June 23, 1931. A. F. W. THORMANN 1,811,409

ELECTROPLATING APPARATUS

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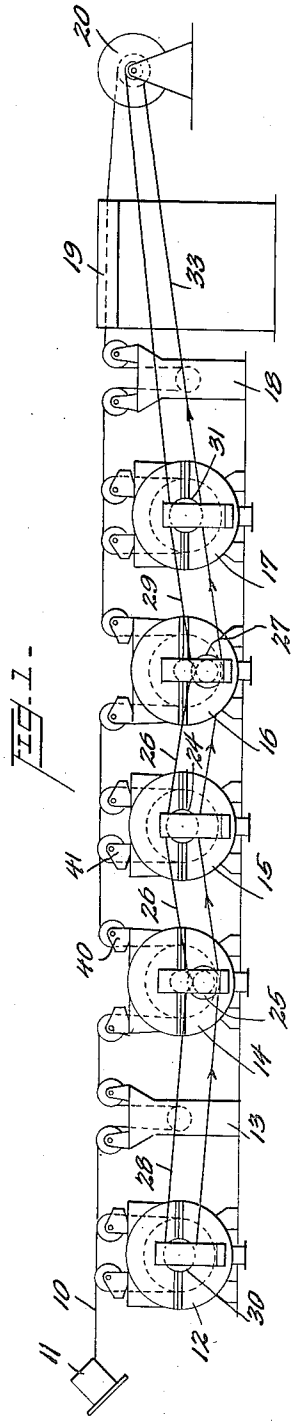


FIG. 1.

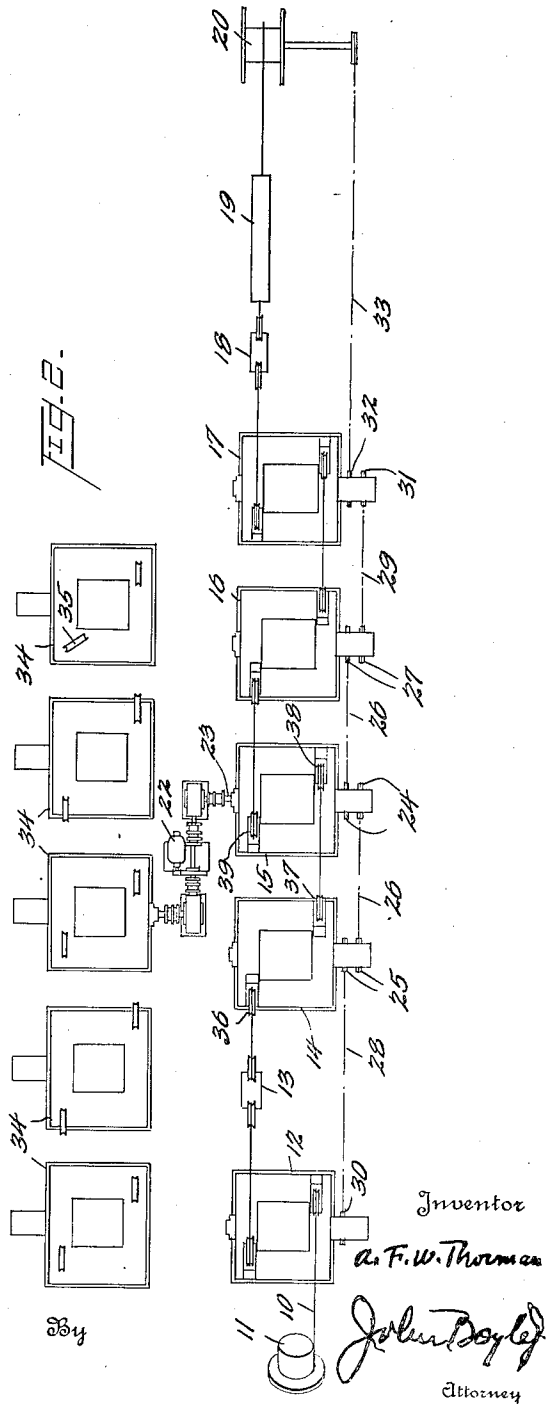


FIG. 2.

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ELECTROPLATING APPARATUS

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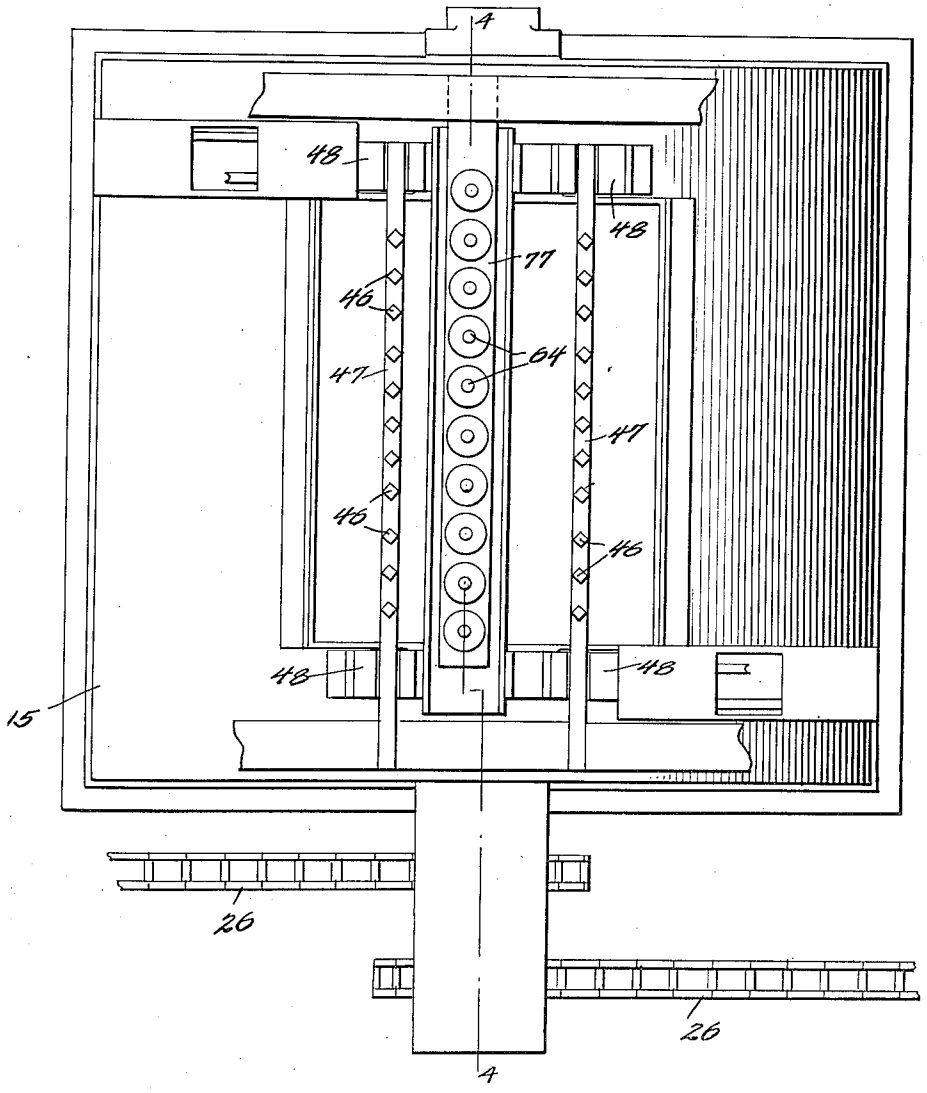


FIG. 3.

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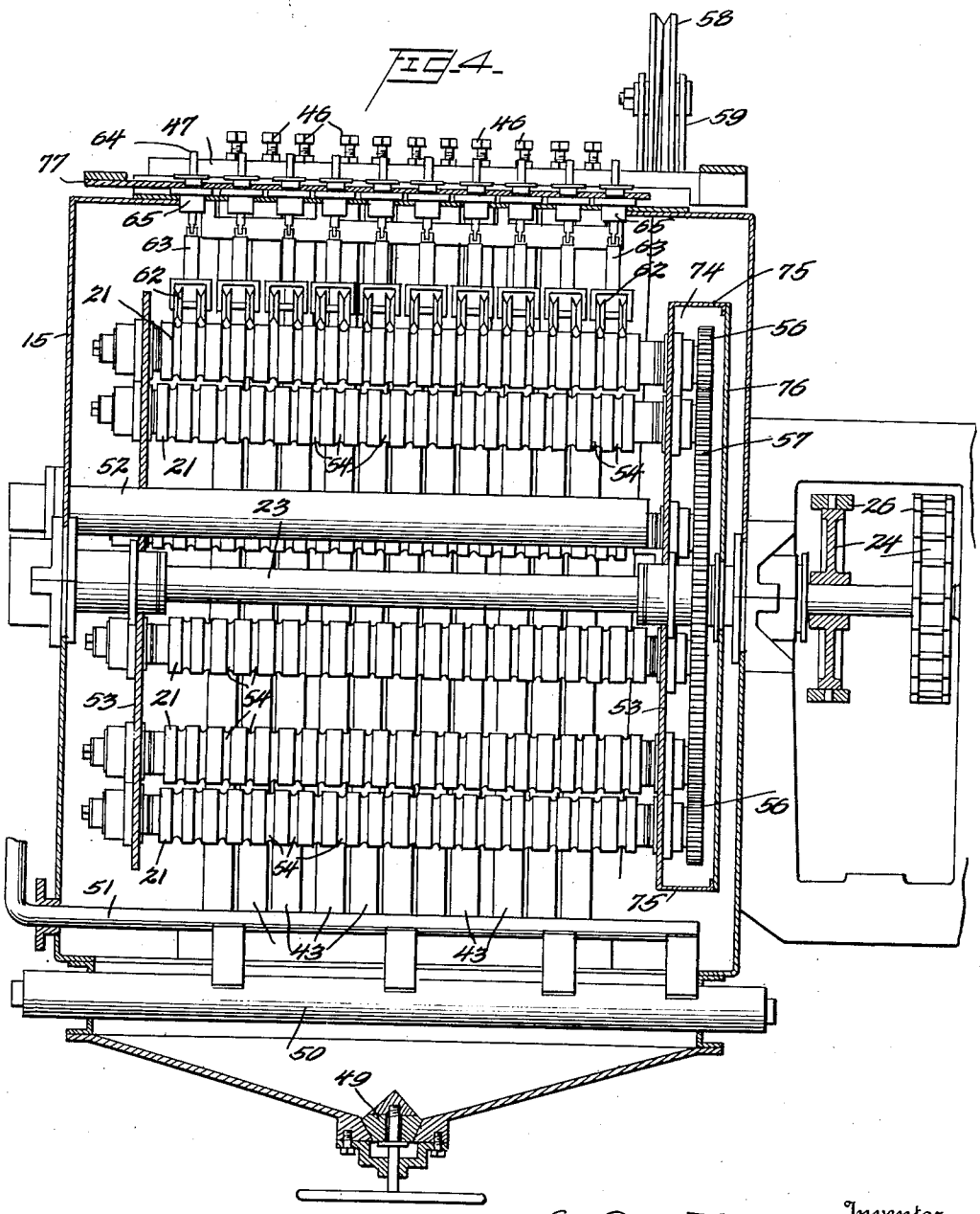
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June 23, 1931. A. F. W. THORMANN 1,811,409

ELECTROPLATING APPARATUS

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FIG. 4.



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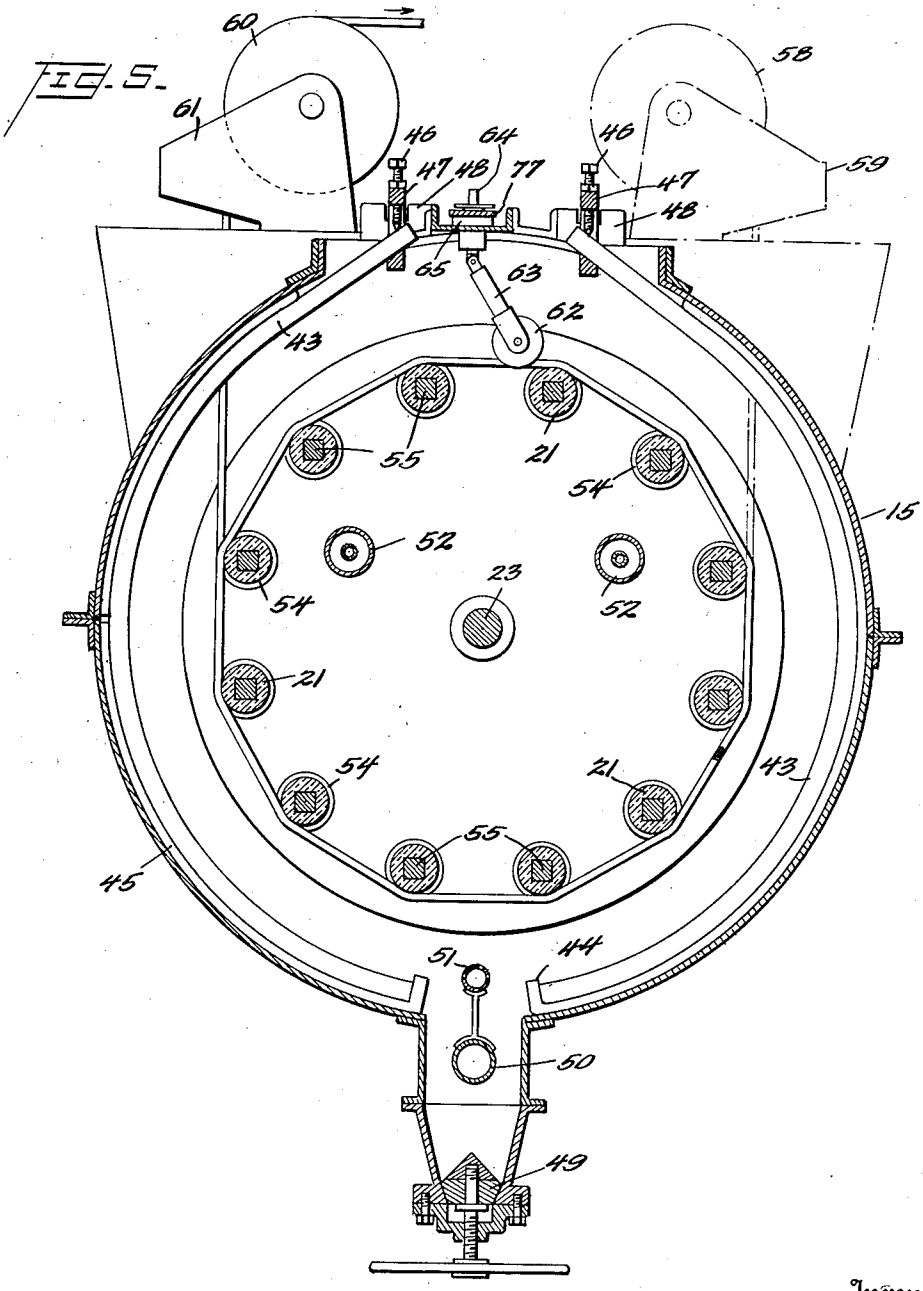
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June 23, 1931. A. F. W. THORMANN 1,811,409

ELECTROPLATING APPARATUS

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FIG. 5.



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June 23, 1931. A. F. W. THORMANN 1,811,409

ELECTROPLATING APPARATUS

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FIG. 6.

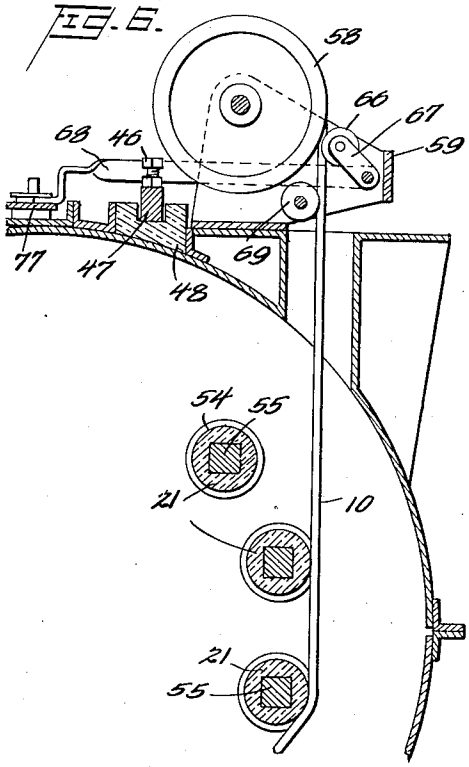


FIG. 7.

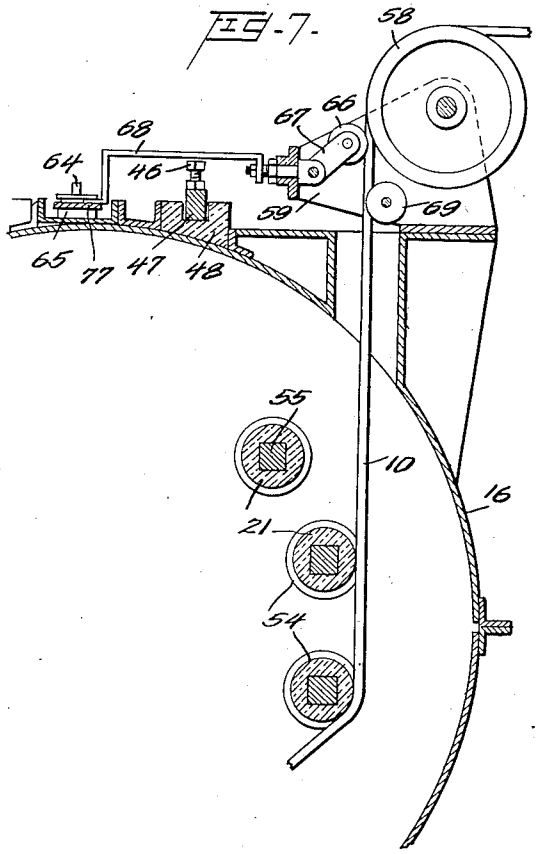


FIG. 8.

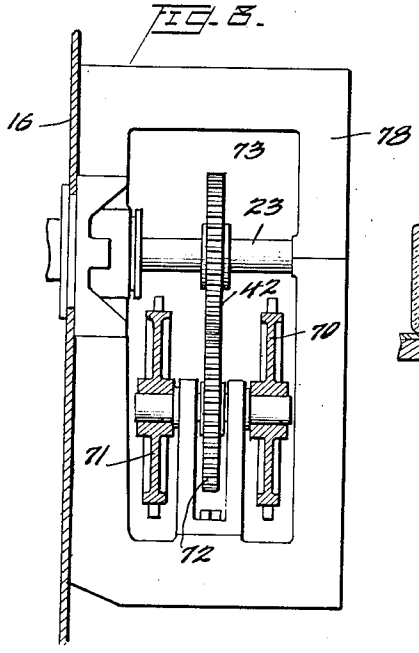
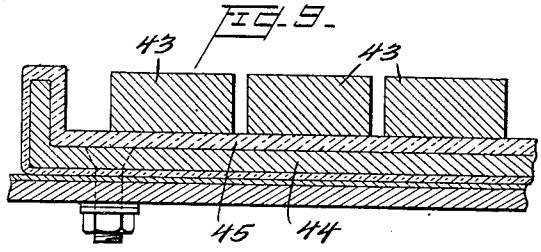


FIG. 9.



A. F. W. Thormann Inventor

By John Boyle Jr.

Attorney

Patented June 23, 1931 1,811,409

UNITED STATES PATENT OFFICE

ALBERT F. W. THORMANN, OF PITTSBURGH, PENNSYLVANIA

ELECTROPLATING APPARATUS

Application filed June 29, 1929. Serial No. 374,787.

My invention relates to an apparatus for electroplating steel wire rope and similar long strands in a continuous working process. I will explain the construction and operation of my machine in connection with wire rope only by way of illustration, it being understood that other strands such as hollow woven or braided steel cable, also plain wire, can be coated this way with suitable adaptation of the apparatus. The conventional steel wire rope has usually a hemp center and twisted around this are a plurality of metal strands, each strand being made of a number of wire filaments. The rope is flexible and my purpose is to produce such an article as is disclosed in my Patent No. 1,766,201 dated June 24, 1930.

Referring now to the drawings for a more complete disclosure of the invention:

Fig. 1 is an elevation of the plant arrangement,

Fig. 2 is a plan of a modified plant arrangement,

Fig. 3 is a plan of one of the plating tanks,

Fig. 4 is a vertical transverse section of a plating tank on the line 4—4 of Fig. 3,

Fig. 5 is a vertical-transverse section of a plating tank,

Figs. 6 and 7 are fragmentary sectional elevations of the tops of the tanks,

Fig. 8 is a transverse sectional elevation of the reversing drive,

Fig. 9 is a detail view of the insulated supporting plate for the anodes.

The wire rope 10 to be coated is placed on the reel 11 and passes first into an electrolytic copper cyanide tank 12, in which the steel wire rope is cleaned and also gets a flashing of copper. From the tank 12 the rope passes through a rinsing tank 13 and then successively through electrolytic copper sulfate tanks 14, 15, 16 and 17 where it receives its electrolytic copper deposit of the desired thickness. The wire then passes through another rinsing tank 18, a drying oven 19 and is wound up on the reel 20.

Within the electrolytic tanks are revolving rolls 21, of glass or a similar insulating material which are rotated through the medium of an electric motor 22 coupled to a shaft 23, which is provided with sprockets 24, engaging sprocket chains 26, which rotate the sprockets 25, and 27 and through the medium of the sprocket chains 28 and 29 rotate the sprockets 30 and 31. The rotation of sprocket 31 causes the rotation of sprocket 32 and the sprocket chain 33 connected therewith rotates the winding reel 20 which, as is usual in winding on reels the burden of which gradually increases in circumference, is frictionally mounted on its spindle to permit of a degree of slip with reference to the travel of the rope on the various rods of the drums. The purpose of this arrangement of parts is to cause a slow forward movement of the wire rope through the various baths, and, because of the action of the grooved glass guiding rods, later described at the same time rotating the rope about its longitudinal axis so as to produce an even electrodeposited coat thereon. This gradual axial rotation is imposed by the spiral winding of any stiff metal body such as a wire rope when it is held against a drum on which the whole is being wound, the blank necessarily gradually turning over on its side, so to say, as it goes round and round the drum, advantage of which principle is utilized by the inventor, as is later described in connection with the description of the stationary winding drums contained in the various tanks containing the electrolyte used in coating the rope. If desired, an additional number of tanks 34 can be utilized and suitably coupled up to the motor 22. The wire would then pass from the last roller in tank 17 diagonally across to the roller 35 and thence in and out of the successive tanks 34. It will be noted that the wire 10 enters and leaves the successive electrolytic tanks, alternately from opposite corners. Referring to tank 14, the wire enters over the roll 36 and leaves over roll 37 and in tank 15 enters over the roll 38 and leaves over roll 39 and so on. It will also be noted that the brackets 40 and 41 on the tanks 14 and 15 are in reversed position for this reason.

The reversal in successive tanks of the

direction of rotation of the several drums takes advantage of the fact that woven wire rope needs, while in contact with the plating electrolyte, to be bent in various directions to insure the effective opening of the texture of the rope to the extent of promoting entrance of the electrolyte as far as possible into the interior of the rope, and so more effectively protecting the rope with the applied coating.

The various sprocket chains move in the direction shown by the small arrows. In the tanks 12, 15 and 17 the sprockets are mounted on the axial shafts of the tanks but on the tanks 14 and 16 a reversing gear 42 is provided, more particularly as shown in Fig. 8.

Referring now to the particular construction of the electrodepositing tanks. the cleaning tank 12 and the copper sulphate tanks 14, 15, 16 and 17 are in general the same, except that steel anodes may be used for a first cleaning in the first tank and copper anodes in a second cyanide tank for a second cleaning and copper flashing.

A number of curved copper anodes 43 are used and are supported on a plate 44 provided with insulation 45. The anodes are held in position by the contact screws 46 supported in the conducting bar 47 which is mounted in the insulator 48. At the bottom of the tank is a suitable clean out valve 49, a heating pipe 50, and an agitating air pipe 51 and water cooling pipes 52.

Mounted within the tank is a stationary drum having the parallel sides 53, in which are mounted to rotate, the glass rods 21. The glass portion is a hollow tube having parallel grooves 54 therein, and this tube is mounted on a square shaft 55 and the two together rotate in bearings carried by the sides 53. On reference to Fig. 5 it will be apparent that the drum comprises 12 of these grooved rods and that the winding as a whole on these rods constitutes what in end view is a twelve-sided polygon. It is also clear, from Fig. 4, that what has already been said as to the rotational tendency of spiral windings in general, is particularly true when the rope is bound by the groove in each successive rod, and held at the rotational phase at which it has arrived at that point. As the rod continues its feeding rotation, the point of rope held by it is exposed on its top to the electrolyte and then additionally partially turned over as it advances to the next groove, thus insuring positively regular applications of the electrolyte to all successive portions, the blank for the moment of its binding in the groove being held without slip which could not assuredly be the case if the rods exercised no positive gripping action on the rope. The grooves 54 on adjacent rollers are out of alignment in a graduated manner so that, as the wire rope in the grooves progresses forwardly, it rotates about its own axis, thus exposing gradually to the copper solution the entire outer surface of the wire rope. One end of each glass roller shaft has keyed to it a spur gear 56. Keyed to the driving shaft 23 is a large spur gear 57, meshing with the gears 56, rotation of the former causing thereby rotation of the glass rods, thus causing the wire rope to travel through the bath. The gears 56 and 57 are protected from the electrolyte by means of an enclosing casing 74 formed by a side wall 53 of the drum end walls 75 and another partition 76.

The wire rope 10 passes over a sheave 58 supported in a bracket 59 at one corner of the tank, then enters the tank and forms a spiral as it is wrapped around the glass rollers and leaves the tank and passes over another roller 60 supported in the bracket 61 at the other corner of the tank. The cathode connection in the tank consists of metal rollers 62, in contact with the rope, mounted in an arm 63, pivoted to the post 64 which post is mounted in an insulator 65 and in contact with the conductor bar 77. A similar roller 66 mounted in the pivoted arm 67 and in circuit with a connecting bar 68 or similar conductor provides an outside cathode connection. A guide roller 69 of insulated material may be carried by the brackets 59 and 61.

The reversing gear 42 used on tanks 14 and 16 comprises two sprockets 70 and 71, keyed to the same shaft as the spur gear 72. This spur gear meshes with another spur gear 73 that is keyed to the driving shaft 23 so that the driving shafts and hence the glass rollers of the tanks 14 and 16 rotate in opposite directions to the other tanks. The sprockets are supported within a casing 78.

Operation

The various tanks having been filled with the proper kind of solution, the electric motor having been started and the depositing current turned on the electrolytic tanks, the glass rollers will begin to slowly rotate about their own axis. The wire rope will be slowly advanced through the electrolytic bath and a deposit of copper will be electroplated on it. The offset grooves in the glass rollers will cause the wire to rotate slightly about its axis thus presenting gradually all sides of the rope to electroplating solution.

From the above description it will be seen that I have produced an arrangement by which it is possible to produce a uniform adherent coating of electrolyte copper on a flexible wire rope in a continuous working process, and while I have shown and described a specific embodiment, it will be understood that I reserve the right to all changes properly falling within the scope and spirit of the appended claims.

What I claim is:

1. A continuous working apparatus for electrodepositing a copper coating on wire rope or similar products, comprising a tank for the electrolyte, a drum in the tank, rotary rods carried by the drum, rope seizing and guiding grooves in the rods, the rope being spirally wound around the drum in the grooves and successive grooves in adjacent rods being relatively offset conformably to the spiral path followed by the rope and means for rotating the rods.

2. A continuous working apparatus for electrodepositing a copper coating on wire rope or similar products, comprising a tank for the electrolyte, a drum in the tank, rotary rope seizing and guiding rods carried by the drum, grooves in the rods, the grooves in adjacent rods being out of alignment conformably to the spiral path of the rope, the rope being in the grooves and means for rotating the rods to advance the rope and revolve the rope about its longitudinal axis.

3. An electroplating tank comprising a drum having parallel sides, a plurality of parallel rods mounted therein, grooves in the said rods for frictionally engaging a wire rope or the like the said grooves in adjacent rods being out of alignment, and means for simultaneously rotating all the rods.

4. A continuous working apparatus for electrodepositing metallic coatings on wire ropes or similar products, comprising a tank for an electrolyte, means for advancing the product through the tank, and a succession of guides in the tank so engaging the product while advancing through the tank as to compel its simultaneous advance in a substantially polygonal spiral and its regular rotation about its axis.

5. A continuous working apparatus for electrodepositing metallic coatings on wire rope or similar products, comprising a tank for an electrolyte, means for advancing the product through the tank, a succession of rotary guides in the tank so engaging the product while advancing through the tank as to compel its simultaneous advance in a substantially polygonal spiral and its even rotation about its axis, and means for rotating the guides to insure travel of the product substantially without slip while in contact with the guides.

In testimony whereof I affix my signature.

ALBERT F. W. THORMANN.