O. M. LEICH.

SELECTIVE SIGNALING APPARATUS.

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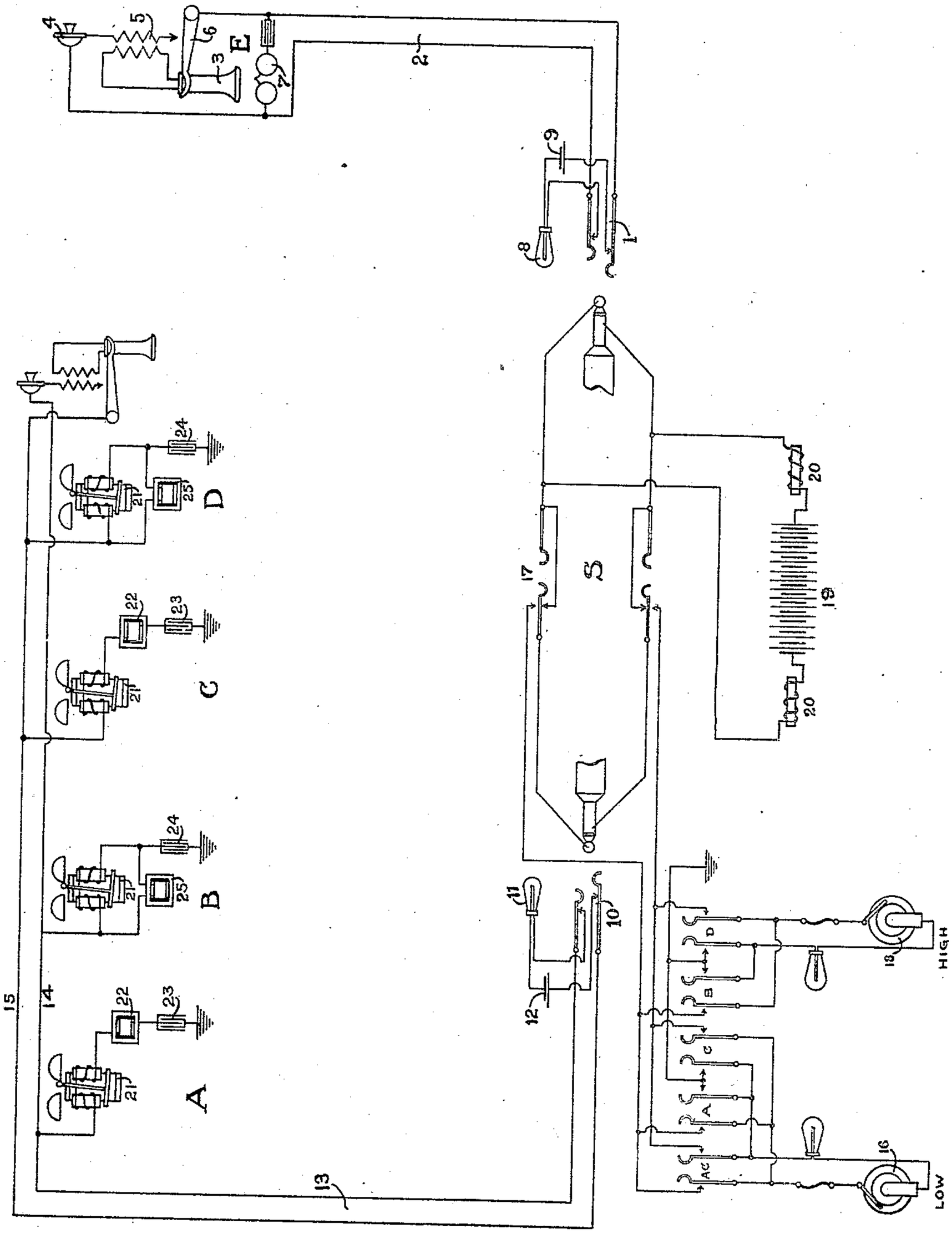
943,115.

Patented Dec. 14, 1909.



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SELECTIVE SIGNALING APPARATUS.

943,115. Specification of Letters Patent. Patented Dec. 14, 1909.

Application filed February 3, 1905. Serial No. 244,013.

To all whom it may concern:

Be it known that I, OSCAR M. LEICH, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented a certain new and useful Improvement in Selective Signaling Apparatus, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to selective signaling apparatus and has for its object the provision of an improved system in which the apparatus at sub-stations is simplified so that a cheap and easily adjusted system may be supplied which will be free from defects previously present in apparatus of this kind.

In certain respects my present invention is an improvement on previous systems invented by me, such, for example, as those shown in United States Letters Patent No. 799,010, dated September 5th, 1905, and in my prior co-pending application Serial Number 58,647 dated May 3rd, 1901.

I will describe the preferred embodiment of my invention more in detail by referring to the accompanying drawing illustrating one manner of its application, in which I have shown a complete arrangement of my improved signaling system as applied more particularly to telephone systems.

Referring to the drawing, I have shown central station equipment at S, which is adapted to interconnect various subscribers' lines entering an exchange. As all know, a central station is provided with jacks at which the subscribers' lines terminate. I have shown a jack 1 in which the subscriber's line 2 terminates, the subscriber's line 2 terminating at its other extremity in the sub-station equipment comprising a telephone receiver 3, transmitter 4, induction coil 5 and switch hook 6. The sub-station equipment also has one alternating current polarized bell 7 which is shown in this instance as permanently connected to the circuit. The jack 1 is here shown of the double cut-off type, having auxiliary springs which are connected with an indicating lamp 8 and a battery 9. I have shown a second jack 10 associated with a lamp 11 and battery 12 which serves as the terminus of a party line 13, to which four subscribers' stations A, B, C, and D have been connected, each of the subscribers' stations comprising the ordinary telephone equipment as outlined in connection with subscriber's station E on line 2, although in this instance shown only in association with the station D, which talking apparatus is adapted to be connected in metallic circuit across the limbs of the subscriber's line 13. Each sub-station apparatus A, B, C and D is also provided with signaling apparatus, the stations A and B having their signaling apparatus connected between the limb 14 of the subscriber's line 13 and the ground, and the signaling apparatus of the stations C and D being connected with the limb 15 of the subscriber's line 13 and the ground. Thus when signaling current is projected over the limb 14 stations A and B receive current, and when signaling current is projected over limb 15 current traverses through signaling apparatus of the stations C and D.

I have shown two signaling generators, one marked "low" and the other marked "high." The generator marked "low" is adapted to supply currents of a relatively low frequency—that which is preferably employed being about 20 cycles per second. The generator marked "high" is adapted to furnish current of a relatively high frequency, and I preferably employ about 60 cycles for this high frequency alternating current. These two generators are connected to the signaling circuit by means of a selective key having different selecting springs marked AC, A, B, C and D. When button AC is depressed the low frequency generator 16 is connected metallically between the tip and sleeve wires of the cord circuit, thus projecting signaling current of low frequency metallically over a subscriber's line. This button AC would be depressed and the ringing key 17 actuated, for instance, if it were desired to call a metallic station. If it is desired to call stations A, B, C and D either buttons A, B, C and D must be depressed and the ringing key 17 actuated. If the springs A are operated low frequency ringing current is connected between the line wire 14 and the ground through the jack 10. If the springs B are operated high frequency ringing current from the generator 18 is connected between the line wire 14 and the ground. Similarly the springs C of the selective key connect the low frequency generator through the in-

terposition of the key 17 and the spring jack between the wire 15 and ground, and the key D connects the high frequency generator 18 between the line wire 15 and the ground. At the central station also a battery having impedance coils 20, 20 is employed to provide talking current for the subscriber's line.

As stations C and D are similar to the stations A and B, I will explain the selective operation only of the stations A and B. Station A has signaling apparatus which responds when a low frequency current is impressed upon its terminals and will not respond when a high frequency current is impressed upon its terminals. Conversely, station B will respond when high frequency current is impressed on the terminals of its signaling apparatus, but will not respond when a low frequency current is impressed on the same terminals. The way in which I accomplish this selective operation is as follows: I preferably employ at each station ordinary polarized magneto bells 21, 21. At the station A this polarized bell or signal 21 is connected in series with an impedance coil 22 and a condenser 23. The condenser 23 is not necessary so far as the selective operation of the instrument is concerned, being employed for the purpose of preventing a grounding of the line, whereby a wasteful flow of the battery 12 would be occasioned. The impedance coil 22 is arranged with impedance that will permit a low frequency current to pass therethrough in sufficient quantity to actuate the signal 21. If a high frequency alternating current, such, for instance, as would be delivered by the generator 18 is impressed on the line wire associated with this signal and the ground, the impedance of the impedance coil 22 will be raised correspondingly to such a degree that a flow of alternating current in sufficient operative quantity would be prevented from passing through the signal 21. In the station B the signal 21 is connected in series with a condenser 24, which condenser is preferably of low capacity, and this condenser is so chosen that the high frequency ringing current furnished by the generator 18, for instance, will pass therethrough in sufficient quantity to operatively actuate the signal 21. When the low frequency ringing current furnished by the generator 16 is impressed on the same line and ground this low frequency current is prevented from operatively actuating the signal 21 by reason of the greatly increased impedance of condenser 24. On account of this change of frequency the signal 21 at station A will readily respond to a low frequency and not to a high frequency current, and the signal 21 at station B will readily respond to a high frequency current but will not respond to a low frequency current. To more thoroughly cause the selective operation of the high frequency instrument I employ an impedance coil 25, which is connected in bridge of the signal 21. The reason for this is that the low frequency current will be diverted from passing through signal 21 by the path offered by the impedence coil 25, but on account of the greatly increased impedance of this coil when a high frequency is impressed no appreciable amount of high frequency current is diverted away from the signal 21. For this reason I preferably employ an impedance coil with a closed iron circuit as shown.

The operation of the system will be readily apparent now to those skilled in the art.

A high and a low frequency instrument is connected between either line wire and the ground and high or low frequency signaling current projected over either line wire and ground, depending upon which signal of the four shown it is desired to actuate.

By non-tuned or non-resonant, I mean a circuit that is not tuned or resonant for the frequency that traverses it to operate the signal.

While I have herein shown and particularly described the preferred embodiment of my invention, I do not wish to limit myself to the precise construction and arrangements as herein set forth, but

Having thus described one embodiment thereof, what I claim as new and desire to secure by Letters Patent is:—

1. In a selective signaling system, the combination with means for supplying alternating currents of different frequency, each to a different substation on the line, of an electric circuit, signal receiving apparatus associated with said circuit and responsive to alternating currents of a given frequency, said signaling apparatus comprising an impedance coil for causing the selective operation of the signal associated therewith, and electrically non-tuned signal receiving apparatus responsive to currents of a different frequency, said signaling apparatus having means associated therewith to prevent its operation on currents adapted to operate the first aforesaid signal receiving apparatus.

2. In a selective signaling system, the combination with means of supplying currents of different frequency, each to a different substation on the line, of an electric circuit, signal receiving apparatus adapted for association with said circuit, said apparatus comprising a signal and an impedance device whose serial impedance effect causes the selective operation of said signal between currents of different frequency, and electrically non-tuned signaling apparatus adapted for association with said electric circuit, said signaling apparatus being provided with a series impedance device caus-

ing it to operate on a different frequency from that which actuates the first aforesaid device and to prevent its operation on the current of the frequency which will operate the first aforesaid apparatus.

3. In a selective signaling system, the combination with means for supplying currents of different frequency, each to a different substation on the line, of an electric circuit, selective signaling apparatus adapted for association with said circuit and responsive to alternating currents of a given frequency, and electrically non-tuned signaling apparatus also adapted for association with said circuit, said second signaling apparatus being provided with a series impedance device causing it to operate on a frequency other than that which operates the first said aforesaid device and to be non-responsive to currents adapted to operate the first aforesaid device.

4. In a selective signaling system, the combination with means for supplying currents of different frequency, each to a different substantion on the line, of an electric circuit, selective signaling apparatus adapted for association with the said circuit and responsive to alternating currents of a given frequency, and electrically non-tuned signaling apparatus also adapted for asscciation with said circuit, said second signaling apparatus being provided with a condenser causing it to operate on a frequency other than that which operates the first aforesaid device and to be non-responsive to currents adapted to operate the first aforesaid device.

5. In a selective signaling system, the combination with means for supplying currents of different frequency, each to a different substation on the line, of an electric circuit, selective signaling apparatus adapted for association with said circuit and responsive to alternating currents of a given frequency, and electrically non-tuned signaling apparatus also adapted for association with said circuit, said second signaling apparatus being provided with a bridged impedance device causing it to operate on a frequency other than that which operates the first aforesaid device and to be non-responsive to currents adapted to operate the first aforesaid device.

6. In a selective signaling system, the combination with means for supplying currents of different frequency, each to a different substation on the line, of an electric circuit, selective signaling apparatus adapted for association with said circuit and responsive to alternating currents of a given frequency, and electrically non-tuned signaling apparatus also adapted for association with said circuit, said second signaling apparatus being provided with a bridged impedance coil causing it to operate on a frequency other than that which operates the first aforesaid device and to be non-responsive to currents adapted to operate the first aforesaid device.

7. In a selective signaling system, the combination with means for supplying currents of different frequency, each to a different substation on the line, of an electric circuit, key switching mechanism for selectively impressing currents of different frequency on said electric circuit, an electromagnetic signal adapted for association with said circuit, an impedance coil in series with said circuit causing operation on a certain frequency, a second electromagnetic signal adapted for association with said circuit having a condenser included in series therewith to cause its selective operation on a different frequency from that adapted to operate the first aforesaid signal, said signals being included in electrically non-tuned circuits.

8. In a selective signaling system, the combination with means for supplying currents of different frequency, each to a different substation on the line, of an electric circuit, key switching mechanism for selectively impressing currents of different frequency on said electric circuit, an electromagnetic signal adapted for association with said circuit, an impedance coil in series with said signal causing operation on a certain frequency, a second electromagnetic signal adapted for association with said circuit having an impedance coil included in parallel therewith to cause its selective operation on a different frequency from that adapted to operate the first aforesaid signal, said signals being included in electrically non-tuned circuits.

9. In a selective signaling system, the combination with means for supplying currents of different frequency, each to a different substation on the line, of an electric circuit, selective signaling apparatus adapted for association with said circuit and responsive to alternating currents of a given frequency, and a signaling apparatus also adapted for association with said circuit, said second signaling apparatus having a path that is non-resonant for the frequency to which it is responsive, and having serial impedance to cause a selective operation of its associated signal as between the frequencies aforesaid.

10. In a selective signaling system, the combination with means for supplying currents of different frequency, each to a different substation on the line, of an electric circuit, key switching mechanism for selectively impressing currents of different frequency on said electric circuit, an electromagnetic signal adapted for association with said circuit, said signal having series impedance to control its operation on certain frequencies, a second electromagnetic sig-

nal adapted for association with said circuit having a condenser included in series therewith to control its selective operation on a different frequency from that adapted to operate the first aforesaid signal, said signals being included in electrically non-tuned circuits.

11. In a selective signaling system, the combination with means for supplying currents of different frequency, each to a different substation on the line, of an electric circuit, selective signaling apparatus adapted for association with said circuit, and responsive to alternating currents of a given frequency, and signaling apparatus also adapted for association with said circuit, said second signaling receiving apparatus having a path that is non-resonant for the frequency to which it is responsive, and being provided with a serial impedance device to control its operation on a frequency other than that which operates first aforesaid device.

12. In a selective signaling system, the combination with means for supplying currents of both high and low frequency, each to a different substation on the line, of an electric circuit, selective signaling apparatus adapted for association with said circuit, and responsive to alternating currents of a given frequency, and electrically non-tuned signaling apparatus also adapted for association with said circuit, said second signaling apparatus being provided with reactive means which are adapted to permit all high frequency currents to operatively actuate said signal and which also prevent low frequency currents from operatively reaching said signal.

13. In a selective signaling system, the combination with means for supplying currents of both high and low frequency, each to a difficult substation on the line, of an electric circuit, selective signaling apparatus adapted for association with said circuit, and responsive to alternating currents of a given frequency, and electrically non-tuned signaling apparatus also adapted for association with said circuit, said second signaling apparatus being provided with serial reactive means which are adapted to permit all high frequency currents to operatively actuate said signal and which also prevent low frequency currents from operatively reaching said signal.

14. In a selective signaling system, the combination with means for supplying currents of both high and low frequency, each to a different substation on the line, of an electric circuit, selective signaling apparatus adapted for association with said circuit, and responsive to alternating currents of a given frequency, and electrically non-tuned signaling apparatus also adapted for association with said circuit, said second signaling apparatus being provided with a condenser which is adapted to permit high frequency currents to operatively actuate said signal and which also prevent low frequency currents from operatively reaching said signal.

15. In a party line selective ringing telephone system, a polarized ringer for each party line subscriber, means for supplying suitable ringing currents of different frequencies, an impedance coil connected in series with one ringer, to render the same responsive to a certain frequency, and an impedance coil connected in shunt of another ringer, to render the same responsive to another frequency.

16. In a party line selective ringing telephone system, a polarized ringer for each party line subscriber, means for supplying suitable ringing currents of different frequencies, a reactive element connected in series with both windings of one of said ringers, to render the same responsive to a certain frequency, and a reactive element connected in shunt of both windings of another ringer, to render the same responsive to another frequency.

17. In a party line selective ringing telephone system, a polarized ringer for each party line subscriber, means for supplying suitable ringing currents of different frequencies, an impedance coil and a condenser connected in series with both windings of said ringers, to render the same responsive to a certain frequency, and an impedance coil and condenser associated with another ringer, the impedance coil being connected in shunt thereof, but the condenser being connected in series with the ringer.

18. In a party line selective ringing telephone system, a polarized ringer for each party line subscriber, means for supplying suitable ringing currents of different frequencies, inductance in series with one or more of said ringers, and inductance in shunt of one or more of said ringers, whereby one ringer is responsive to a certain frequency, and another ringer is responsive to a different frequency.

In witness whereof, I hereunto subscribe my name, this 27th day of November A. D., 1904.

OSCAR M. LEICH

Witnesses:
MAX W. ZABEL,
F. B. BOICE.

Correction in Letters Patent No. 943,115.

It is hereby certified that in Letters Patent No. 943,115, granted December 14, 1909, upon the application of Oscar M. Leich, of Rochester, New York, for an improvement in "Selective Signaling Apparatus," an error appears in the printed specification, requiring correction, as follows: Page 4, line 43, the word "difficult" should read *different;* and that the said Letters Patent should be read with this correction therein, that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 4th day of January, A. D., 1910.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.