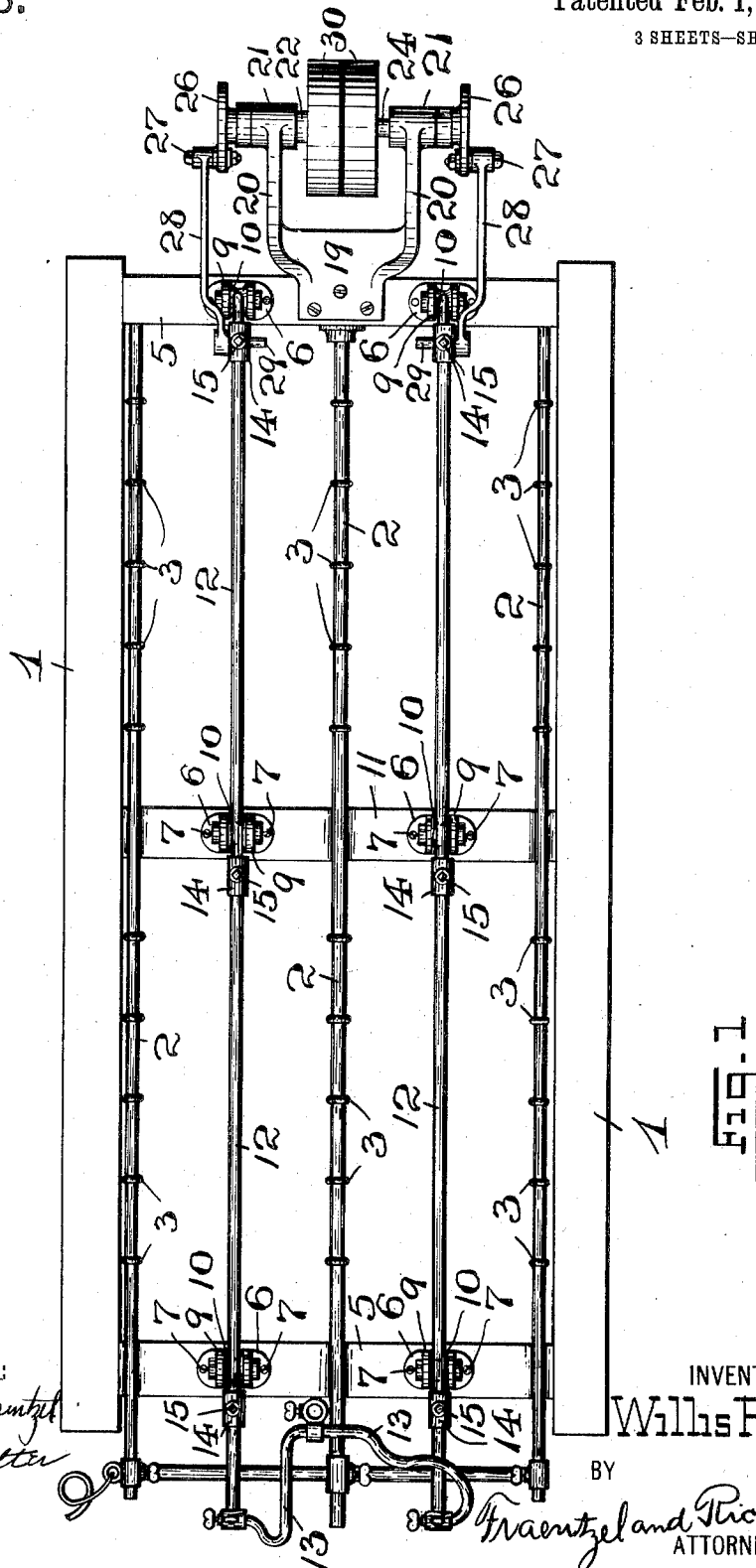


W. R. KING.
ELECTROPLATING APPARATUS.
APPLICATION FILED SEPT. 30, 1909.

948,056.

Patented Feb. 1, 1910.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

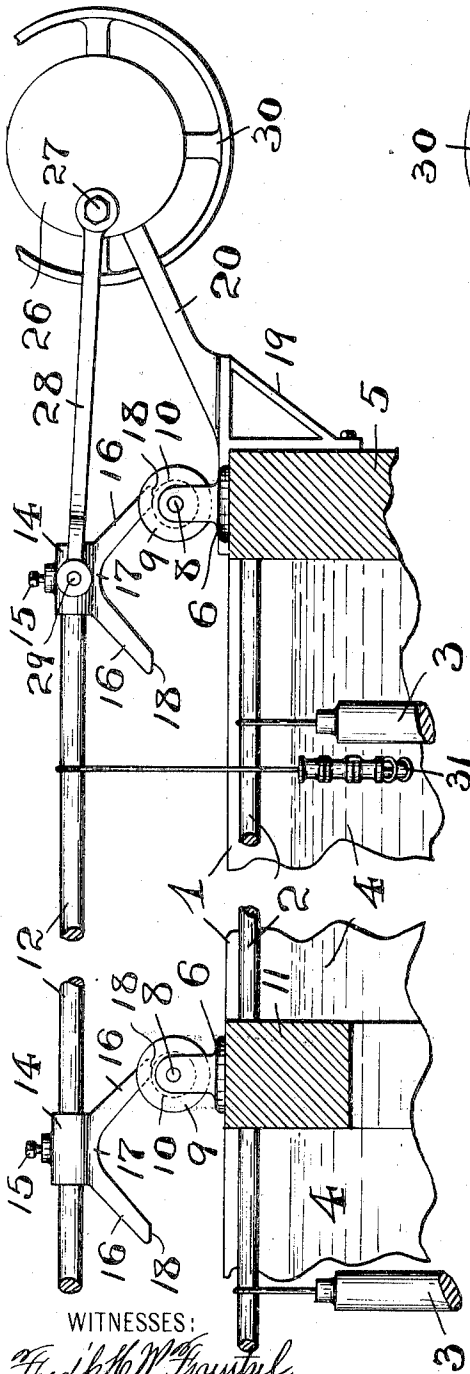


FIG. 2

WITNESSES:
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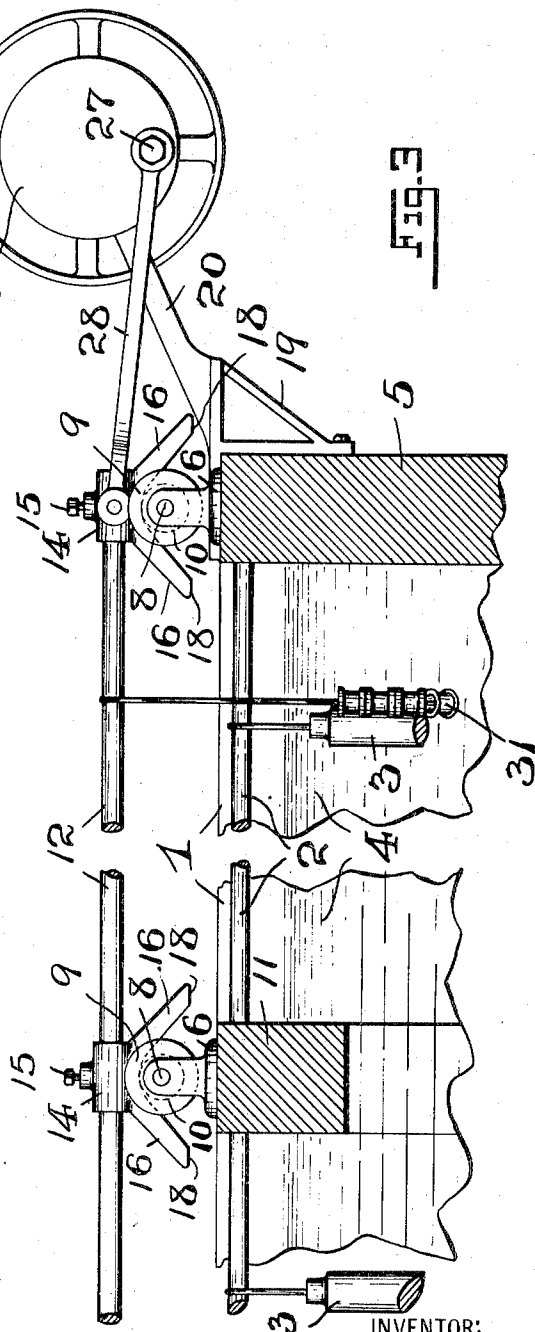


FIG. 3

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3 SHEETS—SHEET 3.

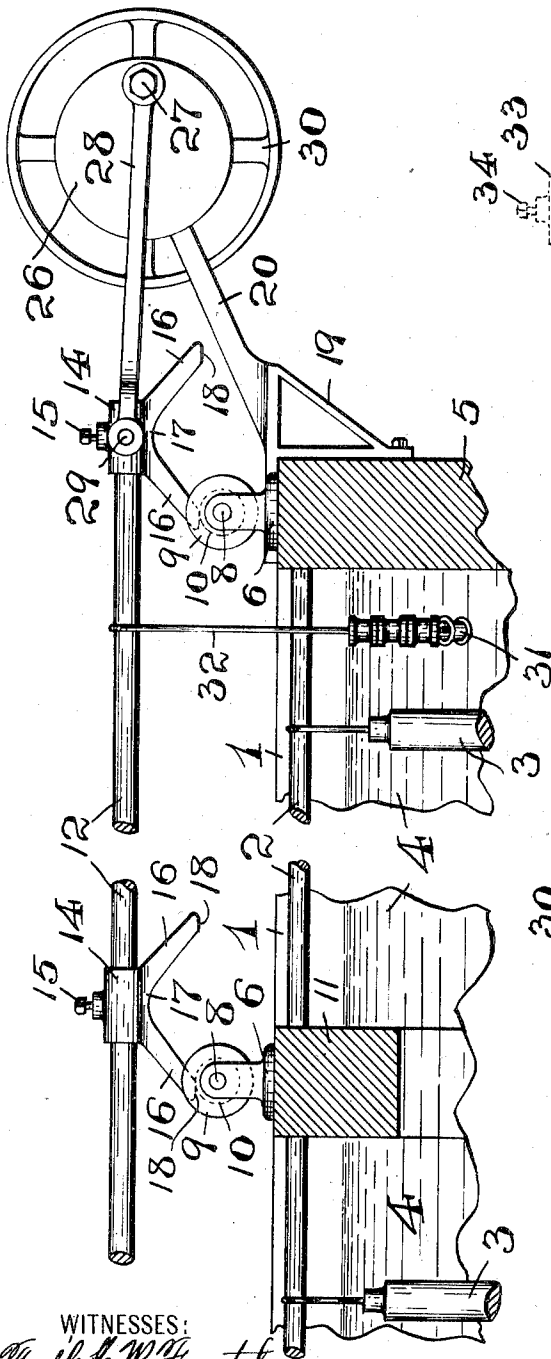


Fig. 4

WITNESSES:
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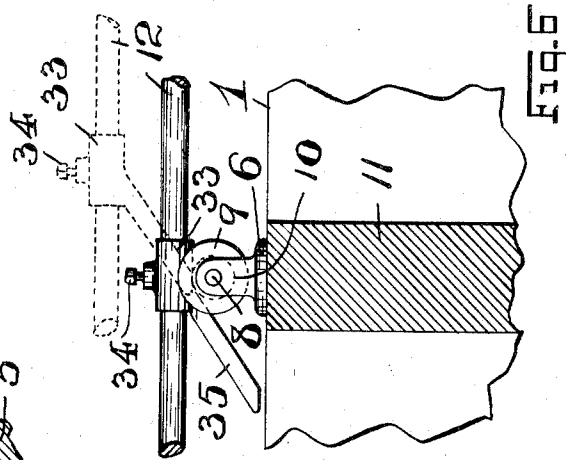


Fig. 6

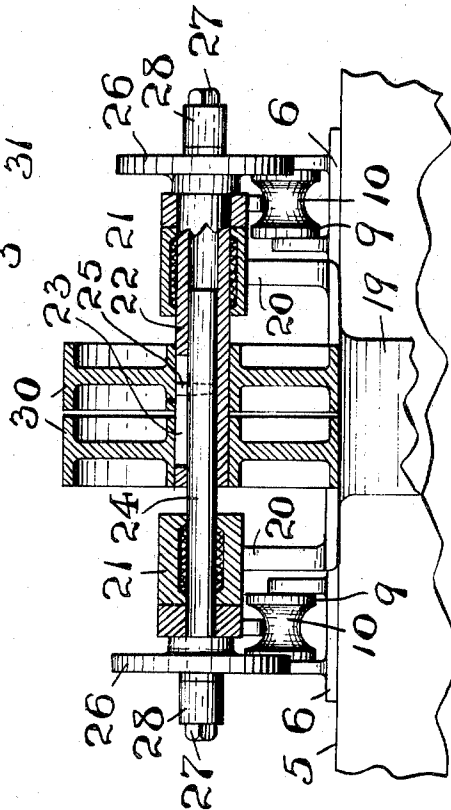


Fig. 5

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UNITED STATES PATENT OFFICE.

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ELECTROPLATING APPARATUS.

948,056.

Specification of Letters Patent.

Patented Feb. 1, 1910.

Application filed September 30, 1909. Serial No. 520,302.

To all whom it may concern:

Be it known that I, WILLIS R. KING, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Electroplating Apparatus; 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, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

The present invention has reference, generally, to improvements in apparatus used for producing the electro-deposition of metals; and, this invention relates, more particularly, to a novel means for agitating the "work" or articles to be plated within the plating solution.

It is well known to those skilled in the art of electrolytic processes that the rapidity with which plating or deposition of metal is accomplished depends ordinarily upon the strength or intensity of the electrical current used and the richness of the plating solution; but, it is also known that proper plating or deposition of metal can only be accomplished ordinarily by the use of but moderate current-intensity.

The principal object of the present invention is to provide a means for so agitating the "work" or articles to be plated within the plating solution, that an increased intensity of electric current may be safely used without danger of "burning" the work, whereby the plating process can be accomplished in a much shorter period of time than by means of the use of the ordinary plating apparatus.

A further object of the present invention is to provide a novel arrangement and construction of agitating devices, whereby the "work" or articles to be plated are agitated within the plating solution with a wave-like motion, accompanied with slight jarring movements at intervals, whereby the air and hydrogen bubbles, which collect upon the "work" and interfere with and delay the deposition processes, are shaken or jarred off, thereby leaving the surfaces of the "work" free to receive the deposit of metal.

A further object of the present invention is to provide in connection with the above-

mentioned agitating devices, a driving mechanism therefor which is adjustable, so as to enable the same together with the agitating devices to be operatively arranged within electroplating tanks of varying widths.

Other objects of this invention not at this time more particularly specified will be clearly understood from the following detailed description of the same.

With the various objects of my present invention in view, the same consists, primarily, in the novel agitating-devices for electro-plating tanks, and the driving mechanism therefor; and, the invention consists, furthermore, in the novel arrangements and combinations of devices and parts, as well as in the details of the construction of the same, all of which will be hereinafter more fully described, and then finally embodied in the clauses of the claims, which are appended to and which form an essential part of the specification.

The invention is clearly illustrated in the accompanying drawings, in which:—

Figure 1 is a plan view of an electroplating tank equipped with the novel construction and arrangement of agitating devices embodying the principles of my present invention. Figs. 2, 3 and 4 are all of them enlarged detail vertical longitudinal sections of portions of said electro-plating tank and the agitating devices connected therewith, together with the driving mechanism for the latter; these respective views each indicating some operative movement or position of said agitating devices. Fig. 5 is a longitudinal vertical section of the driving-mechanism for said agitating devices, the same illustrating more particularly the adjustable features of said driving mechanism. Fig. 6 is a detail view of a slightly modified agitating device.

Similar characters of reference are employed in all of the hereinabove described views, to indicate corresponding parts.

Referring now to the several figures of the drawings, the reference-character 1 indicates an electro-plating tank of any well-known or ordinary form. The said electro-plating tank 1 is provided with a plurality of horizontal and immovably fixed contact-rods 2 which are connected in proper electrical circuit, and the said contact-rods 2 being adapted to support, in suspended contact, a plurality of the usual anodes 3, the

same being adapted to be submerged in the plating-solution 4.

Arranged upon the upper surface of the end-walls 5 of said tank 1, are bearing-brackets 6, the same being secured in suitable locations by means of screws 7, or other desirable fastening means. Rotatably mounted in said bearing-brackets 6, by means of their journal-portions 8, are idler-wheels or rollers 9 provided upon their outer circumferences with a groove or channel 10.

When a tank 1 is of considerable length it may be provided with one or more supporting-arches 11, upon the upper surfaces of which may be secured more of the said bearing-brackets 6, and the idler-wheels or rollers 9 connected therewith.

The reference-character 12 indicates movable rods which are properly connected in an electrical circuit by means of flexible electrical connections 13 which will permit reciprocating movements of said rods, as will be subsequently described. Secured upon said rods 12 are two or more agitator-members, each member comprising a tubular hub-member 14, through the opening of which passes said rod 12, the said tubular hub-members 14 being secured in a proper position on said rod 12 by means of a set-screw 15, or any other suitable fastening means. Projecting from said hub-members 14 are a pair of oppositely extending arms or cam-like members 16, the same extending downwardly and outwardly in an oblique direction. The said pair of arms or cam-like members 16 are joined at their base-portion 17. The free-ends of said arms or cam-like members 16 may be provided with the chamfered or flattened end-portion 18. The said agitator-members, thus constructed, are secured upon said movable rods 12 at points corresponding to the location of the above described idler-wheels or rollers 9 and the arms or cam-like members of said agitator-members are adapted to be in movable contact with the grooves or channels 10 of said idler-wheels or rollers 9 in such a manner, so as to support said rods 12 in their movable relation to the tank 1. The means for accomplishing the movement of said rods 12 comprises the following mechanism:

Secured to one end of said electro-plating tank 1, in any suitable manner, is a supporting-bracket 19, the same being provided with a pair of outwardly extending arms 20, upon the free ends of which are formed bearing-members 21. Mounted in said bearing-members 21, is a telescopic shaft comprising a tubular-member 22 provided with a suitable longitudinally extending slot 23 and a sliding shaft-member 24 adapted to slide within said tubular-member 22, said sliding shaft-member 24 being provided

with a pin 25 which extends into and moves in said slot 23, so that while said sliding shaft-member 24 may be moved longitudinally within said tubular-member 22 it must nevertheless revolve therewith when the same is rotated. Secured respectively upon the free ends of both said tubular member 22 and said sliding shaft-member 24 are crank-disks 26, the same being each provided with a suitably located stud 27 to which is secured a connecting-rod 28, the opposite end of said connecting-rod 28 being pivotally connected with a stud or pin 29 which forms a part of, or is secured to said hub-member 14 of one of said agitator-members. Secured upon said tubular member 22 is a fast and loose-pulley member 30 which is adapted to drive said telescopic shaft and the crank-disks 26. In carrying out the plating operations with the above mechanism, the "work" or articles 31 to be plated are suspended by means of wires 32, or other suitable means, from said contact-rods 12 so as to submerge the same in the plating solution 4.

Having thus set forth the general construction of my novel electro-plating apparatus, together with the various parts which go to make up the same, it remains to describe the operation thereof in carrying out the process of electro-deposition.

The "work" or articles to be plated are suspended within the plating-solution 4 from said contact-rods 12, and the electric current is caused to make its circuit through the said solution, in the usual and well known manner. The said telescopic shaft and the crank-disks 26 connected therewith are now revolved through the agency of the belt-driven fast and loose pulley-member 30. The rotary movement of said crank-disks 26 is transmitted through said connecting-rods 28 to said contact-rods 12 and converted into a reciprocating movement. By this means, the contact-rods are moved backward and forward. In addition to the backward and forward movement of said contact-rods 12, there is a simultaneous vertical rise and fall of said contact-rods. This vertical rise and fall movement is produced by said agitator-members riding in contact with the grooved or channeled idler-wheels or rollers 9. The arms or cam-members 16 of said agitator-members are carried backward and forward upon said idler-wheels or rollers as the contact rods 12 move longitudinally backward and forward, and the said rods 12 rise as the free end of an arm or cam-member 16 is brought in contact with said idler-wheel or roller 9 and falls, as the angle of said arm or cam-members 16 provide for. As the base of said arm or cam-member is reached, the idler-wheel or roller 9 comes in contact with the rib-portion 17, and this contact produces quite a perceptible jar or jounce, just previous to the rising of said rod 12 due to the

contact of said idler-wheel or roller with the opposite arm or cam-member 16. The combined longitudinal and vertical movement of said contact-rods 12, produced in the manner above described, has the effect of carrying the work or articles which are to be plated with a wave-like motion through the plating-solution, thus causing an agitation of the solution and the work therein, which permits the use of a higher current-density and a consequent greater rapidity of the plating process, without danger of spoiling or "burning" the "work" or articles to be plated. Furthermore, the slight jar or jounce produced at the bottom of said wave-like motion, as above described, tends to free the surfaces of the "work" or articles, while being plated, from the collection of air or hydrogen bubbles thereon which are detrimental both to a rapid as well as a good quality of electro-deposition of metals.

Referring now more particularly to Fig. 6 of the accompanying drawings, there is illustrated therein a slightly modified form of agitator-member embodying the principles of my present invention, the same comprising a hub-member 33 adapted to be secured upon said contact-rod 12 by means of a set-screw 34. Extending obliquely in a downward direction from the underside of said hub-member 33 is an arm or cam-like member 35, which is adapted to ride in operative contact with the grooves or channels 10 of one of said idler-wheels or rollers 9, in a manner and for the purposes clearly to be understood when viewed in the light of the above specification.

I am fully aware that changes may be made in the general arrangements and combinations of the various devices and parts, as well as in the details of the construction of the same, without departing from the scope of my present invention as set forth in the appended claims. Hence, I do not limit my invention to the exact arrangements and combinations of the devices and parts as described in the foregoing specification, nor do I confine myself to the exact details of the construction of the said parts as illustrated in the accompanying drawings.

I claim:—

1. In electro-plating apparatus the combination with a tank, of a plurality of idler-rollers secured upon said tank, movable contact-rods adapted to support the "work" to be plated, a plurality of agitator-members fixed upon said contact rods, the same being adapted to be in movable engagement with said idler-rollers, and means for moving said contact-rods and their agitator-members to produce a combined vertical and longitudinal reciprocatory movement thereof, said means comprising a supporting-bracket provided with bearing-members, a telescopic shaft mounted in said bearings, fast and

loose driving-pulley members connected with said telescopic shaft, crank-disks secured to said telescopic-shaft, and connecting-rods secured by one end to said crank-disk and by the other end to a stud formed upon one of said agitator-members secured to said contact-rods, substantially as and for the purposes set forth.

2. In electro-plating apparatus the combination with a tank, of a plurality of idler-rollers secured upon said tank, movable contact-rods adapted to support the "work" to be plated, a plurality of agitator-members fixed upon said contact-rods, said agitator-members comprising a hub-member and obliquely and downwardly extending arms or cam-like members connected with said hub-members, said arms or cam-like members being adapted to be in movable engagement with said idler-rollers, and means for moving said contact-rods and their agitator members to produce a combined vertical and longitudinal reciprocatory movement thereof, substantially as and for the purposes set forth.

3. In electro-plating apparatus the combination with a tank, of a plurality of idler-rollers secured upon said tank, movable contact-rods adapted to support the "work" to be plated, a plurality of agitator-members fixed upon said contact-rods, said agitator-members comprising a hub-member and obliquely and downwardly extending arms or cam-like members connected with said hub-members, said arms or cam-like members being adapted to be in movable engagement with said idler-rollers, and means for moving said contact-rods and their agitator members to produce a combined vertical and longitudinal reciprocatory movement thereof, said means comprising a supporting-bracket provided with bearing-members, a telescopic shaft mounted in said bearings, fast and loose driving-pulley-members connected with said telescopic shaft, crank-disks secured to said telescopic-shaft, and connecting-rods secured by one end to said crank-disk and by the other end to a stud formed upon one of said agitator-members secured to said contact-rods, substantially as and for the purposes set forth.

4. In electro-plating apparatus the combination with a tank, of a plurality of idler-rollers secured upon said tank, movable contact-rods adapted to support the "work" to be plated, a plurality of agitator-members fixed upon said contact-rods, said agitator-members comprising a hub-member and obliquely and downwardly extending arms or cam-like members connected with said hub-member, a rib-portion connecting the base of said arms or cam-like members, said arms or cam-like members and said connecting rib-member being adapted to be in mov-

able engagement with said idler-rollers, and means for moving said contact-rods and their agitator-members to produce a combined vertical and longitudinal reciprocatory movement thereof, substantially as 5 and for the purposes set forth.

5. In electro-plating apparatus the combination with a tank, of a plurality of idler-rollers secured upon said tank, movable contact-rods adapted to support the "work" to 10 be plated, a plurality of agitator-members fixed upon said contact-rods, said agitator-members comprising a hub-member and obliquely and downwardly extending arms 15 or cam-like members connected with said hub-member, a rib-portion connecting the base of said arms or cam-like members, said arms or cam-like members and said connecting rib-member being adapted to be in movable engagement with said idler-rollers, and 20 means for moving said contact-rods and

their agitator-members to produce a combined vertical and longitudinal reciprocatory movement thereof, said means comprising a supporting-bracket provided with 25 bearing-members, a telescopic shaft mounted in said bearings, fast and loose driving pulley-members connected with said telescopic shaft, crank-disks secured to said telescopic shaft, and connecting-rods secured 30 by one end to said crank-disk and by the other end to a stud formed upon one of said agitator members secured to said contact-rods, substantially as and for the purposes set forth. 35

In testimony, that I claim the invention set forth above I have hereunto set my hand this 13th day of September, 1909.

WILLIS R. KING.

Witnesses:

FREDK. C. FRAENTZEL,
ANNA H. ALTER.