C. G. MILLER.

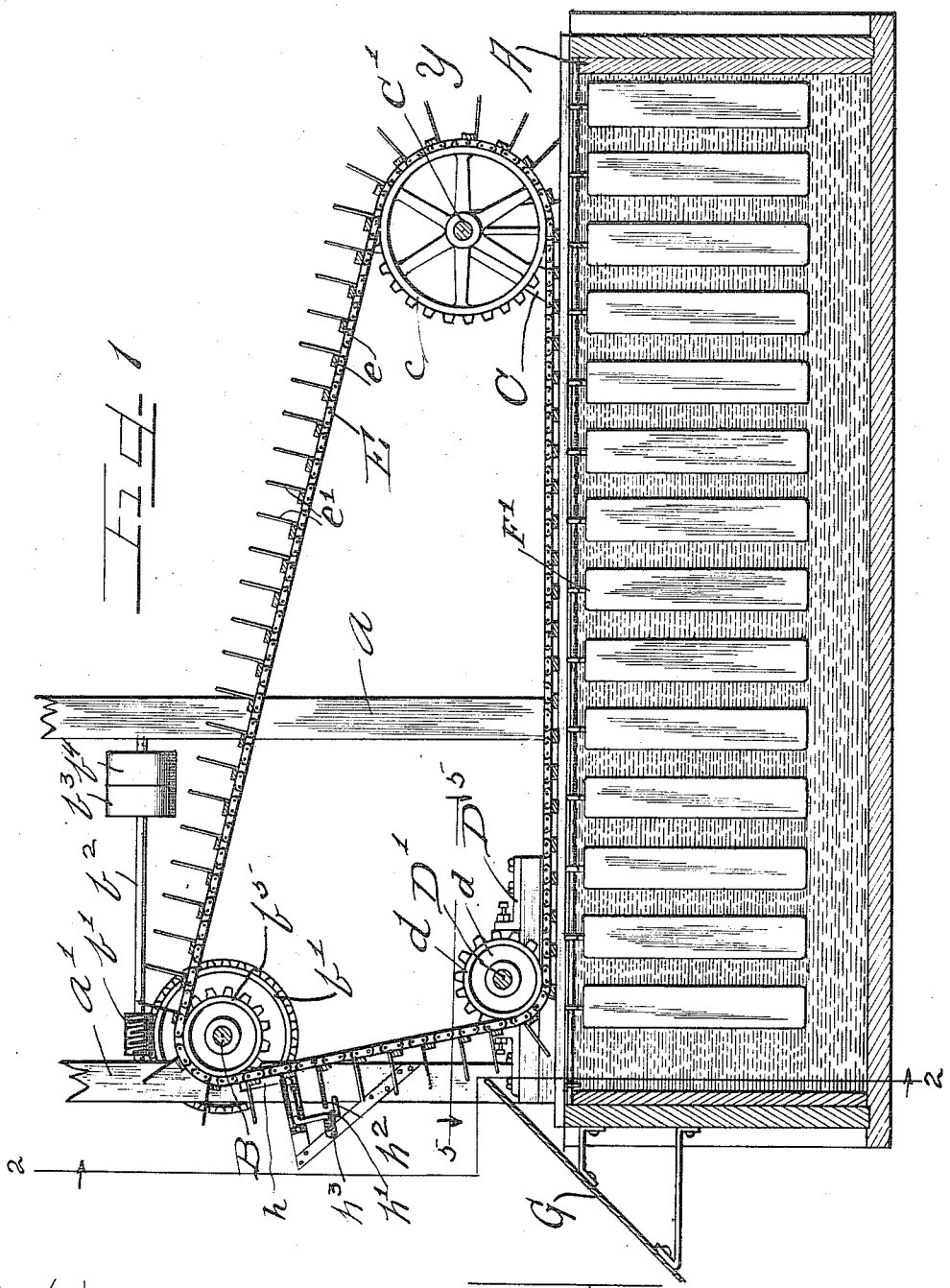
ELECTROPLATING MACHINE.

APPLICATION FILED NOV. 23, 1908.

986,303.

Patented Mar. 7, 1911.

3 SHEETS—SHEET 1.



Witnesses

J. W. Angell

J. B. Hannah

Inventor

Constantine G. Miller.

by Charles D. Lines

Atty.

C. G. MILLER.

ELECTROPLATING MACHINE.

APPLICATION FILED NOV. 23, 1908.

986,303.

Patented Mar. 7, 1911.

3 SHEETS—SHEET 2.

Fig. 2

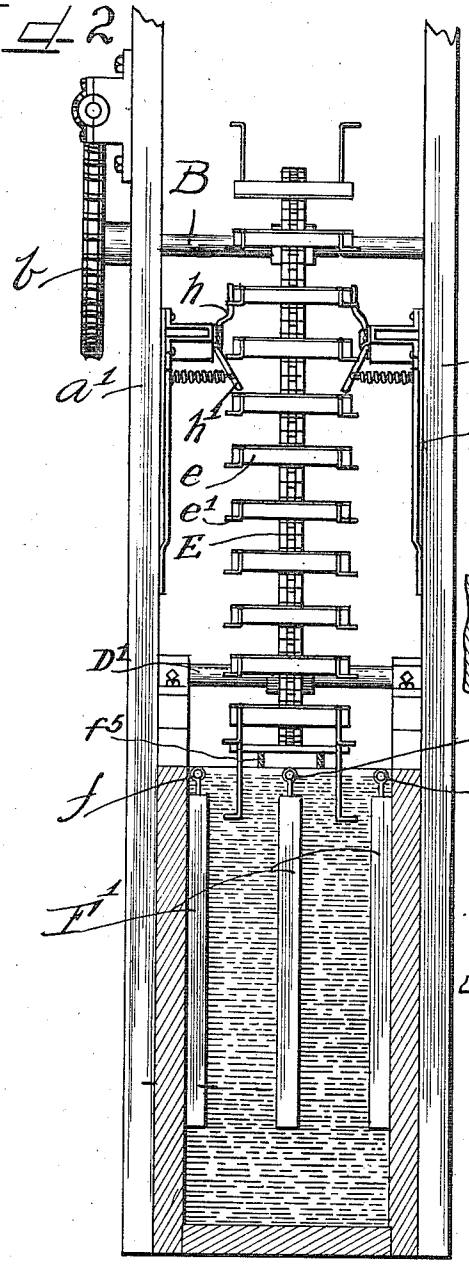



Fig. 3

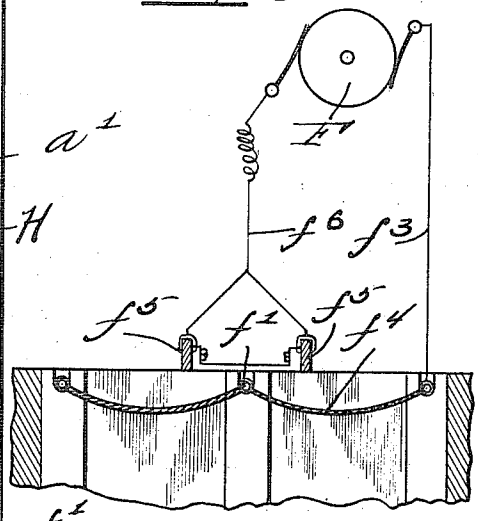
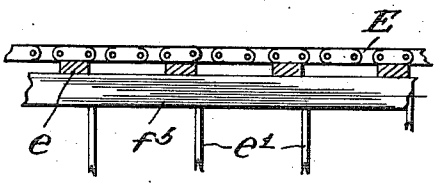



Fig. 4




Witnesses

J. H. Angell.

D. E. Hannah

by

Inventor

Constantine G. Miller.

Charles O. Tells.

Atty.

C. G. MILLER.

ELECTROPLATING MACHINE.

APPLICATION FILED NOV. 23, 1908.

986,303.

Patented Mar. 7, 1911.

3 SHEETS—SHEET 3.

Fig. 7

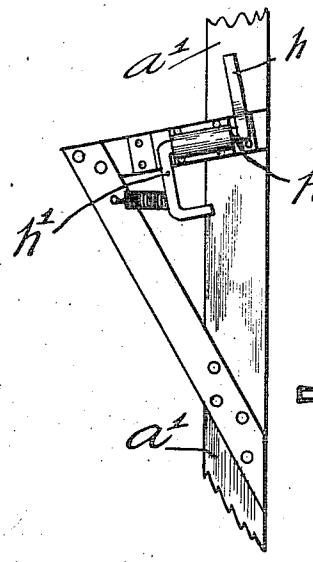



Fig. 6

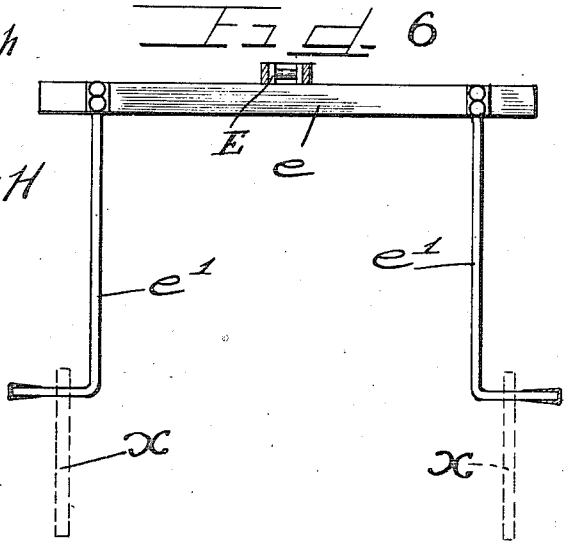
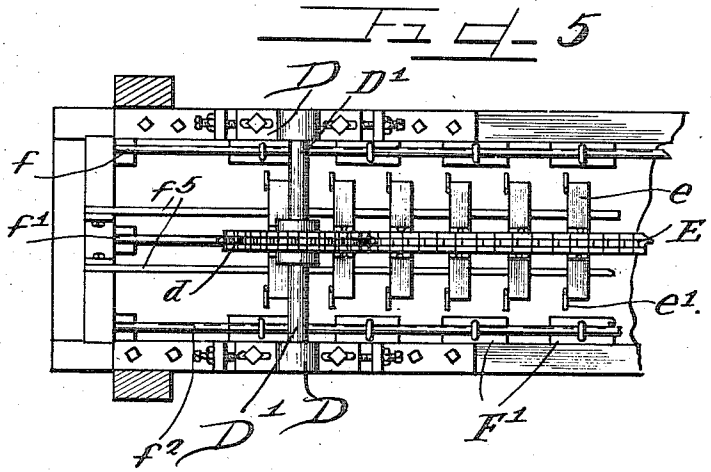



Fig. 5




Witnesses

J. H. Angell.

[illegible]

Inventor

Constantine G. Miller.

by Charles A. Wiles Atty.

# UNITED STATES PATENT OFFICE.

CONSTANTINE G. MILLER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE MEAKER COMPANY, A CORPORATION OF ILLINOIS.

## ELECTROPLATING-MACHINE.

986,303. Specification of Letters Patent. Patented Mar. 7, 1911.

Application filed November 23, 1908. Serial No. 463,950.

*To all whom it may concern:*

Be it known that I, CONSTANTINE G. MILLER, a citizen of the United States, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electroplating-Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

Electroplating is usually a comparatively slow operation, but with the very great demand for such work owing to the enormous extension in the various arts of the use of plated articles, as, for instance, articles coated with zinc or nickel, it has become necessary to provide as nearly as possible a continuously operating machine whereby the articles may be carried progressively through a plating solution to be automatically discharged from the end of the machine. Such an invention should afford as nearly as possible a uniform coating of the articles treated, and it is therefore an object of this invention to provide a continuously operating electroplating machine of such construction as to enable the articles treated to be given a uniform coating in passing through the bath or electrolyte, and to automatically discharge the articles from the opposite end of the machine from which they entered.

It is also an object of the invention to provide means not only for carrying the articles through the electrolyte while subjecting the same to an electrical current, but as well to occasionally jar the articles in their passage to insure as well as may be uniformity of deposition as well as to jar or strike the finished articles from the carrier.

It is finally an object of the invention to provide a device of the class described in which a very large surface of the metallic anode is exposed to the action of the electrolyte and to afford in connection therewith movable mechanical supports for the articles to be treated and which, while submerging the articles in the electrolyte, moves the same toward the discharge position suspended between the anodes.

The invention consists in the matters hereinafter described and more fully pointed out and defined in the appended claims.

In the drawings: Figure 1 is a central vertical section taken longitudinally the machine. Fig. 2 is an enlarged, fragmentary, vertical section on line 2—2 of Fig. 1. Fig. 3 is an enlarged fragmentary section illustrating the electrical connections. Fig. 4 is an enlarged fragmentary detail in side elevation of the lower run of the chain showing the same supported upon the bus bars. Fig. 5 is a fragmentary, horizontal section taken on line 5—5 of Fig. 1. Fig. 6 is an enlarged detail illustrating the supporting hooks for the articles to be plated or coated. Fig. 7 is a fragmentary side elevation of the spring impelled jar arms for shaking or striking the articles from the hooks after coating.

As shown in the drawings: A, indicates a tank conveniently constructed of wood though, obviously, it may be lined with any suitable material. As shown, at the rear or discharge end of said tank is provided an upright frame composed of posts $a$—$a'$, two on each side and which may be transversely connected in any suitable manner to afford rigidity and strength, and journaled upon the uprights $a'$, which are at the rear end of the tank is a shaft B, provided on its outer end with a worm gear $b$, adapted to be driven by means of a worm $b'$, on a shaft $b^2$, provided with tight and loose belt pulleys $b^3$—$b^4$, as is usual.

Journaled upon a standard C, at the forward end of the tank, is a transverse shaft C′, provided centrally with a sprocket wheel $c$, thereon. Journaled on adjustable pulley blocks D, of any suitable kind, secured on the rear end of the tank on each side thereof, is a shaft D′, corresponding with the shaft C′, and parallel thereto and provided with a sprocket $d$, centrally thereon and in alinement with the sprocket wheel $c$, on the shaft C′. A corresponding sprocket wheel $b^5$ is provided on the shaft B, above the shaft D′, and trained about said sprocket wheels is a sprocket or link belt chain E, of any suitable kind or construction, adapted to be run on said sprocket wheels.

As shown, the diameter of the sprocket wheels $c$—$d$, is such that the lower run of the sprocket chain E, is parallel with the top of the tank, and of course, with the electrolyte in the tank, and secured transversely on said chain at short intervals apart, are metallic bars $e$, which are en-

gaged to the appropriate links of said chain near the middle of each bar. Engaged near each end of each of said bars, is a downwardly directed hooked wire or rod $e'$, the lower end of which is directed laterally and outwardly toward the wall of the tank, as shown in Fig. 6, and serve as hooks to support the articles to be plated or coated.

Extending longitudinally the tank near each of the side walls and at the middle of the same, are conductors $f$—$f^1$—$f^2$ which, as shown, are round metallic rods connected with one of the leads $f^3$, from the generator F, on which are suspended the anodes F′, which hang downwardly in the electrolyte in parallel relation with each other and, of course, may be of any desired number, and afford a sufficient surface for the purpose required. Said conductors are connected by a cable $f^4$, with each other at one end of the tank. As shown, the central, parallel bus bars $f^5$, are provided on each side the central conductor F′, and as shown, are flat bars of metal, which are supported upon the top of the tank and projecting above the same, and on which the flat bars $e$, on the chain, slide and which thus serve to support the lower run of the chain and its load during the plating operation. Said bus bars are connected with the other lead $f^6$, of the generator.

As shown, the shaft D′, with its sprocket wheel $d$, thereon, is arranged forwardly of the upper shaft B, and its sprocket wheel thus inclining the upward run of the chain outwardly over the discharge end of the tank, and as shown, an inclined chute board G, is supported upon suitable brackets on the discharge end of the tank, and its upper end projects to near the extended ends of the hooks $e'$, as they rise from the electrolyte, and is adapted to receive the articles discharged from said hooks to direct the same from the tank.

Means are provided for jarring the chain to shake the articles more or less during the plating or coating operation and also to remove the coated articles from the hooks. For this purpose, as shown, a short shaft H, is journaled in suitable bearings on the inner face of each of the uprights $a'$, and the ends $h$—$h'$, of which are directed oppositely to provide arms. The arm $h$, is curved to provide a cam, as shown more clearly in Fig. 2, and is adapted to be engaged by the end of each bar $e$, to adjust the other arm $h'$, to engage within the hook $e'$. Said arm $h'$, is provided with a hooked end $h^2$, and a spring $h^3$, is secured at its ends to the arm and bar and acts to throw the hook $h^2$, outwardly when the bar $e$, passes the cam $h$, thereby removing the articles from the hooks $e'$.

The operation is as follows: An operator stands at the receiving end Y, of the tank, and as the chain travels downwardly toward the tank, engages the articles to be coated or plated upon the hooks. This is, of course, easily accomplished if the articles are apertured. If not, wire loops may be provided whereby the article may be engaged upon the hook. The chain is thus loaded progressively, and as the articles are submerged in the electrolyte within the tank, the current passes therethrough into the bus bars, thus completing the circuit. Obviously, a very large surface of the metal to be plated is exposed between the anodes supported vertically in the tank, and as the articles to be plated travel longitudinally in the tank between the same, the thickness of the coating may be regulated by the rate of travel and, of course, the current. Having passed through the tank, said articles are raised from the electrolyte upon the upward run of the chain and as the same approach the hooked jar arms $h$—$h'$ these, as the successive bars $e$, engage the arm $h$, the arms $h'$ swing inwardly after which the springs retract the arms $h'$, for their hooked ends to remove the articles from the carrying hooks adapting the articles to fall upon the chute G. Owing to the quick retraction caused by the spring, the arm $h$, of the jar mechanism is thrown inwardly to engage the succeeding bar $e$, which jars the supporting mechanism and particularly the lower run of the chain gently, thus tending to constantly shift the contact surface on the hook of the article being coated. In this manner, uniformity of the coating is assured.

In use, the outer end of the supporting hook becomes slightly enlarged by the deposition thereon of the plating metal as shown in Fig. 6. This assists in holding the articles (while coating) on said hooks, and in consequence, there is little or no tendency of the same to fall therefrom to the bottom of the tank.

Of course, other means may be provided for releasing the plated or coated articles from the supporting hooks, the jar arms, however, acting simultaneously and oppositely are very effective and are automatic in operation.

Obviously, the lower run of the chain is at all times supported in horizontal position whatsoever the load thereon, by means of the bus bars. If the chain should at any time become slack, the adjustment may be quickly made by means of the adjustable bearings D, for the shaft D′.

Various details of the construction may be varied. I therefore do not purpose limiting this application for patent otherwise than necessitated by the prior art.

I claim as my invention:

1. An electroplating machine embracing a tank adapted to contain an electrolyte, re-

movable conductors extending in the tank, an endless member movable above the tank and supporting hooks thereon adapted to dip into the electrolyte between the conductors and to afford support for the articles to be plated and means for jarring the hooks when immersed in the electrolyte and simultaneously removing the articles from the hooks after the hooks are elevated from the electrolyte.

2. In a device of the class described a tank adapted to contain an electrolyte, bars supported on the tank, anode bars suspended therefrom providing a plurality of vertical passages therebetween, transverse shafts journaled above the tank, an endless sprocket chain thereon, the lower run of which extends parallel to the top of the tank and adjacent thereto, conducting bars secured to the chain, conducting vertical supporting members electrically connected with the conducting bars depending in the vertical passages, means for jarring the supporting members, conducting members arranged above the tank and adapted to contact the conducting bars, and to support the lower run of chain, and means for automatically engaging the plated articles and pushing the same from said supporting members at the discharge end of the machine.

3. An electroplating machine embracing a tank, conductors extending longitudinally the tank at each side thereof and in the middle, an endless chain movable above the tank, supporting hooks thereon adapted to dip into the electrolyte adjacent the conductors and to afford support for the articles to be plated and mechanism for engaging and automatically removing the articles from the hooks.

4. An electroplating machine embracing a tank adapted to contain an electrolyte, parallel conductors in the tank at each side thereof and in the middle, supporting hooks adapted to dip into the electrolyte between the conductors and hooks for disengaging the articles from the supporting hooks.

5. In a device of the class described a tank adapted to contain an electrolyte, removable anode members suspended in the electrolyte, continuous moving cathode members adapted to suspend the articles to be coated in the electrolyte and oscillating mechanism for automatically removing the articles from the cathode members.

6. In a plating machine the combination with a tank adapted to contain the electrolyte, and the anodes therein, of an endless carrier movable above the tank, bus bars supporting said carrier in part, hooks engaged on said carrier and adapted to depend in the electrolyte between the anodes and to afford the supports for the articles to be coated, mechanism adjusted by the carrier to engage the coated articles and a spring for actuating the mechanism to remove the articles from said carrier.

7. In a plating machine the combination with a tank adapted to contain the electrolyte, and the anodes therein, of an endless carrier movable above the tank and horizontal on its lower lap, bus bars supporting said carrier in part, hooks engaged on said carrier and adapted to depend in the electrolyte, between the anodes and to afford the supports for the articles to be coated, and automatic means for engaging the articles and removing the same from said carrier and for jarring the horizontal lower lap thereof.

8. The combination with a narrow tank adapted to contain an electrolyte, of anodes electrically connected and supported in the electrolyte, an endless metallic carrier acting longitudinally of, and above the tank, bus bars on which the lower run of said carrier slides, metallic hooks connected with the carriers and dipping into the electrolyte between the anodes and simultaneously movable arms, one adapted to strike and vibrate the carrier and the other to remove articles from the hooks.

9. The combination with a narrow tank adapted to contain an electrolyte, of removable anodes electrically connected and supported in the electrolyte, outwardly directed supports movable longitudinally of the tank, each having an angularly directed extremity for supporting the articles to be plated, mechanism operated by the carrier for engaging the coated articles, a spring for actuating the mechanism for discharging the coated articles from the angular extremities of the supports and means for directing the articles plated from the tank.

10. In an electroplating machine a tank, individual supports successively movable into and out of the tank and oscillating arms, one adapted to automatically remove articles suspended from the supports and the other adapted to strike and jar the supports.

11. In an electroplating machine rows of anodes, successively immersing cathodes adapted to depend articles between the rows of anodes, and connected members for removing the plated articles from the movable cathodes as said cathodes move therepast and for jarring the immersed cathodes.

12. An electroplating apparatus comprising a tank for the electrolyte, anode elements supported in rows in the tank providing a plurality of passages therebetween, rows of continuously moving cathode elements, one row for each passage and an independent oscillating member for each row of cathodes adapted to remove the plated articles from the cathodes.

13. In a device of the class described a tank for electrolyte, an endless conveyer, a plurality of cathode elements secured to the

conveyer and mechanism for engaging and removing each plated article from each cathode element.

14. In a device of the class described a tank, an endless conveyer, carriers for supporting articles advanced by said conveyer, and spring actuated members for engaging the articles supported by said carriers and removing the same therefrom.

15. In a device of the class described a tank, cathode elements adapted to support articles, means for advancing the cathode elements and simultaneously movable arms, one adapted to jar the articles while in the tank and the other arm adapted to remove the articles from the cathode elements after said articles are raised from the tank.

16. In a device of the class described a tank, an endless conveyer, hooks supported by the conveyer for supporting articles and simultaneously movable members adapted first to jar the articles supported by the hooks and then engage the articles and remove them from the hooks.

17. In a device of the class described a tank for the electrolyte, removable anodes therein, continuously advancing means for supporting articles to be coated and oscillating means non-connected with the advancing means for shifting the position of the articles on the support and removing the articles after the same are plated.

In testimony whereof I have hereunto subscribed my name in the presence of two subscribing witnesses.

CONSTANTINE G. MILLER.

Witnesses:
K. E. HANNAH,
LAWRENCE REIBSTEIN.