

(No Model.)

P. BOUCHEROT.

METHOD OF CONVERTING OR TRANSFORMING PERIODIC ELECTRIC CURRENTS
TO OBTAIN CONSTANT EFFECTIVE INTENSITY OR VOLTAGE.

No. 548,511.

Patented Oct. 22, 1895.

FIG. 1.

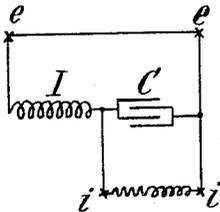


FIG. 2.

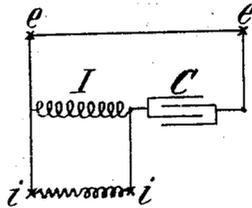


FIG. 3.

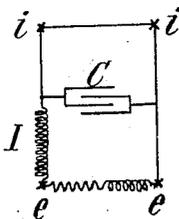
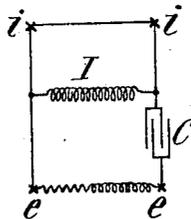


FIG. 4.



WITNESSES.

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METHOD OF CONVERTING OR TRANSFORMING PERIODIC ELECTRIC CURRENTS TO OBTAIN CONSTANT EFFECTIVE INTENSITY OR VOLTAGE.

SPECIFICATION forming part of Letters Patent No. 548,511, dated October 22, 1895.

Application filed December 10, 1892. Serial No. 454,767. (No model.) Patented in France November 4, 1890, No. 209,287, and in England May 5, 1891, No. 7,781.

To all whom it may concern:

Be it known that I, PAUL BOUCHEROT, of the city of Paris, France, have invented a Method of Converting or Transforming Periodic Electric Currents to Obtain Constant Effective Intensity or Voltage, (for which I have obtained Letters Patent in France for fifteen years, dated November 4, 1890, No. 209,287, and in England for fourteen years, dated May 5, 1891, No. 7,781.) of which the following is a full, clear, and exact description.

The invention relates to periodic or alternating currents, and in order that the description following hereinafter may be fully understood I will observe that with reference to such currents the effective intensity or the "current" is defined as the square root of the mean of the squares of the intensity at every moment, and the effective electromotive force or "pressure" is defined as the square root of the mean of the squares of the electromotive force.

The object of this invention is to obtain a current of which the intensity is constant where a periodic electromotive force of a constant effective average value is given, or, in other words, where a constant effective difference of potential is maintained between two poles.

A second object of the invention is, vice versa, to obtain a constant effective difference of potential where a current of constant effective intensity is given.

The first object is attained by inserting in series between the poles where the constant effective difference of potential is obtained any apparatus possessing the quality of electrical capacity of a suitable value and another apparatus possessing the quality of self-induction also in a suitable degree. Then from the two terminals of either the capacity apparatus or the self-induction apparatus there may be taken in shunt a second circuit, and the effective intensity of this second circuit will be constant, whatever may be the apparatus included in this circuit, whether incandescent or arc lamps, resistances, self-induction coils, condensers, motors, transformers, or other apparatus.

It will be understood that the relative proportions of capacity and self-induction are

such—viz., $w = \frac{1}{\sqrt{LC}}$ —as to produce what is

known as the "condenser effect," with the result that the electromotive force i , Fig. 1, for example, is theoretically capable of variation from zero to a very large value, and in inverse ratio to the impedance of that portion of the circuit between those terminals.

To fulfill the second object the capacity apparatus is placed in the circuit where the constant effective periodic intensity exists, and the one pole of the self-induction apparatus is connected to one pole of the capacity apparatus, or the self-induction apparatus may be inserted in the circuit and the one pole of the capacity apparatus connected to the one pole of the self-induction apparatus. In either case a constant effective difference of potential will then be found to exist between the other pole of the capacity and the corresponding pole of the self-induction apparatus.

In applying the invention any device or apparatus capable of electrical capacity or of self-induction may be used, provided its value for its respective purpose is sufficient, looking to the known value of intensity or of electromotive force in question.

The best relation to be observed is the following: Thus if I is the constant intensity in ampères, E the constant difference of potential in volts, and T the periodic time of the current in seconds, C the value of the electrostatic capacity in farads is found by the equation

$$C = \frac{IT}{E2\pi},$$

and the value of the coefficient of self-induction (indicated by L) is found in henrys or sechms by the equation

$$L = \frac{ET}{12\pi},$$

π being in each case the proportion of the circumference of a circle to its diameter, or about 3.1416.

The accompanying four diagrams illustrate

the relative arrangements of the apparatus herein described.

I represents an apparatus of self-induction; C one of capacity. Between ee there exists the constant effective difference of potential; between ii the constant effective intensity of current.

In Figure 1 the intensity is found in a circuit in shunt with the capacity. In Fig. 2 it is found in a circuit in shunt with the self-induction. In Fig. 3 the constant effective difference of potential is found between the one terminal of the self-induction and the one terminal of the capacity. In Fig. 4 it is found between the other terminals of these two apparatus.

As stated above, I may employ any kind of apparatus having capacity and self-induction, provided the coefficients have appropriate values for the purposes of the invention.

The action of the apparatus is as follows: Suppose, for example, that the resistance in the branch ii of Fig. 1 were to decrease, then more current would pass through the self-induction coil I, and as a consequence increase the electromotive force of the self-induction, and since the electromotive force between the points ee is constant the electromotive force due to the condenser C must decrease, thus tending to reduce the current in the branch ii and keep it constant. If, however, the resistance in the branch ii increases the current in the self-induction coil I decreases, and as a result the electromotive force at the terminals of the condensers increases, and so tends, as before, to preserve a constant current. Theoretically the current is constant whatever be the resistance of the circuit, and this is believed to be the distinguishing advantage of the invention. In practice the current varies one or two per cent., according to whether the apparatus is working without any load—that is, with a very slight resistance—or with a full load—that is, with the apparatus of the self-induction and capacity at the limit of the intensity and tension, respectively, to which they can be subjected.

The function of the apparatus is similar to that of a transformer, with the difference, however, that instead of the electromotive force being in the secondary circuit it is the current which is constant, and that irrespect-

ive of the resistance. For instance, in Fig. 1, let us suppose that the terminals ee are those of an alternating-current machine giving a constant electromotive force of one thousand volts and that the current in the branch ii is ten ampères when the resistance of said branch is one ohm, then the current will practically be 9.9 ampères when the resistance is one hundred ohms and 9.8 ampères when the resistance is two hundred ohms, the pressure in this branch then being nineteen hundred and sixty volts (9.8×200 .) Of course the alternating-current machine will yield a stronger current—for instance, a current of twenty ampères at the electromotive force of one thousand volts. If the resistance increases to three hundred ohms, the current will be 9.7 ampères and the alternating-current machine will produce a current of thirty ampères.

I claim—

1. The method of obtaining a current of constant effective intensity from a periodic electric current of constant effective electromotive force consisting in combining in series in the circuit of constant electromotive force, an apparatus possessing electrical capacity and one possessing the quality of self induction and connecting the circuit in which the constant effective intensity is required in shunt with either of these two apparatus.

2. The method of obtaining a constant effective difference of potential where a current of constant effective intensity is given, consisting in combining in shunt in the circuit in which the current of constant effective intensity is given an apparatus possessing electrical capacity and one having the quality of self induction, whereby the constant difference of potential will be found between the one or other pair of adjacent terminals of these two apparatus.

The foregoing specification of my method of converting or transforming periodic electric currents to obtain constant effective intensity or voltage signed by me this 30th day of September, 1892.

PAUL BOUCHEROT.

Witnesses:

ROBT. M. HOOPER,
ALBERT MOREAU.