H. P. CLAUSEN.

SUBSCRIBER'S TELEPHONE APPARATUS.

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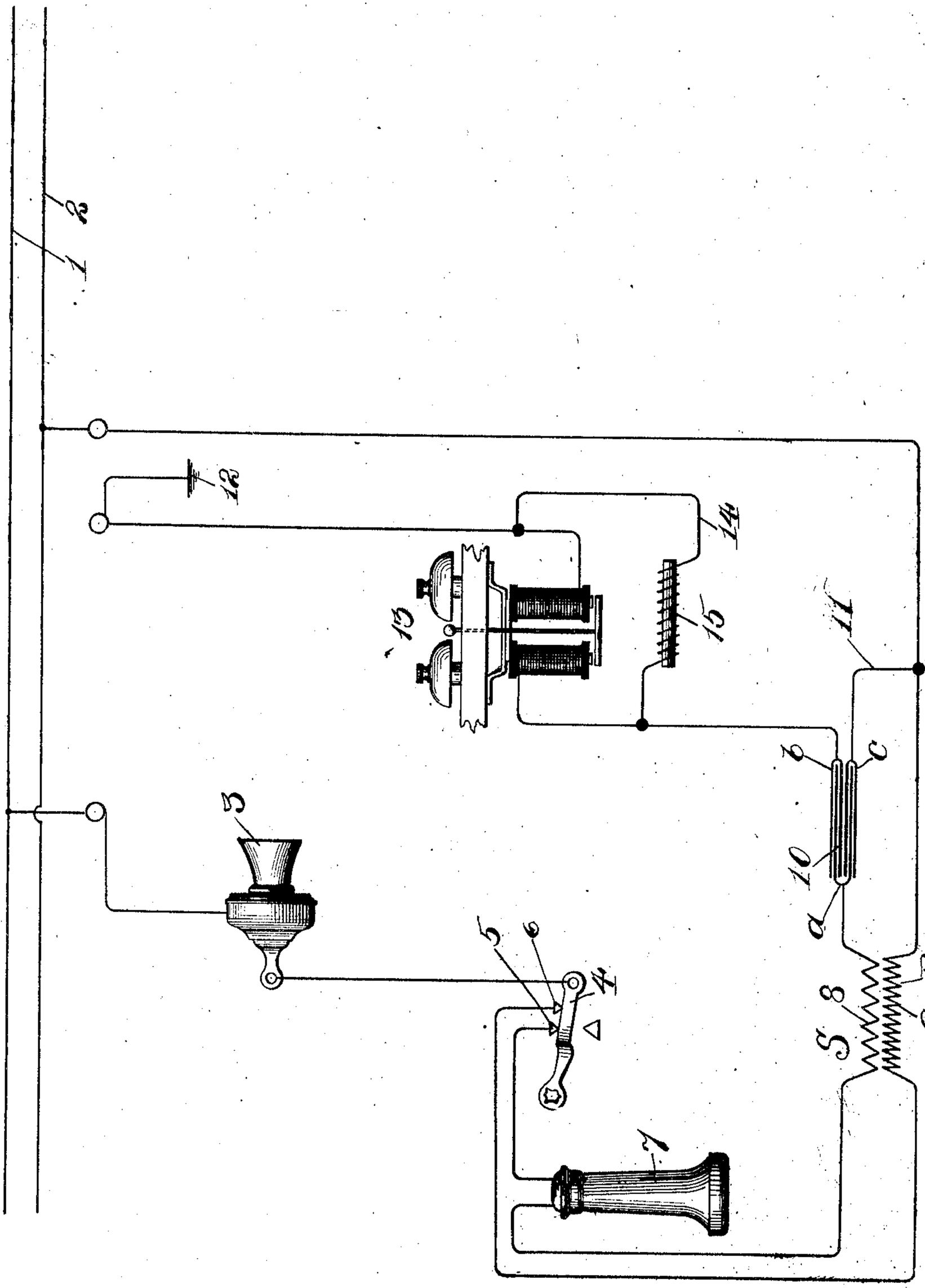

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UNITED STATES PATENT OFFICE.

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SUBSCRIBER'S TELEPHONE APPARATUS.

1,010,478. Specification of Letters Patent. **Patented Dec. 5, 1911.**

Application filed March 23, 1903. Serial No. 149,045.

To all whom it may concern:

Be it known that I, HENRY P. CLAUSEN, a citizen of the United States of America, and resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Subscribers' Telephone Apparatus, of which the following is a specification.

My invention relates to subscribers' telephone apparatus adapted more particularly for use on party-lines and in connection with means for selectively signaling any one of the many subscribers located on one line; and the object of the invention is to provide an improved subscriber's telephone apparatus of such character that it will respond to signaling current of a predetermined character, such as a predetermined frequency, and also of such character that side tones or disturbances in the receiver will be cut down or eliminated as much as possible. The side-toneless feature of my invention is, however, claimed in my application, Serial Number 147,322, filed March 11, 1903, and the claims of this patent are, therefore, limited to the features and combinations not disclosed in said prior application.

To the foregoing and other useful ends, my invention consists in matters hereinafter set forth and claimed.

In the accompanying drawings, the diagram illustrates a subscriber's telephone apparatus embodying the principles of my invention.

As thus illustrated, and as thus embodied in practical form, my invention may comprise a pair of line conductors 1 and 2, adapted to serve as a party-line for a number of subscribers. The apparatus at one of the subscribers' stations may be of the character shown in the diagram. In this diagram the transmitter 3 has one terminal connected with the line wire 1, and its other terminal connected with the hook-switch 4. The said transmitter and hook-switch may be of any suitable known or approved construction, the latter, however, being preferably provided with the two contacts 5 and 6. These contacts are normally opened, but are closed when the receiver 7 is removed from its normal position or resting place upon the said hook-switch. As illustrated, the receiver has one terminal connected with the contact 5, and its other terminal connected with one terminal of the winding 8 of the induction coil. The other contact 6 can be connected with one terminal of the other winding 9 of said induction-coil. The other terminals of the windings 8 and 9 are respectively connected with the three-way condenser 10 and the line-wire 2. The winding 9 is also connected with another part of the said condenser through the medium of the conductor 11. The third portion of the said condenser is provided with a conductor leading to ground at 12. In this ground connection, a polarized bell or ringer 13 is located, and around this bell there is preferably a shunt connection 14 including an impedance coil 15. The coils of the said bell and impedance coil can be of any suitable or requisite resistance. For ordinary work an impedance coil of say 1000 ohms resistance gives good results, it being preferable, however, that the impedance of this coil be higher than that of the bell-magnet. The winding 8 can be of 600 turns, and the winding 9 may be of 1800 turns. The resistance of the coils 8 and 9 can be suitably adjusted. For example, the coil 8 can be of 9 ohms resistance, and the coil 9 can be of 21 ohms resistance. The capacity of the condenser can also vary according to requirements. For example, from *c* to *b* it may be of $\frac{3}{8}$ microfarads, and from *a* to *c* of two microfarads. These resistances etc. have been tried and found to give very good results.

In operation the novel circuit arrangement particularly of the induction coil, condenser, receiver, and transmitter, tends to prevent disturbances in the receiver during the use of the transmitter, and to cut down what are commonly known as "side tones." In other words, the arrangement of the instruments appears to give a reactionary effect, which, as stated, quiets the circuit and permits the use of the transmitter without creating disagreeable disturbances in the receiver. Furthermore, the signal-receiving portion of the apparatus is designed to respond to an alternating or other fluctuating current of a certain pre-determined character, but not to other currents. In this way, the apparatus is adapted for use in what are commonly known as selective telephone systems. For example, an alternating current of too high frequency to pass through

the impedance coil 15, when projected on to the wire 2 will then pass through the coils of the bell 13. But if such current is of comparatively low frequency, then it may pass through the impedance coil 15, and in such case the bell does not ring. Thus the bell 13 will respond to a current of predetermined character, and a current which is projected on to the line for the express purpose of ringing this bell, but not to currents of a decidedly different character, and which may be projected on to the line for the purpose of ringing other bells along the party line.

It will be seen that the condenser 10 excludes battery current from the ringer 13, as well as from the receiver 7, the latter being excluded from all flow of battery current through the transmitter. Neither can any battery current flow from the line through the transmitter and receiver to the ringer and then to ground, as the condenser is not only in the parallel path including one winding of the induction coil, but is also directly in the leg to ground through the ringer. With such arrangement an alternating current of comparatively high frequency can pass over the line and through the condenser and through the ringer, as it will not pass through the impedance coil 15. A current of lower frequency, however, will pass through the said impedance coil, and thus the bell will not be rung. For the other bells or ringers on the line, any other suitable or desirable provision can be made for making them selectively responsive to their allotted ringing currents. Furthermore, with the arrangement shown the so-called side tones are cut down and modified in the receiver, when the subscriber uses his transmitter. At the same time voice currents are efficiently received in the receiver from the other end of the circuit.

In operation the ringing current, of suitable frequency, comes over the line wire 2, thence over the conductor 11 to the condenser, through the condenser 10 to the ringer 13, and then to ground at 12. The ringing current does not pass through the impedance coil 15, because the retardation thereof is too great for the frequency employed. Thus the one condenser is included in two circuits, namely the ringer circuit just described, and the line circuit through the receiver. The receiver circuit includes the two line conductors, the condenser 10, the secondary transformer winding 8, the receiver 7, the contact point 5 and switch-hook 4, and the transmitter 3. The transmitter circuit includes the two line conductors 1 and 2, the transmitter 3, the switch-hook 4, the switch contact 6, and the primary transformer winding 9, as illustrated. During use of the transmitter, the side tones usually resulting therefrom are cut down and materially reduced in the receiver, by the combined action of the condenser and transformer. The condenser cuts off battery current from the receiver and the ringer, and also serves in conjunction with the inductance of the transformer to reduce side tones in the receiver.

I claim as my invention:—

1. The combination of a subscriber's telephone line, a transmitter having one terminal connected with one side of the line, a hook-switch connected with the other terminal of the transmitter, said hook-switch having two normally open contacts, an induction-coil having one terminal of its primary coil connected with the other side of the line, and its other terminal connected with one of said contacts, a receiver having one of its terminals connected with the other of said contacts, and its other terminal connected with one terminal of the secondary winding of said induction-coil, a three-way condenser connected with the other terminal of the secondary winding of the induction-coil, said condenser being also connected with the terminal of the primary winding which is connected to one side of the line, a ground connection extending from said condenser, an electric bell having its magnet coils located in said ground connection, and an impedance coil located in a shunt connection extending around said magnet coils.

2. The combination of a subscriber's telephone line, a transmitter and a hook-switch and the primary winding of an induction coil connected in a normally open bridge across the line, said bridge being normally open at the hook-switch, a normally-open parallel connection extending around said primary winding, said parallel connection being normally open at the hook-switch, and said parallel connection including a condenser and the secondary winding of said induction-coil and a receiver, the said secondary winding being located between the receiver and the condenser, a ground connection extending from said condenser, an electro-magnet signaling device having its coils located in said ground connection, and an impedance coil located in a shunt extending around said signaling device.

3. The combination of a complete metallic line circuit, a suitable transmitter and receiver, a suitable hook-switch and induction-coil, a three-way condenser and a signaling device and an impedance coil connected in parallel and located in a conductor extending from said condenser to ground, and suitable connections whereby the closing of said switch places the transmitter, the receiver, the secondary winding of the induction-coil, and the condenser in a bridge extending across the circuit, and whereby such action of the switch also operates to place the primary winding of the induction coil

in a parallel connection extending around the condenser and receiver.

4. The combination of a subscriber's line, a condenser connected with the line, a bell having its coils located in a conductor extending from said condenser to ground, an impedance coil located in a parallel connection extending around said bell, said impedance coil being of higher impedance than the bell magnets, a hook-switch with two normally open contacts, a transmitter and a receiver, a suitable induction-coil, suitable connections whereby the closing of said switch-contacts places the transmitter, the receiver and the secondary winding of said induction coil in a bridge across the talking circuit, said bridge including suitable capacity, and whereby such action on the part of said switch also operates to place the primary winding of the induction coil in a parallel connection extending around said condenser and receiver.

5. The improved subscriber's telephone apparatus, including transmitter, receiver, hook-switch, condenser, induction coil, bell and impedance coil, the bell and impedance coil connected in parallel, and the condenser serving for both talking and signaling, being in the path of voice currents through the receiver and ringing currents through the bell, all organized substantially as shown and described.

6. The improved subscriber's telephone apparatus comprising a bell, an impedance coil connected in parallel with said bell, a three-way condenser having one member thereof connected to ground through the medium of said bell and impedance coil, a telephone receiver, and a path for voice currents including the condenser in series with the telephone receiver.

7. A telephone subscriber's apparatus comprising a receiver, a three-way condenser having one member thereof connected to ground, a selectively responsive bell having its coils in said grounded connection and a path for voice currents including the condenser in series with the telephone receiver.

8. The improved subscriber's telephone apparatus, including a receiver, a three-way condenser having one member thereof connected to ground, an impedance coil and the coils of a selective bell connected in said ground connection and a path for voice currents including the other two members of the condenser in series with the telephone receiver.

9. A subscriber's telephone apparatus, comprising a receiver, a condenser connected to ground, an impedance and selective bell in parallel in said ground connection and a path for voice currents including said condenser and receiver in series.

10. A subscriber's telephone circuit, comprising a condenser, a receiver, an impedance coil and an electric bell, the receiver being grounded through the condenser in series with the bell and impedance coil in parallel.

11. A subscriber's telephone apparatus comprising an induction coil having both windings temporarily connected in parallel in the talking circuit, together with a bell 13 and impedance coil 15 connected in parallel in a connection extending between ground and the parallel path of the secondary winding.

12. In combination, a telephone circuit, a source of current and a transmitter in said circuit, the primary of a transformer in said circuit, and a condenser and the secondary of said transformer serially connected in shunt only of said primary winding, together with a bell 13 and impedance coil 15 connected in parallel in a connection extending between ground and the parallel path of the secondary.

13. A telephone circuit having two parallel paths, one of said paths including only a primary transformer winding and the other path including a condenser serially connected in circuit with a telephone receiver and the secondary of said transformer, together with a bell 13 and impedance coil 15 connected in parallel in a connection extending between ground and the parallel path of the secondary.

14. In combination, a telephone transmission circuit, a source of current and a telephone transmitter serially included in the main circuit, an induction coil included in said circuit having a primary and a secondary winding connected in parallel with each other and included serially in the circuit with said transmitter, one of the parallel branches serially including a condenser and receiver in circuit, together with a bell 13 and impedance coil 15 connected in parallel in a connection extending between ground and the parallel path of the secondary.

15. A subscriber's telephone apparatus comprising a telephone line, a three-way condenser provided with three terminals and with ground; a selectively responsive ringer connected with one terminal, a receiver connected with another terminal, and a connection between the other terminal and the line, substantially as set forth.

16. A common battery telephone system comprising a condenser, a subscriber's receiver excluded from the path of battery current by the condenser, a ringer connected to ground through said condenser, and an impedance element connected in shunt of said ringer.

17. A common battery telephone system comprising a condenser, a subscriber's receiver excluded from the path of battery current by the condenser, an induction coil having its two windings included in parallel in the talking circuit, a ringer connected

to ground through said condenser, and an impedance element connected in shunt of said ringer.

18. A common battery telephone system comprising a condenser, a subscriber's receiver excluded from the flow of all common battery current by the condenser, a ringer connected to receive ringing current through said condenser, and an impedance element connected in shunt only of said ringer.

19. A common battery telephone system comprising a condenser, a subscriber's receiver excluded from the path of battery current by the condenser, an induction coil having its two windings included in parallel in the talking circuit, a ringer connected to receive ringing current through said condenser, and an impedance element connected in shunt of said ringer.

20. A common battery telephone system comprising a condenser, a transformer, a selectively responsive ringer, a receiver connected in series with the secondary of the transformer, and in series with the condenser and the selectively responsive ringer.

21. A telephone circuit having two parallel paths, one of said paths including only a primary transformer winding and the other path including a condenser serially connected in circuit with a telephone receiver and the secondary of said transformer, and a selectively operated ringer connected to receive ringing current of the proper frequency through said condenser.

22. In combination, a telephone transmission circuit, a source of current and a telephone transmitter serially included in the main circuit, an induction coil included in said circuit having a primary and a secondary winding connected in parallel with each other and included serially in the circuit with said transmitter, one of the parallel branches serially including a condenser and receiver in circuit, and a selectively operated ringer connected to receive ringing current of the proper frequency through said condenser.

23. A telephone circuit having two parallel paths, one of said paths including only a primary transformer winding and the other path including a condenser serially connected in circuit with a telephone receiver and the secondary of said transformer, and a ringer and impedance coil in shunt thereof and connected to receive ringing current through said condenser.

24. In combination, a telephone transmission circuit, a telephone transmitter serially included in the main circuit, an induction coil included in said circuit having a primary and a secondary winding connected in parallel with each other and included serially in the circuit with said transmitter, one of the parallel branches serially including a condenser and receiver in circuit, and a ringer and impedance coil in shunt thereof and connected to receive ringing current through said condenser.

25. A telephone circuit having two parallel paths, one of said paths including only a primary transformer winding and the other path including a condenser serially connected in circuit with a telephone receiver and the secondary of said transformer, and a selectively responsive ringer connected with a third terminal of said condenser.

26. In combination, a telephone transmission circuit, a source of current and a telephone transmitter serially included in the main circuit, an induction coil included in said circuit having a primary and a secondary winding connected in parallel with each other and included serially in the circuit with said transmitter, one of the parallel branches serially including a condenser and receiver in circuit, and a selectively responsive ringer connected with a third terminal of said condenser.

27. A receiver, a selectively responsive ringer, a condenser interposed between the receiver and ringer, and a line connected with the receiver and ringer through the medium of said condenser.

28. A receiver, a selectively responsive ringer, a condenser interposed between the receiver and ringer, and a line connected with the receiver and ringer through the medium of said condenser, said condenser having a higher capacity for the receiver than for the ringer.

Signed by me at Chicago, Cook county, Illinois, this 17th day of March, 1903.

HENRY P. CLAUSEN.

Witnesses:
A. F. DURAND,
WM. A. HARDERS.