

(No Model.)

3 Sheets—Sheet 1.

A. B. STROWGER.  
AUTOMATIC TELEPHONE EXCHANGE.

No. 447,918.

Patented Mar. 10, 1891.

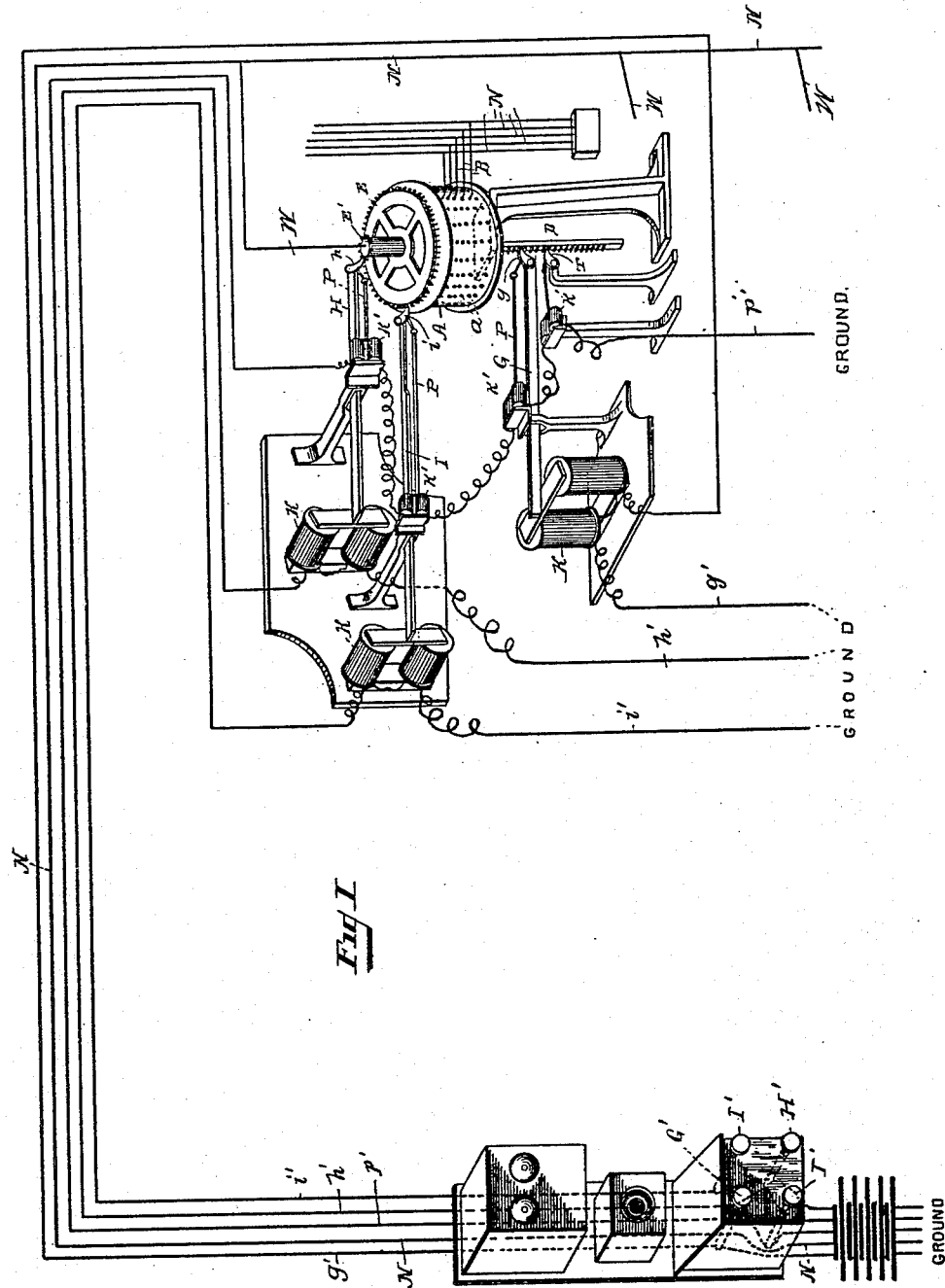


Fig 1

Witnesses:

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A. M. Strowger.

Inventor:

Almon B. Strowger

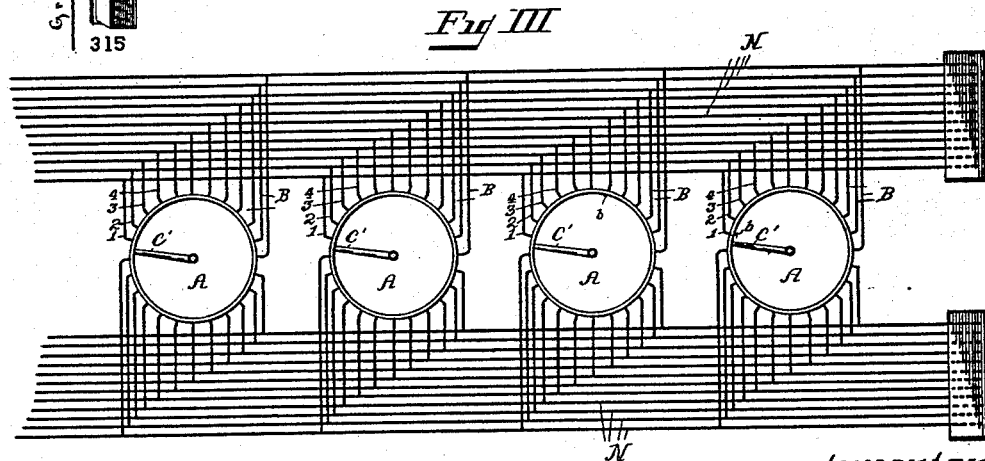
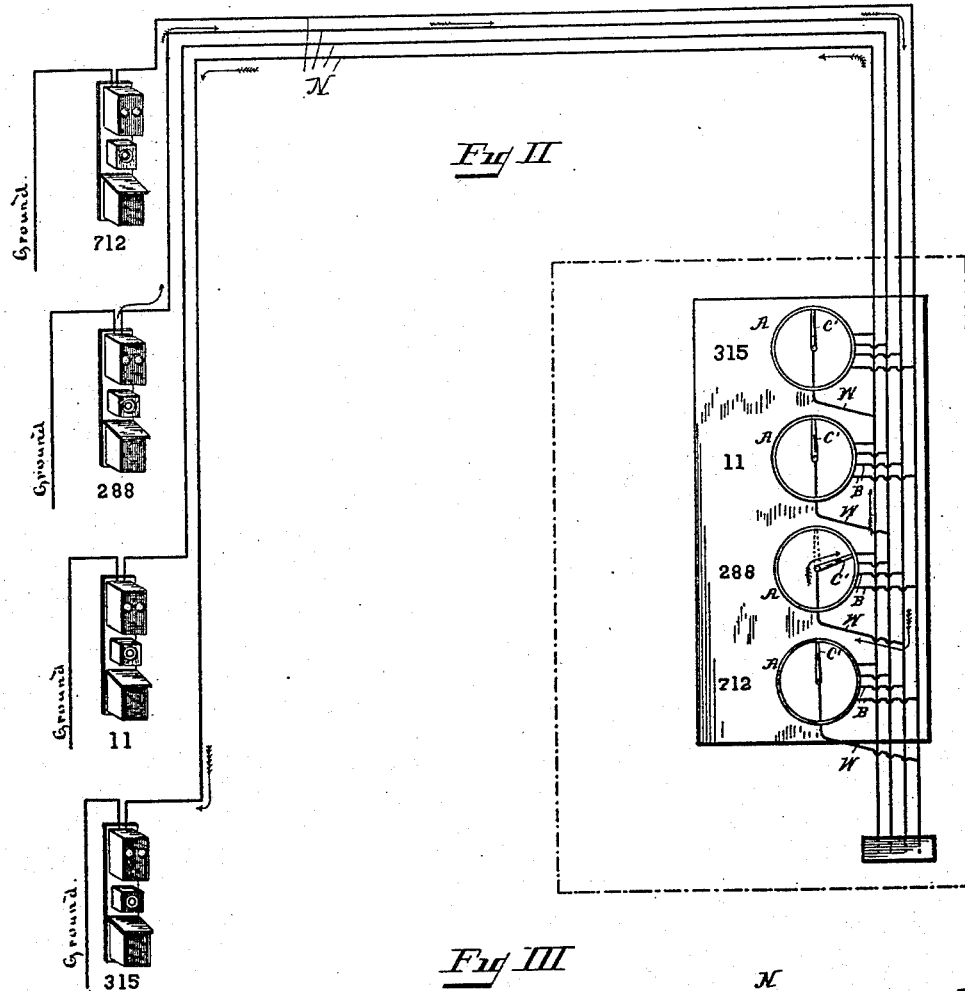
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Fig. IV.

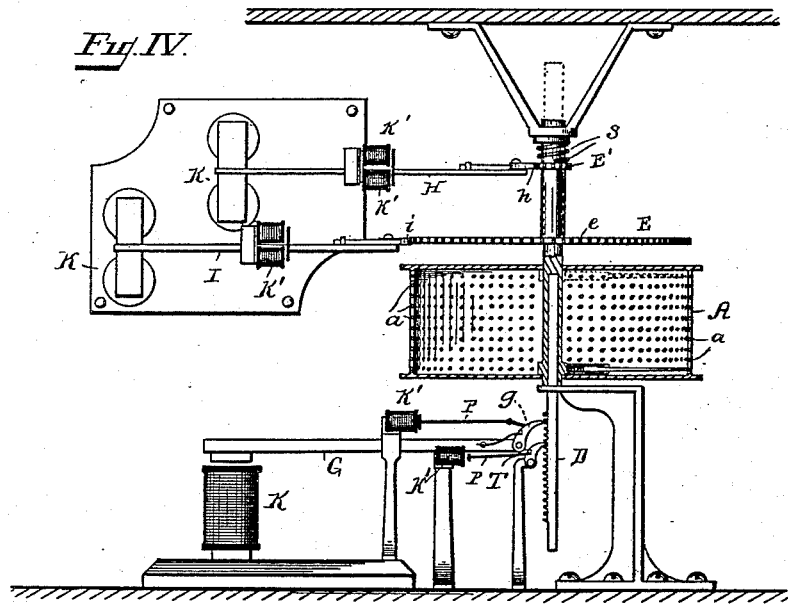


Fig. V

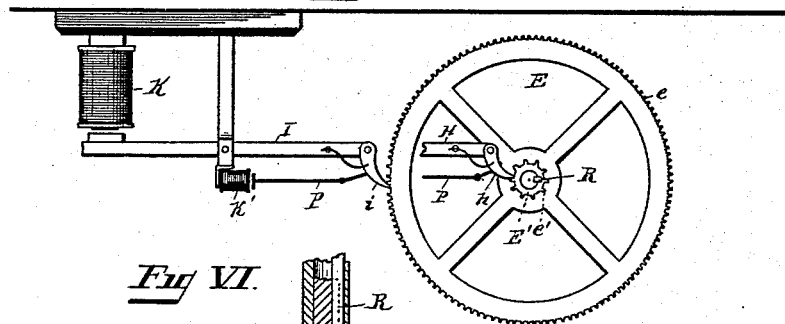
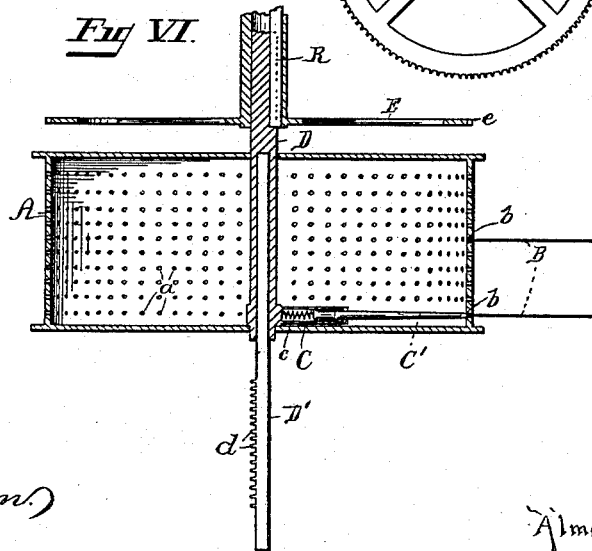


Fig. VI.



Witnesses

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# UNITED STATES PATENT OFFICE.

ALMON B. STROWGER, OF KANSAS CITY, MISSOURI.

## AUTOMATIC TELEPHONE-EXCHANGE.

SPECIFICATION forming part of Letters Patent No. 447,918, dated March 10, 1891.

Application filed March 12, 1889. Serial No. 303,027. (No model.)

*To all whom it may concern:*

Be it known that I, ALMON B. STROWGER, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Automatic Telephone-Exchanges; 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.

My invention relates to an improvement in automatic, telephonic, telegraphic, and other electrical exchanges.

The object is to provide means whereby a person at one station may make connection with any other station in the system, by the aid of electrical appliances, without the assistance of an operator at the central station.

A further object is to provide means of the above character which shall be reliable and adapted to general use.

With these ends in view my invention consists in certain features of construction and combination of parts, as will be hereinafter described and pointed out in the claims.

The same general plan is adopted as in the systems now in use, in that of having a principal or central station, (central office,) and a number of sub-stations, the said sub-stations being placed in electrical connection with each other at the central office by and through line-wires, which line-wires, for the sake of brevity, will be designated "phonic" wires, (introducing the ancient obsolete form,) but differ in that of having, in addition to the said phonic wires, a series of wires (one or more) to operate the hereinafter-described mechanisms located at the central office. At the sub-stations are the appliances which are used to transmit and receive communication, as telephones and keys. At the central office are arranged in methodical order as many switch-cylinders, with their attendant mechanisms, as there are sub-stations. The above-mentioned phonic wires trend within the central office in close proximity to each cylinder. From each phonic wire and attached thereto wire terminals, connectives, or "legs" extend to the inside of each cylinder, there being as many connectives attached to each phonic wire as there are sub-stations.

With this brief outline, I will proceed to more fully describe my invention and elucidate its workings by the aid of the accompanying drawings.

Figure I represents in a perspective view my invention, showing at a distant sub-station one telephone and its exchange device at the central office, also the main-line wires connecting the central office with the sub-station. Fig. II represents four of such devices as is represented by Fig. I, showing the manner in which the cylinders are connected, also the trend of the electrical current from one sub-station to another through the central office. Fig. III is a plan view of a series of cylinders, line-wires, and connectives, showing the normal position of the circuit-closers. Fig. IV is a sectional view showing the magnets, levers, and pawls by which the device is operated. Fig. V is a detail view of the ratchet-wheels and pawls for operating the same. Fig. VI is a sectional view of the cylinders, showing more clearly the construction of the circuit-closer and feather-and-groove attachment.

Referring to the drawings by letter, A represents a hollow cylinder constructed of glass, wood, or any other suitable substance which is a non-conductor of electricity, supported in any well-known or approved manner. The cylinders are provided with perforations *a*, arranged in transverse and vertical rows.

B represents the wire connections extending from the inside of the cylinder through the perforations *a* to the main-line wires N and is attached thereto. Their use is to conduct the electricity, when in contact with the circuit-closing needle C C', to and via the line-wires N to the desired sub-station. The terminals of said connectives within the cylinder are shown at *b*, Fig. VI. In this last-named figure the circuit-closing arm is represented in parts, in which C is the circuit-closing sleeve and is firmly attached to the lower end of the sleeve-rod D. Within this circuit-closing sleeve is closely fitted the circuit-closing needle C', held in such a manner as to be in perfect electrical contact with the wire-terminal *b* by the spring *c*. The rod D, (see Fig. VI,) is located along the axle-line of the cylinder and is free to rotate and move longitudinally. The lower end of the

rod D is sleeved, into which is inserted the upper portion of the ratchet-rod D'. This sleeve construction between the rods D and D' allows the ratchet-rod D' to have a longitudinal motion only, thereby keeping the ratchet-teeth *d* continuously toward its attendant pawl.

The ratchet-rod D' is provided outside of the cylinder A and conveniently below it with a series of ratchet-teeth *d*, by means of which the rods D and D' are moved longitudinally. The wheels E and E', through the hub of which the rod D extends with a feather-and-groove connection R, (see Fig. VI,) so as to cause the rotation of the rod D and at the same time admit of its longitudinal sliding movement therein, are provided on their peripheries with a series of ratchet-teeth *e* and *e'*, by which the rod D is rotated, and with it the circuit-closer C and C'.

G H I represent levers having pawls *g h i* pivoted in their ends in position to engage the ratchet-teeth, with which they are respectively in contact. Each lever has a vibratory movement and is oscillated by the alternate energizing and de-energizing of their respective magnets, thereby imparting motion to its adjacent ratchet-teeth and consequently the circuit-closing needle C'. At each pulsation of the push-button at the sub-station made at the will of the operator causes, through the channels thus described, the circuit-closing needle C' to move from row to row and from wire to wire in the row. When only three levers are used, the dog T (see Figs. I and II) would be necessary. Its use is obvious.

The magnets K K K are located in suitable positions that when energized by the manipulation of certain keys at the sub-station, operate their respective levers. A set of magnets K' K' K' K' are also located in suitable positions, that when energized their respective levers P serve to release the pawls from their engagement with the ratchet-teeth and allow the circuit-closing needle C C' to assume the initial position by the aid of gravity and the spring S. At each sub-station there is a set of keys marked, respectively, G', H', I', and P'. Each key is connected by wire with its respective lettered magnet at the central office, and when pressed an electrical circuit is established, it being understood that both ends of the wire are grounded or connected with a return-tap, it also being understood that a battery is used to generate the electricity and may be located at the sub-station between the keys and the ground. The line-wire N extends from the telephone to and within the central office, there connected by the circuit-closing connective wire W to the circuit-closing needle C, and also by connective B to the inside of each cylinder.

Each perforation *a* of the cylinder A is numbered with respect to an initial or starting point on the cylinder—for example, in rows numbered 1 2 3 4, &c.—from the lower

end of the cylinders upwardly, and by places in each row—as, for example, 1 2 3 4 &c.—to the right or left of a given vertical row, so that, supposing there were one hundred perforations in each of the rows, No. 310 would be in the third row from the bottom, ten spaces to the right or left of the vertical initial line.

Each connective wire B and phonic line-wire N, Figs. II and III, with which the connections are attached, is also numbered to correspond with the number of the perforations *a*, through which the terminals extend.

The person wishing to place his transmitter and earphone in connection with those of another, he will do so by successively pressing or depressing the keys, which cause the circuit-closer C C' to move. For example, if telephone 288 wishes to place himself in connection with telephone 315 he will do so by pressing the key marked G' three times, then the key marked H' once, and then the key marked I' five times. Its circuit-closer C C' is then in contact with wire-terminal No. 315. In Fig. II sub-station No. 288 is represented as being in connection with sub-station No. 315. This is known by the positions of the circuit-closer C of cylinder No. 288, the course of the electrical current being indicated by arrows. Had its circuit-closer C been turned to the next wire indicated in the drawings, 288 would be in connection with 11. The person at telephone 315 will take down his earphone. The two are then able to converse with each other. When conversation is ended, the person calling up hangs up his earphone, depresses key marked P', which causes the magnets K' to be energized, attracting the armatures, thereby withdrawing the several pawls from their engagement with the ratchet-teeth and allow the circuit-closer C C' to fall and return to its initial point.

If a person has called up the wrong number, he will push the key marked P' and start over again.

The size of the cylinder A will depend solely upon the number of wires required in the system and the distance apart which it may be found most expedient to place them; and it is also evident that various slight changes might be resorted to in the mechanical construction of the several parts which I have described without materially departing from the spirit and scope of my invention, and hence I do not wish to be limited strictly thereto.

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

1. In a system of telephone, telegraph, or other electrical exchange, the combination, with a series of wires leading to different stations in the system and having their ends insulated and held in curved rows, of a contact-needle supported at the axis of the rows, mechanism for moving the needle from row

to row, mechanism for moving the needle along the row, magnets for actuating said mechanisms, and wires leading from a sub-station for conducting electricity to energize  
5 the said magnets, substantially as set forth.

2. In a system of electrical exchange, the combination, with an insulating-cylinder, a system of wires having their ends extending to the inside of the cylinder, and a rotary and  
10 longitudinally-movable rod located at the axis of the cylinder, of a contact-needle attached to the rod, levers for moving the rod longitudinally, levers for rotating the rod, magnets for actuating the levers, and means for  
15 energizing the magnets at pleasure, substantially as set forth.

3. In a system of electrical exchange, the combination, with an insulating curved surface, a system of wires having their ends extending to and through said surface to the  
20 concave surface thereof, and a rotary and longitudinally-movable rod located at the axis of curvature, of a contact-needle fastened to the rod, levers for moving the rod longitudi-  
25 nally, levers for rotating the rod, magnets for vibrating the lever, and means for energizing the magnets at pleasure, substantially as set forth.

4. In a system of electrical exchange, the combination, with an insulating-cylinder, a  
30 system of wires having their ends extending to the inside of the cylinder, and a rotary and longitudinally-movable rod located at the axis of the cylinder, of a sleeved arm fastened to the rod, a contact-needle, levers for mov-  
35 ing the rod longitudinally, levers for rotating the rod, magnets for actuating the levers, means for pressing the needle outwardly, and means for energizing the magnet at pleasure, substantially as set forth.

5. In combination, the set of wires having their ends secured in a cylinder, the cylinder, the rod at the axis of the cylinder, the pieces fastened to the rod, the levers provided with  
40 pawls pivoted thereto for actuating the rod, the magnets for actuating the levers, the magnets for actuating the pawls, the keys at the sub-station, and the wires connecting the keys with the actuating-magnets, substan-  
45 tially as set forth.

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

ALMON B. STROWGER.

Witnesses:

BESSIE E. YOUNG,  
P. C. PHILLIPS.