(No Model.) 2 Sheets—Sheet 1.

H. D. SISSON.

Chronometric Signaling Apparatus for Telephone Lines

No. 238,977. **Patented March 15, 1881.**

Fig: 1.

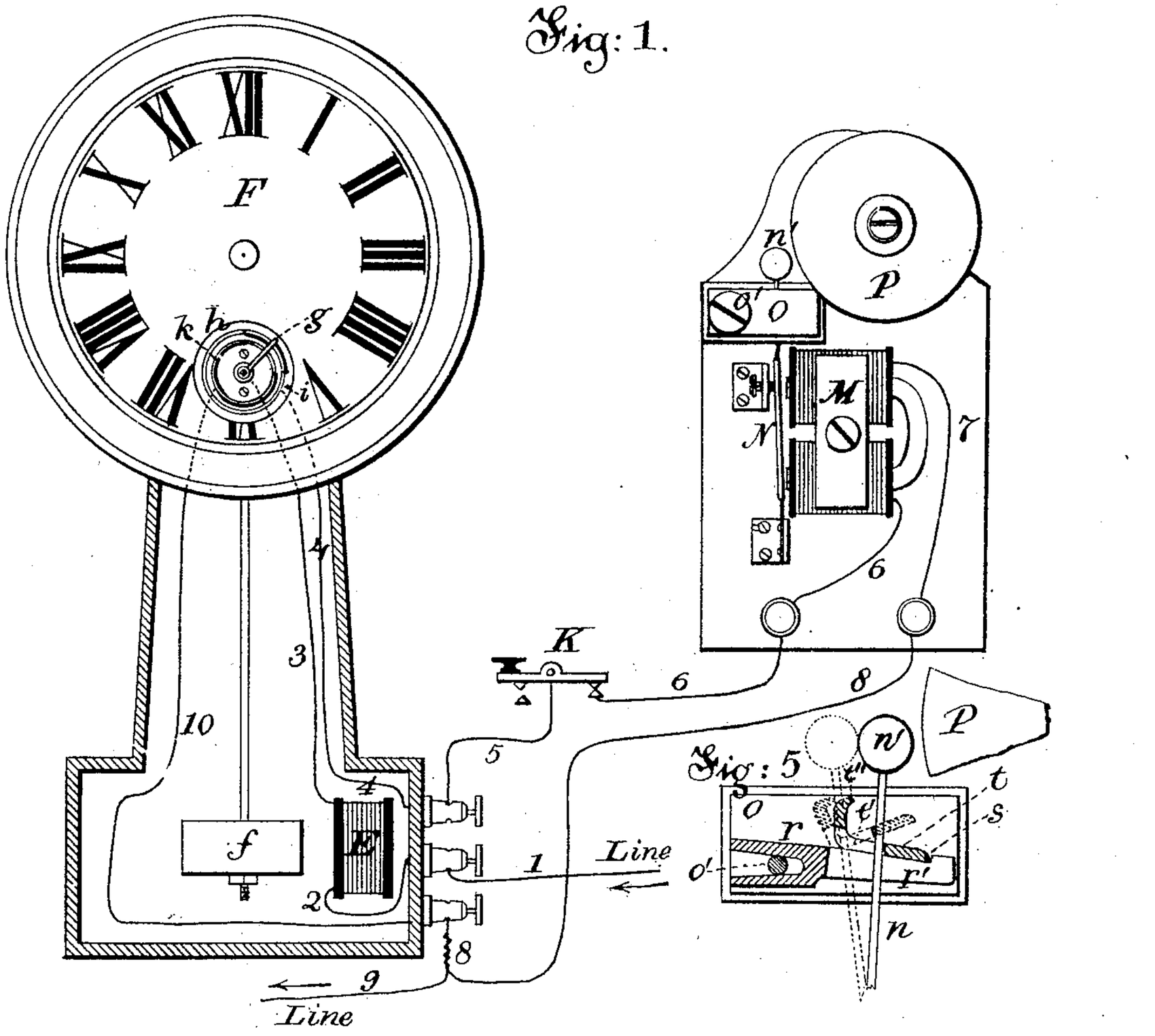

Fig: 2.

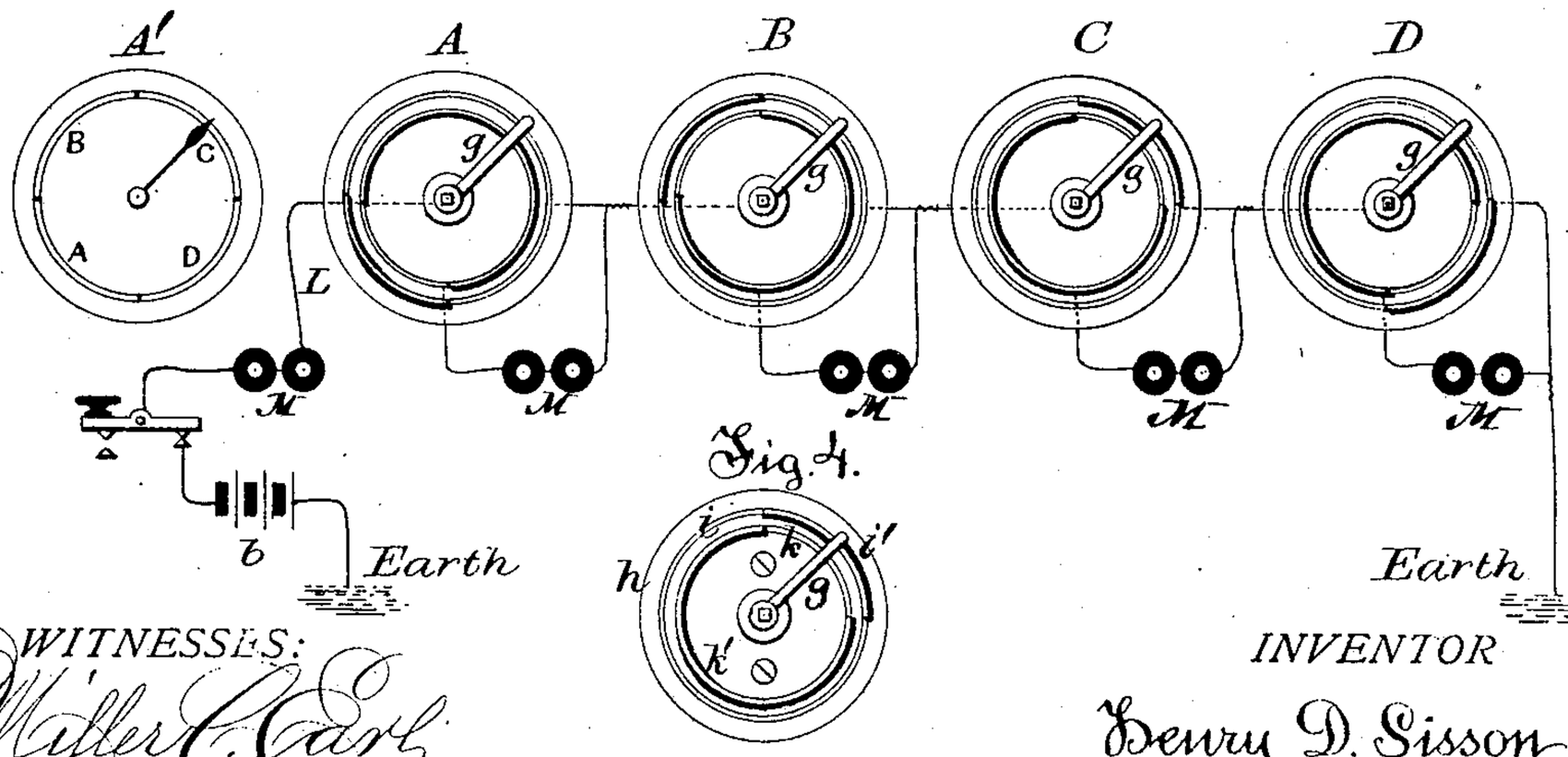

Fig. 4.

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(No Model.) 2 Sheets—Sheet 2.

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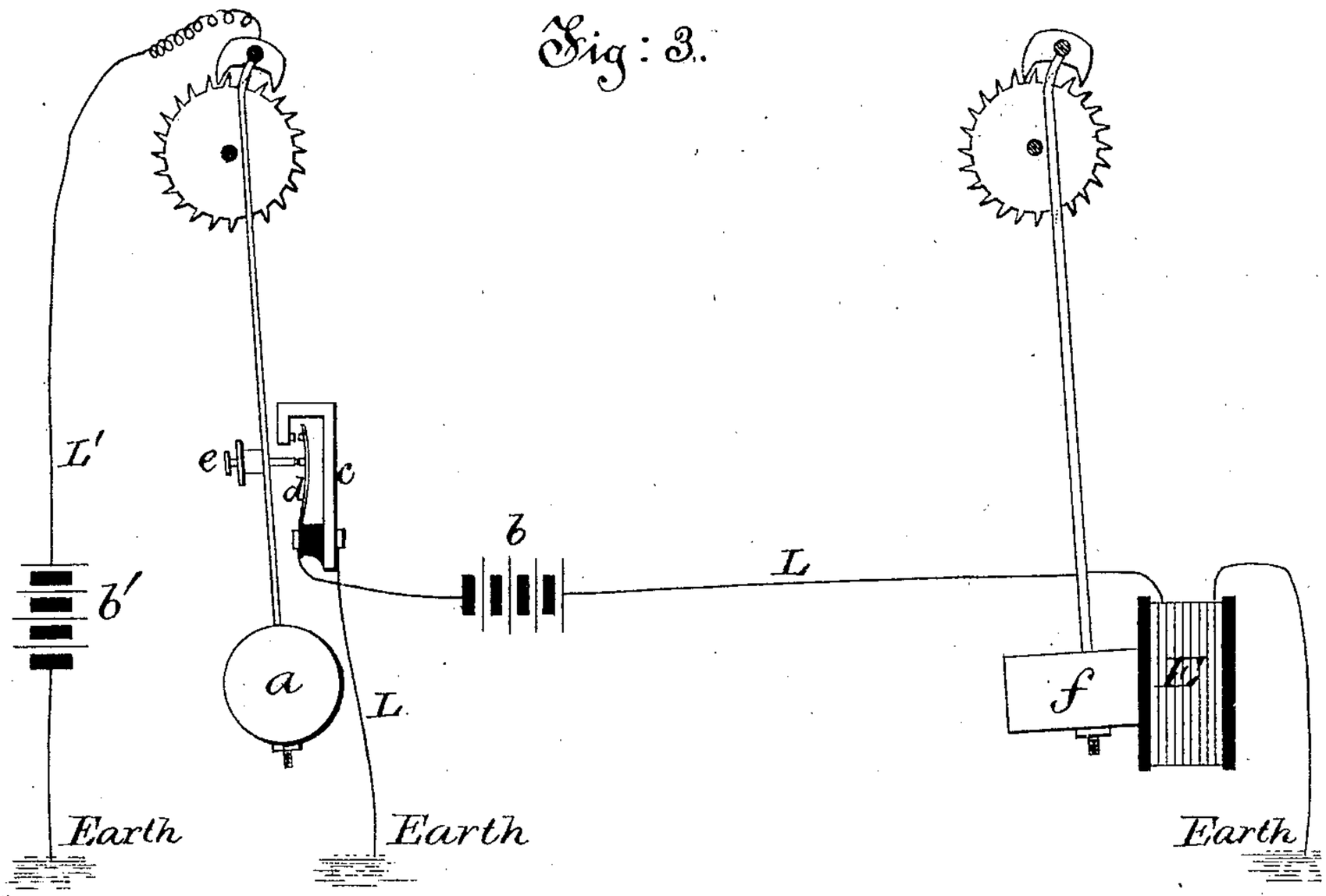
Fig: 3.



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UNITED STATES PATENT OFFICE.

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CHRONOMETRIC SIGNALING APPARATUS FOR TELEPHONE-LINES.

SPECIFICATION forming part of Letters Patent No. 238,977, dated March 15, 1881.

Application filed July 20, 1880. (No model.)

To all whom it may concern:

Be it known that I, HENRY D. SISSON, a citizen of the United States, residing at Mill River, in the county of Berkshire and State of Massachusetts, have invented certain new and useful Improvements in Chronometric Signaling Apparatus for Telephone-Lines, of which the following is a specification.

My invention relates to the signaling apparatus which is used in connection with telephone-lines when a number of different stations are connected with the central or principal office by a single wire.

My invention consists in a method of and apparatus for bringing the signaling apparatus at the several stations into the circuit of the main line for a predetermined length of time, one after the other, in succession, so that each station can send or receive signals to or from the central station only during the portion of time allotted to it.

It further consists in improved devices for keeping in unison the time-trains by which the switches at the several stations are controlled, and in mechanism for preventing the alarm or signaling apparatus from being operated by the movements of the switches when moved by the time-trains.

In the accompanying drawings, Figure 1 is a diagram showing the construction and arrangement of the apparatus at one of the stations on the line. Fig. 2 is a diagram showing the relative position of the circuit-changing devices at the different stations on a single line. Fig. 3 is a diagram showing the apparatus by which the synchronism of the time-trains at the stations is effected and maintained. Fig. 4 is a detached view of the switch device, and Fig. 5 shows certain details of the signaling or alarm apparatus.

Any desirable number of different stations may be placed upon a single line; but in order to illustrate my improved system I have deemed it sufficient to describe and show its application to a line having four sub-stations and one principal or central station, and to describe the apparatus at one sub-station, as the apparatus at all the other sub-stations is precisely similar, with the exception of the arrangement of the switches with reference to the circuits, which differs at each sub-station, as will be hereinafter more particularly explained.

I will now describe the apparatus at a sub-station.

Referring to Fig. 1, F represents a clock or time-piece of ordinary construction, except that its pendulum-bob *f* is of soft iron, preferably of a cylindrical form. A stationary hollow coil of insulated wire, E, is mounted within the case of the clock in such a position that at each oscillation the pendulum-bob swings partially into the opening in the center of the coil.

To one of the arbors of the time-train of the clock is attached a metallic arm, *g*, which revolves constantly at a uniform rate so long as the time-train is in motion. I have shown this arm attached to the seconds-arbor of the clock, so that it will make one revolution per minute of time; but, if desirable, it may be attached to any other portion of the train, so as to revolve at a greater or less speed than this, provided the other apparatus in the system is arranged in a corresponding manner.

Upon the face of the clock, underneath the arm *g*, is a circular dial or disk, *h*, secured thereto by means of screws, or otherwise, so that it may readily be removed, if necessary. This dial or disk *h* (as best seen in Fig. 4) is composed of non-conducting material, such as wood or hard rubber, and has two concentric circles of metal let into its face. A segment, *i'*, of the metallic circle *i* projects from the face of the disk *h*, but the remaining portion is cut down flush with the surface of the disk. In like manner a segment, *k'*, of the circle *k* projects, while the remainder is flush with the disk. The arm *g*, in its revolution, makes a frictional contact with the projecting surfaces *i'* and *k'*, and these are arranged in the manner shown, with the projecting segments alternating, so that the arm *g* can be in contact with only one of them at a time, except during the instant it is passing from one to the other. The proportion which the operative segments or contact surfaces of the metallic circles *i* and *k* of each disk bear to each other depends upon the number of different sub-stations which are to be provided for. In the present system there are four such stations, and for that reason the disk is so arranged that the

arm *g* is in contact with the segment *i'* during one-fourth of each revolution, and with the segment *k'* during the remainder, or three-fourths of each revolution.

At each station is placed an alarm apparatus of any suitable character, actuated by an electro-magnet. I have shown in Fig. 1 an ordinary single-stroke electric bell, and a key for breaking and closing the circuit for giving signals. I will remark, however, that the ordinary key and sounder of the Morse telegraph may often be used as a signaling apparatus in connection with my invention with manifest advantage, by merely substituting it in place of the key and bell which I have shown in the drawings.

The electrical connections at each sub-station are arranged as follows: The main line from the central station enters at 1, (see Fig. 1,) and thence goes by wire 2 to the hollow coil or helix E, and thence to the revolving arm or circuit-changer *g*. In the figure this arm is represented as being in a position to form a connection with the branch circuit, which starts from the outer circle, *i*, upon the disk *h*, and proceeds, by way of wires 4 and 5, to the signaling-key K, and thence by wire 6 to the electro-magnet M, which operates the alarm by causing the hammer *n'* to strike the bell P. From the electro-magnet M the circuit returns by way of the wires 7 and 8, and thence by wire 9, which is the main line, to the next sub-station in the series. The inner circle, *k*, of the disk or dial *h* is connected directly with the outgoing-line 9 by means of the wire 10. Thus it will be understood that if the time-train of the clock F be set in motion the arm *g* will be caused to revolve at a uniform rate of, say, one revolution per minute, and during each revolution, or period of sixty seconds, the main line from the central station will be in connection with the branch line, which includes the key K and signal-operating electro-magnet M, for fifteen seconds, while during the remaining forty-five seconds the connection will be made through the wire 10, cutting the signal devices entirely out of the circuit. The arm *g*, therefore, forms a switch, which acts to direct the circuit through the signal machinery for a predetermined length of time and at given intervals, and directly through the main line for the remainder of the time. There is a constant current maintained upon the main line by means of a battery at the central station, as hereinafter explained, and this traverses the signal-operating magnet whenever the arm *g* closes the circuit through the branch in which it is placed. This current is never interrupted by the operation of switching the circuit to and from the branch, the arm *g* being made broad enough so that it makes contact with one segment before it breaks contact with the other.

In order to prevent the signal-bell P from being struck each time that the current is switched onto the branch, and made to traverse its electro-magnet, and thus give a false signal, I have devised the mechanism shown in Figs. 1 and 5 of Sheet 1.

The armature-lever N carries a bell-hammer, *n'*, upon a rod *n*. The rod *n* passes through a slot, *r'*, formed in the guard *r*, the latter being made adjustable by means of a screw, *o'*, which acts to clamp it between side plates, *o*, as seen in Figs. 1 and 5. Upon the slotted guard *r* an angular dog, *t*, is loosely placed, having a slot, *t'*, at its angle, through which passes the rod *n* of the bell-hammer. A projection is formed at *s* by filing away a notch or portion of the upper surface of the guard *r*, or otherwise, as shown.

The operation of this device is as follows: When no current is passing through the electro-magnet M the bell-hammer and rod *n* remain in the position indicated by the dotted lines, and the dog *t* in the position indicated by the full lines, but a little farther to the left. If, now, the circuit is closed, the rod *n* is drawn forward, carrying the dog with it; but the point of the latter strikes against the notch or projection *s* and stops the hammer, so that it cannot strike the bell, and the apparatus remains in this position until the circuit through the magnet is cut off. If, however, a signal is given by breaking and closing the circuit by a key at the central station, or otherwise, the bell-hammer falls back, the rod *n* strikes the projection *t''* on the upper end of the dog and tilts it backward into the position indicated by the dotted lines, and then, upon the circuit being closed again, the rod *n* moves forward so quickly that the dog does not have time to drop into a position to take hold of the notch or projection *s*, and consequently the hammer *n'* strikes the bell P and gives the required signal. Thus it will be understood that unless the forward stroke of the bell-hammer is preceded by a back stroke the dog *t* cannot be thrown into a position which will permit the bell to be rung.

In placing a number of chronometric switches at a like number of different stations upon the line, they are arranged upon the principle shown in Fig. 2, so that the time when the signal devices at any station are placed in circuit and rendered operative is different at each sub-station. For example, the signal at station A may be in circuit during the first fifteen seconds of each minute, station B from the fifteenth to the thirtieth, station C from the thirtieth to the forty-fifth, and station D during the remainder of the minute. If the switches are all so arranged as to revolve synchronously with a pointer or index placed upon the clock A' at the central station, it is obvious that the operator at that station may signal either of the sub-stations during the period of time appropriated to it, as indicated by the index upon his own clock, without affecting any of the others, while they, in turn, may signal the central station in the same way.

In order to control the synchronism of the different time-trains and switches in the system, I make use of the arrangement shown in

the diagram, Fig. 3, which consists of a standard or controlling pendulum, *a*, at the central station. The pendulums of the time-trains at the sub-stations, one of which is shown at *f*, are adjusted so that their normal rate is as nearly as possible the same as that of the standard. If, however, there should be any tendency to inaccuracy or departure from the rate of the standard pendulum, it is corrected by a device about to be described.

The main line L, at the central station, passes normally through the battery *b*, insulated spring *d*, and metallic frame *c*, and thence to the earth. A contact-screw, *e*, is inserted in the metallic rod of the pendulum, which at each oscillation thereof momentarily touches the spring *d* and lifts it off from *c*, breaking contact with the earth by way of L and forming a contact momentarily by way of wire L′, which includes the supplementary battery *b*′. Thus an impulse from the latter battery is superposed upon the normal current of the battery *b* upon the line at regular intervals corresponding with the vibrations of the standard pendulum *a*, and these impulses pass through the coil E at each sub-station. By this means, if the pendulum *f*, for example, should tend to vibrate too slowly, the impulse will be felt in the coil E before the completion of the vibration of *f*, and it will tend to accelerate its movement, and in like manner to check it on its return vibration, if its rate of motion is too fast. These impulses are transmitted over the line without interrupting the circuit or interfering with its use for signaling purposes. It is not necessary in all cases to make use of the controlling device which has just been described, as in some cases the rate of the time-trains may be sufficiently accurate for all practical purposes.

The switch *g* is mounted upon its arbor with a friction coupling, so that it may be turned with a key, as the hands of a clock are turned, to adjust it in its proper position when necessary.

By making use of a removable disk or dial in the manner I have described it is easy to adapt a system of switches to a greater or less number of stations by simply removing the disks and replacing them with others, divided to correspond with the number of stations in the new arrangement.

The disk or dial may obviously be made in various forms without departing from the principle of the invention.

I claim as my invention—

1. The combination, substantially as herein set forth, of a main line, branch circuits located at different stations upon said line, each of which branches includes an electro-magnetic signal or alarm apparatus, circuit-changers or switches at each station, so arranged as to transfer the circuit from the main line to the branch, or vice versa, without interrupting it, and synchronous time-trains, controlling the movements of the respective switches, so that the branch circuits, which include the signaling device, are brought into the main circuit one at a time, in regular succession and for a definite period.

2. The combination, substantially as herein set forth, of a main line and two branch lines, an electro-magnetic alarm or signal in one of said branch lines, a switch or circuit-changer, adapted to connect the main line alternately with each of the two branch lines, and to form the connection with either branch before breaking connection with the other, and a time-train to control the movements of said switch, and thus connect the main line alternately with the respective branches for a predetermined length of time, substantially as specified.

3. The combination, substantially as hereinbefore set forth, of a main line, branch circuits located at different stations upon said line, each of which branch circuits includes an electro-magnetic signal or alarm apparatus, circuit-changers or switches at each station, so arranged as to transfer the circuit during predetermined intervals of time from the main line to the branch, or vice versa, time-trains controlling the movements of the respective switches, and a standard pendulum, arranged to control the movements of the several time-trains by transmitting electrical impulses through the said main line.

4. The combination, substantially as herein set forth, of a main line, branch circuits located at different stations upon said line, synchronously-revolving arms or circuit-changers at each station, controlled by time-trains, and removable dials at each station, having contact-surfaces electrically connected with the main and branch circuits, respectively, and so arranged as to determine the portion of time during which the electric current will traverse the branch line.

5. The combination, substantially as hereinbefore set forth, of an electro-magnet, a vibrating armature-lever, a notched guard, and a movable dog, constructed and arranged, substantially as described, so as to drop into the notch of the guard and lock the armature-lever upon its forward movement, except when the latter is preceded by a backward movement.

Signed by me this 17th day of July, A. D. 1880.

HENRY D. SISSON.

Witnesses:

FRANK L. POPE,

MILLER C. EARLE.