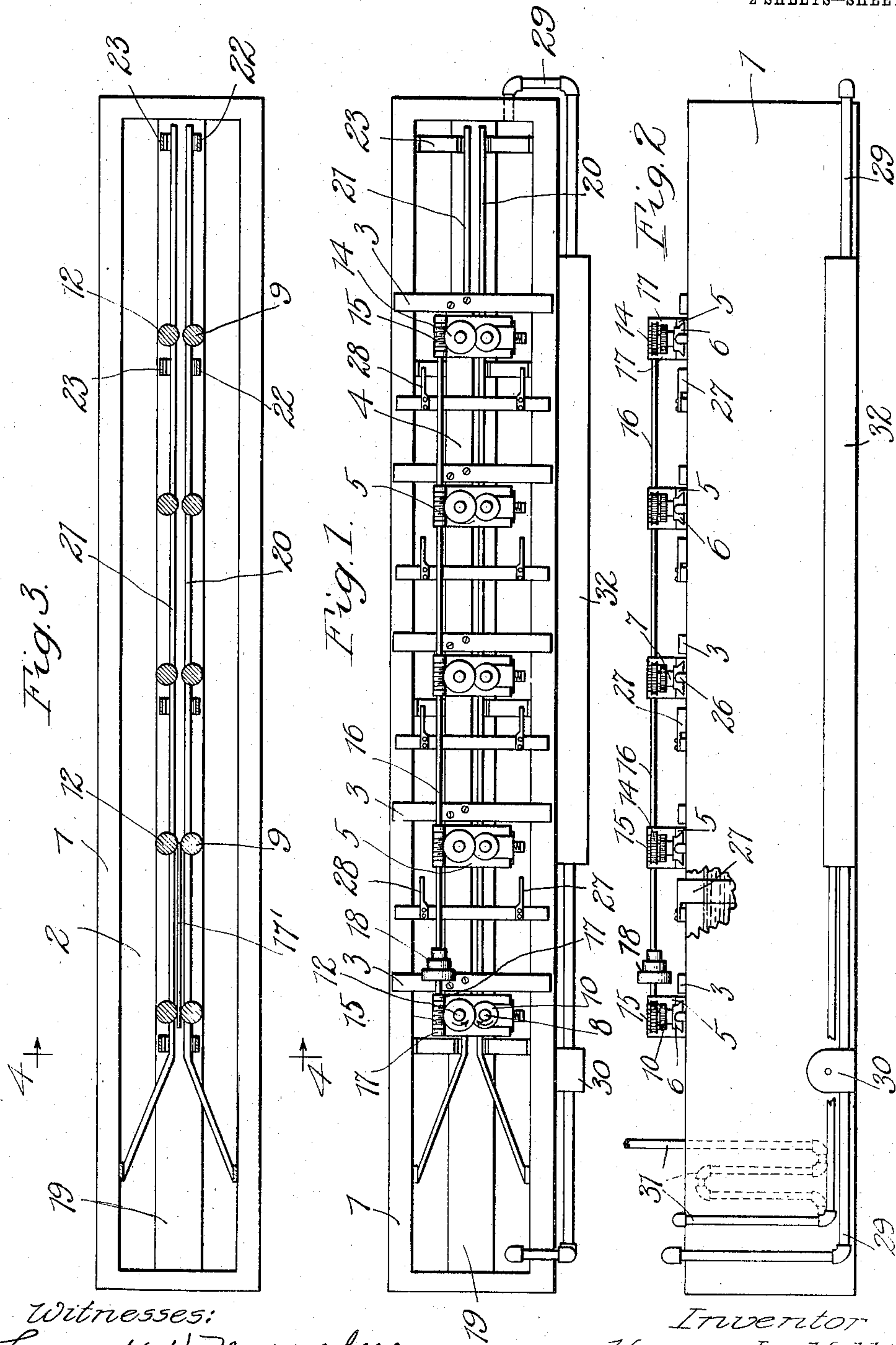


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 APPARATUS FOR ELECTROPLATING METAL SHEETS.
 APPLICATION FILED AUG. 1, 1907.

900,169.

Patented Oct. 6, 1908.

2 SHEETS—SHEET 1.



Witnesses:
 Leonard W. Novander,
 George C. Higham.

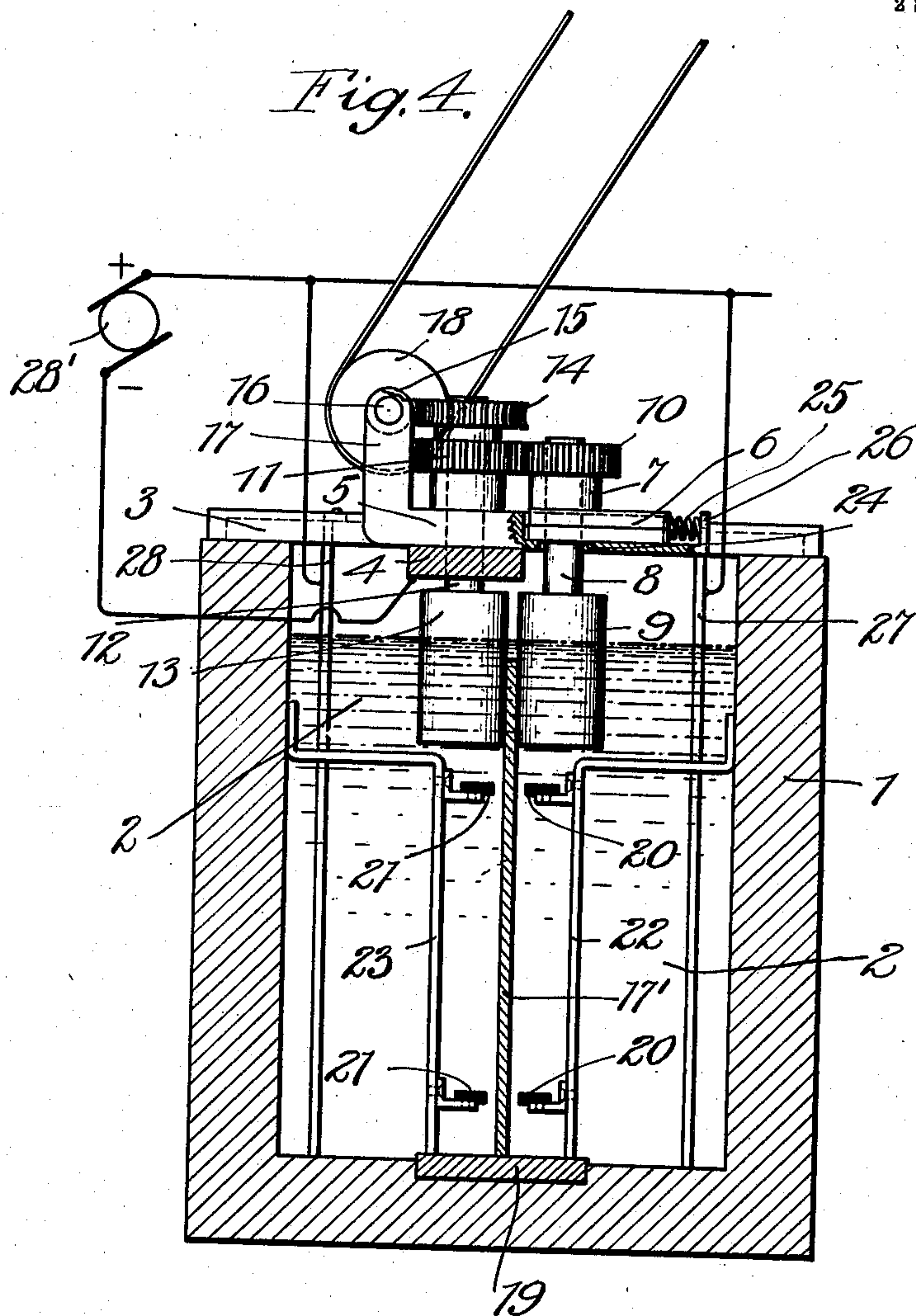
Inventor
 Henry L. Hollis
 By Charles A. Brown,
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UNITED STATES PATENT OFFICE

HENRY L. HOLLIS, OF CHICAGO, ILLINOIS.

APPARATUS FOR ELECTROPLATING METAL SHEETS.

No. 900,169.

Specification of Letters Patent.

Patented Oct. 6, 1908.

Application filed August 1, 1907. Serial No. 386,523.

To all whom it may concern:

Be it known that I, HENRY L. HOLLIS, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Apparatus for Electroplating Metal Sheets, 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.

My invention relates to apparatus for electroplating metal sheets and consists in providing suitable mechanism for conveying the sheets vertically through a bath.

My invention contemplates the provision of a plurality of vertical rotatable rollers associated with driving mechanism and which are so disposed with relation to each other as to convey the sheets through the bath when motion is imparted thereto, these rollers being spaced so that one set of rollers engages the sheet before the preceding set releases it, and in this way securing a continuous movement of the sheet through the bath.

One of the main objects in the employment of my invention is to obtain a complete and uniform coating on the entire surfaces of the sheets of metal as they are submerged and conveyed through a preferably heated solution.

My invention will be better understood, reference being had to the accompanying drawings in which similar reference characters represent like parts throughout the figures.

Figure 1 is a plan view of the apparatus embodying the preferred features of my invention; Fig. 2 is a side elevation thereof; Fig. 3 is a plan view, showing the sets of rollers in section and engaging a sheet of metal, and Fig. 4 is a sectional view taken on line 4—4 of Fig. 3.

The vat or tank 1 constructed preferably of some non-corrosive material contains a solution 2 of any desired ingredients. This vat may be of any desired length to meet various requirements, and extending across the top thereof are cross-pieces 3, 3 to which is secured a bar 4 running lengthwise of the vat, and at suitable distances frames 5, 5 are also secured to this bar. In each of these frames a dove-tailed slide piece 6 is provided each of which has a bearing 7 at one

end thereof and through which passes a stem 8 which extends downwardly through the dove-tailed piece 6 and is secured to the roller 9.

10 designates a pinion which is keyed to the stem 8 and which meshes with a pinion 11 secured to a shaft 12 extending through the frame 5 and terminating in the roller 13 which is disposed opposite but out of engagement with the roller 9. At the upper end of the shaft 12 and above the pinion 11 there is secured a worm wheel 14 meshing with a worm 15 which is mounted upon a shaft 16 journaled in the arms or bearings 17, 17 which extend upwardly from each of the frames 5, 5.

By virtue of the foregoing mechanism the upper portion of plate 17', as shown in Fig. 4, engages between the rollers 9 and 13, and upon motion of the rollers the plate is carried vertically through the bath. In order to secure varying degrees of speed of the rollers, a cone pulley 18 is mounted upon the shaft and may be belted to any source of power. It will be seen that upon rotation of this pulley, there will be consequent rotation of the rollers 9 and 13 to carry the plate 17' forward from one set of rollers to the succeeding set. At the bottom of the vat, the sheets are guided by a strip of insulating material 19, preferably of glass, and also insulated guides 20 and 21 are provided which may be mounted upon vertical members 22, 23 suitably secured to the vat. When a sheet of metal is placed into the vat, it is placed into engagement with the first set of rollers at one end of the vat, the sheet at the same time being guided by the insulating strips 20 and 21. The revolving rollers convey the sheet of metal a sufficient distance so that the succeeding set of rollers will engage it and carry it forward before the preceding rollers are released therefrom, thus obtaining a continuous movement of the sheet through the solution without any interruption.

In order to provide for different thicknesses of sheets, I have shown a slot 24 in each of the frames 5, this slot serving to permit lateral movement of the shaft 8 and of the associated roller. A spring 25 rests against the slide 6 and also an upturned portion 26 of the frame, this spring serving to hold the slide so that the rollers will prop-

erly engage the plate 17'. In the practice of my invention, sheets 27 and 28 suitably supported on cross pieces are adapted to form the anodes and are connected together with the positive terminal of the generator 28', the sheet 17' in this instance forming the cathode, and the current will flow from the positive terminal of the source of current through the conductors to the anodes 27 and 28 through the solution 2, and the plate 17', the roller 13 and the bar 14, back to the negative terminal of the source of current. The metal will thereupon be supplied from the anodes and will be electrolytically conveyed and deposited upon the metal sheets 17' carried between the rollers, or an insoluble anode may be used and the metal obtained from the solution, to which from time to time additions are made. The amount of metal deposited is dependent, of course, upon the current strength and time during which the current flows and also the period in which the sheets remain in the solution or the period which is required for the sheets to be carried from one end of the vat to the other, this being regulated, of course, by the varying speeds of the rollers.

In order to agitate the solution, it may be drawn off through a pipe 29 connected at one end of the vat, and by means of a centrifugal pump 30, the solution is pumped into the other end thereof, thus effecting sufficient circulation of the solution. It is desirable that the solution should be kept at an even temperature, and to this end I employ steam heating coils 31 which pass through the solution and may exhaust into a pipe 32 surrounding the pipe 29. It will thus be apparent that no appreciable amount of heat is lost during the time that the solution is carried through the pipe 29.

It is apparent from the foregoing apparatus that sheets of metal of varying sizes may be coated with tin or other substances to provide a preservative coating, and it is obvious that the mechanism employed conveys the sheets vertically through the bath and equidistantly between the anodes, thus securing uniform plating of the entire surfaces of each sheet which are equally exposed.

While I have shown and described the foregoing mechanism as being supported by the vat, I prefer at times to have this mechanism entirely independent and supported upon an auxiliary framework.

It is apparent that changes may be made from the construction herein shown without departing from the spirit and scope of my invention. I do not, therefore, wish to be limited to the exact construction and arrangements of the parts, but

I desire to secure by Letters Patent:

1. In apparatus for electroplating sheets of metal, the combination of a vat holding a solution, mechanism secured to the top of

said vat for engaging said sheets of metal, and driving means connected with said mechanism, said mechanism being adapted for conveying sheets of metal vertically from one end of the vat to the other end thereof.

2. In apparatus for electroplating sheets of metal, the combination of a vat for holding a metallic solution, mechanism secured to the top of said vat for engaging the upper portion of said sheets, and driving mechanism adapted to be connected therewith, thereby to convey said sheets of metal vertically from one end of the vat to the other end thereof.

3. In apparatus for electroplating sheets of metal, the combination of a vat for holding a solution, a plurality of vertical rotatable members suitably supported at the top of said vat, and driving mechanism adapted to be connected therewith, thereby to convey sheets of metal from one end of the vat to the other end.

4. In apparatus for electroplating sheets of metal, the combination of a vat for holding a solution, a plurality of rotatable rollers mounted in supporting mechanism, said rollers engaging the upper portions of said sheets of metal, and driving mechanism associated with said rollers and adapted to convey said sheets vertically from one end of the vat to the other.

5. In apparatus for electroplating sheets of metal, the combination of a vat for holding a solution, a plurality of vertical rotatable rollers mounted in supporting members, said members being secured to a bar extending longitudinally of the vat, and driving mechanism supported in said frames and adapted to actuate said rollers, said rollers being adapted to engage sheets of metal and when actuated to convey said sheets from one end of the vat to the other end thereof.

6. In apparatus for electroplating sheets of metal, the combination of a vat for holding a solution, a plurality of rotatable rollers mounted in supporting frames disposed at suitable distances longitudinally of said vat, said frames having upwardly extending bearings, a shaft journaled in said bearings, driving means associated with said shaft, said rollers being adapted to engage the upper portions of sheets of metal which are to be conveyed vertically from one end of the vat to the other end thereof.

7. In apparatus for electroplating sheets of metal, the combination of a vat for holding a solution, cross pieces extending across the vat and adapted to support a bar running lengthwise of said vat, a plurality of mounting frames secured to said bar and adapted to journal the upper ends of rollers, pinions secured to said rollers and adapted to be connected with driving mechanism, said rollers being adapted to engage sheets of metal to convey said sheets vertically from

one end of the vat to the other, and insulated guides disposed below said rollers and secured to said vat for guiding said sheets of metal.

5 8. In apparatus for electroplating sheets of metal, the combination of a tank for holding a solution, a plurality of rotatable rollers disposed in sets at the top of said tank, supporting means for said rollers and means associated therewith for adjusting the relative positions of said rollers, and guides of insulation disposed below said rollers to guide the sheets of metal as they are conveyed vertically by said rollers from one end of the tank to the other.

10 9. In apparatus for electroplating sheets of metal, the combination of a tank for holding a solution, a plurality of vertically rotatable rollers disposed in sets at the top of said tank, supporting means for said rollers and means associated therewith for adjusting the relative positions of said rollers, guides of insulation disposed below said rollers to guide the sheets of metal as they are conveyed by said rollers from one end of the tank to the other, and insulating means at the bottom of said tank for supporting said sheets of metal.

15 10. In apparatus for electroplating sheets of metal, the combination of a tank for holding a solution, a plurality of vertically rotatable rollers disposed in sets at the top of said tank, supporting means for said rollers and means associated therewith for adjusting the relative positions of said rollers, guides of insulation disposed below said rollers to guide the sheets of metal as they are conveyed by said rollers from one end of the tank to the other, and a strip of glass disposed at the bottom of said tank and adapted for supporting said sheets of metal as they are conveyed from one end of the tank to the other end thereof.

20 11. In apparatus for electroplating sheets of metal, the combination of a vat for holding a solution, a plurality of vertical rotatable rollers disposed in pairs at the top of said vat, supporting means for said rollers and means associated therewith for adjusting the relative positions of said rollers, guides of insulation disposed below said rollers to guide the sheets of metal as they are conveyed by said rollers from one end of the vat to the other, and a strip of insulating material disposed at the bottom of said vat and adapted for supporting said sheets of metal as they are conveyed vertically from one end of the vat to the other end thereof.

25 12. In apparatus for electroplating sheets of metal, the combination of a vat for holding a solution, a plurality of vertical rotatable rollers disposed in pairs at the top of said vat, supporting means for said rollers and means associated therewith for adjusting

the relative positions of said rollers, said rotatable rollers and the associated parts therewith being disposed independently of said vat, guides of insulation disposed below said rollers to guide the sheets of metal as they are conveyed by said rollers from one end of the vat to the other, and a strip of glass disposed at the bottom of said vat and adapted for supporting said sheets of metal as they are conveyed vertically from one end of the vat to the other end thereof.

30 13. In apparatus for electroplating sheets of metal, the combination of a tank for holding a solution, a plurality of vertical rotatable rollers disposed in sets at the top of said tank, driving mechanism connected with said rollers, said rollers and driving mechanism being supported upon an auxiliary framework, guides of insulation disposed below said rollers, to guide the sheets of metal as they are conveyed by said rollers from one end of the tank to the other, and a strip of insulating material disposed at the bottom of the tank and adapted for supporting said sheets of metal as they are conveyed vertically from one end of the tank to the other end thereof.

35 14. In apparatus for electroplating sheets of metal, the combination of a vat for holding a solution, a plurality of vertical rotatable rollers adapted to engage the upper portions of the sheets of metal and disposed in sets at the top of said vat, supporting means for said rollers and means associated therewith for adjusting the relative positions of said rollers, all of said parts being supported upon auxiliary mechanism independent of said vat, guides of insulation disposed below said rollers to guide the sheets of metal as they are conveyed by said rollers from one end of the vat to the other, and a strip of glass disposed at the bottom of said tank, adapted for supporting said sheets of metal as they are conveyed vertically from one end of the tank to the other end.

40 15. In mechanism for electroplating metal sheets, the combination of a vat for holding a solution, means for conveying said sheets vertically and submerged through the solution to thereby completely and uniformly coat the entire surfaces of the sheets of metal.

45 16. In mechanism for electroplating metal sheets, the combination with a vat for holding a solution, conveying mechanism for carrying said sheets vertically and submerged through the solution, anodes disposed equidistantly at each side of the metal sheets, said sheets forming the cathodes, and a source of current connected therewith for conveying metal from the anodes to the sheets of metal.

50 17. In mechanism for electroplating metal sheets, the combination with a vat for hold-

ing a solution, vertical rotatable rollers associated with driving mechanism for conveying said sheets vertically and submerged through the solution, and means associated
5 therewith for completely and uniformly coating the entire surface of said sheets of metal.

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

HENRY L. HOLLIS.

Witnesses:

A. HUNTER,
LEONARD W. NOVANDER.