(No Model.) 3 Sheets—Sheet 1.

E. T. GILLILAND.

TELEPHONE CIRCUIT AND APPARATUS.

No. 306,238. Patented Oct. 7, 1884.

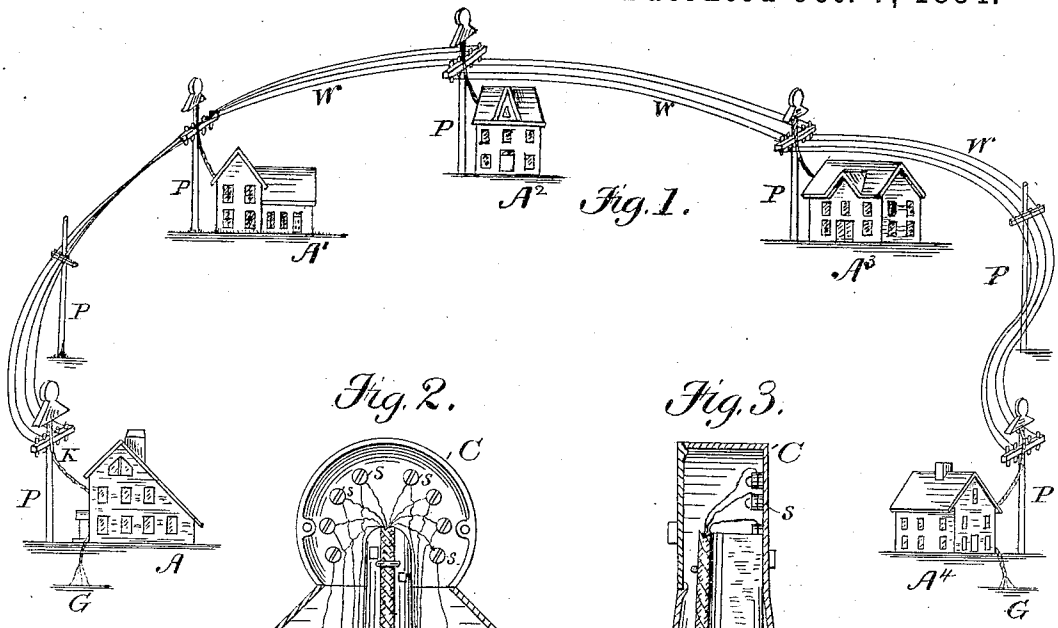


Fig. 1.

Fig. 2.

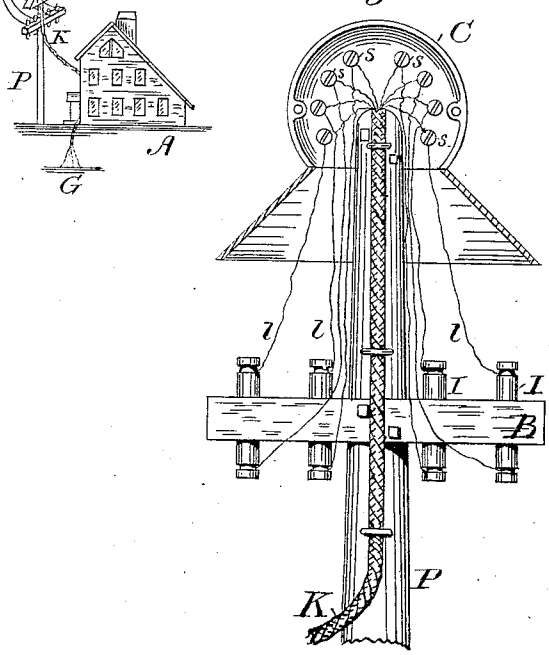


Fig. 3.

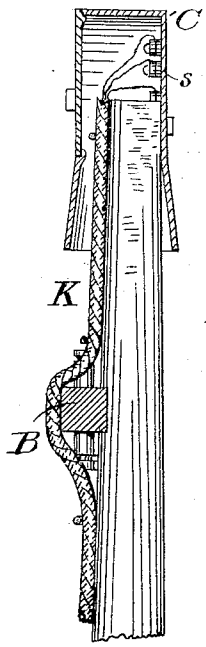
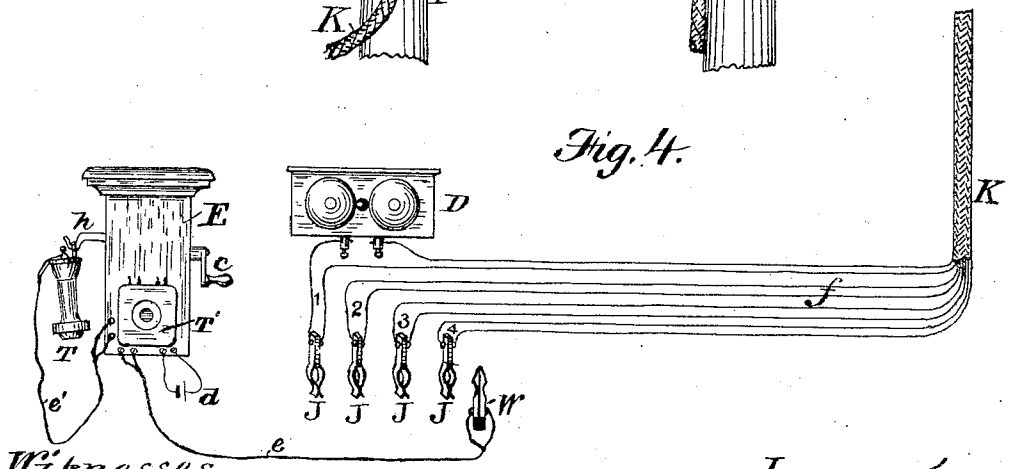


Fig. 4.



Witnesses.
Geo. Willis Pierce
D. E. Richards

Inventor,
Egra T. Gilliland

(No Model.) 3 Sheets—Sheet 2.

E. T. GILLILAND.

TELEPHONE CIRCUIT AND APPARATUS.

No. 306,238. Patented Oct. 7, 1884.

Fig. 5.

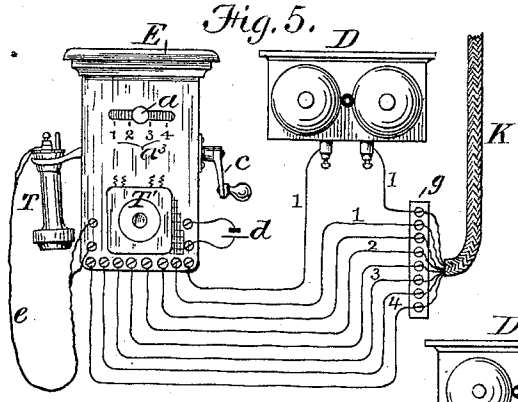


Fig. 6.

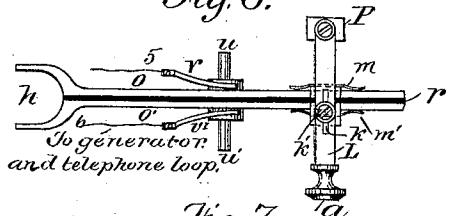


Fig. 7.

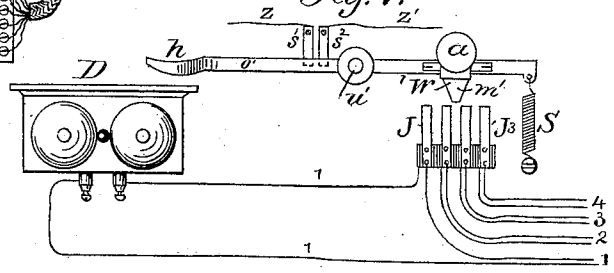
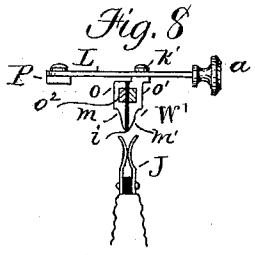


Fig. 8.



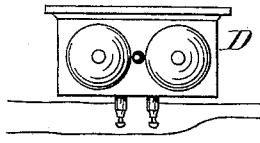


Fig. 9.

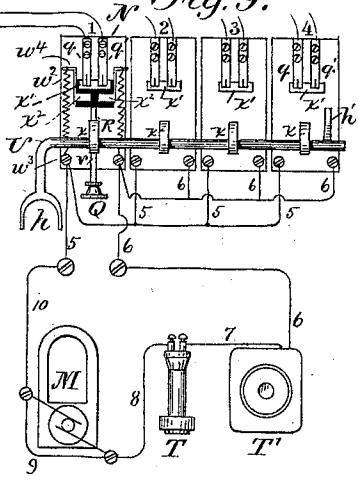


Fig. 10.

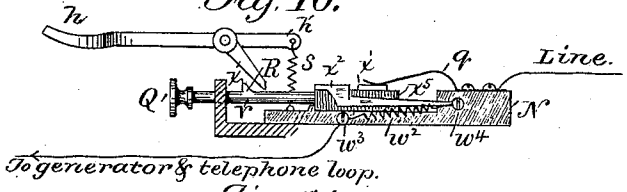


Fig. 11.

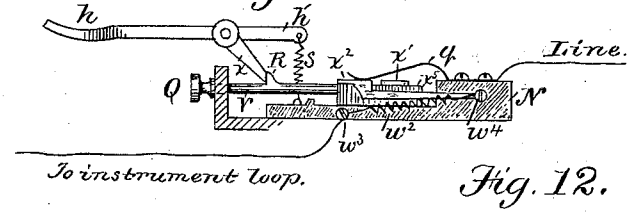
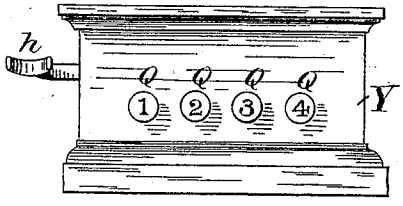


Fig. 12.



Witnesses.
Geo Willis Pierce
D. E. Richards

Inventor.
Ezra T. Gilliland

(No Model.) 3 Sheets—Sheet 3.

E. T. GILLILAND.

TELEPHONE CIRCUIT AND APPARATUS.

No. 306,238. Patented Oct. 7, 1884.

Fig. 13.

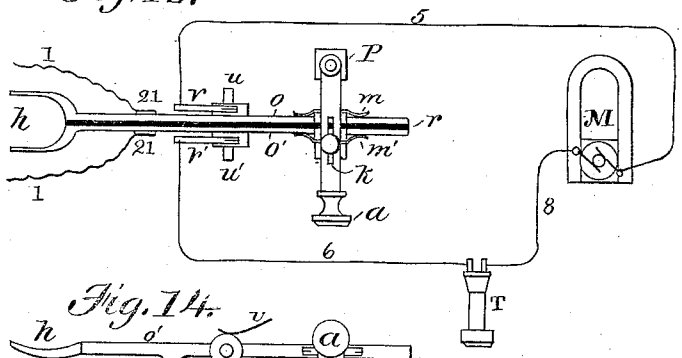


Fig. 14.

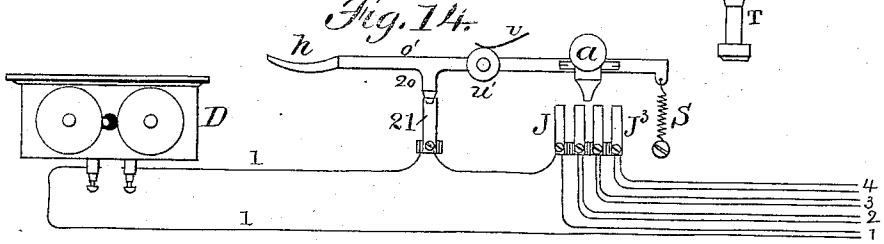
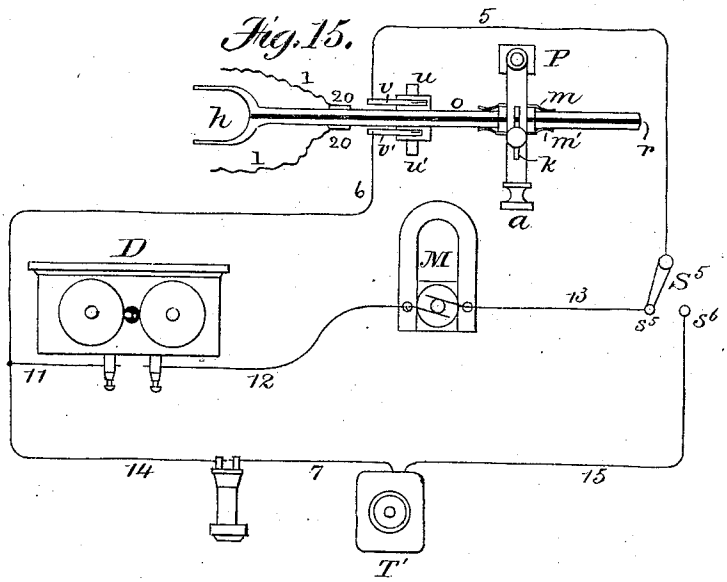


Fig. 15.



Witnesses.
Geo. Willis Pierce
D. E. Richards

Inventor.
Egra. T. Gilliland

UNITED STATES PATENT OFFICE.

EZRA T. GILLILAND, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE AMERICAN BELL TELEPHONE COMPANY, OF SAME PLACE.

TELEPHONE CIRCUIT AND APPARATUS.

SPECIFICATION forming part of Letters Patent No. 306,238, dated October 7, 1884.

Application filed April 21, 1884. (No model.)

To all whom it may concern:

Be it known that I, EZRA T. GILLILAND, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Telephonic Circuits and Apparatus, of which the following is a specification.

My invention relates to systems of electrical intercommunication, and is intended especially for use in conjunction with articulating-telephones. The ordinary telephonic "central office" or "exchange" consists, as is well known, of a central or exchange station, which is connected with a number of sub-stations by means of telegraphic or telephonic lines radiating therefrom, these latter being so organized and arranged that any two of the sub-stations may be placed, at a moment's notice, (usually through the instrumentality of a switch-board,) in direct telegraphic or telephonic communication with each other by the act of an attendant or operator at the central or exchange station, who, upon being notified to do so, connects the two lines leading to the respective sub-stations, so that they are enabled thereafter to communicate with one another directly. Suitable signaling appliances are of course provided at the said central station, whereby signals may be received from and transmitted to sub-stations. Such an organization has proved very serviceable in a large number of cities and towns, and has gone into general use. Experience has, however, demonstrated that many small towns and villages throughout the country are debarred from the use of such systems by reason of the expense attaching thereto, for, inasmuch as the number of persons desiring to avail themselves of telephonic privileges and facilities in sparsely-populated localities is necessarily small, it frequently happens that a sufficient number of subscribers who are willing to pay a rental high enough to make a central-office system profitable cannot be obtained, for the expenses of office rental and manipulation are substantially as great in an exchange of forty subscribers as they would be in an exchange of one hundred. These considerations have induced me to devise a system of intercommunication for such towns as are unable to sustain the expense of a regular exchange in which the central station, with all its paraphernalia of switching and signaling apparatus, together with the operators or manipulators thereof, are totally dispensed with.

The object of my invention is, then, the establishment of an economical yet efficient system whereby a number of telephone-stations upon different main lines may freely signal and communicate with one another, dispensing altogether with the use of a central station or a central apparatus, and without the introduction of complex or expensive machinery or instrumentalities.

For the accomplishment of these purposes my invention consists, broadly, in a series of sub-stations, and a series of main lines extending between and entering all of the said sub-stations, a looping-in switch being provided at each station, whereby the subscriber may introduce his signaling mechanism and telephones into any one of the main-line circuits, and call and converse with the sub-stations normally connected thereon.

It consists, also, in connecting the said apparatus at each station normally in any particular one of the said main lines, so that when the entire system is quiescent a certain number of stations—say five—are normally connected in and with No. 1 main line, five more with No. 2 main line, five more with No. 3, and so on. Thus any station may call and communicate with any other station on the same line without a change in its connections, and may, furthermore, connect with any station on any other line by transferring his instrument-loop to the said line. Each sub-station therefore has its calling and telephonic instruments normally connected in one of the said main lines, and is understood to be so connected by all stations, while at the same time each station has the power of withdrawing its instruments from their normal location, and of transferring them to any other of the entering main lines, so that the stations on those lines may readily be called and communicated with.

In carrying out my invention I have devised several ways of accomplishing this transfer; and my invention further consists in apparatus whereby the said transfer of the instruments from one line to another, as also their

restoration, may be manually effected; in apparatus whereby the operation is made partly automatic, and in other apparatus whereby the transfer may be effected either manually or automatically, while the restoration is completely and solely automatic.

In carrying out my invention, in order to effect the automatic restoration of the apparatus from any main-line circuit in which it has been placed to its normal line-wire, I have found it desirable to employ a switch or circuit-changer which may be set by the operator prior to the removal of the telephone from its support, so that the telephone, when so removed, will be introduced into any desired line to which it is set, and so that when the telephone is replaced in its support the normal condition of things is automatically restored, and the station-instruments replaced in their normal circuit, or, with the exception of the signal-bell, withdrawn from all of the circuits. Such a switch or circuit-changer is shown and described in patent issued July 18, 1882, to Theodore N. Vail, and numbered 261,186, and to that patent reference may be made. I have also found it very convenient to employ at each station a short cable, including all the necessary wires, whereby the several line-circuits may be led into and out of the said stations. This extends, preferably, outward to the nearest pole.

In the drawings by which my invention is illustrated, and which constitute a part of this specification, Figure 1 is a diagram showing several main lines extending between a number of stations. Figs. 2 and 3 are respectively front and side views of the terminal pole at each station, showing the method of entering. Fig. 4 is a diagrammatic drawing of a station apparatus adapted for manual operation. Fig. 5 is also a diagram of the station-circuits and apparatus, arranged partly for automatic operation. Fig. 6 is a plan view of one form of telephone-holding switch which I incorporate in my station apparatus. Fig. 7 is an elevation of the same, showing also the station signaling apparatus and the several circuit-loops. Fig. 8 is a detail of the circuit-changing device. Fig. 9 shows another form of switch, worked by the telephone-support, together with the circuit arrangements. Figs. 10 and 11 are side elevations of the switch shown in Fig. 9, illustrating the two positions of said switch. Fig. 12 is a view of the entire switch and telephone-holder incased in a single box. Fig. 13 is a modified form of Fig. 6, showing the instrumental loop carried out, and indicating the complete arrangement shown in Fig. 14. Fig. 14 illustrates the most complete circuit arrangement which I have devised, in which the station-instruments are all maintained in one of the circuits when the telephone is in its support; and Fig. 15 is a diagram of a similar arrangement in which the signaling-instruments are shown in one branch circuit and the telephones in another.

My invention contemplates a number of main-line wires, W, extending to and between any number of stations, A, and entering all of the said stations. We may suppose, for example, a system of twenty subscribers, in which case four main lines might each extend to the twenty stations, entering them all. Each of the stations may, however, have its instruments, or a part thereof, normally connected with some definite one of the wires, while at the same time the said instruments, or one or more of them, may be capable of being withdrawn from that specific line and be connected with any one of the other lines. In the case I have instanced there are five stations normally connected with each line, and it is obvious that it must be clearly understood by all the stations which line any specific station is normally connected with, to the end that if a station connected with one of the lines desires communication with a station on another line it may at once connect its instruments in the loop belonging to such line. The wires W are supported between the stations A, A', A^2, A^3, and A^4 on poles, in the usual manner, and inasmuch as it is evidently inconvenient to bring all the wires loose into each station, I supply the station-pole with a suitable cover or cap, C, in which the several lines 1 terminate at binding-screws *s*. A compound conductor-cable, K, then extends from these binding-screws down the pole, as shown in Figs. 2 and 3, and into the stations.

The station apparatus comprises, as usual, a signal-bell for indicating incoming signals, a generator or equivalent device for sending outgoing signals, and a telephone or telephones. (A transmitting-telephone is not essential, but is preferably employed.)

The principle of my invention is clearly shown in Fig. 4, which represents a diagram of the station circuits and apparatus adapted exclusively for manual operation. At each station the several lines *f*, after issuing from the cable K, may be terminated as shown. In the figure, which is assumed to represent one of the stations in which the apparatus is normally connected with main line No. 1, K is the entering cable, which may be composed of any number of conducting-wires, *f*. In the present instance I show four loops, each constituting the in and out wire of a single main line. The several lines are numbered 1, 2, 3, and 4. In the special station under consideration a call-bell, D, is permanently included in loop 1, and this station is said to be connected in line-circuit No. 1. Each of the other loops, 2, 3, and 4, terminate in this station and in the other stations on No. 1 wire in spring-jacks J, into which the signaling and telephone apparatus of the station may be looped by means of the instrumentalities which I am now about to describe. A casing, E, incloses a magneto-generator, which is operated by the crank *c*, and a lever-switch, *h*, for transferring the through-circuit from the generator to the telephones, and also, when desired, for closing the circuit of the transmitter-battery

d. The magneto-telephone T, when not in use, is hung on the hook *h*, and, by means of the cord *e'*, is so disposed, in a manner well understood, as to be adapted for inclusion in the circuit of the wedge W and conducting-cord *e* when removed from the said hook. The transmitter T' is not essential to the working of the apparatus, but is preferably employed as facilitating conversation. It also is, when employed, included in the telephone-circuit and brought into action by the removal of the magneto-telephone from its support. The entire apparatus is in the loop *e'*, which, by means of the wedge, (which is one of an ordinary character, consisting of two metallic surfaces separated by a sheet of some suitable non-conductor,) may be included in any of the lines entering the station by means of their several spring-jacks J. When the station is not in communication with any other station, the wedge W is preferably left in the spring-jack J of circuit No. 1, so that the station-instruments form a part of the said circuit; or it may, at the option of the subscriber, be left disconnected from all of the lines, leaving the signal-bell only in circuit. If, however, the subscriber should inadvertently leave the wedge in any of the spring-jacks belonging to the other line-circuits, the only adverse result is in the additional resistance thus thrown into that circuit, since the alarm-bell is still in line-circuit No. 1, whereby calls may be duly received; yet in some cases it may be found desirable to include the signal-bell in the loop controlled by the wedge W, and I may so connect it, if I prefer, without departing from the spirit of my invention. Stations on lines 2, 3, and 4, desiring to communicate with stations on line No. 1, will insert the wedge W into the jacks J, which there represent No. 1, and call the required signal of the station they desire. In like manner stations on No. 1, desiring to communicate with stations on Nos. 2, 3, or 4, will insert the wedge W into the jack J of such line-circuit and call and converse.

I will now proceed to describe the apparatus by which I effect a certain amount of automatic operation in these devices.

Fig. 5 represents the complete apparatus, and Figs. 6, 7, and 8 enlarged details of one form of the automatic and circuit-changing apparatus. The chief distinction of the organization shown in Fig. 5 from that in Fig. 4 is that the spring-jacks J of the different lines are all incorporated with and inclosed in the mechanism in the case E, and that by turning the handle *a*, which projects from the front of the case, to the figure 1, 2, 3, or 4, representing the desired line, the subscriber or operator is enabled to determine before he removes his telephone from its support which line he will be connected with. The several lines, as in the preceding view, enter the station by the cable K. They are divided and pass to the generator and switch-case E, No. 1 first passing by one of its loop-wires to the station signal-bell. The telephone receiver and transmitter are connected with one another on a branch of the operative loop, as before, the shunted generator being in another branch of the same loop.

Referring to Figs. 6, 7, and 8, it will be seen that the several line-loops terminate in as many spring-jaws J to J^5, each of which is indicated on the front of the case by an index-number, and that the signal-bell D may be placed in the circuit of that one of the said line-loops to which it belongs—in the present illustration, No. 1. Fig. 8 shows a side view of one of the said jaws J and of the wedge W', adapted for insertion therein. The telephone-support *h*, which is pivoted at *u*, and which is adapted to operate as the circuit-changer, is formed of two sides, *o* and *o'*, insulated from one another by an insulating-partition, *r*, of any suitable non-conducting material. One terminal, 5, of the generator and telephone-box, by means of a contact-spring, *v*, rests on a collar of the pivot *u*, while the other terminal, 6, of the said loop, similarly rests by the spring *v'* upon the collar of the complementary pivot *u'*, thus constituting a telephone or generator loop adapted to be completed by being included in any one of the entering line-wires.

The details of the said telephone-loop may be understood by reference to Fig. 7, in which it is fully delineated. The contact-springs *s'* and *s*^{2} are merely terminals of the transmitter-battery circuit of which the wires *z* and *z'* are a part. The said circuit is at this point, for obvious reasons, normally open, and when the telephone T is removed from its support the lever flies upward under the influence of the spring S or its equivalent, and brings one of the sides *o* and *o'* into contact with the two flat springs *s'* and *s*^{2}, uniting them electrically and closing the circuit. A lever, L, provided with handle, *a*, pivoted at P, and capable of swinging in a horizontal plane, has a slot, *k*, cut through it, in which works the head *k'* of the wedge W', which, as in Fig. 4, consists of two metal surfaces, *m* and *m'*, separated by a non-conducting partition, *i*. The entire wedge, although controlled by the lever L, is supported on the telephone-switch lever *h*, which passes through the wedge by the square hole *o*^{2}, the said wedge being capable of sliding freely along the said telephone-lever when moved by its controlling-lever L. The metal surface *m* of the wedge is in electrical connection with the side *o*, and the surface *m'* is similarly in contact with the other side, *o'*, of the telephone-switch lever. An index, *a*^{3}, is shown on the front of the box E, and the handle of the lever L may be turned opposite to the figure representing the desired line. The whole is arranged so that by turning the said lever until the handle thereof is opposite the required number the station-instruments, or such part of them as may be transferable, may be introduced into the circuit of the line-wire with which the station to be communicated with is normally connected, whereupon, if the telephone T is removed from its support, the

spring S draws down the rear end of the pivoted switch-lever, forcing the wedge W' between the spring-jaw J of the desired line-wire. The required stations may then be signaled by turning the crank *c*, after which conversation may be carried on. In this plan it will be seen that the calling station must remove his telephone from the support before he can call a second station. Conversation may already be passing over the line, and would be broken in upon were the subscriber to call without first listening; but the fact that the subscriber must first remove his telephone will tend to remind him invariably to listen and ascertain that the line is not in use before he sends the call-signal, while the additional resistance of a single telephone and transmitter makes no practical difference in the working of the line.

Figs. 9 to 12 exemplify a modification of the above combination. Figs. 10 and 11 are sectional elevations of the switch or circuit changer shown in the said modification. It consists of a series of spindles—one for each line-circuit—which, when in their normal position, maintain the loop of their respective line-circuits closed, but which, when pushed in, introduce the station apparatus into the line-circuit of the particular spindle pushed. Any number of such spindle-switches may be employed, according to the number of the entering lines. I have shown four. Each switch consists of a non-conducting base, N, on which a spindle, *v*, is capable of sliding longitudinally when pushed inward by the button Q, or when retracted automatically by its retracting and conducting springs w^2. The spindle carries a non-conducting block, x^3, in which is left a single conducting-plate, *x'*, crossing the said block, and two other conducting-plates, x^2, insulated from one another, but each in electrical connection with one of the wires of the generator and telephone-loop, as shown in the diagram, Fig. 9. The plates x^2 are in electrical connection with the points w^1, to which the springs w^2 are attached, and the circuit is from these through the springs to the screw w^3, and from thence by the wires 5, 6, 7. 8, 9, and 10 to and through the generator M, magneto-telephone T, and transmitter T', the generator, however, being normally shunted by the wire 9, which in practice is broken either manually or by the movement of the crank *c* when the call is being sent. The wires 5 and 6 of the telephone-loop are branched to each of the spindle-switches, where they remain as open terminals until any special spindle is pushed in. The several main-circuit loops entering, as shown in Fig. 9, are made normally complete or continuous by their contact-springs *q* and *q'*, which rest upon the conducting-plates *x'*. When the spindle is pushed in, the said springs are brought each in contact with one of the plates x^2, which, being permanently in circuit with the telephone-loop, constitutes that loop virtually a part of the line-circuit. Any spindle so pushed in would, by the constant tension of the springs w^2, withdraw itself as soon as the pressure was removed from its button Q, if means were not provided for its retention. It will be observed that on each spindle is an upwardly-projecting stud, R, and that attached to the telephone-support lever is a lug, *x*, projecting downward and inward. So long as the telephone rests on the yoke *h* the lug *x*, which is attached to the pivot-rod V, is prevented from engaging the stud *x;* but if the telephone is first removed and any of the spindles are then pushed in, the stud R of that spindle passes the end of the lug, and then on the attempted withdrawal of the spindle engages therewith, the said lug being brought into its path by the retracting-spring S, which is attached to the heel *h'* of the telephone-switch lever. The spindle is thus locked, and the telephone-loop is brought into the circuit of the main line represented by such spindle until the telephone is replaced, when the lug recedes, freeing the spindle, which thereupon flies outward. The axis of the switch-lever is furnished with as many cams or lugs *x* as there are spindle-switches, and thus is enabled to control them all. The line-loops 2, 3, and 4 are merely indicated in the drawings.

Fig. 12 is a representation of the spindle-switch arranged in a compact case, Y, independent of the generator and telephones.

From the foregoing description it will appear that any station-operator desiring to communicate with any other station will first remove his telephone, will then push in the spindle of the line with which the required station is connected, will listen to see if such line is already in use, and then proceed to call and converse with the required station; and that when, on the conclusion of the conversation, he replaces his magneto-telephone the spindle will automatically be freed and fly outward, thus disconnecting the telephones. The station call-bell is, as before shown, permanently connected in its own circuit.

The plans which up to the present point in this specification have been described, while showing the signal-bell constantly in circuit with one line, show no means of maintaining the signal-sending and telephonic apparatus in such line, or of restoring the same thereto after it has been used in any other line. The plans shown in Figs. 13, 14, and 15 afford such means. In these organizations the complete apparatus is made to depend for its external connection upon the condition of the conducting-sides *o* and *o'* of the switch-lever, which practically constitute the terminals of a normally-open telephone-loop which may be connected with any circuit. In every respect the telephone-supporting switch itself depicted by Figs. 13, 14, and 15 is identical with that shown in Fig. 6, and hereinbefore described. The loop leading from the sides *o o'* by means of the springs *v* and *v'* is, however, shown in detail. The switch has, moreover, an additional attachment. The switch-lever is fitted with an extra

double wedge, 20, by which its two sides *o* and *o'*, when the telephone T is in place, supported by the switch, are brought into connection with the two jaws of an auxiliary spring-jack, 21, all of the jacks J being at the same time totally disconnected. This auxiliary jack 21 is in the circuit of the wire to which the station is supposed to belong. In this case, therefore, it is in circuit with the spring-jack of No. 1 circuit, and as the loop of the generator M and telephone T is always connected with the two sides of the switch-bar, the said loop is thus normally, by means of the extra wedge 20 and jack 21, connected with circuit No. 1, virtually constituting a part of said circuit. The path of the circuit entering the station is then by wire 1 into the signal-bell D; from thence to one spring of the auxiliary jack 21 to one side, *m*, of the wedge 20 to the side of the switch-lever, to pivot-collar *u*, spring *v*, wire 5, generating apparatus M, wire 8, telephone T, wire 6, spring *v'*, collar *u'*, switch-lever side *o'* to the other side, *m'*, of the wedge 20, front side of the auxiliary spring-jack 21 to one side of the spring-jack J, normally by spring-contact to the other side of the same jack, and then out to line. When this plan is adopted, the subscriber may, if he so desire, signal by operating his generator without removing his telephone from its support.

Although I prefer the arrangement of contact-springs *v* shown in the figures, in which they are in frictional contact with the pivot-collars *u* and *u'*, because by so placing them there is very little mechanical resistance offered against the free movement of the lever on its pivots, there are many other ways which will readily suggest themselves to those skilled in the art.

In practice the same switch-lever which I employ for the purpose hereinbefore described is also utilized, in a manner well understood, to make any other necessary circuit changes, such as cutting out the signaling-instruments and introducing the telephone. I do not, however, regard it as essential to recount such attachments circumstantially, as they are not material to my invention. In Fig. 15 I have indicated that such changes may be effected by placing the manual button-switch S^6 in the instrument-loop circuit, and including the signaling-instruments in one branch thereof, and the telephones in another. Normally, the switch S^5 is turned to the button s^5, and the line-circuit No. 1 is thus led through the signal-bell and generator *via* wire 6, wire 11, bell D, wire 12, generator M, wire 13, button s^5, switch S^5, and wire 5. When the subscriber desires to listen or converse over the line, the switch is turned to s^6, and the circuit is from wire 6 to wire 14, telephone T, wire 7, transmitter T', wire 15, and button s^6.

To the end that my invention shall be thoroughly understood, I will describe the operations necessary for a complete communication. Suppose that No. 2 on line No. 1 desires to talk with No. 14 on line No. 3. The subscriber at No. 2 will, if the plan shown in Figs. 5, 6, 7, 13, 14, and 15 be adopted, first turn the lever L till the button *a* comes opposite the figure 3 on the index, and will then remove his telephone from its support. The telephone is thus looped into line 3, and the subscriber listens to ascertain whether line No. 3 is or is not already in use. If the line is found to be clear, he calls the station No. 14 and converses with him. Upon the conclusion of the conversation, the replacement of the telephone once more withdraws the telephone from the line and restores the normal condition of the circuits.

It is obvious that a system such as I have described presents many advantages. A central office, with its expensive apparatus and necessary operators, is dispensed with. Each sub-station is known by all the members of the system to be always on his own line-wire, and can be signaled there, and each sub-station, while in a line of comparatively low resistance and in normal circuit with but few other stations, is capable of being readily put into connection with many other stations, each of which is always to be found on its own line. Each sub-station, moreover, can readily ascertain whether any other station is or is not already busy, and, as he can communicate directly with any station, can always understand the reason of delay in obtaining the desired correspondent. Furthermore, each station, upon the conclusion of a conversation, is automatically restored to its original condition, and the resistance of all lines is thus kept at a minimum.

I do not in this application claim any special form of circuit-changing switch, *per se*, as any desired form may be employed, and as, moreover, I propose to file a separate application for Letters Patent for one of the forms I have herein shown—to wit, that illustrated in Figs. 9, 10, 11, and 12.

I do not regard the establishment of a number of line-circuits, all of which enter all the stations together, with a single station apparatus adapted to be included, at the pleasure of the operator, in either of the said lines, as being new, *per se*, as I believe such a system to be well known in the ordinary practice of commercial telegraphy, and I do not broadly claim such a system; but

What I do claim as of my own invention is—

1. A system of telephonic intercommunication comprising a number of subscribers' stations connected directly together, without the intervention of a central office, by a series of main lines entering each station, a call-bell at each station, permanently connected with one main line, and a single telephonic and signaling apparatus at each station, normally included in the circuit of one of the said main lines, but adapted to be withdrawn therefrom and introduced into any other of the said main

lines, whereby a subscriber normally connected with any one of the lines may connect himself with any other of the said lines and communicate with subscribers normally connected therewith.

2. In a system of telephonic intercommunication, a series of subscribers' stations connected directly together, without the intervention of a central office, by a series of main lines entering each station, each station being appropriated to a particular line, so that a given number of stations are normally connected with each line, a call-bell at each station, permanently connected with the particular main line to which that station belongs, telephonic and signaling apparatus normally connected with that line, and means, substantially as indicated, for withdrawing said telephonic and signaling apparatus from the said main line, and for including it in the circuit of any other main line, so that call and telephonic signals may be exchanged between it and the stations on the second line.

3. The combination, substantially as hereinbefore described, of a series of subscribers' stations, a series of main lines, each of the said lines extending to all of the said stations, a telephonic and signaling apparatus at each station, normally in circuit with one of the said main lines, on which incoming calls may be received and conversation carried on, switching devices whereby the said apparatus may be included for outgoing calls and conversation in any other of the said main lines, and means for the automatic restoration of the said apparatus to its normal line-circuit upon the conclusion of a communication, substantially as described.

4. The combination, substantially as hereinbefore described, of a series of subscribers' stations, a series of main lines, all of which extend to and loop into all the stations, a series of spring-jacks or other loop-receiving devices—one for each line at each station—a telephonic and signaling apparatus at each station, the said apparatus consisting of a signal-bell for receiving call-signals, a generator for sending calls, a telephone or telephones, and a switch-bar constituting a support for the receiving-telephone, with switching devices included, normally, in one of the said main lines, but adapted to be withdrawn therefrom and included in any one of the line-circuits by means of the spring-jacks therefor, means, controlled by the telephone-holding switch-bar, for maintaining the said apparatus in the desired line-circuit during the displacement of the telephone, and other means, actuated by the telephone-holding support when the telephone is replaced therein, for automatically transferring the apparatus to its normal connection.

5. In a system of telephonic intercommunication in which a number of stations are directly connected together by a series of main lines and at each station thereof, a series of spring-jacks or other loop-receiving and circuit-closing devices, each jack or circuit-closer itself constituting a station-loop of a separate main-line circuit, a signal-bell for receiving incoming calls permanently connected in the circuit of one of the said main lines, an instrument-loop including in its circuit a generator for sending outgoing call-signals and a telephone or telephones, and adapted to be normally included in and form a part of that main circuit in which the signal-bell is connected, but capable of transference therefrom to any other of the said main lines by means of the respective loop-receiving devices, whereby the subscriber at any station is enabled to signal and converse with any station on any of the lines, and at the same time may receive a call-signal upon his own line, substantially as described.

6. In a system of telephonic communication comprising a number of main lines entering all the stations and terminating thereat in spring-jacks—one for each main line—the combination of the telephonic and signaling apparatus in a loop at each station, and the wedge forming the terminals of said loop, said wedge being carried by the telephone-supporting arm, and being adjustable thereon, to make contact with the spring-jacks of any line-circuit, whereby on adjusting the said wedge and removing the telephone the said loop is automatically included in the desired main-line circuit, and on restoring the telephone such connection is broken, substantially as described.

7. In a telephone system of the character described, the combination, at a station, of the spring-jacks—one for each main line—the wedge forming the terminals of a loop, including the telephone and signaling apparatus, said wedge being carried by and adjustable on the telephone-supporting arm, so as to make contact with one of the spring-jacks when the telephone is removed, an auxiliary spring-jack permanently included in the circuit of the particular main line to which the station belongs, and a second wedge, also carried by the supporting-arm, and arranged to make contact with said last-named spring-jack when the telephone is in place, whereby the removal of the telephone automatically includes the said loop in one of the main-line circuits, determined by the position of the adjustable wedge, and its replacement automatically restores said loop to the particular line to which the station belongs, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 14th day of April, 1884.

EZRA T. GILLILAND.

Witnesses:
D. E. RICHARDS,
GEO. WILLIS PIERCE.