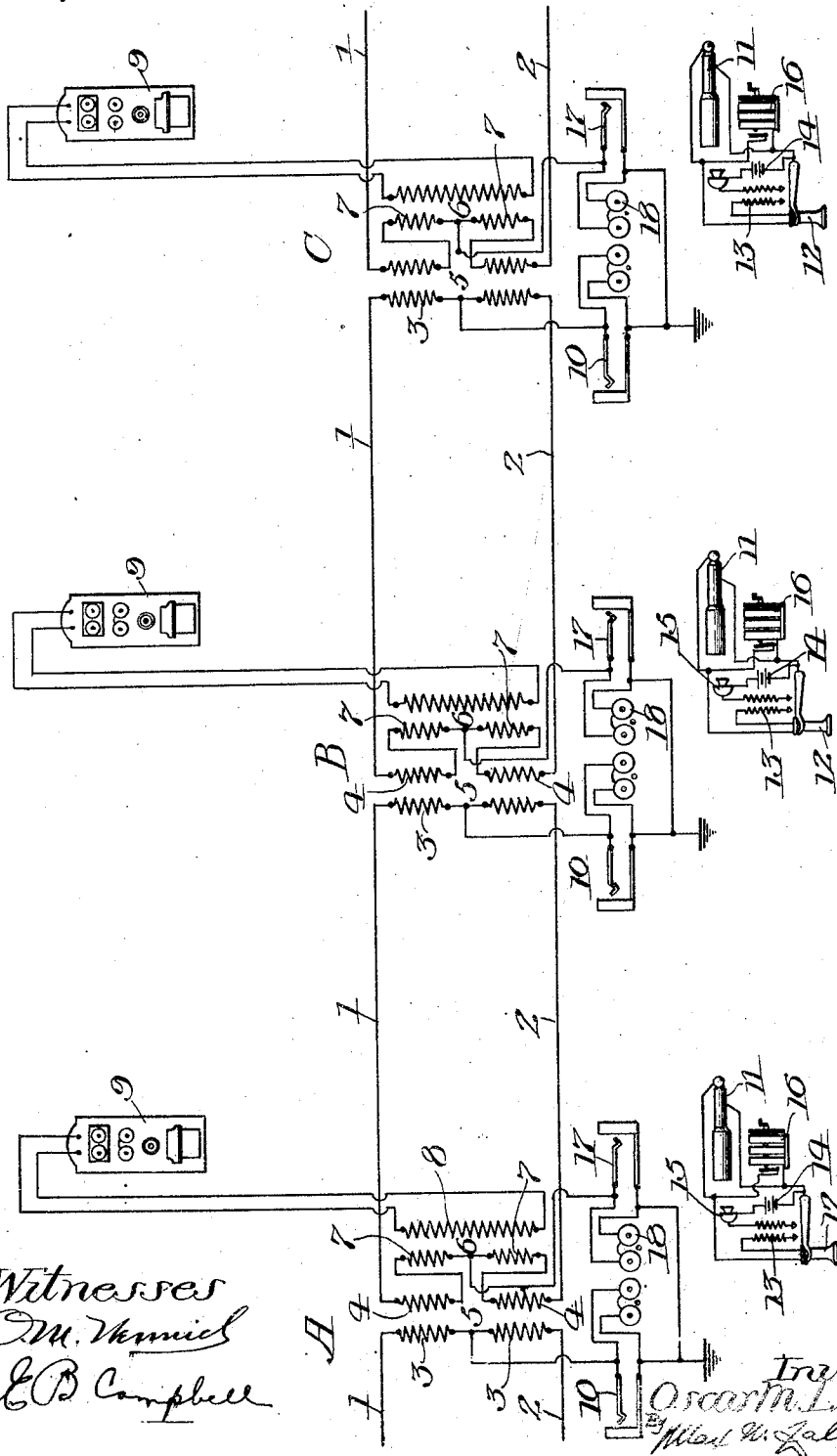


O. M. LEICH.
TELEPHONE SYSTEM.
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938,154.

Patented Oct. 26, 1909.



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TELEPHONE SYSTEM.

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To all whom it may concern:

Be it known that I, OSCAR M. LEICH, a citizen of the United States, residing at Genoa, in the county of Dekalb and State of Illinois, have invented a certain new and useful Improvement in Telephone Systems, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to telephone systems, and has for its object the provision of an improved system which has its application more particularly in railway service, where it can be used to transmit messages from one end of the line to the other, and where over the same circuit used for this long distance transmission a plurality of local conversations between stations can be maintained.

Details and advantages of this system will be more apparent from the following description, taken in connection with the accompanying drawing, illustrative of one embodiment thereof. In this drawing the circuit arrangements and also portions of the apparatus are shown diagrammatically.

I employ two line conductors, 1 and 2, which unite various stations, A, B, C. At each station I provide a repeating coil, consisting of the primary windings, 3, 3, and the secondary windings, 4, 4, which repeating coil renders the conductors 1 and 2 continuous through these stations. These repeating coils, consisting of the coil 3, 3 and 4, 4, I have designated by the numeral 5. In association with each repeating coil 5 there is a repeating coil 6, having windings 7, 7 in inductive relation to a winding 8. The winding 8 is in series with a telephone 9.

It will be apparent from the illustration given so far that the telephones 9, 9 can intercommunicate with each other using the conductors 1 and 2, which provide for this communication a metallic circuit. The conversation, for instance from the left-hand telephone 9 is transmitted from the winding 8 to the windings 7, 7, and is transmitted to the coils 4, 4, which are in series with the coils 7, 7 and coils 4, 4, in connection with coils 3, 3, project the voice current in both directions over the line-wires 1 and 2. Long-distance communication therefore may be had between the various telephones 9, 9, 9, the number being increased to suit the num-

ber of blocks or stations which comprise a division. It is necessary in railway service not only to provide this long-distance communication, so that the train despatcher can talk to any station along the line, but it is also necessary to provide service so that each station can talk with its adjoining station on either side. To obtain this result, I provide a jack 10, one contact of which is connected between the coils 3, 3, and the other contact of which is connected to ground. In connection with this jack, I use a plug 11, having connected to it a receiver 12, an induction coil 13, a battery 14, and a transmitter 15, likewise a generator, 16. Thus, when the plug 11 is inserted in the jack 10, voice currents can be propelled over the line wires 1 and 2, which now operate in parallel for this talking service and the ground.

The coils 3, 3 do not offer any special impedance, because of the fact that one terminal of the jack is connected between the coils 3, 3, so that currents through these coils flow in opposite directions, and they therefore act differentially, and in the ideal case there is no magnetism in the core due to the conversation received from the telephone connected with the plug 11. It is likewise apparent that with this construction no talking currents are transmitted from the coils 3, 3 to the coils 4, 4, so that if we take the middle telephone at station B, for instance, and it is connected in the jack 10, it can hold communication with jack 17 of station A only, or if the plug 11 is inserted in jack 17 of station B, it can hold communication only with jack 10 of station C. If it is desired to hold a conversation from jack 10 of station B, for instance, with jack 17 of station A, the plug 11 is inserted in jack 10 of station B, and the generator 16 operated to ring the bell 18. It will be apparent from this, therefore, that a conversation over the two line wires and ground can be maintained between stations A and B, between B and C, between station C and the station to the right (not here shown), and between station A and its associate station on the left (not here shown), all these conversations being simultaneous, and can go on without disturbing a further conversation which can be held at the same time over the line wires 1 and 2 metallicly by the telephones 9, 9, 9.

In order to properly propel ringing currents through the coils 7, 7 and 8, it is neces-

sary to use a very high frequency calling current in the telephones 9, 9, 9, which high frequency calling device is the subject of another application of mine.

5 It will be seen from the illustration that jack 17, instead of being connected between the coils 4, 4, as would be the case if these two coils were joined together, is connected midway between coils 7, 7, which accom-
10 plishes the same object.

This system is adapted for train despatching purposes, in which case telephones 9, 9, 9 are used, and local conversations, together with the ordinary inter-station block signals
15 can be had between the jacks 10 and 17 of the various stations:

I have herein shown and particularly described one embodiment of my invention, and

20 by Letters Patent is:

1. A telephone system, comprising a metallic circuit, repeating coils for maintaining the continuity of said circuit, a plurality of telephone instruments associated with
25 said circuit, for the purpose of metallic intercommunication, a plurality of groups of telephones likewise associated with said circuit, and arranged along said circuit in tandem formation, so that intercommunication
30 can be held between the telephones of each group, and repeating coils for preventing telephonic intercommunication between the first aforesaid telephones and the grouped telephones.

35 2. A telephone system, comprising a metallic circuit, repeating coils for maintaining the continuity of said circuit, a plurality of telephone instruments associated with said circuit, for the purpose of metallic inter-
40 communication, high frequency calling and signaling devices provided for said telephones, a plurality of groups of telephones likewise associated with said circuit, and arranged along said circuit in tandem forma-
45 tion, so that intercommunication can be held between the telephones of each group, and repeating coils for preventing telephonic intercommunication between the first aforesaid telephones and the grouped telephones.

50 3. A telephone system, comprising a metallic circuit, repeating coils for maintaining the continuity of said circuit, each winding of said repeating coil being divided into two component parts, a second repeating
55 coil associated with each of the aforesaid repeating coils, one of the windings of each of the last aforesaid repeating coils being

connected in series with the winding of its associated repeating coil first aforesaid, a telephone instrument associated with the 60 second winding of each of the last aforesaid repeating coils, telephone instruments adapted for connection midway between the windings of the first aforesaid repeating coil and the ground, and high frequency signal- 65 ing arrangements provided for the first aforesaid telephones.

4. A railway telephone system, comprising a metallic line circuit and a return circuit in combination with a central station 70 and a plurality of substations, of a telephone set at each of said stations arranged for metallic intercommunication over said line circuit, electro-magnetic means for establishing a plurality of adjoining, non-in- 75 terfering telephone circuits in tandem arrangement over said line circuit and return circuit, said last mentioned circuits not interfering with the metallic circuit telephones aforesaid, and said last mentioned circuits 80 being continuous between and ending at the various substations, a second telephone set at each substation, and switching instrumentalities for connecting same to either one of the adjoining last mentioned circuits 85 terminating at its associated substation.

5. A railway telephone system, comprising a metallic line circuit and a return circuit in combination with a central station 90 and a plurality of substations, of a telephone set at each of said stations arranged for metallic intercommunication over said line circuit, electro-magnetic means for establishing a plurality of adjoining, non-inter- 95 fering telephone circuits in tandem arrangement over said line circuit and return circuit, said last mentioned circuits not interfering with the metallic circuit telephones aforesaid, and said last mentioned circuits 100 being continuous between and ending at the various substations, a second telephone set at each substation, switching instrumentalities for connecting same to either one of the adjoining last mentioned circuits terminat- 105 ing at its associated substation, and high frequency vibratory signal receiving devices associated with each of the first aforesaid metallic telephones.

In witness whereof, I hereunto subscribe my name this sixth day of June A. D., 1908. 110
OSCAR M. LEICH.

Witnesses:

O. M. NERMICH,
E. B. CAMPBELL.