(No Model.) 2 Sheets—Sheet 1.

E. L. BRADY.

APPARATUS FOR UTILIZING THE CURRENT FORCE OF WATER.

No. 328,447. Patented Oct. 13, 1885.

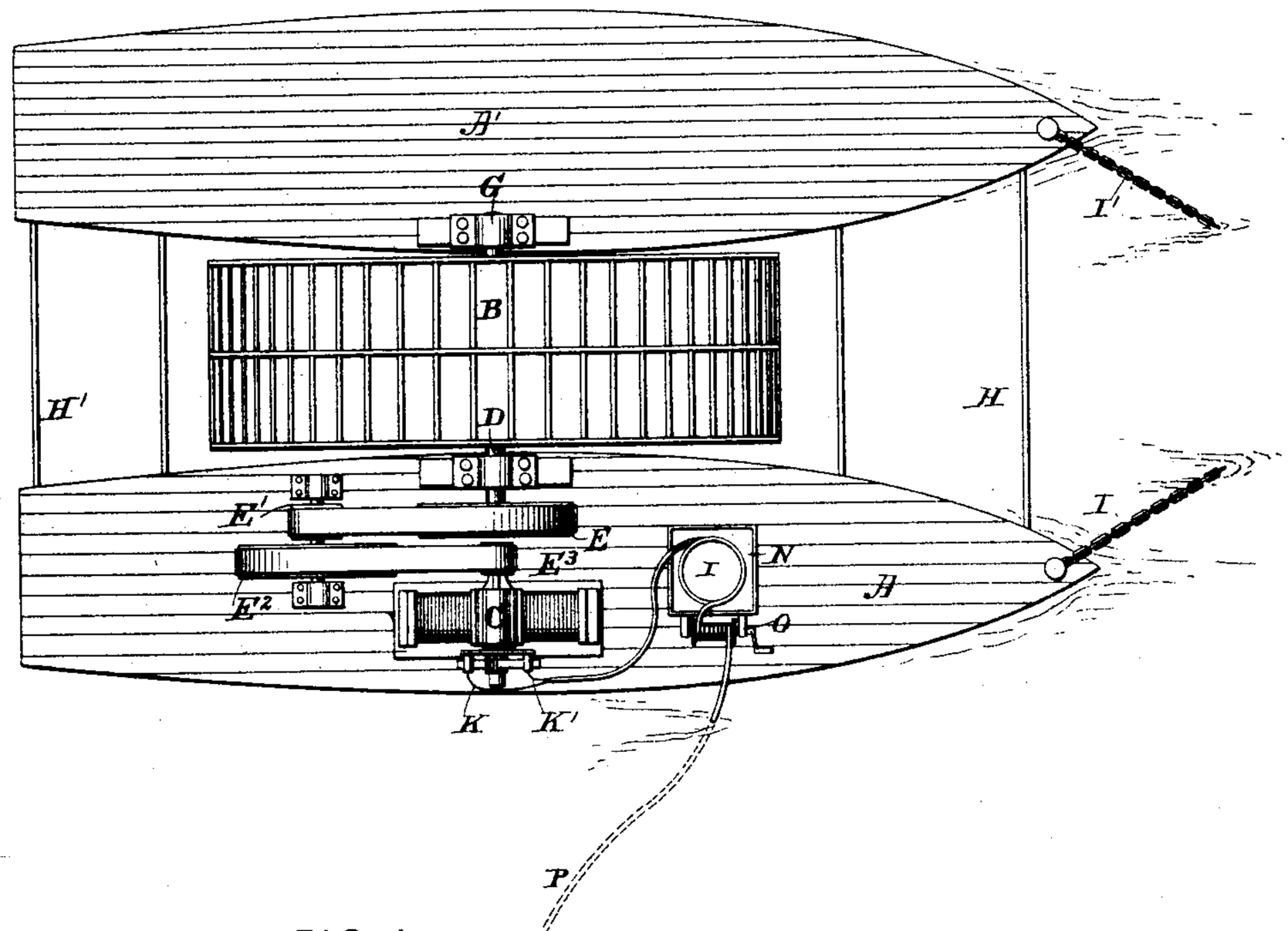
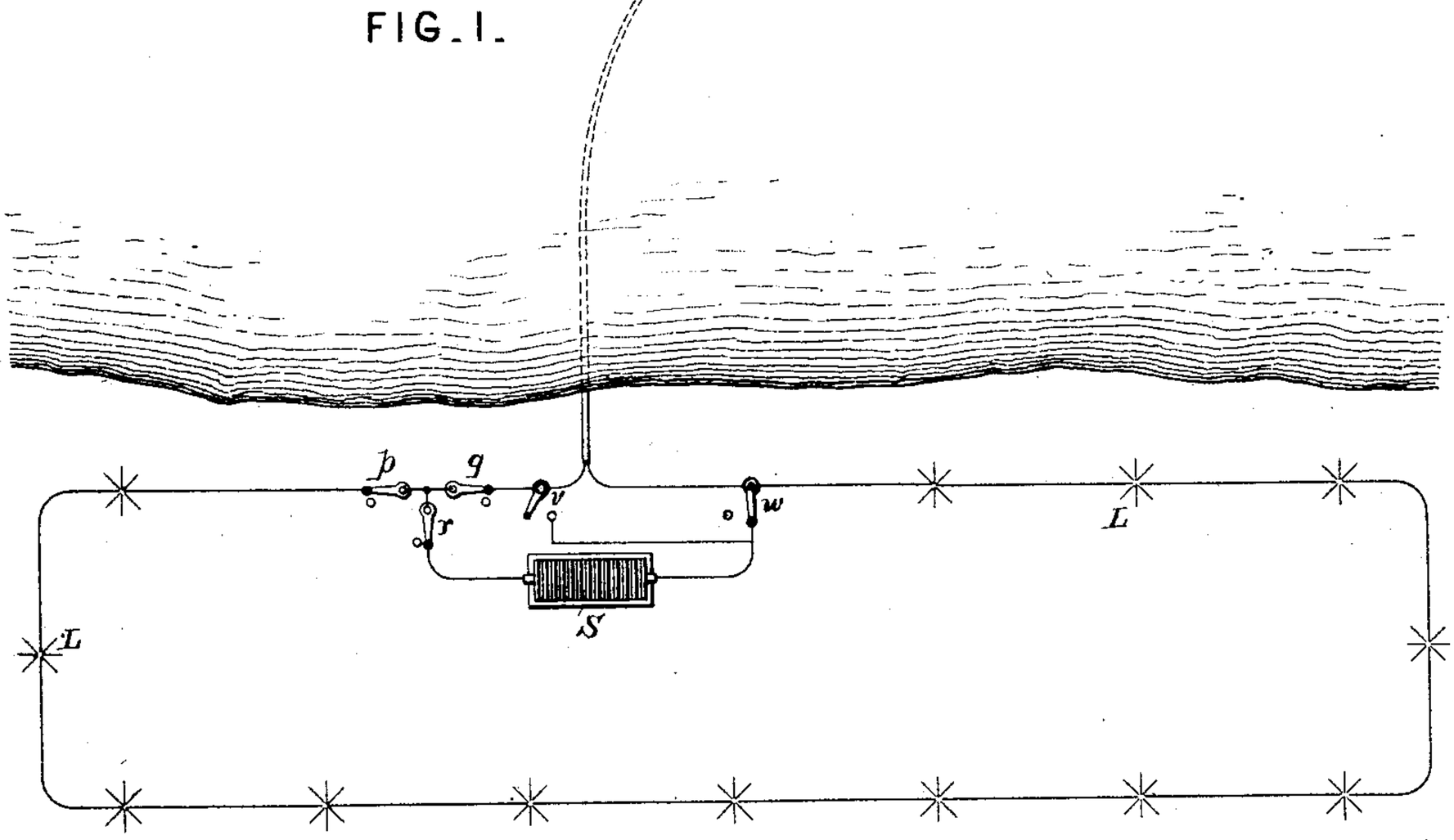


FIG. I.



Witnesses
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FIG. II.

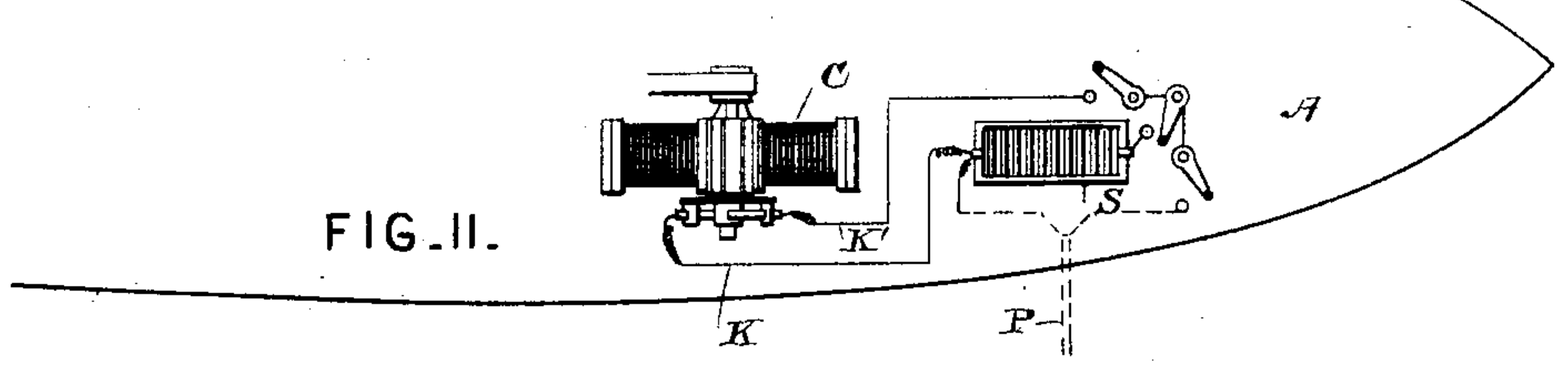
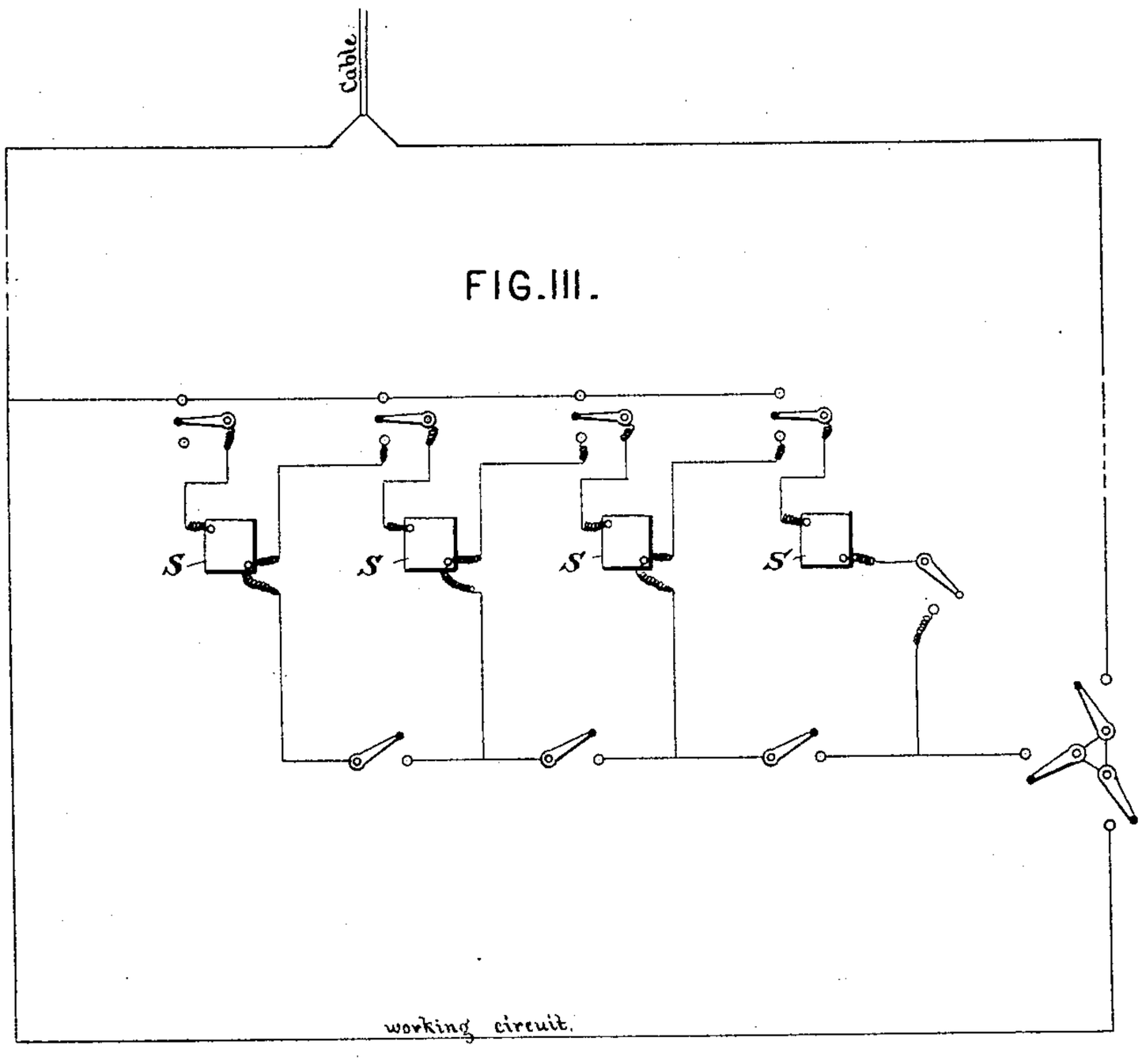


FIG. III.



Attest:
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UNITED STATES PATENT OFFICE.

EDWIN L. BRADY, OF STAMFORD, CONN., ASSIGNOR TO THE RIVER AND RAIL ELECTRIC LIGHT COMPANY, OF OHIO COUNTY, WEST VIRGINIA.

APPARATUS FOR UTILIZING THE CURRENT FORCE OF WATER.

SPECIFICATION forming part of Letters Patent No. 328,447, dated October 13, 1885.

Application filed July 17, 1885. Serial No. 171,914. (No model.)

To all whom it may concern:

Be it known that I, EDWIN L. BRADY, a citizen of the United States, residing at Stamford, in the county of Fairfield, in the State of Connecticut, have invented certain new and useful Improvements in Apparatus for Utilizing the Current Force of Flowing Water, of which the following is a specification.

My invention relates to that form of current-motors in which the mechanical energy developed by the wheel is converted into electrical energy and conveyed to shore over flexible conductors, for which I have already applied for Letters Patent; and it has for its object to promote uniformity and continuity in the work obtained by means of apparatus of this sort. The results obtained from these motors are likely to be constantly variable, because of the normal variations in the rapidity of the currents by which they are driven, and they are also subject to occasional interruptions where tidal currents are utilized, because of the recurring periods of slack water in such currents. It must also at times happen that breaks in the operation of the apparatus will occur while the float is in process of movement from one position in the current to another, and also when the apparatus is stopped for repairs.

It is one of the objects of my invention to provide means for overcoming the inequalities referred to in the work given off, and to provide power for continuing the work during the intervals of inaction of the motor due to failure of current or other causes; and for this purpose I propose to make use of the principle of electrical storage, causing the dynamos on the floats, when they are running at a high rate of speed under the influence of a strong flow of water, to charge secondary batteries, from which currents may be drawn to re-enforce the current from the dynamos when the efficiency of the latter falls below normal or to replace that current when for any reason the dynamos are stopped.

My invention embraces all the ways in which storage-batteries can be used to give uniformity to a variable or intermittent current, a number of which are hereinafter referred to specifically. I also propose to utilize by this means the power exerted by flowing water at times when it cannot be immediately used, and would, unless used to charge batteries, run to waste.

My invention further consists in certain details of construction hereinafter set forth

In the drawings, Figure I shows a current-motor with storage-battery in circuit and circuit-connections. Fig. II shows the storage-battery on the float instead of on shore. Fig. III shows a storage-battery arranged in sections, to provide for taking off currents of any desired tension.

A A′ are boats or floats of any desired description, securely fastened together by braces H H′, and together forming a floating support for the current-wheel B, mounted on shaft D, turning in bearings secured to the float. Motion-multiplying apparatus E E′ E^2 E^3 communicates motion from the shaft of the wheel to the dynamo C, the float being held in its position by anchors I I′, or ropes carried to piles or other fixed objects, and the wheel being propelled by the current of the stream. The current generated by the dynamo passes out and returns by the two wires K K′ contained in cable P.

The tank N is provided for holding a great length of surplus cable, to be used when it is necessary to shift the float from one position in the stream to another for the purpose of utilizing the swiftest or most available part of the current. I suppose that in ordinary use on such rivers as the Mississippi, it will frequently be desirable to carry several miles of surplus cable for this purpose.

As an additional device for facilitating the handling of the cable, I provide a reel, O, over which the cable passes in being run out or drawn in. This reel may be made small, and used merely to facilitate the movement of the cable, or it may be made of such size as to carry a large quantity of cable, dispensing with the tank, if desired. The current from the wires contained in the cables passes to the main working-circuit on shore, containing lights, motors, or other translating devices.

The electrical connections of the battery S are such that by proper manipulation of the circuit-closers it may be placed in multiple arc with the working-circuit, as shown in the drawings, or in series with the dynamo and the working-circuit, or in circuit with the dy-

namo, the working-circuit being cut out, or in the working-circuit, the dynamo being cut out; or it may be itself cut out of circuit altogether. When the circuit-closers *p q r w* are closed, and the circuit-closer *v* is open, as shown in the drawings, the battery is in the first position—that is, in multiple arc with the working-circuit. When the circuit-closers *p*, *r*, and *v* are closed and *q* and *w* are open, the battery is in its second or series position. When *p* and *v* are open and *q*, *r*, and *w* closed, the battery is in circuit with the dynamo, and the working-circuit is cut out. When *q* and *v* are open and *p*, *r*, and *w* closed, the battery is in the working-circuit with the dynamo cut out. Finally, when *r* and *v* are open, with *p* and *q* closed, the dynamo is in the working-circuit with the battery cut out. When in the first position—*i. e.*, in a shunt from the main circuit—the resistances should be so adjusted that the storage-battery will receive a charge only when the current generated by the dynamo is in excess of the normal demands of the working-circuit, and will tend to discharge and re-enforce the current in the working-circuit when the latter falls below its normal strength. Its operation will therefore be to promote uniformity in the working-current within certain limits of variation.

It will obviously be necessary in this arrangement to use an automatic cut-out for preventing the short-circuiting of the battery through the coils of the dynamo in case the electro-motive force of the dynamo should at any time fall below that of the battery.

Another mode of using the battery in shunt would be to place in it an automatic circuit-closer, which should operate to close the shunt only when the current given off by the dynamo is above normal. Excess of current could in this way be stored up for use when needed and thrown into the working-circuit as desired.

When in the second position—*i. e.*, in series between the dynamo and working-circuit—the battery should be combined with some one of the automatic reversing devices in common use, whereby when the current of the dynamo falls to a certain point it may be re-enforced by a discharge from the battery.

It may be desirable to throw the whole current of the dynamo into the battery, as in the third position, at times when the demand of the working-circuit is suspended, for the purpose of storing up electricity for future use, and it may be necessary when the dynamo is inactive, as during slack water in a tidal current, to operate the working-circuit entirely from the battery, as in the fourth position.

Another obvious application of my invention is to charge the batteries from the circuit of the dynamo, either upon shore or upon the float, and transport them charged to the point of utilization, using them, for instance, to furnish light for, or to propel, vessels traveling upon the stream.

It will frequently be desirable to have the storage-batteries used arranged in sections with such electrical connections that a current of any required tension may be taken therefrom. This will be particularly useful where the distance between the dynamo and the storage-battery is great and a low tension-current is required in the working-circuit. I have illustrated this arrangement in Fig III.

While I have thus shown several ways in which a storage-battery may be of service in connection with a dynamo-electric machine driven by a current-motor, my invention is not confined to these methods or any of them, and I have not attempted to enumerate all which might be devised, and I wish it understood that my invention includes all possible adaptation of the storage principle to electrical currents generated by dynamos driven in this way.

While I have shown the dynamo as driven by a water-wheel, I do not limit my invention to a motor of that description, it being immaterial whether that or some other form of water-power mechanism is used.

I claim—

1. The combination of a water-power mechanism, a floating support therefor anchored or otherwise secured in the stream, a dynamo-electric machine mounted on said floating support and driven by said water-power mechanism, electrical conductors for conveying the current generated by the dynamo to shore, a working-circuit containing electrical translating devices, and a storage-battery in circuit with the dynamo, whereby regularity of the working-current is maintained, substantially as described and shown.

2. The combination of a water-power mechanism, a floating support therefor anchored or otherwise secured in the stream, a dynamo-electric machine mounted on said support and driven by said water-power mechanism, electrical conductors for conveying the current of the dynamo to shore, a working-circuit containing electrical translating devices, and a storage-battery with electrical connections, whereby it may be thrown into or out of circuit, as required, to maintain the continuity and regularity of the working-current, substantially as described and shown.

3. The combination of a water-power mechanism, a floating support therefor anchored or otherwise fixed in the stream, a dynamo-electric machine mounted on said support and driven by said water-power mechanism, electrical conductors for conveying the current generated by the dynamo to shore for the performance of work, and a storage-battery in circuit between the dynamo and the working-circuit and located upon the floating support, substantially as described, and for the purposes set forth.

4. The combination of a water-power mechanism, a floating support therefor anchored or otherwise fixed in the stream, a dynamo-electric machine mounted on said support and driven by said water-power mechanism, elec-

trical conductors for conveying the current generated by the dynamo to shore, and a storage-battery and electrical connections therefor, whereby it may be thrown into and taken out of the circuit of the dynamo at will.

5. The combination of a water-power mechanism, a floating support therefor anchored or otherwise fixed in the stream, a dynamo-electric machine mounted on said support and driven by said water-power mechanism, and a storage-battery and electrical connections therefor, whereby it may be thrown into or out of circuit with the dynamo at will, said storage-battery and connections being also located upon the floating support.

6. The combination of a dynamo-electric machine mounted upon and driven by a floating current-motor, and provided with a flexible electric conductor for conveying its current to distant fixed points for utilization with storage-batteries arranged in sections in the circuit of the dynamo, and provided with working-circuits and electrical connections, whereby currents of varying degrees of tension, as desired, may be taken from the said batteries for the performance of work, substantially as described, and for the purpose set forth.

7. The combination of a water-power mechanism, a floating support therefor anchored or otherwise secured in the stream, a dynamo-electric machine mounted on said support and driven by said water-power mechanism, electrical conductors for conveying the current generated by the dynamo to the shore, a working-circuit connected with said conductors, and a storage-battery in multiple arc with said working-circuit, substantially as described, and for the purpose set forth.

8. The combination of a water-power mechanism, a floating support therefor anchored or otherwise secured in the stream, a dynamo-electric machine mounted on said support and driven by said water-power mechanism, electrical conductors for conveying the current generated by the dynamo to shore, a working-circuit connected with said conductors, a storage-battery in multiple arc with said working-circuit, and a circuit-breaker in the branch circuit passing through the storage-battery, substantially as described, and for the purpose set forth.

9. The combination of a water-power mechanism, a floating support therefor anchored or otherwise secured in the stream, a dynamo-electric machine mounted on said support and driven by said water-power mechanism, electrical conductors for conveying the current generated by the dynamo to shore, a working-circuit connected with said conductors, a storage-battery in multiple arc with said working-circuit, and three circuit-breakers, one in the storage-battery branch and one on each side thereof in the main circuit, substantially as described, and for the purpose set forth.

10. The combination of a water-power mechanism, a floating support therefor anchored or otherwise secured in the stream, a dynamo-electric machine mounted on said support and driven by said water-power mechanism, conducting-cables for conveying the electricity generated by said dynamo to shore, and a tank on said float for receiving a reserve coil of said cable.

11. The combination of a water-power mechanism, a floating support therefor anchored or otherwise secured in the stream, a dynamo-electric machine mounted on said support and driven by said water-power mechanism, conducting-cables for conveying the electricity generated by said dynamo to shore, a tank on said float for receiving a reserve coil of said cable, and a reel for readily running the cable on and off the float.

12. The combination of a water-power mechanism, a floating support therefor, a dynamo-electric machine mounted on said support and driven by said power mechanism, a cable for carrying the current of said generator to shore, and a reel for carrying a part of said cable and running it on and off the float.

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