No. 726,659. PATENTED APR. 28, 1903.

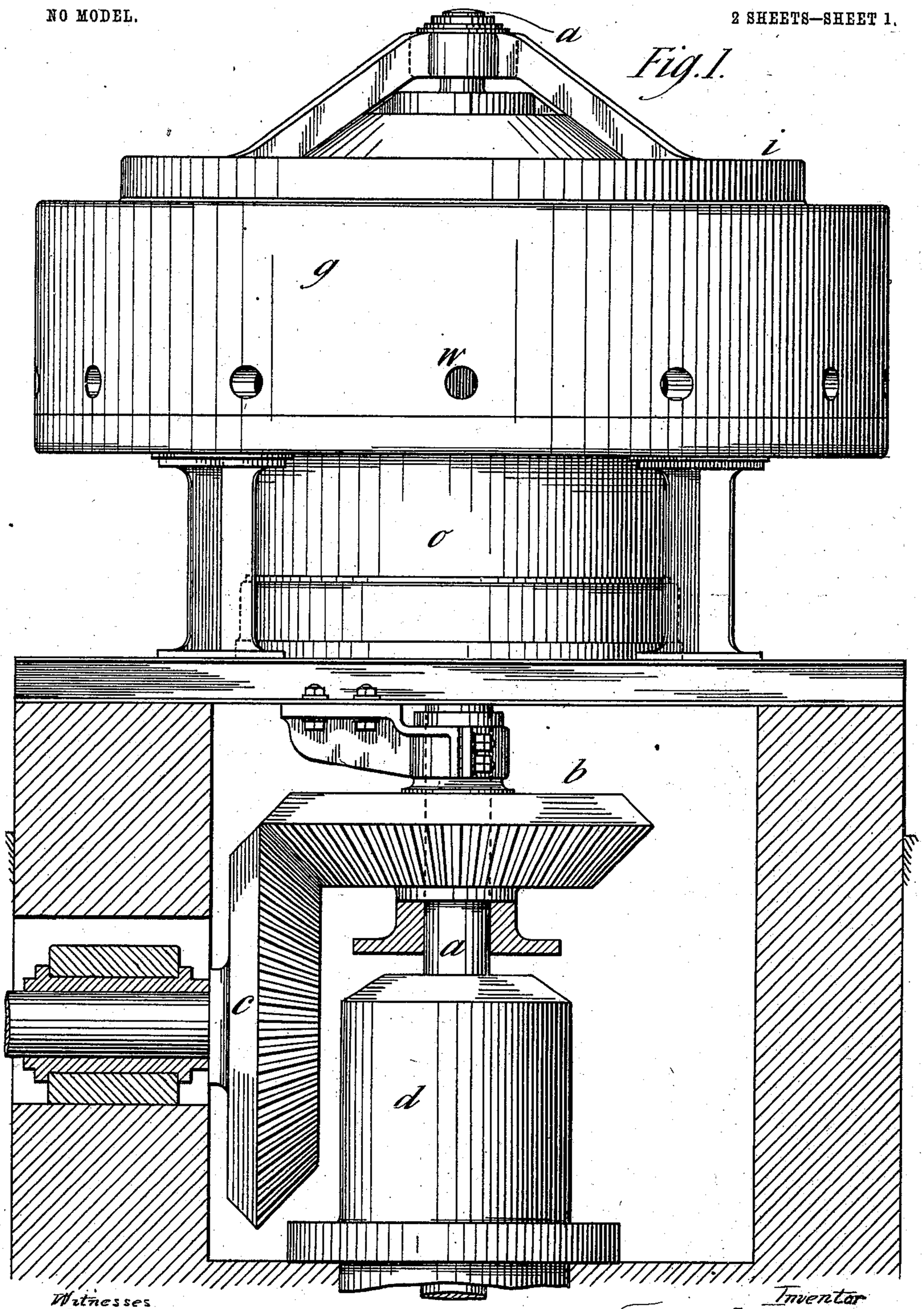
F. E. ELMORE.

APPARATUS FOR THE GENERATION AND DIRECT ELECTROLYTIC APPLICATION OF ELECTRIC CURRENTS.

APPLICATION FILED JAN. 10, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



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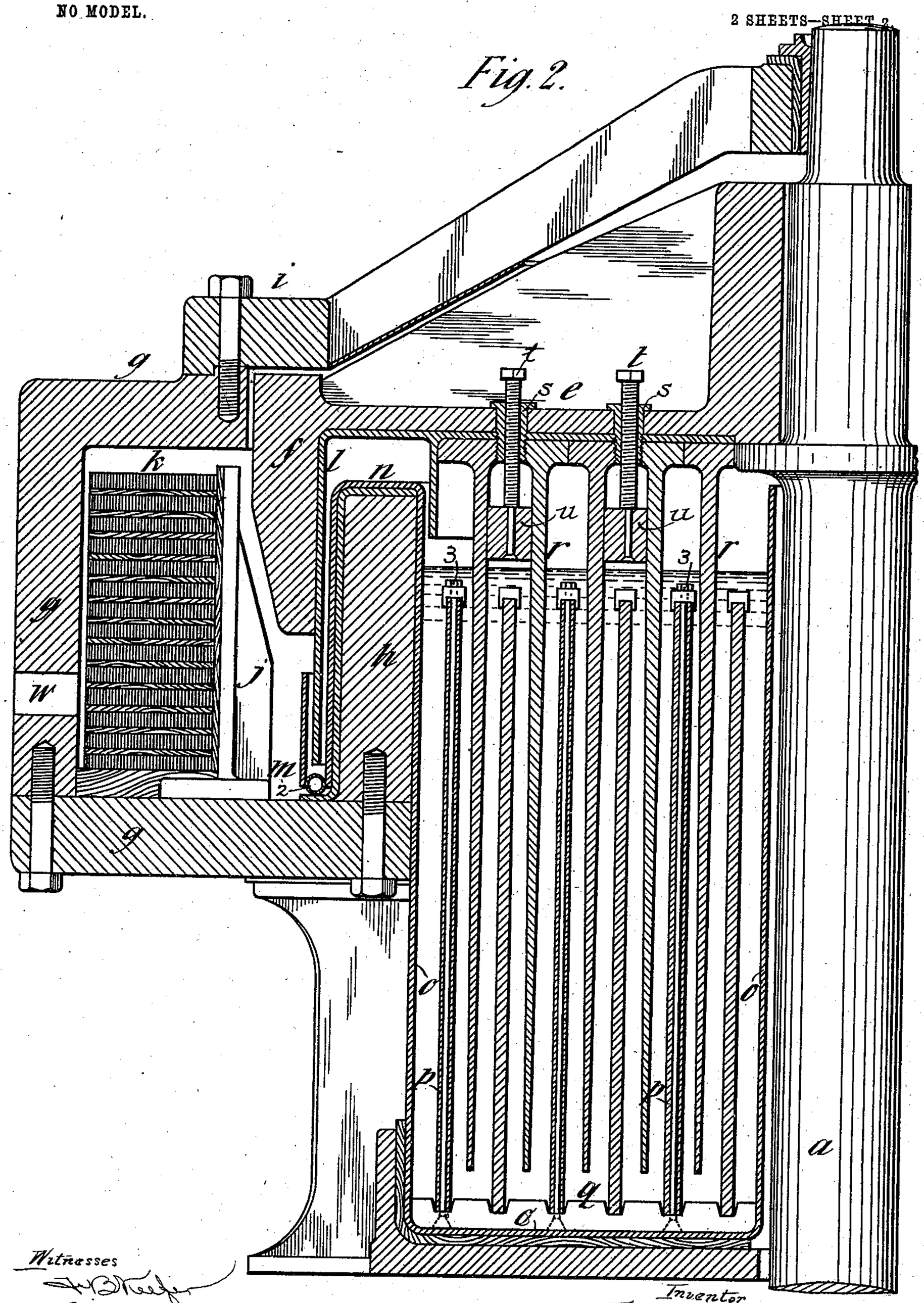
NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.



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FRANCIS EDWARD ELMORE, OF LONDON, ENGLAND.

APPARATUS FOR THE GENERATION AND DIRECT ELECTROLYTIC APPLICATION OF ELECTRIC CURRENTS.

SPECIFICATION forming part of Letters Patent No. 726,659, dated April 28, 1903.

Application filed January 10, 1902. Serial No. 89,187. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS EDWARD ELMORE, a citizen of England, residing at 4 Bishopsgate street within, in the city of London, England, have invented certain new and useful Apparatus for the Generation and Direct Electrolytic Application of Electric Currents, (for which I have applied for a patent in Great Britain, dated December 31, 1901, No. 26,673,) of which the following is a specification.

This invention relates to apparatus of the unipolar-dynamo kind for generating large electric currents and applying them directly to electrolysis.

The chief objects of the invention are to overcome in great measure the difficulties hitherto attending the collection and distribution of large currents and to obtain electro deposits rapidly and economically. Apparatus for this purpose may be made in many different forms, according to the various purposes to which they may be applied.

The accompanying drawings serve to illustrate a convenient form of apparatus according to this invention.

Figure 1 is a side elevation, and Fig. 2 is a vertical section of half, drawn to an enlarged scale.

a is a vertical shaft which is driven by bevel-gearing *b c* and has its lower end extending as a plunger into a hydraulic cylinder *d*. The horizontal bevel-wheel *b* runs between upper and lower bearings and is fitted on the shaft *a* with keys sliding in grooves, so that while the wheel revolves with the shaft the shaft can slide longitudinally through it. On the upper part of the shaft *a* is fixed an iron disk *e*, having at its periphery a deep flange *f*, which may be termed the "armature." This armature extends down into the interior of a cylindrical electromagnet having a base outer and upper side *g* and an inner side *h;* also, a cover *i*, which is the periphery of a frame carrying the upper bearing for the shaft *a*.

j is a cylindrical shell of non-magnetic metal lined externally with insulating material, on which are wound a number of coils *k*, of insulated hoop, each coil separated from the next above it by a layer of insulating material.

To the flange *f* is attached a cylindrical shell *l*, of good conducting metal, such as copper, the edge of which dips into a trough *m*, containing fluid-conducting material, preferably an alloy of lead and mercury, the fluidity of which is insured by a steam-pipe 2 at the bottom of the trough. The shell *l* continues as a lining of the under side of the disk *e*, and the one side *n* of the trough *m*, which is insulated from *h*, turns over it and extends down to form the sides *o* and bottom of a cylindrical tank or cell having its bottom resting on insulating material on the base of the apparatus. The tank *o* is of metal, such as lead, which is not attacked by the electrolyte. From the bottom of the tank *o* extend upward a number of anodes, each in the form of a cylindrical shell *p*, held in position by long bolts 3, passing through it at intervals and fixing it in a groove in a disk *q*, of lead or equivalent metal, at the bottom.

To the lining *l* of the disk *e* are attached a number of cathodes *r*, each in the form of a cylindrical shell, tapering in thickness, so as to be thinner at the lower end than at the top. They are fixed to the disk *e* by screwed sleeves *s*, through which pass setting-screws *t*, the ends of which are reduced in diameter and pass through holes in annular blocks *u*, in which they can turn, the ends of the screws being burred over the lower faces of the blocks.

The apparatus operates as follows: The magnet *g h* being excited by a current of electricity traversing the coils *k*, and the shaft *a*, with the disk *e* and cathodes *r*, being caused to revolve, while the tank or cell *o* is charged with suitable electrolyte liquid, a large electrical current is generated, which passes from *f* through the alloy in *m* to the cell *o* and its bottom, thence along the anodes *p* and through the electrolyte to the cathodes *r*, thence back to *f*, the result being that the metal of the anodes *p* is rapidly dissolved and deposited on the cathodes *r*. When desired, the cover *i* can be unscrewed, leaving the frame and copper bearing of the shaft free. The shaft can then be raised by pressure in the hy-

draulic cylinder *d*, raising with it the disk *e* and the cathodes *r* with the metal deposited on them, which can be pushed off them by means of the screws *t*. The deposited metal forms a shell inclosing each cathode *r*, the upper edges of the shells on two cathodes terminating at the under side of the block *u* between them. Now on screwing down the screw *t* the block *u* is pushed down, forcing the shell of metal off, this being facilitated by the taper form of the cathode. It is of course to be understood that this removal of the metal from the cathodes is effected when they are all lifted out of the cell along with the upper part of the apparatus to which they are attached. As the part *i* of the magnet extends over the flange *f*, there is a certain amount of attraction tending to raise the disk *e* with the cathodes and shaft, thus reducing to a certain extent the gravitating effect of these parts. The ribs of the disk *e* as they revolve act as the blades of a fan, causing currents of air to pass through the air-spaces of the magnet and through between its coils to outlets *w*, thus keeping the coils cool.

Although I have shown and described the cathodes attached to the disk *e* and revolving with it, while the anodes are stationary, obviously this arrangement might be inverted, the cathodes being fixed to the bottom of the cell, while the anodes are attached to and revolve with the armature-disk *e*.

Having thus described the nature of this invention and the best means I know of carrying the same into practical effect, I claim—

1. In an organized structure, an electrolytic cell and a unipolar dynamo-electric machine, the armature of the latter being in direct electrical connection with the anodes or cathodes of the former.

2. In an organized structure, an electrolytic cell, a unipolar dynamo-electric machine, and direct electrical connections within the structure between the armature of said machine and the anodes or cathodes of said cell.

3. The combination of the rotary armature of a unipolar dynamo-electric machine, a fixed electrolytic cell, the electrodes of which are connected respectively with said armature and with said cell, and direct electrical connections between said armature and said electrodes.

4. The combination of the rotary armature of a unipolar dynamo-electric machine and a fixed electrolytic cell in electrical connection with said armature, one set of the electrodes of said cell being secured therein, and the other set being secured to, and in electrical connection with, said armature.

5. The combination with a cylindrical field-magnet of a unipolar dynamo-electric machine, and a rotary disk having an annular flange thereon constituting the armature of said machine, of a fixed cylindrical electrolytic cell, an annular trough containing an electric conducting liquid in electrical connection with the shell of said cell, a shell secured to said armature dipping into said trough and secured to the under side of said disk, a set of electrodes secured within said cell and in electric connection with the shell thereof, and a second set of electrodes dipping into said cell, and secured to, and in electrical connection with, the shell secured to said armature.

6. The combination with a cylindrical field-magnet of a unipolar dynamo-electric machine, and a rotary disk having an annular flange thereon constituting the armature of said machine, of a fixed cylindrical electrolytic cell, an annular trough containing an electric conducting liquid in electrical connection with the shell of said cell, a shell secured to said armature dipping into said trough and secured to the under side of said disk, a set of parallel cylindrical electrodes located within said cell, and in electrical connection with the shell thereof, and a second set of cylindrical electrodes secured to said rotary disk, in electrical connection with the shell secured to said armature, and located in the spaces between the first set of said electrodes.

7. The combination with a cylindrical field-magnet of a unipolar dynamo-electric machine having an annular pole, and a rotary disk having an annular flange thereon constituting the armature of said machine, of a cylindrical electrolytic cell attached directly to the annular pole of said magnet, an annular trough containing an electric conducting liquid in electrical connection with the shell of said cell, a shell of conducting material secured to said armature dipping into said trough and secured to the under side of said disk, a set of electrodes in said cell in electrical connection with the shell thereof, and a second set of electrodes secured to said disk and in electrical connection with the shell secured to the under side thereof.

8. The combination with the rotary armature of a dynamo-electric machine and a fixed electrolytic cell, of a disk integral with said armature located above said cell, cylindrical cathodes arranged in parallel relation to each other secured to said disk, and longitudinally-movable annular blocks between said cathodes for removing the accumulated metal from the surfaces thereof.

9. The combination with the rotary armature of a dynamo-electric machine and a fixed electrolytic cell, of a disk integral with said armature located above said cell, cylindrical cathodes arranged in parallel relation to each other secured to said disk, annular blocks located between said cathodes, and screws having swivel connections with said disk, for removing the accumulated metal from the surfaces of said cathodes.

10. The combination with the rotary armature of a dynamo-electric machine and a fixed

electrolytic cell, the electrodes of which are cylindrical in form, the anodes being secured within said shell and the cathodes being secured to said armature, of annular blocks located between said cathodes, and means for moving said blocks longitudinally, for removing the accumulated metal from the surfaces of said cathodes.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FRANCIS EDWARD ELMORE.

Witnesses:
GERALD L. SMITH,
K. SIMMONS.