

(No Model.)

C. E. BUELL.
TELEPHONE SWITCH DEVICE.

No. 251,178.

Patented Dec. 20, 1881.

Fig. 1.

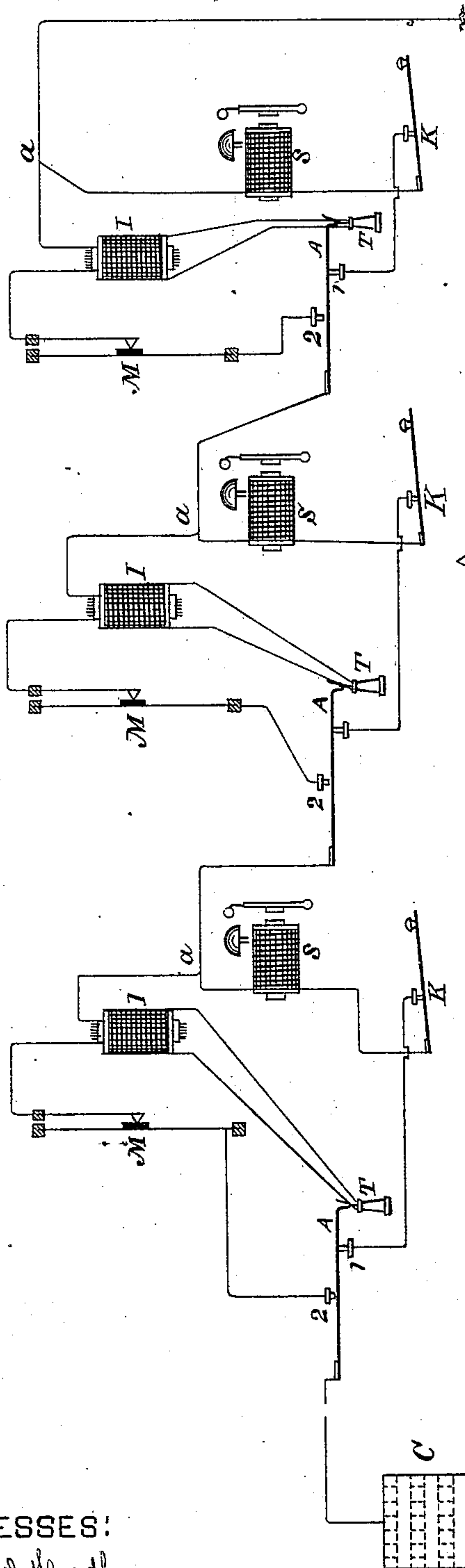
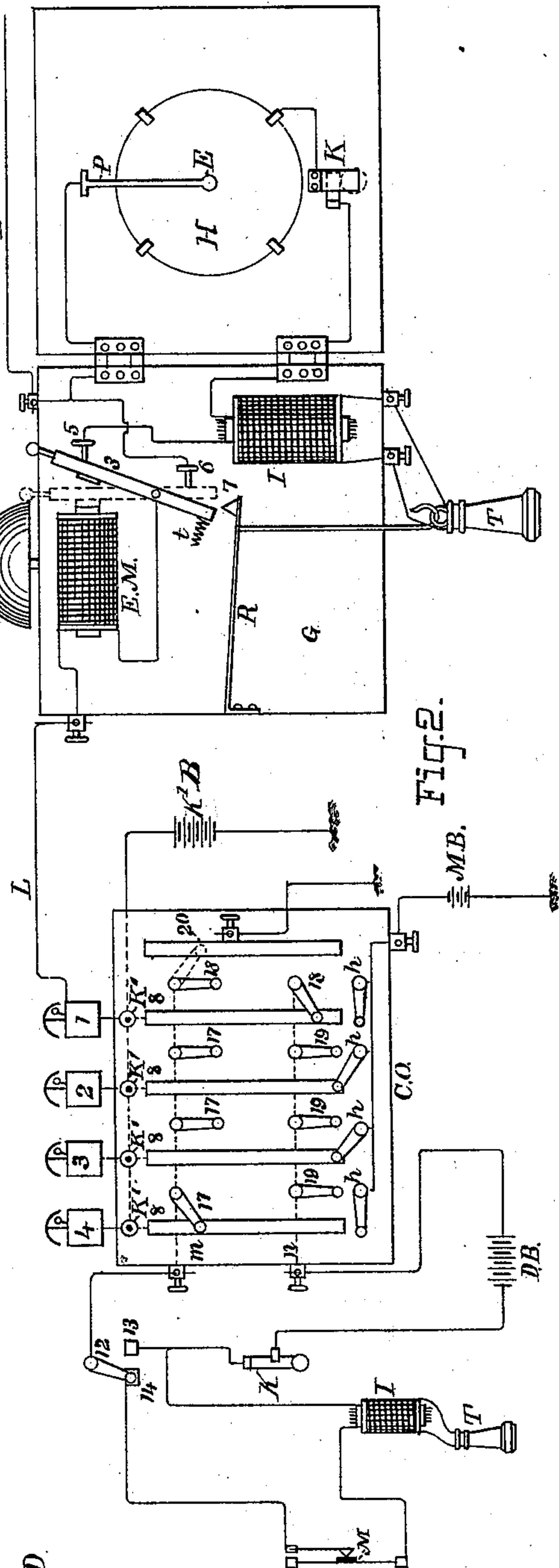


Fig. 2.



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TELEPHONE SWITCH DEVICE.

SPECIFICATION forming part of Letters Patent No. 251,178, dated December 20, 1881.

Application filed September 24, 1881. (No model.)

T, all whom it may concern:

Be it known that I, CHARLES E. BUELL, a citizen of the United States, residing at New Haven, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Telephone Switch Devices, of which the following is a specification.

In an application for patent filed by me March 22, 1881, No. 29,438, of which this present application is a division, I have described an invention the object of which is to simplify the construction and arrangement of apparatus at subscribers' stations of telephone-lines and to do away with the use of local batteries.

In carrying out that invention I have proposed to arrange at each subscriber's station an induction-coil whose primary coil may be connected to the line-circuit, to connect the receiving-telephone at each station in a local circuit with the secondary of said induction-coil, and for purposes of oral communication to place the contact-transmitters directly in the line-circuit, which is itself to be charged during oral communication between two points by a battery or generator at the central office, or at either or both of said points. I have also proposed to place at each station of a line arranged as above described a switch device electrically controlled from the central office, and provided with a spring or equivalent locking device controlled by the weight of the telephone, the whole so arranged that when the line is not in use at any station the removal of the telephone will automatically lock the transmitter and the primary of the induction-coil in circuit, while if the telephone is removed from its hook when the line is in use at other stations and properly charged by a battery at the central office the switch will be locked in position so that the circuit through the transmitter and induction-coil will be held broken, and the branch circuit completed by the movement of the switch when charged by the battery at the central office will be held closed.

My present application relates to the switch device last referred to, and also to the central-office switch apparatus employed in connection therewith and with telephone-lines whose subscribers' stations are provided with induction-coils and telephone-instruments connected to line and to one another according to the in-

vention which forms the subject of my prior application.

Figure 1 is a diagram illustrating one plan of arranging telephone apparatus according to the invention which forms the subject of my application before referred to. Fig. 2 shows the manner of applying the automatic switch which forms the subject of the present application, and shows also the central-office apparatus to be used with said switch or with a telephone system in which the subscriber's station apparatus is constructed in the manner indicated in Fig. 1.

In Fig. 1 the apparatus at each station is thus arranged:

A is a gravity-switch connected to line on that side of the station nearest the central office, and making contact, when depressed by the weight of the magneto-telephone *t*, with a contact-stop, 1, joined through a circuit-breaking or signaling key, *k*, and a signal-bell, *S*, with the line on the other side of the station. The magneto-telephone *t* is connected in local circuit with the secondary of an induction-coil, *I*.

M indicates a battery or contact transmitter of any approved construction, whose electrodes are directly in a circuit passing from the contact-stop 2 of the switch through the primary of the induction-coil to the point *a*, where connection is made with the line. When the switch is relieved from the weight of the telephone, contact is made with the point 2, and the main-line circuit is then directly through the battery-transmitter and the primary of the induction-coil, while at the same time the circuit through the signal-bell *S* and the key *K* is broken.

C designates a central station, and *D* a charging-battery located thereat, which is connected to line when oral communication takes place between any two of the stations represented.

Bell *S* and key *K* are for use in the ordinary manner in conjunction with the usual apparatus employed at the central station.

For the purposes of oral communication between any two stations the switches at those stations are so manipulated as to place the transmitter *M* and primary of induction-coil *I* directly in the main line, and the battery *D* at

the central office is connected to the line. Under these circumstances it is obvious that either transmitter, when spoken to, will vary in the well-known manner the current of battery D passing through the primaries of I, and the result will be a succession of secondary pulsations in the telephones T in a manner to produce articulate sounds.

I do not design limiting myself to any particular arrangement or construction of switches and devices, as there are many well known in the art, and I contemplate the employment of others besides those here described. It is evident that the charging-battery may be placed at either of the points that are telephonically connected.

In Fig. 2 I have shown a modified arrangement of devices at the subscriber's station forming the subject of this application. In this plan I employ a provision for cutting the transmitter and primary of the induction-coil out of the circuit when the line is in use at another station or stations. I have also means whereby, when the line is not in use and the receiving-telephone at any station is removed from its support, the transmitter and telephone at that station are locked in circuit and the operation of an electro-magnetic switch controlled by the central office can be only made effectual to cut out the transmitter and induction-coil of other stations. For this purpose I make use at the subscriber's station of an electro-magnetic switch adjusted above a normal weak current and provided with contacts and connections so arranged that when against its back stop the main-line circuit will be through the transmitter and induction-coil, but when operated by a current of sufficient strength it will break said first circuit and complete a branch circuit around the transmitter and induction-coil. For the purpose of signaling to the central station without affecting said switch, I may decrease still further the tension of the normal line-current, or may entirely break it.

G designates a case, to the cover of which is secured a contact or battery transmitter, whose diaphragm is indicated at H and electrodes at E.

P is an arm supporting the movable or adjustable electrode. The automatic switch is controlled by the electro-magnet of the call-bell, and consists of the armature lever and bell-hammer 3, connected directly through electro-magnet E M with the line-wire on the side leading to the central station, and provided with contact-stops 5 and 6, one connected to the line-wire on the other side of the station and the other with the primary of the induction-coil I, the hinges of the box, the circuit-breaking call-key *k*, (shown in bottom view,) the diaphragm of the transmitter and electrode in contact therewith, and to the line-wire L. The secondary of the induction-coil I is connected to the receiving-telephone T, by preference permanently.

The telephone-support R consists of a blade-spring, or of any suitable spring-actuated support. It is provided with a locking-point, 7, of suitable shape, which engages with the switch-lever, when it is relieved from the weight of the telephone, upon the one side or the other thereof, according as said switch-lever is drawn forward by the electro-magnet or is against its back stop, and, according to the condition of the switch, locks the transmitter and induction-coil into or out of circuit. With a normal or weak current to line, which is designed to be broken or weakened by signaling-key K, and to thereby affect delicately-adjusted apparatus at the central station, the switch-lever is in the position shown in full lines, the strength of current being insufficient to draw it forward against the stress of its retractile spring T, as adjusted. The path of the main-line current at this and other stations upon the same line is then through electro-magnet E M, switch-lever 3, back stop, 5, induction-coil I, key K, and transmitter contacts. By still further weakening the normal current, or by breaking the circuit by key K, or in any other suitable manner, a call may be sent to the central office. The removal of the telephone T from its support will allow the same to rise, and the locking-point upon the end thereof will come into position to lock the lever in the condition shown in full lines, with the circuit through the transmitter. For the purpose of cutting out the transmitter and induction-coil at other stations, an increased battery is used during oral communication, which draws the switch-lever forward and holds it in that position while the line is in use. At all stations where the telephone is still attached to its support the lever will be free to move to break the circuit through the transmitter and the induction-coil, and it will be held in the position shown in dotted lines so long as the stronger or increased battery is to line. Under these circumstances the locking-point 7, when a telephone at any of such stations is removed from the support, will come into position to lock the armature against stop 6, in which position the circuit through 5 is broken.

The subscriber's station may be called in the well-known manner by placing to line a current of sufficient strength to overcome the stress of retractile spring T. Other specific devices may be used in place of those herein described, as the principle of the invention consists in causing the support for the telephone, when relieved of its presence, to lock an electro-magnetic switch controlled from the central office in position to hold the circuit through the transmitter or the receiving devices closed, so that when the switches are operated to hold the transmitters or the receivers at other stations out of circuit the switch at the station whose telephone is in use cannot be affected.

Other arrangements of circuits and devices will readily suggest themselves to those skilled

in the art, whereby the combined switch and locking support for the telephone may be utilized for this purpose.

It is obvious that such an arrangement of switch and lock might be adopted with the systems in ordinary use in which the line is charged normally; but the battery is withdrawn from the line-circuit when the telephones are in use. In such a case, however, the switch would be arranged to complete the circuits controlling the operation of the communicating apparatus when drawn forward by the electro-magnet, and to break such circuits or close a shunt thereto when against its back stop. In other respects its operation, in conjunction with the lock-support for the telephone, would be the same.

A central-office switch and one plan of devices for completing the necessary connections through the charging-battery used during oral communication between subscribers on the same or different lines, or between a subscriber and the central office, is shown at C O. For the sake of simplicity but four lines are shown, each of which is connected to a vertical or line strip, S, in turn connected, when the line is not in use, through switch-levers *h*, with a battery, M B. This battery is of sufficient strength to charge the electro-magnets of the annunciators and bells at the central office, but is not sufficient to operate the switch and bell electro-magnets at the subscribers' stations.

The charging-battery to be used during oral communication is shown at D B, one pole joined to a connecting strip or wire, *n*, and the other to a similar connecting-strip, *m*, through a circuit-breaking key, K, and a switch, 12, which serves to make the connection directly through 13 or indirectly through the primary of induction-coil I, electrodes of transmitter M, and point 14. The secondary of the induction-coil is connected, as in the other figures, to the receiving telephone T. The connecting-strips or wires are provided with switches 17 and 19, which may be thrown into contact with the line-strips. The terminal switches 18 may be placed in contact with a plate or strip, 20, connected to ground.

K' K' designate calling-keys, which may control a separate battery, K' B, for the purpose of signaling to a subscriber's station after the manner described in patent to Geo. W. Coy, filed February 17, 1880, No. 224,653. I propose, however, to use for this in ordinary cases the charging-battery D B. The annunciators 1 2 3 4 are arranged and adjusted to give a signal upon a weakening or breaking of the line-current from battery M B. When the non-interference switches are used it is necessary that the charging-battery D B used during oral communication should be stronger than the normal line-battery M B, for the purposes before explained. When, however, the arrangement shown in Fig. 1 is employed the relative strength of said batteries is immaterial, and the main or signaling batteries or sections

thereof may be under some circumstances the charging-battery. The strip 20 should, by preference, be normally connected to one of the connecting-strips—say 11—by a terminal switch-lever, 18. Upon the reception of a signal from any line its vertical strip is connected with battery D B by a switch-lever, 18 or 19, and its switch-lever *h* is disconnected. The charging-battery D B is thus thrown to line, the circuit being from ground to bar 20, lever 18, connecting-strip *m*, switch-point 12, transmitter M, induction-coil I, key-battery D B, strip *n*, switch-lever 18 or 19, and line-strip, to line. Conversation may then be carried on between the subscriber and the central station through their battery-transmitters, which are in the direct circuit of the charging-battery and the primaries of the induction coils whose secondaries include the receiving-telephone. If the lock-switches are used at the subscriber's station, the result of connecting the battery D B to that particular line has been to cut out the transmitting and receiving apparatus at all stations upon said line excepting at the station calling. Should the call be for a station upon the same line, the signal appropriate to that station may be given by manipulating the circuit-breaking key. The charging-battery is then to be withdrawn from line for an instant to allow the subscriber called to lock his telephone in circuit, and after that has been done the battery is to be again placed to line, thus cutting out the apparatus at all other stations and placing the line in condition for oral communication. If desired, the weaker battery M B may be placed to line when the stronger battery is disconnected, and the subscriber called may then give notice of the fact that he has removed his receiving-telephone from its support, so as to lock the switch, by operating his calling-key. When this signal is received at the central office the battery D B is again introduced and the connection to battery M B broken. If the subscriber with whom communication is desired is upon another line, the connection of the plate 20 with strip *m* is to be broken, and the lines may then be connected through the line-strips and the charging-battery by throwing the proper line-switches 17 and 18 or 19. In the diagram lines 1 and 4 are shown thus connected. The path of the current may be readily traced. When the arrangement of switches shown in Fig. 1 is used the operation of the central-office switch is substantially the same as already described. Under such circumstances, however, subscribers may be called in the ordinary manner by circuit-breaking keys introduced in the several lines at the central office.

It is obvious that other switch mechanism may be used for the purpose of making the desired connections and for introducing the charging-battery, and in practice the manipulation would be much simplified.

The central-office switch is shown in the form indicated to avoid confusion.

As many pairs of connecting-strips m n and as many charging-batteries D B are to be used as may be required by the size of the exchange and the frequency of the connections.

5 Instead of the switches h and 19 for each line, a single switch may be used, its pivot connected to the line-strips, and its free end arranged to make connection with either of two studs, one connected to battery M B and
10 the other to strip n .

If desired, an independent electro-magnet may be used instead of the bell electro-magnet for controlling the station-switch.

15 Instead of using a neutral electro-magnet for the switch, I may employ a polarized electro-magnet, and control the same by changing the polarity when the line is charged for oral communication.

I do not in this application make any claim
20 to the arrangement of the primary coil and charging-battery in the main-line circuit and the secondary coil and receiver in the local circuit; nor do I make any claim to the plan of arranging the primary in one loop or branch
25 and the bell in the other loop or branch, as shown in Fig. 1, as these form the subject of my prior application.

What I claim as my invention is—

1. In a telephone-station apparatus, a contact-transmitter normally in the main-line circuit, in combination with an electro-magnetic switch whose back contact is included in the circuit of said transmitter and whose front contact completes a branch circuit around the
35 same, substantially as described.

2. The combination of an electro-magnetic switch in the main-line circuit, connections through the transmitting or receiving apparatus controlled thereby, and a locking device
40 released by the telephone for the purpose of locking said switch in position where the circuit through the telephone apparatus will be closed.

3. In combination with an electro-magnetic switch-lever controlling the circuit-connections through a telephone, a spring telephone-support arranged, when freed from the weight of the telephone, to lock the switch-lever upon one side or other thereof, according as said lever
50 is against its front or its back stop.

4. An electro-magnetic switch controlling the circuits through the instruments at a telephone-station, and located in the direct circuit

at said station, in combination with mechanical locking devices brought into connection
55 with said switch in the act of using the instruments, substantially as and for the purpose described.

5. In a telephone-exchange system, two or more lines normally connecting to earth through
60 a battery, and devices for connecting any two lines together through a battery of increased power, substantially as and for the purpose described.

6. In a telephone-exchange switch, one or
65 more pairs of line-connecting strips, each of which is connected to one pole of a generator, and each provided with switch devices for connecting one of said strips to earth, substantially as and for the purpose described.
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7. In a telephone-exchange switch, line-connecting strips and circuit-connections therefrom passing through a galvanic battery and contact-points of a battery-transmitter, as and
75 for the purpose described.

8. At each of a series of stations on a telephone-line, electro-magnetic switches whose retractile devices are adjusted above the strength of current normally connected to said line, and which control through suitable connections the circuits of telephone-instruments, in combination with devices at a central station for increasing the strength of current for the purpose of operating said switches.
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9. An electro-magnetic switch at a station of
85 a telephone-line, provided with contacts and connections whereby the telephone may be thrown into and out of operative electrical condition by increasing and decreasing the strength of current upon the line, substantially as described, in combination with a bell and a bell-hammer attached to the vibrating portion of the switch.
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10. The combination of two or more telephone-lines, each of which contains devices at
95 the subscribers' stations for introducing the primary of an induction-coil and a battery-transmitter into the line-circuit, a central-office switch to which said lines are connected, and switch devices for connecting any two
100 lines through a battery for oral communication, substantially as described.

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Witnesses:

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THOMAS TOOMEY.