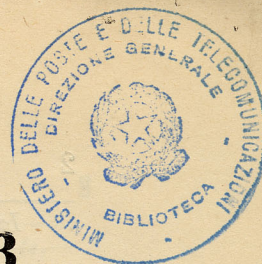


[Third Edition.]

N° 13,637



A.D. 1913



Date of Application, 12th June, 1913

Complete Specification Left, 12th Jan., 1914—Accepted, 11th June, 1914

PROVISIONAL SPECIFICATION.

Improved Means for Increasing the Frequency of Alternating Currents.

We, MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED, and CHARLES SAMUEL FRANKLIN, Electrical Engineers, both of Marconi House, Strand, London, W.C., do hereby declare the nature of this invention to be as follows:—

It is known that if any rectifier, for example, a mercury arc rectifier, is connected in series with a source of alternating current, then only one half of the alternating current passes through the rectifier.

According to this invention we connect in series with a source of alternating current and a rectifier, a polarising direct voltage of any desired strength, which may be in the same direction as or opposed to that half of the alternating current which normally passes through the rectifier.

If the polarising voltage is opposed the time during which current passes through the rectifier will be shorter than a half period, whereas if the polarising voltage is in the same direction, such time will be longer than a half period and the current will cease for some time which is shorter than a half period.

If we include in the circuit a suitable transformer the secondary of which is connected to a condenser and is suitably tuned we can, by adjusting the polarising voltage, double the original frequency in the transformer secondary.

Such an arrangement can therefore be used for stepping up frequencies.

Obviously more than one rectifier circuit may be employed in order to utilise both halves of the alternating current and also to utilise two or more phase currents.

Dated this 12th day of June, 1913.

CARPMAEL & Co.,

Agents for Applicants,

24, Southampton Buildings, London, W.C.

COMPLETE SPECIFICATION.

Improved Means for Increasing the Frequency of Alternating Currents.

We, MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED, and CHARLES SAMUEL FRANKLIN, Electrical Engineers, both of Marconi House, Strand, London, W.C., do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

It is known that if any rectifier, for example a mercury arc rectifier, is connected in series with a source of alternating current, then only one half of the alternating current passes through the rectifier.

[Price 6d.]

Improved Means for Increasing the Frequency of Alternating Currents.

According to this invention we connect in series with a source of alternating current and a rectifier, a polarising direct voltage of any desired strength, which may be in the same direction as or opposed to that half of the alternating current which normally passes through the rectifier.

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If we include in the circuit a suitable transformer the secondary of which is connected to a condenser and is suitably tuned we can, by adjusting the polarising 10 voltage, double the original frequency in the transformer secondary.

Such an arrangement can therefore be used for stepping up frequencies.

Obviously more than one rectifier circuit may be employed in order to utilise both halves of the alternating current and also to utilise two or more phase 15 currents.

The accompanying diagrams illustrate our invention.

Figure 1 shows the voltage which will act on the circuit if the polarising voltage is opposed to and Figure 2 the voltage if the polarising voltage is in the same direction as the current passing through the rectifier.

It will be seen that the part of the wave which passes the rectifier in Figure 1 20 and which is indicated by a thick line is nearly identical with part of a double frequency curve which is shown dotted. In Figure 2 the same part of the curve is effective as in Figure 1; for the part *a b* annuls the effect of the part *b c*. and *d e* annuls the effect of *e f*.

Figure 3 shows the simplest form of circuit containing an alternator *a*, battery *b* 25 for supplying polarising voltage, rectifier *r* and transformer *t*.

The secondary circuit of the transformer is tuned to double the frequency of the alternator and by adjusting the polarising voltage it will be found that a current having double the frequency of the alternator can be obtained in the secondary circuit. This double frequency may be passed through another circuit 30 containing a rectifier, polarising voltage and transformer, and the frequency thus again doubled.

The frequency may however be doubled several times with only one rectifier and source of polarising voltage as shown in Figure 4. Here the current from the alternator *a* of frequency *n* passes through a series of transformers *t t¹ t²*, the 35 rectifier *r* and battery *b*.

The polarising voltage is adjusted so as to obtain a frequency $2n$ in the secondary of transformer *t*. This secondary is connected through a tuning condenser *c* to a point between *t* and *t¹* and to a point *x* between the alternator and the battery. Owing to the inductance of the alternator and the trans- 40 former *t* practically all the alternating current of frequency $2n$ passes through the transformers *t¹* and *t²* the rectifier and battery.

The transformation ratio and the coupling of *t* are so adjusted that with the polarising voltage of *b* a frequency $4n$ is obtained in the secondary of transformer *t¹*. This secondary is connected through a tuning condenser *c¹* to a 45 point between *t¹* and *t²* and to the point *x*, thus passing a current with frequency $4n$ through the rectifier.

If the transformation ratio and the coupling of *t¹* are adjusted correctly a frequency $8n$ will be obtained in the secondary of the transformer *t²*. If *t²* is the last transformer its secondary is connected to a tuning condenser *c²* and an 50 inductance *i* and this circuit is tuned to $8n$ or the secondary of *t²* may form part of an aerial tuned to the frequency $8n$.

During working the battery *b* becomes charged if its voltage is opposed to that half of the alternating current which normally passes through the rectifier; the energy thus accumulated may be used to help drive the alternator by means 55 of a motor.

In this arrangement simple transformers are shown; it may however be an

Improved Means for Increasing the Frequency of Alternating Currents.

advantage to insert intermediate circuits tuned to the frequency required between the primary and secondary shown.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that
5 what we claim is:—

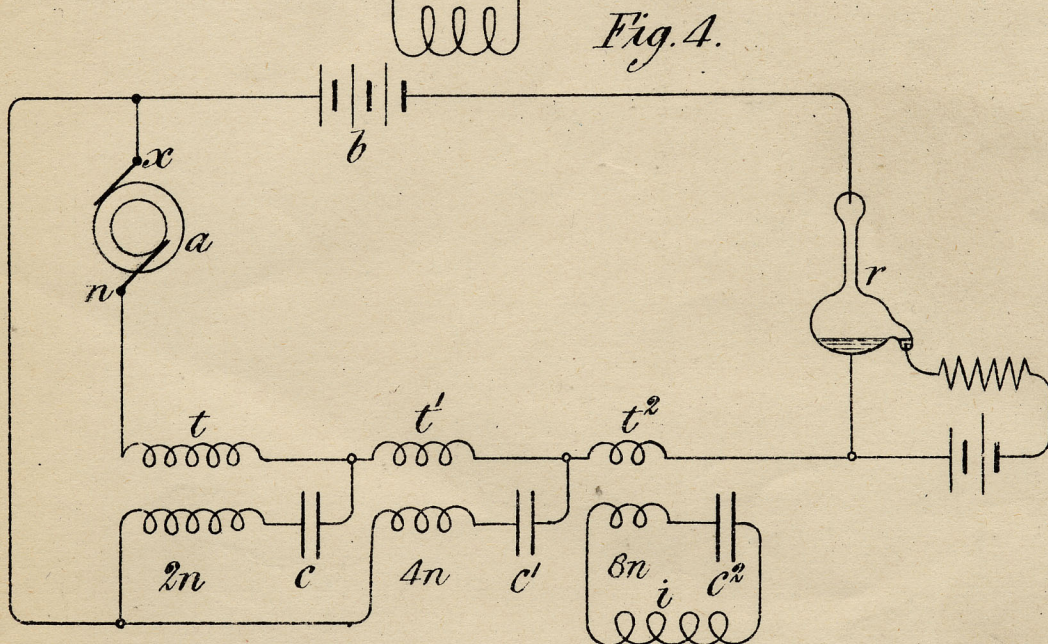
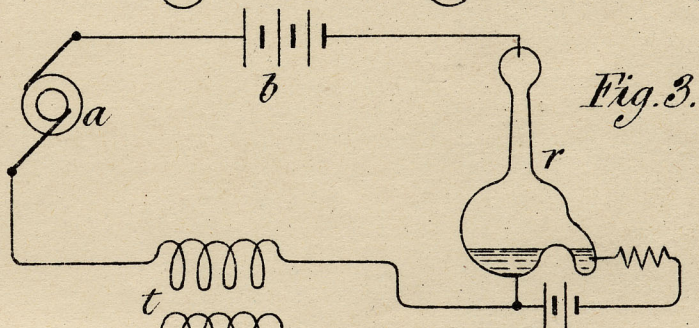
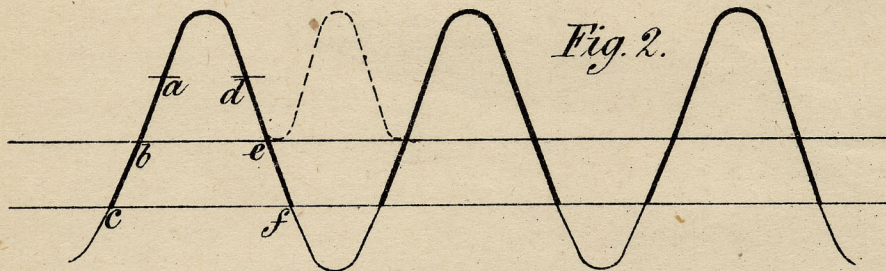
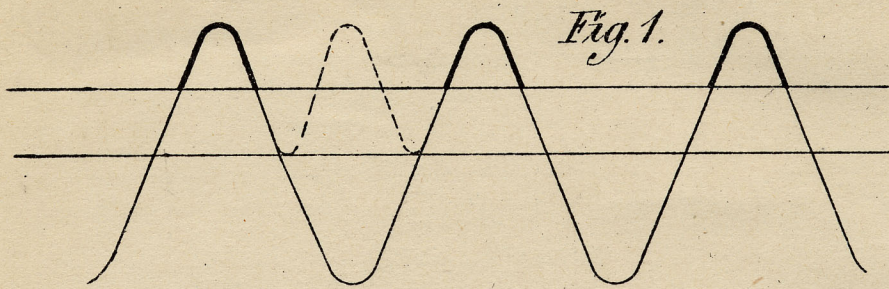
1. Multiplying the frequency of an alternating current by passing it through a rectifier, an adjustable polarising voltage and a transformer the secondary of which is tuned to twice (or a greater even multiple of) the original frequency substantially as described.
- 10 2. In the multiplication of the frequency of an alternating current as claimed in Claim 1 employing several transformers with a single rectifier and polarising voltage substantially as described.

Dated this 11th day of January, 1914.

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(3rd Edition)



[This Drawing is a reproduction of the Original on a reduced scale.]