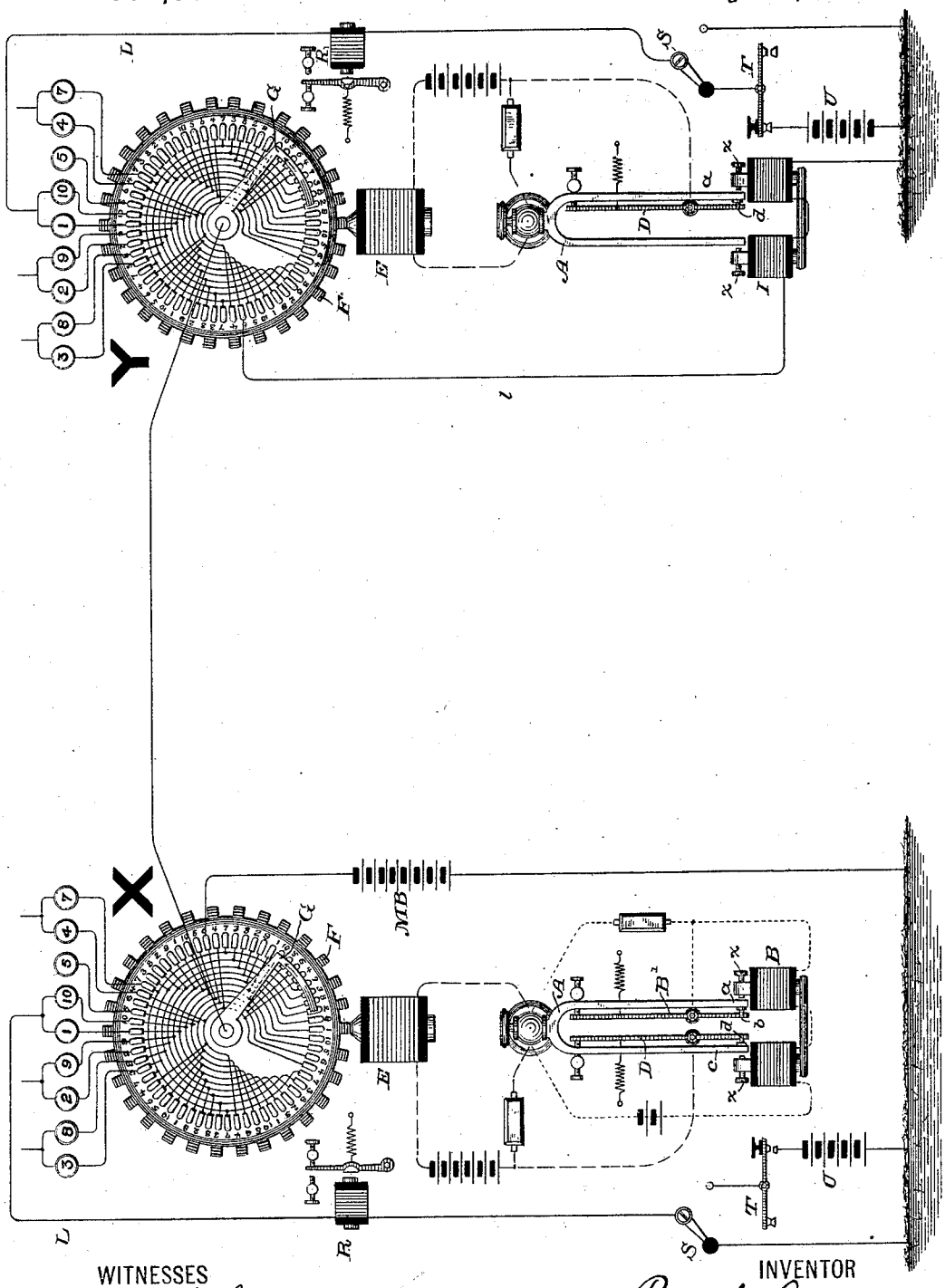
(No Model.)

P. LA COUR.

SYNCHRONOUS TELEGRAPHY.

No. 302,502. Patented July 22, 1884.



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SYNCHRONOUS TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 302,502, dated July 22, 1884.

Application filed February 13, 1884. (No model.)

To all whom it may concern:

Be it known that I, POUL LA COUR, a subject of the King of Denmark, and a resident of the city of Copenhagen, in the Kingdom of Denmark, have invented certain new and useful Improvements in Synchronous Telegraphy, of which the following is a specification.

My invention is based upon the synchronous movement of two sets of apparatus connected by an electric circuit; and it consists in the arrangement or grouping of a series of independent contacts into different circuits for multiplex transmission.

In Letters Patent of the United States No. 203,423, granted to me May 7, 1878, I have shown an instrument in which, by the electro-magnetic vibration of a reed or fork, a motor-circuit is intermittently made and broken. This motor-circuit contains an electro-magnet, the pole or poles of which act upon teeth on the periphery of an armature ring or disk, the makes and breaks in the circuit causing a continuous and rapid rotation of the disk.

The apparatus herein illustrated is represented somewhat diagrammatically, though it fully illustrates the method of operation. For a detailed description of the instrument, however, reference is hereby made to my patent above mentioned.

The accompanying drawing is a diagrammatic view illustrating two electrically-connected stations arranged according to my invention.

At station X I have illustrated diagrammatically the apparatus shown in my patent. A fork, A, tuned to a given pitch, is vibrated by the magnet B, included in a local circuit, (shown by dotted lines,) the circuit being automatically made and broken between the tine *a* of the fork and a light contact-finger, *b*, carried on an adjustable lever, B′. The opposite tine of the fork, *c*, as it vibrates, makes and breaks contact with a light contact-finger, *d*, on an adjustable lever, D. The tine *c* and the contact *d* are included in a local circuit, (shown by broken lines,) in which the motor-magnet E is placed. This magnet acts upon a toothed armature-disk, F, and causes its continuous rotation. Fast upon the axis or rotating shaft of the armature-disk a contact-finger, G, is mounted, which, in its rotation, sweeps over a concentric circle of independent insulated contact-pieces. There are sixty contacts represented on the circular table, numbered from 1 to 10, for convenience of description, in six independent series. The main line is connected with the contact-finger G, and at the other station, Y, is connected to a like finger, which sweeps a like table of contacts, and is actuated by the rotation of the toothed wheel or armature-disk, caused by the makes and breaks in the local circuit, which includes the motor-magnet E, as at station X. The makes and breaks in this local circuit are caused by the vibration of the fork A, which is tuned to the same pitch, and consequently has the same rate of vibration as the fork at station X. At station X six of the contacts—say the contacts numbered 6 in each series—are connected together and, through a battery, M B, with the ground. At station Y the corresponding six contacts are connected together, and by a line, 1, through the coils of a magnet, I, and thence to ground. This magnet is placed to act upon the tines of the fork, as is the one illustrated at station X. The poles of the magnets I and B are provided with adjustable or screw pole-pieces *x*, by the adjustment of which the vibration of the forks may be controlled, so as to adjust them to unison in case of any disturbance or want of synchronism, as is presently described.

I will now describe the grouping or connection of the contacts in independent circuits, which constitutes the subject-matter claimed in this application.

The contacts 1 2 3 4 5 7 8 9 10 in each series are connected together and to a correspondingly-numbered binding-post, as clearly shown at both stations. The binding-posts numbered 1 and 10 are connected together and with a line, L, in which a relay, R, switch S, key T, and battery U are placed. By means of the switch S the line may be either put direct to ground or connected with the key and battery in the usual way. The 1's and 10's at the other station are similarly connected with the line, which is equipped in the same way. At each station the 3's and 8's, the 2's and 9's, and the 4's and 7's are shown as simi-

larly joined, and each pair is to be connected with a line equipped with instruments, as just described. It will be seen, therefore, that there are four independent sets of telegraphic instruments at each station. The 5-contacts are shown unconnected with any circuit.

It will be obvions that the line L, connected with the contacts 1 and 10, will be connected with the trailing contact-finger or circuit-completer, and through said finger with the main line twelve times in each revolution of the finger; and if the finger rotates three times a second (more or less) there will be about thirty-six completions of contact per second of the line L with the trailing-finger and the main line. This occurs at both stations. Obviously, therefore, if the trailing-fingers at both stations simultaneously rest upon the corresponding 1 and 10 contacts, there will be a completion of the circuit from the instruments in the line L at one station to the corresponding instruments at the other station. These completions of the circuit are independent of all the other contacts, and are so rapid that the circuit is practically continuous for Morse transmission, and the operators are not aware that the circuit is at any time broken or taken from them. The same is true of instruments connected with the other pairs of contacts—namely, the 3's and 8's, the 2's and 9's, and the 4's and 7's—so that if the trailing-fingers at each station move synchronously there are four independent telegraphic circuits, which may be worked in the ordinary way with as much freedom as if each pair of operators had a separate line devoted to their own use.

The synchronous rotation of the trailing-fingers at the two stations is obtained in the following way: The forks, which are tuned as nearly as possible to the same pitch, consequently have the same or approximately the same rate of vibration; and when these forks are vibrated the two disks at the stations will be rotated at substantially the same speed. The forks at both stations having been mechanically started into vibration and an impulse of rotation imparted to the toothed disks, the circuit-completers at each station will be caused to rotate. The vibrator-circuit of the fork at station X, being automatically made and broken, will cause the continuous vibration of the fork. The operators' instruments at both ends of the line are normally put to ground, as is usual, and if the apparatus at the two stations happen to start synchronously there will be no sound on the instruments at either of the stations, and it will therefore be known that the contact-fingers are rotating synchronously. If they continue to rotate in synchronism, six impulses of electricity will be sent from the battery M B at station X through the contacts numbered 6 at each station to the magnet I, and maintain the continued vibration of the fork at station Y. If the apparatus does not start synchronously, or having so started runs out of synchronism, the operator at station Y will be able to tell whether his fork is vibrating more slowly or more rapidly than that at the other station by the sounds on the telegraph-instruments, which will give a stroke whenever the circuit is completed from a 6-contact at station X through one of the contacts with which the instrument is connected at station Y. The order in which the instruments are caused to sound will indicate whether the fork at station Y is running faster or slower than that at station X. The operator therefore may adjust the screw pole-pieces on the magnet I so that the vibrating impulses received from station X will act to cause the fork to vibrate slower or faster, as may be desired. The apparatus at the two stations, having been once brought into synchronism, will continue to rotate at the same speed, being governed by the forks, which will continue to vibrate at the same rate.

I have shown and described my own synchronous system contemplated in my patent above mentioned. It is obvious, however, that the arrangement of contacts for telegraphic transmission or other purposes may be used in connection with other synchronous systems, and is not dependent upon the special system described, or upon any particular system. For instance, the invention is well adapted to the synchronous systems of Patrick B. Delany, patented October 9, 1883, in two of which patents, Nos. 286,273 and 286,278, the circuits and contacts are shown as grouped in substantially the manner herein illustrated.

No claim is made herein to the manner of obtaining and maintaining the synchronous movement of the two apparatus—that is, by impulses of electricity sent from the 6's at station X, which are all connected together and to a battery, M B, to the vibrator-magnet at station I, which, by means of said periodic transmitted impulses from the 6-contacts, maintains a fork at Y in constant vibration. Nor is any claim made to the manner of driving the toothed wheel; but what is desired to be covered in this application is the manner of grouping or distributing the independent series of contacts in the circle among several independent branch lines for the purpose of multiplex transmission.

I claim as my invention—

1. The combination of a main line, a series of independent contacts at each end of the line, two or more separate circuits or branch lines at each end of the main line, each of said branch lines being connected with two or more of said contacts, means, substantially such as described, for successively placing the main line at both ends in connection with said contacts, and means for synchronously actuating such circuit-completers.

2. The combination of a main line, a series of independent contacts at each end of the line, two or more separate circuits or branch lines at each end of the main line, in each of which two or more of the contacts placed at regular intervals in the series are connected

independently of the other contacts, means, substantially such as described, for successively placing the main line at both ends in connection with said contacts, and means for synchronously actuating such circuit-completers.

3. The combination of the main line, the circular series of independent contacts placed at each end of the main line, the trailing circuit completers or fingers permanently connected with the line, which traverse said contacts, means for synchronously actuating such fingers, and two or more branch lines at each end of the main line, in each of which two or more of the contacts placed at intervals in the circular series are connected independently of the other contacts.

4. The combination of a main line, a series of contacts at one end of the line, means, substantially such as described, for successively placing the line in connection with each of said contacts, and two or more branch lines, in each of which two or more of the contacts in the series are connected independently of the remaining contacts.

5. The combination of a single main line, a series of independent contacts at each end of the line, means for successively placing the line in connection with each of said contacts, means for synchronously actuating such circuit-completing devices, two or more branch lines, in each of which one or more of said contacts are connected independently of the other contacts, and instruments in the branch lines for either transmitting or receiving at either station.

In testimony whereof I have hereunto subscribed my name this 19th day of December, A. D. 1883.

POUL LA COUR.

Witnesses:
LUDVIG SCHRYDER,
POUL PEDERSEN.