

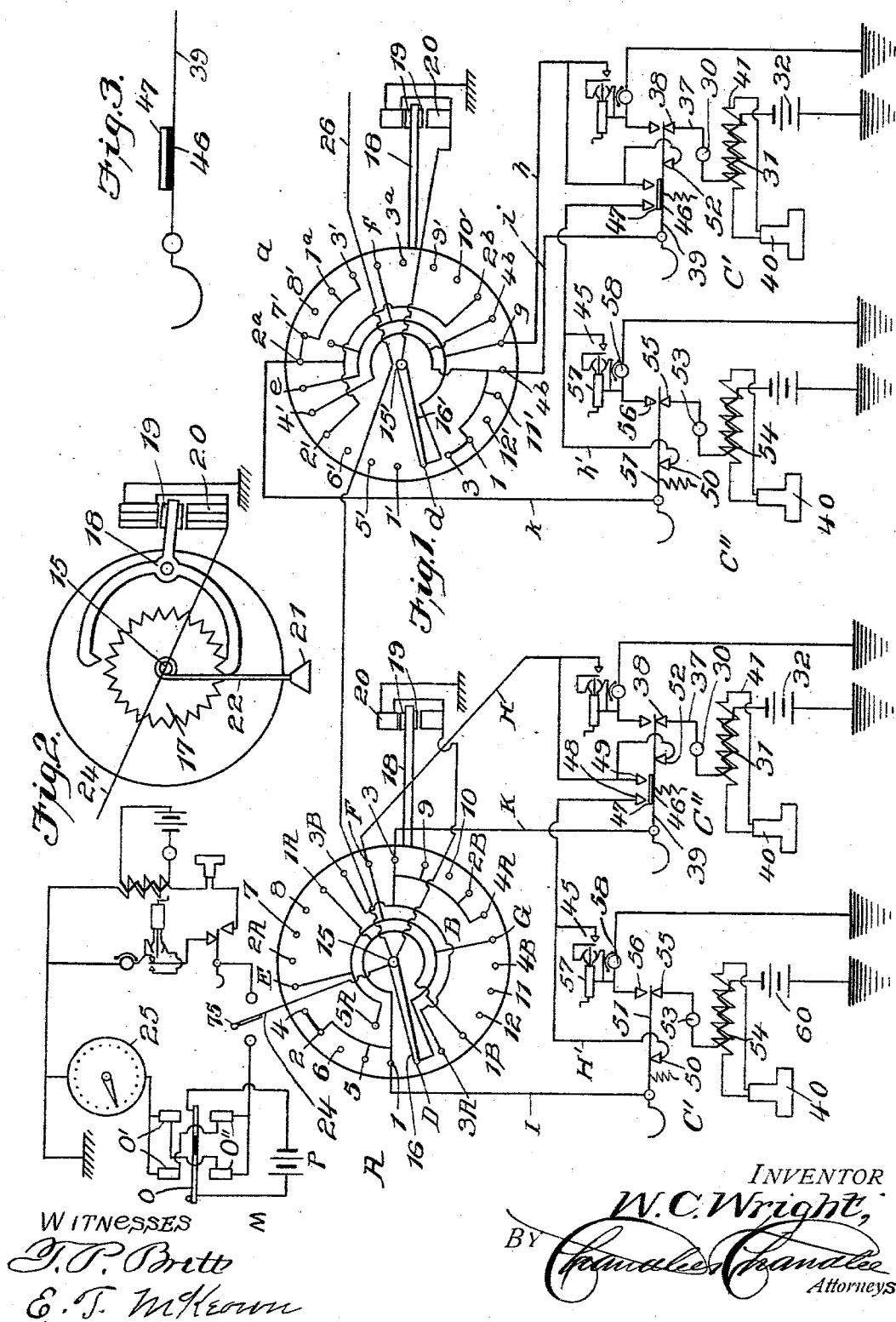
No. 716,802.

Patented Dec. 23, 1902.

W. C. WRIGHT.  
TELEPHONE SYSTEM.

(Application filed Jan. 29, 1902.)

(No Model.)



INVENTOR

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# UNITED STATES PATENT OFFICE.

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## TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 716,802, dated December 23, 1902.

Application filed January 29, 1902. Serial No. 91,713. (No model.)

*To all whom it may concern:*

Be it known that I, WAYNE C. WRIGHT, a citizen of the United States, residing at Amarillo, in the county of Potter, State of Texas, have invented certain new and useful Improvements in Telephone Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to automatic switchboards; and it has for its object to provide a construction of board and a connected system of wiring which will permit a subscriber at a telephone in one town to call up the operator or central at a distant point and converse with him without operating the other instruments in his town and at the same time preventing other subscribers from breaking into the line.

A further object of the invention is to provide for permitting the operator to connect a subscriber in one town with a subscriber in another town in such manner that other subscribers cannot break into the line, this connecting of the subscribers being done from a distant point.

A further object of the invention is to permit of a subscriber in one town talking on the main line through the next town and to a third town without permitting the subscriber in the intermediate town to come into the line or hear the conversation.

Other objects and advantages of the invention will be understood from the following description and include the provision of means for permitting the different subscribers in the same town to talk among themselves independently of other subscribers.

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts of the several views, Figure 1 is a diagrammatic view showing two of the switchboards connected in series in a main line with central. Fig. 2 is a rear elevation of the dial-plate, showing the means for progressing the circuit-closing hand of the switchboard with a step-by-step movement. Fig. 3 is a view showing one of the receiver hooks or levers.

Referring now to the drawings, there are shown in the present instance two switch-

boards A and *a*, one of which is located at each town to be placed in communication, and with the switchboard A are connected the two subscribers' instruments or stations C' and C'', while with the switchboard *a* are connected the two subscribers' instruments *c'* and *c''*. The switchboard A consists of a dial B, of insulating material, on which is mounted, adjacent to the edge thereof, an annular series of twenty-four contact-points, as shown. Four of the contact-points D, E, F, and G are electrically connected mutually and may be known as the "signal-contacts," inasmuch as the signal-line H, hereinafter more particularly referred to, is connected thereto. This signal-line extends to all of the subscribers' instruments that are connected with the switchboard A.

The four contacts D, E, F, and G are spaced equally about the periphery of the dial, and between each pair of these signal-contacts are five other contacts, as shown. The switchboard *a* also has four signal-contacts *d*, *e*, *f*, and *g*, all of which are electrically connected with the signal wire or line *h*, which leads to the subscriber's instrument *c'* and which signal or line wire is connected normally, as hereinafter described, with instrument *c''* through the wire *h'*, the plate 47 on the lever 39, and the contacts with which said plate normally engage.

To the right of the contact D, rotatably of the dial, is a contact 1, to which is connected the subscriber's line I, while on the switchboard *a*, next to the contact *d*, is a dead-contact 1'. The line I leads to the subscriber's station C'. The second contact on the board A (shown at 5) is connected with the contact 1 referred to, the third contact 6 is a dead-contact, and the fourth and fifth contacts 2 and 4 are connected with the contact numbered 1. The contact 5' and the contact 6' on the board *a* correspond to the contacts 5 and 6 in location and are dead-contacts, while the contact 2', corresponding to contact 2 on board A, is connected with the contact 2<sup>a</sup>, which is the first contact to the right of the contact *e* and corresponds in location to the contact 2<sup>a</sup> on the board A. Next to the contact 2<sup>a</sup> is a dead-contact 7, corresponding to contact 7' on board *a*, and each contact 7' is in circuit with 2<sup>a</sup>. The third contact from

contacts E and e, respectively, (shown at 8 and 8') are dead-contacts. On board A contact 1<sup>A</sup>, next to the contact 8, is connected with the contact 1, while the corresponding contact 1<sup>a</sup> on the board *a* is connected with the contact 7' and the contact 3', which is adjacent to the contact 1<sup>a</sup>. The contact 3<sup>B</sup> on the board A, adjacent to the contact F and corresponding to the contact 3' of the board *a*, is connected with a subscriber's contact 3, connected by wire K with the subscriber's instrument C''. The contact 2<sup>a</sup> on the board *a* is likewise a subscriber's contact and is connected by wire *k* with the subscriber's instrument c''. The subscriber's contact 3 on the board A is to the right of the signal-contact F and corresponds to the contact 3<sup>a</sup> to the right of the contact *f* on the board *a*. The contact 9 on board A is connected with contact 3, as are also contacts 2<sup>B</sup> and 4<sup>A</sup>, corresponding to contacts 2<sup>b</sup> and 4<sup>a</sup> on the board *a*. The contact 10 on board A between contacts 9 and 2<sup>B</sup> is a dead-contact. On the board *a* the contacts 9' and 10', corresponding to contacts 9 and 10, are dead-contacts, while the contact 2<sup>b</sup> is connected with contact 2<sup>a</sup> and the contact 4<sup>a</sup> is connected with 4'. Next to the contact G are three dead-contacts 4<sup>B</sup>, 11, and 12, while on the board *a*, next to the contact *g*, are the contacts 4<sup>b</sup>, 11', and 12', of which contact 11' is connected with a subscriber's contact 4<sup>b</sup>, while the contact 12' is dead. A wire *i* connects the contact 4<sup>b</sup> with the subscriber c'. On the board A, next to the contact 12, is a contact 1<sup>B</sup>, which is connected with the contacts 1 and 1<sup>A</sup>, while between the contacts 1<sup>B</sup> and D is a contact 3<sup>A</sup>, which is connected with contacts 3 and 3<sup>B</sup>. It will thus be seen that on the board A all of the contacts 1, 1<sup>A</sup>, and 1<sup>B</sup> are electrically connected, as also the contacts 3, 3<sup>A</sup>, and 3<sup>B</sup>, these being the main contacts for the subscribers C' and C''. On the board *a* the contacts 2', 2<sup>a</sup>, and 2<sup>b</sup> are connected, while contacts 4', 4<sup>a</sup>, and 4<sup>b</sup> are connected.

At the center of each dial is a shaft 15 and 15', respectively, the two shafts carrying hands 16 and 16', having circuit-closing brushes or contact-fingers at their free ends, which engage the contacts successively as the hands are rotated over the faces of their respective dials. Each of the shafts referred to is provided with an escapement-wheel 17, with which is engaged an escapement-lever 18, carrying a polarized armature 19 in the field of force of an electromagnet 20, so that when the magnet is energized by an alternating current the escapement-lever will be vibrated to permit rotation of the shaft 15 under the influence of the weight 21, suspended from the cord 22 wound upon the shaft. The electromagnets 20 are connected between the hands and the ground, while connecting the hands of the two instruments is a line-wire 23. From the hand 16 leads a main line-wire 24 to the operator's station 25 or

central, while from the hand 16' leads a main line-wire 26, which may extend to a third switchboard or any other instrument at a distant station. At station C'' is a transmitter 30, one terminal of which is connected through the primary coil 31 of an induction-coil and through a local battery 32 to the ground. The second terminal of the transmitter 30 is connected by a wire 37 with the contact-point 38, which is engaged by the lever or receiver-hook 39 when the receiver is in use, said lever 39 having the wire K connected thereto. A receiver 40 is connected with the secondary winding 41 of the induction-coil, so that when the receiver is off of the hook and the lever 39 is in engagement with the contact 38 conversation may be held over the wire K. Upon the lever 39 is an insulating-block 46, on which is a contact-plate 47 for engagement with the two contact-points 48 and 49 when the receiver is on the hook, the wire H being broken and having its ends connected to the points, as shown, so that when the receiver is from the hook the circuit of the wire H between the instruments C'' and C' is broken. From the contact 48 the wire H extends to the spring-finger 45 at the subscriber's instrument C', a branch wire H' being connected with a switch-point 50, which is disposed for engagement by a hook-lever 51, connected with the wire I.

At central is a source M of alternating currents, which are passed over the main line and which energize the two magnets 20 simultaneously, so that the hands 16 and 16' traverse the dials in unison to engage corresponding points of the dials.

Below the hook-lever 39 and in position for engagement thereby when the receiver is removed therefrom is a contact 52, which is connected with that portion of the wire H connected to the contact 49.

At the subscriber's station C' is a transmitter 53, connected through the primary winding 54 of an induction-coil and battery 60 with the ground, said transmitter being also connected with the contact 55, which is engaged by the lever 51 when the receiver is removed therefrom. At the same time the lever 51 engages the contact 50, and as the wire I is connected with the lever 51 said wires H' and I are connected in multiple with the transmitter 53. In the path of the movement of the lever 51, under the influence of the weight of the receiver, is a contact 56, connected with the magneto 57 and connected also through the bell 58 with the ground.

Supposing that subscriber C' wishes to talk with C'', it being understood that the hand 16 is normally on one of the signal-contacts D, E, F, or G, the subscriber operates the magneto 57 and the current passing over the line H and through the contact-strip 47 to the point F passes thence to the hand 16 and to the operator who is rung up. The subscriber C' then removes his receiver from his hook 51, which latter engages the contact 50, and

places his transmitter in circuit with the signal line or wire H. He then converses over the signal-wire and tells the operator that he wishes to talk to the subscriber at C'. The operator then moves the hand 16 to 3 and rings up C' over his wire K. Subscriber at C' removes his receiver from the hook and entering into conversation with the operator at central is notified by the operator that C' wishes to talk to him. The operator then returns the hand 16, so that it rests upon the point 5 and the point 5<sup>A</sup>, which is in radial alinement therewith, thus electrically connecting points 5 and 5<sup>A</sup>. The subscriber C' having removed his receiver from the hook, the lever 39 is in engagement with the contacts 38 and 52 and carries the strip 47 out of contact with the points 48 and 49. At this time the transmitter 30 is in circuit with the wire H through the wire 37, contact 38, lever 39, and contact 52 and that portion of the signal-wire H between the two subscribers' stations is cut out. The two subscribers are then in a talking-circuit which includes the wire I, points 1, 5, and 5<sup>A</sup>, the contact F, and the wire H and the ground. Supposing that the subscriber C' wishes to talk to some one on the line 26 beyond the board *a*, he calls up the central operator in the manner hereinbefore described, using the signal-wire H, and the operator moves the hand 16 to the point 1 and the hand 16' to the point 1'. The point 1 connects the subscriber with the line 23 through the hand 16, and the hand 16' being on a dead-point no current can pass from said hand 16', but passes onto the line 26 and through said line to the distant instrument.

It will be noted that with this apparatus when any one subscriber is conversing with another subscriber no one can hear any portion of the conversation excepting the person with whom conversation is had and the operator at central. Furthermore, when talking with central no other subscriber can hear the conversation.

The apparatus at *c'* is a duplicate of that at C', while the apparatus at *c''* is like that at C'. If the subscriber at C' wishes to talk with the subscriber at *c''*, he operates his magneto and the current traverses the signal-wire H, and the hand 16 being normally at one of the signal-contacts the current passes through said hand to the wire 24 to the operator's instrument and he is rung up. The subscriber at C' then takes down his receiver and his transmitter is cut into circuit with both wires H and I, but the hand 16 being on a signal-contact, such as D, there can be no flow of current along the wire I, and conversation is hence held with the operator over the signal-wire H. The subscriber then tells central that he wishes to talk with the subscriber at *c''*, and the operator then sends a sufficient number of alternations of current over the line 24 and through the magnet 20 and over the line 23 and through the magnet of the board *a* to cause the hand 16 to move

to the contact 2 and the hand 16' to move to the contact 2'. When the hand 16 moves from the contact D, the circuit of the signal-wire H is broken, and inasmuch as the contact 1 of the switchboard A is connected with the contact 2 the current will pass from station C' over the wire I to contact 1, to contact 2 through the hand 16 and wire 23 to hand 16', and thence to point 2', to point 2<sup>a</sup>, to wire *k*, to the instrument at the subscriber's station *c''*. When the subscriber at C' begins conversation with central or with any subscriber, as soon as the receiver is taken from the lever 39 the latter is operated and moved from contacts 48 and 49 to cut out that portion of the wire H at the opposite side of subscriber C' from the board A, so that the subscriber at C' cannot use the signal-wire, and hence cannot hear any portion of the conversation. Should the subscriber at C' attempt to listen to the conversation between C' and the central operator over the wire H, he would of course have to remove his receiver and the lever 39 would immediately be operated to cut C' off from the wire H. In any event one subscriber cannot overhear the conversation of another subscriber that is not intended for him.

It will be noted that for sending alternate currents from the main line a simple form of lever O is employed, above and below which are arranged pairs of contacts O' and O'', respectively. The contacts O' are connected directly with the instrument 25 at central, while the contacts O'' are connected directly to the main-wire line 24, leading to the subscribers. The contact O' at the left is connected to the contact O'' at the right, and the contact O' at the right is connected to the contact O'' at the left. The lever O has its end portions insulated from each other and connected with the corresponding terminals of the battery P. As the lever O is rocked it connects the battery reversely between the instrument 25 and the wire 24.

It will be noted that the magnets 20 are in multiple between the instrument 25 at central and the ground. The magnets are so wound that the resistances of the circuits of the magnets are substantially the same, and they will therefore be operated simultaneously. At central is an ordinary telephone instrument, as illustrated, which is normally connected between the instrument 25 and the switchboards, so that when a subscriber calls up central the bell of the instrument at central will be sounded and conversation may be had with central, so that directions may be given for connecting the subscriber with the proper other subscriber. When central has been notified of the subscriber wanted, he operates the switch 75 so that his telephone instrument is cut out of the circuit and the lever O and its mechanism is cut into circuit and may be then operated to energize the magnet 20 and operate the hands 16 and 16'. It is of course understood that the hand or index of the instrument 25 is likewise pro-

vided with a mechanism including a lever, an armature, and a magnet, so that all three indexes or hands will travel synchronously.

The magnetos used for calling up central 5 and for calling up the subscribers are continuous-current magnetos, so that in calling up the escapement mechanisms of the switchboards are not effected, but are only effected when alternating currents are transmitted— 10 as, for instance, when the lever O is operated at central. With the wiring shown if the subscribers were provided with alternating magnetos they would when operated actuate the escapement mechanism and send the indexes over the dials.

What is claimed is—

1. In a system of the class described the combination with a plurality of subscribers' stations, a line-wire for each subscriber's station, and a central operator's station, of a switchboard comprising a plurality of contacts for each subscriber's station and with which said subscriber's line-wire is connected, a signal-wire common to all of the subscribers' instruments, a plurality of contacts on the switchboard with which said signal-wire is connected, a return, means for connecting each subscriber's line-wire in multiple with the signal-wire between the switchboard and the return, and an operator's wire, said switchboard including a contact-arm with which the operator's wire is connected, said arm being adapted to contact with certain of the signal-wire contacts and certain of the subscriber's-wire contacts individually, and to engage a signal-wire contact and a subscriber's-wire contact simultaneously.

2. In a system of the class described the combination with a plurality of subscribers' stations, a line-wire for each subscriber's station, and a central operator's station, of a switchboard comprising a plurality of contacts for each subscriber's station and with which said subscriber's line-wire is connected, a signal-wire, common to all of the subscribers' instruments, a plurality of contacts on the switchboard with which said signal-wire is connected, a return, means for connecting each subscriber's line-wire in multiple with the signal-wire between the switchboard and the return, an operator's wire, said switchboard including a contact-arm with which the operator's wire is connected, said arm being adapted to contact with certain of the signal-wire contacts and certain of the subscriber's-wire contacts individually, and to engage a signal-wire contact and a subscriber's-wire contact simultaneously, and means for cutting off the remote subscribers from connection

with the switchboard through the signal-line, when an instrument nearer to the switchboard is operated.

3. A system of the class described comprising a plurality of switchboards each including a dial and a contact-hand adapted to traverse the dial, an operator's instrument connected directly with all of the hands, a plurality of subscribers' stations for each switchboard, a line-wire for each subscriber's station, a plurality of contacts on each switchboard for each subscriber's station and with which said subscriber's line-wire is connected, a signal-wire common to all of the subscribers' instruments of each switchboard, a plurality of signal-contacts on each switchboard with which the signal-wire of that board is connected, a return, means for connecting each subscriber's line in multiple with the corresponding signal-wire between the switchboard and the return, the arm of the switchboard being adapted to contact with certain of the signal-wire contacts and certain of the subscriber's-wire contacts individually and to engage a signal-wire contact and a subscriber's-wire contact simultaneously.

4. A system of the class described comprising a plurality of switchboards each including a dial and a contact-hand adapted to traverse the dial, an operator's instrument connected directly with all of the hands, a plurality of subscribers' stations for each switchboard, a line-wire for each subscriber's station, a plurality of contacts on each switchboard for each subscriber's station and with which said subscriber's line-wire is connected, a signal-wire common to all of the subscribers' instruments of each switchboard, a plurality of signal-contacts on each switchboard with which the signal-wire of that board is connected, a return, means for connecting each subscriber's line in multiple with the corresponding signal-wire between the switchboard and the return, the arm of the switchboard being adapted to contact with certain of the signal-wire contacts and certain of the subscriber's-wire contacts individually and to engage a signal-wire contact and a subscribers'-wire contact simultaneously, and means for progressing the hands of the switchboards simultaneously to engage corresponding contacts.

In testimony whereof I affix my signature in presence of two witnesses.

WAYNE C. WRIGHT.

Witnesses:

GEO. W. CHANDLER,  
ALFRED B. DENT.