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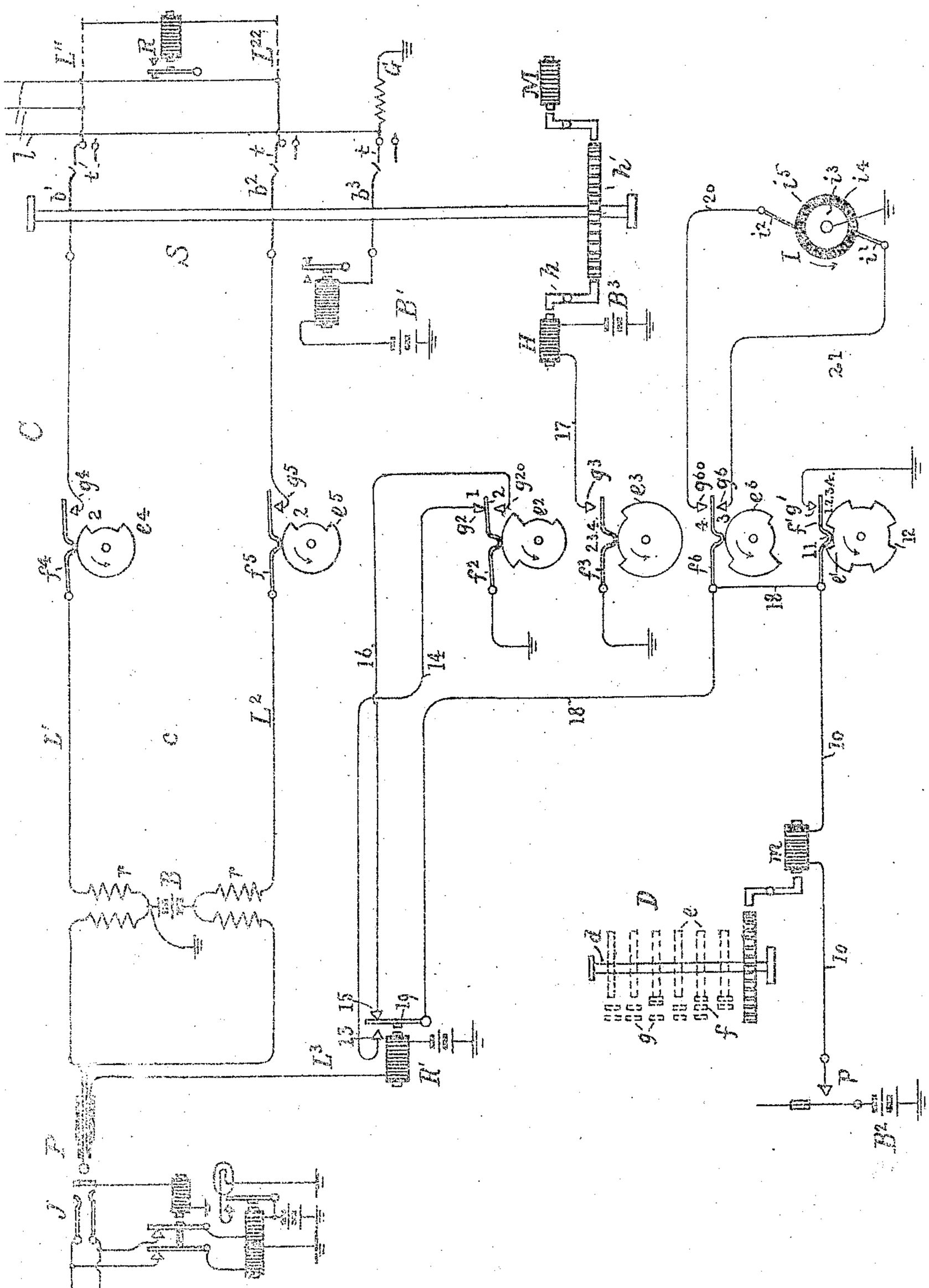
MEANS FOR DETERMINING TIME INTERVALS IN TELEPHONE SYSTEMS.

APPLICATION FILED MAY 4, 1911.

1,114,725.

Patented Oct. 27, 1914.



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MEANS FOR DETERMINING TIME INTERVALS IN TELEPHONE SYSTEMS.

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Application filed May 4, 1911. Serial No. 624,971.

To all whom it may concern:

Be it known that I, WILLIAM G. BLAUVELT, residing at New York, borough of Manhattan, in the county of New York and State of New York, have invented certain Improvements in Means for Determining Time Intervals in Telephone Systems, of which the following is a specification.

In telephone systems it may be desirable to cause the operation of a mechanism for a definite interval of time or similarly prevent a mechanism for acting. For example, one may wish to provide a period sufficient for associated mechanisms to attain a certain condition, or to produce a signal continued for a predetermined time and discontinued before some other fixed time. I have chosen to illustrate the present invention in connection with the first named application, the specific embodiment disclosed being for the purpose of delaying the action of release mechanism (or it may be considered as continuing the action of retaining mechanism) of an automatic line selecting switch for such an interval that a trunk line to which it is connected will be guarded until mechanism at the opposite extremity of the trunk shall have returned to normal. More generically, however, the invention consists in the coöperation between a time mechanism and a circuit controlling mechanism which will lead to the action of the latter at determinable intervals.

The accompanying drawing illustrates this invention diagrammatically and as applied to a manual-automatic telephone system.

The line L of a telephone substation A leads to a switching device at a central station C, said switching device being here illustrated as a jack J with which coöperates plug P at the answering end of a cord or connecting circuit *c*. Current is supplied to the cord circuit from a battery B bridged across the main conductors L^1, L^2 through the usual repeating coil *r*. As is customary, the battery has one pole grounded, and though hereafter, for convenience in tracing the circuits, other batteries are referred to by different reference characters, in practice but one would be employed. At the opposite or calling end of the cord is an automatic selector S, of any convenient form, with its brushes b^1 and b^2 terminating the cord conductors and traveling over a series of fixed contacts *t*. This selector is merely shown conventionally, having a suitable motor magnet M by which the brushes are advanced over their contacts, controlled in any desired manner. Such selecting switches are common and do not call for particular description. Mechanism is provided to retain the brushes upon the selected contacts or terminals, this appearing as a pawl *h* moved into engagement with a ratchet wheel h^1, upon the selector shaft by a magnet H, which when energized acts as a retaining means and when deënergized as a releasing means. The contacts *t* corresponding to the brushes b^1 and b^2 are shown as joined to the outgoing extremity of a two conductor trunk L^{11}, L^{22}, leading, for example, to another selector situated at the incoming end of the trunk in a distant office; but this selector is not illustrated, there being shown only a release mechanism consisting of a relay R, which we may consider as adapted upon its deënergization to open the circuit of the retaining means of its selector or otherwise cause said selector to return to normal. Such an expedient is well known in automatic practice. A third brush b^3 of the selector S has only a local connection, testing for its set the idle or busy condition of the trunks. This difference in condition may be characterized by the existence at the third or test contact *t* of a ground normally present thereon, or by a battery B^1 applied to the test contact by some one of the associated selectors S of other cord circuits through the multiple *l*. The particular testing means forms no part of my invention, and will not be further discussed. In the third conductor L^3 of the cord is a relay R^1, the purpose of which will later appear.

Associated with the cord circuit *c* is an automatic switching mechanism D, the arrangement and functions of which will depend upon the requirements of the system of which it is a part, but which, in any event, is adapted to assume successive controlling positions in regular sequence. In the present instance, it is employed solely as a means for governing the retention and release of the selector apparatus, and for this purpose it consists of a shaft *d* upon which is fixed a series of cams *e*, the peripheries of which cooperate with springs *f* to force them against

or permit them to separate from contacts g. These cam springs and contacts all appear in two places in the drawing, in dotted lines in their actual relation to the shaft d and in full lines at points most clearly developing the circuit organization. In the latter case, they are distinguished from one another by numerals affixed to their reference letters. The switch shaft with its cams may be moved from position to position by mechanism including a motor magnet m actuating ratchet mechanism. The pulsator p supplies intermittent current from a battery or other source B^2 of electrical energy through a conductor 10 to the motor magnet m, and thus rotates the shaft whenever its circuit is completed at one of the contacts of the sequence switch D to ground or other return conductor. This ground connection may be at some external point or local to the switching mechanism itself, the cam e^1 controlling the latter condition and determining the correct stopping points of the switch shaft. When the spring f^1 coöperating with this cam is separated from the contact g^1, this being in the positions indicated by the numerals placed at the opposite side of the spring from the contact, the projection 11 of said spring lies in a depression 12 in the periphery of the cam, and the shaft with the associated cams is properly positioned. Upon the completion of the circuit of the motor magnet m at some point in the system, the projection rides out of the depression, and when resting upon elevations of the cam e^1 closes a local circuit for the motor magnet from ground through the contact g^1 and spring f^1 to conductor 10, which insures the rotation of the shaft to the next position at which the cams are to stop, regardless of external conditions. The numerals applied to the contacts of the remaining cams show the positions in which said contacts are closed. Of the other cams of the switch D, e^2 has its contact g^2 united to the front contact 13 of relay R^1 by a conductor 14 and its contact g^{20} to the back contact 15 of said relay by a conductor 16. The spring f^2 of the cam e^2 is grounded. Spring f^3 of cam e^3 is also joined to ground, while its contact g^3 is connected through the retaining and release magnet H of the selector S to battery B^3. Springs f^4 and f^5 and contacts g^4 and g^5 of cams e^4, e^5 govern the continuity of the cord conductors L^1 and L^2, respectively. A conductor 18 leads from the armature 19 of relay R^1 to the springs f^1 and f^6 of cams e^1 and e^6. The contacts g^6, g^{60} of cam e^6 are connected by conductors 21 and 20 to brushes i^1, i^2, coöperating with a rotatable cylinder i^3 of a time mechanism in the form of a current interrupter I. The surface of the cylinder has alternate narrow metal segments i^4, which are grounded, and relatively wide insulating segments i^5. The brushes so rest upon the cylinder that they successively contact with the segments i^4, but never simultaneously. The cylinder is rotated at a constant definite speed which is so chosen, and the brushes and segments so spaced, that the ground connection will be alternately applied to the sequence switch contacts g^6 and g^{60} at measured intervals of time, say one second. Through these contacts current is delivered over the grounded circuit to the motor magnet m from battery B^2 and pulsator p. The sequence switch thus governs at its contacts the reception of energy by its motor magnet.

Considering the effect of the system, the operator having received a call from substation A, answers by inserting the plug P of a cord c in the jack J. Relay R^1 is energized in series with the cutoff relay of the calling line L, and at its contact 13 completes a circuit from battery B^2 and pulsator p to ground through conductors 10, 18 and 14 and contact g^2 and spring f^2 of the sequence switch, contact g^2 being closed in the first or normal position. The resulting current impulses cause the switch to take its second position, in which contacts g^{20}, g^3, g^4 and g^5 are completed, the circuit of g^{20} being open at contact 15 of relay R^1. Contact g^3 prepares the selector S for operation by energizing the magnet H by current from Battery B^3 and thus applying the retaining pawl h. Contacts g^4, g^5, close the cord conductors through from the plug P to the selector S, and the operator may now actuate suitable mechanism to start the selector in its hunt for a non-busy trunk and to control the other apparatus of the selective chain, so that the line of the desired subscriber may be connected with. When the conductors L^1, L^2 are completed at the sequence switch contacts, and a trunk, as L^{11}, L^{22}, selected, current from battery B flows out over said trunk and energizes the release relay R at the distant or incoming end. The trunk is now guarded against appropriation by the selectors of other cords by battery B^1 put upon its test terminal by the selector brush b^3. The operator, upon being notified of the completion of the conversation, withdraws the plug P. Armature 19 of relay R^1 falls back upon its contact 15, and we have a circuit for the motor magnet of the sequence switch through conductors 10, 18 and 16 and contact g^{20} and spring f^2, which brings the sequence switch to its third position. At this time, the contacts g^4 and g^5 open, cutting off battery from relay R and causing the distant apparatus to release and return to normal. If upon its release the trunk L^{11}, L^{22} could at once be seized by another selector at the outgoing extremity, the controlling impulses sent over it might be mutilated as a result of the off normal position of the distant apparatus;

or if this were not the case, it would be necessary that the new call over the trunk should be delayed until the normal position had been resumed. Instead of permitting this, the busy condition of the trunk is maintained by selector S, the brush b^3 of which is held upon the test contact by the retaining pawl, magnet H being energized in the third position of the sequence switch through contact g^2. The restoration of the distant apparatus controlled by relay R will consume a maximum time, which may be determined. During at least this time, the selector S holds its brushes upon the terminals of the trunk, controlled by the time mechanism I) since the energization of the magnet H is continued through the fourth or final position of the sequence switch, and its movement to said fourth position and from it to normal are brought about by current from battery B^2 through the ground furnished at the cylinder i^3. The third position is retained until a segment i^4 reaches the brush i^1. This may be the entire time necessary for an insulating segment i^5 to pass under the brush, as previously indicated, one second; or it may be some shorter time, depending upon angular relation of the cylinder when the sequence switch is shifted from the second position. Then the ground at the time mechanism gives a battery circuit for the motor magnet m by way of conductors 10, 18 and 21, through spring f^6 and contact g^6, whereupon the sequence switch takes its last position. The resumption of the normal position is now dependent upon the contact g^{60} and the brush i^2, the circuit from the motor magnet m being over the path just indicated to the spring f^6, then by contact g^{60}, conductor 20 and brush i^2 to ground. This can only occur after the mechanism has measured off a full time interval. As the sequence switch goes to the first position, the contact g^3 opens, magnet H releases the pawl h and the selector returns to normal, removing the busy condition from the trunk and rendering it free to be appropriated for another call. Thus the electromechanisms at the opposite extremities of the trunk have been successively released by the sequence switch, with a period intervening which is defined between a minimum limit sufficient to accomplish the results sought, and a maximum limit which is so small that it is not wasteful of time.

Having thus described my invention, I claim:

1. In a telephone system, the combination with switching mechanism adapted to assume a plurality of circuit controlling positions, of a motor magnet for the switching mechanism, a source of electrical energy, and a time mechanism for determining the time interval between advances of the switching mechanism from one circuit controlling position to another, said time mechanism controlling the supply of current to the motor magnet through contacts of the switching mechanism and consisting of a rotatable interrupted driven at a predetermined speed.

2. In a telephone system, the combination with switching mechanism adapted to assume a plurality of circuit controlling positions, of motor mechanism for the switching mechanism, a source of electrical energy, and means operable independently of the switching mechanism for connecting said source in circuit with the motor mechanism to operate the switching mechanism from one circuit controlling position to another within a definite time interval, said circuit extending through contacts of the switching mechanism which latter governs at said contacts the reception of energy by its motor mechanism through the connecting means.

3. The combination of a sequence switch having contacts adapted by operation of the switch to be actuated in definite order or cycle, a motor mechanism for operating the switch, an actuating circuit for said motor mechanism extending through and controlled by a contact of the switch, and a time mechanism in said actuating circuit acting at times within predetermined limits to also control said circuit and thereby determine the time interval between successive operations of the switch contacts.

4. The combination of a sequence switch having contacts adapted by operation of the switch to be actuated in definite order to thereby perform a cycle of circuit controlling operations in fixed succession, associated electro-mechanisms including a motor-mechanism for the sequence switch, circuits for said mechanisms extending through and controlled by contacts of the sequence switch, and a time mechanism in one of the aforesaid circuits which includes the motor mechanism and a contact of the switch, said time mechanism acting at times within predetermined limits to control said circuit and thereby determine the time interval between successive operations of the switch contacts.

5. The combination with a sequence switch provided with contact devices and a motor magnet, of a source of electrical energy for the motor magnet, a current interrupter associated with said source of electrical energy and acting to determine a time interval between movements of the sequence switch from one switching position to another, and circuits of the motor magnet, source of electrical energy and interrupter completed through different contacts of the sequence switch.

6. The combination with a telephone line, of different electromechanisms associated

therewith, a switching electromechanism adapted upon its energization to control one of the first-named electromechanisms and upon its further energization to control another of said electromechanisms, and means for automatically determining the time interval between the energizations of the switching electromechanism.

7. The combination with a trunk line, of releasable electromechanisms associated with the outgoing and incoming extremities of the trunk line, means associated with the outgoing extremity of the trunk line for releasing the mechanism at the opposite end and after a time interval sufficient for the restoration of said mechanism operating to release the mechanism at the outgoing end.

8. The combination with a telephone line, of releasable electromechanisms associated therewith, a switching mechanism adapted to assume circuit controlling positions for the successive release of the electromechanisms, and means for operating the switching mechanism at predetermined time intervals.

9. The combination with a telephone line, of releasable electromechanisms associated therewith, and switching mechanism adapted to assume circuit controlling positions for the successive release of the electromechanisms, motor mechanism for the switching mechanism, and means for applying current to the motor mechanism at definite time intervals.

10. The combination with a trunk line, of a selector provided with release mechanism at one extremity of the trunk line, other apparatus having release mechanism at the opposite extremity of the trunk line, and a sequence switch having independent contacts controlling the release mechanisms.

11. The combination with a trunk line, of a selector provided with release mechanism, other apparatus having release mechanism, a sequence switch having contacts controlling the release mechanisms, and time mechanism governing the movement of the sequence switch.

12. The combination with a trunk line, of a selector provided with release mechanism, other apparatus having release mechanism, a sequence switch having contacts controlling the release mechanisms, and time mechanism connected through contacts of the sequence switch to govern its movement.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses, this twenty-fourth day of April, 1911.

WILLIAM G. BLAUVELT.

Witnesses:
SAMUEL RASMISON,
ROBERT S. SUTLIFFE.