M. LEVISON.

SIGNALING SYSTEM.

APPLICATION FILED APR. 15, 1911.

1,108,998.

Patented Sept. 1, 1914.

2 SHEETS—SHEET 1.

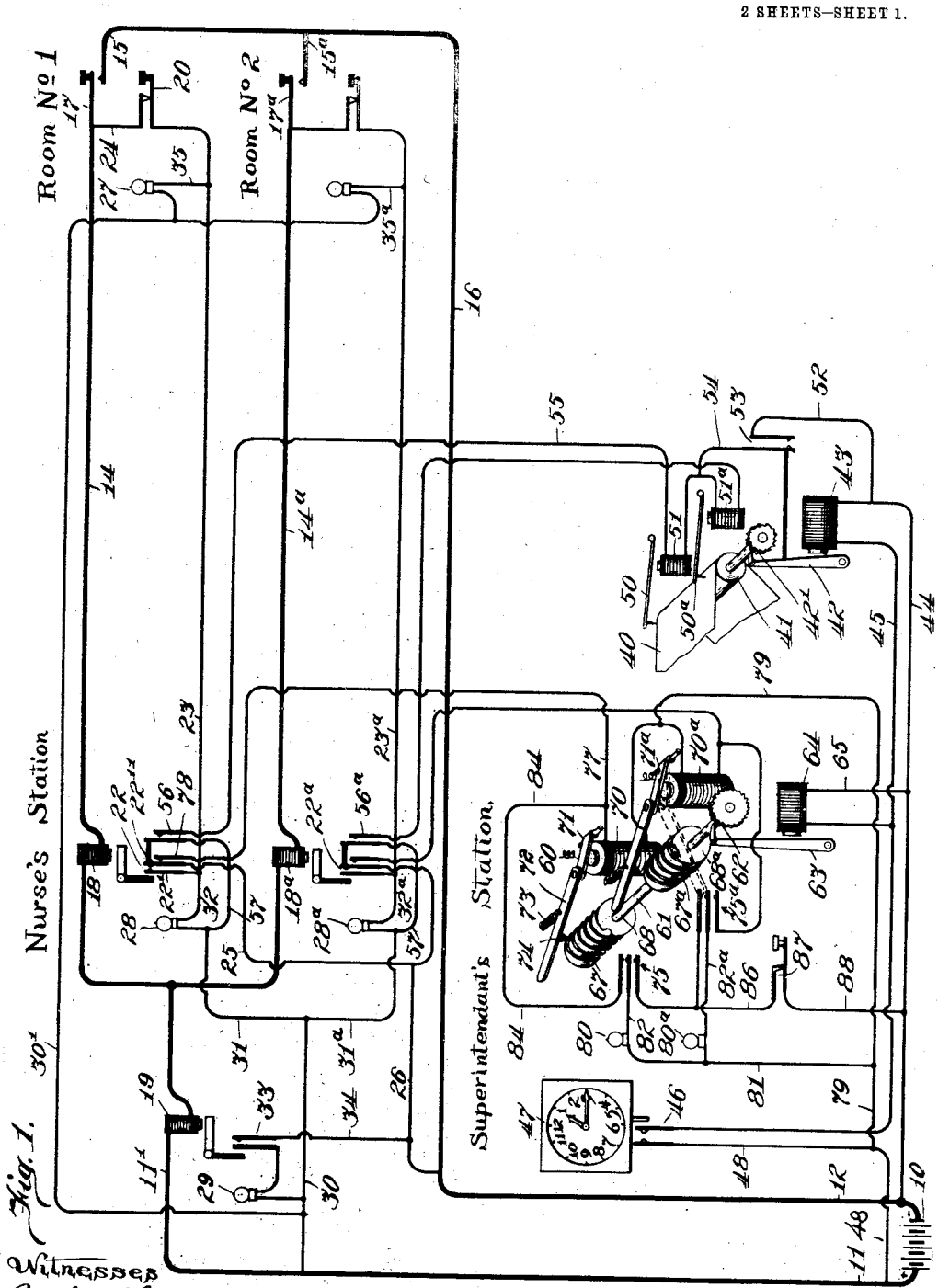


Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

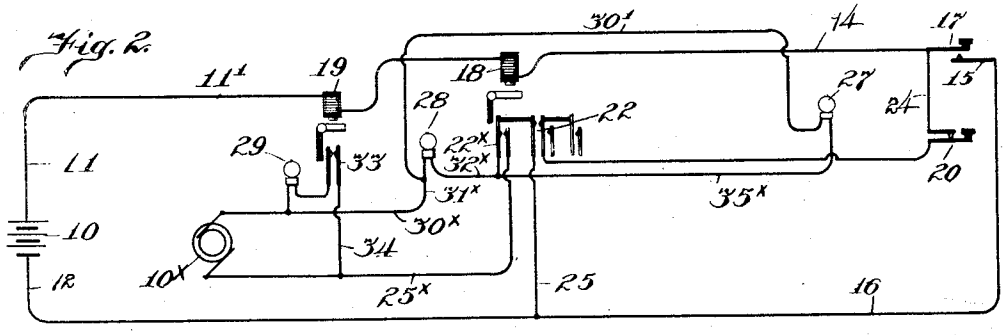


Fig. 3.

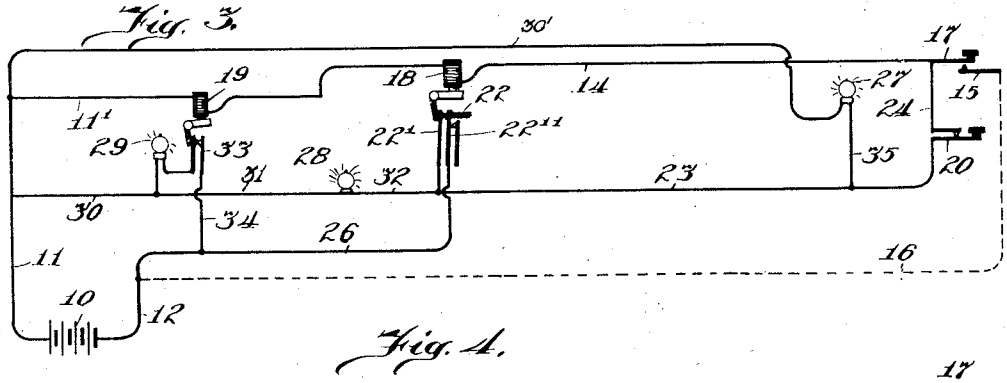


Fig. 4.

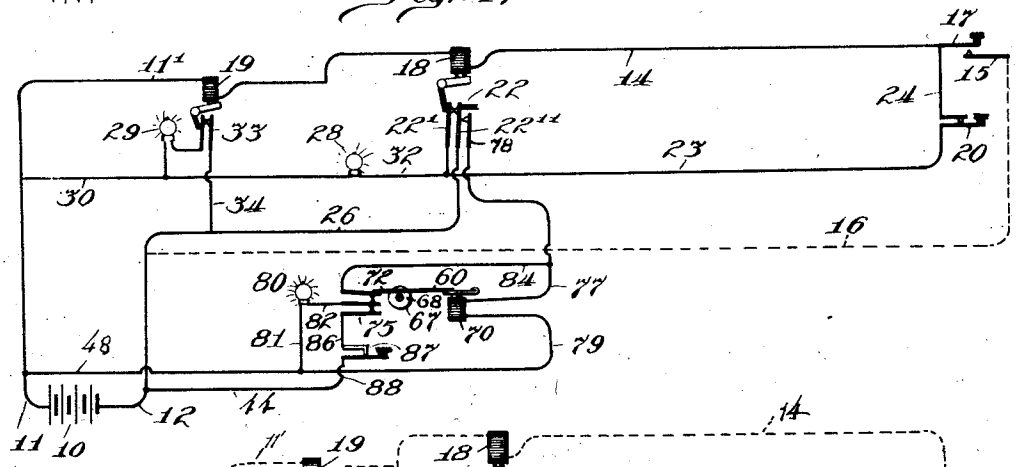
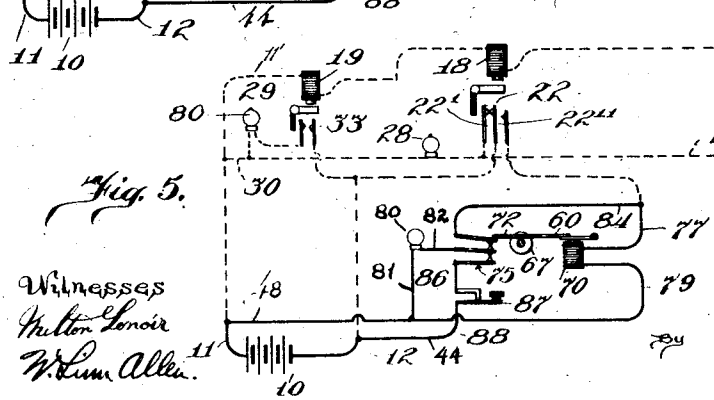


Fig. 5.



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UNITED STATES PATENT OFFICE.

MAURICE LEVISON, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO CHICAGO SIGNAL COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

SIGNALING SYSTEM.

1,108,998. Specification of Letters Patent. Patented Sept. 1, 1914.

Application filed April 15, 1911. Serial No. 621,186.

To all whom it may concern:

Be it known that I, MAURICE LEVISON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Signaling Systems, of which the following is a specification.

My invention relates to improvements in signaling systems and more particularly to signaling systems adapted for installation in hospitals and in other environments where the object of signaling from a sending station to a relatively remote receiving station is to secure the presence of an attendant at the sending station. Since hospital service is one in which my invention may be applied to excellent advantage, I will hereafter particularly describe my invention as employed in such service, but by way of convenient example.

In my prior application, Serial No. 390,431, filed August 28, 1907, I have disclosed and claimed a system whereby an electrically controlled annunciator (*i. e.*, any attention attracting device, as a lamp or otherwise) located at a receiving station, may be set by a patient or operator at a relatively remote sending station, through the operation of a signal initiator, and when set, may be released only by the operation of a releasing switch at the sending station effected by the attendant, and this general arrangement I retain in my present system.

One of the objects of my present system is to provide, in association with devices of the general character above referred to, means for registering the time interval between the transmission and release of every signal or call from each sending station, and its relation in point of time to all other calls.

Another object is to provide means for effecting a supplemental or supervisory signaling operation upon the lapse of a predetermined time between the transmission and the release of any call, to indicate the fact of tardy service, and to identify the station from which such call was sent.

A further object of my invention is to provide simple mechanisms, and advantageous electrical co-relation between such mechanisms, for attaining the desired ends.

Other objects of my invention will become apparent to those skilled in the art from the following description, taken in conjunction with the accompanying drawings.

In the drawings, Figure 1 is a diagrammatic illustration of an embodiment of my invention in a hospital signaling system. Fig. 2 is a diagrammatic illustration of parts of the system, showing the annunciator lights in a circuit separate from the signaling circuits. Fig. 3 is a skeleton diagram, showing the signal circuit in its self-maintained, annunciator-actuating condition before release of a signal. Fig. 4 is a similar view showing the condition of the tell-tale or supervisory signal circuits resulting from a prolonged call. Fig. 5 is a skeleton diagram showing the tell-tale or supervisory signal circuits in self-maintained condition following a release of the main signal.

In general it is my preference that all of the electrical appliances of the system be operated from a common battery so that to some extent common wiring is used for different circuit connections, and in the embodiment shown in Fig. 1, 10 indicates the common battery and 11 and 12 indicate common leads or main wires extending from the respective battery terminals, and which I may for convenient designation respectively term the positive and negative mains. The primary or signaling circuit comprises a connection 11′ from the positive main 11 running to the principal signal-receiving station, such as the nurse's cabinet, and there divided into a plurality of branches of any desired number, all arranged in parallel, as indicated by the two wires 14 and 14ª. Each of said parallel individual branches extend to a signal initiator at a relatively remote sending station, such as a patient's room, whence each signaling branch continues by wire 15, or 15ª, etc., to a common return wire 16, connected back to the negative main 12. The devices connected with the several signaling-circuit-branches are all alike, and, therefore, I will describe in detail only the parts associated with branch 14, it being understood that like parts of branch 14ª are designated by like numerals of reference, distinguished by the exponent *a*, and that the system may be multiplied indefinitely as to number of branches. The circuit branch 14 has connected therein, at the sending station, a signal initiator in the form of a push button, or other appropriate switch, 17, conveniently located for operation by the patient; and at the receiving station or nurse's cabinet, it

embodies an electro-responsive annunciator-actuating device, such as the relay 18, controlling a nurse's annunciator, such as a lamp. Preferably also a pilot relay 19 is included in the common connection 11', so that obviously the closure of the patient's sending switch or signal initiator 17, closes the circuit 10, 11, 11', 19, 18, 14, 17, 15, 16, 12, 10, energizing the relay 18 individual to the sending station, and also the pilot relay 19 common to all of the stations.

It is important in my system, that when once a signal is set—that is, an annunciator is caused to perform its characteristic function—by a line relay 18, it shall remain set until released by the operation of a releasing device located at the sending station, for operation by the attendant whose presence at the transmitting station is demanded by the signal sent. To this end, I provide a signal release circuit, including the relays 18 and 19, but normally open, automatically closable upon the closure of the signal initiator 17, said release circuit being self-retaining in closed condition subject to a normally closed releasing switch 20 at the sending station. One convenient manner of effecting this automatic control is to provide for relay 18 a switch 22 closable when the relay 18 is energized, one switch limb 22' having connection by wire 23 to the releasing key 20, at the patient's room, and from the closed contact thereof by wire 24 to the main circuit branch 14, the other limb of switch 22 having connection by secondary circuit branch wire 25 and common wire 26 to the negative main 12 of the battery. Thus it will be apparent that once the relay 18 is energized by closure of a signal initiator 17, as heretofore described, the automatic closure of relay-switch 22 establishes a circuit for the relay magnet through the path 10, 11, 11', 19, 14, 18, 14, 24, 20, 23, 22', 22'', 25, 26, 12, 10, to maintain the relay 18 energized until the release circuit last described is broken by the opening of the release switch 20 at the sending station. Such self-retaining circuit, closed at release switch 20, is shown in Fig. 3. Thus it will be apparent that when a relay 18 is energized to set a nurse's annunciator it can not be deënergized until the nurse goes to the sending station and operates the release key by the patient's bed-side.

The signals proper, or annunciators, controlled by the respective individual relays 18 and pilot relay 19, are preferably lamps, there being a nurse's lamp 28 at the signal-receiving station or nurse's cabinet for each relay 18, a pilot lamp 29 for the pilot relay 19, and, preferably, a door lamp, 27, for each signal initiator 17, all arranged to be included in parallel circuit upon the transmission of a signal from the appropriate sending station, and to remain energized until extinguished by the releasing operation. Where the lamps are energized from the same source of power as the signaling circuits, connection may conveniently be made as shown in Fig. 1, a common lamp circuit wire 30 being run from positive main 11 with a continuation 30' running in common to all of the transmitting stations. From the common wire 30 branches 31, 31^a are run to the respective nurse's lamps 28, 28^a, etc., and thence lamp 28 is connected by wire 32 to the switch limb 22' of relay switch 22, heretofore referred to. The pilot lamp 29 is located, together with a switch 33 controlled by the armature of pilot relay 19, in a connection 34, bridged directly across the wires 30 and 26. Each patient's lamp 27 is connected by wire 35 between the common lamp circuit wire 30' and the release circuit wire 23 individual to the particular sending station. Thus, when relays 18 and 19 are energized by the closure of a signal initiator, 17, so closing the respective relay switches, 22 and 33, the lamp 29 is bridged by connection 33; 34 across the common lamp circuit wires 30 and 26, connected with opposite terminals of the battery; nurse's lamp 28 is bridged between said wires 30 and 26 by connections 31, 28, 32, 22', 22'', 25; and lamp 27 is paralleled with lamp 28 by connections 30', 27, 35, 23, 22', 22'', 25, 26. Thus all the said lamps are energized by circuits controlled by switches of relays 18 and 19, and remain energized until the releasing operation, heretofore described, deënergizes said line relays 18 and 19, and opens the respective relay switches.

It will be apparent that whenever deemed desirable the lamp circuit may be installed entirely separately from the balance of the circuit connections, as shown in Fig. 2, such arrangement being desirable for instance where an alternating current is to be used in lighting the lamps. Under such conditions, the lamp circuit wire 30^x, with its branches 31^x, is connected to one terminal of the auxiliary source of current supply 10^x; the lamp controlling switches 22^x for the respective relays 18 are made separate from the switches 22, a connection 25^x being made from each switch 22^x to the remaining terminal of source of supply 10^x, and the connection 35^x for each room lamp 27 being run back to the wire 32^x to throw the lamp 27 directly in parallel with lamp 28. The connections for the parts energized by battery 10 may be made as shown in Fig. 1.

For the supervision of the service of attendants in response to signals transmitted, I provide supervisory appliances which may conveniently be installed in a supervisory station such as the quarters of the

superintendent, whereby complete record of signals may be kept, and whereby supervisory signals may be displayed whenever a call is not followed by a releasing operation within such definite time limit as may be set by the supervising authority. The registering of calls is highly important to the patient, to the attendant, and to the authorities, in checking up the demands of individual patients, the diligence of the individual attendants, and guiding the most advantageous distribution of attendants, and the like, while the supervisory signal devices insure authoritative attention to delinquencies of attendants, and reference to the registers gives the supervising authorities fair means of determining whether apparent delinquencies are due to press of work.

The registering mechanism herein shown comprises in general tape-feeding means, automatically operating, step by step, at constant time intervals, tape-marking means individual to each signaling station, each controlled by an electro-responsive device, and circuit connections for each such electro-responsive device controlled by the signal responsive relay of the appropriate signaling branch, and preferably controlled also by a switch closed at regular time intervals.

Specifically 40 indicates a suitable tape carried by a roll 41 driven by a ratchet-and-pawl mechanism 42′ operated by an armature lever 42 for an electro-magnet 43 having one terminal connected by wire 44 to the negative main 12, its other terminal connected by wire 45 with one limb of a switch 46 automatically closed at regular timed intervals—say half-minute intervals—by a clock movement 47, the remaining limb of switch 46 having connection by wire 48 with the positive main 11. Obviously, at the regular time intervals the clock closes switch 46, thereby energizing magnet 43 (through circuit 10, 48, 46, 45, 43, 44, 12, 10) and causing an advance or feeding movement of the tape 40. The register is provided with markers 50, 50ª, etc., one for each sending station, each marker being actuated by an electro-magnet 51 connected in circuit controlled by a switch operated by the line relay 18, for the appropriate sending station, and also preferably controlled by a switch common to all of the magnets 51, intermittently closed at regular intervals. Specifically, a common connection 52 is made from wire 44, through a switch 53, adapted to be closed by armature lever 42 on each attraction thereof at half-minute intervals, and from said switch by wire 54 and multiple branch connections to the respective operating magnets 51, 51ª, etc. The remaining terminal of said magnet 51 has connection by wire 55 to one limb of switch 56, controlled by relay 18 of the appropriate signal circuit branch, the other limb of said switch, 56, having connection by wire 57 to the appropriate branch wire 31. Of course the other magnets 51ª, etc., have like connections for control by relays 18ª, etc. Thus, when a signal is set by the operation of any relay 18, (which it will be remembered remains energized until the signal is thereafter released) each closure of the interval switch 53 accompanying a feeding movement of the tape, closes a circuit 10, 44, 52, 53, 54, 51, 55, 56, 57, 31, 30, 11, 10, energizing operating magnet 51 and causing the marker 50 to make a dot, or perforation, on the tape. Therefore, the number of dots on the tape will indicate in half-minutes intervals the time elapsing between the initiation and release of a call, only the marker 50 appurtenant to the particular station calling being operated.

The supervisory or tell-tale signaling means comprises in general a time switch for each signal circuit branch arranged to be set in operation by the initiation of a signal, and to be restored to normal position if the release of the signal takes place before the time switch completes its functional operation; said time switch functionally operating upon the lapse of a predetermined time of continuous operation to actuate a supervisory annunciator, which when set can be released only at the supervisory station, and that only in the event the nurse has already released the primary signal.

In the specific construction herein shown the time switch mechanism, 60, comprises a shaft 61, driven at a known rate of revolution, as by ratchet and pawl mechanism 62 operated by an armature lever 63 of an operating magnet 64, which is bridged by wire 65 across the wires 44—45 in parallel with magnet 43, so that the ratchet advances a step with each closure of the clock-controlled switch 46. For each individual switch the shaft carries a worm 67, 67ª, etc., terminating in an annular recess 68. For each switch is provided an operating magnet 70, 70ª, etc., the normally retracted armature 71 thereof carrying an arm 72 pivotally mounted thereon for transverse movement, and vertically movable with the armature 71, arm 72 being normally held at one limit of its lateral throw by a spring 73. Such arm 72 carries a tooth 74, normally raised out of engagement with the worm by the retraction of the armature 71, and arranged to be brought into engagement with the worm when the armature is attracted by its magnet 70, so that the arm 72 may be driven by the worm in a lateral direction toward the end recess 68. The contact of said tooth with the worm prevents the armature from being moved to its closest proximity to the

operating magnet, but when the tooth 72 passes the end of its worm, the armature lever pulls it into the recess 68 at the end of the worm so that further rotation of the shaft has no effect on arm 72. Opposite this recess is arranged a switch 75 shown as providing three limbs all arranged to be closed by the arm 72 when it has thus been pulled into the worm recess 68.

Each operating magnet 70 is arranged in a circuit controlled by the line relay 18 of the corresponding signaling branch, and to this end, the operating magnet 70 has one terminal connected by wire 77 to the switch-limb 78, associated with contact 22″ for relay 18, and its other terminal connected by wire 79 common to all of the magnets 70, with the wire 48, which is connected to the positive main. Thus whenever relay 18 is energized, closing a switch-limb 22″ against limb 78, the operating magnet 70 of the tell-tale supervisory switch, is closed through the path 10, 48, 79, 70, 77, 78, 22″, 25, 26, 12, 10, and the armature 71 is attracted. This throws the tooth 74 of the arm 72 into engagement with the worm 67, movement of which, at half-minute intervals, shifts the arm laterally toward the recess 68, the distance to be traveled laterally by the arm (variable at will) determining the retardation or time-limit in the operation of the switch 75. Each switch 75 controls the circuit for a tell-tale lamp 80 of the superintendent's set, and also controls a circuit for the operating relay 70, so that once the switch 75 is closed, relay 70 can not be de-energized by rupture of the circuits heretofore described at the switch 22″, 78, so insuring that once the tell-tale signal is set it remains set until it is released by operation of the supervising authority. Specifically 81 indicates a wire connected to wire 79, having branches 82, 82ª, etc., including the respective tell-tale, or supervisory, lamps 80, 80ª, each such branch being connected to one limb of the corresponding switch 75. Another limb of the switch 75 has a connection 84 to the wire 77 of its actuating magnet 70. The remaining limbs of switches 75, 75ª, etc., are connected to a common wire 86, to a normally closed superintendent's releasing switch 87, and thence by wire 88 to the wire 44. Thus, it will be apparent that as soon as the continued operation of the switch arm 72 causes it to close switch 75 the conditions shown in Fig. 4 prevail; that is a circuit for the appropriate tell-tale lamp 80 is established by the path 10, 11, 48, 79, 81, 80, 82, 75, 86, 87, 88, 44, 10, and also a retaining circuit for magnet 70 is established through the path 10, 11, 48, 79, 70, 84, 75, 86, 87, 88, 44, 12, 10. It will be observed that this retaining circuit is beyond control of the releasing devices for the main signaling circuit, being local to the supervisory set, as shown in Fig. 5, and that when the said local circuits for the tell-tale lamp 80 and magnet 70 are once established they may be broken, for release of the tell-tale signal, only by the operation of the superintendent's release switch 87, following an operation of the nurse's releasing switch 20 thus insuring that the supervisory signal will remain in evidence until it has received attention from the supervising authorities.

In brief résumé of the operation of the system: When any patient presses his push button 17 he establishes a main line circuit, shown in heavy lines through the relay 18 appurtenant to the signaling branch individual to this station, and through the pilot relay 19, common to all stations, causing both of these relays to close their respective switches. The closure of the switches of relay 18, establishes a circuit for the nurse's lamp 28, and door lamp 27, and operation of pilot relay 19 lights the pilot lamp 29; all of these lamps being in parallel, so that the burning out of any one does not affect the main signaling circuit nor the energization of the remaining lamps. Thus, if the nurse's lamp is burned out pilot lamp 29 and door lamp 27 suffice to identify the calling station. Further, the closure of the switches of relay 18, establishes a circuit for the magnet of said relay independent of the signal initiator 17, but inclusive of the release switch 20, located at the sending station, (as shown in Fig. 1) so that only by answering the call and operating the release switch may an attendant restore the annunciator to normal, by deënergizing the relay 18. As long as any relay 18 remains energized one of its switches effects closure of a connection for the appropriate register magnet 51, so that the circuit of said magnet may be completed at regular intervals (say every half minute) when the clock 47 closes its contact switch 46, thereby causing a series of marks to be made on regularly fed registry tape 40, equal in number to the number of time units elapsing between the initiation of a call and the operation of the release switch 20. Thus every call and its duration is recorded, and of course the tape may have printed thereon indications of actual time as the feed of the tape is governed by the clock. Further the closure of a switch 22″—78 governed by relay 18 initiates the operation of a tell-tale time switch 60, the operating arm of which, 72, when moved a definite distance by the regularly moving worm appurtenant thereto, establishes a circuit for the tell-tale lamp 80 and a local retaining circuit for the electro-magnet 70, as shown in Fig. 4, so that when once set, the tell-tale signal can not be released by any other agency than the superintendent's release key 88, and that only in the event that the nurse has released the main signal, leaving the tell-

tale 80 locally controlled as shown in Fig. 5.

While I have herein described in detail for purposes of full disclosure one embodiment of my invention, it will be apparent to those skilled in the art that numerous changes in construction and arrangement might be made within the spirit of my invention and within the scope of the appended claims.

What I claim is.

1. In a signaling system, the combination of a primary circuit having a plurality of branches from a common signal-receiving station to a plurality of signal-transmitting stations, and suitable means of current supply; at each transmitting station, switching means to establish, control and maintenance of, and to break, the circuit branch individual to that station; at the central station a relay magnet in each circuit branch, and registering means comprising a plurality of actuating magnets, one responsively associated with each circuit branch and controlled by the relay-magnet pertaining to such branch, a circuit having a common portion, and branches each for energizing, respectively, one of said actuating magnets, a switch in the common portion of said circuit, a relay magnet for controlling said switch, means for energizing the last said relay magnet at regular timed intervals, a record strip driven by the last said relay magnet, and markers actuated by the several actuating magnets.

2. In a signal system, the combination of a source of current supply; a line circuit divided into a plurality of normally open branches each extending from a common receiving station to a respective transmitting station; at the receiving station a plurality of relays each having its magnet in one respective branch circuit, a circuit pertaining to each said relay and controlled thereby and including an electro-responsive actuating magnet, time-interval-controlling means associated with the circuits of said actuating magnets, marking devices controlled by said actuating magnets, a record receiving surface associated with said marking devices; and at each transmitting station a signal initiating device and a separate release device, the two being independently operable, said signal initiating device controlling the energization of the first said relay and said release device controlling its deënergization.

3. In a signaling system, the combination of a primary circuit having a plurality of branches from a common signal-receiving station to a plurality of signal-transmitting stations, suitable means of current supply, central station relays, each having its magnet in one, respectively, of said circuit branches, a holding circuit for each primary-circuit branch automatically closable upon the closure of the primary-circuit branch, and including the relay-magnet pertaining to that branch; at each transmitting station a normally open call switch in the primary-circuit branch, and a normally closed release switch in the holding circuit; and at the central station registering means comprising a plurality of markers, one pertaining to each primary-circuit branch, an actuating magnet for each said marker controlled by the signal receiving relay of the appropriate primary-circuit branch, and means for advancing said strip at a regular rate of speed.

4. In a signaling system, the combination with a primary circuit having a plurality of parallel branches from a signal receiving station to separate signal transmitting stations, suitable means of current supply; at each sending station means to establish, control the maintenance of, and to break an energized circuit through the branch individual to said station, at the central station a plurality of electro-responsive signal receiving devices, each connected for inclusion in its respective one of said circuit branches, and registering means comprising a plurality of markers, each individual to one sending station, an actuating electro-responsive device for each marker, and circuit connections for each said actuating device, controlled by the electro-responsive signal receiving means appurtenant to the individual circuit branch for the corresponding transmitting station.

5. In a signaling system, the combination with a primary circuit having a plurality of parallel branches, from the signal receiving station to separate signal transmitting stations and means of current supply, at each sending station means to establish, control the maintenance of, and to break an energized circuit individual to said station; at the central station a plurality of electro-responsive signal receiving devices, each connected for inclusion in its respective one of the last said circuits, and registering means comprising a like plurality of markers, each individual to one transmitting station, an actuating electro-responsive device for each marker, and circuit connections for each said actuating device, controlled by the electro-responsive signal receiving means appurtenant to the individual circuit of the corresponding transmitting station, a switch common to all of the actuating devices, and means to close the last said switch at regular time intervals.

6. In a signaling system, the combination of a signaling circuit including signal initiating means and electro-responsive means; an annunciator controlled by said electro-responsive means; a holding and release circuit controlled by said electro-responsive means, and including the same; a

releasing switch also included in said holding and release circuit; and registering means controlled by said electro-responsive means for operation contemporaneously with the said electro-responsive means.

7. In a signaling system, the combination of a primary circuit comprising a source of current supply, a main wire divided into a plurality of individual branches extending from a common receiving station to independent transmitting stations, and a common return; of a signal receiving relay pertaining to each branch and having its magnet therein; a circuit closer in each branch at its transmitting station; release circuit connections individual to each branch, including a normally closed release switch, located at the transmitting station; a controlling switch for actuation by the receiving relay magnet to establish an energized circuit including said relay and the releasing switch; actuating magnets respectively corresponding with the receiving relays; circuits for said magnets respectively controlled by said corresponding receiving relays; and marking devices controlled by said actuating magnets.

8. In a signaling system, the combination with appropriate means of current supply, and circuit connections extending uninterruptedly from central station electro-responsive apparatus to transmitting station signal controlling apparatus; of central station electro-responsive signal receiving means; means at the transmitting station directly to establish, control the maintenance of, and to break a circuit for said electro-responsive means; a tell-tale annunciator; and retardedly-timed actuating means therefor controlled by the electro-responsive signal receiving means.

9. In a signaling system, the combination with appropriate means of current supply and circuit connections; of central station electro responsive signal receiving means, means at the transmitting station to establish, to control the maintenance of, and to break the signaling circuit for said electro-responsive means; a tell-tale annunciator; a time switch to actuate the annunciator after a predetermined interval of continuous operation of the switch; and means controlled by the electro-responsive signal-receiving means for setting said time in operation, whereby the tell-tale is actuated upon maintenance of the signaling circuit for a predetermined length of time.

10. In a signal system, the combination with appropriate means of current supply and circuit connections, of central station electro-responsive signal receiving means, means at the transmitting station in constant connection with said electro-responsive signal receiving means to establish control the maintenance of and to break a signaling circuit for said electro-responsive means, an annunciator controlled by said electro-responsive means, a supervisory annunciator, also controlled by said electro-responsive means, and means for retarding the operation of said supervisory annunciator.

11. In a signal system of the character described, the combination of a central station relay having a magnet, a primary signal controlled by said relay, a supervisory signal annunciator, suitable circuit connections for said relay magnet and at a transmitting station means associated with said connections to control the energization and deënergization of said relay magnet; a circuit controlled by said signal relay and including a magnet; an operating member movable to different positions by the last said magnet; a timing means for imparting timed movements to said operating member when it is in one of its said positions; the said supervisory annunciator responding to predetermined movements of said operating part by said timing means.

12. In a signal system, the combination of a main signaling circuit including call-initiating means arranged to vary the condition of said circuit and means for response to such variation in the circuit to indicate the same, said responsive means being in constant connection with said call-initiating means, a tell-tale annunciator; a time switch to cause the actuation of the annunciator after a predetermined interval of continuous operation of the switch; and means operable during continuance of a predetermined condition of the main signaling circuit imposed by the call-initiating means for operating said time switch, whereby the tell-tale annunciator is actuated upon maintenance of a certain condition in the circuit for a predetermined length of time.

13. In a signal system, the combination of means of current supply, signaling circuit connections divided into individual branches, circuit closing means in each branch, a relay magnet in each branch, a release switch for each branch; means for establishing a holding-and-release circuit through the relay and release switch when the circuit closing means for the signaling circuit is closed; and indicating and timing means controlled by the relay and operable to register the duration of closure of the release circuit.

14. In a signaling system, the combination with appropriate means of current supply and circuit connections, of a central station signal relay, means at the transmitting station to establish, control the maintenance of, and to break a circuit for said relay, registering mechanism controlled by said relay to register the duration of each operation thereof, a time switch controlled by said relay, and annunciator means controlled by said time switch.

15. In a signaling system, the combination with appropriate means of current supply and circuit connections; of central station electro-responsive means; means operable at the transmitting station to establish, control the maintenance of, and to break a circuit for said central station electro-responsive means; registering mechanism controlled by said electro-responsive means to register the duration of each operation thereof; a tell-tale annunciator; and means for actuating said tell-tale annunciator after continued operation of said electro-responsive device for a predetermined length of time.

16. In a signaling system, the combination with a main signaling circuit including a source of current supply, a signal initiator, and a signal responsive relay, of a primary annunciator controlled by said relay, a supervisory annunciator, a time switch controlling said supervisory annunciator controlled by the relay, and means for maintaining said supervisory annunciator in set condition, controlled by said time switch independently of said signal relay.

17. In a signal system, the combination with a main signaling circuit including a relay, of a supervisory annunciator, a time switch therefor comprising an electro-responsive actuating magnet and circuit connections therefor, controlled by the relay, and holding-circuit connections for said magnet controlled by the time switch and excluding the relay.

18. In a signaling system, the combination of a signaling circuit, extending from a transmitting station to a receiving station another circuit controlled by the condition of the signaling circuit, a timing device controlled by the condition of the last said circuit, and operating in response to continued maintenance of a certain condition therein for a predetermined length of time, and an annunciator controlled by said timing device.

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

MAURICE LEVISON.

In the presence of—

GEO. T. MAY, Jr.,

MARY F. ALLEN.