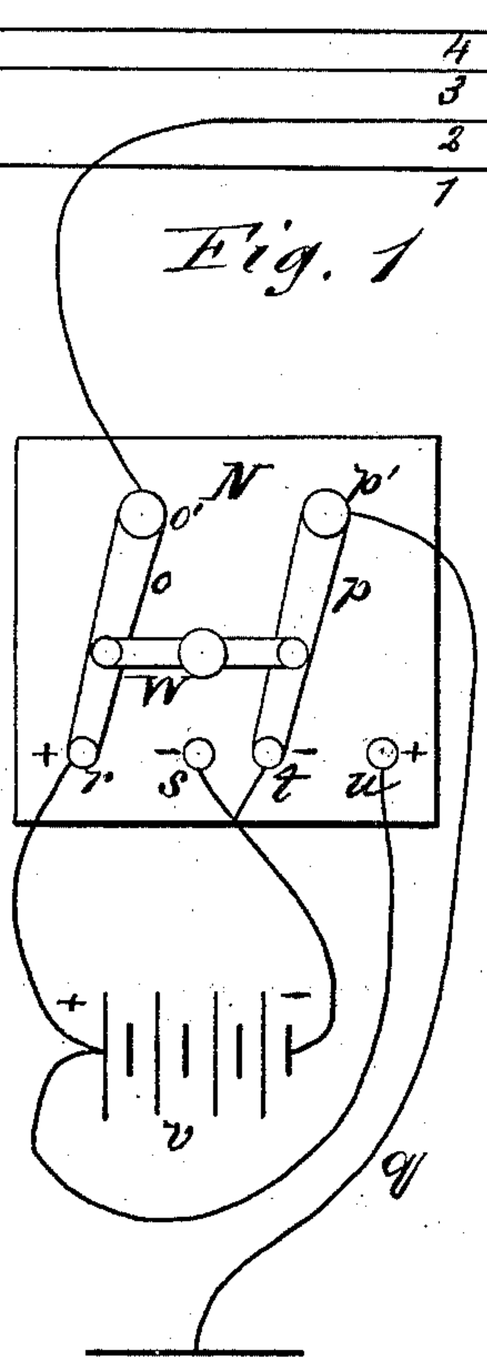
(No Model.)

G. M. HOPKINS.

TELEPHONE CENTRAL OFFICE SYSTEM.

No. 257,331. Patented May 2, 1882.

Fig. 1



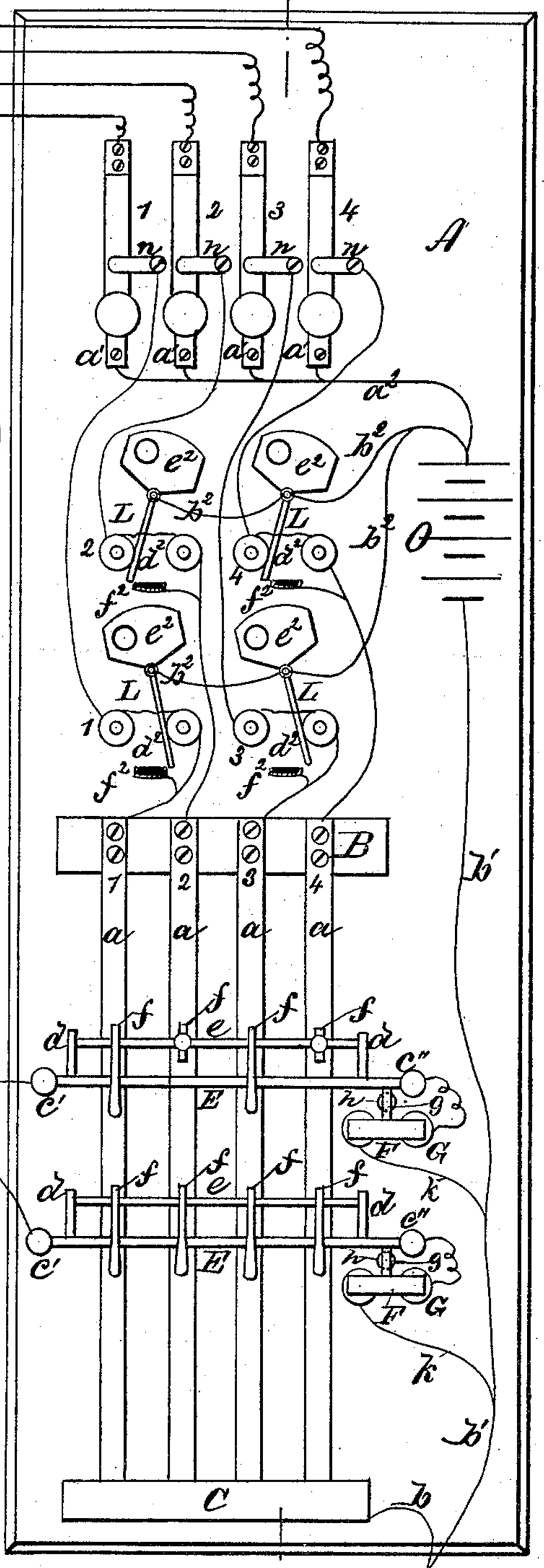
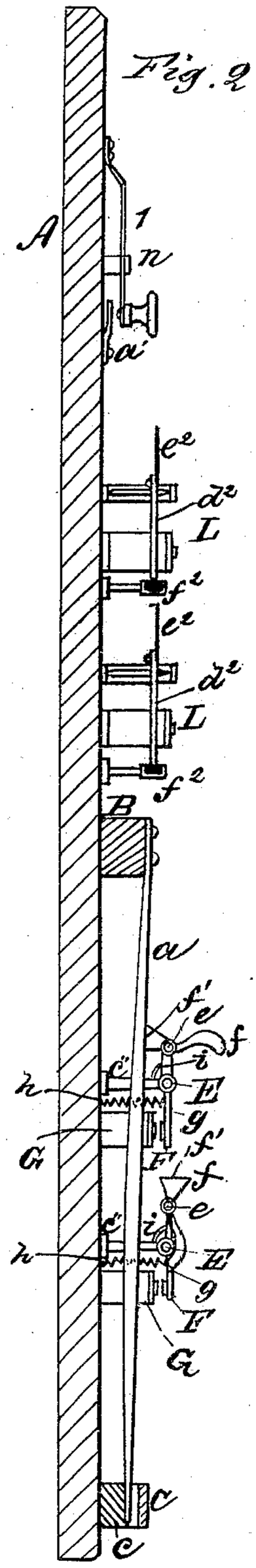


Fig. 2



WITNESSES:

C. Sedgwick

E. Sedgwick

INVENTOR:

Geo M. Hopkins

BY Munn & Co

ATTORNEYS.

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

GEORGE M. HOPKINS, OF NEW YORK, N. Y.

TELEPHONE CENTRAL-OFFICE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 257,331, dated May 2, 1882.

Application filed February 16, 1882. (No model.)

To all whom it may concern:

Be it known that I, GEORGE M. HOPKINS, of the city of New York, in the county of New York and State of New York, have invented a new and Improved Telephonic Central-Office System, of which the following is a full, clear, and exact description.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in both the figures.

Figure 1 is a front elevation of a central-office switch-board and a subscriber's switch and battery, forming a part of my improved central-office system. Fig. 2 is a vertical section taken on line *x x* in Fig. 1.

My improvement relates to switch-boards for connecting two or more line-wires at a central telephone-office, and for signaling subscribers or users, and for ascertaining their wishes through the central-office telephone.

The improvement consists in movable spring switch-bars combined with movable transverse rods having cam-levers for establishing a connection between two or more of the switch-bars and at the same time removing the switch-bars from the ground-connection.

It also consists in a system of central-office combined polarized annunciators and relays for operating local circuits, so as to move the transverse bars carrying cam-levers to disengage the cam-levers and place the switch-board in its normal condition.

It also consists in an arrangement of subscriber's switch and circuit, whereby the subscriber may send either a positive or negative current over the line and through the polarized annunciator and relay, so as to call the attendant at the central office or operate the local circuit of the central office so as to return the switch-board to its normal condition.

The object of my invention is to relieve the attendant of the central-office switch-board from the necessity of replacing or removing any of the parts of the switch-board or connections after having connected the lines of two subscribers, and to insure the return of the switch-board to its normal condition after the subscribers have done using the lines. All of the parts of the central-office switch-board are by preference secured to a single board or back piece, A, which is supported securely in a vertical position.

Across the board, near the middle, there is a strip, B, of non-conducting material, to which are secured the vertical brass spring-bars *a a*, any desired number of which may be used. These bars *a* extend downward, and their lower ends are covered by a metal plate, C, which is connected with the ground D by wires *b b'*.

Between the plate C and board A, and behind the lower ends of the bars *a*, there is a block, *c*, of non-conducting material, to limit the rearward movement of the bars *a*. One or more horizontal rock-shafts, E, extend across the face of the bars *a* a short distance from them, and are journaled in posts *c' c''*, projecting from the board A. Each shaft E carries two studs, *d*, which support a rod, *e*, parallel with the shaft E and in about the same plane. The rod *e* supports as many cam-levers *f* as there are vertical bars *a* in the switch-board. The cam-levers *f* have flat faces *f'*, which enable them to maintain a horizontal position when the flat faces are brought into contact with the bars *a*, and the handles of the levers are sufficiently heavy to disengage the levers *f* and bring them into a vertical position whenever their flat faces are removed from the bars *a* by the means presently to be described.

To an arm, *g*, projecting from the rock-shaft E, is attached an armature, F, which is within the influence of the electro-magnet G, secured to the base-piece A. The arm *g* is pressed outward in opposition to the attractive force of the magnet G by a spring, *h*, and the motion of the rock-shaft is limited by the stop *i*, projecting from the post *c''*. One terminal of the magnet G is connected by a wire, *k*, with the ground-wire *b'*. The other terminal of the magnet G is connected with the post *c''*. The posts *c'* on the opposite ends of the shafts E are all connected with the secondary wire of the attendant's transmitting and receiving instrument, the latter consisting of the transmitter H, battery I, and primary wire of the induction-coil J in the primary circuit and the secondary wire of the induction-coil J and receiving-telephone *k* in the secondary circuit. The receiving-telephone is grounded through the wire *l*.

Between each post *c'* and the secondary wire of the induction-coil J there is a resistance-coil,

m, which prevents the local-battery current from passing from one shaft E to another. The resistance-coils *m* obstruct the flow of the current from the posts *c'*, so that only a very small portion of the local-battery current can flow from one rock-shaft E to another when the current is sent to the magnet G through one of the shafts E and its connections by the operation of one of the subscribers' annunciator-relays.

Upon the upper part of the board A there are as many polarized annunciators L as there are bars *a* in the series, one annunciator being connected electrically with each bar *a*.

Above the polarized annunciators there is a series of double-contact signaling-keys, 1 2 3 4, one key for each annunciator and bar. Each annunciator-magnet is connected electrically with the top contact, *n*, of one of the signaling-keys, 1, 2, &c. The normal position of the spring of the key is in contact with the top contact, *n*. The springs 1 2 3 4 are connected respectively with the line-wires 1 2 3 4, which extend to the subscribers' instruments, each of which is provided with a double switch, N, like that connected with the wire 2. This switch consists of two arms, *o p*, movable on the pivots *o' p'*, the pivot *o'* being connected with the line-wire 2, the pivot *p'* being connected with the ground-wire *q*. There are four points of contact, *r s t u*, on the switch, which are connected with the battery *v*, so that the points *r u* communicate electrically with one pole of the battery, while the points *s t* are connected with the opposite pole of the battery. The two switch-arms are connected together by a bar, *w*, of insulating material, so that they may both be moved together.

The lower contact, *a'*, of each signaling-key is connected with a wire, a^2, leading to the main battery O, which is grounded through the wire *b'*, so that the subscriber's bell may be rung at any time by depressing the key corresponding with his line. In order to trace each line and its connections I have placed on the lines the signaling-keys, the annunciators, and the spring switch-bars the numbers 1, 2, 3, and 4, in addition to the letters of reference, the same numbers belonging to the same line in the various parts of the switch-board.

The battery O is connected with the pivot of the armature of each annunciator L by a wire, b^2. The polarized annunciators used in this connection are of the well-known type in which the magnetized bar d^2 carries an indicator-card, e^2, and is pivoted above the middle of the space between the two poles of the annunciator-magnet, so that it may be attracted by one pole and repelled by the other, its movement depending upon the direction of the current.

Below each bar d^2, and in a central position relative to the annunciator-magnet, there is a small cup, f^2, containing a drop of mercury, whose convex surface may be touched by the end of the bar d^2 in its excursions from one pole of the electro-magnet to the other. The mercury-cups are connected electrically with the spring switch-bars *a*. The normal position of the annunciators is shown by the two lower ones in the drawings.

The operation of the device is as follows: The subscriber at the switch N moves the switch-arms so that the arm *o* touches the point *r* and the arm *p* touches the point *t*, sending a positive current over the line 2 to the key 2 at the central office, thence through the annunciator-magnet 2, switch-bar *a*, 2, ground-plate C, to the ground D. The current returns to the subscriber's battery through the ground-wire *q*, switch-arm *p*, and point *t*, and wire connecting the latter with the battery. This results in tipping the bar d^2 of the annunciator 2, which attracts the attention of the attendant at the central office, who immediately raises the cam-lever *f* opposite the spring switch-bar *a*, 2, bringing the bar into electrical connection with the attendant's receiving-telephone K through the post *c'*, resistance-coil *m*, and secondary wire of the induction-coil J. The operation of raising the cam-lever *f* depresses the spring switch-bar *a* so that it breaks contact with the ground-plate C. The subscriber's line 2 is then grounded through the ground of the attendant's telephone K and ground-wire *l*. Subscriber 2 then makes known his want, which, for example, may be communication with subscriber 4. The attendant then depresses key 4, breaking connection with the annunciator and switch-board, and making connection with the lower contact, *a'*, of the key, sending a current from the battery O through the line 4, ringing the bell of subscriber 4, who answers by moving his switch so as to send a current through the annunciator 4, tipping its magnetized bar d^2, as shown in the drawings. The attendant then raises the lever *f*, making contact with the spring switch-bar a^4. The lines 2 and 4 are now connected and conversation may proceed between subscribers 2 and 4, and when done either of the subscribers moves his switch, bringing the switch-arms *o p* into contact with the points *s u*, thus sending a negative current over the line, which returns the annunciator-bar connected with that line to its normal position. The bar, in touching the mercury in the cup, completes a local circuit through the wires b^2, bar d^2, mercury-cup f^2, switch-bar *a*, 2, cam-lever *f*, bar *e*, stud *d*, shaft E, post *c''*, magnet G, and wires *k* and *b'*. The effect is to draw the armature F toward the magnet G, turning the shaft E, withdrawing the cam-levers *f* from the spring switch-bars *a*, when the latter regain their contact with the ground-plate C and the cam-levers swing into a vertical position. The several parts of the switch-board, so far as its relation to the line upon which the current has been reversed is concerned, are in their normal condition; but upon the other line the annunciator-bar d^2 remains unmoved until the subscriber connected with it reverses the current on his line, when the remaining annunciator

will be readjusted and the whole will be in condition for another signal.

It is obvious that some of the forms of polarized telegraphic relay may be substituted for the annunciators. Therefore I do not limit or confine myself to the use of the particular annunciator herein described.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a telephonic central-office switch-board, a series of spring-bars, a series of weighted cam-levers on a support movable by an electro-magnet, and a corresponding series of relays for controlling a local circuit for operating the said electro-magnet, constructed and combined substantially as herein specified.

2. In a telephonic central-office system, the combination of the bars *a*, cam-levers *f*, rock-shaft E, and magnet G, as herein specified.

3. The combination, in a central-office system, of two or more spring-bars, *a*, two or more weighted cam-levers, *f*, the rock-shaft E, carrying the rod *e*, the magnet G, and the annunciators L, adapted to control a local circuit, substantially as herein specified.

4. In a telephonic central-office switch-board, the polarized annunciators L and mercury-cups f^2, in combination with a local circuit, including the battery O, magnet G, spring switch-bars *a*, and cam-levers *f*, as herein specified.

5. In a telephonic central-office switch-board, the combination of the double-contact keys 1, 2, &c., annunciators L, bars *a*, and cam-levers *f*, substantially as specified.

6. In a telephonic central-office switch-board, a series of spring-bars, *a*, a series of cam-levers, *f*, and the ground-connecting plate C, in combination with a series of subscribers' lines, whereby one subscriber's line may be disconnected from the central-office ground and connected with another subscriber's line, substantially as specified.

7. The combination of the receiving-instrument K and transmitting-instrument H with the rock-shaft E, bars *a*, lines 1, 2, &c., and intermediate devices, substantially as herein specified.

GEO. M. HOPKINS.

Witnesses:
JAMES RICHARDSON,
C. SEDGWICK.