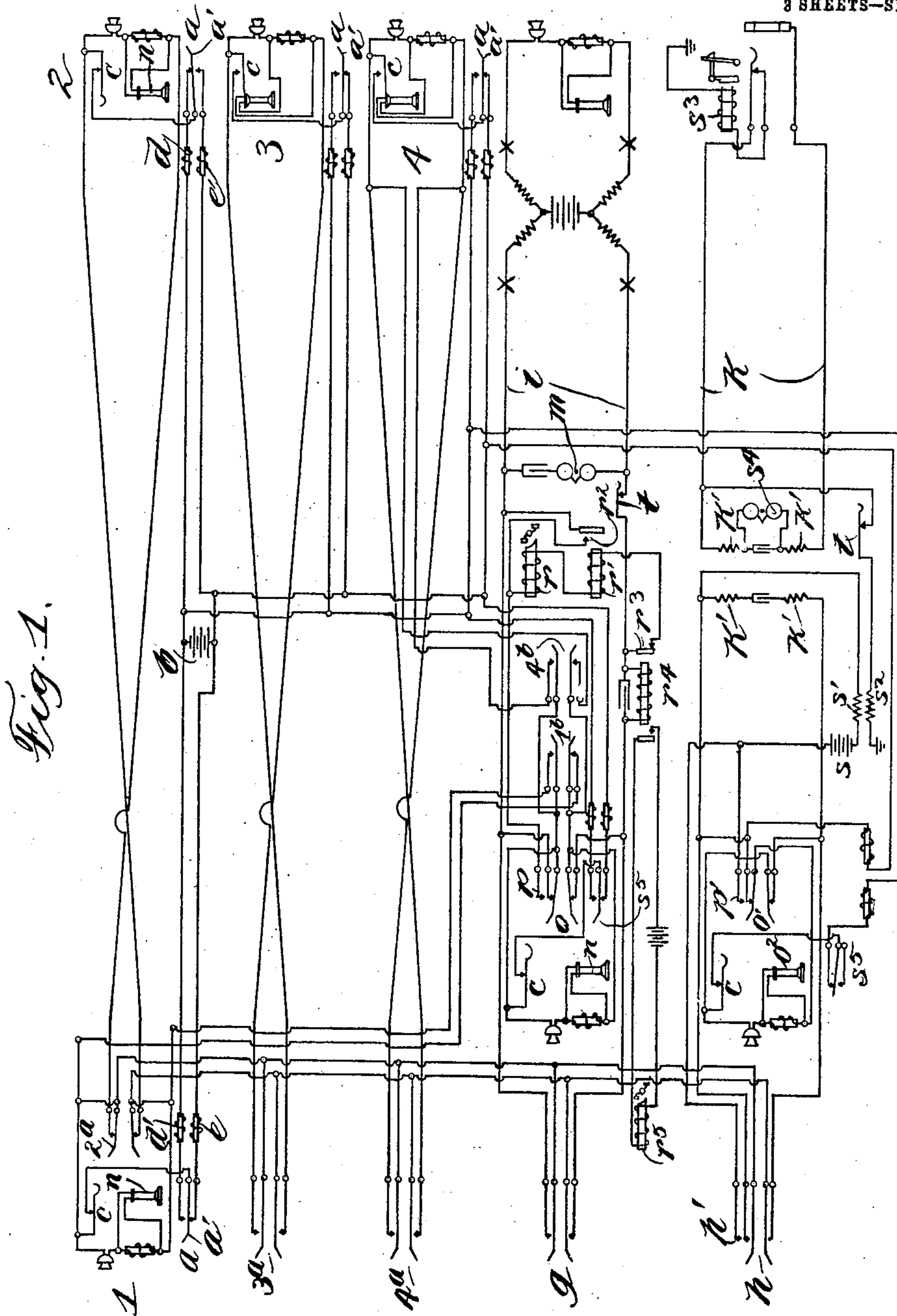


W. A. FRICKE.  
TELEPHONE EXCHANGE SYSTEM.  
APPLICATION FILED APR. 11, 1908.

925,573.

Patented June 22, 1909.

3 SHEETS—SHEET 1.



WITNESSES:

*L. E. Stroh*  
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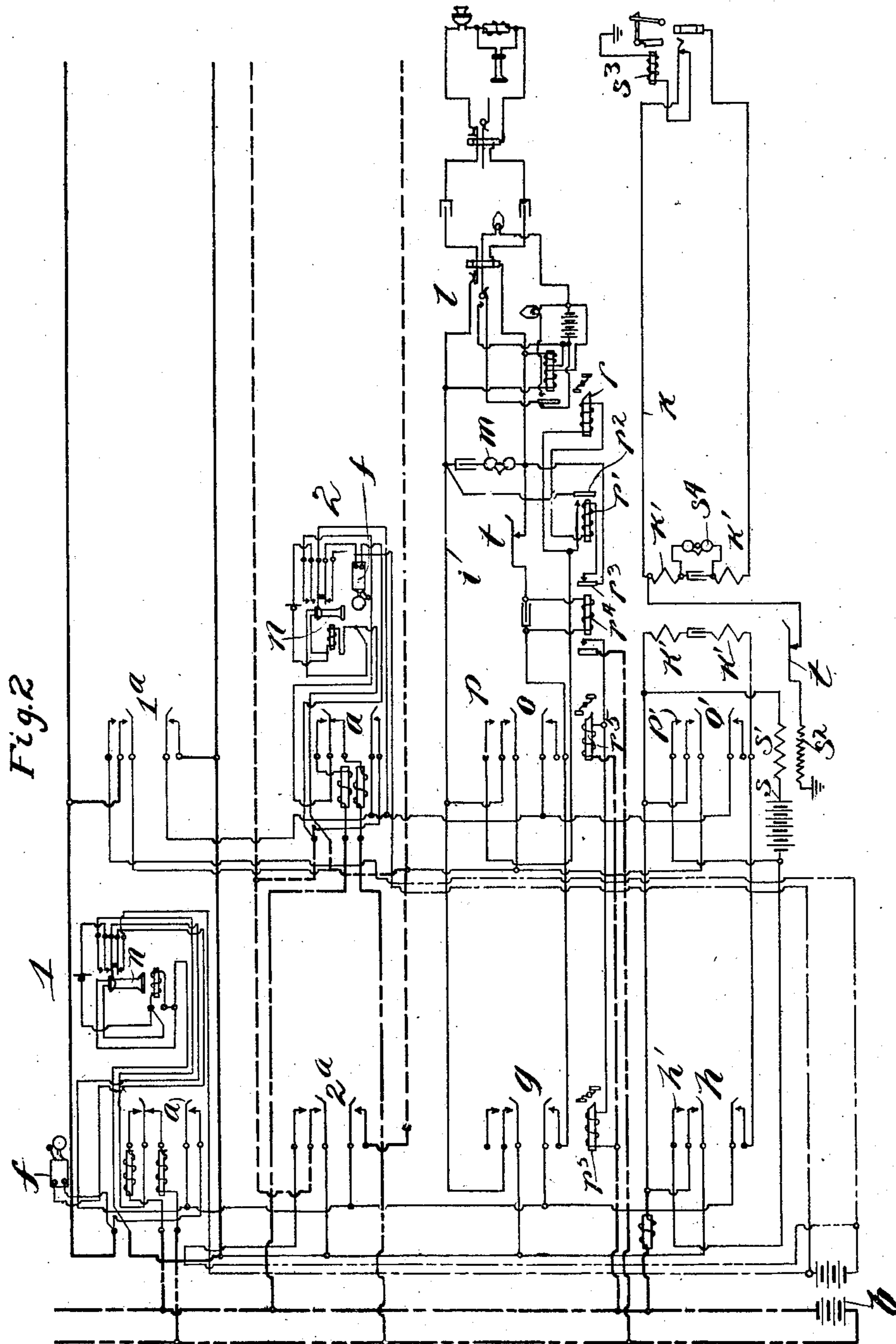
ATTORNEY

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3 SHEETS—SHEET 2.



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8 SHEETS—SHEET 3.

Fig. 3.

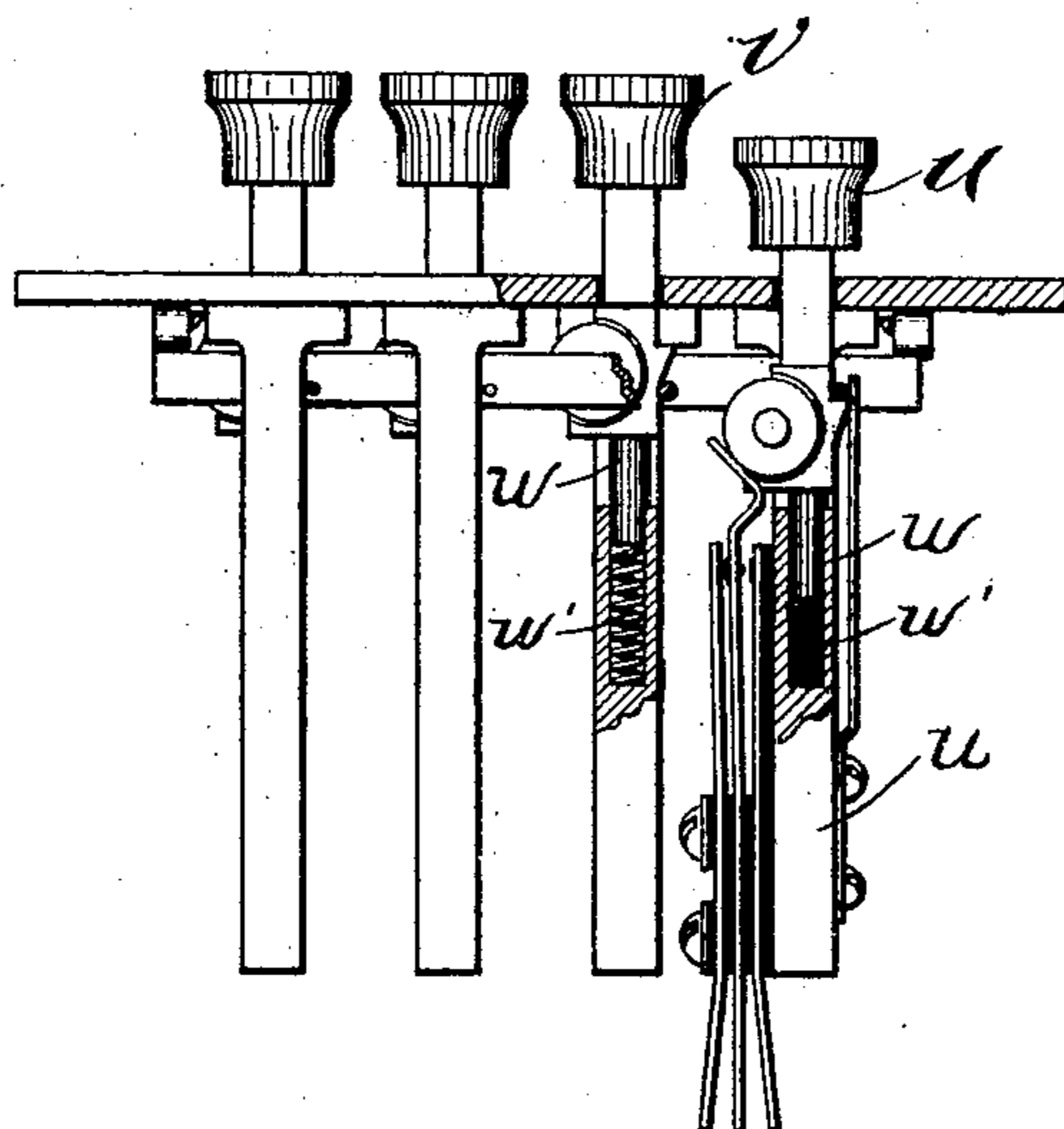


Fig. 4.

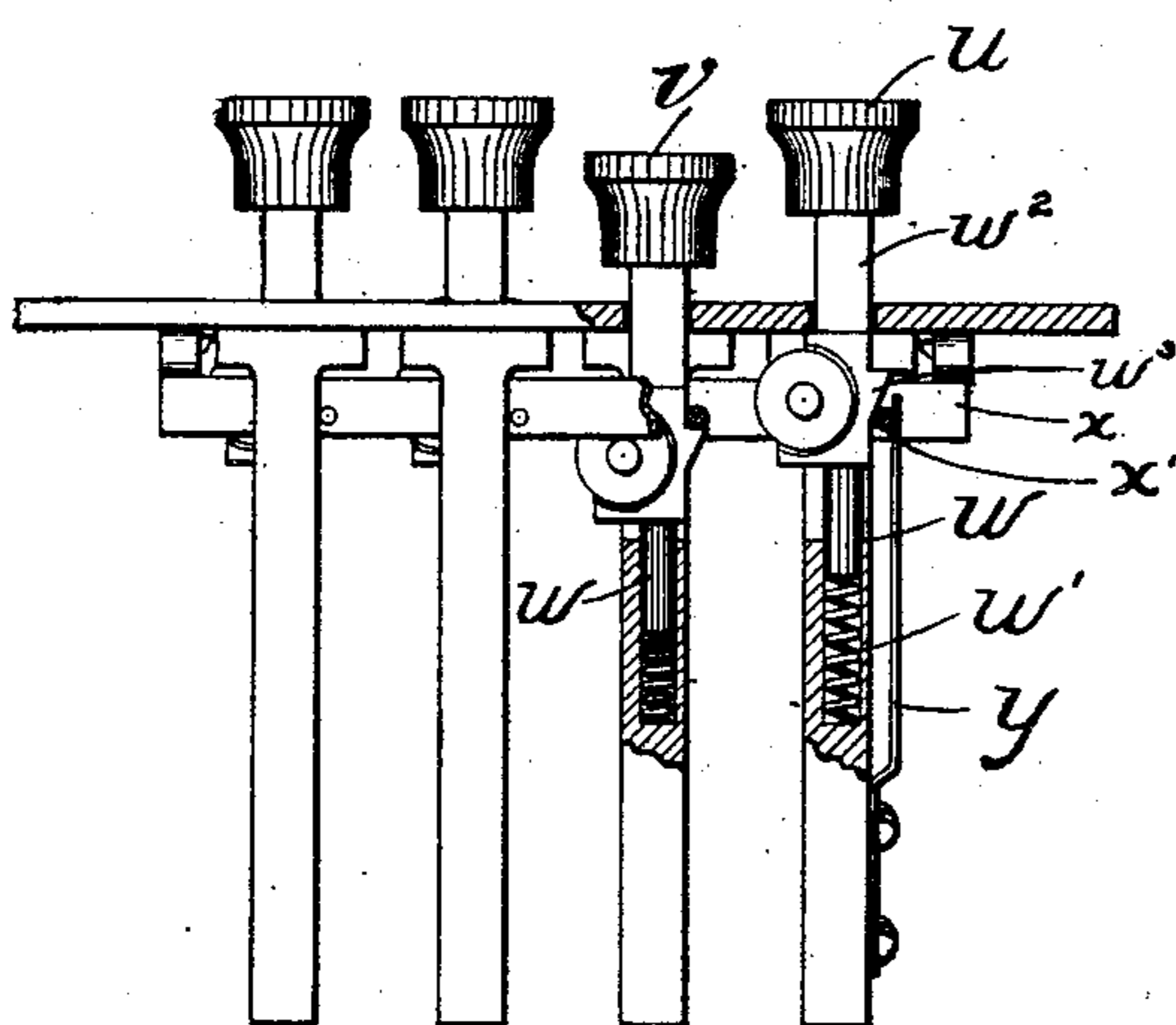
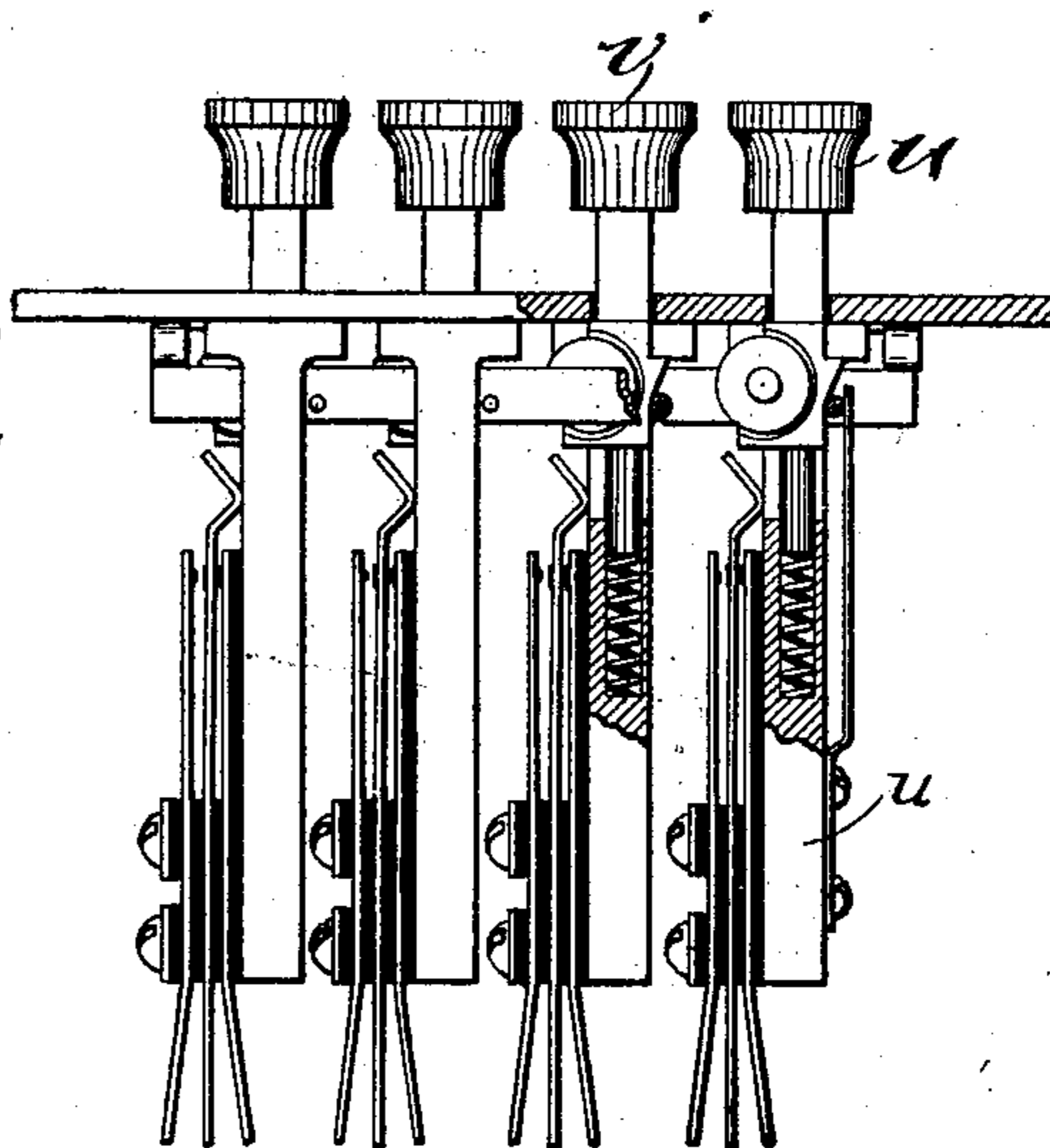


Fig. 5.



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# UNITED STATES PATENT OFFICE.

WILLIAM A. FRICKE, OF CHICAGO, ILLINOIS, ASSIGNOR TO MONARCH TELEPHONE MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## TELEPHONE-EXCHANGE SYSTEM.

No. 925,573.

Specification of Letters Patent.

Patented June 22, 1909.

Application filed April 11, 1908. Serial No. 426,575.

*To all whom it may concern:*

Be it known that I, WILLIAM A. FRICKE, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Telephone-Exchange Systems, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to telephone systems and finds its preferred embodiment in telephone systems known as interior telephone systems or house telephone systems.

As is well known to those skilled in the art, interior telephone systems have been devised by which any one of a number of sub-stations could be connected with any other of the sub-stations of the interior system, by means of switching mechanism whose operation is effected at the sub-stations. To this end, it has hitherto been the practice to provide what has been termed a home button or switch peculiar to its station and calling switches or buttons equal in number to one less than the total number of sub-stations in the system. If a person at a sub-station desired to communicate with a person at one of the other sub-stations, he would depress the calling key corresponding to the sub-station to be called, whereupon a signal device at the called station would be set into operation. A person responding to this call would operate his home station key or switch, which was so mechanically inter-related with the calling keys at the same station that the operation of the home key would re-set to normal any of the calling keys that might previously have been actuated to a calling position, and the operation of any calling key would set back to normal the associate home key or any other previously operated calling key associated therewith. It is understood that the calling party's home button or key is in normal position, or, if not, it is placed in a normal position by the calling key which the calling party actuates. It is also understood that the home keys at all other stations when such stations are not called, may be at normal position, but that when a station is called, the home key is placed in its alternative position when the call is responded to, whereupon said home key effects the restoration to normal of any calling key which may

previously have been set to a calling position.

Specifically speaking, features of my invention are improvements upon systems of this character.

Hitherto the only control exercised over the common battery was effected by the switch-hooks at the different sub-stations of the system, so that, by the proper operation of any switch-hook, it was hitherto at all times possible to include the common battery in circuit with the transmitter at the station having such switch-hook.

By means of my invention, I cause the home keys or buttons to take part in the control of the application of the battery to the transmitters and telephone lines, in addition to their function of resetting the calling keys associated therewith, so that it will be necessary for the home keys to occupy predetermined positions, in order that the switch-hooks, when released, may effect the application of battery to the lines.

By means of my invention, I am enabled to employ a lesser number of retardation coils in each existing telephonic connection and am enabled to avoid the damage that was hitherto possible upon the occasion of short circuits, for in interior telephone systems as hitherto devised there was no means of determining the presence of short circuits, except the failure of the system to operate. Short circuits when placed upon the telephone lines, obviously would enable the common battery quickly to run down, which unnecessary loss of battery I am enabled to avoid by means of my invention.

My invention further contemplates the provision of improved means whereby any station of an interior system may be brought into connection with any station not included within the interior system, such as a subscriber's station of a telephone switch-board exchange system.

I will explain my invention more fully by reference to the accompanying drawings, showing the preferred embodiment thereof, in which—

Figure 1 is a simplified diagrammatic view illustrating my invention. Fig. 2 is a diagrammatic view somewhat more in detail, of the embodiment of my invention illustrated in Fig. 1. Fig. 3 is a view in elevation, partially in section, of a bank of keys such as may be employed in the prac-

tice of my invention. Fig. 4 is a view generally similar to Fig. 3, a different key, however, being depressed. Fig. 5 is a view similar to Figs. 3 and 4, none of the keys being depressed.

Like parts are indicated by similar characters of reference throughout the different figures.

In Fig. 1, I have illustrated stations 1, 2, 3 and 4, regularly forming part of an interior system, a home key or switch  $a$  being provided at each station. In association with station 1 I have shown three calling keys  $2^a$ ,  $3^a$  and  $4^a$  employed for calling stations 2, 3 and 4, respectively, the signals being omitted from Fig. 1, however, inasmuch as an illustration thereof is not essential to an understanding of my invention. It is understood that there are three calling keys for station No. 2, three calling keys for station No. 3, and three calling keys for station No. 4, these calling keys not being illustrated in order to relieve the drawing of complication. Thus there are provided at each regular station of the interior system, a number of calling keys equal to one less than the total number of stations regularly forming parts of the interior system, in addition to the home key at each of said stations. The keys at each of the sub-stations are mechanically inter-related as illustrated in Figs. 3, 4 and 5, whereby an operation of any one of the keys in a group will effect the restoration of any other previously actuated key of such group. The description of such mechanical inter-relation of these switches will be furnished hereinafter, it being sufficient for present purposes generally to state that these switches have the mechanical inter-relation stated.

A talking battery  $b$  has its lower terminal normally in connection with similar switch-hook contacts at the different sub-stations, those contacts, in the embodiment of the invention shown, that are out of connection with the switch-hooks when said switch-hooks support the receivers. The home keys, in their normal positions, effect such connection of the lower pole of the battery  $b$  with said switch-hook contacts, the spring  $a^1$  of each home key normally resting against a normal contact, which spring and contact are in serial relation with each other and with the battery and the aforesaid switch-hook contact. The upper terminal or pole of the battery  $b$  is connected with the alternate contacts of the different home keys or switches  $a$  and normally has no connection with any telephone line.

When a home key is moved from its normal to its alternate position, the spring  $a^1$  thereof, instead then of being connected with the lower terminal of the battery  $b$ , is connected with the upper terminal of the

battery  $b$ , so that the upper switch-hook contact, instead of being in connection with the lower terminal of the battery, is brought into connection with the upper terminal of the battery, so that said battery is then included in circuit with the line that connects one station, the calling station, in talking circuit with another, the called station, it being assumed that the receivers of the connected stations are removed from their hooks  $c$ , whereby the connection of the battery with the lines is rendered complete. In order that the battery when thus connected with the line between two connected interior stations, may not be short circuited, I cause the actuated calling key directly to connect the switch-hook at each station with the transmitter at the other station, whereby the battery is connected in multiple between the sides of the united telephone line. In other words, by means of the calling key at the calling station, the incoming terminal of the transmitter at each station is directly connected with the outgoing terminal of the transmitter of the other station, considering, for example, that the upper terminals of the transmitters are the incoming terminals and that the lower terminals of the transmitters are the outgoing terminals. The battery being in multiple with the transmitters, is contained in a bridge which includes suitable impedance, preferably contained in two coils  $d$   $e$  between which the battery is disposed, considering station 1 to be calling. This bridge containing the battery and the impedance coils also includes the contact springs  $a^1$  of the home buttons of the connected stations, the normal contact of the home button of the calling station, the alternate contact of the home button of the called station, the switch-hooks of these stations, and the upper contacts of said switch-hooks. If station 2 should happen to be the calling station and station 1 the called station, then the impedance coils  $d^1$   $e^1$  would be substituted for the coils  $d$  and  $e$ , as will be well understood by reference to the drawing. Thus the home keys or buttons normally effect the connection of but one terminal to similar portions of the interior system, it requiring the home button at one station to be in its normal position and the home button at a station connected with this station to be in its alternate position before both terminals of the battery (or other suitable source of current) may be properly connected in circuit relation with the transmitters.

It will be unnecessary to repeat the description which I have hitherto given to Fig. 1 in describing Fig. 2, it sufficing to give similar parts similar characters of reference. I have shown in addition to the apparatus already described, suitable signal-receiving devices  $f$  whose circuits are jointly

established by calling keys and the associated switch-hooks at the stations, all as will be apparent from an inspection of Fig. 2, which need not be more particularly described inasmuch as the signal and circuits therefor form no novel part of the system of my invention.

In Fig. 2 I have shown but two stations, which are arbitrarily numbered 1 and 2, regularly forming part of the interior system, inasmuch as Fig. 1 renders the illustration of additional stations unnecessary. I have shown in association with station No. 1 in Fig. 2 a home button or key *a* and one calling key *2<sup>a</sup>*, while I have shown in association with station 2 another home key *a* and a calling key *1<sup>a</sup>*.

I will now describe that feature of my present invention which has to do with the inter-connection of telephone stations that are extraneous to the interior system with stations of the interior system. While I have illustrated this feature of my invention in association with the interior system hitherto described, I do not wish to be limited to this association of the present feature of the invention about to be particularly described.

Where facilities are to be afforded for inter-connecting any station of an interior system with an exchange extraneous to such system, I employ an additional calling button or switch corresponding to a trunk line leading to such exchange, such switch being designated *g* in Figs. 1 and 2, each station of the interior system having one such button *g*, each button being adapted to connect the same trunk line with the interior station associated with the button. If it should be desired to connect any station of an interior system with another exchange extraneous to the interior system, I provide an additional calling button or switch *h*, one for each interior station, each button *h* being adapted to connect its associate station with a trunk line leading to said other exchange. Of course, it may be desired to have only a portion of the stations of the interior system adapted for connection with the outgoing trunks, in which case only those interior stations that are to have this privilege would be provided with the trunk keys *g h*. In Fig. 1, the sides of the common battery trunk line *i* are connected with the back contacts of the springs of a depressed switch *g*; the trunk line *i* being thereby made a continuation of the telephone line of a calling interior station. The calling interior station may effect the operation of the common battery calling device at the common battery exchange, and the operator at the common battery exchange will ascertain the want of the calling interior station and effect connection of the calling interior station line with the called subscriber whose line extends to the common

battery exchange in a manner well known and which need not be described. If a calling common battery subscriber should desire connection with an interior station, he will signal a common battery exchange operator, who will connect the calling subscriber's line with the jack *l* (Fig. 2) of the trunk line *i*, in a manner well understood. The common battery exchange operator will thereafter effect the operation of a magneto call bell *m* located at a station within the building or territory embraced by the interior system. An attendant at this station will remove the telephone *n* from its switch-hook and will ascertain the want of the calling common battery subscriber, this attendant first having partially depressed the key *o*, which has back contacts that are connected with the sides of the trunk *i*, the springs of the switch *o* being in connection with the attendant's telephonic outfit. There are provided in association with the trunk line *i*, as many keys *1<sup>b</sup> 4<sup>b</sup>* etc. as there are stations in the interior system proper. In the present instance, there will be four such keys for the trunk circuit *i*, the attendant upon the trunk line *i* operating one of these keys corresponding to the called interior station, serving thereby to bring about the response of the called interior station 1, 2, 3 or 4 with whom connection was desired by the calling common battery subscriber. Before the attendant has called the called interior station, for example, station 1, by the depression of the corresponding key (*1<sup>b</sup>*) he further depresses the key *o*, this time to close circuit at *p* through a signal device *r* and the common battery at the common battery exchange that has been thrown into connection with the trunk line *i*, whereby the trunk line attendant is kept informed that the trunk line *i* is in service, the signal device *r* acting as a supervisory signal over the trunk line *i* for the information of the trunk line attendant. The circuit that includes the signal *r* also includes a relay *r<sup>1</sup>* which is energized when circuit is closed therethrough to establish a local circuit through the elements *r* and *r<sup>1</sup>* by the attraction of the armature *r<sup>2</sup>* of the relay *r<sup>1</sup>*. This local circuit includes the normally closed contacts *r<sup>3</sup>* of a relay *r<sup>4</sup>*, this relay *r<sup>4</sup>* being included in one side of the trunk circuit *i* and being energized when telephonic connection between an interior station and a common battery station has been established, whereby the local circuit for the signal device *r* and relay *r<sup>1</sup>* will be opened at *r<sup>3</sup>*, said signal device being thereupon restored to its normal condition to apprise the attendant that telephonic connection is complete. The local circuit having once been opened at *r<sup>3</sup>*, is, of course, also opened at *r<sup>2</sup>*, so that the signal device *r* is not again operated. When the relay *r<sup>1</sup>* is operated, it establishes a bridge connection

across the trunk line, whereby the supervisory signal in association with the plug engaging the trunk line jack is caused to remain inert, whereby the trunk line is held busy, so that the exchange operator may not prematurely remove the plug from the trunk line jack. The relay  $r^4$ , when energized, establishes a local circuit through a signal device  $r^5$  to indicate that the trunk line is busy. There may be as many signals  $r^5$  as there are interior stations, one signal at each station (Fig. 2). I have only shown one signal  $r^5$  in Fig. 1, as it is well understood the other signals  $r^5$  will be in multiple relation therewith as shown in Fig. 2. In Fig. 1 the signal  $r^5$  is shown in association with station No. 1.

The attendant, as has been stated, establishes connection between the trunk line  $i$  and the called interior station, by the operation of a key, such as  $1^b$ , corresponding to the called interior station, as station No. 1, the key  $o$  is restored to its normal position. If the attendant should observe that the called interior station does not respond, the attendant will again partially depress the key  $o$  and take off his receiver  $n$ , thereby again establishing circuit through the relay  $r^4$  to release the signal device  $r$  so that it may assume its normal condition.

Referring now to the trunk line  $k$  extending to the magneto switch-board, this trunk line is divided into two sections that are inductively related by means of the repeating coils  $k^1$ . I have not shown keys similar to keys  $1^b$   $4^b$  etc. in association with the trunk circuit  $k$ , in order that I may avoid complication in the illustration. I have shown a key  $o^1$  having an extra contact  $p^1$ . The key  $o^1$ , when partially depressed, is capable of connecting the telephone outfit  $o^2$  in telephonic relation with the trunk  $k$ , in order that the attendant at the telephonic apparatus  $o^2$  may be informed of the connection desired by a calling subscriber of the magneto switch-board exchange. Having ascertained the connection desired by the magneto switch-board subscriber, the attendant at  $o^2$  would operate a key corresponding to the called interior station and having circuit relationship with such station similar to that possessed by either of the keys  $1^b$   $4^b$  etc., no keys corresponding to these being illustrated in connection with the trunk circuit  $k$ , for the sake of simplicity. In order to enable the attendant at  $o^2$  or any interior station possessing a key  $h$ , to signal the operator at a magneto switch-board, I provide an extra contact  $p^1$  for the key  $o^1$  and an extra contact  $h^1$  for each key  $h$ , which contacts are included in circuit with a battery  $s$  and a coil  $s^1$  of an induction or kick coil, this coil being in primary relation to a secondary coil  $s^2$  in circuit with a suitable signal  $s^3$  at the magneto exchange end

of the trunk circuit  $k$ . The full operation of a key  $h$  at any calling interior station, or a key  $o^1$ , will, therefore, occasion the impression of a sudden impulse of current upon the circuit including the signal device  $s^3$ , whereupon the operator at the magneto switch-board will respond to the signal, ascertain the connection desired, and complete the same. The operator at the magneto switch-board, in calling for an interior station, will in a manner well known, effect the operation of the magneto signal  $s^4$ , whereupon the attendant at  $o^2$  will bring about the connection of the trunk line  $k$  with the called interior station, as has been described.

The stations at  $o$  and  $o^1$  may, if desired, be regularly equipped interior telephone stations which may call any of the other stations and each other and which may be called by any of the other stations or each other, the attendant or attendants at  $o$   $o^1$  having additional work to perform in bringing about connections between calling exchange subscribers and called exchange subscribers and any of the other interior stations 1, 2, 3 and 4. This being the case, I provide the stations at  $o$   $o^1$  with home buttons  $s^5$ , whose circuit relations are similar to the circuit relations of the home buttons  $a$ .

In reference to Fig. 2, the apparatus in association with the trunk lines  $i$  and  $k$  is somewhat more fully illustrated. It will be observed that the common battery at the common battery exchange supplies the transmitter at the interior station, whether it be a calling or called station with battery. In order that the interior station when connected with a magneto trunk line, may be supplied with battery, I connect the upper strand of the left-hand section of the trunk line  $k$  with the upper pole of the battery  $b$ . It may be desirable to have the attendant limit the calls outgoing from the interior stations to certain of those stations, to which end a key  $t$  may be provided in the trunk lines, as illustrated in Figs. 1 and 2, this key being normally open and being closed by the attendant upon the trunk lines, when he will permit a call to go through an exchange.

Figs. 3, 4 and 5 illustrate a group of switches such as may enter into the equipment of the interior stations of my system. Fig. 5 shows in elevation, four switches, with none of the keys in a depressed position. Fig. 3 shows the home switch or button  $u$  depressed, while Fig. 4 shows a calling key  $v$  depressed. Each of Figs. 3, 4 and 5 show three calling keys and one home key. Certain of the switch contacts are shown as they would appear in the view taken according to Fig. 5. Certain of these contact springs have been omitted in Figs. 3 and 4, as the repetition of their illustration is not essential to an understanding of the invention. Each key has a plunger  $w$  working

against the force of a spring  $w^1$ . The shank  $w^2$  of each key is provided with a nose  $w^3$  flat upon its top and inclining downwardly and inwardly to form at its inclined portion, a cam. A plate  $x$  is provided with a pin  $x^1$  for each cam, the pin  $x^1$  in association with the home button  $u$  being in constant engagement with a spring  $y$ . When any key is depressed, the cam or nose element  $w^3$  engages the adjacent pin  $x^1$ , thereby effecting the longitudinal movement of the plate  $x$  against the force of the spring  $y$ , said spring effecting the return of the plate when the nose  $w^3$  of the actuated key has been pushed below the pin. When any other key is thereafter depressed, its cam  $w^3$ , by engaging the associate pin  $x^1$ , shifts the plate  $x$  against the force of the spring  $y$ , thereby removing the pin  $x^1$  associated with the previously actuated key from the path of the nose  $w^3$  of said actuated key, whereupon the spring  $w^1$  effects the restoration of the previously actuated key to its normal position.

It is not new with me to provide an interior telephone system including a plurality of stations, a trunk line leading to an exchange, a switching key at an interior station being adapted to have at least two operating positions, in one of which it is adapted to connect an interior system with said trunk line, a signal device at the exchange end of the trunk line adapted to respond to impulses of current, a primary kick coil circuit which is closed by said switching key when occupying a different operating position, and a secondary kick coil circuit in inductive relation with said primary kick coil circuit and including the signal device at the exchange end of said trunk line. Nor is it new with me to provide such a telephone system with a plurality of local common-battery lines common to a plurality of stations, a trunk line extending from the inter-communicating system to a magneto exchange, a repeating coil inductively connecting one of the local lines with the trunk line for talking purposes whereby the common-battery local line is kept separate from the magneto trunk line, a kick-coil having its primary winding connected with the inter-communicating system and its secondary winding bridged across the trunk line, and means for sending an impulse of current through the primary of the kick-coil to induce an impulse of current in the secondary of the kick-coil and the trunk line, to throw a drop connected with the trunk line at the magneto exchange. Nor is it new with me to provide such a telephone system with a plurality of local lines common to a plurality of stations, a trunk line extending from the inter-communicating system to a magneto exchange, a repeating coil inductively connecting one of the local lines with the trunk line for talking purposes, a kick-coil

associated with the trunk line at the inter-communicating system for throwing a drop connected with the trunk line at the magneto exchange, and a condenser in series with the trunk-line side of the repeating coil whereby any considerable portion of the impulse of current produced in the trunk line by the kick-coil is kept from flowing through the repeating coil. Nor is it new with me to provide such a telephone system with a plurality of local lines common to a plurality of stations, a trunk line extending to a magneto exchange, a repeating coil inductively connecting one of the local lines with the trunk line for talking purposes, a pair of condensers in series with the respective windings of the repeating coil, a kick-coil at the intercommunicating system having its secondary bridge across the trunk line, and means for causing the kick-coil to send an impulse of current over the trunk line to throw a drop at the magneto exchange.

While I have herein shown and particularly described the preferred embodiment of my invention, I do not wish to be limited to the precise arrangement shown, as changes may readily be made without departing from the spirit of my invention, but,

Having thus described my invention, I claim as new and desire to secure by Letters Patent the following:—

1. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, and an additional switching device at each of said plurality of stations serving normally to connect one terminal of the battery with conductors leading to similar terminals of the transmitters, each of said switches serving, when operated, to remove said battery terminal from its normal association with one of said transmitters and to bring said battery into circuit relation with the transmitters.

2. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, and an additional switching device at each of said plu-

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connection of the outgoing terminal of the transmitter at each connected station with

switching device at each of said plurality of stations serving normally to connect one terminal of the battery with conductors

operated, to remove said battery terminal from its normal association with one of said transmitters and to bring said battery into

mechanical inter-connection, whereby the operation of the switches will occasion the restoration to normal of the switches me-

a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said

one of the other of said stations, each calling switch, when actuated, serving to permit the

other connected station, and an additional switching device at each of said plurality

transmitters, each of said switches serving, when operated, to remove said battery terminal

from its normal association with one of said transmitters and to bring said battery in multiple with the transmitters at the connected stations, the switches at each of said stations having mechanical inter-connection, whereby the operation of the switches will occasion the restoration to normal of the switches mechanically related thereto.

9. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, and an additional switching device at each of said plurality of stations serving normally to connect one terminal of the battery with conductors leading to similar terminals of the transmitters, each of said switches serving, when operated, to remove said battery terminal from its normal association with the transmitter at the same station therewith and to bring said battery into circuit relation with the transmitters, the switches at each of said stations having mechanical inter-connection, whereby the operation of the switches will occasion the restoration to normal of the switches mechanically related thereto.

10. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, and an additional switching device at each of said plurality of stations serving normally to connect one terminal of the battery with conductors leading to similar terminals of the transmitters, each of said switches serving, when operated, to remove said battery terminal from its normal association with the transmitter at the same station therewith and to bring said battery in multiple with the transmitters at the connected stations, the switches at each of said stations having mechanical inter-connection, whereby the operation of the switches will occasion the restoration to normal of the switches mechanically related thereto.

11. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said

stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, and an additional switching device at each of said plurality of stations serving, when actuated, to permit the inclusion of said battery in circuit with the transmitters of the connected stations, the switches at each of said stations having mechanical inter-connection, whereby the operation of the switches will occasion the restoration to normal of the switches mechanically related thereto.

12. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, and an additional switching device at each of said plurality of stations serving, when actuated, to include said battery in multiple with the transmitters at the connected stations, the switches at each of said stations having mechanical inter-connection, whereby the operation of the switches will occasion the restoration to normal of the switches mechanically related thereto.

13. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, an additional switching device at each of said plurality of stations serving normally to connect one terminal of the battery with conductors leading to similar terminals of the transmitters, each of said switches serving, when operated, to remove said battery terminal from its normal association with one of said transmitters and to bring said battery into circuit relation with the transmitters, and switch-hooks at the interior stations serving, when supporting the receivers, to prevent the flow of current from the battery to the transmitters, and, when relieved

of the influence of the receivers, to permit such flow when the associate switching devices have been properly operated.

14. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, an additional switching device at each of said plurality of stations serving normally to connect one terminal of the battery with conductors leading to similar terminals of the transmitters, each of said switches serving, when operated, to remove said battery terminal from its normal association with one of said transmitters and to bring said battery in multiple with the transmitters at the connected stations, and switch-hooks at the interior stations serving, when supporting the receivers, to prevent the flow of current from the battery to the transmitters, and, when relieved of the influence of the receivers, to permit such flow when the associate switching devices have been properly operated.

15. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, an additional switching device at each of said plurality of stations serving normally to connect one terminal of the battery with conductors leading to similar terminals of the transmitters, each of said switches serving, when operated, to remove said battery terminal from its normal association with the transmitter at the same station therewith and to bring said battery into circuit relation with the transmitters, and switch-hooks at the interior stations serving, when supporting the receivers, to prevent the flow of current from the battery to the transmitters, and, when relieved of the influence of the receivers, to permit such flow when the associate switching devices have been properly operated.

16. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each

of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, an additional switching device at each of said plurality of stations serving normally to connect one terminal of the battery with conductors leading to similar terminals of the transmitters, each of said switches serving, when operated, to remove said battery terminal from its normal association with the transmitter at the same station therewith and to bring said battery in multiple with the transmitters at the connected stations, and switch-hooks at the interior stations serving, when supporting the receivers, to prevent the flow of current from the battery to the transmitters, and, when relieved of the influence of the receivers, to permit such flow when the associate switching devices have been properly operated.

17. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, an additional switching device at each of said plurality of stations serving, when actuated, to permit the inclusion of said battery in circuit with the transmitters of the connected stations, and switch-hooks at the interior stations serving, when supporting the receivers, to prevent the flow of current from the battery to the transmitters, and, when relieved of the influence of the receivers, to permit such flow when the associate switching devices have been properly operated.

18. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, an additional switching device at each of said plurality of stations serving, when actuated, to include said battery in multiple with the transmitters at the connected stations, and switch-hooks at the interior stations serving,

when supporting the receivers, to prevent the flow of current from the battery to the transmitters, and, when relieved of the influence of the receivers, to permit such flow when the associate switching devices have been properly operated.

19. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, an additional switching device at each of said plurality of stations serving normally to connect one terminal of the battery with conductors leading to similar terminals of the transmitters, each of said switches serving, when operated, to remove said battery terminal from its normal association with one of said transmitters and to bring said battery into circuit relation with the transmitters, the switches at each of said stations having mechanical inter-connection, whereby the operation of the switches will occasion the restoration to normal of the switches mechanically related thereto, and switch-hooks at the interior stations serving, when supporting the receivers, to prevent the flow of current from the battery to the transmitters, and, when relieved of the influence of the receivers, to permit such flow when the associate switching devices have been properly operated.

20. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, an additional switching device at each of said plurality of stations serving normally to connect one terminal of the battery with conductors leading to similar terminals of the transmitters, each of said switches serving, when operated, to remove said battery terminal from its normal association with one of said transmitters and to bring said battery in multiple with the transmitters at the connected stations, the switches at each of said stations having mechanical inter-connection, whereby the operation of the switches will occasion the restoration to normal of the switches mechanically related thereto, and

switch-hooks at the interior stations serving, when supporting the receivers, to prevent the flow of current from the battery to the transmitters, and, when relieved of the influence of the receivers, to permit such flow when the associate switching devices have been properly operated.

21. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, an additional switching device at each of said plurality of stations serving normally to connect one terminal of the battery with conductors leading to similar terminals of the transmitters, each of said switches serving, when operated, to remove said battery terminal from its normal association with the transmitter at the same station therewith and to bring said battery into circuit relation with the transmitters, the switches at each of said stations having mechanical inter-connection, whereby the operation of the switches will occasion the restoration to normal of the switches mechanically related thereto, and switch-hooks at the interior stations serving, when supporting the receivers, to prevent the flow of current from the battery to the transmitters, and, when relieved of the influence of the receivers, to permit such flow when the associate switching devices have been properly operated.

22. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, an additional switching device at each of said plurality of stations serving normally to connect one terminal of the battery with conductors leading to similar terminals of the transmitters, each of said switches serving, when operated, to remove said battery terminal from its normal association with the transmitter at the same station therewith and to bring said battery in multiple with the transmitters at the connected stations, the switches at each of said stations having mechanical inter-connection, whereby the operation of the switches will occasion the

restoration to normal of the switches mechanically related thereto, and switch-hooks at the interior stations serving, when supporting the receivers, to prevent the flow of current from the battery to the transmitters, and, when relieved of the influence of the receivers, to permit such flow when the associate switching devices have been properly operated.

23. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, an additional switching device at each of said plurality of stations serving, when actuated, to permit the inclusion of said battery in circuit with the transmitters of the connected stations, the switches at each of said stations having mechanical inter-connection, whereby the operation of the switches will occasion the restoration to normal of the switches mechanically related thereto, and switch-hooks at the interior stations serving, when supporting the receivers, to prevent the flow of current from the battery to the transmitters, and, when relieved of the influence of the receivers, to permit such flow when the associate switching devices have been properly operated.

24. An interior telephone system including a plurality of stations, a battery for supplying the transmitters at each of said stations with current, calling switches at each of said stations, whereby each of said stations may be brought into connection with a selected one of the other of said stations, each calling switch, when actuated, serving to permit the connection of the outgoing terminal of the transmitter at each connected station with the incoming transmitter terminal of the other connected station, an additional switching device at each of said plurality of stations serving, when actuated, to include said battery in multiple with the transmitters at the connected stations, the switches at each of said stations having mechanical inter-connection, whereby the operation of the switches will occasion the restoration to normal of the switches mechanically related thereto, and switch-hooks at the interior stations serving, when supporting the receivers, to prevent the flow of current from the battery to the transmitters, and, when relieved of the influence of the receivers, to permit such flow when the asso-

ciate switching devices have been properly operated.

25. An interior telephone system including a plurality of stations, a trunk line leading to an exchange, means whereby an interior station may effect connection with said trunk line, means whereby an exchange operator may secure connection with an interior station by way of said trunk line, a signal device in association with the trunk line and operable by the exchange operator to secure the attention of a trunk line attendant, an attendant's telephonic outfit, a switching device whereby said telephonic outfit may be included in circuit relation with the trunk line, a supervisory signal, a relay having its circuit established by the attendant's switching device, a local circuit established through the relay and the signal device by said relay, and a supplemental relay controlling contacts included in the circuit of the aforesaid relay, and having circuit established therethrough by the apparatus at the called interior station when the call to said station is answered, whereby the circuit through the first aforesaid relay and the said supervisory signal is open.

26. An interior telephone system including a plurality of stations, a trunk line leading to an exchange, means whereby an interior station may effect connection with said trunk line, means whereby an exchange operator may secure connection with an interior station by way of said trunk line, a signal device in association with the trunk line and operable by the exchange operator to secure the attention of a trunk line attendant, an attendant's telephonic outfit, a switching device whereby said telephonic outfit may be included in circuit relation with the trunk line, a relay having its circuit established by the attendant's switching device, a local circuit established through the relay and the signal device by said relay, and a supplemental relay controlling contacts included in the circuit of the aforesaid relay, and having circuit established therethrough by the apparatus at the called interior station when the call for said station is answered, whereby the circuit through the first aforesaid relay is opened, and a bridge placed across the sides of the trunk line when the first aforesaid relay is actuated to maintain said trunk line in a busy condition in the process of effecting connection between parties.

In witness whereof, I hereunto subscribe my name this 7th day of April, A. D. 1908.

WILLIAM A. FRICKE.

Witnesses:

G. L. CRAGG,  
L. G. STROH.