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COMBINED TELEPHONE AND FIRE ALARM OR KINDRED SERVICE SYSTEM.

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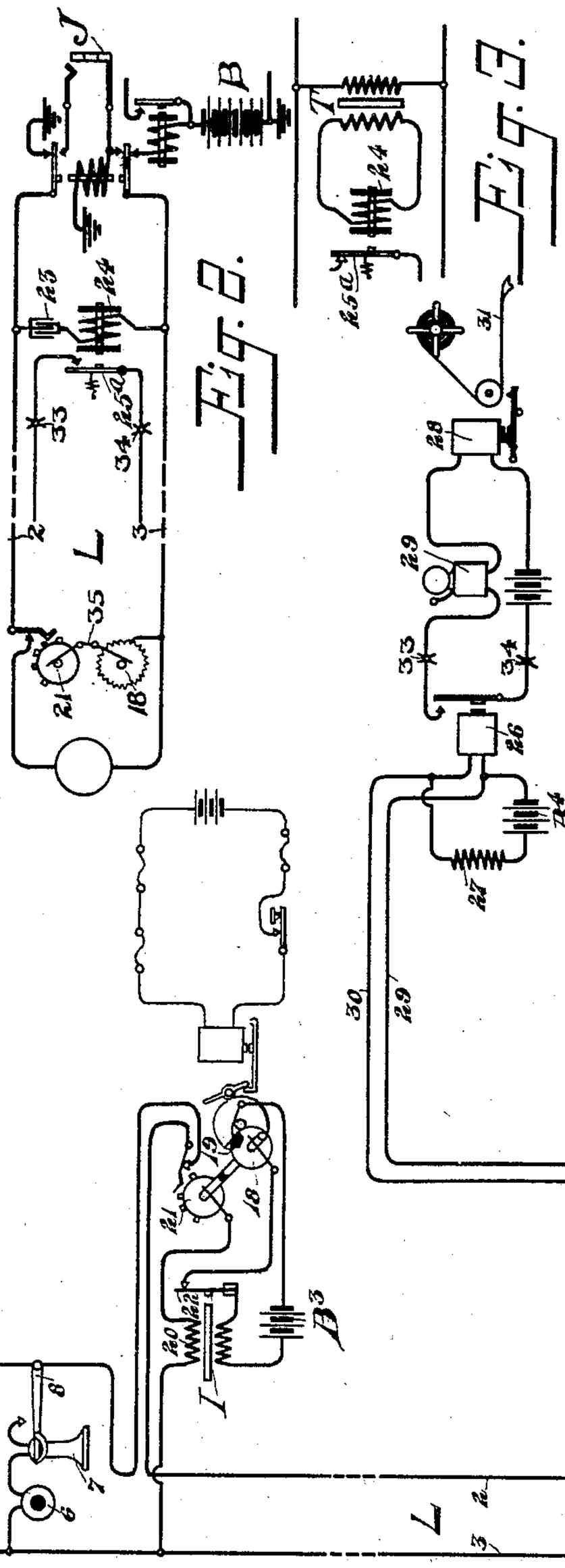

Fig. 1.

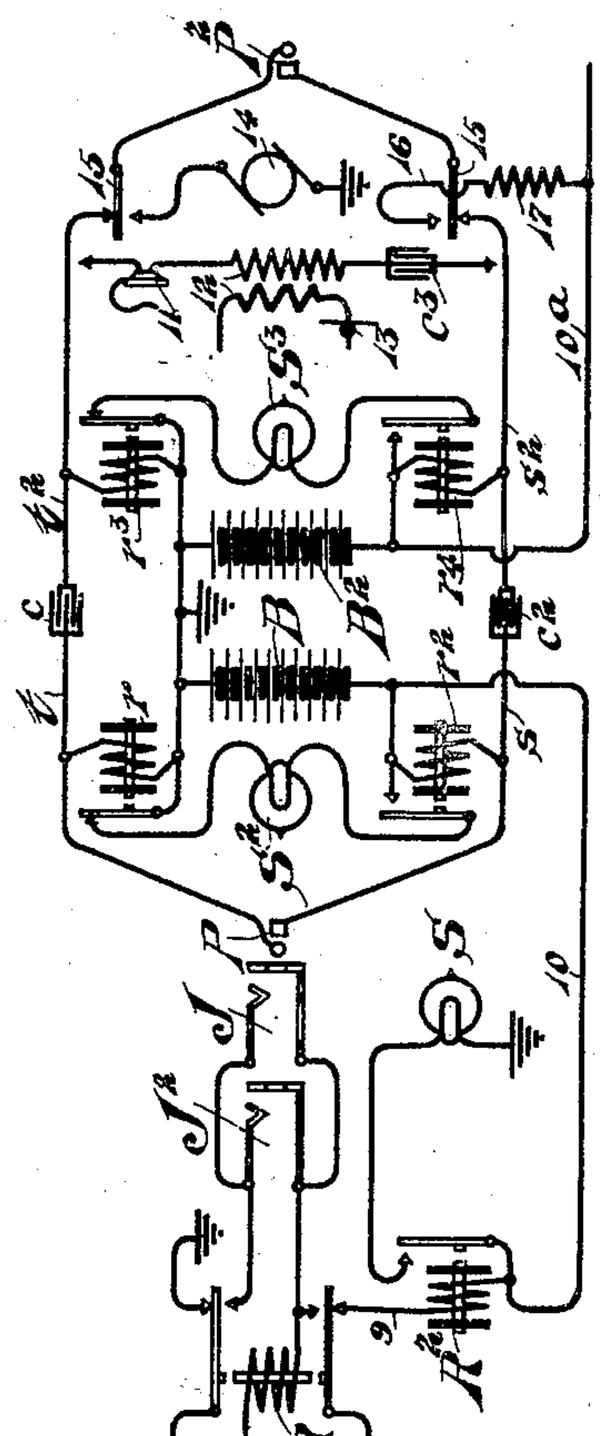

Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE.

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COMBINED TELEPHONE AND FIRE-ALARM OR KINDRED SERVICE SYSTEM.

955,056. Specification of Letters Patent. Patented Apr. 12, 1910.

Application filed August 15, 1903. Serial No. 169,558.

To all whom it may concern:

Be it known that I, WILLIAM W. DEAN, a citizen of the United States of America, and resident of Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Combined Telephone and Fire-Alarm or Kindred Service Systems, of which the following is a specification.

My invention relates to fire and kindred alarm service as applied to telephone exchanges, my object being to provide a system in which the currents used in the alarm service do not normally affect the telephone apparatus and in which likewise the currents employed for telephonic purposes do not affect the alarm service.

In the ordinary type of telephone system in which a common source of current at the central office is employed for conversation, trouble is experienced in engrafting thereupon an auxiliary alarm service due to the fact that ground connections and live battery connections are present at different points and in different ways upon the lines and circuits of the telephone exchange.

In carrying out my invention I prefer to use for the auxiliary service high frequency signaling currents which do not cause the operation of the telephone apparatus normally associated with the lines and an alarm receiving apparatus at the central office which is responsive to such high frequency currents but is unresponsive to the telephone signaling and talking currents. Again, it is desirable in any fire alarm, messenger call, telephonic or other similar electrical installations in buildings, to dispense with all ground connections for the active operation of electrical apparatus, since such connections are not subject to a constant test as to their working condition. In my invention I also seek to avoid all ground connections outside of the central station, and to operate said alarm system over the metallic circuit whereby all objections of the kind mentioned are avoided.

My invention is illustrated in the accompanying drawings in which—

Figure 1 is a diagram of a system showing one manner of applying the invention to a telephone exchange; Fig. 2 is a diagram of a modification, and Fig. 3 is a diagram of still another modification.

In Fig. 1, L indicates a telephone line extending in two limbs 2 and 3 from the subscriber's station to the central office. At the subscriber's station, the usual call bell 4 and condenser 5 are included in a permanent bridge of the line conductors, while a transmitter 6 and receiver 7 are located in a second bridge, which is normally open at the switchhook 8. This outfit is intended merely to typify any usual or desired subscriber's set. At the central office the line is fitted as usual with multiple jacks such as J, J^2 in any number, and with a line signal S. The line conductor 2 is normally grounded but when the cut-off relay R is energized it is disconnected from ground and is connected with the tip conductor of the jack section of the telephone line. The line conductor 3 is normally connected through contacts of said cut-off relay with a conductor 9 leading to the line relay R^2 whose other terminal is joined to the common lead 10 extending to the live pole of the central and common battery B. The said line relay R^2 controls the local circuit of the line signal S and the cut-off relay R has its winding grounded from the sleeve conductor of the jack section of the telephone line with which said line conductor 3 is connected when the cut-off relay is energized, said line relay R^2 being disconnected at the same time to render the line signal inoperative.

The cord circuits are of the usual type and each includes an answering plug P and a calling plug P^2 having tip and sleeve contacts adapted to register with the corresponding contacts of the spring jacks of the telephone line, the said tip contacts being connected by the flexible strands t and t^2 and the condenser c, while the sleeve contacts are similarly joined by strands s and s^2 and the interposed condenser c^2. Supervisory relays r and r^2 are connected across the answering end of the cord circuit upon opposite sides of the battery B and together control the local circuit of the supervisory signal S^2 associated with the answering plug P, while supervisory relays r^3 and r^4 are similarly connected across the calling end of the cord circuit upon either side of a second common battery B^2, and control the local circuit of supervisory signal S^3 associated with the calling plug. In the ordinary manner, the operator's head telephone

11, the secondary of her induction coil 12 and a suitable condenser c^3 are adapted to be bridged across the calling end of the cord circuit by means of any suitable listening key, the primary of the said induction coil 12 and her transmitter 13 being charged from any suitable source of current. A ringing generator 14 is adapted to be connected with the forward portion of the tip strand t^2 of the cord circuit by means of the springs 15 of any suitable listening key, the sleeve strand s^2 being at the same time connected through conductor 16 including a suitable resistance 17 and the conductor 10^a common to a certain number of the lines of the exchange with the live pole of the battery B^2. With this arrangement of the telephone line conversation may be carried on thereover in the ordinary manner, the subscriber operating his line signal by taking up his receiver and the operator answering the call by inserting the plug P of her cord circuit in the answering jack of the telephone line. Upon learning the number of the wanted line and after determining its idle or busy condition in the usual manner, if found idle, the calling plug P^2 is inserted in the spring jack of that line and the ringing key springs 15 operated to ring the subscriber. The supervisory relays operate in the well known manner to independently indicate the position of the subscriber's telephone and to thus keep the operator informed as to the condition of the connection.

The alarm transmitting device which may be applied at the substation of the line or at any other point thereon includes a local circuit containing a battery B^3, the primary winding of a rapid magnetic interrupter I, and a contact disk 18 and coöperating brush of the call alarm box. This brush rests upon an insulating segment or portion 19 of the disk 18, and serves to normally open the said local circuit. The secondary winding 20 of said interrupter I is included in a bridge of the line conductors 2 and 3, which includes also the brush and the make-and-break wheel 21 of the signaling box. It will be understood that this alarm box may be controlled in any ordinary or desired manner and may be operated either manually as in an ordinary telegraph call box, or automatically by means of thermostats or other devices in a local house circuit as is common in installations of this type and as is indicated in dotted lines. The armature 22 of the interrupter I is preferably a tuned reed having a high rate of vibration. As is evident, when the signaling box is operated the disks 18 and 21 rotate and the local circuit is closed through the disk 18 and its coöperating brush and the reed 22 is started vibrating. The rapid make and break of this local circuit induces corresponding current impulses in the secondary 20 of the interrupter which are transmitted to the telephone line to actuate the alarm receiving mechanism at the central office as hereinafter explained. To prevent these secondary impulses from passing through the subscriber's instrument in case his receiver should be off the hook, the circuit is opened as indicated by the contact of wheel 21. At the central office the said receiving apparatus includes in a bridge of the line a condenser 23 of very small capacity, 1/10 micro-farad having been found satisfactory, and a high resistance relay 24, say of 5000 ohms, and of high self induction bridged across the telephone line.

The capacity of the condenser and the self induction of the coil of relay 24 are preferably so adjusted that the bridge is approximately resonant to the alternating currents of the alarm system. The magnet 24 actuates a tuned reed 25 preferably corresponding to the rate of actuation of the reed 22 at the substation. A local circuit including the magnet 26, the battery B^4 and a very high resistance 27 is permanently closed, said resistance being of substantially 5000 ohms, the relay 26 controlling through its normally open contacts the common register magnet 28 and an audible alarm 29. 33 and 34 indicate the junction points of the individual and common register circuits. The said magnet 26 is likewise of high resistance, and is adapted to be normally shunted or short circuited by the said reed 25 and the conductors 29 and 30. Thus under normal conditions the magnet 24 is deënergized, and the magnet 26 is likewise deënergized owing to its short circuit, thus opening the circuit of the common register 28. When said magnet is actuated, however, said short circuit about the magnet 26 is opened by the reed 25, the magnet 26 is energized by current from the battery B^4 and the local circuit of the register 28 is closed.

When the alarm box is actuated at the substation, alternating currents of a high frequency are sent out to the line when the contact of the disk 21 engages its teeth, and the magnet 24 is actuated, these high frequency alarm currents being adapted to readily pass through the small capacity condenser 23 and the high resistance magnet 24. Such currents encounter retardation in the line relay R^2 in attempting to pass over the metallic line so that the leakage in that direction is negligible. The reed 25 is thus operated and withdrawn from its normal contact thereby opening the short circuit and permitting the magnet 26 to be actuated in accordance with said intermittent alarm signaling currents. Under such circumstances although the reed 25 vibrates in accordance with the high frequency currents the short circuit of magnet 26 will not be

closed sufficiently thereby to permit said magnet to be deënergized as long as such currents are present on the line. The register 28 is adapted to register the signal upon the tape 31, the audible or visual signal 29 being also actuated.

The voice currents are prevented from passing to any great extent through the bridge containing the magnet 24 by reason of its impedance as well as on account of the weakness of such currents, while the steady current from the battery B or B^2 is prevented from passing by the condenser 23. This condenser is also of such small capacity that the low frequency ringing currents are likewise prevented from passing. Thus the said alarm signal mechanism remains unaffected by any of the telephonic currents that appear on the line and in the specific arrangement shown such mechanism is not dependent for its operation on ground connections or the source of current at the central office.

As shown in Fig. 2 the relay 24 may be provided with an ordinary pivoted armature 25^a, such relay being constructed in a manner well understood in the art, so as to respond to alternating or rapidly varying currents and thus hold up its armature when subjected to such alarm signaling currents. The register circuit may be thus directly controlled without the intermediation of relay 26. The various batteries shown at the central office may obviously be one and the same. The alarm transmitting device need not be located close to the subscriber's instrument, but may be placed anywhere upon the line as may the alarm receiving apparatus if desired. This figure also shows the make-and-break wheel 21 and interrupter 35, preferably of the rotary type in a bridge of the line, said interrupter being rapidly driven preferably by the mechanism of the call box. The current from the central common battery B flowing when the wheel 21 completes the circuit thereof, is thus broken up into short impulses and the condenser 23 in the alarm bridge at central is thus charged and discharged and the magnet 24 is operated as before described.

In Fig. 3 I show a different method of inductively connecting the relay 24 to the line. In place of the condenser of the other figures to inductively connect the relay 24 to the line, I bridge across the circuit a winding of a transformer T, such winding being of high enough resistance to prevent the battery current that is present on the line from undesirably operating the relays in the path of such current. This transformer is designed to be responsive to the high frequency signaling currents only and not to the ringing or voice currents. These currents are retarded and not shunted to any disadvantageous degree. The relay 24 is thus actuated as before to control the register magnet.

Although I have described specifically these methods of accomplishing the desired results of my invention, I do not wish to be limited thereto in all respects as it is obvious that broadly considered other and various methods than those shown may be employed. For example in my companion application filed August 15th, 1903, Serial No. 169,559, I show other methods of deriving and employing auxiliary signaling currents and which I intend to generically cover by my present claims.

Having thus described my invention and means for carrying the same into effect, what I claim is:

1. In a telephone exchange, the combination with a metallic telephone line, of a subscriber's set at the sub-station of the line, telephonic apparatus associated with the line at the central office adapted to coöperate with said line and set for conversational purposes, said apparatus including a common battery connected with the lines, an alarm signal transmitting device upon the line to send high frequency signaling currents over the two sides of the metallic telephone line in series, an alarm signal receiving apparatus at the central office including a relay of high self induction and a condenser of small capacity in a bridge of the telephone line, the self induction and capacity of said bridge being adjusted to be substantially resonant to said high frequency signaling currents, the condenser serving to prevent the passage of steady currents and low frequency alternating currents while the relay prevents the passage of the voice currents, substantially as described.

2. In a telephone exchange, the combination with a telephone line, of a subscriber's set at the sub-station of the line, telephonic apparatus associated with the line at the central office for coöperation with said line for conversational purposes, said apparatus including a battery connected with the line, an alarm signal transmitting device to send signaling currents of high frequency over the telephone line, an alarm signal receiving apparatus including a relay of high self induction and a condenser of small capacity in a bridge of the line, both being adjusted so as to be substantially resonant to said high frequency signaling currents, the condenser preventing the passage of steady currents and low frequency alternating currents while the relay is opaque to voice currents.

3. The combination with a telephone line of telephonic apparatus thereon, auxiliary signaling apparatus comprising an inductive vibrator with a primary supply circuit, said vibrator having secondary connection with the telephone line, thermally operable means controlling said signaling apparatus, and an

alarm signal receiving apparatus including a relay of high self induction and a condenser of small capacity in the bridge of the line, both being adjusted so as to be substantially resonant to the high frequency currents from the vibrator, but irresponsive to steady currents and low frequency alternating currents as well as substantially opaque to voice currents.

4. The combination with a telephone line, of telephonic apparatus thereon, auxiliary signaling apparatus adapted to send signaling currents of high frequency over the telephone line, and an alarm signal receiving apparatus including a relay of high self induction and a condenser of small capacity in the bridge of the line, both adjusted so as to be substantially resonant to the signaling currents, but impassable for steady currents or low frequency alternating currents and opaque to voice currents.

Signed by me at Chicago, county of Cook, State of Illinois, this 12th day of August A. D. 1903.

WILLIAM W. DEAN.

Witnesses:

ROBERT LEWIS AMES,

EVA A. GARLOCK.