(No Model.) 2 Sheets—Sheet 1.

M. PERREUR-LLOYD.

MANUFACTURE OF METALLIC ARTICLES BY ELECTROLYSIS.

No. 560,533. Patented May 19, 1896.

FIG: 1.

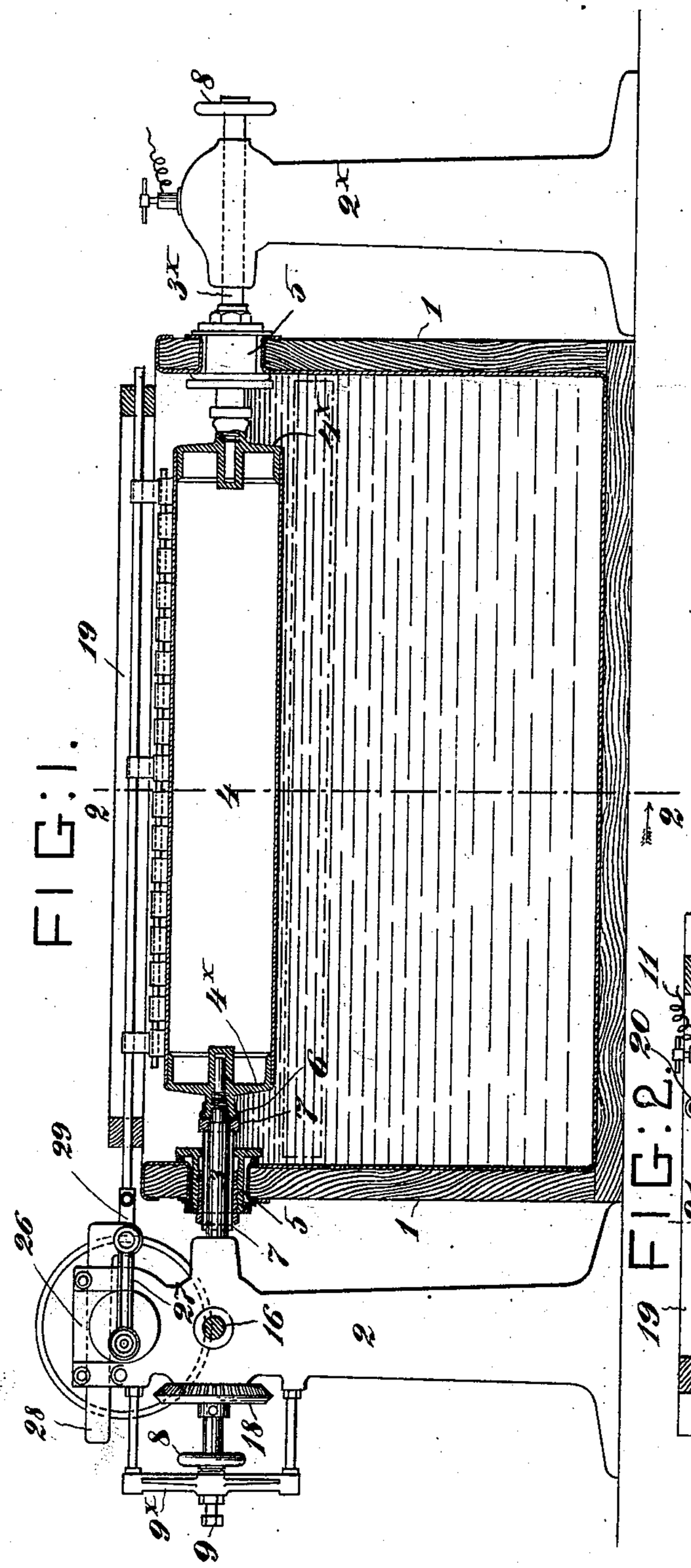


FIG: 5.

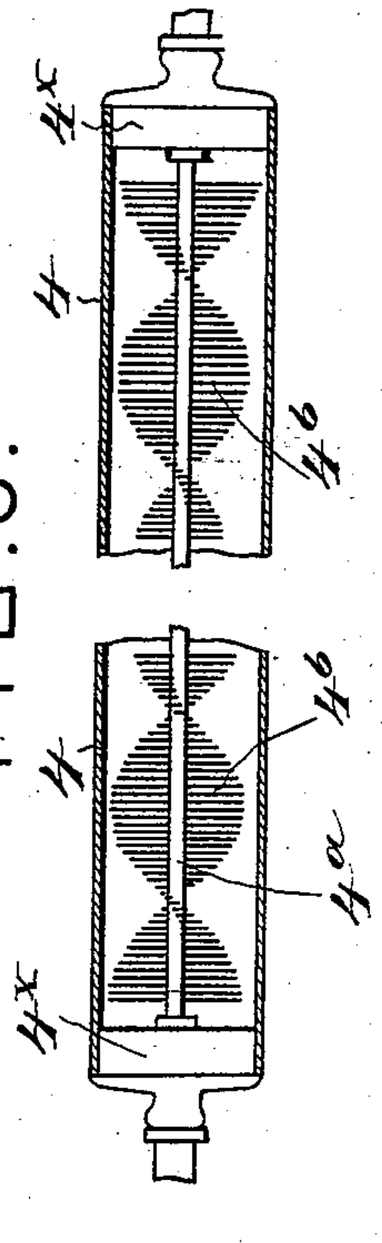
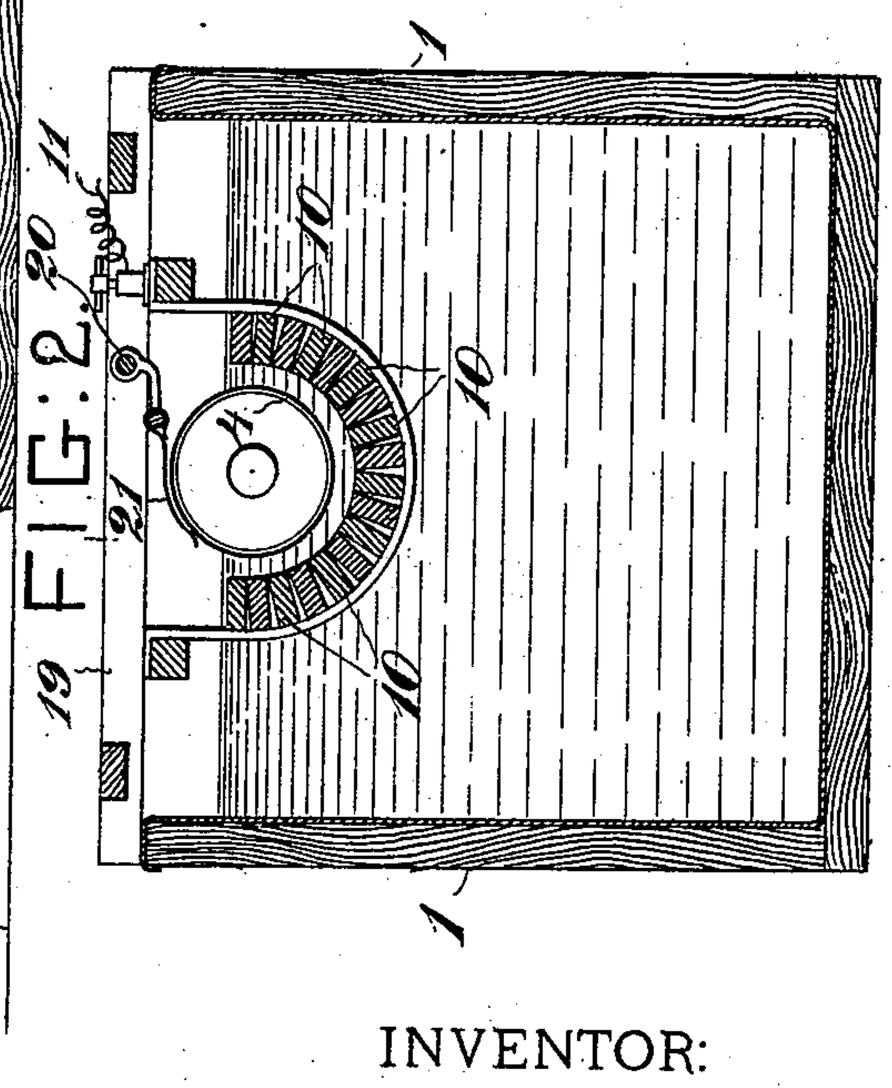


FIG: 2.



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(No Model.)

2 Sheets—Sheet 2.

M. PERREUR-LLOYD.

MANUFACTURE OF METALLIC ARTICLES BY ELECTROLYSIS.

No. 560,533. Patented May 19, 1896.

FIG. 3.

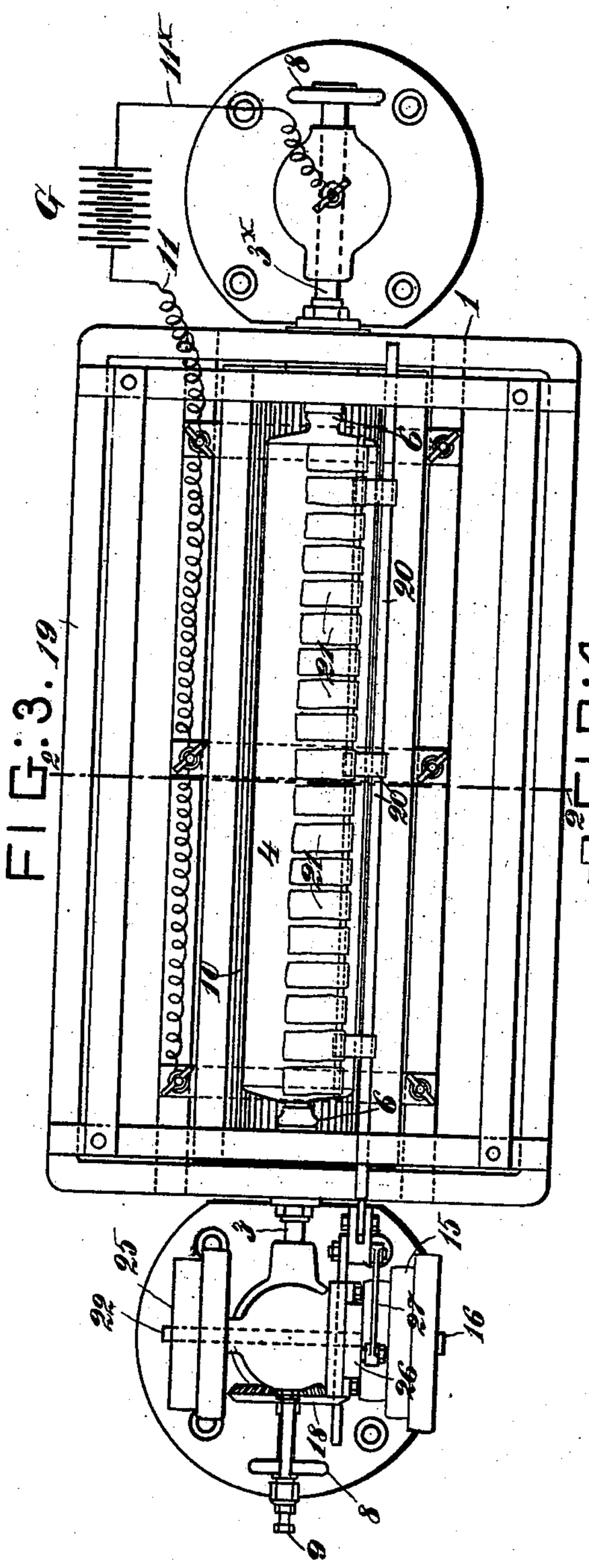
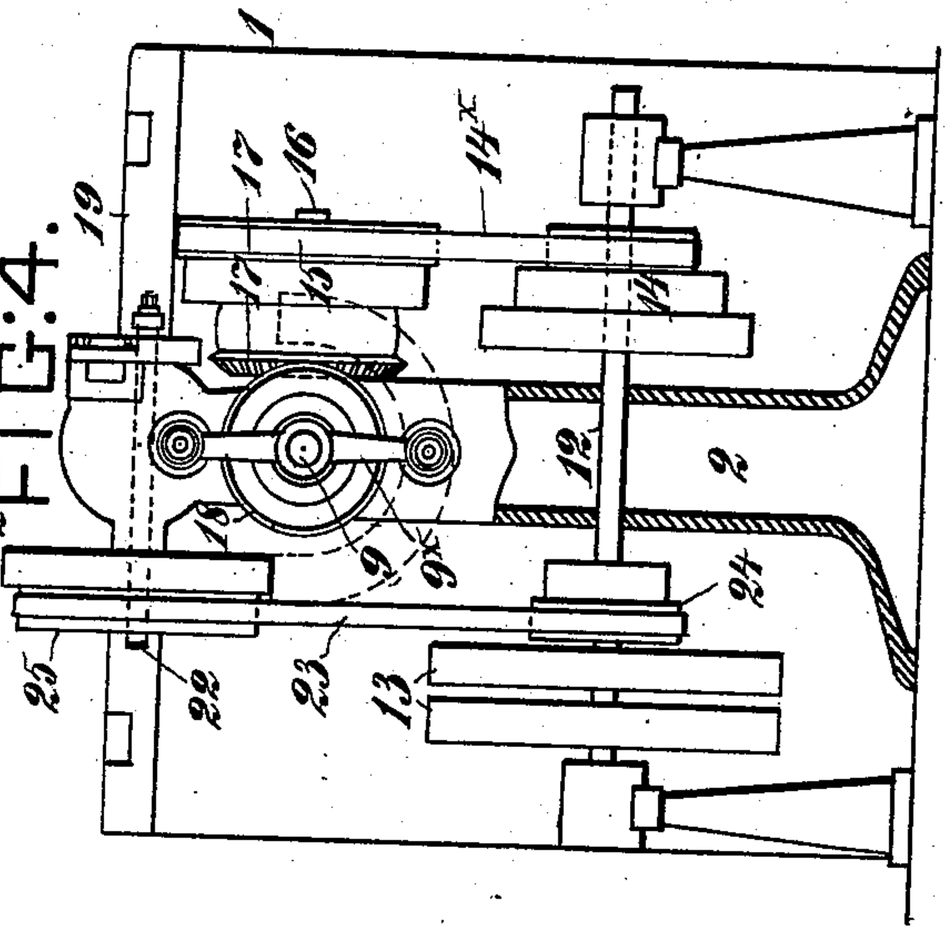


FIG. 4.



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UNITED STATES PATENT OFFICE.

MARCEL PERREUR-LLOYD, OF PARIS, FRANCE, ASSIGNOR TO EMILIEN DUMOULIN, OF SAME PLACE.

MANUFACTURE OF METALLIC ARTICLES BY ELECTROLYSIS.

SPECIFICATION forming part of Letters Patent No. 560,533, dated May 19, 1896.

Application filed September 26, 1895. Serial No. 563,783. (No model.) Patented in France March 11, 1895, No. 245,699.

To all whom it may concern:

Be it known that I, MARCEL PERREUR-LLOYD, a citizen of the French Republic, residing at Paris, France, have invented certain new and useful Improvements in the Manufacture of Metallic Articles by Electrolysis, (for which a patent has been granted in France to my assignee, Emilien Dumoulin, No. 245,699, dated March 11, 1895,) of which the following is a specification.

This invention relates to improvements in the manufacture of articles—such as tubes, sheets, wire, and the like—from copper and other metals by electrolysis. A metal which is obtained in a pure state by electrodeposition has always a crystalline structure and an irregular surface. To overcome these defects and to deposit the metal at once in a finished condition—for example, in the form of a finished tube, sheet, wire, &c.—I prevent the molecules from gradually grouping themselves on the roughnesses, asperities, or projections of the surfaces of the cathode, whereby the formation of an irregular surface is avoided. If, before causing the electric current to pass, these asperities of the surface of the cathode have been insulated, or if the deposit has been prevented at these points by the interposition of a very thin coating, then the molecules will be deposited around the said irregularities or asperities in the hollow parts as long as the said irregularities remain insulated, or if the deposit is simply retarded at these points the molecules will be deposited on the neighboring parts, so that when the insulating material or the coating is removed on the filling up of the cavities or hollows to the level of the asperities the latter will be covered in their turn.

In carrying out my invention I prefer to use a cylindrical cathode, rotatively mounted in the vessel containing the electrolyte, and to apply to the upper part or surface of the same as it rotates a body or substance impregnated with fatty matter more or less adherent by means of what I call "impregnators," which have a to-and-fro movement longitudinally of the cathode or mandrel. The body bearing the fatty matter will be so composed as to yield up the insulating material without disintegration—that is to say, the fatty and insulating matters are taken up only by the asperities of the cylindrical cathode when they pass the same. The asperities or roughnesses are thus impregnated or coated in the same manner as type is inked in printing. This impregnation or coating will take place each time the asperities come in contact with the impregnating material, until in consequence of the said impregnation, or of the prevention of the deposit, the hollows next the asperities have been filled to the level of the latter. The fatty matter scraped off by the points or asperities becomes gradually oxidized in the bath as the points disappear from the filling up around them of the deposited metal, or it is finally rubbed off by the friction of the surface with the impregnators themselves, as these latter yield no fatty matter to a smooth surface, but only to points or asperities which scratch them as they move under them. As the impregnation or coating of the roughnesses can be regulated by the pressure put upon the impregnating-bodies, the quantity of insulating material which adheres to the said projections or roughnesses of the cathode can be regulated in the same way. The insulating material, so to say, filters the molecules of the metal, and the latter are deposited in a fine state of division, which explains the qualities of homogeneity possessed by the metal thus obtained. The materials which are most suitable for the impregnating-body are organic and fatty bodies—animal, vegetable, or mineral—or bodies which contain such fats. As examples I may mention animal membranes or their extracts, (albumin, fibrin, &c.,) muscles, intestines, bladder, and the like. The impregnators are preferably operated to move longitudinally in order that all the parts of the cathode may be impregnated or coated. This movement must, however, be independent of that of the cathode.

In the accompanying drawings I have shown, by way of example, an apparatus adapted for use in manufacturing metal sheets according to this invention. For the manufacture of tubes the apparatus is the same except that the mandrel or cathode is longer and of less diameter.

In the drawings, Figure 1 is a longitudinal vertical section of the apparatus. Fig. 2 is

a transverse vertical section of the same in the plane of the line x^2 in Figs. 1 and 3. Fig. 3 is a plan of the apparatus. Fig. 4 is an end view of the apparatus. Fig. 5 is a sectional view of a hollow mandrel or cathode in which a brush-like conductor is employed to distribute the current more evenly.

1 is a suitable tank or vessel to contain the bath or liquid electrolyte, and at the respective ends of said tank are set metal standards 2 and $2^{\times}$, in which are rotatively mounted, respectively, metal arbors or removable journals 3 and $3^{\times}$ for the mandrel or cathode 4. This cathode is a metal tube or cylinder with heads $4^{\times}$, each of which has in it a screw-threaded socket to receive the screw-threaded inner end of the arbor or journal. The mandrel 4 is inside of the tank 1 and the arbors $3\,3^{\times}$ pass into the tank through stuffing-boxes 5 in the respective ends of the same. The stuffing-boxes are allowed some play (about one centimeter) in the walls of the tank. To prevent the deposit of metal on the portion of the arbor which projects into the tank, I employ an insulating-covering 6 on the neck of the mandrel-head $4^{\times}$ and a ring and sleeve 7 of insulating material which incloses the arbor and extends out through the stuffing-box. The arbors 3 and $3^{\times}$ each has on its outer end a hand-wheel 8. The arbor $3^{\times}$ is left free to be unscrewed from the mandrel and drawn out; but the arbor 3 is provided with an adjustable limiting-stop 9, comprising a set-screw in a frame $9^{\times}$ on the standard 2.

The anode 10 (seen best in Fig. 2) is suspended in the electrolyte below the cathode 4 and is connected with one pole of a generator G, Fig. 3, by a wire 11, while the cathode is connected, through the arbor $3^{\times}$, standard $2^{\times}$, and wire $11^{\times}$, with the other pole of said generator.

Rotary motion is imparted to the mandrel or cathode by the mechanism seen in Fig. 4 and at the left in Figs. 1 and 3. On a driving-shaft 12, provided with tight and loose pulleys 13, are step or cone pulleys 14, connected by a belt $14^{\times}$ with corresponding cone-pulleys 15 on a stud or arbor 16 on the standard 2. On the pulleys 15 is fixed a bevel-wheel 17, which gears with a similar wheel 18 on the arbor or journal 3.

In the top frame 19, on the tank 1, is mounted a slide-rod 20, which extends lengthwise of the tank above the cathode 4 and carries the impregnators 21, which rest on the rotating cathode, as seen in Fig. 2. A reciprocating endwise movement is imparted to the rod 21 and the impregnators from a counter-shaft 22, mounted in the standard 2 and driven by a belt 23 over pulleys 24 and 25 on the main shaft and counter-shaft, respectively. On the shaft 22 is a crank 26, the pin of which is coupled by a connecting-rod 27 to a slide or cross-head guide 28, mounted on the standard 2, and this slide 28 is coupled by a link 29 to the slide-rod 20. Thus rotation of the counter-shaft imparts the desired slow to-and-fro motion to the impregnators.

In cases where the heads of the mandrel or cathode 4 are at a considerable distance apart—as, for instance, in the manufacture of tubes—I provide in the axis of the mandrel, as seen in Fig. 5, a metal rod 4^{a}, connecting the two heads $4^{\times}$, the said rod being a good conductor which distributes the current evenly along the length of the tubular cathode by means of radial copper wires 4^{b}, as shown. These wires may be spirally arranged.

The apparatus is employed as follows: The respective ends of the mandrel 4 are placed to register with the journals or arbors 3 and $3^{\times}$, and the latter are then screwed into the ends of the same by means of the hand-wheels 8. The stop 9 is then set in position, and the apparatus is ready for work.

Having thus described my invention, I claim—

1. The herein-described method of effecting the electrodeposition of metal on a cathode, in a smooth, regular and finished manner, which consists in applying to the slight roughnesses or asperities on the surface of the cathode a very thin coating of fatty matter whereby the deposition on the surfaces so coated is more or less retarded or prevented and the molecules of the metal deposited are allowed to fill up the adjacent depressions, and simultaneously passing the electric current through the electrolyte, substantially as set forth.

2. An apparatus for effecting electrodeposition, comprising a vessel to contain a liquid electrolyte, a cylindrical cathode rotatively mounted in said vessel, means for rotating the said cathode in a uniform manner, and a reciprocating impregnator containing fatty matter arranged over the upper part of said cathode in position to touch the metal deposited thereon and arranged to move in a path parallel with the axis thereof, said impregnator being adapted to apply an insulating fatty substance to the roughness on the surface of the cathode, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

MARCEL PERREUR-LLOYD.

Witnesses:

EMILIEN DUMOULIN,

RUYMOND PERREUR-LLOYD.