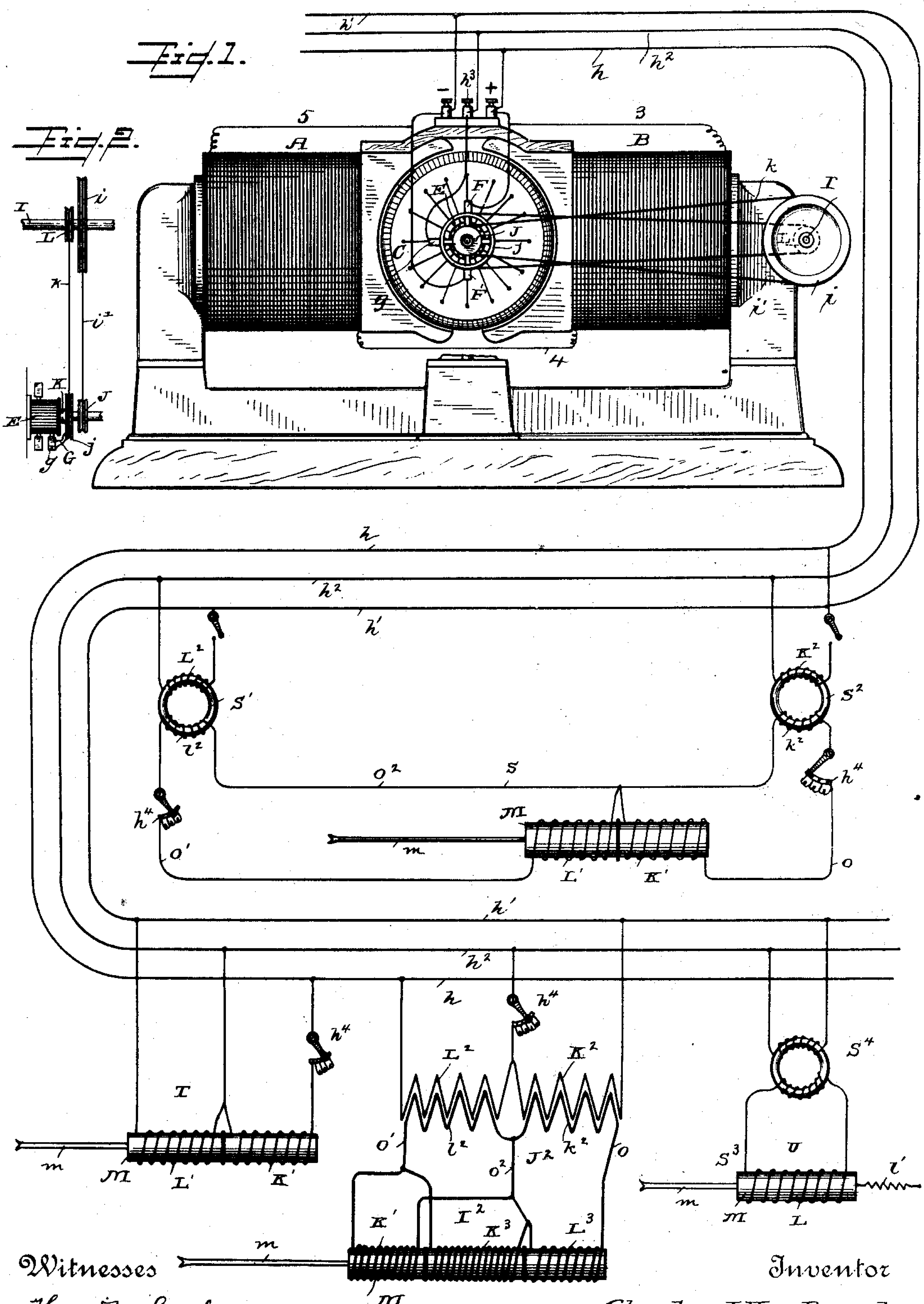
(No Model.)

C. J. VAN DEPOELE.

PULSATING CURRENT SYSTEM.

No. 422,859. Patented Mar. 4, 1890.



Witnesses

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UNITED STATES PATENT OFFICE.

CHARLES J. VAN DEPOELE, OF LYNN, MASSACHUSETTS.

PULSATING-CURRENT SYSTEM.

SPECIFICATION forming part of Letters Patent No. 422,859, dated March 4, 1890.

Original application filed March 23, 1889, Serial No. 304,544. Divided and this application filed October 4, 1889. Serial No. 326,024. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. VAN DEPOELE, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Pulsating-Current Systems, of which the following is a description, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon.

This application is a division of my application filed March 23, 1889, Serial No. 304,544.

My invention relates to improvements in electric generators, more especially with reference to the production of currents having a defined rise and fall—that is to say, pulsating or intermittent currents—for example, such as are referred to in Patents Nos. 400,809 and 401,231, dated, respectively, April 2 and April 9, 1889, and particularly adapted for operating reciprocating electric engines.

As set forth in my said prior applications, my improved electro-magnetic reciprocating engines are operated synchronously with the generator or source of defined currents, each current energizing a coil in the engine for the purpose of imparting movement to the working parts.

Since the rapidity of alternation in what are known as "alternate" currents in electric-lighting machines is altogether too great and beyond the speed at which the piston of a direct-acting engine of any size is required to be moved, and since it is impracticable to operate known forms of alternate-current electric-light generators at a speed low enough to accomplish my purpose, I have provided special means whereby I am enabled to convert a continuous current into undulating or pulsating currents having any desired rate of succession or phase, and without any regard to the speed of the generator.

In the application of which this is a division various methods of producing pulsating or intermittent electric currents are disclosed, together with means, mechanisms, and apparatus for supplying such currents to useful work. Under many circumstances special arrangements to meet special conditions would be extremely desirable and useful.

The object of the present invention is the distribution of pulsating or intermittent electric currents over long distances, and also to translating devices requiring supply-currents of differing electric qualities, so that in fact a group of translating devices, as reciprocating engines, each constructed for current of differing voltage, may be arranged to be operated from a single source and at widely-different intervals.

In carrying out the invention I provide a source of pulsating or intermittent currents, which said currents may be of constant polarity or of alternating polarity, the production of both of which being explained in the parent application. Where the current is to be distributed through an extended field, the tension of the main supply-currents will be proportionately high, so that the same may be conveyed over relatively economical conductors.

In order to provide each separate engine or group of engines with current of the proper quality, I place in proximity to the said translating devices inductional transformers or converters, the primary coils of which are in circuit with the main conductors, and which will give in their secondary circuits intermittent currents of a tension determined by the resistance of the secondary winding thereon. Inductional transformers being operative with either an intermittent or an alternating current, I may use either, as preferred, without in any way departing from the invention.

Certain necessary details of the invention are shown in the accompanying drawings, and will be hereinafter described, and referred to in the appended claims.

In the drawings, Figure 1 comprises a diagrammatic view showing in elevation a source of pulsating currents and in diagram a circuit extending therefrom and including a number of translating devices embodying the invention. Fig. 2 is a detail plan view of the mechanism for actuating the moving commutator-brush.

As seen in said drawings, the source of current is a dynamo-electric generator having an armature C and field-magnets A B. The armature C is of the continuous-current type and provided with a sectional commutator E.

Main positive and negative commutator-brushes F F′ are mounted in any convenient manner and set upon the line of commutation, being adjustable, of course, in order to provide for necessary change of their stationary working positions. The main brushes F F′ are connected to the positive and negative binding-posts. The main working-circuit comprises three conductors $h\ h'\ h^2$. The conductor h is electrically connected with the positive binding-post, and the conductor h' with the negative binding-post. The third conductor h^2 is connected with a third binding-post h^3, and the said binding-post h^3 is connected with an auxiliary commutator-brush g, rotatably mounted with respect to the commutator-cylinder and arranged to be continuously moved about the same, as will appear.

The field-magnet coils of the generator are, as here indicated, connected in shunt relation to the armature C by conductors 3 4 5, although it will be understood that the said field-magnets might be separately excited, if found more convenient. The armature C being rotated within the field of force of the magnets A B, currents will be generated which would ordinarily flow out through the main stationary commutator-brushes, and thence to the working-conductors $h\ h'$. By providing a third circuit-conductor and a third commutator-brush, said third brush being constantly moved about the commutator, the main current of the machine will be caused to flow first in one main conductor and the third wire h^3, and then in the other, thereby producing in effect two circuits, in each of which the current is caused to rise and fall or pulsate. Two moving brushes might of course be used, and a complete double circuit, as seen in Fig. 1 of the parent application; but the present arrangement has obvious advantages.

The armature C is rotated at any speed which may be found best—that is to say, the said armature is operated at its most efficient rate. The rapidity of the current phases is determined by the results sought, and the moving brush g is therefore arranged to be operated at the desired rate of speed irrespective of the armature speed. The rotating brush g may be operated by an independent motor, or may be driven by gearing from the shaft of the armature C, and the latter form is here shown by way of illustration, being fully described and claimed in division A, filed contemporaneously herewith.

Upon a counter-shaft I, rotatably mounted upon some convenient portion of the frame of the generator, is placed a band-wheel i. Upon the armature-shaft is a driving-pulley J, connected by belt i' with the pulley i, thereby imparting rotation to the counter-shaft I. The commutator-brush g is carried by a suitable holder G, which is secured to a sleeve K, mounted rotatably upon the armature-shaft and provided with a driving-pulley j. The pulley j, sleeve K, and commutator-brush carrier are all rotated by a belt k, passing over a driving-pulley L, attached to the counter-shaft. It will be understood, therefore, that the speed of rotation of the moving commutator-brush will depend entirely upon the relative sizes of the driving-pulleys J i j L, and that by altering the proportions thereof, as by exchanging the wheel i for a larger or a smaller one, the rate of rotation of the pulley j will be lowered or raised.

Various forms of my electro-magnetic reciprocating engines may be operated in connection with the circuit $h\ h'\ h^2$, and according to the present invention, which is supplied with a converter adapted to receive the primary current and to supply the working-conductors of the translating devices connected therewith with currents of the quality required to produce the best results. The converters referred to may be of any type or construction capable of operating by induction. The primary circuits of said converters must, of course, be capable of receiving the currents from the circuit $h\ h'\ h^2$; but the secondary circuits thereof will be such as will give the desired currents in the working-circuits of the translating devices connected therewith.

A form of apparatus includes a multiple-coil reciprocating engine I^2, which is in circuit with and arranged to be actuated by a converter J^2. The outer terminals of coils $K^2\ L^2$ of the converter J^2, acting as primaries, are in circuit with the conductors $h\ h'$, and the stationary commutator-brushes and their inner terminals are both connected to the return-conductor h^2 leading to the moving brush g. Secondary coils $k^2\ l^2$ are arranged in inductive relation to the coils $K^2\ L^2$. The secondary coils being connected by conductors O O′ O^2 with the coils K′, K^3, and L^3 of a reciprocating engine I^2, the currents generated in said secondary coils $k^2\ l^2$ by the intermittent currents flowing in the main circuit and primary coils $K^2\ L^2$ will be led to the motor-coils K′ K^3 L^3, energizing the same in alternation. The front coils K′ K^3 are connected in multiple-arc between conductors O′ O^2, and the back coil L^3 between conductors O O^2. The same results will be produced by using two coils, the cross-sectional area of one being greater than that of the other. With a current of constant potential, current will flow into the working-circuits in proportion to the respective resistance thereof, and therefore, when it is desired that the front coil shall develop, for instance, twice the power of the back coil, by making the conductors of the front coil of twice the sectional area of those of the back coil the desired results will be produced. This is claimed, broadly, in the parent case, and an arrangement such as just referred to is indicated in Fig. 6 of the said parent application, of which this is a division, where it will be seen that the conductors comprising the motor-coil L′ are larger in size than those of the coil K′, the current dividing between the said coils in proportion to their respective resistances.

At S is seen a two-coil reciprocating engine operated by secondary currents from the converters S′ S^2. The primary conductor K^2 of the converter S^2 is connected between the conductors h h^2, the secondary circuit k^2 of said converter comprising the coil K′ of the engine, and an adjustable resistance h^4 is included in the secondary circuit of the converter S^2, for modifying and controlling the effect of the current upon the moving parts of the engine. The other coil L′ of the engine S is in circuit with the secondary coil of a converter S′, the primary coils L^2 of said converter being connected between the conductors h^2 h'. An adjustable resistance h^4 is also provided in the secondary circuit of the converter S′ for adjusting the current in the coil L′ of the engine.

It will be understood that by substituting for the converters S′ S^2 other similar devices differently wound and proportioned secondary currents may be produced suitable for the operation of almost any form of translating devices; also, that the engine S might be changed for one of different capacity and the secondary currents from the said converters be adjusted to the proper point by means of adjustable resistances shown in each of their secondary circuits.

A single-coil engine, as indicated at S^3, may be actuated by a single converter S^4. It will also be understood that current may be taken direct from the supply-conductors h h' h^2 for the operation of reciprocating engines, such as described in the application and patents hereinbefore referred to, such devices being indicated at T and U, respectively.

Various other modifications may be made without departing from the invention, as will be understood by a skilled electrician.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, with a source of pulsating or intermittent electric currents, of a line-circuit, a reciprocating electric engine, and an inductional transformer having its primary coils in circuit with the source and its secondary coils connected to the working-circuits of the said reciprocating engine.

2. The combination, with a source of pulsating or intermittent electric currents, of a line-circuit, a reciprocating electric engine having a motor coil or coils, and an inductional transformer having its primary coil or coils in the line-circuit and its secondary coil or coils connected to the motor coil or coils of the engine.

3. The combination, with a source of pulsating or intermittent currents, of a duplex circuit receiving alternate phases, a reciprocating electric engine having a plurality of motor-coils, a duplex converter having primary coils in circuit with both the main circuits and secondary coils connected to the motor-coils of the engine and arranged to supply current thereto in alternation.

4. The combination, with a source of pulsating or rising and falling currents, of a reciprocating electro-magnetic engine having a plurality of motor-coils, two circuits extending between the source of current and the motor-coils, and connections between the conductors of one circuit and the majority of said motor-coils and between the conductors of the other circuit and the remainder thereof.

In testimony whereof I hereto affix my signature in presence of two witnesses.

CHARLES J. VAN DEPOELE.

Witnesses:

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