No. 789,215. PATENTED MAY 9, 1905.

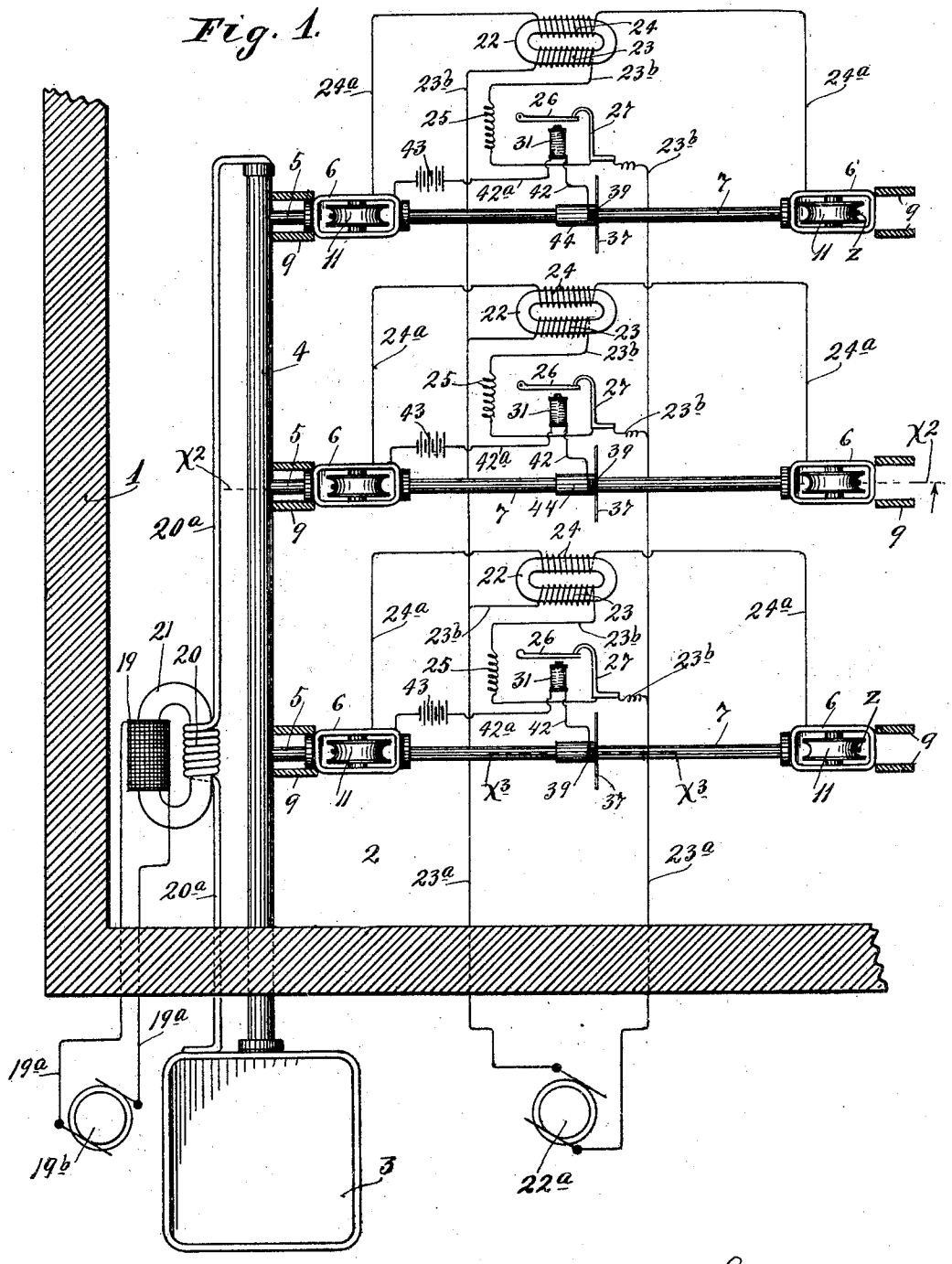
G. A. GOODSON.

APPARATUS FOR GALVANIZING OR OTHERWISE PLATING WIRE OR OTHER METALLIC BODIES.

APPLICATION FILED APR. 7, 1904.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses.
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H. D. Wilson

Inventor.
George A. Goodson.
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3 SHEETS—SHEET 2.

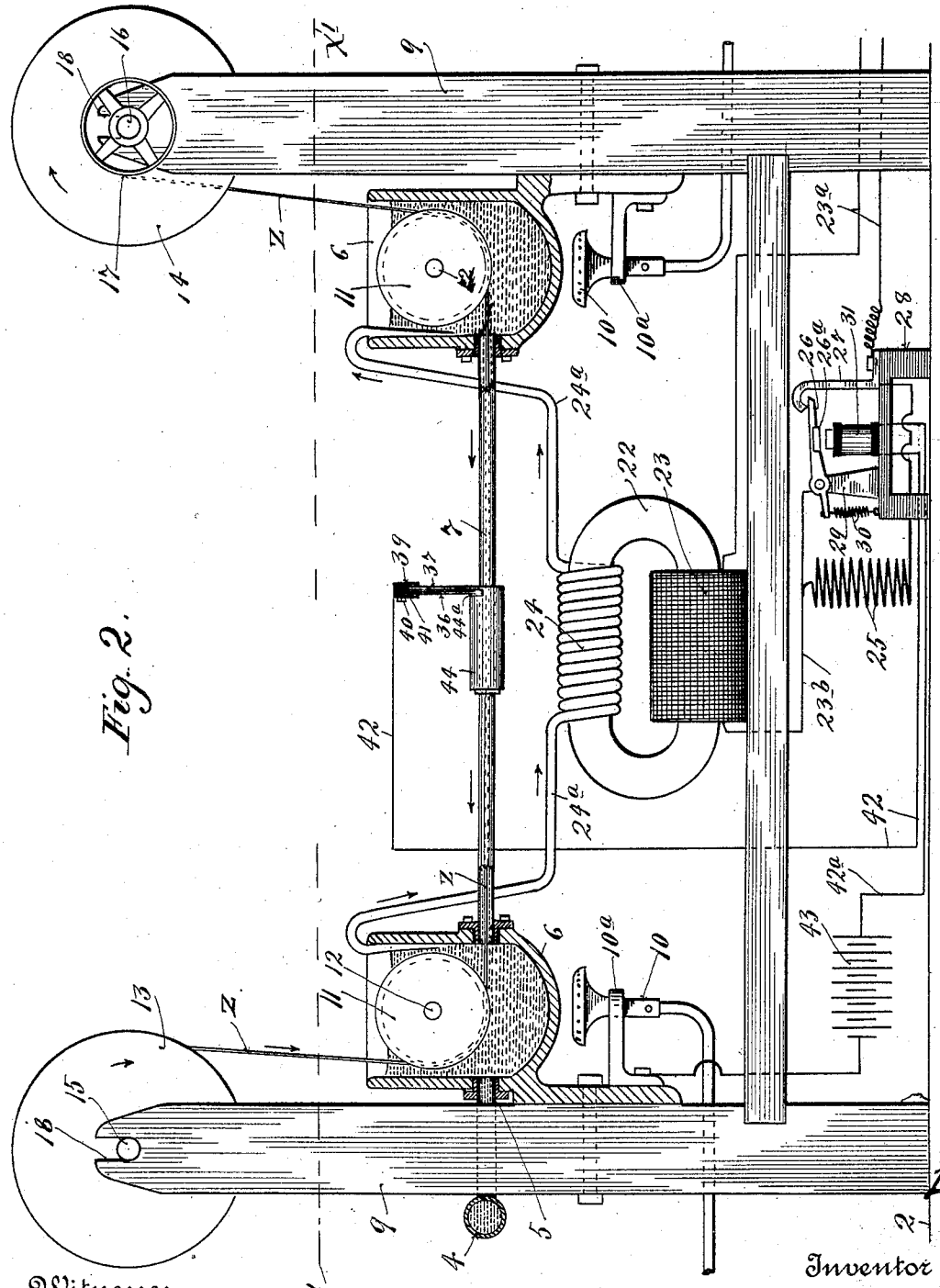


Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 3.

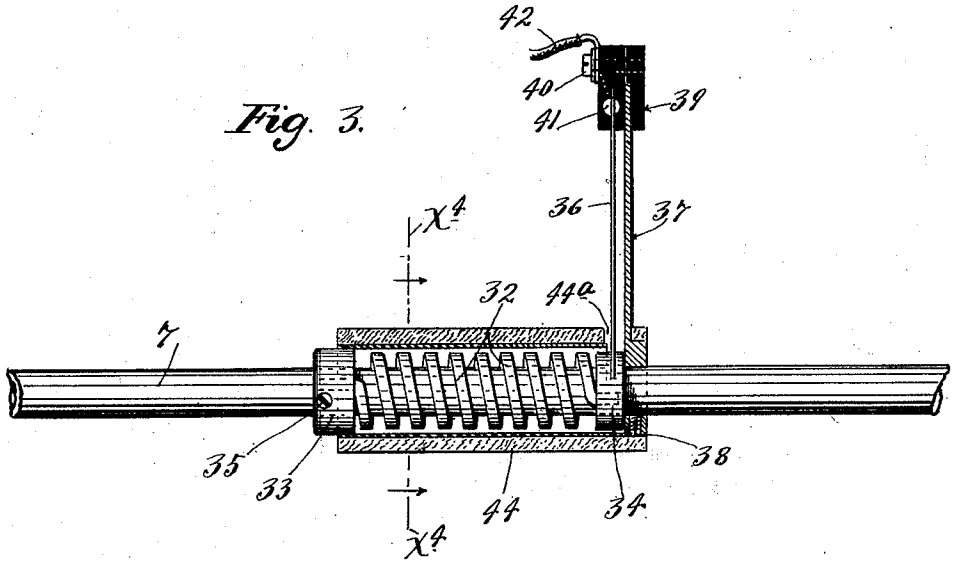


Fig. 4

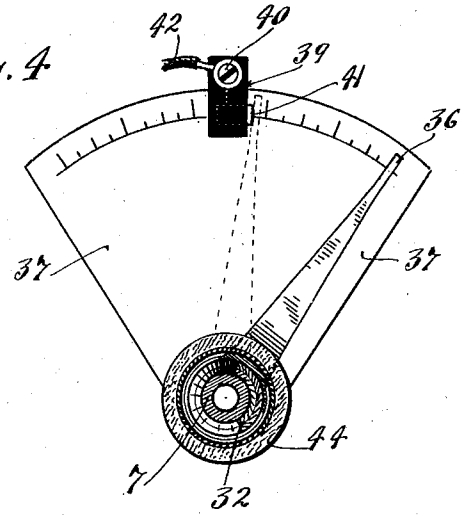
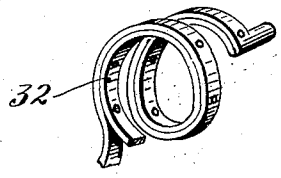


Fig. 5.



Witnesses
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No. 789,215. Patented May 9, 1905.

UNITED STATES PATENT OFFICE.

GEORGE A. GOODSON, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO GOODSON ELECTRIC GALVANIZING COMPANY, OF MINNEAPOLIS, MINNESOTA, A CORPORATION OF MINNESOTA.

APPARATUS FOR GALVANIZING OR OTHERWISE PLATING WIRE OR OTHER METALLIC BODIES.

SPECIFICATION forming part of Letters Patent No. 789,215, dated May 9, 1905.

Application filed April 7, 1904. Serial No. 201,993.

To all whom it may concern:

Be it known that I, GEORGE A. GOODSON, a citizen of the Dominion of Canada, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Apparatus for Galvanizing or Otherwise Plating Wire or other Metallic Bodies; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention relates to apparatus for galvanizing, tinning, or otherwise plating wire and other metallic bodies, and has for its especial object to provide an efficient apparatus for carrying out the process set forth and broadly claimed in my application for Letters Patent of the United States, Serial No. 211,745, of date June 9, 1904, which application was filed as a division of my prior application, Serial No. 200,913, filed of date March 31, 1904, originally entitled "Process and apparatus for galvanizing, tinning, or otherwise plating wire and other metallic bodies," but at present entitled "Apparatus for galvanizing wire or other metallic bodies." In the said prior application Serial No. 200,913 above identified will be found broad or generic claims to the apparatus exemplified by the illustrations given in said application and by the construction illustrated in this present application.

The invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

In the accompanying drawings, which illustrate the apparatus, like characters indicate like parts throughout the several views.

Figure 1 is a plan view, with some parts shown in horizontal section on the line $x' x'$ of Fig. 2, illustrating the apparatus installed as a working plant. Fig. 2 is a transverse vertical section on the line $x^2 x^2$ of Fig. 1. Fig. 3 is a detail in section taken approximately on the line $x^3 x^3$ of Fig. 1, illustrating the construction of a pyrometer used as part of the apparatus. Fig. 4 is a transverse vertical section on the line $x^4 x^4$ of Fig. 3; and Fig. 5 is a detail in perspective, showing a portion of the pyrometer-coil.

In Fig. 1 the numeral 1 indicates the walls, and the numeral 2 the floor, of a building or room in which the plating devices are installed. The numeral 3 indicates a main supply pot or kettle in which a body of suitable plating metal, such as tin or zinc, is kept in a molten condition by heat supplied thereto in any suitable way. This pot may be located outside of the room in which the plating devices are installed and, as shown, is provided with a metallic supply-tube or feed-pipe 4, which leads therefrom into the plating-room. The supply-pipe 4 communicates, through short tubes 5, with the adjacent members of a plurality of kettles 6, which kettles are connected in pairs by approximately horizontal plating-tubes 7. The supply-pot 3 and the small pots or kettles 6 are located at the same or approximately the same level, and the latter are, as shown, supported by vertical pedestals 9, while the former may be supported by any suitable means. (Not shown.) In the apparatus illustrated small gas-burners 10 are placed under the small kettles 6 to keep the metal therein contained in molten condition. To guide the wire z through the plating-tubes or attenuated conduits 7, sheaves 11 are journaled within the kettles 6, being, as shown, loose on short shafts 12, supported by the sides of the said kettles. These guide-sheaves 11 are so positioned that they will guide the wire axially through the tubes 7 without contact with the walls thereof.

The wire z, which is to be galvanized, tinned, or otherwise plated, is conveniently supplied from a reel 13 and may be wound onto a reel 14 after it has been plated. The reels 13 and 14 are provided with projecting shafts 15 and 16, respectively, and said shaft 16 is shown as provided with a pulley 17, by means of which it may be positively rotated to wind up the plated wire on the said reel 14. As a convenient means for supporting and removably holding the two reels in working position the pedestals 9 are notched at their upper ends,

as shown at 18, to afford seats for the respective reel-shafts 15 and 16.

The plating-tube 7, as well as the supply-pipe 4, as shown, are constructed of metal, such as iron, which is an electric conductor. The said tubes are electrically heated, and in practice this will usually be accomplished through the intervention of transformers, which are adapted to convert a high-tension alternating current into a low-tension alternating current of relatively large volume or amperage.

The numeral 19 indicates the primary coil, and the numeral 20 the secondary coil, of a transformer 21, through which an induced current is supplied to the main feed-pipe 4. The leads 19^a of the primary coil 19 are of course connected to a suitable source of current-supply, such as an alternating-current generator, (indicated in diagram at 19^b.) The leads 20^a of the secondary coil 20 are, as shown, electrically connected one to the main supply-pot 3 and the other to the extended end of the supply-pipe 4, so that the said pipe 4 is included as a part of the secondary circuit from the secondary coil 20. For each plating-tube 7 there is a similar but smaller transformer 22, of which the numeral 23 indicates the primary coil and the numeral 24 the secondary coil. The leads 24^a of the secondary coil 24 are electrically connected one to each of the two kettles 6, which are in communication with each other through the corresponding tube 7. The several primary coils 23 are connected in multiple with a suitable source of current-supply, such as an alternating-current generator, (indicated diagrammatically at 22^a,) by leads 23^a, having branch leads 23^b, that connect said main leads 23^a with the said primary coils 23, either through resistance-coils 25 or a circuit-breaker 26 27.

The numeral 27 indicates a contact-post, which, as shown, is rigidly secured on an insulating-base 28, and the member 26 is a lever, which is pivoted to a bracket 29 on said base 28. A coiled spring 30, attached to said lever and to said base, normally maintains contact between the said lever 26 and the contact-post 27. A trip-magnet 31, mounted on the base 28, is positioned for action on an armature 26^a of the lever 26 to break the circuit between said lever and the said contact-post when said magnet is energized.

As part of the means for automatically controlling the electric current which is passed through the plating-tubes or attenuated conduits 7 1 preferably employ a pyrometer of novel construction. This pyrometer comprises a spiral coil 32, made up of plies or layers of two different metals or materials which expand and contract in different ratio—such, for instance, as brass and iron. One of these coils 32 surrounds each tube 7 and is attached at one end to a collar 33 and at its other end to a collar 34. The collar 33 is secured to the tube 7 by a set-screw 35 or other suitable device, while the collar 34 is loose on said tube and is provided with a projecting contact-arm 36, which also serves as a pointer. The contact-arm 36 works over a graduated segmental dial 37, the hub of which is secured on the tube 7 just outward of the collar 34 by means of a set-screw 38 or other suitable device. Adjustably clamped to the peripheral portion of the dial 37 is a stop-block 39, formed of insulating material, such as vulcanized rubber, and constructed in two parts that are clamped onto said dial by a screw 40. Mounted in the block 39 and projecting slightly outward therefrom in position to be engaged by the free end of the arm 36 is a contact-plug 41, which is electrically connected to the clamping-screw 40. A lead 42 connects the screw 40 with the trip-magnet 31, heretofore noted, and another lead, 42^a, connects said magnet with some portion of the metallic framework of the apparatus, such as the burner-supporting bracket 10^a, which bracket through the metallic parts of the apparatus is electrically connected with the contact-arm 36. The numeral 43 indicates a battery, which, as shown, is interposed in the lead 42^a and which when the trip-magnet circuit is closed by the contact of the arm 36 with the plug 41 energizes the said magnet 31. As shown, a heat-insulating casing 44 is placed around the pyrometer-coil 32 and is secured to the hub of the dial 37. This casing 44 is cut away at 44^a, so as to permit free movements of the contact-arm 36.

The pyrometer, the resistance-coil 35, the circuit-breaker 26 27, the trip-magnet 31, and the circuit connections operatively connecting them constitute the automatic means for controlling the current in the supply-circuit of the primary coil 23, and it will of course be understood that an automatic current-controller of this character is provided for each plating-tube or attenuated conduit 7. It will also be understood that a pair of reels 13 and 14 or other suitable devices are provided for coöperation with each plating-tube to take care of the wire which is being plated within the said tubes.

Operation: It is of course evident that when the tubes 4 and 7 and the plating metal therein contained are electrically excited by the means already described they will be heated to a temperature depending upon the strength of the current passed therethrough. It is also evident that that portion of the wire which is submerged in the plating metal contained in any attenuated tube or conduit 7 will be heated to approximately the same temperature as the said plating metal. The current required to maintain the plating metal in molten condition will not of course melt the iron tubes nor the wire which is being plated. In practice it is advisable to keep the metal in the supply-tube 4 at a tempera-

ture somewhat lower than that of the plating metal within the tubes 7. It is only necessary to keep the plating metal in the supply-tube 4 in such condition that it will flow freely therethrough, while it is of course necessary to keep the plating metal in the tubes 7 constantly at approximately the required temperature for producing the best grade of plating, such temperature being considerably higher than that required to cause the metal to flow freely. Under a too low temperature of the plating metal within the tube 7 the pyrometer carries the contact-arm 36 out of engagement with the contact-plug 41, thereby breaking the circuit to the trip-magnet 31 and permitting the spring 30 to hold the contact-lever 26 in engagement with the contact-post 27. When contact is thus maintained between said lever 26 and the post 27, current in the primary circuit is permitted to freely flow therethrough. The electromotive force of the generator 22ª should be such that when contact is maintained between the lever 26 and the post 27, as above described, the induced current supplied to the tube 7 will be sufficient to raise the temperature of the plating metal in said tube considerably higher than required for good plating. On the other hand, the resistance of the coil 25 should be such that when the supply-circuit is broken between the lever 26 and the post 27 the current-flow in the primary circuit will be choked down, so that the induced current applied to the tube 7 will be considerably less than sufficient to maintain the molten plating metal contained in said tube at a temperature high enough for good plating. The adjustable block 39 on the segmental dial 37 of the pyrometer should be so set that the contact-arm 36 will be brought into engagement with the contact-plug 41 whenever the temperature of the molten plating metal in the tube 7 rises slightly above the exact desired temperature for the best grade of plating, thereby closing the trip-magnet circuit and causing said switch-magnet 31 to be energized and draw the lever 26 out of contact with the post 27. It will thus be seen that whenever the temperature of the molten plating metal in the tube 7 drops but very slightly below the desired temperature additional current is turned on and that by a very slight increase in temperature above the predetermined point the trip-magnet circuit is closed and the current in the supply-circuit is immediately again reduced.

By the above means the plating metal may be automatically maintained substantially at the exact required temperature for the best grade of plating. As is evident, the temperature at which the plating metal is to be maintained will be determined by the adjustment of the block 39 and contact-plug 41 on the segmental dial 37.

An automatic controller of the above character is of the highest importance, because the speed at which the wire is moved through the body of molten plating metal, the size of the wire, and other things will vary the amount of heat per unit of time required to maintain the plating metal in molten condition at the proper temperature.

With the apparatus above described the main body of the molten plating metal within the supply-pot may be located at a point remote from the plating-tubes, and by locating it outside of the plating-room the dirt and heat incident to keeping up the fire under the said supply-pot are of course kept out of the plating-room. Furthermore, the amount of metal which must be kept at or approximately at the predetermined required temperature for the best plating is reduced to a minimum and by the plating tubes or conduits is kept out of contact with the air, thereby preventing to a very great extent oxidation of the plating metal. From what has been said it will also be understood that the apparatus while especially adapted for use in plating wire is also adapted for use in plating metal in other forms.

The apparatus described is capable of many modifications within the scope of my invention as herein set forth and claimed.

In practice a common alternating-generator would usually be employed to supply the current to the supply tube or pipe and to the plating-tubes or attenuated branch conduits.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. An apparatus for plating wire or other metallic bodies comprising an attenuated conduit containing molten plating metal in which the wire or other metallic body may be submerged, with only an attenuated body of plating metal surrounding the same, and means for passing an electric current through the attenuated body of plating metal and the submerged portion of the wire or other metallic body to be plated, substantially as described.

2. An apparatus for plating wire or other metallic bodies, comprising an attenuated conduit containing molten plating metal through which the wire or other metallic body may be drawn, under a continuous movement, means for maintaining the molten metal within said conduit at a constant level, and means for passing an electric current through the submerged portion of the wire, the molten plating metal and the conduit itself, substantially as described.

3. The combination with a reservoir adapted to contain a body of molten plating metal, through which the wire may be drawn, of means for passing an electric current through said plating metal, and automatic means for regulating the current, to maintain the plating metal in molten condition, at the desired temperature.

4. The combination with an attenuated conduit adapted to contain an attenuated body of

molten plating metal, through which the wire may be drawn, of means for passing an electric current through the attenuated body of plating metal contained within said conduit, and through the submerged portion of the wire, and automatic means for regulating the current, to maintain said plating metal in molten condition, at the desired temperature.

5. The combination with a reservoir adapted to contain molten plating metal, through which the wire may be drawn, of means for passing an electric current through said plating metal, to maintain the same in molten condition, and automatic means for regulating the current, involving a pyrometer, which is adapted to be variably set, to maintain the molten plating metal at different temperatures for different settings.

6. The combination with an attenuated conduit adapted to contain an attenuated body of molten plating metal, through which the wire may be drawn, of means for passing an electric current through said attenuated body of plating metal, and through the submerged portion of the wire, a resistance coil or device, and a circuit-breaker, in the supply-circuit to the said plating metal, a pyrometer subject to the heat applied to said plating metal, a trip-magnet for operating said circuit-breaker, and a trip-magnet circuit, arranged to be opened and closed by said pyrometer.

7. The combination with an attenuated metallic tube adapted to contain an attenuated body of molten plating metal, through which the wire may be drawn, of means for passing an electric current through said tube, through the plating metal therein contained, and through the submerged portion of the wire, a resistance-coil and a circuit-breaker in the supply-circuit to said tube, a pyrometer subject to the heat applied to said tube, and to the metal therein contained, a trip-magnet for operating said circuit-breaker, and a trip-magnet circuit, arranged to be opened and closed by said pyrometer.

8. The combination with an attenuated metallic tube adapted to contain an attenuated body of molten plating metal, through which the wire to be plated may be drawn, means for passing an electric current through said tube, through the plating metal therein contained, and through the submerged portion of the wire, a resistance-coil and a circuit-breaker in the supply-circuit, a pyrometer having a coil surrounding said tube, a trip-magnet for operating said circuit-breaker, and a trip-magnet circuit, arranged to be opened and closed by said pyrometer.

9. The combination with a supply tube or conduit for the molten plating metal, of a plurality of attenuated branch tubes or conduits leading therefrom, and adapted to contain attenuated bodies of plating metal, through which the wires to be plated may be drawn, and means for passing an electric current through the plating metal contained in said attenuated branch tubes, and through the submerged portions of the wires, substantially as described.

10. The combination with a plurality of reservoirs adapted to contain molten plating metal through which the wires to be plated may be drawn, of a common source of electrical energy, having circuit connections to the bodies of plating metal contained in the several reservoirs, and independent automatic current-controllers for the several reservoirs, for regulating the current, to maintain the plating metal in molten condition, at the desired temperature, substantially as described.

11. The combination with a main supply-pot for the plating metal, of a feed tube or conduit leading therefrom, and provided with a plurality of attenuated branch tubes or conduits, adapted to contain attenuated bodies of molten plating metal, through which the wires to be plated may be drawn, a common source of electrical energy having circuit connections for passing the current through the several attenuated bodies of plating metal within said attenuated branch tubes, and independent automatic circuit-controllers for regulating the current, to maintain the said attenuated bodies of plating metal in molten condition, at the desired temperature, substantially as described.

12. The combination with a main supply-pot for the molten plating metal, of a metallic feed tube or pipe leading therefrom, and provided with attenuated metallic branch tubes adapted to contain attenuated bodies of molten plating metal, through which the wires to be plated may be drawn, of means for passing an electric current through said feed tube or pipe, to maintain the metal therein contained in molten condition, a source of electrical energy having circuit connections to the several attenuated branch tubes, and independent automatic current-controllers for regulating the current-flow through the several branch tubes, for maintaining the plating metal therein contained in molten condition, at the desired temperature.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE A. GOODSON.

Witnesses:
H. D. KILGORE,
F. D. MERCHANT.