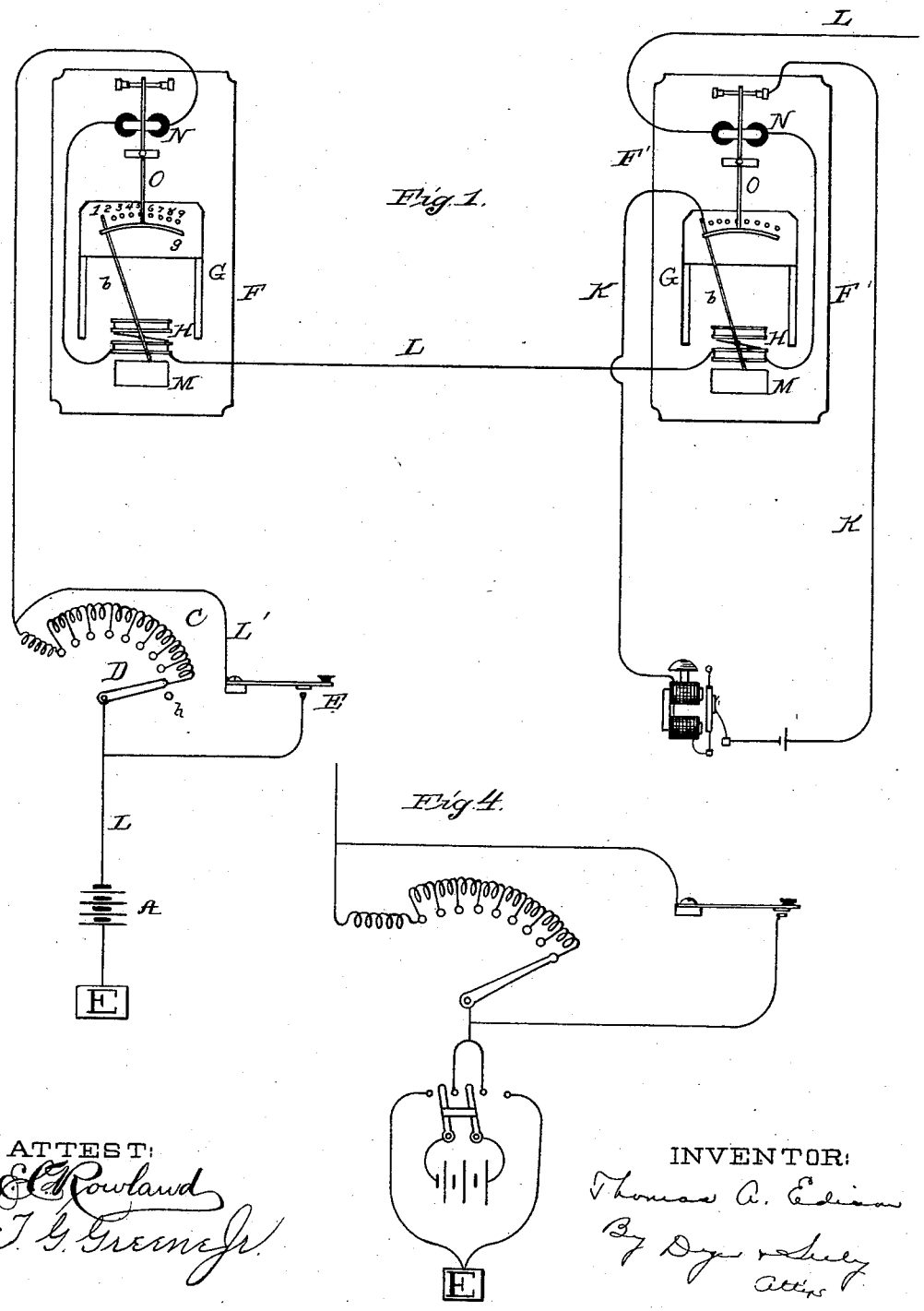
(No Model.) 2 Sheets—Sheet 1.

# T. A. EDISON.

## ELECTRICAL SIGNALING APPARATUS.

No. 347,097. Patented Aug. 10, 1886.

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INVENTOR:

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(No Model.) 2 Sheets—Sheet 2.

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## ELECTRICAL SIGNALING APPARATUS.

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Fig 2.

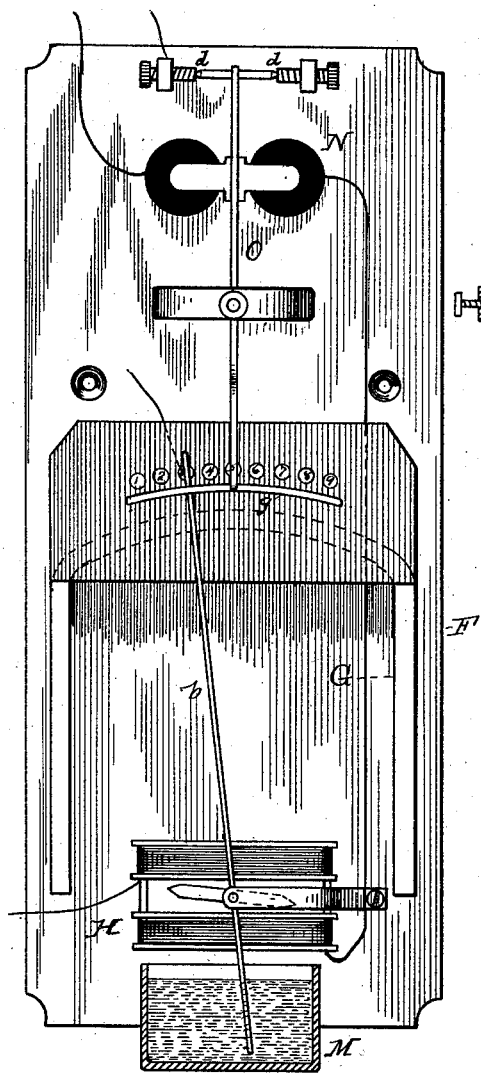
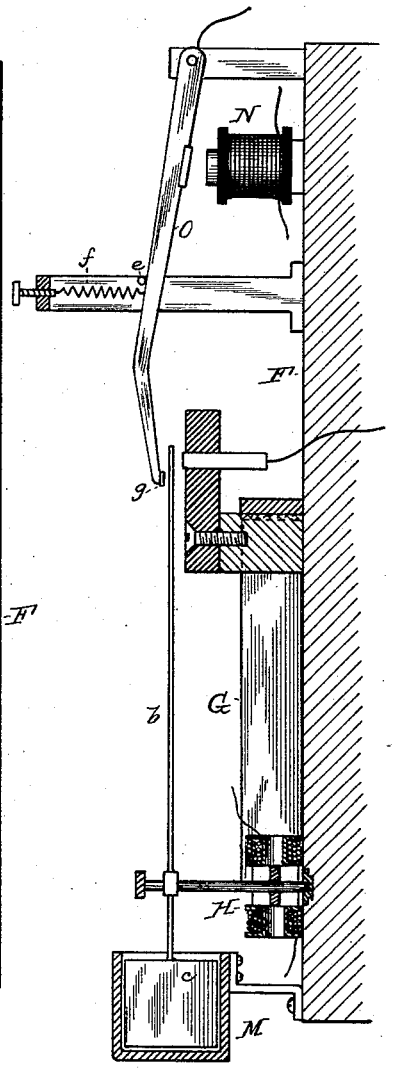



Fig 3.

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# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF MENLO PARK, NEW JERSEY.

## ELECTRICAL SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 347,097, dated August 10, 1886.

Application filed January 12, 1885. Serial No. 152,621. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, have invented a new and useful Improvement in Electrical Signaling Apparatus, (Case No. 640,) of which the following is a specification.

My invention relates to apparatus by means of which signals of any character may be communicated from a central office or other place to any one of a number of receiving or indicating instruments on the same line without affecting any of the other instruments.

In carrying out my invention I provide at each point to which the signals are to be communicated a circuit-closing device in the main line, which controls a local circuit in which a local battery and a suitable audible or visual indicator is placed. All the circuit-controllers in the line are affected by a current from the signaling station to the same extent; but the local circuits are all differently arranged relatively to said circuit-closers, so that one current is required to cause the closing of one local circuit and a different amount of current to cause the closing of each of the others.

The apparatus which I prefer to use for controlling a local circuit consists of a galvanometer whose needle plays in front of a series of contacts and whose coils are in the line. The local circuit, including the signal-indicator, extends from one of the contacts of the series and includes also the pivoted armature of an electro-magnet whose coils are in the line, and this armature carries a contact arc or blade so situated and of such length that it is always in position to come in contact with the galvanometer-needle if it is attracted by its magnet. Normally, however, it is held back from such contact by a strong spring. At the signaling station apparatus, preferably an adjustable resistance is provided for sending a variable current upon the line. A certain current being sent, all the galvanometer-needles of the system are moved opposite the same contact of each of the series of local-circuit contacts—namely, opposite that contact to which the local circuit of the particular station to which the signal is to be communicated is connected. A stronger current is then sent over the line by short-circuiting the whole resistance, or in any other suitable manner, sufficient to cause all the main-line magnets to attract their armatures, which then strike all the galvanometer-needles and bring them all against the opposite contacts, thus closing through the armature-lever and the end of the galvanometer-needle the desired local circuit, and no other. This mode of closing a circuit through a galvanometer-needle by making contact at the end of it, instead of having a permanent connection to its pivot, is an important feature of my invention, because it does not interfere with the adjustment and delicate operation of the instrument, as such connections have done as have heretofore been used, and because it allows of the transmission of a heavier current than such former connections. Any suitable answer-back device may be provided by which the local operators or subscribers may communicate with the signaling station.

My invention may be more readily understood by reference to the accompanying drawings, in which Figure 1 is a diagram of a signaling system embodying my invention; Fig. 2, an elevation of one of the main-line-circuit controllers; Fig. 3, a vertical section of the same, and Fig. 4 a diagram of the arrangements at the signaling station for a modification of the invention.

A is the line-battery at the signaling station.

L is the main line.

C is a series of resistance-coils, having a pivoted arm, D, for throwing more or less of them into circuit. A shunt, L′, is made around the resistance C, provided with a circuit-controlling key, E.

F F′ are the line-instruments which control the local circuits. At F, however, no local circuit is shown, this being intended as an instrument by which the signaling operator at the station may determine the condition of the other instruments. As many instruments F′ may be placed on the line as desired.

Each of said instruments is constructed and arranged as follows: G is the permanent magnet of a galvanometer, and H H are the coils thereof included in the main circuit L. The pivoted needle *a* carries the pointer or index arm *b*. Arm *b* plays in front of a series of contacts, 1 2 3, &c., arranged upon an insulating-piece, I, carried by magnet G. As shown, these contacts pass through piece I, and the

connections to them are made at the other side. At each instrument a local circuit, K, extends from one of the contacts 1 2, &c. At instrument No. 1, for instance, this local circuit extends from contact 1, and at instrument No. 2 from contact 2, and so on, there being as many contacts preferably at each instrument as there are instruments in the line. Instead of this, each instrument may have only one contact, all the contacts being placed in different positions relative to the arm *b*. It is preferred, however, to make all the instruments alike, and in installing the system to connect the local circuit of each to the proper contact. Each arm *b* carries at its lower end a fan-blade, *c*, moving in a vessel, M, containing a liquid, for retarding the movement of the arm, or any other suitable retarding device may be employed instead.

N is an electro-magnet whose coils are in the line. It has an armature-lever, O, pivoted at *d d* and normally held away from the magnet against a stop, *e*, by an adjustable retracting-spring, *f*. At its free end lever O carries a curved metal bar, *g*, which hangs outside and away from the index-arm *b*. Lever O is preferably of the bent form shown, so that its free end is brought near the index-arm. The other terminal of the local circuit K is brought to the lever O.

The operation of these devices is as follows, referring to Fig. 1 especially: The operator at the signaling station desires to signal the subscriber No. 1, whose instrument is at F. He moves lever D away from the stop *h*—the circuit having previously been open—and closes the circuit, as shown, through the whole resistance C. The galvanometer-needles and index-arms are so arranged that when no current is passing in the coils the index-arm is thrown off to one side of the series of numbered contacts. The current which passes when the whole resistance C is in circuit is sufficient to move the needle so as to bring each of the index-arms of the system opposite contact 1 of its instrument, and they will all remain in that position so long as that current is passing. The operator, however, now immediately closes the key E, which short-circuits the whole resistance C, and throws such a current upon the line as to cause the magnets N to move their armatures, the retracting-springs *f* of the armatures being of such strength as to hold the armatures against the attraction due to any current which can flow when any part of resistance C is in circuit. The contact-bars *g*, carried by the armature-levers, are all thus brought against the index-arms *b*, and these being long and flexible are pressed down against contacts 1. This evidently has no effect except at the proper instrument in which the local circuit is connected to contact 1. Here such local circuit is closed, and local battery rings the bell P, or any other indicating or signaling device placed in such local circuit is affected. The fan *c* or other retarding device prevents the needle from moving quickly away from the contact when the resistance C is short-circuited, retaining it in front of the contact until the armature-lever forces it against the same. To affect any other instrument, the arm D is moved to another division of the resistance C, so that current enough will flow to move the index-arms opposite the right contacts. By means of the instrument F, placed at the station, which is affected simultaneously with the other instruments, the operator can see when the index-arms have reached the right positions. Such instrument may, however, be dispensed with, the resistance-contacts being graduated to correspond with the local-circuit contacts, so that the operator can tell where the index-arms are by the position of the resistance-arms. The galvanometers may be arranged so that their arms will stand normally at the middle of the scale, and will move one way for a current of one polarity and the other way for an opposite current. The arrangement at the signaling station in this case is that shown in Fig. 4. A circuit-reverser, R, is connected with the battery, and the whole of the resistance C is normally in the line, the current then given to the line being such as to maintain all the galvanometer-arms at the middle position on the series of contacts. The current being in one direction, the galvanometer-arms move over the contacts on one side of it a distance determined by the amount of resistance C in circuit, as before. On reversing the current at R the arms will move in the other direction from the center over the contacts on that side according to the amount of resistance as before. The operation of the magnet N is the same as above described.

It is evident that any number of lines each having a suitable number of signaling devices may extend from the same signaling station.

What I claim is—

1. In a circuit-controller, the combination of two contacts, a galvanometer-arm adapted to enter between said contacts, and means for forcing the contacts together upon said arm, substantially as set forth.

2. In a circuit-controller, the combination of a series of contacts, a galvanometer-arm playing in front of said contacts, and a movable contact adapted to force said galvanometer-arm against such contact of the series as it may stand opposite, substantially as set forth.

3. In an electrically-controlled circuit-closer, the combination of a series of contacts, a galvanometer in the controlling-circuit whose arm plays in front of said contacts, an electro-magnet in the controlling-circuit, and a movable armature therefor, carrying a contact adapted when the magnet is energized to force the galvanometer-arm against such contact of the series as it may stand opposite, said magnet being adapted to move its armature only with a stronger current than that which affects the galvanometer, substantially as set forth.

4. In electrical signaling apparatus, the combination of a galvanometer in the main

line whose arm plays before a contact of the local signaling-circuit, the signaling-circuit including a pivoted armature-lever carrying the other local-circuit contact situated before said galvanometer-arm, an electro-magnet controlling said armature-lever, means at the signaling station for affecting said galvanometer-arm, and means also at the signaling station for energizing said electro-magnet, substantially as set forth.

5. In an electrical signaling apparatus, the combination of two or more main-line instruments, each comprising a galvanometer whose arm moves before a local-circuit contact, all said contacts being situated differently relative to said arms, and an electro-magnet also in the main line, having an armature-lever carrying a local-circuit contact situated before said galvanometer-arm, said magnet being adapted to move its armature only on a stronger current than that which affects the galvanometer with an adjustable resistance at the signaling station, and a shunt around said resistance provided with a circuit-controller, substantially as set forth.

This specification signed and witnessed this 19th day of December, 1884.

THOS. A. EDISON.

Witnesses:
WM. H. MEADOWCROFT,
T. G. GREENE, Jr.