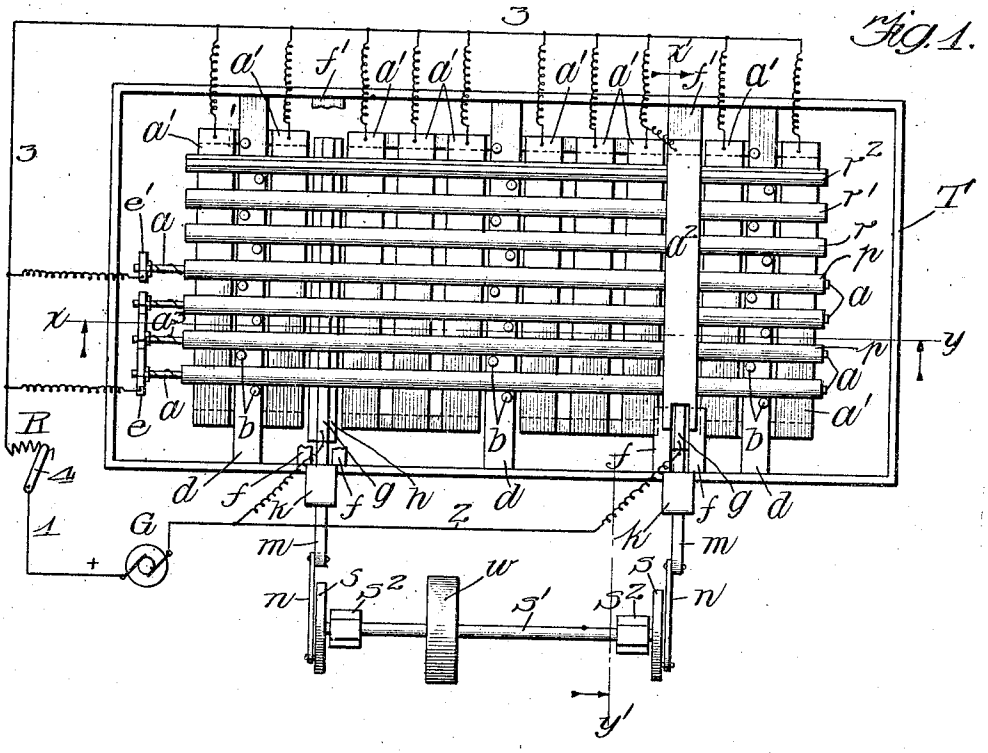
D. H. MURPHY.

MEANS FOR ELECTROPLATING RODS, PIPES, &c.

APPLICATION FILED OCT. 30, 1907.

3 SHEETS—SHEET 1.

Fig. 1.



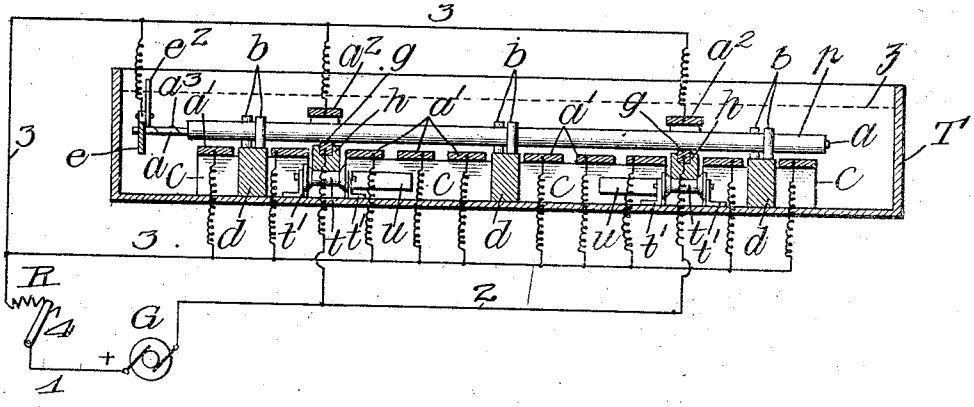


Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 3.

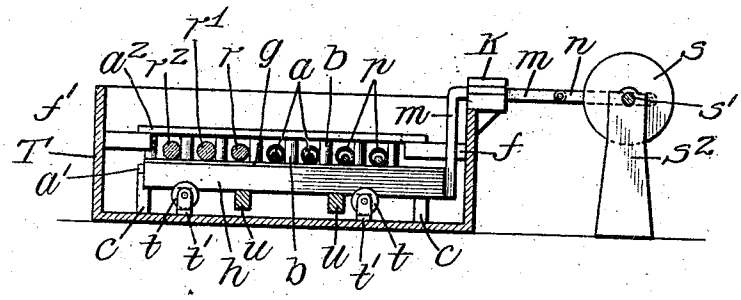


Fig. 5.

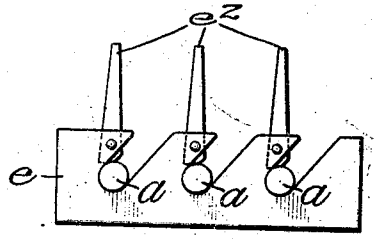


Fig. 4.

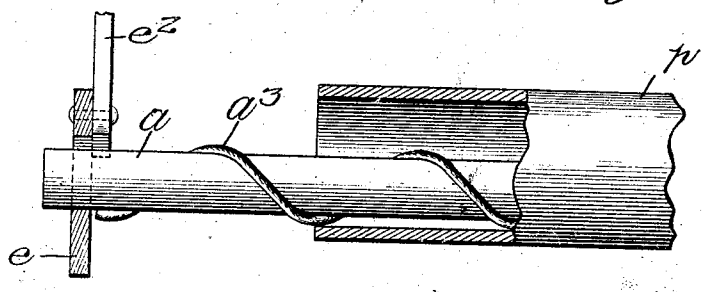
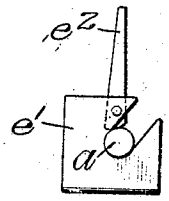


Fig. 6.



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3 SHEETS—SHEET 3.

Fig. 7.

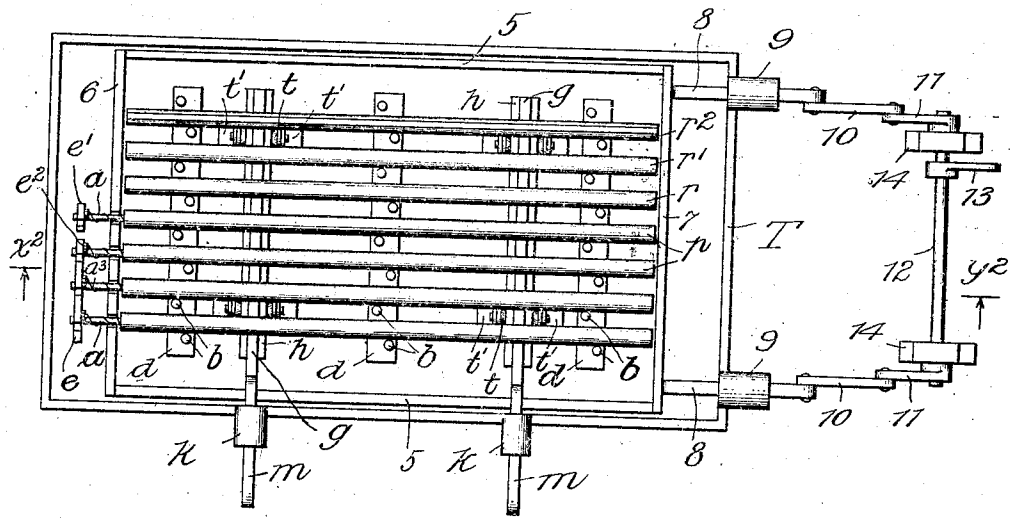
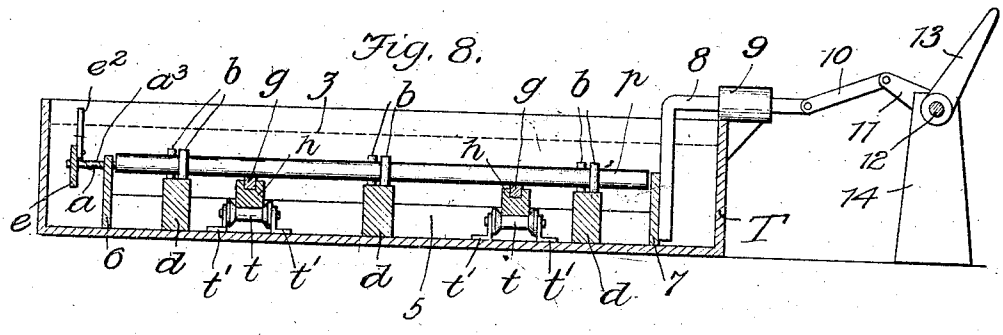


Fig. 8.



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UNITED STATES PATENT OFFICE.

DANIEL HAYES MURPHY, OF NEW CASTLE, PENNSYLVANIA.

MEANS FOR ELECTROPLATING RODS, PIPES, &c.

No. 891,361. Specification of Letters Patent. Patented June 23, 1908.

Application filed October 30, 1907. Serial No. 399,904.

To all whom it may concern:

Be it known that I, DANIEL HAYES MURPHY, a citizen of the United States, residing at New Castle, in the county of Lawrence and State of Pennsylvania, have invented a new and Improved Means for Electroplating Rods, Pipe, &c., (Case No. 1,) 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.

The object of my invention is to provide an improved means for electroplating pipe, rod and similar articles with a view to eliminating many of the difficulties that have heretofore existed. In the past it has frequently occurred, particularly in connection with electroplating pipe on the inside, that the internal anodes, which have heretofore been made of the same material that it is desired to deposit, have become bent and, as a result, caused unequal deposits at different portions of the internal surface of the pipe. This has caused serious difficulty and loss, which is prevented in my process by the means I employ to equalize the electrolytic action between the anode and the inside surface of the pipe.

Briefly stated, my invention consists in supporting the internal anode in the pipe in such a manner that it is rigidly held so as to be incapable of rotation, while the pipe within which it is secured is caused to rotate. As a result of this, since the anode rests upon the inner portion of the pipe, being removed therefrom by suitable insulating means, the electrolytic action from the anode to the internal surface of the pipe is maintained uniform and an even, smooth coating of the material used is secured. It has frequently occurred in connection with processes used heretofore, in which the internal anode has been free to move with the inclosing pipe, that in the event of the anode becoming bent or out of shape so that it did not occupy its proper position, that is, parallel with the inclosing pipe, as a result of some portions of the anode being much closer to the inside surface of the pipe than other portions, there would be a concentration of electrolytic action at these points, and the accompanying deposit on the inner surface of the pipe would be excessive and would be of such a character as not to be permanent and would readily part from the inner surface of the pipe and peel off, thus resulting in waste and poor work.

It is a further object of my invention to equalize the deposit upon the inner and outer surfaces of the pipe when it is desired to electroplate the pipe both inside and outside, and this I accomplish by using an electrolyte containing in solution the material to be deposited and by using other material than that to be deposited for constructing the internal anodes, while the anodes used outside of the pipe are preferably made from the material to be deposited. As a result of this, the material deposited on the inside surface of the pipe must necessarily come entirely from the electrolyte, and hence the action is slower than would otherwise be the case and a uniform coating is secured, but on account of the relatively short path for current flow from the internal anode to the inside surface of the pipe compared with the current flow from the outside anodes to the outside surface of the pipe, the actions inside and outside of the pipe are practically equalized, so that at no time is there an excessive deposit inside the pipe.

Another great advantage in my system is that since the pipes are supported and rotated, and the anodes inside the pipe are not called upon to support the pipe, there is no danger of breaking down the insulation placed around the internal anodes, and hence the liability of short circuits between the internal anodes and the pipe is removed.

Another advantage of my invention is that I am able to make rigid connection between the outside circuit and the internal anodes, since these anodes do not rotate, and hence I am able to improve the results that have characterized processes heretofore used, in which the internal anodes were permitted to rotate. The reason for poor results in this connection, in processes heretofore used, was that on account of the poor contact usually made between the internal anodes and the conductors with which they were in working contact, there was great tendency to wide variation in resistance at such contact and hence great variation in the character of the deposit at different times. By using internal anodes of stiff metal, as iron or steel, when it is desired to deposit softer metal, as lead or zinc, the cost of production is much re-

duced, since the first cost of the anodes is much less and the waste of material deposited is almost entirely eliminated.

The several drawings illustrating my invention are as follows:

Figure 1 is a top view of the means I employ for accomplishing my invention and shows, partially in diagram, the mechanism involved, as well as the electrical connections used; Fig. 2 is a longitudinal sectional view taken along the broken line x—y in Fig. 1; Fig. 3 is a transverse sectional view taken along the broken line x^1—y^1 in Fig. 1; Fig. 4 is an enlarged detailed view of one end of a pipe having the interior anode in place for plating such pipe; Figs. 5 and 6 are detailed views of the means that may be used to securely connect the interior anodes to the circuit of the generator used for plating the pipe; Fig. 7 is a top view of a modified form of my invention; and Fig. 8 is a longitudinal sectional view taken along the broken line x^2—y^2 of Fig. 7.

Similar letters refer to similar parts throughout the several views.

As shown in the several views of drawing, T is a tank for holding the electrolyte to be used in the operation, the upper surface of this electrolyte being indicated by the dotted line z in Fig. 2. In this electrolyte conductors g, incased on all except the upper surfaces by supporting and insulating bars h, are adapted to move transversely of the tank upon suitable rollers t supported by brackets t^1 from the tank T. These conductors g and the bars attached to them are secured at one end to bent bars m slidably supported in bearings k from the tank T and are engaged at their outer ends by connecting rods n which serve to communicate motion to such bent bars from crank disks s supported by shaft s^1 in suitable bearings s^2. This shaft s^1 may be driven by any suitable means, as pulley w in a manner not indicated. The conductors g are adapted to support the rods r, r^1, r^2 and the pipe p that it is desired to plate. Pins b of insulating material, preferably wood, are located between the several rods and pipe and are supported from cross-bars d secured to the bottom of the tank T. As a result of the construction just described, it will be observed that when the shaft s^1 is rotated the conductors g will be moved back and forth and tend to carry the rods and pipe supported thereon with them, but since this motion is opposed by the pins b the result is to rotate these rods and pipe with practically no lateral displacement of the same in the tank T.

Suitable anodes a^1 are disposed beneath the rods and pipe to be plated and are supported in proper position in the electrolyte by means of blocks c from the bottom of the tank T In order to plate the portion of the pipe normally protected from electrolytic action by the conductors g, anodes a^2 are disposed in the electrolyte above the pipe and above the conductors g. To effect the plating of the inside of the pipe internal anodes a are used, extending from one end of the pipe to the other and rigidly secured, as indicated at e e^1 to one terminal of the circuit used for supplying the current required. This securing means is more clearly indicated in Figs. 5 and 6 and consists, as indicated, in eccentrically pivoted levers e^2 adapted to clamp the electrodes a firmly in contact with the common bar e in the modification shown in Fig. 5, or with the individual connecting terminal e^1 as indicated in Fig. 6. Either of these methods may be used, but in most cases I find it desirable to employ the common clamping bar e. In order to prevent the internal anodes a from making electrical contact with the pipe p, a strip of insulation, as a^3, consisting of twine, india rubber, or similar substance, is spirally wound around such anodes and secured thereto in any desired manner, not shown.

G represents a generator for furnishing current, the circuit from which is as follows: Beginning at the positive terminal of such generator through conductor 1, switch 4, regulating resistance R, positive bus bars 3 to the several anodes a, a^1, a^2, through the electrolyte to the pipe, thence to the conductors g and returning by negative bus bar 2 to the generator G. Blades u, rigidly attached to the bars h, are provided for the purpose of agitating the electrolyte as the bars are moved reciprocally.

In the modification shown in Figs. 7 and 8 I have indicated a means for moving the rods and pipe longitudinally of the tank T, which I have sometimes found desirable for the purpose of more thoroughly plating the portions of the pipe normally protected from electrolytic action by the conductors g and pins b. As shown in these figures, a frame consisting of side pieces 5, 5 and end pieces 6, 7 is disposed in the tank T in such a manner that the end pieces 6, 7 engage the ends of the rods and pipe. The end piece 6 is preferably notched, as indicated, on its upper edge to receive the anodes a. Bent bars 8 are secured to the end piece 7, such end bars being supported in guides 9 secured to the upper edge of the tank T and connected at their outer ends by links 10 to cranks 11 carried by shaft 12. This shaft is supported in suitable bearings 14 and carries an operating lever 13. When it is desired to move the rods and pipe longitudinally of the tank it may be accomplished by moving the lever 13 either up or down, and by means of the mechanism connected thereto the framework above mentioned is moved longitudinally of the tank T and carries with it the rods and pipe. It is evident that this operation may be made use of or not, according to the nature of the work

to be done, and in any particular case the rods and pipe may be moved longitudinally of the tank as often as necessary during the plating operation to secure the results desired.

I have found when all of the anodes are constructed of the material it is desired to deposit, that on account of the current path in the electrolyte between the internal anodes and the pipe being shorter than the current path from the outside anodes through the electrolyte to the pipe, there is an excessive deposit inside of the pipe, as a result of which there is waste of the plating material and also a tendency to poor results. In this case the deposit has a tendency to be porous and does not adhere strongly to the surface of the pipe. I have found that a very effective way of overcoming this difficulty is to make the internal anodes of some other material than the material to be deposited, and have found iron or steel to be admirable for this purpose, since it is quite rigid and is a suitable conductor of electricity for this purpose. The materials usually deposited in work of this class are zinc, lead, etc., and when the internal anodes are constructed of these materials, they are very readily bent out of shape with corresponding liability of making contact directly with the inside surface of the pipe. Internal anodes constructed of these softer materials, besides being more liable to deformation, are much more expensive than iron or steel anodes and result in poorer work, even when they are in good condition, for the reasons mentioned above.

In order to facilitate the use of iron or steel anodes in my plating operation, I find the following electrolytes answer very satisfactorily.

In case it is desired to use an alkaline electrolyte, I combine cyanid, carbonate of zinc and potash with the requisite amount of water, and in case I desire to use an acid electrolyte I combine zinc sulfate, sodium sulfate, zinc chlorid and boric acid with a suitable amount of water.

While I have shown herein one particular embodiment of my invention, I do not, however, limit myself to this construction; but desire to cover broadly by my claims the many modifications that will suggest themselves to those skilled in the art.

What I claim is:

1. As a means for electroplating metallic rods or pipe, a tank and an electrolyte therein, an anode in such electrolyte, a source of electric energy, means outside of and under such rods or pipe for supporting the same in such electrolyte, means for closing a circuit from such source through such anode, such electrolyte and such rods or pipe and means for moving such rods or pipe without displacing them relatively to such tank.

2. As a means for electroplating metallic rods or pipe, a tank and an electrolyte therein, an anode in such electrolyte, a source of electric energy, means outside of and under such rods or pipe for supporting the same in such electrolyte, means for preventing lateral motion of such rods or pipe in such tank, means for closing a circuit from such source through such anode, such electrolyte and such rods or pipe and means for rotating such rods or pipe.

3. As a means for electroplating metallic rods or pipe, a tank and an electrolyte therein, an anode in such electrolyte, a source of electric energy, conductors for supporting such rods or pipe in such electrolyte, means for preventing lateral motion of such rods or pipe in such tank, means for closing a circuit from such source through such anode, such electrolyte, such rods or pipe and such conductors and means for moving such conductors and thereby rotating such rods or pipe.

4. As a means for electroplating metallic rods or pipe, a tank and an electrolyte therein, an anode in such electrolyte, a source of electric energy, conductors for supporting such rods or pipe in such electrolyte, means for closing a circuit from such source through such anode, such electrolyte, such rods or pipe and such conductors, means for reciprocally moving such conductors laterally of such rods or pipe and means for preventing lateral displacement of such rods or pipe, such preventing means causing such rods or pipe to rotate as such conductors are moved reciprocally.

5. As a means for electroplating metallic pipe, a tank and an electrolyte therein, an anode adapted to be contained within such pipe in such electrolyte, a source of electric energy, means for supporting such pipe horizontally in such electrolyte, means for closing a circuit from such source through such anode, such electrolyte and such pipe, means for preventing contact between such anode and such pipe and means for rotating such pipe relatively to such anode.

6. As a means for electroplating metallic pipe, a tank and an electrolyte therein, an anode adapted to be contained within such pipe in such electrolyte, a source of electric energy, means for supporting such pipe in such electrolyte, means for closing a circuit from such source through such anode, such electrolyte and such pipe and means for uniformly distributing the current flow from such anode to the inside surface of such pipe when such anode is not parallel with such pipe.

7. As a means for electroplating metallic pipe, a tank and an electrolyte therein containing the material to be deposited, a conducting anode of another material than that contained in such electrolyte and adapted to be contained within such pipe in such electrolyte, a source of electric energy, means for supporting such pipe in such electrolyte,

means for closing a circuit from such source through such anode, such electrolyte and such pipe, means for preventing electrical contact between such anode and such pipe and means for rotating such pipe relatively to such anode, such anode serving to equalize the deposit upon such pipe.

8. As a means for electroplating metallic pipe, a tank and an electrolyte therein containing the metal to be deposited, a conducting anode of another material than that contained in such electrolyte and adapted to be contained within such pipe in such electrolyte, a source of electric energy, means for supporting such pipe in such electrolyte, means for closing a circuit from such source through such anode, such electrolyte and such pipe, means for preventing electrical contact between such anode and such pipe, means for rotating such pipe relatively to such anode, such anode serving to equalize the deposit upon such pipe and detachable means for rigidly securing such anode to a conductor of such circuit.

9. As a means for electroplating pipe, a tank and an electrolyte therein, an anode adapted to be contained within such pipe in such electrolyte, an anode in such electrolyte outside of such pipe, a source of electric energy, means for supporting such pipe in such electrolyte, means for closing a circuit from such source through such anodes, such electrolyte and such pipe and means for rotating such pipe relatively to such internal anode.

10. As a means for electroplating pipe, a tank and an electrolyte therein, an anode adapted to be contained within such pipe in such electrolyte, an anode in such electrolyte outside of such pipe, a source of electric energy, conductors for supporting such pipe in such electrolyte, means for closing a circuit from such source through such anodes, such electrolyte, such pipe and such conductors, means for reciprocally moving such conductors laterally of such pipe and means for preventing lateral motion of such pipe in such tank whereby the motion of such conductor rotates such pipe.

11. As a means for electroplating pipe, a tank and an electrolyte therein containing the material to be deposited, a conducting anode of another material than that contained in such electrolyte and adapted to be contained in such pipe in such electrolyte, an anode of the material to be deposited located in such electrolyte outside of such pipe, means for supporting such pipe in such electrolyte and means for closing a circuit from such source through such anodes, such electrolyte and such pipe, the difference in composition of such anodes serving to equalize the deposit on the inside and outside of the pipe.

12. As a means for electroplating pipe, a tank and an electrolyte therein, conductors adapted to support such pipe in such electrolyte, a source of electric energy, an anode adapted to be contained within such pipe in such electrolyte, an anode in such electrolyte outside of such pipe, means for closing a circuit from such source through such anodes, such electrolyte, such pipe and such conductors, stops for preventing lateral motion of such pipe in such tank, means for reciprocally moving such supporting conductors laterally of such pipe and thereby rotating such pipe and means for rigidly connecting such internal anode to such circuit and thereby preventing rotation of such anode.

13. As a means for electroplating pipe, a tank and an electrolyte therein containing the material to be deposited, movable conductors adapted to support such pipe in such electrolyte, a source of electric energy, a conducting anode of another material than that contained in such electrolyte and adapted to be contained in such pipe in such electrolyte, such anode material being of rigid, unyielding nature adapting such anode to withstand deformation, anodes of the material to be deposited located in such electrolyte beneath such pipe, anodes of the material to be dedeposited located in such electroltye above such conductors and such pipe, means for closing a circuit from such source through such anodes, such electrolyte, such pipe and such conductors, stops for preventing lateral motion of such pipe in such tank, means for reciprocally moving such supporting conductors laterally of such pipe and thereby rotating such pipe, means for preventing electrical contact between such internal anode and such pipe, detachable means for rigidly securing such internal anode to a conductor of such circuit and thereby preventing rotation of such internal anode and means for agitating such electrolyte.

14. As a means for electroplating metallic pipe, a tank and an electrolyte therein containing the material to be deposited, a conducting anode of another material than that contained in such electrolyte and adapted to be contained within such pipe in such electrolyte, a source of electric energy, means for supporting such pipe in such electrolyte, means for closing a circuit from such source to such anode, such electrolyte and such pipe and means for rotating such pipe relatively to such anode.

15. As a means for electroplating pipe, a tank and an electrolyte therein containing the material to be deposited, a conducting anode of another material than that contained in such electrolyte and adapted to be contained in such pipe in such electrolyte, an anode of the material to be deposited located in such electrolyte outside of such pipe, means for supporting such pipe in such

electrolyte, means for closing a circuit from such source through such anodes, such electrolyte and such pipe and means for rotating such pipe relatively to such internal anode.

16. As a means for electroplating metallic rods or pipe, a tank and an electrolyte therein, an anode in such electrolyte, a source of electric energy, means for supporting such rods or pipe horizontally in such electrolyte, means for closing a circuit from such source through such anode, such electrolyte and such rods or pipe, means for moving such rods or pipe without displacing them relatively to such tank and means for moving such rods or pipe longitudinally in such tank.

17. As a means for electroplating metallic rods or pipe, a tank and an electrolyte therein, an anode in such electrolyte, a source of electric energy, conductors for supporting such rods or pipe horizontally in such electrolyte, means for preventing lateral motion of such rods or pipe in such tank, means for closing a circuit from such source through such anode, such electrolyte, such rods or pipe and such conductors, means for moving such conductors, and means for moving such rods or pipe longitudinally in such tank.

18. As a means for electroplating metallic pipe, a tank and an electrolyte therein, an anode adapted to be contained within such pipe in such electrolyte, a source of electric energy, means for supporting such pipe horizontally in such electrolyte, means for closing a circuit from such source through such anode, such electrolyte and such pipe, means for preventing contact between such anode and such pipe, means for rotating such pipe relatively to such anode, and means for moving such pipe longitudinally in such tank.

19. As a means for electroplating metallic pipe, a tank and an electrolyte therein, an anode adapted to be contained within such pipe in such electrolyte, a source of electric energy, means for supporting such pipe horizontally in such electrolyte, means for closing a circuit from such source through such anode, such electrolyte and such pipe, means for uniformly distributing the current flow from such anode to the inside surface of such pipe when such anode is not parallel with such pipe, and means for moving such pipe longitudinally in such tank.

20. As a means for electroplating metallic pipe, a tank and an electrolyte therein containing the material to be deposited, a conducting anode of another material than that contained in such electrolyte, a source of electric energy, means for supporting such pipe in such electrolyte, means for closing a circuit from such source through such anode, such electrolyte and such pipe, means for preventing electrical contact between such anode and such pipe, means for rotating such pipe relatively to such anode, such anode serving to equalize the deposit upon such pipe and means for moving such pipe longitudinally in such tank.

21. As a means for electroplating pipe, a tank and an electrolyte therein, an anode adapted to be contained within such pipe in such electrolyte, an anode in such electrolyte outside of such pipe, a source of electric energy, conductors for supporting such pipe in such electrolyte, means for closing a circuit from such source through such anodes, such electrolyte, such pipe and such conductors, means for reciprocally moving such conductors laterally of such pipe, means for preventing lateral motion of such pipe in such tank whereby the motion of such conductors rotates such pipe and means for moving such pipe longitudinally in such tank.

22. As a means for electroplating pipe, a tank and an electrolyte therein, conductors adapted to support such pipe in such electrolyte, a source of electric energy, an anode adapted to be contained within such pipe in such electrolyte, an anode in such electrolyte outside of such pipe, means for closing a circuit from such source through such anodes, such electrolyte, such pipe and such conductors, stops for preventing lateral motion of such pipe in such tank, means for reciprocally moving such supporting conductors laterally of such pipe and thereby rotating such pipe, means for rigidly connecting such internal anode to such circuit and thereby preventing rotation of such anode and means for moving such pipe longitudinally in such tank.

23. As a means for electroplating metallic rods or pipe, a tank and an electrolyte therein, an anode in such electrolyte, a source of electric energy, means for supporting such rods or pipe horizontally in such electrolyte, means for closing a circuit from such source through such anode, such electrolyte and such rods or pipe, means for rotating such rods or pipe and means for moving such rods or pipe longitudinally in such tank.

24. As a means for electroplating metallic pipe, a tank and an electrolyte therein containing the material to be deposited, a conducting anode of another material than that contained in such electrolyte and adapted to be contained within such pipe in such electrolyte, a source of electric energy, means for supporting such pipe in such electrolyte, means for closing a circuit from such source to such anode, such electrolyte and such pipe, means for rotating such pipe and means for moving such pipe longitudinally in such tank.

In witness whereof I hereunto subscribe my name this 26th day of October A. D. 1907.

DANIEL HAYES MURPHY.

Witnesses:
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R. C. MCKINLEY.