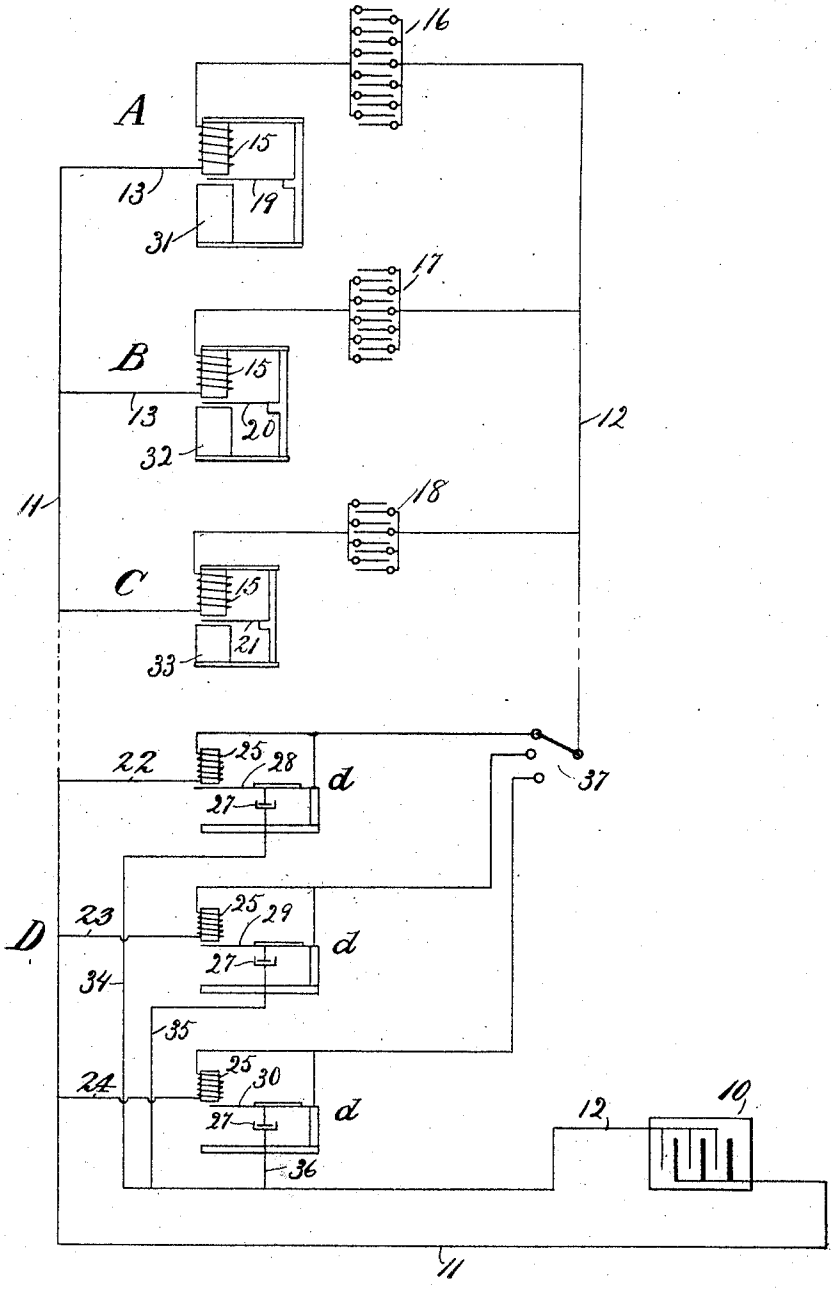
L. W. CARROLL.

SELECTIVE SIGNAL.

APPLICATION FILED OCT. 1, 1906.

1,036,796. Patented Aug. 27, 1912.



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SELECTIVE SIGNAL.

1,036,796. Specification of Letters Patent. Patented Aug. 27, 1912.

Application filed October 1, 1906. Serial No. 336,903.

To all whom it may concern:

Be it known that I, LOUIS W. CARROLL, a citizen of the United States, and resident of Anamosa, county of Jones, and State of Iowa, have invented certain new and useful Improvements in Selective Signals, of which the following is a specification, and which are illustrated in the accompanying drawings, forming a part thereof.

The invention relates to electric signals, and particularly to those in which provision is made for calling any one of a plurality of stations all served by the same signal line.

It is well known that a periodic current having a given period of vibration or frequency can only be caused to freely traverse the coils of an electro-magnet having a definite resistance and number of turns of wire, when there is associated with the magnet an electric condenser of a certain capacity. In order to permit a periodic current having a different period of vibration, to traverse the coils of a similar magnet, a condenser of different capacity is required. Furthermore, an acoustic armature may be vibrated to produce an audible tone if reacted upon by an electro-magnet which is excited by a periodic current having a period of vibration which is in harmony with that of the armature, and if the magnet is excited by a current having a different period of vibration the armature will be affected but little. It is also recognized that a resonating tube may be sounded by a vibrating body placed near its mouth if the two are of similar or harmonic pitch, and that a vibrating body placed in the same position with reference to the tube but having a different pitch will produce little or no sound in the tube.

The invention provides means for employing these principles for the purpose of accomplishing so-called selective signaling, and contemplates an electric circuit and a plurality of signal stations each in a branch of the circuit, the branch circuits being electrically adapted, as by means of condensers of differing capacity, for the passage only of periodic currents having definite periods of vibration. For each signal station there is also an acoustic magnet armature having a period of vibration in harmony with that of the current which may traverse the branch circuit with which it is to be associated, and a further selection of signals may be obtained by means of a resonating tube for each of the acoustic armatures.

The object of the invention is to provide means for increasing the number of signal stations which may be employed upon a single line and for obtaining increased accuracy in the operation of devices of this kind.

In the accompanying drawing there is shown in diagram a signal line constructed in accordance with the invention.

A source of electric energy, as a storage battery, is designated 10, and to this are connected the wires 11 and 12 of a line circuit comprising a plurality of signal stations, of which three, designated A, B and C, respectively, are shown.

Signaling apparatus is provided at each of the stations A, B and C, and as shown comprises an electro-magnet 15 having its coils in circuit with a branch 13 of the line wires 11 and 12. Preferably the magnets for all of the signal stations are similar as to resistance and the number of turns of wire in their coils, and for each of these magnets there is an acoustic armature, as 19, 20 and 21, shown as taking the form of a vibratile reed, the pitch of each of the reeds being different from that of all of the others by reason of a difference in length, as shown.

The coils of each of the electric-magnets 15 are adapted to the passage of a periodic current, the frequency of which is in harmony with the rate of vibration of the magnet armature by means of a condenser, as 16, 17, 18, respectively, preferably connected in series in the circuit branch 13 with the magnet coils. These condensers, as shown, are made of differing capacity by forming each of a different number of laminations or plates.

Means are provided for transmitting through the line circuit from the battery 10 pulsating or alternating currents for operating the signal at any one of the stations A, B and C. Apparatus for effecting this result is preferably located at a central station or switchboard D, and as shown comprises a plurality of sending instruments *d*. Each of the instruments *d* comprises an electro-magnet 25, having a vibratile armature, as 28, 29 and 30, each of the armatures having a rate of vibration similar to that of one of the acoustic armatures 19, 20 and 21 at the signal stations A, B and C.

A current interrupter which preferably takes the form of a variable resistance device 27 is controlled by each of the magnet armatures 28, 29 and 30, and each is located

in a branch, as 34, 35, 36, of the line wire 12, all of the branches leading to a switch 37 adapted for closing the line circuit through any one of them. The coils of the electro-magnets 25 are served with current from the battery 10 through that one of the variable resistance devices which is controlled by the armature of the magnet, and preferably in order to provide a path for the discharge of the condensers 16, 17 and 18 at the several signal stations, each is located in a shunt or branch, as 22, 23, 24, of the line circuit. Preferably the circuit branches 22, 23, 24, lead from the line wire 11 to the branches 34, 35, 36, respectively, of the line wire 12 in front of the switch 37, in order that the circuit may be closed continuously through each of the sending instruments whenever the device is in operation, but beyond the variable resistance devices 27 in order that the path for the discharge of the condensers 16, 17, 18, may not be interrupted thereby.

In practice each of the magnet armatures 28, 29 and 30 at the central station D will be continuously vibrated by the passage of a portion of the current from the battery 10 through each of the magnets 25 and variable resistance devices 27. In order, however, that but little energy may be consumed in this way, the coils of each of the magnets 25 are designed to afford a high impedance to the passage of the current. Whenever the line circuit is closed through one of the sending instruments *d* by means of the switch 37, a vibrating current will traverse the line wires 11 and 12, the period of vibration of such current being controlled by the rate of vibration of the armature of the sending instrument then in use. The greater portion of this current will traverse only that part of the line circuit including the branch circuit 13 at one of the signal stations to which the current is adapted by reason of a condenser, as 16, 17, 18, of the proper capacity, and for the magnet of that branch 13 of the circuit traversed by the current there is an acoustic armature tuned to vibrate at the same rate as the current which the magnet receives. This armature will then be actuated to produce an audible tone, while the armatures at the other stations will be but little affected, as the magnets of those stations receive but a small portion of the current and that which they do receive is out of harmony, as to its rate of vibration, with the armatures.

The tone produced by the magnetic armatures at the several signal stations may be greatly magnified by means of a resonator, preferably taking the form of a tube, as 31, 32, 33, having a pitch in harmony with that of the magnet armature at the station at which they are located. As shown, the pitch of the several resonating tubes is made to correspond with that of the magnet armatures at the various stations by forming the tubes of different size. By means of the resonating tubes a further provision is made for preventing a signal being produced at a station other than that for which it is intended, for while a small amount of a periodic current may traverse the coils of an electro-magnet not adapted to that current by means of a condenser of the proper capacity, and although such a current may cause a distinct vibration in the armature of that magnet, such a vibration of the armature, not being that to which the resonating tube is tuned, will not be enhanced and rendered audible thereby. For this reason, periodic currents, not widely different as to rate of vibration, may be used for the various signals upon the same line, and the number of signals upon a single line may therefore be considerable without requiring a wide range in the character of electric currents employed. As all of the sending instruments *d*, in the particular arrangement of apparatus illustrated, are in operation continuously there is no danger of a false signal being temporarily sent over the line when the switch 37 is first closed, as might occur if it were necessary to start the vibration of the armatures 28, 29 and 30 at that time.

I claim as my invention—

1. In combination with an electric circuit having a generator, a transmitting and a receiving electro-magnet connected in parallel in the circuit, a condenser in series with the receiving electro-magnet, a tuned vibratile armature for each of the electro-magnets, a variable resistance device in the circuit in front of the transmitting electro-magnet, and operative connection between the armature of the transmitting electro-magnet and the variable resistance device.

2. In combination with an electric circuit having a generator, a plurality of signaling electro-magnets connected in parallel in the circuit, a condenser for each of such magnets, a plurality of branches in one arm of the circuit, a switch for controlling the branches, a plurality of electro-magnets each connected in parallel between the other arm of the circuit and one of the branches, a tuned vibratile armature for each of the last-named magnets, and a variable resistance device in each of the circuit branches and controlled by one of the vibratile armatures.

3. In combination, a station circuit including a generator, a vibrating current controller and an actuating magnet therefor, a line circuit, a signal in the line circuit adapted to be actuated by a periodic current and means for connecting the line circuit and station circuit whereby the line circuit and its signal are in shunt with the actuating

magnet for the vibrating current controller in the station circuit.

4. In combination, an electric circuit having a generator and a plurality of signals, each of the signals being adapted for actuation by a periodic current having a period of vibration different from that for actuating all of the others, a plurality of branches in one arm of the circuit between the generator and the signals, a switch controlling the branches, a vibrator in each of the branches, each of such vibrators being designed to produce a current adapted for actuating a different signal, and an electro-magnet for controlling each of the vibrators, one of the magnets being connected in parallel between each of the circuit branches beyond the vibrator from the generator and the other arm of the circuit.

5. In combination, a generator, a transmitting and a receiving electro-magnet served by the generator, a condenser in circuit with the coils of the receiving electro-magnet, a variable resistance device in circuit with the coils of the transmitting electro-magnet, a tuned vibratile armature for each of the electro-magnets, and operative connection between the armature of the transmitting electro-magnet and the variable resistance device.

6. In combination, a generator, a plurality of transmitting and receiving electro-magnets served by the generator, a condenser in circuit with the coils of each of the receiving electro-magnets, a variable resistance device in circuit with the coils of each of the transmitting electro-magnets, a tuned vibratile armature for each of the receiving electro-magnets, such armatures being of differing pitch, a vibratile armature for each of the transmitting electro-magnets, each of such armatures being tuned in harmony with the armature of one of the receiving electro-magnets, and operative connection between the armature of each of the transmitting electro-magnets and the variable resistance device in circuit with the coils of the magnet.

7. In combination, a station circuit including a generator and having a plurality of parallel branches, a vibrating current controller in each branch of said circuit, said current controllers having vibration periods of different frequency, a line circuit having a corresponding number of parallel branches, a signal adapted to be actuated by a periodic current in each branch of the line circuit, each of said signals being adapted to be actuated by a periodic current having a frequency corresponding to the frequency of one of the current controllers and means for connecting the line circuit in shunt with any one of the said branches of the station circuit.

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