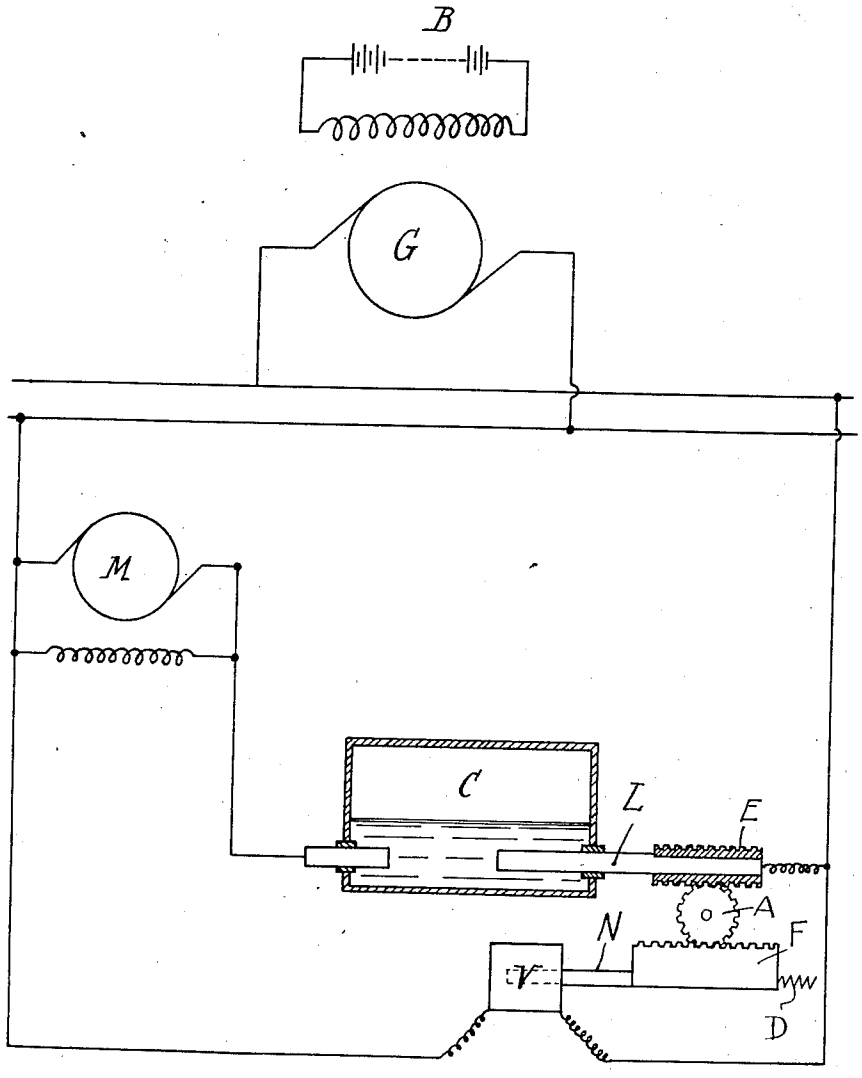
July 10, 1928.

1,677,027

L. CONSTANTIN

METHOD AND MEANS FOR CONNECTING WINDMILLS WITH ELECTRIC GENERATORS

Filed Feb. 5, 1925.



Inventor
Louis Constantin
By Henry Orth & Co
Atty.

Patented July 10, 1928. 1,677,027

UNITED STATES PATENT OFFICE.

LOUIS CONSTANTIN, OF PARIS, FRANCE, ASSIGNOR OF ONE-HALF TO PAUL FORTIER-BEAULIEU, OF ROANNE, FRANCE.

METHOD AND MEANS FOR CONNECTING WINDMILLS WITH ELECTRIC GENERATORS.

Application filed February 5, 1925, Serial No. 7,128, and in France February 12, 1924.

My invention relates to electrical apparatus for dynamo-electrical machines driven by a prime mover having wide variations in power-output such as a windmill and the object of the invention is to so arrange said apparatus as to compensate for the rapid variations in speed to which the generator is subjected.

In order to understand the principle upon which my invention is based, suppose that a generator driven in the manner indicated be connected in circuit with a constant resistance r and a variable resistance R, all in series. Assume that the voltage across the generator is E, then the power consumed by the two resistances (W) will be:

$$W=\frac{E^2}{r+R} \quad (1)$$

The ratio of the amount of power of resistance r to resistance R thus absorbed individually will obviously be:

$$\frac{W_r}{W_R}=\frac{I^2r}{I^2R}=\frac{r}{R} \quad (2)$$

Let us suppose that the voltage at the terminals of the generator is suddenly increased due to an increase in speed of the prime mover and that it has now become α E, where α is greater than unity, and that the variable resistance has been increased to β R where β is greater than unity, the power (W′) consumed under these conditions is readily determined by substituting in formula 1, from which is obtained:

$$W'=\frac{\alpha^2E^2}{r+\beta R} \quad (3)$$

The ratio of the power absorbed by one resistance with respect to the other under these conditions is obtained from formula 2, or

$$\frac{W_r}{W'_R}=\frac{I^2r}{I^2\beta R}=\frac{r}{\beta R} \quad (4)$$

It follows from the foregoing that since the distribution of power depends upon chiefly and becomes greatly modified by varying R, a formula may be obtained for β as a function of α which represents the condition to be fulfilled in order that the variable resistance R shall compensate by itself for the rapid changes in power delivered to the generator by the prime mover independently of the fixed resistance r. Let the intensity of the current (I) be desired to be constant, then the total power consumed by the resistances will be $(I^2(r+\beta R))$ and combining formula (3) we obtain:

$$I^2(r-\beta R)=\frac{\alpha^2E^2}{r+\beta R} \quad (5)$$

$$\beta=\frac{\alpha E-Ir}{IR} \quad (6)$$

In order to obtain the power consumed by the fixed resistance r it is first necessary to solve equation (6) for the value of the current (I) assumed to be constant which gives:

$$I=\frac{\alpha E}{R\beta+r} \quad (7)$$

The power W_r is readily obtained then as follows:

$$W_r=I^2r=\frac{r\alpha^2E^2}{(R\beta+r)2} \quad (8)$$

It will thus be seen that the power in equation (8) will be independent of α and equal to I^2r provided a suitable relation is maintained between α and β so that under these conditions the resistance r will be traversed by a current of constant intensity.

The variable resistance will thus act as a plugging resistance the value of which is determined by regulating β as a function of α. In actual practice the resistance r is replaced by a working circuit and translating devices which cannot ordinarily support but a limited overload. The value of the variable resistance may thus be regulated to conform to the best working conditions in the manner above described.

The single figure of the accompanying drawing shows, by way of example, a diagrammatic view of how the above outlined principles of my invention may be put into practice.

A generator G, which is excited for instance by the battery B, supplies current to a work circuit represented in the drawing as comprising the motor M, and also to an electric boiler whereof one electrode L is movable. To this end the electrode L is carried by a circular rack E engaged by a gear wheel A which in turn is operated by a rack F retracted by a spring D. The rack F is connected to the core N of the regulating device V. The motor M and the boiler

C are connected in series. The electrode L is adjusted by the automatic regulating device V which operates according to the voltage variations at the terminals of the generator in such manner that each increase in voltage will correspond to an additional spacing of the electrodes of the said boiler.

Obviously many variations may be made in my invention without departing from the scope thereof, such as the number of generators, the number and character of translating devices M and the number of boilers C. Likewise the generators and the translating devices may be located at a point remote from each other or from the rest of the apparatus and be connected by suitable power lines.

What I claim is:

1. A voltage regulating system for dynamo-electric machines comprising in combination with a generator subjected to rapid variations in speed, a translating device, an electric boiler, a movable and a fixed electrode in said boiler, means for serially connecting said translating device, said generator and the electrodes of said boiler, means for varying the resistance of said boiler by changing the position of said movable electrode and automatic means for varying said last mentioned means in accordance with the voltage supplied by said generator for the purpose disclosed.

2. A voltage regulating system for dynamo-electric machines comprising in combination with a generator subjected to rapid variations in speed, a translating device, an electric boiler, a movable and a fixed electrode in said boiler, means for serially connecting said translating device, said generator and the electrodes of said boiler, a rack on said movable electrode, a pinion meshing with said rack, a solenoid, a plunger for said solenoid, a rack on said plunger meshing with said pinion and means for connecting said solenoid in parallel with said boiler and said translating device for the purpose disclosed.

In testimony whereof I have signed this specification.

LOUIS CONSTANTIN.