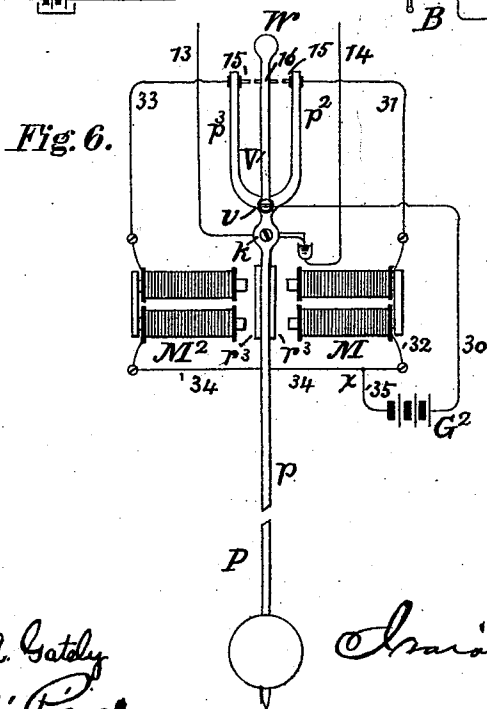
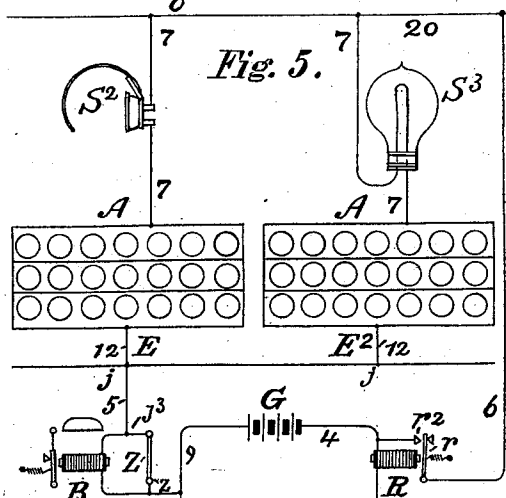
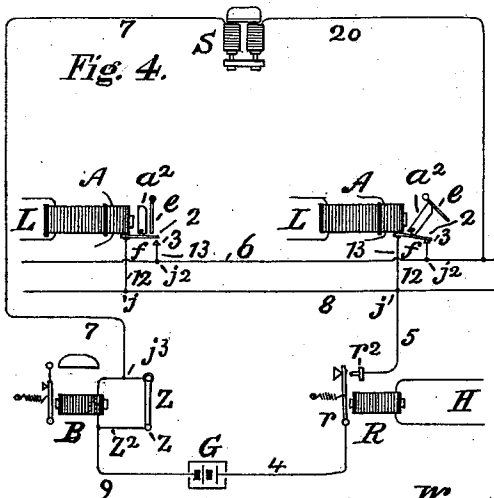
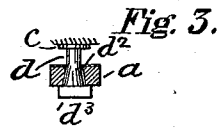
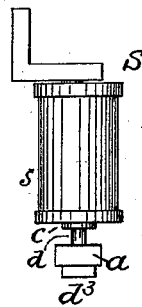
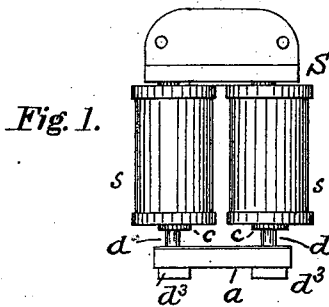


(No Model.)

I. H. FARNHAM.
ANNUNCIATOR SIGNAL.

No. 527,839.

Patented Oct. 23, 1894.



Attest.
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UNITED STATES PATENT OFFICE.

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ANNUNCIATOR-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 527,839, dated October 23, 1894.

Application filed February 23, 1894. Serial No. 501,216. (No model.)

To all whom it may concern:

Be it known that I, ISAIAH H. FARNHAM, residing at Wellesley, in the county of Norfolk and State of Massachusetts, have invented certain Improvements in Auxiliary Telephone-Signals, of which the following is a specification.

The invention I am about to describe is designed for use in connection with telephone central station switchboards, and has in fact been already found useful in such association for purposes to be hereinafter stated.

In the construction of certain desirable forms of switchboard, especially large ones of the multiple type, the major portion of the face of the board is occupied by the springjack apertures or plug sockets, it being desirable that as great a number of such sockets as possible shall be placed within reach of the operators.

In switchboards of recent design, the act of inserting the plug connector in its socket is by suitable arrangements enabled to close a local circuit whereby the call annunciator having displayed its signal is automatically restored to its potential condition, or in other words is reset without any special act of the operator. When self-setting annunciators are thus employed, it is evident that it is no longer necessary that the call annunciators shall be within easy reach of the operator, and as switchboards are now preferably constructed, the annunciators are placed in an elevated position above the plug sockets, thus allowing a greater space within which plug sockets may be disposed than has heretofore been feasible; and as a consequence enabling a greater number of sockets than hitherto had been possible to be massed within reach of the operator; but the call annunciators so elevated, are in a position somewhat above the operator's natural or normal plane of vision, and together with the circumstance that the annunciators used on modern switchboards such as that which has become known as the "branch terminal switchboard," make no sound when they operate to indicate the call signal, occasions a liability on the part of the operator to overlook and disregard the incoming substation calls as the annunciators fall and causes delay in responding to

such call signals; or else necessitates painfully close observation by the operator in an uncomfortable and constrained position.

My invention has for its object to obviate this fault without changing the otherwise advantageous position of the annunciator drops; and to enable such annunciators as have given their call signal to notify the operator of such fact if they are not answered promptly, so that the fixed attention of the operator shall no longer be essential.

In pursuance of this object my invention comprises the association with the telephone switchboard and its concomitant call annunciators of means actuated by the operation of the said annunciators for notifying the operator when any call remains unanswered, or has not received prompt attention; and for repeating such notification at suitable intervals until the said call is duly responded to, and until the annunciator giving such call has been reset.

It also consists in combining with a system of call receiving annunciators, an intermittent auxiliary audible or visible signal, and an electrical circuit containing the latter and operated by the former. In combining a telephone switchboard and its associated call annunciators with an auxiliary audible or visible signal common to a number of such annunciators, a local signaling circuit normally discontinuous at one point and periodically broken and closed at another, containing the said auxiliary signal and circuit closers therefor controlling the said normally open point, actuated by the call annunciators respectively, whereby the said auxiliary signal is caused to become intermittently operative, and to direct attention to any call signal received by means of the said call annunciators which is not promptly answered; also in certain other specific combinations hereinafter more fully described, and more definitely indicated in the several claims hereof.

I arrange an auxiliary audible or visible signal device such as a sounder, "ticker," or glow lamp, in connection with a battery or other generator, having in circuit an intermittent contact attached to a pendulum or like vibratory device which closes the circuit at every oscillation, and I connect this appa-

ratus with the annunciator drops in such a manner that the circuit through the said signal device is normally open or discontinuous, but will be closed upon the falling of an annunciator shutter or other operation of an annunciator, through and by means of the usual local or "night alarm" contacts, or circuit closing points. A separate sounder is preferably provided for the annunciators of each group, the several groups being assigned each to a separate operator, and all the sounders may receive current from a common source, used in association with a single pendulum, or other suitable form of circuit interrupter.

I prefer the audible signal, as by its employment a clear sharp signal is produced, occurring at intervals of sufficient frequency to certainly attract the operators' attention, and yet not so often as to be confusing. It is better than ordinary forms of visible indicator as it does not necessitate the fixed gaze of the operator upon the point where the signal is placed. The operator on the contrary is free to change her line of vision from one part of the switchboard to another, in the manner which naturally occurs in making connections; and at the same time she is always in readiness to be notified in case an annunciator operates. The auxiliary signal whether audible or visible may be operated directly by the interrupting circuit changer, or through the intermediation of a relay which as hereinafter mentioned is generally preferable.

Referring to the drawings which accompany and illustrate this specification:—Figures 1 and 2 show respectively, front and side elevations of the form of sounder preferred for the auxiliary audible signal device; and Fig. 3 is a detail thereof showing the attachment and indicating the mode of operation of its armature. Fig. 4 is a diagram of the local auxiliary circuit through the sounder of one group of annunciators, and is illustrative of the method of actuating the auxiliary signal by the operation of the call annunciator. Fig. 5 is a diagram of the arrangement complete including the pendulum interrupter; and Fig. 6 shows one way of operating the said pendulum.

The sounder which I have found well adapted for use with my invention if an audible signal be employed, is as previously stated shown in Figs. 1, 2, and 3, of the drawings.

As a complete appliance the sounder is indicated by S and has two spools or helices *s*, having cores *c*, to which are screwed or otherwise secured supporting pins *d* which project through holes drilled in the armature *a*, and are provided with enlarged heads *d*³ on which (while the electro-magnet remains unexcited) the said armature rests within the field of force of the magnet. The armature is thus held in front of the magnet poles and has no retracting or adjusting spring, being retained in its normal position or retracted thereto by the force of gravity. The supporting pins

are of course made of non-magnetic metal, and are tapered as shown in Fig. 3 at *d*², in such manner as to absolutely prevent friction on the upward movement of the armature; and the entire appliance is small and compact and designed to be placed either on the rear or front of one of the blank switchboard panels in front of the operator.

The sounders are so placed, and the sound they give is so modulated, that the operators of each section hear or notice the sound produced by that appliance only which is assigned to their own section.

In Fig. 4, A represents the call annunciators of a group, connected respectively with telephone circuits L. S is the auxiliary signaling sounder; Z, a switch, normally placed on the contact *z*; B, a night alarm bell which may be made operative on the reception of a signal by any of the annunciators of a group by turning the switch Z from the position *z*, and R is a relay in a circuit H in which may be a source of current and a periodic interrupter, the said relay controlling the auxiliary signal circuit through the sounder S. The auxiliary signal circuit 20, may be traced from the generator G by conductor 4 to the armature *r* of relay R, front contact stop *r*², conductor 5, conductor 8, junctions *j* and branches 12 to the circuit closers *f*, (one for each call annunciator) which each consists of normally separated contacts adapted to be united on the reception of a call signal by the said annunciators respectively, as manifested by the release of the armature *a*² and the consequent display of the shutter signal *e*. These circuit closers may each consist as shown of a fixed contact point 3, and an insulated spring contact 2. As drawn, the branch conductors 12 are attached to the spring member of the circuit closers *f*. The fixed members 3 of such circuit closers connect by other branch conductors 13 and junctions *j*² with conductor 6, which continues the circuit to the auxiliary signal S, and from thence by way of conductor 7 to junction *j*³ switch Z, point *z*, branch Z², and conductor 9 to the generator. The circuit closers for the several annunciators of a group are thus placed in normally discontinuous parallel branches of the auxiliary signaling circuit, so that they all have the like function of closing the said circuit.

The alarm bell B is ordinarily switched out of circuit as shown. It is for the purpose of giving an alarm in case of a call in the night when there are but few wires on duty. It is arranged in connection with the local circuit in such manner that when switched in by turning the switch Z it will be operated whenever any of the annunciators displays its signal.

It is evident from what has been stated that the auxiliary circuit 20 is normally discontinuous, being broken at all of the annunciator circuits connected therewith; and is likewise periodically interrupted or inter-

mitted by the relay at r^2 , this last being controlled by a pendulum or other periodic circuit controlling device. The periodic interruptions have of course no effect upon the circuit 20, or upon the sounder S contained therein, as long as none of the annunciators A operate, or if after they indicate a call, such call is promptly answered, and the shutter is thereby promptly restored; but if such a call should remain unobserved or be neglected for but a brief space of time, the auxiliary circuit being thus closed between the points 2 and 3, the sounder S will be enabled to respond to the periodic action of the relay, or of the pendulum direct as the case may be, and will by the corresponding motions of its armature produce a series of soft rhythmic ticks, continuing to repeat the same with every beat of the pendulum or master circuit interrupter, until the call is answered, and the annunciator reset.

In the more complete development of the apparatus indicated in Fig. 5, the arrangement of the auxiliary circuit conductors is slightly modified although the effect is the same; the same generator being however used for both relay and auxiliary signals. This diagram illustrates the application of the invention to one central station, showing for clearness but two switchboard sections or operators' tables $E E^2$, in which the annunciators A are indicated by circles. The pendulum P is kept swinging at all times, either by means of a clock movement in a manner well understood, or through the aid of electro-magnets, and periodically makes and breaks the contact 23 between the mercury cup m , and the dipping point m^2 . Each time the point m^2 dips in the mercury the circuit H of the generator G is established through the relay R, and each time the said point breaks such contact, the said circuit is disestablished. Hence for each swing of the pendulum, the relay armature r is once attracted and retracted, making and breaking the contact with its front stop r^2 , which operation produces periodic interruptions and completions of the auxiliary signaling circuit 20. The relay circuit is traceable from one pole to the other of the generator G, as follows: conductor 4, relay R, conductor 14, mercury cup m , dipping point m^2 , pendulum rod p , conductor 13, resistance I, conductor 10, and conductor q .

The resistance coil I is used for the purpose of reducing the amount of current in the relay circuit, for since in this instance the auxiliary signals are operated by the same battery, it is desirable that as little current as possible be used to work the relay.

Experience has shown that generally it is preferable in practice to operate the signals by means of the relay, although it is evident that if in any individual case it becomes desirable to dispense with the relay R and circuit H, this can be done by placing the initial interrupter 23 operated by the pendulum or

otherwise, directly in the signaling circuit 20. I will now trace the said signaling circuit. As shown, starting from the right hand end of the generator G, it follows wire 4, to relay contact r^2 . This contact being supposed to be closed, it passes to armature r , wire 6, wires 7 to the auxiliary signals S^2 and S^3 (shown in the present instance as the operator's receiving telephone), and a glow lamp, either of which may be so substituted for the sounder S (which however I prefer) thence to the local normally open drop circuit closers of the several annunciators, as shown in Fig. 4, and one of these circuit closers being closed, it passes to wire 12, thence to wire 8, junction j , and wire 5 to a second junction point j^3 , where two paths present themselves, one through the night bell B, and the other through the switch Z. The switch however being on point z we may disregard the bell which is thereby cut out, and the signaling circuit continues through the switch and by wire to the left hand generator pole where it is completed.

In Fig. 6 is illustrated a mode of electromagnetically actuating the pendulum, and its interrupting device. The pendulum P is suspended at k , and its rod p is forked at its upper end as shown at p^2 and p^3 . Attached to the pendulum at a point v just above the point of suspension is an arm V provided at its upper extremity with a weight W. This arm is not firmly fastened to the pendulum rod, but is held by the screw v in such a manner as to move rather sluggishly on its bearing. Two armatures r^3 are mounted on the rod in a position facing two electro-magnets M and M^2 . The operation of this device is as follows: As the pendulum swings the position of arm V is changed, so that it rests first on one arm of the fork and then on the other, remaining in a fixed position after each change until the oscillation of the pendulum brings the weight out of center. Contact points 15 are provided on the arms of the fork where they meet the movable arm V as it changes from one side to the other. These points, as well as the arm V are electrically insulated from the pendulum rod, and wires, 31 and 33 are attached to them which form a part of the circuit through the magnet coils; there being a complementary contact 16 carried by the arm V which engages with the points 15 respectively. It is evident that when the pendulum swings to the left, the contact 16 will rest on the right hand contact 15, thus closing the circuit through magnet M by way of point 15, wire 31, magnet M, wire 32 point x , wire 35, battery G^2 , wire 30, arm V, and its contact point 16. The magnet M being thereby excited acts upon its armature r^3 , and gives the pendulum a return impulse. The return movement of the pendulum changes the position of the arm to its other contact which excites in turn the left hand magnet at the proper moment, through the conductors 30, 35, 34 and 33 and draws the

pendulum again to the left. It is thus kept in oscillation as long as current is supplied by the generator G^2 . The wires 13 and 14 connect with the dipping point m^2 and mercury cup m for opening and closing the circuit through the relay or sounders. It must be understood that this electrically operated pendulum though a convenient adjunct to the signaling system, is not essential thereto. It is not necessary to have a pendulum of any kind, since it is obvious that a rotating commutator or circuit changer may be employed instead to produce the periodical opening and closing of the sounder circuits.

Having thus fully described my invention, its mode of operation and purposes, I claim—

1. The combination of an annunciator in a main circuit; a circuit closer actuated by the operation of said annunciator; an auxiliary signaling circuit including the said circuit closer, and arranged to be closed by the operation thereof; a periodic interrupter for the said auxiliary circuit, making and breaking the continuity thereof at intervals independent of the said circuit closer; and an auxiliary signal device included in the said auxiliary circuit and organized to respond to the concurrent action of the said interrupter and the said circuit closer on the said auxiliary circuit, and to give intermittent signals at suitable successive periods.

2. The combination of a series of line annunciators; a series of circuit closers for the said annunciators adapted to be actuated by the operation thereof; an auxiliary circuit in which the said circuit closers are arranged in parallel so that the operation of either of them will close it; an automatic periodic interrupter for the said auxiliary circuit, making and breaking the continuity thereof independent of said circuit closers; and an auxiliary audible signaling device common to the said series of annunciators arranged in the said auxiliary circuit and made operative by the concurrent action of the said interrupter and any one of the circuit closers, substantially as described.

3. The combination with a telephone switchboard, and call annunciators connected with the substation circuits centering at such switchboard; of a single auxiliary signal device located at such switchboard and placed in an independent circuit; circuit closers for the said circuit, one controlled by each annunciator; and a periodic interrupter for said circuit, adapted to periodically close and open the same, whereby the said auxiliary signal device may be operated on the reception of a call by any annunciator, and may repeat its signal at periodic intervals until the said call is answered; substantially as specified.

4. The combination of a system or series of call receiving telephone circuit annunciators; with an auxiliary electrical circuit; a periodic

interrupter therefor; a series of circuit closers therefor, one for each annunciator, and each actuated by the operation of its associated annunciator to close its circuit; and an auxiliary signal device included in said auxiliary circuit, and requiring for its operation the concurrent action of the said periodic interrupter and some one of the circuit closers.

5. In a telephone system a switchboard or table, and a group of call annunciators associated therewith; combined with an auxiliary audible or visible signal common to a number of such annunciators; a local signaling circuit normally discontinuous at one point, and periodically broken and closed at another containing the said auxiliary signal; and circuit closers therefor controlling the said normally open point, actuated by the call annunciators respectively whereby the said auxiliary signal is caused to become intermittently operative and to direct attention to a call signal received by any of the said annunciators and remaining unanswered, substantially as described.

6. An apparatus for reporting or indicating the unobserved operation of a telephone call annunciator, comprising an auxiliary signaling circuit normally open; a series of circuit closers therefor, each associated with a separate annunciator and actuated by the operation thereof to close said circuit; a sounder included in said circuit; and a periodic interrupting device for said circuit, breaking and closing the same at regular intervals, whereby the said sounder is caused to produce a regular succession of sounds when an incoming call is neglected, substantially as specified.

7. An apparatus for reporting or indicating the unobserved operation of a telephone call annunciator comprising an auxiliary normally discontinuous signaling circuit; a sounder included in such circuit; a series of circuit closers for the said circuit each associated with a separate call annunciator and actuated by the operation thereof to close the said circuit; a relay having its operative contacts included in the said auxiliary signaling circuit, and its helices in an independent circuit; and a periodic interrupter in said independent circuit acting through said relay to make and break the said auxiliary signaling circuit at regular intervals, substantially as and for the purposes specified.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 20th day of February, 1894.

ISAIAH H. FARNHAM.

Witnesses:

GEO. WILLIS PIERCE,
FRANK C. LOCKWOOD.