

Feb. 24, 1925.

1,527,434

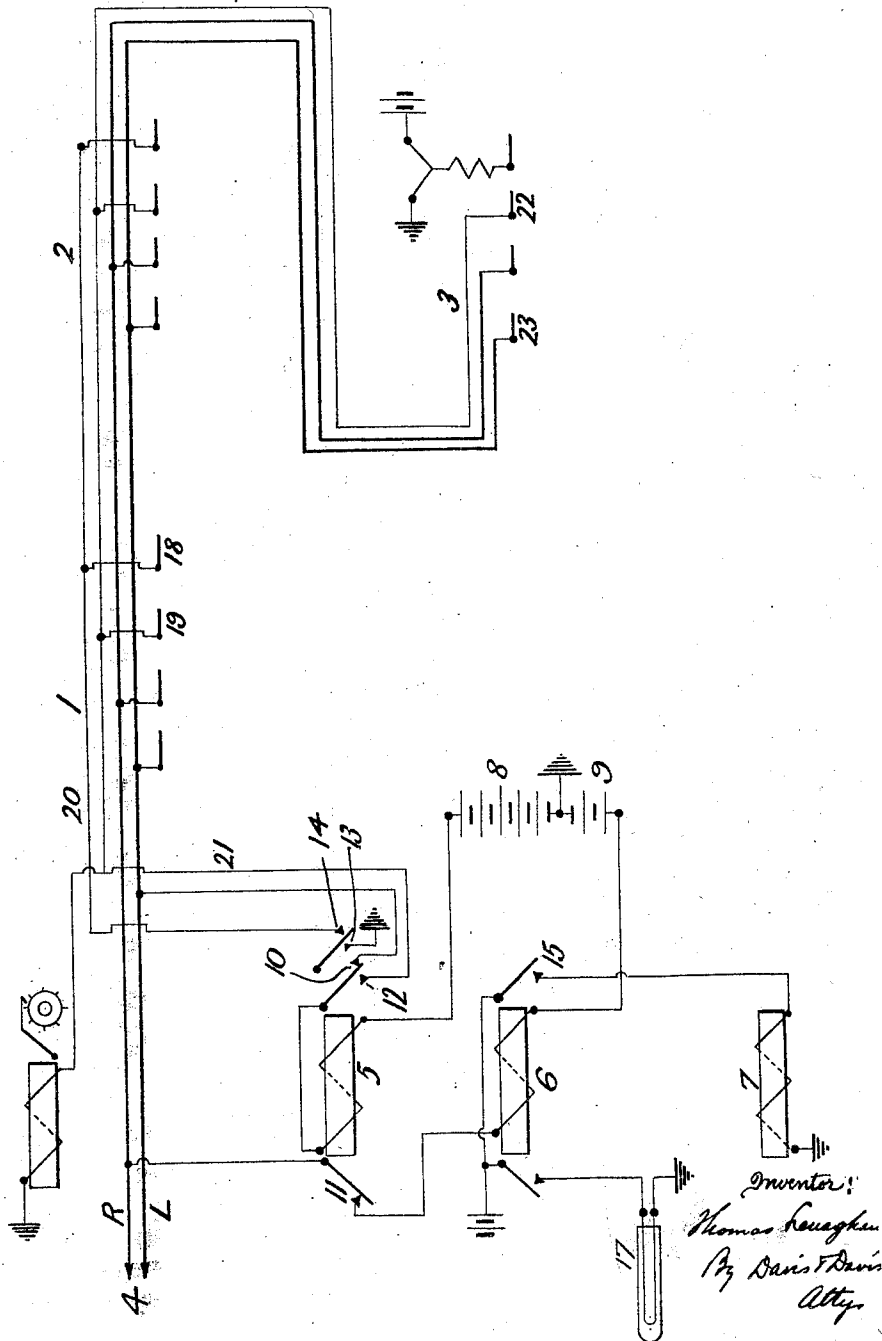
T. LENAGHAN

AUTOMATIC TELEPHONE SYSTEM

Filed June 12, 1922

2 Sheets-Sheet 1

Fig. 1.



Feb. 24, 1925.

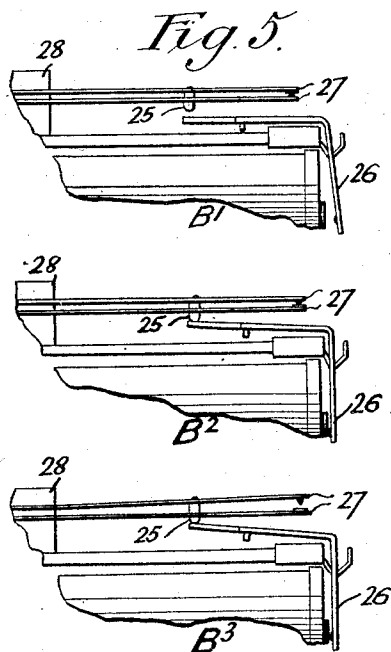
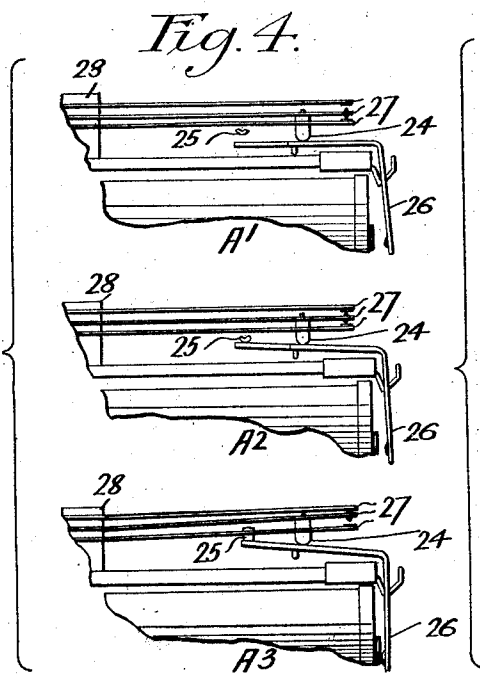
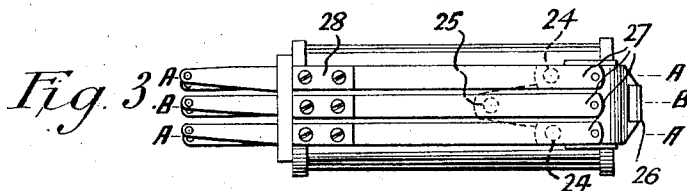
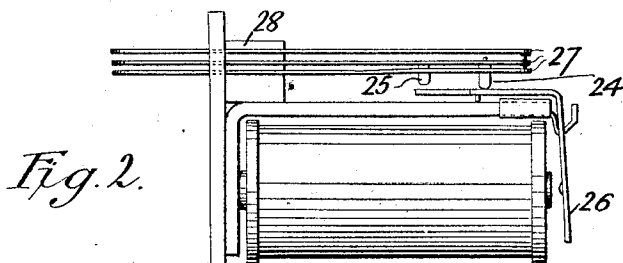
1,527,434

T. LENAGHAN

AUTOMATIC TELEPHONE SYSTEM

Filed June 12, 1922

2 Sheets-Sheet 2



Inventor:
Thomas Lenaghan
By Davis & Davis
Atty.

UNITED STATES PATENT OFFICE.

THOMAS LENAGHAN, OF CROYDON, ENGLAND.

AUTOMATIC TELEPHONE SYSTEM.

Application filed June 12, 1922. Serial No. 567,833.

To all whom it may concern:

Be it known that I, THOMAS LENAGHAN, a subject of the King of Great Britain and Ireland, residing at 9 Royal Mansions, London Road, Croydon, in the county of Surrey, England, have invented Improvements Relating to Automatic Telephone Systems, of which the following is a specification.

This invention relates to automatic telephone systems such as described in Patent No. 1,472,604, Oct. 30, 1923, although the application of the invention is not limited to the said system, nor to automatic systems in particular.

Briefly stated, the invention aims at an improved arrangement whereby the amount of apparatus required in an individual circuit is reduced to the minimum by the use of a member capable of a plurality of movements when actuated under different conditions. In the particular application shown, a relay is associated with a subscriber's line circuit, in which, when operated by the completion of the subscriber's loop, the relay will only partially energize, and when connected to the exchange connecting apparatus the relay will be fully energized.

The idea of a relay having marginal movements has been already anticipated by methods such as the employment of plural windings, with external resistances incorporated with the windings, with the relay having retractile springs, etc. and with the different operating conditions governed by some external means.

In the invention herein described, the relay, the subject of my invention, serves to partially operate, by way of the subscriber's loop, to complete its own connection for its fuller operation when the exchange connecting member, which may be an automatic switch or in manual systems, an answering plug, is actuated, the relay, furthermore, when in the full operated position, serving to disconnect from the line or associated circuit.

This marginal operation is accomplished by the incorporation with the relay winding, of a small battery opposing that of the main battery, when the relay is not fully operated.

A description will now be given of the invention as applied to a telephone system, such as described in Letters Patent 1,472,604, with reference to the accompany-

ing drawings, of which Fig. 1 shows the relay incorporated in the line circuit of the aforesaid system Figs. 2 and 3 being respectively, an elevation and plan of the relay. Fig. 4 is a group of views showing certain parts of the relay in differing positions and Fig. 5 is a similar group of views of other parts in different positions.

Referring now to Fig. 1, where 1 shows the control recorder section; 2 the outgoing trunk section, and 3 the incoming trunk section of a connecting unit as described in the system heretofore referred to, 4 represents the subscriber's loop; 5 the line relay, 6 the pilot relay, 7 the starting magnet, 8 the main battery, and 9 the opposing battery. The operation will now be described. On the subscriber removing the receiver a loop is closed, as at 4; then battery 8 has a circuit by way of winding relay 5, contact 10, L line 4, R line 4, contact 11, winding 6, opposing battery 9 to earth. The current flowing in the foregoing circuit is sufficiently strong to fully operate 6 and to partially operate 5, the armatures of which move sufficiently to make contact with the front contacts 12 and 13, but not to break the back contacts 10, 11 and 14.

Relay 6 operating closes contact to pilot lamp 17, and to operate power magnet 7 by way of contact 15. On 7 operating, a seeking switch, in this case a control recorder, is operated over the bank contact 1 to find the line calling which is found by the earth potential on punching 18, derived from 13 by way of 14 and lead 20. On the switch making contact with the line aforesaid an earth is placed on punching 19 which by way of lead 21, contact 12, winding 5 to battery 8 serves to fully operate line relay 5, to break contact 10, 11 and 14 thereby cutting the relay from the line circuit and restoring 6 and 7. It will thus be seen that 5 acts both as a line and cut off relay by its own operation.

On incoming calls, that is, calls incoming to the line, an earth, which may be derived from the talking feed circuit of the incoming trunk, is placed on punching 23, thence by way of L lead, contact 10, winding 5 to battery 8, 5 now being held by earth potential at 22, from incoming switch, lead 21, contact 12, winding 5 to battery, which holds 5 in the fully operated position as before. Referring now to Figs. 2, 3, 4 and 5 wherein the construction of

relay 5 is shown, in the illustration a relay of the type as described in Patent No. 1,481,104 is shown, but it must be understood that the scope of the invention is not limited to this particular type, but may be used with any known type of relay without departing from the spirit of this invention.

Referring now to Figs. 2 and 3 which show the relay in the normal position; it will herein be seen that the armature 26 which operates the contact springs 27 by way of pips 24 in the usual manner has an extension piece which operated 25 at a point close to the fixed end 28, the pips 25 being arranged that 26 has a limited movement, before engaging with 25. It will be seen that with a given pull on 26, pips 24 will operate the springs in connection therewith a given distance, which in this case, will close the front contacts but not break the back contacts.

On the full current being applied to the relay, 26 will be more strongly attracted and have sufficient power to operate pips 25 and by this fuller movement to break all of the back contacts.

In Fig. 4 are shown three views of the outer springs located at lines A—A Fig. 3, A¹ being the normal position, A² the partially operated position and A³ the full operated position.

In Fig. 5 are shown similar views of the springs located at line B—B Fig. 3, B¹ being the normal position, B² the partially operated position, and B³ the fully operated position.

What I claim is:—

1. In a telephone system, an electromagnetic relay having a single excitation winding, a single armature, and means adapted to energize the winding to different definite degrees, a series of spring members each having one end fixed, means adjacent the free end of one such spring member adapted to produce a predetermined movement of the latter with partial movement of the relay armature and means located nearer the fixed end of another spring member whereby such other spring member is moved by the relay

armature only after the partial movement of the latter referred to, when both spring members are moved in unison.

2. In a telephone system, an electromagnetic relay having a single excitation winding, a single armature, and means adapted to energize the winding to different definite degrees, a series of movable spring members each having one end fixed, means adjacent the free end of one such spring member adapted to produce a predetermined movement of the latter with partial movement of the relay armature, a back contact member normally in engagement with the movable spring member and a front contact normally out of contact therewith, the limited armature movement aforesaid establishing engagement between the movable spring member and front contact whilst maintaining the engagement between the said member and back contact, means located nearer the fixed end of another spring member whereby such other spring member is moved by the relay armature only after the partial movement of the latter referred to, when both spring members are moved in unison, and a front contact associated with the second spring member similarly engaged by the latter and subsequently separated therefrom.

3. In a telephone system an electromagnetic relay comprising a single winding, and a single armature, a movable spring member fixed at one end, a pip upon said spring member located near the free end thereof and adapted to be displaced by the armature, another movable spring member fixed at one end and having a pip located nearer its fixed end than is the pip of the other spring member and shorter than said pip, the arrangement being such that upon partial energizing of the relay, the first named spring member is dislodged to a certain extent followed upon complete energizing of the relay by movement of the second spring member simultaneously with combined movement of the first member.

Signed at London, England this 30th day of May 1922.

THOMAS LENAGHAN.