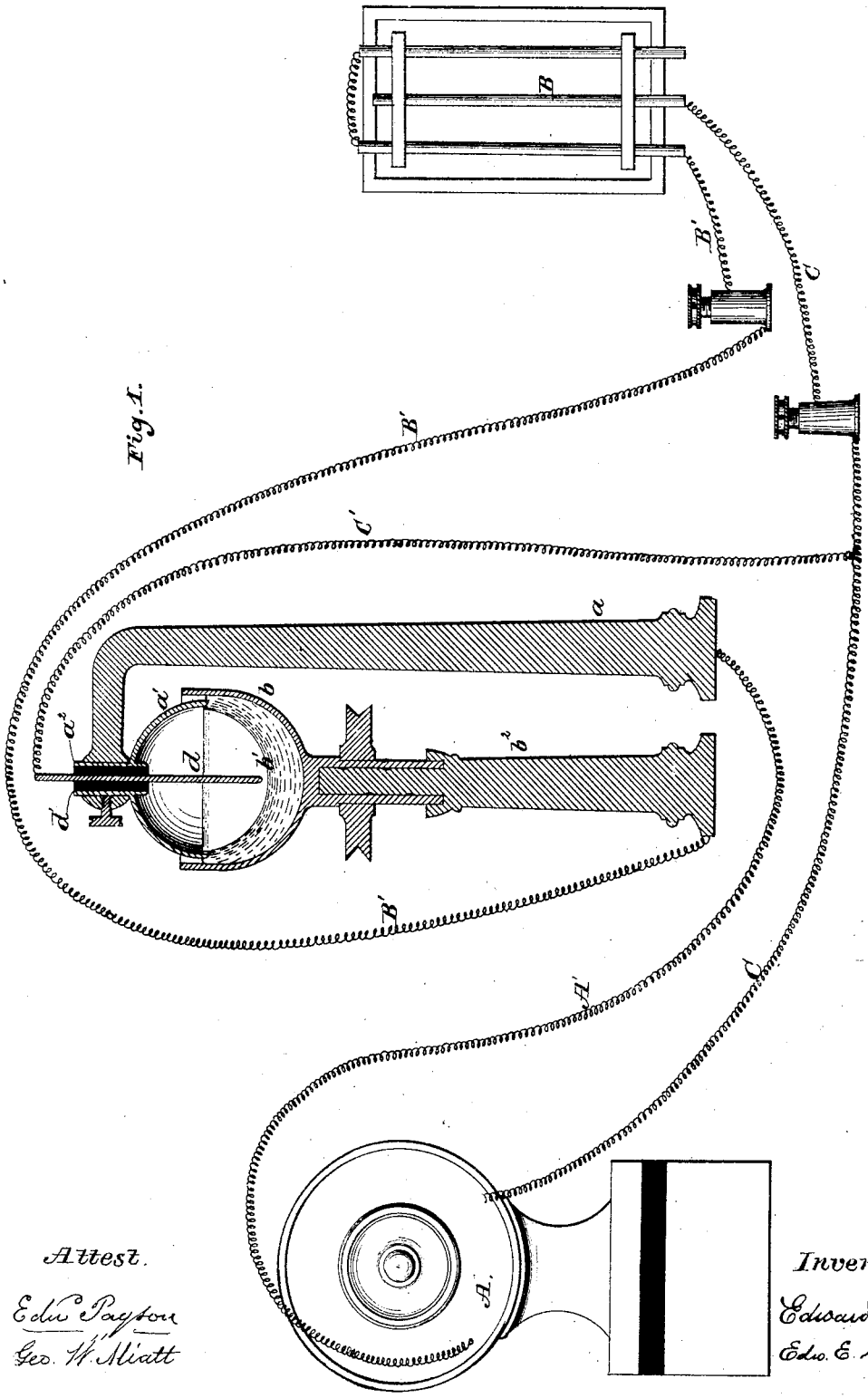
2 Sheets—Sheet 1.

E. WESTON & E. E. QUIMBY.

Compound Switch in Dynamo-Electric Machines Employed in the Art of Electro-Plating.

No. 196,846. **Patented Nov. 6, 1877.**



Attest.

Edw. Payson

Geo. W. Miatt

Inventors.

Edward Weston

Edw. E. Quimby

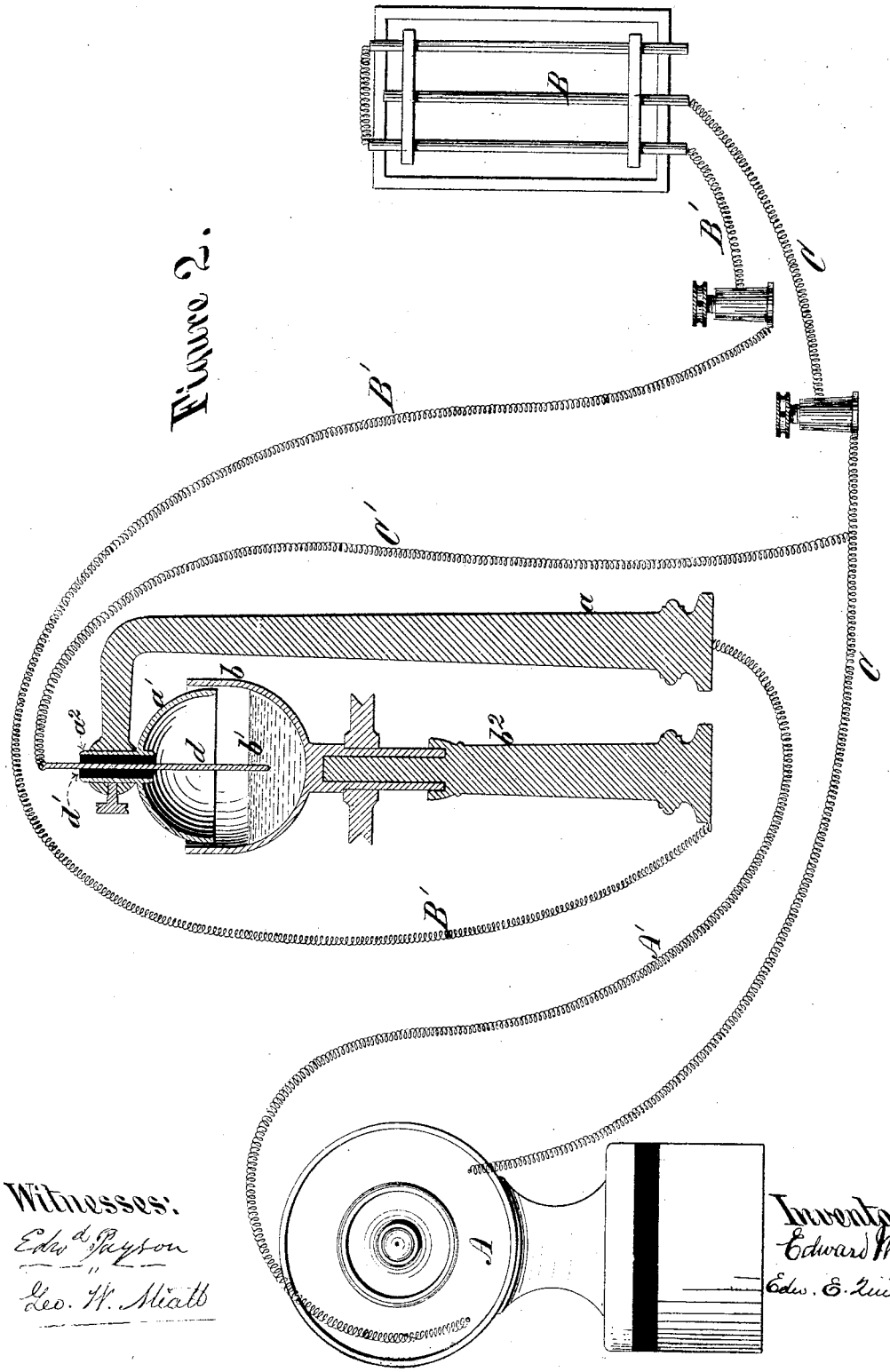
2 Sheets—Sheet 2.

E. WESTON & E. E. QUIMBY.

Compound Switch in Dynamo-Electric Machines Employed in the Art of Electro-Plating.

No. 196,846. Patented Nov. 6, 1877.

Figure 2.



Witnesses:

Edw. A. Payson

Geo. W. Miatt

Inventors:

Edward Weston

Edw. E. Quimby

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EDWARD WESTON, OF NEWARK, AND EDWARD E. QUIMBY, OF ORANGE, ASSIGNORS TO WESTERN DYNAMO-ELECTRIC MACHINE COMPANY, OF NEWARK, NEW JERSEY.

IMPROVEMENT IN COMPOUND SWITCHES IN DYNAMO-ELECTRIC MACHINES EMPLOYED IN THE ART OF ELECTROPLATING.

Specification forming part of Letters Patent No. **196,846**, dated November 6, 1877; application filed August 24, 1877.

To all whom it may concern:

Be it known that we, EDWARD WESTON, of Newark, and EDWARD E. QUIMBY, of Orange, New Jersey, have invented certain Improvements in Devices for Facilitating the Employment of Dynamo-Electric Machines in the Art of Electro-Deposition, of which the following is a specification:

The object of our invention is to increase the usefulness of dynamo-electric machines in the art of electro-deposition.

The difficulty which our invention is intended to overcome results from the gradual polarization of the electrodes, and the tendency hence arising of a current of electricity to flow from the electrodes in a direction opposite to the direction of the current generated in the dynamo-electric machine.

When a series of vats is employed, so that there are several pairs of electrodes, the energy of the reverse current due to the polarization of the electrodes may ultimately exceed the energy of the current generated in the dynamo-electric machine, and in such an event the current from the electrodes may flow through the coils surrounding the magnets in the machine, and reverse their polarities, and thus reverse the direction of the current thereafter generated by the continued motion of the machine. Metal deposited by the action of the original current will be removed from objects remaining in the plating solution by the action of the reverse current, and thus the work will be spoiled.

To meet this difficulty Edward Weston, one of the applicants, heretofore invented an instrumentality which, when the rotation of the dynamo-electric machine is arrested or diminished in speed in a given degree, automatically breaks the circuit between the machine and the vat, and thus prevents the flow of the reverse current from the electrodes through the machine. The same instrumentality automatically closes the circuit between the machine and the vat when the machine, after having been started, has attained a given speed of rotation. By this means the machine is started upon open circuit, and therefore is started easily, and has an opportunity to acquire momentum before the circuit is closed. This mode of operation, however, does not provide for the depolarization of the electrodes, because when the machine is stopped there is no circuit connecting the electrodes. To provide for the flow of the current between the electrodes when the machine is stopped, the said Edward Weston heretofore connected the two wires leading from the machine to the vat by a bridge-wire, and placed in the bridge-wire a circuit closer and breaker, operating to break the continuity of the bridge-wire when the machine, after having been started, has acquired a given rate of speed, and also adapted to close the break in the bridge-wire when the rotation of the machine is arrested, and thus provide, by means of the bridge-wire, a short circuit through which the current from the electrodes may flow until exhausted; but in this case the machine always remains on closed circuit, and is therefore started with considerable difficulty—so much so as to occasionally throw off the belt.

Our present invention, which is an improvement upon the contrivances which we have thus described, consists of two circuit breakers or closers, or of a compound circuit breaker and closer, adapted to break the circuit between the machine and the vat whenever the speed of rotation of the machine is diminished to a given point, and simultaneously to close the gap in the bridge-wire or short circuit between the electrodes, by means of which the current due to the polarization of the electrodes is provided with a path through which it can flow until exhausted, or, in other words, until the electrodes resume their neutral condition.

By this mode of operation the dynamo-electric machine is always started on open circuit, and after it has attained the desired speed of rotation our compound circuit breaker and closer breaks the circuit connecting the electrodes, and simultaneously closes the machine-circuit, so that the current generated in the

machine is conducted through the plating solution.

It will be seen that the distinctive characteristic of our present invention is, that it combines the advantages of both said Edward Weston's former inventions.

Our machine is started easily, because it always starts on open circuit, and our electrodes are depolarized whenever the machine stops.

The accompanying drawings, illustrating our invention, exhibit an end view of a dynamo-electric machine, a top view of an electroplating-vat, two principal conducting-wires, forming the main circuit connecting the machine and the vat, a bridge-wire connecting the two principal conducting-wires at a point between the machine and the vat, and a central vertical section of a compound circuit breaker and closer, which is a modification of the automatic switch described in Letters Patent of the United States No. 182,977, granted to Edward Weston, October 3, 1876.

Figure 1 shows the main circuit closed and the short circuit open. Fig. 2 shows the main circuit open and the short circuit closed.

Referring to the drawings, it will be seen that the main circuit, between the dynamo-electric machine A and the vat B, is formed by the principal wires A′, B′, and C. The wire A′ is electrically connected with the wire B′, when the machine is in motion at the desired rate of speed, by means of the metallic post *a* and an inverted cup, a^1, which is supported by the post *a* within the revolving cup *b*, containing a quantity of mercury, b^1.

The rotation of the cup *b* is governed by the rotation of the machine. When it has reached a given rate of speed the mercury b^1 is thrown upward on the inside of the cup, and comes in contact with the lower edge of the inverted cup a^1, as shown in Fig. 1.

The wire B′ is connected with the base of the pillar b^2, which supports the revolving cup *b*. When, therefore, the mercury occupies the position shown in Fig. 1, the wires A′ and B′ are electrically connected, and the machine is then on the closed circuit, which includes the vat.

When the motion of the machine is arrested or diminished in speed in a given degree, the mercury b^1, under the preponderating influence of gravity, falls to the bottom of the cup *b*, out of contact with the edge of the inverted cup a^1, and thus breaks the circuit between the machine and the vat, which, for convenience, I call the "main circuit." In this condition, which is represented in Fig. 2, the mercury forms an electrical contact with the lower end of the vertical wire *d*, which is supported within the stem a^2 of the inverted cup a^1, but is separated therefrom by the insulating material *d′*.

The upper end of the vertical wire *d* is connected by means of the wire C′ to the principal wire C. When the machine is stopped, therefore, the main circuit is broken, because of the gap between the mercury b^1 and the edge of the cup a^1, but a closed short circuit is established between the electrodes in the vat by means of the wire B′, the pillar b^2, the mercury b^1, the vertical wire *d*, the wire C^1, and the portion of the wire C between the point of junction of the wire C′ with it and the vat.

We do not confine ourselves to the particular instrumentality for opening and closing the circuit shown and described, as there are various other devices which may be applied to the same purpose.

Our invention is present when the main circuit, which includes a dynamo-electric machine and an electroplating-vat, is combined with a bridge-wire or short circuit, and an instrumentality which is adapted to automatically open the main circuit and simultaneously close the short circuit when the motion of the machine is arrested, and, vice versa, to automatically open the short circuit and close the main circuit when the machine, after having been started, has attained a predetermined speed of rotation.

The patent for the automatic switch hereinbefore referred to described two alternative modes of construction and operation, one exhibiting the combination of the rotating mass of mercury with an inverted cup, and the other exhibiting the combination of the mass of mercury with a central vertical wire. In our present invention these two alternative modes of construction and operation are combined in one instrumentality. This is effected, as will be seen, by supporting both the inverted cup and the vertical wire which is insulated from the inverted cup within the rotating cap, in suitable positions to alternately form an electrical connection with the mercury contained in the rotating cup, according to the different positions which the mercury is made to occupy by its subjection to the preponderating influence, either of gravity or of centrifugal force, as the case may be.

We claim as our invention, in the employment of dynamo-electric machines for electro-deposition—

1. The principal wires or main circuit connecting the machine with the vat, in combination with a bridge-wire or short circuit electrically connecting the two principal wires together between the machine and the vat, and an instrumentality adapted to simultaneously open the main circuit and close the short circuit when the rotation of the machine is partially or wholly arrested, and also adapted to open the short circuit and close the main circuit when the machine, after having been started, has attained a predetermined speed of rotation, substantially as and for the purposes set forth.

2. The combined circuit breaker and closer herein described, consisting of a mass of mercury contained in a cup adapted to rotate with more or less speed, according to the

rotation of the dynamo-electric machine, and of two conductors insulated from each other, and supported in suitable proximity to the mass of mercury to enable one conductor to form an electrical connection with the mercury while the mercury is occupying the position due to the preponderating influence upon it of centrifugal force, and to enable the other conductor to form an electrical connection with the mercury in the position which it assumes in obedience to the preponderating influence of gravity.

EDWARD WESTON.
EDW. E. QUIMBY.

Witnesses:
EDWD. PAYSON,
GEO. W. MIATT.