

899,850.

E. TANKE.
TELEPHONE EXCHANGE APPARATUS.
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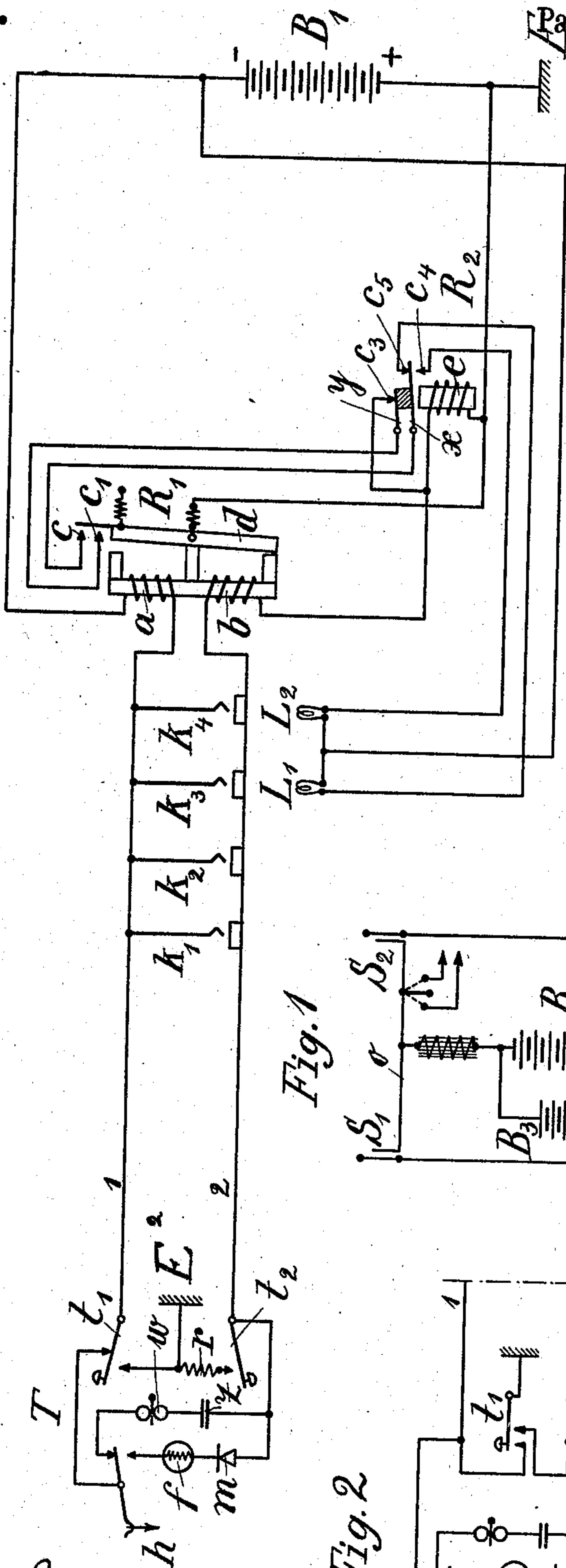


Fig. 1

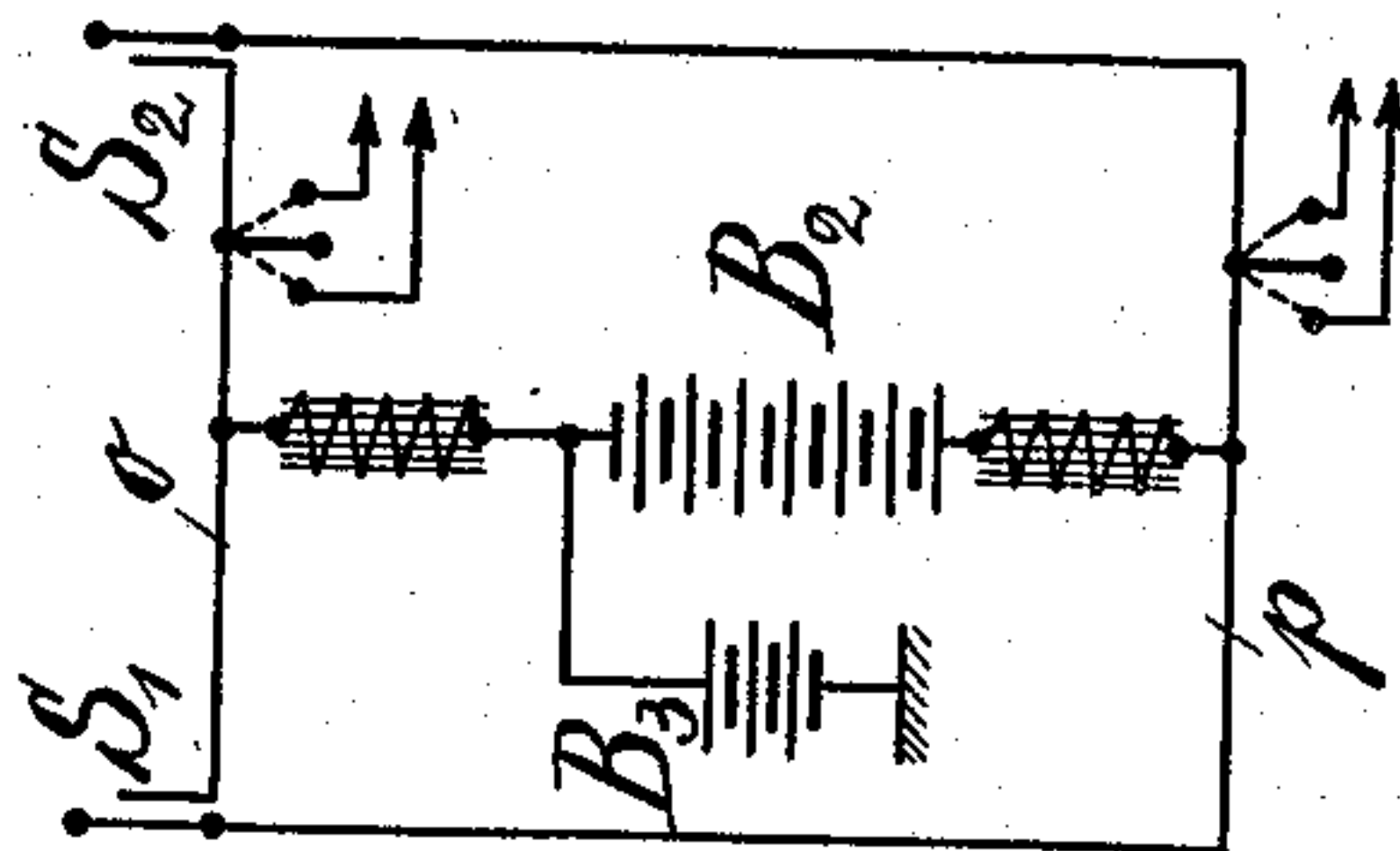


Fig. 2

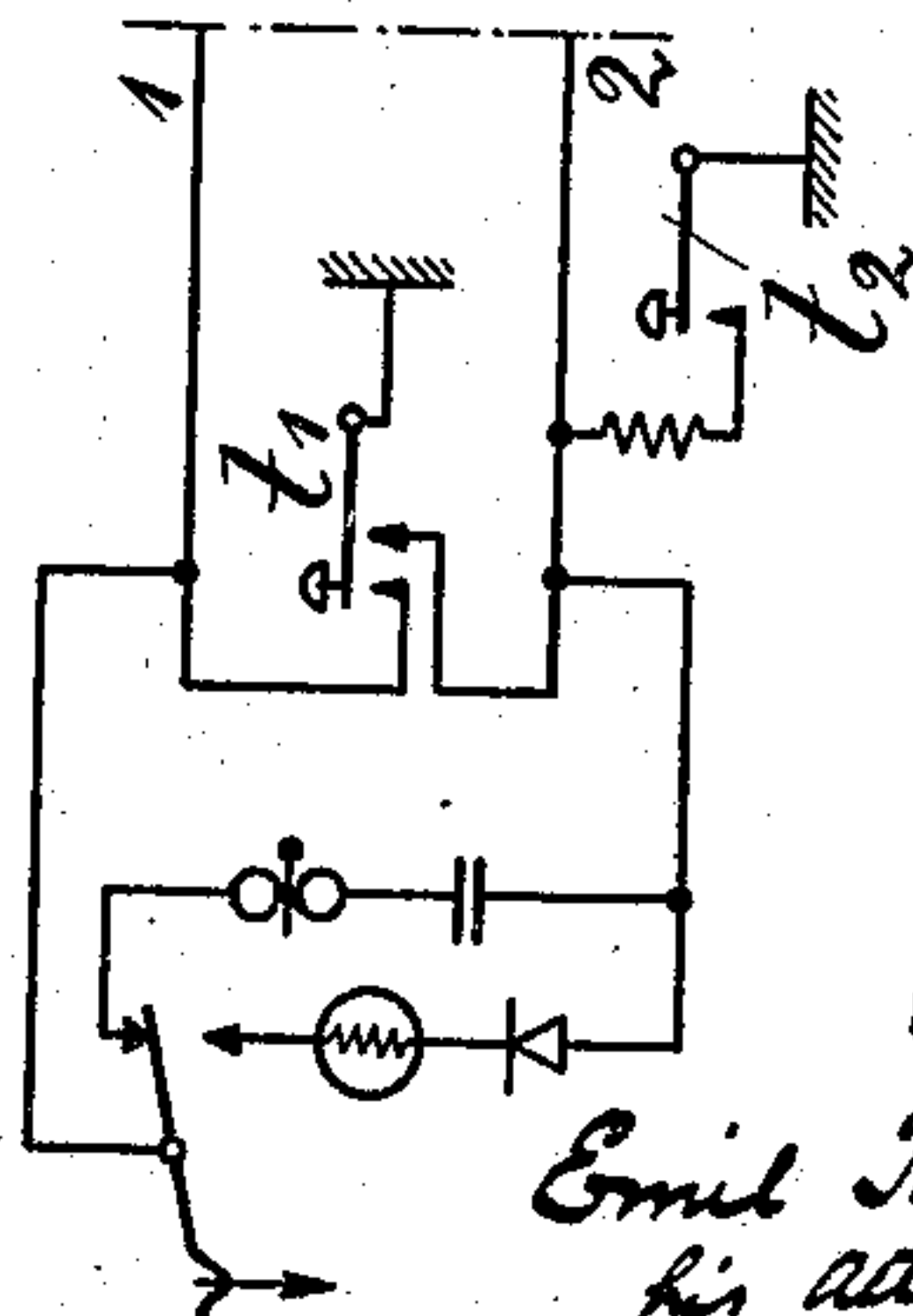
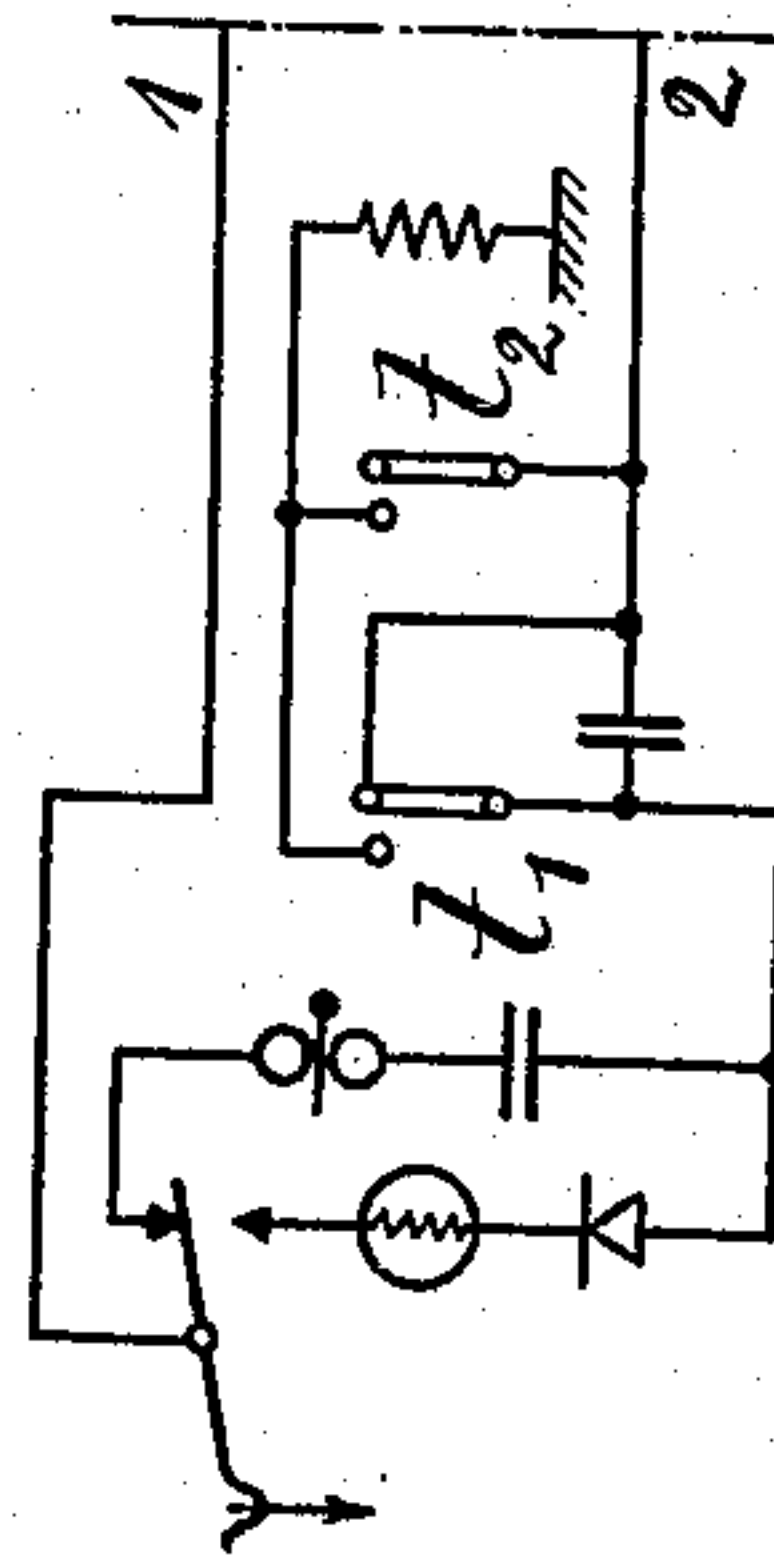


Fig. 3



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TELEPHONE-EXCHANGE APPARATUS.

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To all whom it may concern:

Be it known that I, EMIL TANKE, a subject of the King of Prussia, German Empire, and resident of Berlin, Germany, have invented new and useful Improvements in Telephone-Exchange Apparatus; and in order that others skilled in the art may make and use my invention I give the following description and specification thereof.

My invention relates to apparatus for telephone exchanges in which each subscriber is connected with a plurality of terminal groups at the exchange.

The object of my invention is to provide a telephone system of the above character in which the subscriber may select the group he desires to call, and may after calling one group retake that call and call on another group.

My invention comprises in an apparatus of the above character for the selective calling of two exchange groups, the use of one calling relay common to both groups, connected so that it will control the annunciator of one group when acting alone and which besides will cooperate with the selecting relay so that in energizing both relays, the current will be switched by means of the selecting relay or to control the annunciator of the other group, whereby the selective operations of the subscriber have to be made only momentarily.

My invention further contemplates the employment of devices in a system of the above character for causing the subscriber's instrument to be supplied from the central or exchange office.

In the drawings Figure 1 is a diagrammatic view representing one embodiment of my invention. Figs. 2 and 3 are similar views showing modifications.

Referring to Fig. 1, the subscriber's station is illustrated at T and is provided with the usual microphone *m*, telephone *f*, call bell *w*, condenser or polarization cell *z*, and receiver hook *h*. The subscriber's station and instrument T is connected by the conductors 1 and 2, relay coils *a* and *b* of a calling relay *R*¹ and thence directly to one side of the central battery *B*¹ and to the other side of said battery through a relay *R*². The battery *B*¹ is located at the central station and has one pole grounded at *E*, spring contacts or jacks *k*¹, *k*², *k*³ and *k*⁴, serve to connect the subscriber's

station with other subscribers' stations, (not shown) in the usual manner by means of the plug cord *o*, *p*, and plugs *S*¹, *S*².

The apparatus is illustrated in the drawing in an inoperative condition, the microphone and telephone branch being interrupted, the circuit being through the branch containing the call bell *w*, which is energized only by alternating current. The relay armatures are held in their inoperative positions by means of springs or other suitable means. *L*¹, *L*² indicate annunciators for showing the particular group called. The selective calling of these groups is made by the subscriber by means of the grounding keys *t*¹, *t*². If, for instance, the subscriber desires to call group 1 of which the lamp *L*¹ is the annunciator, he takes his receiver from its hook *h*, and presses key *t*¹. A circuit is thus made through which a current flows from battery *B*¹ through coil *a* of calling relay *R*¹, conductor 1, key *t*¹ to ground at *E*² back to the battery *B*¹. Coil *a* being thus energized the armature *d* of the relay *R*¹ moves to make contacts at *c*, *c*¹. A circuit is thereby established as follows: from the battery *B*¹ through armature *d*, contact *c*, armature *x* of relay *R*², contact *c*⁵, lamp *L*¹ and back to the minus pole of battery *B*¹. Lamp *L*¹ lights up and announces the call for group 1. Armature *d* also closes a contact at *c*¹ and thereby short-circuits coil *e* of relay *R*¹ so that this relay is not energized by current flowing through conductor 2. If now the key *t*¹ be released there is made a circuit from battery *B*¹ through relay coil *a*, conductor 1, key *t*¹, the microphone branch of the subscriber's station, conductor 2, relay coil *b*, the short-circuit around relay coil *e*, contact *c*¹, armature *d*, and back to the battery. In this condition relay *R*¹ is energized, but no energizing of relay *R*² can take place on account of the short-circuit established about its coil *e*.

Relay *R*¹ is so constructed and wound that its armature *d* maintains its position and does not break contact at *c*, *c*¹ when the circuit just described is made.

The relay consists of two exciting coils *a* and *b* which are arranged adjacent upon an iron core with lateral arms opposite the ends of a pivotally mounted armature *d*, the latter being mounted upon a middle arm so that each half of the core with the armature

forms a magnetic circuit. These two magnetic circuits cooperate with the common armature so that by changing the position of the armature there simultaneously results a change in the magnetic resistance of the circuit. By suitably arranging and proportioning the magnets and armature this change of resistance may be so adjusted that when both coils of the relay are energized the pivoted armature remains in its position. This result follows from the smaller resistance which occurs in the magnetic circuit of that portion of the relay against which the armature lies as compared with that which has the greater air gap between the armature and the core. In consequence of this and when both coils of the relay are excited the magnetic circuit or field carrying the least resistance exceeds the other and holds the armature fast in its position.

In the system, as shown in the drawing, when both armature coils are excited the magnetic circuit or field of coil *a* overpowers that of coil *b* so that the armature *d* is maintained in position, closing the contacts *c*, *c*¹. In consequence of this the lamp annunciator *L*¹ remains lighted notwithstanding the release of key *t*¹ until the operator at the exchange takes up the call. Also, as may be seen, the subscriber has the ability to retake or take back, his call for which purpose he has only to hang up his receiver on the hook *h*. This causes the windings *a* and *b* to be de-energized so that the armature *d* moves away from the contacts *c*, *c*¹ under the influence of its spring weight, or other retractive means, and thereby the system is returned to inoperative condition.

For calling group 2 in the exchange the subscriber takes off the receiver from its hook and presses key *t*². This grounds both conductors 1 and 2 at *E*² through the resistance *r*. Two circuits are thereby established one of which is as follows: from the plus pole of battery *B*¹ to ground *E*, *E*²; resistance *r*, station *T*, key *t*², microphone branch of the subscriber's station, key *t*¹, conductor 1, coil *a* of relay *R*¹, back to the battery. The other circuit is as follows: from the plus pole of the battery coil *e* of relay *R*², coil *b* of relay *R*¹, conductor 2, key *t*², and also through the microphone branch of the subscriber's instrument, key *t*¹, conductor 1, coil *a* of relay *R*¹ back to the minus pole of the battery, thus both coils of relay *R*¹ are excited.

By suitably proportioning *r* as well as all the other resistances in the circuit the current through conductor 2 causes only a weak energizing of coil *b*, which is not sufficient to prevent the attraction of the armature by the stronger magnetization due to coil *a*. The armature *d*, therefore, closes the contact *c* connected with the lamp circuit, as in the case of a call in the first group. Relay *R*² is energized by the current flowing through

coil *b* of relay *R*¹, in consequence of which the armature *x* of relay *R*² is attracted away from contact *c*⁵ to contact *c*⁴. This makes a circuit from the plus pole of the battery through armature *d*, contact *c*, armature *x* of relay *R*², contact *c*⁴, annunciator *L*², back to the battery. Lamp *L*² becomes lighted and announces the call of group 2. As both relays *R*¹ and *R*² are energized and means are provided that the armature tongue *y* is interrupting the contact at *c*³ before the armature *d* makes contact with *c*⁴ relay *R*² is not short circuited as is the case in calling up the first group.

On releasing key *t*² after the call has been made both armatures *d* and *x* remain held in their respective positions closing the contacts at *c*, *c*¹ and *c*⁴, the circuit being the same as that described for calling group 1 under similar conditions; that is, through the subscriber's station and both conductor branches in series—the call of group 2 is therefore maintained. On the other hand, the subscriber has again the ability to retake his call by hanging up his receiver, since thereby coil *a* of relay *R*¹ is left without current and the armature is retracted away from the contacts by means of its retractive devices.

In a similar manner to that here described for the calling of group 2 the calling of group 1 may be effected by the grounding at the same time of both conductors 1 and 2. For example, in such a way that by means of key *t*¹ a direct grounding of the circuit is effected without interruption of the branch circuit formed by taking the receiver from its hook—see, for example, the modification illustrated in Fig. 2. In this case a branch circuit is formed similar to that above described for calling the second group, but with the difference that the relay coils *b* and *e* together with the subscriber's station are practically short-circuited through the ground circuit, so that only coil *a* is energized or effective and the calling of the first group is obtained as above described. From this it is also apparent that the grounding point of the conductor at the subscriber's station may generally be selected at will. In consequence of this the arrangement may also be such that instead of a temporary grounding by means of the key in regard to other purposes a permanent grounding may be provided in such a way that the subscriber shall always have the possibility of retaking his call by hanging up his receiver, as illustrated in the modification shown in Fig. 3.

The return of the armatures *d* and *x* to inoperative position after the call has been taken may be effected at the central station in a similar manner, as above explained for the subscriber's station. A device, however, is shown in the drawings for this purpose which serves at the same time to secure automatically the inoperative position of the

armature *d* for the duration of the speaking connection. This is obtained in such a way that in making a talking connection by the insertion of the plug *S*¹, *S*² the grounded battery *B*³ connected with the plug cord is switched on to the winding *b* of the relay *R*¹ so that by means of the current circulating through coils *e* and *b* and ground connection a sufficiently strong energizing of the coil *b* is effected so that armature *d* is returned to the inoperative position shown, against the effect of coil *a*. This results from the interruption at *c* of the circuit of the lamp annunciators *L*¹, *L*², and the previously lighted lamp will be again without current. Relay *R*² notwithstanding remains energized but the position of its armature is immaterial as regards the switching out of the annunciators *L*¹, *L*², since the operation is determined by armature *d* and contact *c*¹.

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

1. In a telephone system, the combination with a plurality of calling groups and their respective annunciators; of a subscriber's station, a relay having two coils, and a single coil relay, a circuit leading from said subscriber's station through one coil of said two coiled relay to control one annunciator, and another circuit leading through the other coil of said two coiled relay, and through the single coiled relay to control another annunciator.

2. In a telephone system, the combination with a plurality of calling groups and their respective annunciators; of a subscriber's station, a relay having two coils, and a single coiled relay connected in series with one coil of the other relay, a circuit leading from said subscriber's station through the other coil of said two coiled relay to control one annunciator, and another circuit leading through the single coiled relay and that coil of the two coiled relay which is in series with it, to control another annunciator.

3. In a telephone system, the combination of a plurality of calling groups and their annunciators, of a subscriber's station, a two coiled relay, a single coiled relay, means for operating one annunciator from the subscriber's station through one coil of said two coiled relay, and means for operating another annunciator from the subscriber's sta-

tion through said single coiled relay and energizing both coils of said two coiled relay.

4. In a telephone system, the combination with a plurality of calling groups and their respective annunciators; of a subscriber's station, a two coiled relay, a single coiled relay in series with one coil of the two coiled relay, means for operating one annunciator from the subscriber's station through one coil of the two coiled relay, and short circuiting the single coiled relay, and means for operating another annunciator from the subscriber's station through said single coiled relay and energizing both coils of said two coiled relay.

5. In a telephone system, the combination of a central station having a plurality of calling groups and their respective annunciators, a subscriber's station, a two-branched conductor connecting the stations, keys at the subscribers' stations for selectively calling corresponding groups at the central station, a relay for controlling the group circuits having a pivoted armature, coils on the relay one in each branch of the conductor, each coil with the armature of the relay forming a separate magnetic circuit whereby when both coils of the relay are energized the previous position of the armature is not changed.

6. In a telephone system, the combination of a central station having a plurality of calling groups, selective means at the subscriber's station corresponding severally to said groups, two-branched conductors connecting the station with subscribers' stations, a relay controlling the annunciator circuits of the calling groups, said relay having two coils one in each of said conductor branches, said coils each forming a separate magnetic circuit in the relay, whereby when both coils of the relay are energized, the previous position of the armature is not changed a second relay having its coil in series with one of the coils on the first relay, said second relay selectively controlling the annunciator circuit in accordance with the operated subscriber's key, and means comprising the usual plug cord switching connections at the central station for disconnecting the annunciator circuits from the subscriber's station.

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Witnesses:

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