

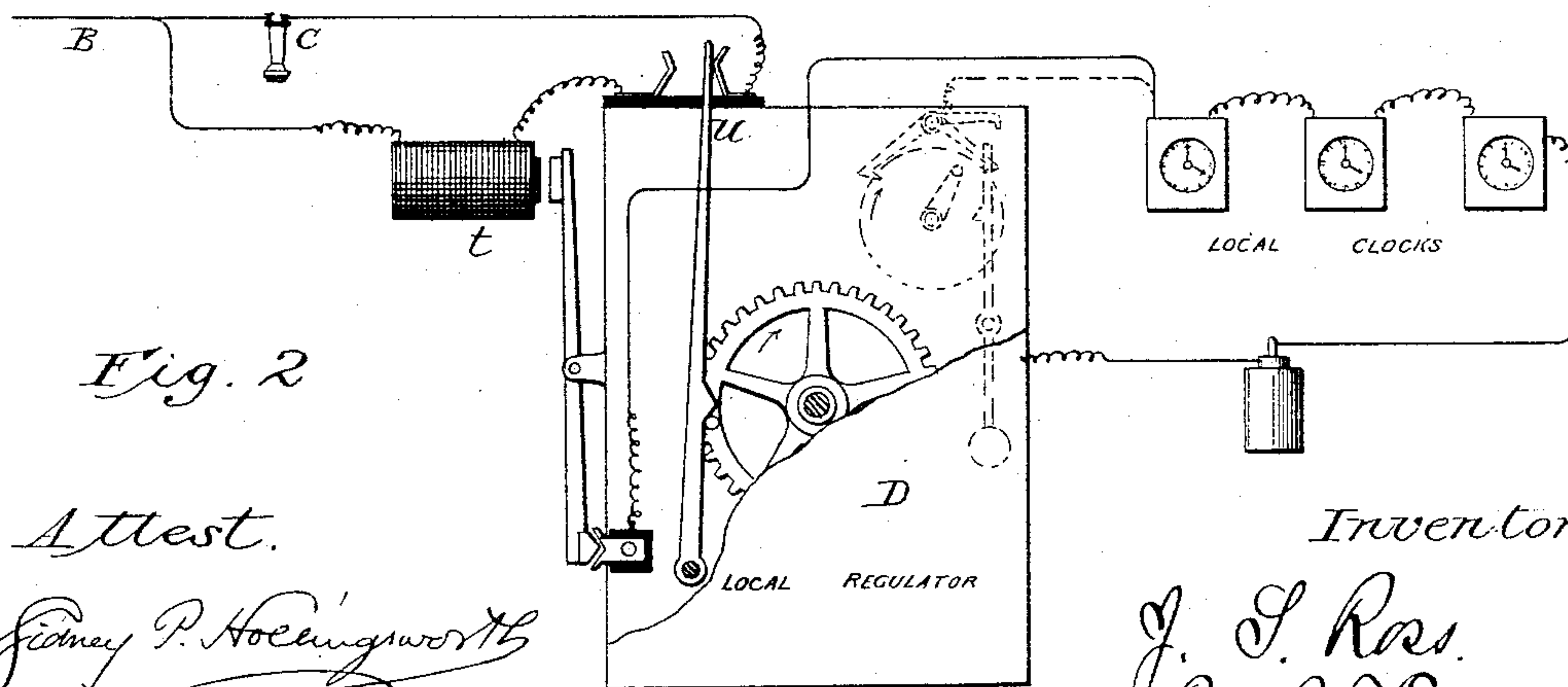
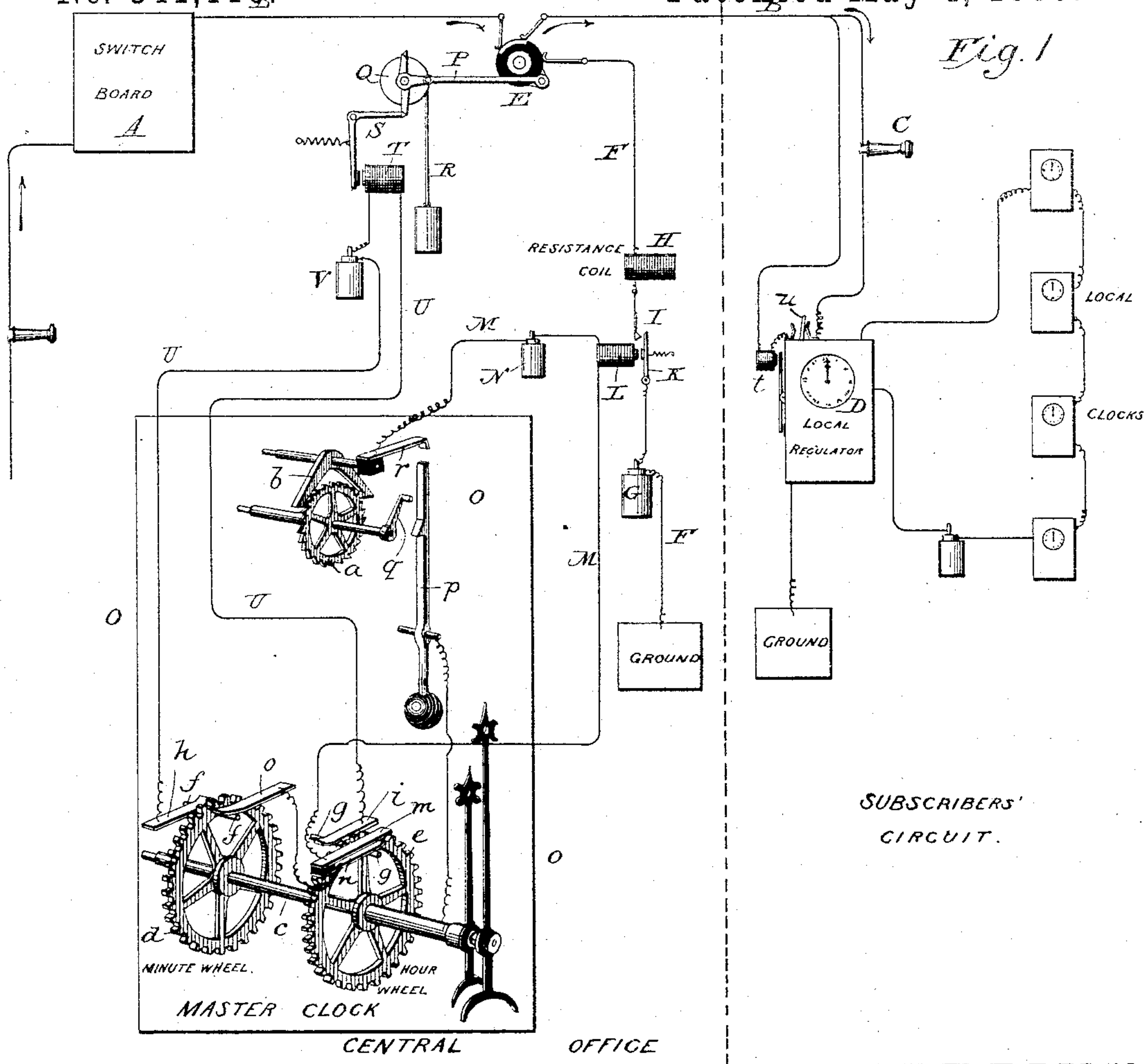
(No Model.)

J. S. ROSS.

ELECTRIC TIME SYSTEM FOR TELEPHONE LINES.

No. 341,110.

Patented May 4, 1886.



Attest.

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# UNITED STATES PATENT OFFICE.

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## ELECTRIC TIME SYSTEM FOR TELEPHONE-LINES.

SPECIFICATION forming part of Letters Patent No. 341,110, dated May 4, 1886.

Application filed August 1, 1885. Serial No. 173,252. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES SAMUEL ROSS, of Nashville, in the county of Davidson and State of Tennessee, have invented certain Improvements in Electric Time Systems, of which the following is a specification.

The aim of this invention is to utilize the local or subscribers' lines of a telephone-exchange system in connection with the time-regulator at the central office to correct or adjust regulators located on said lines at definite times, preferably once in twelve hours.

To this end it consists in combining with a subscriber's line or a series of subscribers' lines at the central office a regulator which acts at the predetermined time, first, to disconnect the subscribers' lines from the switch-board and connect them with an open ground-line containing a resistance-coil and a battery or generator, and, second, to close said ground-line in order that an impulse or current may be transmitted over the subscribers' lines to effect the adjustment or correction of the local or subscribers' regulators located thereon.

It consists, further, in combining with the subscribers' lines controlled as above, the local or subscribers' regulators, each of which may control its own local system of clocks, if desired, and each of which is provided with an electric adjusting or synchronizing mechanism by which the hands are brought to the proper position by the momentary impulse received over the line from the battery before mentioned.

I prefer to employ a local regulator of the form presented in another application filed in my name September 21, 1885, No. 177,687, but any other approved form may be employed.

I propose to have the regulation of the clocks occur only at long intervals—as once in twelve hours—that it may not interfere in an objectionable manner with the usual telephone service; and, on the other hand, interference with the time service is prevented by the fact that all communication with the telephones is interrupted during the brief period required for the time service.

Referring to the accompanying drawings, Figure 1 is a diagram illustrating a general arrangement of my system. Fig. 2 is a view showing as far as necessary the details of the subscriber's regulator.

Referring to the drawings, A represents the

switch-board or equivalent connection at the central office; B, one of the local or subscriber's circuits leading therefrom; C, the subscriber's telephone mounted in or connected with the circuit B; and D, the subscriber's regulator having its controlling or regulating magnet arranged for connection with the said circuit, as hereinafter described.

The subscriber's circuit is provided at the central office with a rotary or other suitable switch, E, by which it may be disconnected from the switch-board or other central-office instruments and connected with a ground-line, F, which contains a battery or dynamo, G, and a resistance-coil, H, so that the current from the battery G may, for the time-being, traverse the subscriber's circuit B, to control the local regulator D. The ground-line F stands normally open at I, where it contains a circuit-closing device, K, actuated by a relay-magnet, L, located in a special or relay circuit, M, containing a battery, N, and opened and closed, as presently described, by the main regulator or master clock O, at the central office. When this regulator closes the relay-circuit, the magnet L closes the ground-circuit F, so that (the switch E being first properly adjusted) an impulse will be transmitted from the battery G, as before alluded to, to the distant regulator D.

For the purpose of moving the switch at the proper time I propose to use a motor of any suitable character. However, I recommend its connection by a pitman, P, to a rotary drum, Q, actuated by a weighted cord, R, and held in check by a detent-lever, S. This detent has an armature in the field of an actuating-magnet, T, located in a special circuit, U, and extended to the main regulator, by which it is momentarily closed at the time when the correction of the clocks is to occur.

As will presently appear, the main regulator, at the predetermined time for effecting the correction of the clocks, closes the circuit U, so that the detent S is released, and the switch E is permitted to cut the subscriber's line off from the switch-board and connect it with the open ground-line F, after which the relay-circuit is momentarily closed at I, so that the current will for the moment pass to the local regulator D. This local regulator is constructed, as hereinafter explained, so that the current transmitted thereto will unlock its train



from the escapement and permit its hands, if in arrears, to advance instantly to the synchronizing point.

From the foregoing it will be understood that the main regulator serves to isolate the subscriber's line from the previous connection, so that there may be no interruption of the timing action, and to ground and close the subscriber's line for the moment that the current may pass from the battery *G* to the subscriber's regulator, after which the original connections are restored and the line left in condition for ordinary telephonic purposes.

Referring to the details of the main or office regulator, attention is directed to Fig. 1, which fully illustrates those parts in which it differs from ordinary clocks. It may be driven by weights, springs, or electricity, and, as regards the time-train and time mechanism, may be of any ordinary or approved form, containing, as usual, the escapement-wheel *a*, pallet *b*, and central arbor, *c*, carrying the minute-wheel *d* and hour-wheel *e* to turn the respective hands. The wheels *d* and *e* are provided, respectively, with conducting-pins *f* and *g*, and are in metallic connection with each other and with the frame, so that the current may pass from one to the other and to the frame. The special office circuit *U*, which contains the switching-magnet *T*, and which I commonly denominate the "switching-circuit," is divided and provided with terminal springs or contacts *h* and *i*, arranged to be encountered by pins on the wheels *d* and *e*, as shown. When both pins are in contact, which happens but once in twelve hours, the circuit is closed through their wheels and arbor and the magnet *T* caused to release the switch *E*, as before explained. The relay-circuit *M*, for closing the ground-connections, is normally broken at three points, which are closed simultaneously by the hour-wheel, the minute-wheel, and the pallet, respectively, as will now be explained. The relay-conductor *M* extends from the relay-magnet to a conducting-spring, *m*, attached to an insulated support and overlying a second conducting-spring, *n*, normally out of contact therewith, to produce the first break in the circuit. At the end of every twelve hours the pin *g* of the hour-wheel acts on an insulated surface of the spring *n* and lifts the same against the spring *m*, thus closing the circuit at this point. From the finger *n* the conductor is continued to a second finger, *o*, which at the end of each hour forms a momentary contact with the pin *f* of the minute-wheel *d*, through which the current passes by the way of the metal frame or other conductor to the axis of an upright weighted finger, *p*. When free, this finger hangs in a vertical position and is idle; but at the end of each minute an arm, *q*, on the arbor of the escapement-wheel, forces the finger over into the path of an insulated conducting-spring, *r*, attached to the pallet-staff and con-

nected by a conductor with the relay-magnet. The spring *r* receives a constant vibration from the pallet-staff, and during the time that the finger *p* is held back by the arm *q* the spring *r* forms a contact therewith, thus closing the circuit.

The closing of the circuit by the devices *m*, *n*, and *o* and *p* coincidently occurs but once in twelve hours, and is maintained for a moment only. The reopening of the circuit is due to the fact that the contacts *f* and *g* are advanced by the clock-train and the finger *p* released by the arm *q*, so that the contacts fail to close concurrently a second time until the hour-wheel has made a complete revolution. The master clock at the central office is timed or adjusted with reference to the local regulators in the subscribers' lines in such manner that the closing of the circuit in the master clock and the grounding of the subscribers' lines through the line *f* and battery *g* occurs just before the local regulators *d* are switched into the subscriber's circuit by the automatic switches *u*, as hereinafter explained.

Each of the subscribers' clocks may have its time mechanism constructed in any ordinary manner, and provided with synchronizing devices, of any known or approved form, adapted to be actuated by a magnet, *t*, on the subscriber's line. In order that the resistance of the telephone may be removed from the line during the adjustment of the clock, and that, on the other hand, the resistance of the clock-magnet may be removed during the period of telephone service, I propose to provide the clock with an automatic switch, *u*, actuated by the clock mechanism. As this switch is no part of the present invention, and is fully described in the application No. 177,687, before alluded to, further description is unnecessary. This switch acts to introduce the telephone *C* and magnet *t* into the circuit alternately, the introduction of the magnet occurring just before the time for the reception of the synchronizing impulse and continuing but a short time.

I am aware that an office regulator has been arranged so that the vibrations of its pendulum controlled a local battery acting through intermediate devices to reverse the direction of the current on a main line, which was in turn connected through a complicated system of delicately-adjusted instruments with a local clock, and this I do not claim. In my system the main line is entirely disconnected from the office instruments and the current of the office battery thrown upon the line and communicated by the latter directly to the synchronizing magnets of the local clocks.

While I have described my system in connection with a telephone-line, it will of course be understood that the main or standard clock may be applied in like manner in connection with telegraph, signal, or other electric lines to cut out the instruments and control tempo-



rarily one or more secondary or controlled clocks thereon, and I consider it especially adapted for railroad-time keeping.

Having thus described my invention, what I claim is—

1. In combination with a telephone-exchange system embracing central-office instruments and subscribers' lines leading therefrom, a ground-line embracing a battery, a central-office regulator which periodically and temporarily disconnects the office instrument and completes the subscriber's line through the ground-line and battery, and a subscriber's regulator provided with an electric synchronizing mechanism located in the subscriber's line, whereby the central-office connections are kept wholly out of connection and a momentary impulse transmitted in the meantime over the subscriber's line to adjust the subscriber's regulator.

2. In combination with a telegraph or telephone line having central-office instruments connected therewith, a special office battery having a ground-connection, and a central-office regulator, whereby the office instruments are periodically and temporarily disconnected from the line and left in an open circuit, and the line connected with the special battery and its ground-connection.

3. The combination, substantially as described, of the subscriber's telephone-line of a telephone-exchange system, the ground-line containing a battery or generator, the switch E, for connecting the ground-line with the subscriber's line and disconnecting the usual office instruments therefrom, the switch-controlling circuit, and the central-office regulator to close said switch-circuit, whereby the office regulator is caused to disconnect the subscribers' lines from the office instruments and ground them through the special battery.

4. In combination with the main or subscriber's line B and central-office instruments connected normally therewith, a ground-line embracing a battery and a normally open circuit-closing device, a switch for disconnecting the office instruments from line B and connecting the ground-line with the latter, a relay-magnet to effect the closing of the ground-line, and a central-office regulator acting at long intervals to momentarily close the relay-circuit, whereby a momentary impulse is transmitted from the local battery over the main line, while the office instruments are disconnected.

5. In combination with a telephone-exchange system embracing subscribers' lines and central-office instruments connected therewith, as usual, subscribers' regulators located on their circuits and provided with electromagnetic synchronizing mechanism, a central-office ground-line embracing a special battery and normally open, an electrically-controlled switch to sever connections between the office instruments and the subscribers' lines, a relay-magnet for grounding the subscribers' lines

through the special battery, a central-office regulator acting at long intervals to control the switch-operating circuit and the relay-circuit.

6. In combination with the office connections and subscriber's telephone-line, the ground-line F and its battery, the switch E, the switch-operating motor and its detent, the magnet T and its battery V, and the regulator adapted to open and close the circuit of the latter, as described, whereby the subscribers' lines are automatically thrown into and out of connection with the ground-line.

7. In a time system, substantially such as described, the combination of a line-conductor, B, office instruments, a ground-line, F, embracing a battery, a switch, E, for connecting the line B alternately with the office instruments and the ground-line, the switch-controlling magnet T, and its circuit U, embracing a battery, and two devices to open and close said circuit, carried, respectively, by the hour and minute wheels of a time-keeper.

8. The subscriber's line having both a time-indicator and a signal mechanism thereon, the ground-line, and the magnetic device for closing the latter, in combination with the circuit embracing said device, and circuit-closing devices controlled by the hour-wheel, minute-wheel, and escapement, respectively.

9. In an electric clock, the vibratory conductor *p*, in combination with the arm *q*, revolving with the escapement-wheel, and the conducting-finger *r*, carried by the pallet, whereby an electric circuit may be periodically completed through said conductors *p r*.

10. In combination with the subscriber's line of a telephone system, a central-office clock acting at long intervals and momentarily first to connect the line with a normally open ground-line containing a battery, and second to close said ground-line, and immediately open the same again.

11. In combination with a telephone-exchange system embracing a central office and a subscriber's line therefrom, a central-office regulator adapted and arranged to switch out the usual office instruments and ground the subscriber's lines through a special battery, and a subscriber's regulator provided with an electric synchronizing device and with mechanism for switching said devices into and out of circuit at the proper times.

12. In combination with a main line or circuit and instruments connected therewith, a regulator or time-piece which acts automatically to switch the instruments out of the circuit and itself into the circuit, and vice versa, whereby the regulator is caused to assume temporarily entire control of the circuit.

In testimony whereof I hereunto set my hand in the presence of two attesting witnesses.

JAMES S. ROSS.

Witnesses:

PHILIP T. DODGE,  
PAUL JONES.