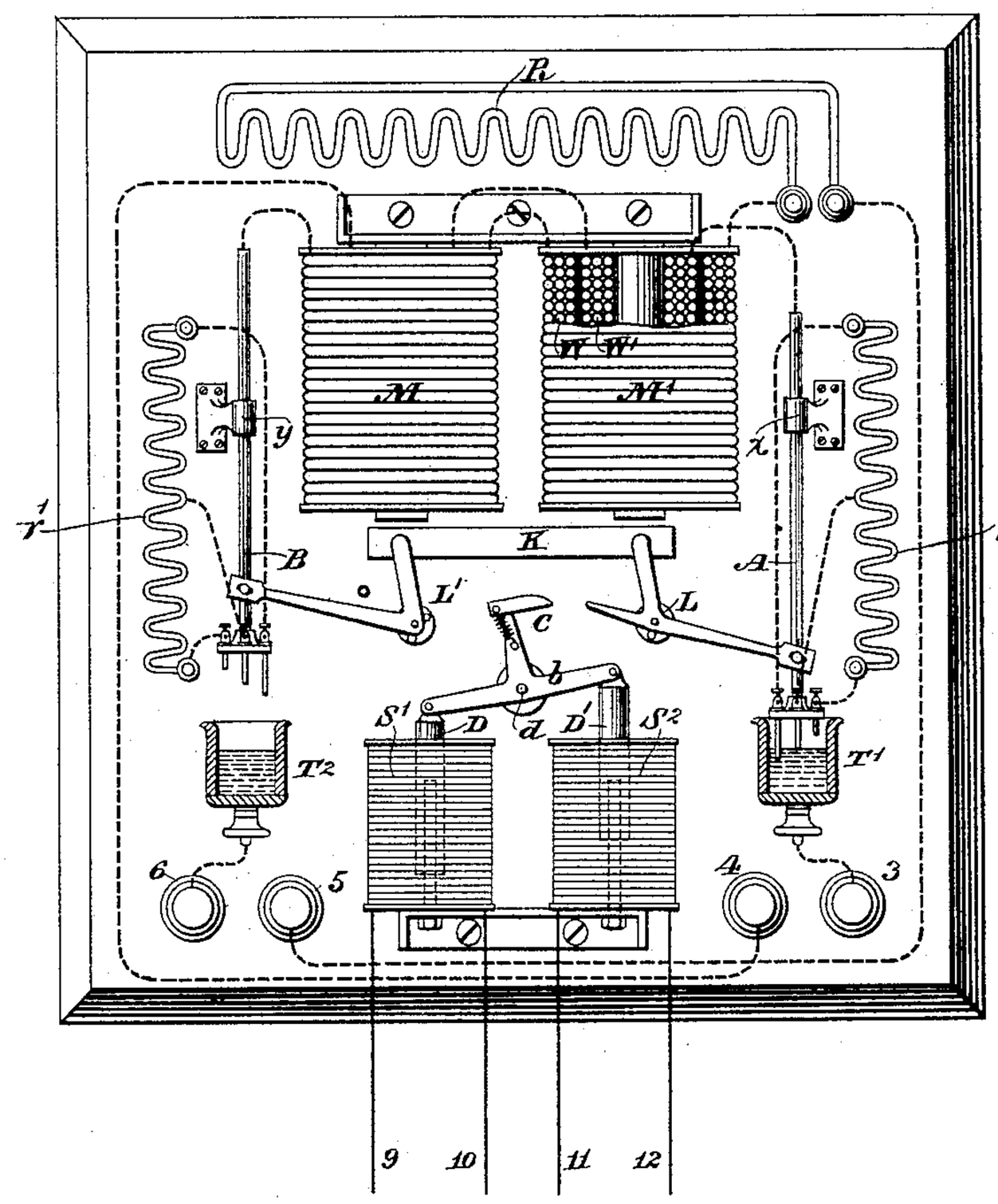
(No Model.) 2 Sheets—Sheet 1.

J. S. SELLON.

AUTOMATIC SWITCH FOR SECONDARY BATTERIES.

No. 384,289. Patented June 12, 1888.

Fig. 1.



Witnesses.
Geo. W. Breck.
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Inventor.
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By his Attorney.
Wm B. Vanuxem.

(No Model.) 2 Sheets—Sheet 2.

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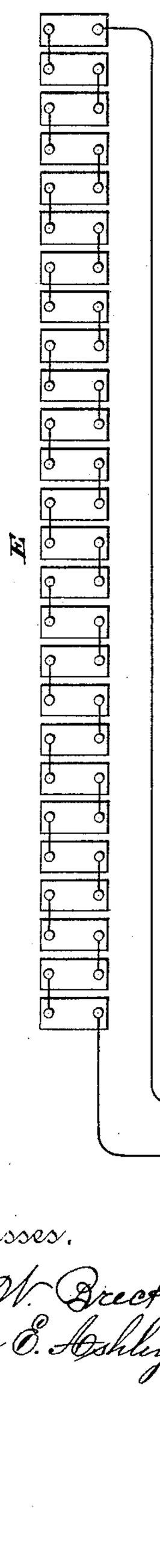
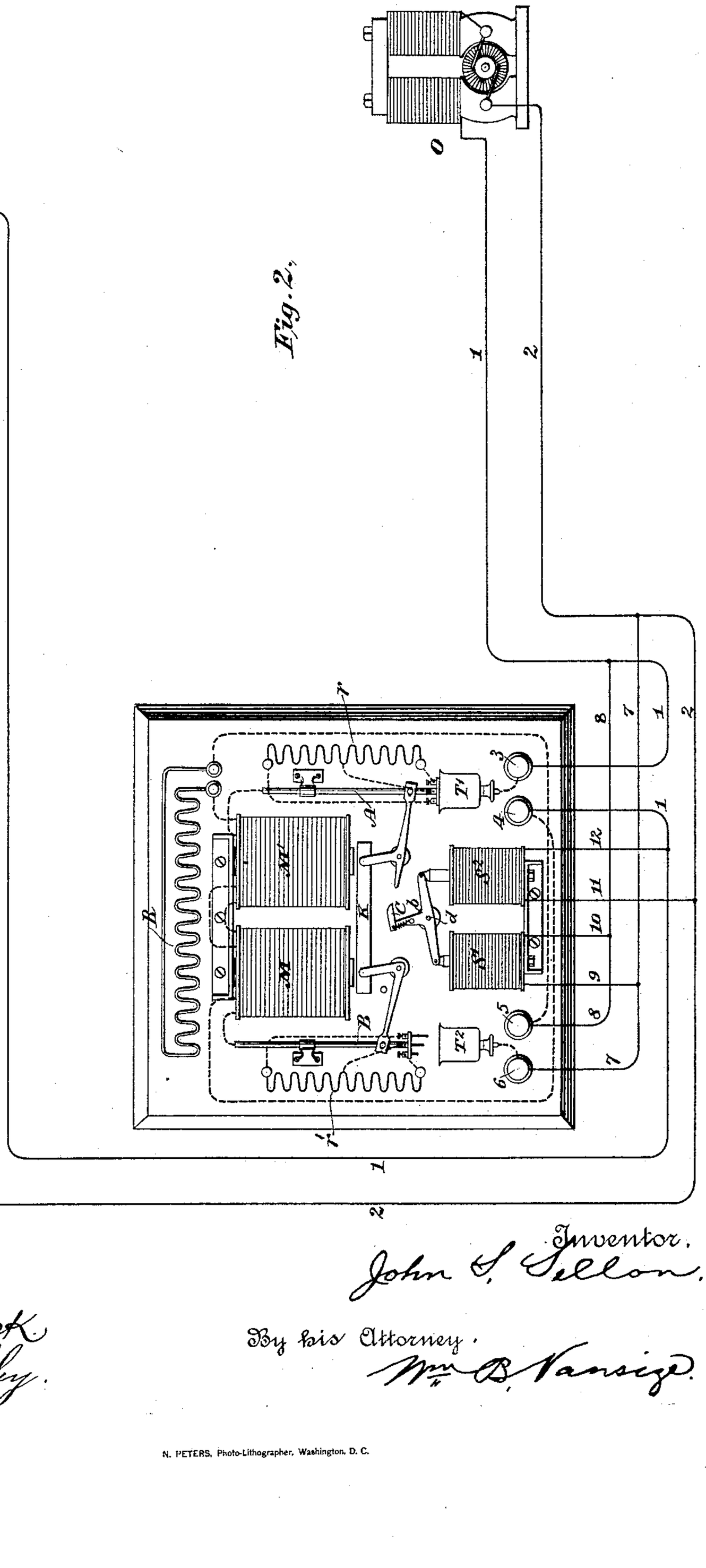


Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN S. SELLON, OF HATTON GARDENS, COUNTY OF MIDDLESEX, ENGLAND, ASSIGNOR TO THE ELECTRICAL ACCUMULATOR COMPANY, OF NEW YORK.

AUTOMATIC SWITCH FOR SECONDARY BATTERIES.

SPECIFICATION forming part of Letters Patent No. 384,289, dated June 12, 1888.

Application filed August 30, 1887. Serial No. 248,262. (No model.) Patented in England January 13, 1883, No. 217; in France June 20, 1883, No. 156,156, and in Germany July 17, 1883, No. 27,868.

To all whom it may concern:

Be it known that I, JOHN SCUDAMORE SELLON, a subject of the Queen of Great Britain and Ireland, and a resident of Hatton Gardens, in the county of Middlesex, England, have invented certain new and useful Improvements in Automatic Switches for Secondary Batteries, (for which I have obtained Letters Patent in Great Britain, No. 217, dated January 13, 1883; in Germany, No. 27,868, dated July 17, 1883, and in France, No. 156,156, dated June 20, 1883,) of which the following is a specification.

My invention consists in an arrangement of apparatus for automatically dividing an electrical circuit containing a primary generator and a secondary battery into two electrically-independent circuits, and for again uniting such circuits into one undivided circuit, which operations both follow predetermined changes in the electrical condition of the circuit or circuits.

I provide an electro-magnet having two substantially equal windings. In circuit with one winding is a circuit-breaker operating to make and break the charging-circuit. The circuit-breaker, when operated, introduces a resistance into the circuit, said resistance being in two or more sections, which are successively introduced through the medium of a mercury-cup and a series of contacts operating therein, each contact being of a different length from either of the others. The second coil of the magnet is in circuit with an artificial resistance, which is approximately a compensation or equivalent for the secondary battery to be charged. The introduction and withdrawal of this resistance is accompanied by the use of a sectional resistance operated upon by means of a circuit-changer like that described with reference to the first coil. When this magnet is operated to break the charging circuit the other coil thereof is included in circuit, with the dynamo and the resistance, and would therefore immediately resume its first position under the influence of the current flowing therein, but for the fact that it is caught and held by a tilting-arm controlled by two electro-magnetic coils of high resistance having the form of solenoids. One of said coils is connected in position to indicate the electro-motive force due to the dynamo, the other that of the battery. When the electro-motive force of the dynamo rises above that of the battery, the action of the magnets, which is differential with respect to each other, is to release the tilting-arm and allow the switch to close the charging-circuit, simultaneously breaking the circuit containing the artificial resistance.

The accompanying drawings illustrate my invention.

Figure 1 shows the magnets, resistances, and electro-motive-force measurers arranged upon a back-board in operative relations. Fig. 2 shows the apparatus applied to a charging-circuit containing dynamo and accumulators.

M M′ is an electro-magnet having two windings or coils of wire, W and W′. A and B are bars of conducting material sliding in the bearings *x* and *y*, respectively.

Near the lower ends of A and B are cups T′ and T² containing mercury. Upon the lower ends of A and B there are disks from which project metallic contacts of different lengths, respectively, insulated from each other, as shown. Each contact is connected to a different point in the artificial resistance *r* or *r*′. Angle-bars, as shown, are pivoted at L and L′, also to armature K and to A and B, re-respectively. When K is attracted by M M′ from its lowest position, it has a resultant movement which raises B out of contact with T² and projects A into T′. When retracted, as by gravity, its operation is reversed.

b is a three-armed bar pivoted at *d*, having upon the end of its perpendicular free arm a fast and loose catch, *c*.

S′ S² are solenoids of high resistance, having cores D D′, pivoted, respectively, at opposite ends of bar *b*. One winding, W′, of magnet M M′ is connected to screw-post 4. The opposite end is connected to bar A. Mercury-cup T′ is connected to screw-post 3. One end of W, the other winding of M M′, is carried to artificial resistance R. From the opposite end of R connection is made with screw-post 5. The opposite end of the coil W is connected to B. Mercury-cup T² is connected to post 6.

In Fig. 2, O is a dynamo having its field-

coils in series with its armature. E is a secondary battery connected to dynamo O by main leads 1 2. Lead 1 is divided and the ends are connected to posts 3 and 4, thus including the circuit-breaker. Posts 5 and 6 are connected to main leads 1 and 2 by wires 7 and 8 at a point between the dynamo and the screw-cups 3 and 4. Solenoid S′ is connected to leads 1 and 2 at the same point by wires 9 and 10. Solenoid S^2 is connected to leads 1 and 2 at a point between the battery and circuit-breaker by wires 11 and 12.

In the drawings, the dynamo is shown in the operation of charging the battery, circuit being made *via* elements 0 1 3 T′ A M M′ 4 to battery, and return by lead 2. Should the dynamo stop or slacken its movement, or its electro-motive force fail for any reason, armature K will leave its attracted position, the bar B will drop into mercury-cup T^2, and simultaneously bar A will be elevated and carried out of contact with mercury-cup T′. As the shortest contact leaves the mercury, the first section of the resistance *r* is introduced. As the second contact leaves the mercury, the second section of the resistance is introduced, and so on, the entire resistance being first inserted and the circuit then broken. By this means sparking is avoided. The converse of this is simultaneously taking place at cup T^2. The entire resistance *r′* is first introduced, this being diminished by sections until *r′* is completely removed and circuit is complete *via* dynamo 1 8 5 R, magnet M M′, B, T^2, 6, 7, and 2. The lead 1 is, however, broken at T′. The result of making circuit through R and the second coil of M M′ would be to attract K and again close the lead 1; but the solenoid S^2 is operated by the electro-motive force of battery in circuit *via* E 1 12 S^2 11 2, the result of which is to tilt catch *c* into position to engage with and hold the inner end of that angular bar which is connected to bar A in a depressed position, and to thus retain A in an elevated position. Solenoid S′ is in circuit with the dynamo *via* 1, 8, 10, S′, 9, 7, and 2. The action of S′ upon tilting-lever *b* is opposite to that of S^2, and when the electro-motive force of the dynamo rises above that of the battery the effect due to S′ will overcome the effect due to S^2, and the catch *c* will be tilted out of contact with the right-hand lever, which, when released, is immediately carried into position to close the main circuit 1 at A T′. Contact at B T^2 is broken and the charging-circuit is again closed.

While the charging-circuit is closed S′ and S^2 should about balance each other, as both are measuring substantially the same electro-motive force.

Resistance R should be sufficient in amount to compensate for the battery A.

What I claim, and desire to secure by Letters Patent, is—

1. The combination of a dynamo-electric machine and a secondary battery to be charged thereby, a switch or circuit-changer in the charging-circuit, a switch or circuit-changer in a separate circuit, an electro-magnet in the charging-circuit, and an electro-magnet in the said separate circuit, both said magnets controlling the movements of the switch or circuit-changer, a second electro-magnet in the said separate circuit, and an electro-magnet in circuit with the secondary battery, both co-operating to control the movements of the switch or circuit-changer.

2. The combination of a dynamo-electric machine and a secondary battery in electrically-independent circuits, an electro-magnetic coil in the dynamo-circuit, an electro-magnetic coil in the battery-circuit, and an electro-magnetic switch or circuit-changer controlled by the co-operation of the two first-named magnets to electrically unite the battery and dynamo in one circuit.

3. The combination of a dynamo-electric machine and a secondary battery in electrically-independent circuits, an electro-magnetic switch or circuit-changer for uniting said circuits, and an electro-magnetic coil in the battery-circuit operated by variations in electro-motive force to control said switch or circuit-changer.

4. The combination of a dynamo-electric machine and a secondary battery electrically connected in one circuit, two electro-magnetic coils in multiple-arc branches of said circuit operated by variations in electro-motive force, and an electro-magnetic circuit-changer located in the main circuit between said multiple-arc branches controlled by the first-named electro-magnets.

5. The combination of a dynamo-electric machine and a secondary battery in one circuit, an artificial resistance, and an automatic electro-magnetic circuit-changer operated by variations in the current flowing in said circuit to divide said circuit into two independent closed circuits, one containing the dynamo and resistance and the other the battery.

Signed at London, in the county of Middlesex, England, this 13th day of August, A. D. 1887.

JOHN S. SELLON.

Witnesses:
JOHN NEWTON,
WM. JOHN WEEKS,
Both of 9 *Birchin Lane, London.*