(No Model.)

G. WESTINGHOUSE, Jr.

SYNCHRONIZING ELECTRIC GENERATORS.

No. 390,930. Patented Oct. 9, 1888.

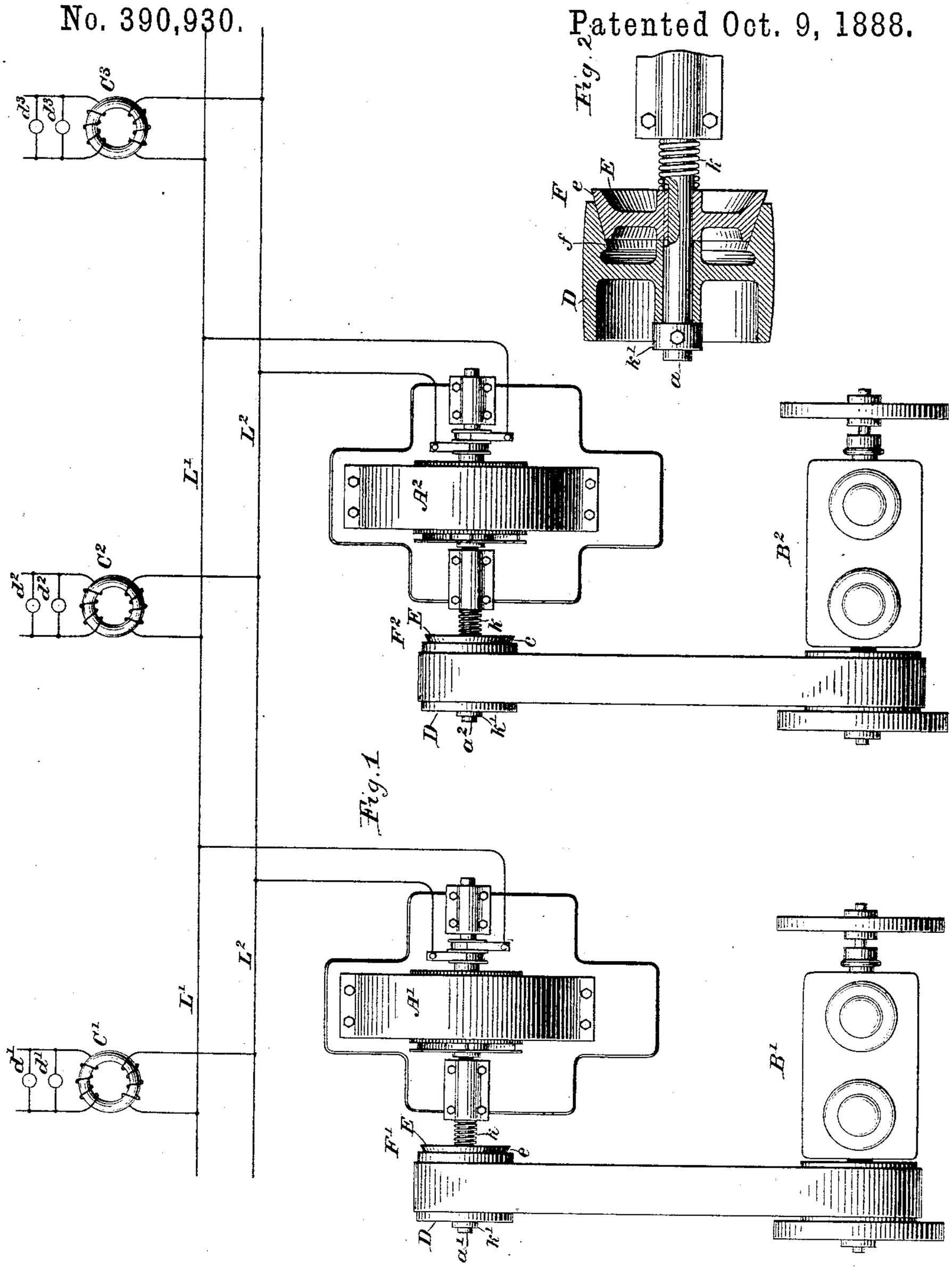

Fig. 1.

Fig. 2.

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UNITED STATES PATENT OFFICE.

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SYNCHRONIZING ELECTRIC GENERATORS.

SPECIFICATION forming part of Letters Patent No. 390,930, dated October 9, 1888.

Application filed December 21, 1887. Serial No. 258,572. (No model.)

To all whom it may concern:

Be it known that I, GEORGE WESTINGHOUSE, Jr., a citizen of the United States, residing in Pittsburg, in the county of Allegheny, in the State of Pennsylvania, have invented certain new and useful Improvements in Synchronizing Electric Generators, of which the following is a specification.

The invention relates to an organization of apparatus for maintaining in synchronism alternate-current electric generators driven from the same or from different sources; and the object is to provide means for insuring that two or more machines normally tending to run at approximately the same speed, but subject to slight variations, shall remain in synchronism and deliver the same number of impulses per second when connected with a common circuit. Thus when several generators are driven by different engines, one or more of which tend to drive ahead of the others, there would be a constant tendency on the part of the corresponding generator to gain upon the others. This invention is designed to prevent such result from following.

In general terms, the invention consists in coupling the generators with their driving-shafts through friction, yielding, or other equivalent couplings which will allow the armature of either generator to move with reference to its driving-pulley or with reference to the shaft of the engine, as may be required to maintain synchronism with the other generators. This may be accomplished in various ways, one of which will be illustrated in connection with the accompanying drawings, in which—

Figure 1 is a plan of an organization of apparatus adapted to carry out the invention, and Fig. 2 illustrates certain details.

Referring to the figures, A′ represents an alternate-current generator, and A² a second generator similar thereto. These are designed to be driven at approximately the same speed by engines B′ B². The pulleys of the generators are coupled with their shafts *a′ a²* in this instance through friction-pulleys or clutches, as shown at F′ and F². In this instance the clutches each consist of wheels E, keyed to the shaft *a′* or *a²*, and having a conical bearing-surface, as shown at *e*. This surface presses against the corresponding bearing-surface, *f*, upon the belt-wheel D, and the force with which this pressure is exerted may be determined by means of a coil-spring, *k*, and set-nut, *k′*, upon the shaft of the armature. By adjusting the set-nut the spring will be caused to force the clutch with greater or less pressure against the pulley and thereby bind it more or less firmly to the armature. The wheel D, it will be understood, is loosely mounted upon the armature-shaft, except for the pressure of the clutch, as described.

Each of the machines A′ and A² is constructed in the usual way.

It is well understood that when alternate-current generators delivering approximately the same number of impulses per minute are connected in multiple arc to deliver currents in the same direction to a work-circuit, L′ and and L², for instance, they tend to remain in synchronism—that is to say, to deliver to the circuit the same number of impulses per second and at the same time; but if, for example, the normal speed of one of the driving-engines should be greater than that of another engine of the system, then there would be a constant tendency for the corresponding generator to gain upon the other; but the movement of the driving-wheels with reference to the armature, which is at all times allowed by reason of the friction-couplings, renders it possible for the engines to move at slightly different speeds when necessary, while the armatures themselves continue to revolve at the same speed, and are therefore in unison.

It will be understood that various other methods may be adopted whereby the necessary movements between the parts may be obtained as required, and whereby the different generators will accommodate themselves to the varying speeds on the part of their driving-engines and will continue to deliver currents to the work-circuit in unison with each other.

In the drawings there is shown a work-circuit consisting of electric converters C′, C², and C³, having their primary coils connected in the circuit L′ L² and their secondary coils closed through translating devices *d′ d′*, *d² d²*, and *d³ d³*.

I claim as my invention—

1. The combination, with an electric circuit and two or more alternate-current electric generators delivering currents to said circuit, of a source of power for driving the same and yielding mechanical connections between the source of power and said machines, whereby the armatures of the machines are allowed a continuous relative movement in either direction with reference to the source of power, substantially as described.

2. The combination, with two or more alternate-current electric generators and a circuit common to the same, of a source of power for driving said generators, connections between said generators and the corresponding driving source, and interposed yielding connections whereby the armatures of the generators are allowed under predetermined amount of force to move with reference to the driving-shafts, substantially as described.

In testimony whereof I have hereunto subscribed my name this 14th day of December, A. D. 1887.

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