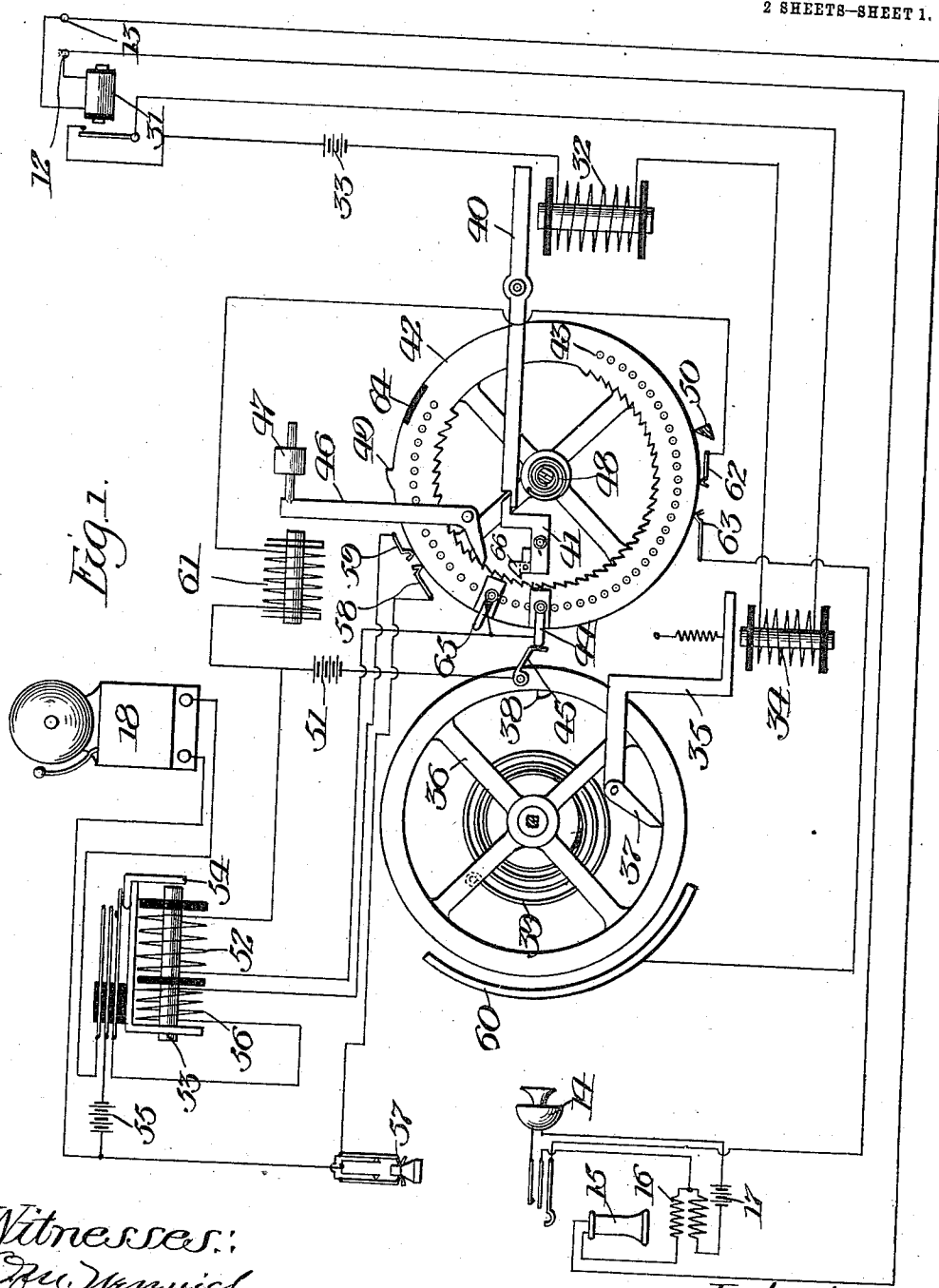


976,380.

O. M. LEICH.
SELECTIVE SIGNALING SYSTEM.
APPLICATION FILED DEC. 10, 1908.

Patented Nov. 22, 1910.

2 SHEETS—SHEET 1.



Witnesses:
C. W. Munnick
L. B. Campbell

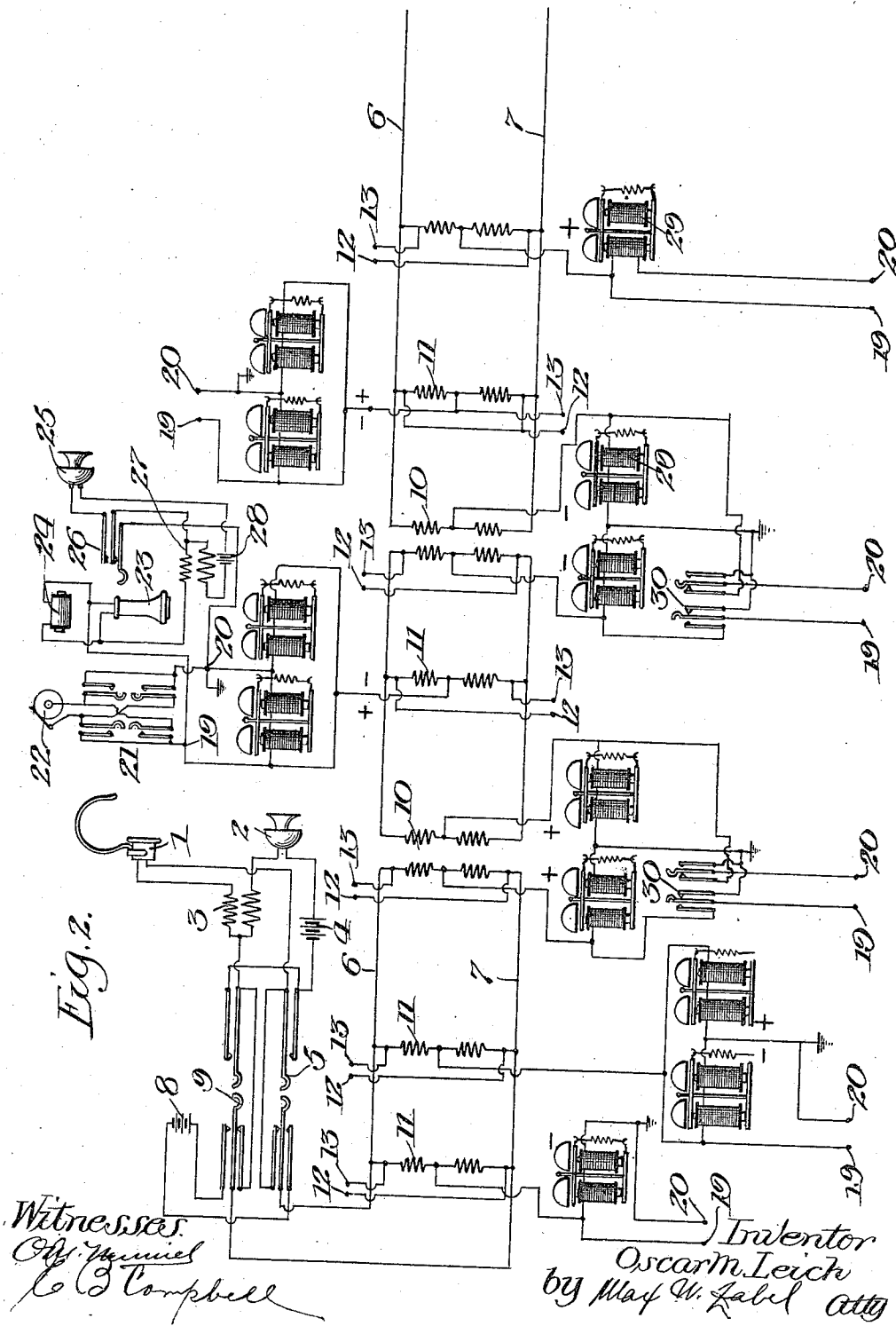
Inventor
Oscar M. Leich
by Max W. Zabel
Att'y

976,380.

O. M. LEICH.
SELECTIVE SIGNALING SYSTEM.
APPLICATION FILED DEC. 10, 1908.

Patented Nov. 22, 1910.

2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

OSCAR M. LEICH, OF GENOA, ILLINOIS, ASSIGNOR TO CRACRAFT-LEICH ELECTRIC COMPANY, OF GENOA, ILLINOIS, A CORPORATION OF ILLINOIS.

SELECTIVE SIGNALING SYSTEM.

976,380.

Specification of Letters Patent. Patented Nov. 22, 1910.

Application filed December 10, 1908. Serial No. 466,777.

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 Selective Signaling 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 signaling systems, and is of particular utility in the operation of railroad telephone systems.

More particularly, my invention contemplates a step-by-step signaling mechanism, in combination with particularly designed line circuits in association therewith.

Generally speaking, my invention comprises a step-by-step element in association with a slower moving step-by-step element, both of which are to be started from a state of rest when any signal is to be called, the step-by-step element being stepped up from the central station as desired, and the slower moving element while starting at the same time, does not move so rapidly, yet when it overtakes the step-by-step element, circuit conditions are established which cause the local signal to operate.

My invention is designed so that impulses of current going in one direction only are sufficient for causing a complete operation of the device without the necessity of using positive or negative, or other special currents, as has heretofore frequently been the case.

My invention is especially applicable in connection with telephone systems where a despatching service is carried on over a metallic line circuit, and local circuits between stations are also maintained. My improved step-by-step mechanism is therefore very serviceable in that current of only one character is necessary for its operation.

I will describe my invention more in detail by referring to the drawings, in which—
Figure 1 represents diagrammatically a system equipped in accordance with my invention, and Fig. 2 sets forth the line circuit arrangements.

Referring more particularly to Fig. 2, I have shown a central station telephone set, comprising the receiver 1, transmitter 2, induction coil 3, and battery 4, which through the agency of the listening key 5 are adapt-

ed for connection with the metallic line conductors 6 and 7. A signaling battery 8 is likewise employed, and is connected to a calling-button 9, which is used to send impulses over the line wires 6, 7.

In my co-pending application, Serial No. 466,778, filed of even date herewith, I have shown a line circuit and telephones associated therewith, as shown in this figure, which comprises the repeating coils 10—10, and the impedance coils 11—11. The despatching telephones are connected, at the stations where there are either impedance coils or repeating coils, metallically, and are brought out to contacts 12—13, there being seven stations shown in the drawings. Each telephone circuit connects to a pair of terminals 12 and 13, as is shown in Fig. 1, and consists of the transmitter 14, receiver 15, induction coil 16, and battery 17. These telephones are at all times able to converse with the train-despatcher, and each said despatching telephone is provided with a local signal 18, all of which local signals can be called selectively by means of the apparatus shown in Fig. 1, as will be described more in detail hereinafter. It is also designed to have talking facilities between each one of the telephone stations shown in Fig. 2, and for this reason connections are brought out from the center of each one of the repeating coil windings and impedance coil windings, which, after passing through suitable calling devices to be explained, end in terminals 19 and 20. Each pair of terminals 19 and 20 is provided with a ringing key 21, all of which is only shown in connection with one of the stations in Fig. 2, which ringing key 21 serves to send positive or negative current from the generator 22 over the circuit which connects with the center of either of the impedance coil windings or repeating coil windings. In addition this local telephone comprises a receiver 23, impedance coil 24, transmitter 25, switchhook 26, induction coil 27, and battery 28. The impedance coil 24 serves to deflect telegraphic currents tending to leak through the receiver 23. Thus each station has a local telephone and a despatching telephone. The local telephones, by virtue of the connections shown, are enabled to talk to the adjoining stations, either to the right or to the left, without interfering with the metallic circuit despatching telephones. This

will be understood, as the repeating coils break the continuity of the circuit for these local telephones. The local telephones are each provided with polarized plus and minus
 5 ringers 29, having the polarity shown, so that any local station can call the adjoining local station, either to the right or to the left, by sending either positive or negative current from its generator 22. The local
 10 telephone equipment at the repeating coil stations is provided with reversing key 30, so that they can be connected either to the right-hand or left-hand side of the line where they enter the repeating coil. By
 15 reason of all these instrumentalities which are associated on the same line, it is desirable that a step-by-step system be provided which does not require any other current for operating than just impulses in one direction, and the details of this mechanism I
 20 will now describe, referring more particularly to Fig. 1.

As already stated, each of the terminals 12 and 13 is provided with the equipment
 25 shown in Fig. 1, which is the train-despatching set. The signal operating equipment comprises a relay 31 connected metallically to the terminals 12 and 13, which, by means of its armature, opens and closes
 30 a circuit whenever it is actuated by impulses from the key 9 through the relay 32, battery 33, and relay 34. This relay 31 is designed to receive impulses and the number of impulses sent determines which station is called; for instance, if station No.
 35 10 is desired, the relay 31 is actuated ten times. The first impulse of relay 31 operates the relay 34, thereby attracting its armature 35, which thereupon releases the slow
 40 moving wheel 36 by disengaging the pawl 37 from the stop 38. A suitable clock mechanism shown here only by the spring 39 maintains a slow motion of the wheel 36 when it is released.

The action of the relay 32 is responsive to
 45 all of the impulses of the relay 31, and each impulse of the relay 31 actuates the armature 40 of the relay 32, which actuates a pawl 41, thereby to rotate the step-by-step
 50 element 42. As shown in the illustration, the step-by-step element has been moved around twenty-nine units, it being understood that the station shown in Fig. 1 is
 55 station No. 29. At the particular hole 43, to which the station corresponds, I place a contact post 44, which will be, as shown, in a horizontal position when that station is to be called.

After the step-by-step element 42 has
 60 been rotated so that its contact post is in a horizontal position, the slower moving element 36 overtakes the more rapidly moving element 42, and a contact strip 45 on the wheel 36 engages the contact 44 to affect
 65 circuit changes which operate the signal 18.

A locking-pawl 46, having a weight 47, holds the step-by-step element in its rotated position against the effort of the spring 48. A
 stop 49 is provided upon the step-by-step element 42, which normally engages a post 50 in the neutral position of the apparatus. When contacts 45 and 44 are closed, circuit
 is established through battery 51 and winding 52 of the relay 53. This attracts the
 armature 54 thereof, which closes a local
 75 circuit through the signal 18, by means of the springs associated with the relay armature and a battery 55. Immediately the relay 53 has become energized, circuit is
 closed through its winding 56 by means of
 80 the contact springs on the relay 53, which circuit is completed through the battery 55, circuit-breaking switch 57 and springs 58 and 59, which springs bearing against the
 85 metallic wheel 42 maintain the continuity of the circuit. The relay 53 thus is locked and remains in a locked position, during all
 of which time the signal 18 is operating until the operator who is to be called there-
 by presses the button 57, which deenergizes
 90 the winding 56, and the winding 52 having been already deenergized, due to the movement of the spring contact 45, past the contact 44, the circuit between the battery 55
 95 and the signal 18 is opened. As will have been apparent, the wheel 42, having been stepped up to its required position, and the slower moving wheel 36 having completed
 its arc to close the circuit through springs 45 and 44, said wheel 36 continues in its rotated
 100 position until the stop 38 again engages the pawl 37, where it will remain until another operation of the relay 31 is had in calling a particular station. The release of
 the wheel 42 is automatic in that the continued rotation of the wheel 36 finally brings
 105 the spring 45 into contact with the segment 60, which thereby closes a circuit from said contact 45, through the battery 51, the relay 61, springs 62 and 63, and the segment 60.
 110 This energizes the relay 61, and it attracts the pawl 46, thereby releasing the wheel 42, and permitting it to rotate until the stop 49 engages the post 50.

There is provided on the contact wheel 42
 115 an insulating section 64, which engages the springs 63 and 62 when the wheel 42 is in normal position, thereby opening the circuit through the relay 61, and all parts are then
 in normal condition. Means are further
 120 provided, consisting of the contact point 65, which in this instance, is placed in hole 33, and a similar contact point 65 is placed in all of the wheels 42 in the hole 33, so that
 125 whenever No. 33 is signaled, all of the stations will be called. It may furthermore be desirable to stop one of the signals 18 from ringing when it has been erroneously called, or otherwise, and it is for this reason that
 130 the contact springs 58 and 59 have been pro-

vided. In this case the step-by-step wheel 42 is moved around until the insulating section 64 comes under the springs 58 and 59, thereby opening the circuit through the locking winding 56 to stop the operation of the signal 18, the same as would be done by the switch 57. The stop 49 of course is so placed that it will not interfere with the springs 58 and 59. It will be apparent from this that the signal 18 at any station can be called without disturbing the signal at any other station, or all of the stations can be called in unison. Likewise, any signal that is operating can be stopped from further operation from the central station. The pawl 41 is provided with a jointed nose 66 to permit it to return to normal after each forward movement.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A signaling system comprising a substation having a local signal and a circuit therefor, in combination with a step-by-step device for effecting upon operative actuation circuit changes in said circuit to thereby continuously operate said signal irrespective of the return of said device to normal position, a central station, switching instrumentalities at the central station to operate said step-by-step device to perform said function, mechanism associated with the step-by-step device for restoring the circuit of the operating signal to its initial condition, upon suitable actuation thereof from the central station, and switching devices at the substation for restoring the circuit of the operating signal to its initial condition.

2. A signaling system including a central station and substations, each substation having a step-by-step signal receiving device, comprising a local signal and an electric circuit for said signal, in combination with a movable step-by-step mechanism and a retarded clock mechanism adapted conjointly when started, after said clock mechanism overtakes said step-by-step mechanism, to change the current conditions through said local signal thereby to operate same independently of said mechanisms, selective arrangements on each step-by-step mechanism to permit of the call of any predetermined signal to the exclusion of others from the central station, uniform appliances on a plurality of said step-by-step mechanisms to permit of the call in unison of all of the signals associated with said plurality of mechanisms, and switching devices at the central station for actuating said step-by-step mechanism.

3. A step by step signal receiving device comprising a local signal and an electric circuit for said signal, in combination with a movable step by step mechanism and a slower moving clock mechanism adapted

conjointly when started after said clock mechanism overtakes said step by step mechanism to change the circuit conditions through said local signal, thereby to operate same.

4. A step by step signal receiving device comprising a local signal and an electric circuit therefor, a movable step by step element responsive to impulses, a second slower moving element, means for simultaneously starting both elements from a state of rest, said elements having circuit controlling appliances whereby when the slower moving element overtakes the step by step element circuit conditions through the local signal are changed to effect a call.

5. A step by step signal receiving device comprising a local signal and an electric circuit for said signal, in combination with a movable step by step mechanism and a slower moving clock mechanism adapted conjointly when started after said clock mechanism overtakes said step by step mechanism to change the circuit conditions through said local signal thereby to operate same independently of said mechanisms, and switching means for restoring the signal circuit to normal.

6. A step by step signal receiving device comprising a local signal and an electric circuit for said signal, in combination with a movable step by step mechanism and a slower moving clock mechanism adapted conjointly when started after said clock mechanism overtakes said step by step mechanism to change the circuit conditions through said local signal thereby to operate same, independently of said mechanisms, a locking relay for effecting said independent operation and switching means for restoring the signal circuit to normal.

7. A step by step signal receiving device comprising a local signal, and an electric circuit for said signal, in combination with a movable step by step mechanism and a slower moving clock mechanism adapted conjointly when started after said clock mechanism overtakes said step by step mechanism to change the circuit conditions through said local signal thereby to operate same, independently of said mechanisms, a locking relay for effecting said independent operation, and a push button for restoring the signal circuit to normal.

8. A step by step signal receiving device comprising a local signal and an electric circuit therefor, a movable step by step element responsive to impulses, a second slower moving element, means for starting both elements from a state of rest, said elements having circuit controlling appliances whereby when the slower moving element overtakes the step by step element circuit conditions through the local signal are changed to effect a call, and means associated with said second

element for restoring said first element to normal after operation.

9. A step by step signal receiving device comprising a local signal and an electric circuit therefor, a movable step by step element responsive to impulses, a second slower moving element, means for starting both elements from a state of rest, said elements having circuit controlling appliances whereby when the slower moving element overtakes the step by step element circuit conditions through the local signal are changed to effect a call, and switching means associated with said second element for restoring said first element to normal after operation.

10. A step by step signal receiving device comprising a local signal and an electric circuit therefor, a movable step by step element responsive to impulses, a second slower moving element, means for starting both elements from a state of rest, said elements having circuit controlling appliances whereby when the slower moving element overtakes the step by step element circuit conditions through the local signal are changed to effect a call, switching means associated with said second element for restoring said first element to normal after operation, and a relay controlled by said switching means.

11. A step by step signal receiving device comprising a local signal and an electric circuit therefor, a movable step by step element responsive to impulses, a second slower moving element, means for starting both elements from a state of rest, said elements having circuit controlling appliances whereby when the slower moving element overtakes the step by step element circuit conditions through the local signal are changed to effect a call, means associated with second element for restoring said first element to normal after operation, and automatic means for bringing said second element to its initial position after operation.

12. A step by step signal receiving device comprising a local signal and an electric circuit therefor, a movable step by step element responsive to impulses, a second slower moving element, means for starting both elements from a state of rest, said elements having circuit controlling appliances whereby when the slower moving element overtakes the step by step element circuit conditions through the local signal are changed to effect a call, switching means associated with said second element for restoring said first element to normal after operation, and automatic means for bringing said second element to its initial position after operation.

13. A step by step signal receiving device comprising a local signal and an electric circuit therefor, a movable step by step element responsive to impulses, a second slower moving element, means for starting both elements from a state of rest,

said elements having circuit controlling appliances whereby when the slower moving element overtakes the step by step element circuit conditions through the local signal are changed to effect a call, and switching means associated with said second element for restoring said first element to normal after operation, said switching means, including contact making devices, controlled by the first element.

14. A step by step signal receiving device comprising a local signal and an electric circuit therefor, a movable step by step element responsive to impulses, a second slower moving element, electromagnetic means for simultaneously starting both elements from a state of rest, said elements having circuit controlling appliances whereby when the slower moving element overtakes the step by step element circuit conditions through the local signal are changed to effect a call.

15. A step by step signal receiving device comprising a local signal and an electric circuit therefor, a rotatable step by step element responsive to impulses, a second slower moving automatically propelled rotatable element, automatic means for propelling said element, electromagnetic means for simultaneously starting both elements from a state of rest and for stepping up the first element to its desired call making position, and circuit controlling appliances whereby when the slower moving element overtakes the step by step element circuit conditions through the local signal are changed to effect a call.

16. A step by step signal receiving device comprising a local signal and an electric circuit therefor, a rotatable step by step element responsive to impulses, a second slower moving automatically propelled rotatable element, automatic means for propelling said element, electromagnetic means for starting both elements from a state of rest and for stepping up the first element to its desired call making position, circuit controlling appliances whereby when the slower moving element overtakes the step by step element circuit conditions through the local signal are changed to effect a call, said second element continuing its motion to its starting point, and a stop for arresting said second element at its starting point.

17. A step by step signal receiving device comprising a local signal and an electric circuit therefor, a rotatable step by step element responsive to impulses, a second slower moving automatically propelled rotatable element, automatic means for propelling said element, electromagnetic means for starting both elements from a state of rest and for stepping up the first element to its desired call making position, circuit controlling appliances whereby when the slower

moving element overtakes the step by step element circuit conditions through the local signal are changed to effect a call, said second element continuing its motion to its starting point, switching devices controlled by said second element to restore said first element to normal position, and a stop for arresting said second element at its starting point.

18. A step by step signal receiving device comprising a local signal and an electric circuit therefor, a rotatable step by step element responsive to impulses, a second slower moving automatically propelled rotatable element, automatic means for propelling said element, electromagnetic means for starting both elements from a state of rest and for stepping up the first element to its desired call making position, circuit controlling appliances whereby when the slower moving element overtakes the step by step element circuit conditions through the local signal are changed to effect a call, said second element continuing its motion to its starting point, switching devices controlled by said second element to restore said first element to normal position, said switching devices controlling a pawl actuating relay, and a stop for arresting said second element at its starting point.

19. A step by step signal receiving device comprising a local signal and an electric circuit therefor, a rotatable step by step element responsive to impulses, a second slower moving automatically propelled rotatable element, automatic means for propelling said element, electromagnetic means for starting both elements from a state of rest and for stepping up the first element to its desired call making position, circuit controlling appliances whereby when the slower moving element overtakes the step by step element circuit conditions through the local signal are changed to effect a call, said second element continuing its motion to its starting point, switching devices, including a segment of a ring, controlled by said second element to restore said first element to normal position, and a stop for arresting said second element at its starting point.

20. A step by step signal receiving device comprising a local signal and an electric circuit therefor, a rotatable step by step element responsive to impulses, a second slower moving automatically propelled rotatable element, automatic means for propelling said element, electromagnetic means for starting both elements from a state of rest and for stepping up the first element to its desired call making position, circuit controlling appliances whereby when the slower moving element overtakes the step by step element circuit conditions through the local signal are changed to effect a call, said second element continuing its motion to its starting

point, switching devices, including a segment of a ring, controlled by said second element to restore said first element to normal position, said switching devices controlling a pawl actuating relay, and a stop for arresting said second element at its starting point.

21. A step by step signal receiving device comprising a local signal and an electric circuit therefor, a rotatable step by step element responsive to impulses, a second slower moving automatically propelled rotatable element, automatic means for propelling said element, electromagnetic means for starting both elements from a state of rest and for stepping up the first element to its desired call making position, circuit controlling appliances whereby when the slower moving element overtakes the step by step element circuit conditions through the local signal are changed to effect a call, said second element continuing its motion to its starting point, switching devices, including a segment of a ring and contact devices associated with the first element, controlled by said second element to restore said first element to normal position, and a stop for arresting said second element at its starting point.

22. A step by step signal receiving device comprising a local signal and an electric circuit therefor, a rotatable step by step element responsive to impulses, a second slower moving automatically propelled rotatable element, automatic means for propelling said element, electromagnetic means for starting both elements from a state of rest and for stepping up the first element to its desired call making position, circuit controlling appliances whereby when the slower moving element overtakes the step by step element circuit conditions through the local signal are changed to effect a call, said second element continuing its motion to its starting point, switching devices, including a segment of a ring and contact devices associated with the first element, controlled by said second element to restore said first element to normal position, said switching devices controlling a pawl actuating relay, and a stop for arresting said second element at its starting point.

23. A step by step signal receiving device comprising a local signal and an electric circuit for said signal, in combination with a movable step by step mechanism and a retarded clock mechanism adapted conjointly when started after said clock mechanism overtakes said step by step mechanism to change the circuit conditions through said local signal thereby to operate same independently of said mechanisms, and switching means for restoring the signal circuit to normal.

24. A signaling system comprising a sub-

station having a local signal and a circuit therefor, in combination with a step by step device for effecting upon operative actuation circuit changes in said circuit to thereby
5 continuously operate said signal irrespective of the return of said device to normal position, a central station, switching instrumentalities at the central station to operate said step by step device to perform said
10 function, and mechanism associated with the step by step device for restoring the cir-

cuit of the operating signal to its initial condition, upon suitable actuation thereof from the central station.

In witness whereof, I hereunto subscribe 15
my name this 13th day of November A. D.,
1908.

OSCAR M. LEICH.

Witnesses:

ALEX. C. REID,
MAX W. ZABEL.