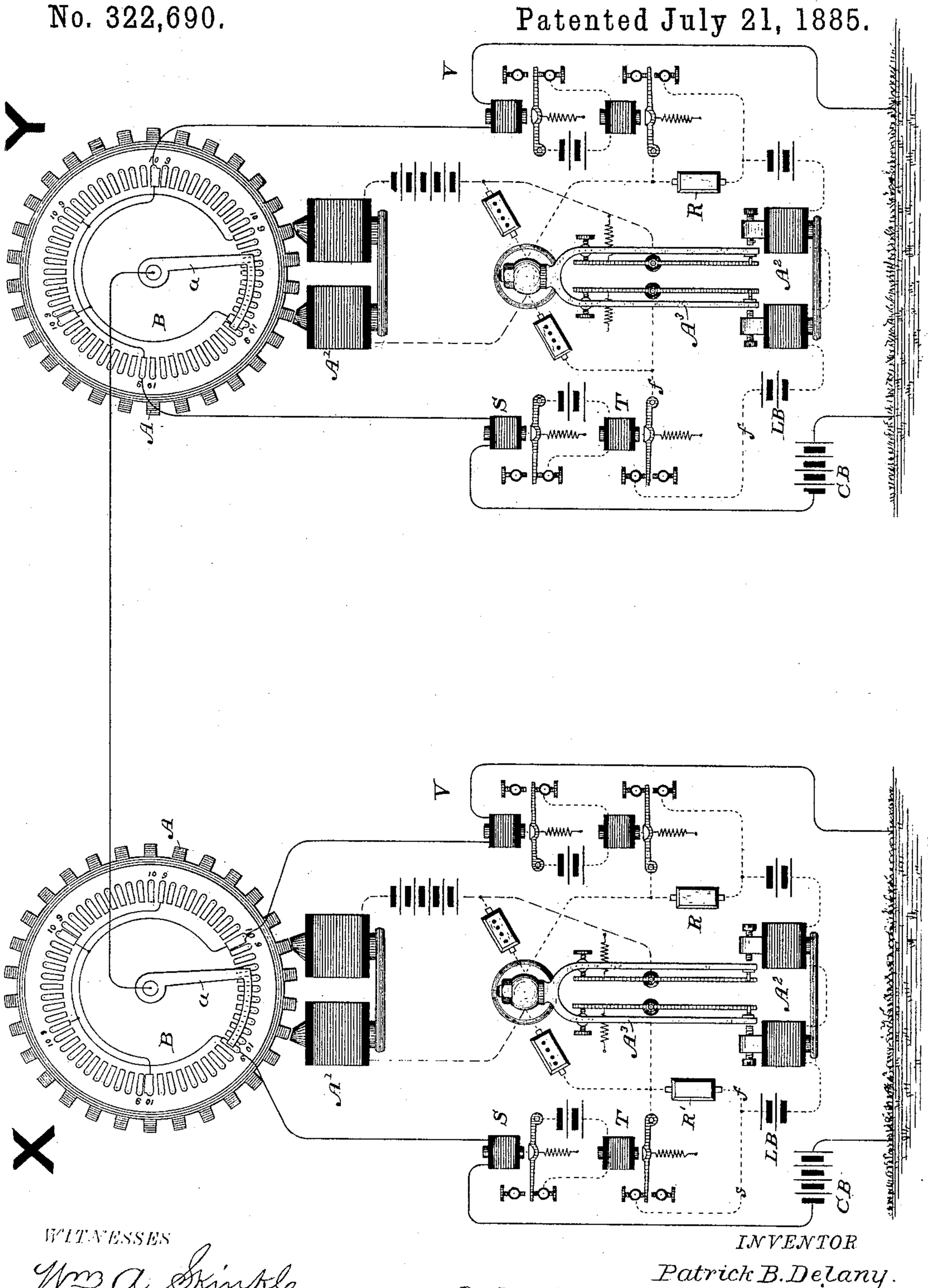
(No Model.)

P. B. DELANY.

MEANS FOR EFFECTING ELECTRICAL SYNCHRONOUS MOVEMENTS.

No. 322,690. Patented July 21, 1885.



WITNESSES

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MEANS FOR EFFECTING ELECTRICAL SYNCHRONOUS MOVEMENTS.

SPECIFICATION forming part of Letters Patent No. 322,690, dated July 21, 1885.

Application filed February 26, 1884. (No model.)

To all whom it may concern:

Be it known that I, PATRICK B. DELANY, of the city, county, and State of New York, have invented certain new and useful Improvements in Electrical Synchronous Movements, of which the following is a specification.

My invention relates specially to the methods of obtaining synchronous movements shown in sundry Letters Patent of the United States granted to me on the 9th day of October, 1883; and it consists in a new arrangement for correction whereby moving apparatus at opposite ends of a main line may be maintained in synchronism.

The accompanying drawing is a diagram view illustrating two connected stations arranged according to my present invention.

Letters Patent No. 286,278, of October 9, 1883, fully describes the actuation of the armature-disk A, on the spindle of which the trailing finger *a*, which traverses the table of contacts B is carried. In that patent also the operation of the motor-magnet A′, the vibrator-magnet A^2, and the fork A^3, and the various circuits and attachments are fully and elaborately illustrated and described, and further description is unnecessary, reference being made to said patent for full information as to details.

In Letters Patent No. 286,281, of October 9, 1883, I have fully described the arrangements of contacts and circuits herein shown, by which a correcting impulse of electricity is sent from one station to the other whenever the apparatus at a distant station runs out of time; and have also described and claimed in said patent the method of controlling the speed of the mechanism at the distant corrected station by throwing a resistance into or out of the vibrator-circuit.

The arrangement of contacts and circuits and group of instruments V shown in the accompanying drawing are identical with those shown and described in said patent, and do not therefore need particular description here, as their operation will be obvious upon a mere inspection of the drawing. Thus, if while the trailing-finger *a* at station X is on the 9 connected with the battery C B the finger at station Y should be moving fast enough to bring it upon the extended 10, a correcting impulse of electricity would pass from the correcting-battery C B through the 9-contact at station X, trailing finger, line, trailing finger at station Y, and 10-contact to the group of controlling-instruments V, and the resistance R would be shunted or cut out of the vibrator or fork circuit so as to increase the electro-magnetic power of the fork magnet in that circuit and slow the speed of rotation of the trailing-finger so that it would drop back into proper position.

The operation is precisely the same when an impulse is sent from the correcting-battery C B at station Y to the group of correcting-instruments V at station X. The correction is therefore reciprocal; and although the corrections are shown as acting by retardation, they could obviously be arranged to act by acceleration, as is fully set forth in the patent last mentioned.

Thus far the arrangement described is exactly the same as that shown in said patent. My present invention, however, involves a different method of operation; and it consists, primarily, in correcting the speed of the apparatus at which a correcting impulse is sent into the line, and, secondly, in means for simultaneously correcting the apparatus at both stations. Thus (having reference to the latter plan) when a correcting impulse is sent, say from station X to retard the apparatus at station Y, the same impulse is at station X utilized to accelerate the instrument at that station, so that a correction of acceleration at one station and of retardation at the other will act more vigorously and promptly to control the instruments.

The operation is the same when a correcting impulse is sent from Y to X, and I will now describe it. We will again suppose that the apparatus at Y is running faster than at X, and that a correcting impulse is transmitted as before described from the correcting-battery C B at X to the group of controlling-instruments at Y to retard the apparatus at Y. The same impulse, however, is made effective at X to accelerate the apparatus there in the following manner: The line from the battery C B passes through the coils of a relay, S,

and thence to the 9-contact, as shown. The armature of this relay controls a local circuit in which the coil of a second relay, T, is placed. A shunt-circuit, *s*, controlled by the armature of the relay T, normally shunts the resistance R′ out of the fork-circuit *f*, as clearly shown in the drawing. When, however, a correcting impulse of electricity from the battery C B energizes the relay S, its armature is drawn to its front stop, its local circuit is broken, and the relay T demagnetized so that its armature falls from its front stop, thus breaking the shunt *s* and causing the fork-circuit *f* to run from the local battery L B through the resistance R′. This resistance is therefore thrown into the fork or vibrator circuit whenever a correcting impulse is sent from the battery C B. The effect is to reduce the electro-magnetic power of the magnet of the fork-circuit, which results in a consequent increase of rate of vibration and increase of speed in the rotation of the trailing finger. The conditions are precisely the same when a correcting impulse is sent from station Y to station X. At station Y, however, I have shown a somewhat modified arrangement for accomplishing the same result, in which I dispense with a resistance in the controlled fork-circuit *f* when a correcting impulse of electricity is sent out from that station by momentarily interrupting said circuit when the armature of the relay T leaves its front stop. The effect and principle of operation are precisely the same as at station X. The momentary interruption of the fork-circuit at Y introduces an infinite resistance into the circuit. The decrease in amplitude of the vibration of the fork would be slight, as the interruption of the circuit is but momentary, and the normal rate of vibration of the fork would prevent too great a decrease in amplitude.

Instead of simultaneously correcting at both stations as just described, it is obvious that if the correcting-instruments V are omitted and the 10-contacts at each station connected directly with the ground the correcting impulse sent into the line at either station will correct the speed of the apparatus at that station only, and this will be sufficient to maintain a regular synchronous rotation of the instruments. This constitutes the primary feature of my present invention.

I have shown different arrangements at each station for the purpose of convenience of illustration. In operation, however, it would be better to have the arrangements alike at both stations. I prefer to operate with the resistance R′, as shown at station X, as I consider this the most efficient arrangement for practical use. The apparatus may, however, be worked by interruptions of the fork-circuit. Obviously whenever the apparatus is to be accelerated the fork-circuit may be interrupted; and, therefore, if the group of instruments V were arranged to accelerate, the fork-circuit might be interrupted at that point and the resistance R dispensed with.

Further description is deemed unnecessary.

I have shown my present invention embodied in the form deemed by me best adapted to the purpose. It may, however, possibly be varied without departing from the spirit of my invention, which contemplates broadly, primarily, the method of operation consisting in correcting the speed of the instruments at which the correcting impulse is sent into the line, and, secondly, in simultaneously correcting at both stations, by acceleration at the station from which the correcting impulse is sent and by retardation at the distant station, or vice versa.

No claim is made herein to the method of correcting consisting in simultaneously correcting the apparatus at both ends of the main line whenever either runs out of time, as that constitutes the subject-matter of a division of this application filed August 21, 1884, and numbered 141,133.

I claim as my invention—

1. The combination of a main line, synchronously-actuated apparatus at each end of the main line, mechanism, substantially such as described, at one station by which the speed of the apparatus at that station is corrected when a correcting impulse of electricity is received from the distant station, and mechanism, substantially such as described, at the distant station for correcting the speed of the apparatus at that station when the correcting impulse of electricity is transmitted to the other station.

2. The combination of a main line, synchronously-actuated apparatus at each end of the main line, mechanism, substantially such as described, at each station for controlling the speed of the apparatus at that station when a correcting impulse of electricity is received from the distant station, and mechanism, substantially such as described, at each station for correcting the speed of the apparatus at that station when a correcting impulse of electricity is transmitted to the distant station.

3. The combination of a main line, synchronously-actuated apparatus at each end of the main line, an electric circuit for controlling or regulating said apparatus at one station, mechanism, substantially such as described, at said station for correcting the speed of said apparatus by varying the resistance of said circuit when a correcting impulse of electricity is received from the distant station, an electric circuit at the distant station for controlling or regulating the apparatus at that station, and mechanism, substantially such as described, for correcting the speed of that apparatus by varying the resistance of said circuit when a correcting impulse of electricity is sent to the other station.

4. The combination of a main line, synch-

ronously-actuated apparatus at each end of the main line, an electric circuit at each apparatus for controlling or actuating said apparatus, mechanism, substantially such as described, at each station for correcting the speed of the apparatus at said station by varying the resistance of the controlling-circuit whenever a correcting impulse of electricity is received from the distant station, and mechanism, substantially such as described, at each station for correcting the speed of the apparatus at that station by varying the resistance of the circuit at said station when a correcting impulse of electricity is sent out from said station to the distant station.

5. The combination of a main line, synchronously-actuated apparatus at each end of the main line, a battery from which correcting impulses are sent into the line, and mechanism, substantially such as described, by which the speed of the apparatus at the station where the correcting impulse is sent into the line is corrected by the action of said impulse to maintain its synchronous movement with the apparatus at the distant station.

6. The combination of a main line, synchronously-actuated apparatus at each end of the main line, batteries from which correcting impulses of electricity are sent into the line, and mechanism, substantially such as described, at each station by which the speed of the apparatus at that station only is corrected when a correcting impulse of electricity is sent into the line from that station.

In testimony whereof I have hereunto subscribed my name this 20th day of February, A. D. 1884.

Witnesses: PATRICK B. DELANY.
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