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F. C. EWING.

SELECTIVE SIGNALING.

(Application filed Feb. 8, 1900.)

(No Model.)

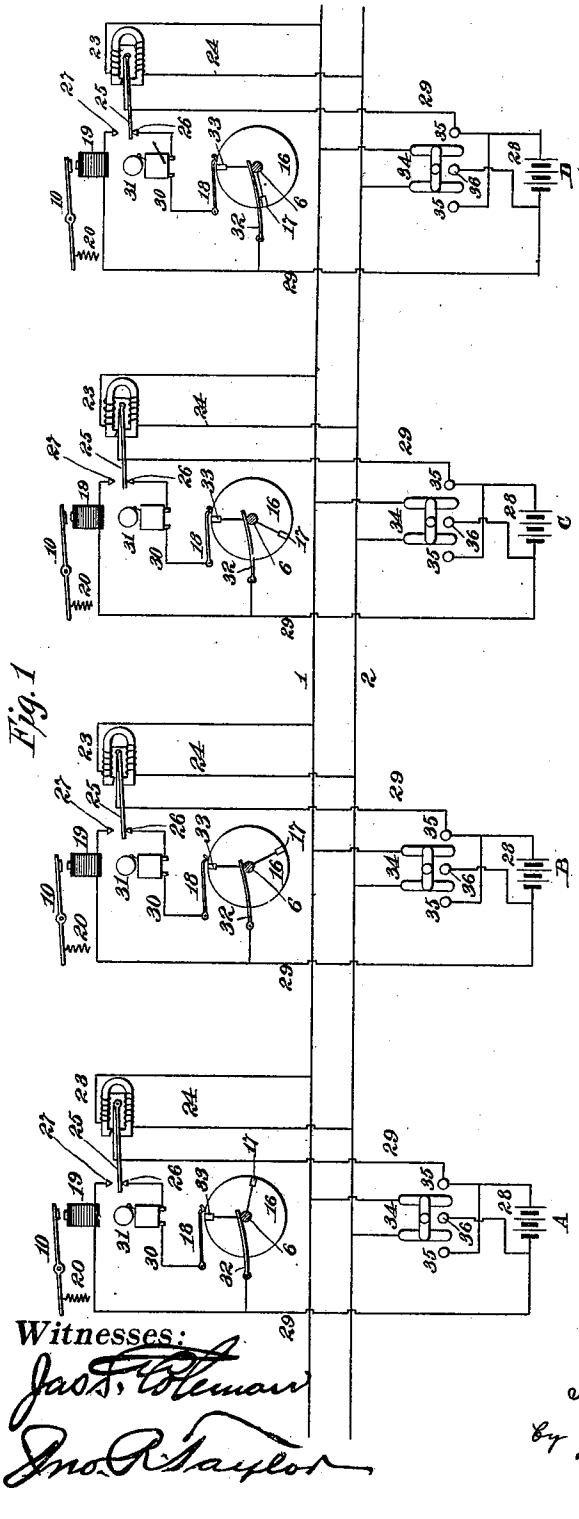

Fig. 1

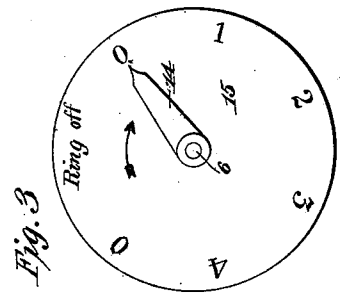

Fig. 3

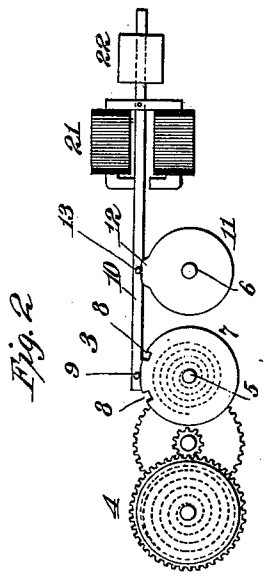

Fig. 2

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UNITED STATES PATENT OFFICE.

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SELECTIVE SIGNALING.

SPECIFICATION forming part of Letters Patent No. 666,958, dated January 29, 1901.

Application filed February 8, 1900. Serial No. 4,454. (No model.)

To all whom it may concern:

Be it known that I, FRANK CARROLL EWING, a citizen of the United States, residing and having my post-office address at Acadia, in the county of Lee and State of Virginia, have invented a certain new and useful Improvement in Selective Signaling, of which the following is a specification.

My invention relates to new and useful improvements in selective signaling applicable particularly to telephone-lines; and the object of the invention is to provide an improved system of selective signaling by which communication between any two stations on a line may be established without interfering in any way with the other stations.

Broadly considered, my improved system comprises a main line extending between any desired number of stations, said line being either an all-metallic circuit or being a single metal circuit with a grounded return. At each station I employ a suitable clockwork mechanism controlled in its starting and stopping by a magnet included either in the main line or in a multiple-arc branch therefrom or in a local circuit controlled by a relay placed either directly in the main line or in a multiple-arc branch at each station. This clockwork mechanism at each station rotates a shaft which carries a contact-plate corresponding to each station, whereby when all of the shafts are started in synchronism the contact-plates of the several stations will be brought into a local circuit successively at each station, the contact-plate at the first station being first brought into its local circuit, whereupon the contact-plate at the second station is next brought into contact with its local circuit, and so on, the contact-plate at one station not being brought into circuit until the contact-plate of the station in advance has been connected and disconnected to and from its local circuit. The local circuit in question at each station includes an electric bell or other signaling device, which when a polarized relay is employed, as is preferable, will be always in contact with the back stop of said relay. Each of the shafts in question also carries a ring-off contact-plate, all of these plates being placed in the same position with respect to the shafts, so that the ring-off contact-plates will simultaneously make contact at the several stations with the local circuit, including the bell or other signaling device. The first-mentioned contact-plates or "selective" plates, as they will be hereinafter described, are so located on the shafts with respect to the ring-off plates that there will be at each station a clear space on either side of the ring-off plate, for a purpose to be explained in detail. Thus assuming the shaft at each station to carry a pointer and that said pointer coöperates with a dial and that there are four stations connected to the line, said dial will carry at one point the words "Ring-off" or other designation, then a blank space or the representative "0," then the numbers "1," "2," "3," and "4" equidistantly spaced and corresponding to the selective plates on the shafts at the different stations, and a second blank space or a space represented by "0" between the fourth plate or the plate corresponding to the fourth station and the ring-off plate. The controlling-magnets of the clockwork mechanism at each station or the relays which control said controlling-magnets are actuated in any suitable way, but preferably from separate sources of current at each station, either a battery or a small generator preferably of the direct-current type. When a battery is employed at each station, a convenient arrangement is to provide therewith a pole-changing switch normally disconnected from the line and adapted to be moved to one side or the other to send over the line currents of one or the other polarity. The pole-changer when used may be conveniently operated by the receiver of a telephone system when my improved selective signaling apparatus is employed in connection with telephone-lines. In this use also the battery which effects the selective operations can be utilized in the ringing of a bell or the operation of any other signaling device and also in connection with the telephone-transmitter at each station, so that only a single battery requires to be used for performing all the functions of selection, signaling, and transmission.

My invention is capable of modification in many respects, as will be understood by those skilled in the art; but in the accompanying

drawings I have illustrated a convenient embodiment of the system as it may be applied in connection with telephone-lines.

In the drawings, Figure 1 is a diagram showing four stations connected to an all-metallic circuit, with the selecting mechanism; Fig. 2, a separate detached view illustrating the mechanism for controlling the clockwork and showing a polarized magnet for operating the locking-lever, which magnet may be placed either directly in the main line or in a multiple-arc branch thereof instead of being operated from a relay, as in Fig. 1; and Fig. 3, a face view of a suitable arrangement of pointer and dial.

In all of the above views corresponding parts are represented by the same characters of reference.

1 and 2 are the main-line wires of an all-metallic telephone-circuit connecting the four stations A, B, C, and D, respectively. Any number of such stations may be similarly connected to the main circuit, and instead of an all-metallic circuit it will be obvious that an earth return with a single line-wire may be used. At each station there is a clockwork mechanism 3, as shown in Fig. 2, driven from a spring-barrel 4 and comprising at least a balance or escapement shaft 5 and a shaft 6, driven at the proper rate of speed—say, for example, one rotation in fifteen seconds. The escapement-shaft carries the usual balance-wheel 7, which may be provided with two notches 8 8 in its periphery. A pin 9, carried by a stop-lever 10, is adapted to engage with either one of said notches 8 8, so as to lock the escape-wheel 7 from movement, with its hair-spring under tension, whereby when said pin is removed from the notch the escape-wheel will start its oscillations. Instead of forming the notches 8 8 directly in the periphery of the escape-wheel said notches may be formed in a disk which is carried on the shaft 5, as will be understood. The shaft 6 carries a disk 11, having a cam 12 thereon and adapted to coöperate during each rotation of the shaft with a pin 13 on the stop-lever 10.

The shaft 6 may carry a pointer 14 at its outer end, which may coöperate with a dial 15, suitably placed upon or adjacent to the telephone instrument. A convenient arrangement of dial is shown in Fig. 3, wherein the dial is divided into seven segments, designated, respectively, "0," "1," "2," "3," "4," "0," and "Ring-off," there being preferably three more sections on the dial than there are stations on the line, such additional sections in each case corresponding to the sections which are designated "0," "Ring-off," and "0." Thus if there are eighteen stations on the line the dial will be divided into twenty-one sections. Each of the shafts 6 carries a disk 16, made, preferably, of a suitable insulating material, such as hard rubber, and on the periphery of each of said disks is a selective plate 17, in contact, preferably, with the shaft 6, as shown. The selective plate of station A is placed on the disk 16 thereof, so as to engage with a contact-spring 18 when the index 14 corresponds to the segment 1 of all the dials. The selective plate of station B corresponds to the segment 2, that of station C to the segment 3, and that of station D to the segment 4.

In Fig. 1 I illustrate the stop-lever 10 as being moved in one direction by a magnet 19 and in the other direction by a spring 20, and in Fig. 2 I illustrate the stop-lever as being moved in one direction or the other by a polarized magnet 21, the lever being provided with a counterbalance-weight 22, so as to remain in either position to which it may be moved by the attraction. The former arrangement I consider preferable, in which case the magnet 19 at each station will be controlled by a polarized relay 23, connected in a circuit 24 in multiple arc to the main line 1 2. The armature 25 of each relay is normally maintained against its back stop 26, but is adapted to be moved into contact with the front stop 27. At each station there is preferably a separate source of supply—as, for example, a battery 28, included in a local circuit 29 with the relay-armature 25, front stop 27, and controlling-magnet 19. This local circuit is normally broken between the relay-armature 25 and the front stop 27 thereof. The back stop 26 of the relay is connected in a branch circuit 30 through an electric bell 31 of the usual type or any other desired form of signaling mechanism, the contact-spring 18, and a spring 32, which connects, through a part of the local circuit 29, with the battery 28. Each of the disks 16 carries a ring-off plate 33, similarly located on the disks at all the stations, so that all of said ring-off plates will simultaneously pass beneath the contact-springs 18 to momentarily close the circuit of the battery 28 at each station through the relay-armature 25, back stop 26, bell 31, spring 18, ring-off plate 33, shaft 6, and spring 32.

In order to operate the selective mechanism at any one of the stations, each of the batteries 28 or other source of supply at each station is preferably adapted to be connected to the line by an ordinary pole-changing switch 34, the two arms of which are adapted to make contact successively with contact-plates 35 or 36 to send to the line an impulse of one polarity or the other. These pole-changing switches may be operated in any suitable way, and they may conveniently coöperate with the telephone instruments, as will be understood by those familiar with the art. Normally the pole-changing switches 34 occupy a position midway between the contact-plates 35 and 36, as shown.

The operation of a system such as that which I have illustrated is as follows: Normally the stop-levers 10 will be moved to engage the pin 9 with one of the notches 8 of the escapement-shaft of the clockwork mechanism to

hold the latter stationary, with all the pointers 14 corresponding to the plate "0" directly in advance of plate numbered "1," and the cams 12 on all of the disks 11 at the several stations will be so proportioned in location and length as to engage beneath the pin 13 while the pointer 14 passes from the plate numbered "0" at the left past the ring-off plate to the point of starting. Therefore with the pointers 14 in the position shown in Fig. 3 the cam 12 at each station will have passed just to the right of the pins 13 and the pin 9 at each station will hold the clockwork mechanism thereat at rest. Assume now that station A desires to communicate with station D. The pole-changing switch 34 is moved in one direction or the other to send a current of the desired polarity from the battery 28 at the station A over the line 1 2. This current energizes all the polarized relays 23, elevating their armatures 25 and closing the local circuit from each of the batteries 28 through the relay-armature 25, front stop 27, and magnet 19. The energizing of these magnets elevates each of the stop-levers 10, withdrawing the pin 9 from one of the notches 8 in the escape-wheel, and the clockwork mechanisms at the several stations start in synchronism. When the relays 23 are not used, the current may operate the polarized magnet 21 directly, as shown in Fig. 2, to release the clockwork mechanisms. The clockwork mechanisms starting in unison, all of the pointers 14 will be carried around the dial. When the pointer 14 at the station A indicates the number "4," the pole-changing switch 34 at the station A is moved in the opposite direction. This movement results in sending an impulse of the opposite polarity over the line, reversing the relays 23 and moving all of the relay-armatures 25 into contact with the back stops 26. This operation will result in the ringing of the bell 31 at only the station D, because at that station the selective plate 17 will be in contact with the spring 18, and hence the local circuit at the station D will be complete from the battery 28 through the relay-armature 25, back stop 26, bell 31, spring 18, selective plate 17, shaft 6, and spring 32. The bells at the intermediate stations and at the station A will not ring, because at those stations the selective plates will not be in contact with the spring 18. The pole-changing switch 34 at the station A is kept in this position a sufficient time to insure the proper notification at the station D, whereupon the pole-changing switch at the station A is returned to its first position to again elevate all of the relay-armatures and allow the clockwork mechanisms at the several stations to start again. As soon as the pointer 14 reaches the segment "0" at the left of the ring-off segment the pole-changing switch is reversed, so as to send a current of opposite polarity over the line to depress all of the relay-armatures. This movement will not ring any of the bells, because no station is provided with a selective segment which corresponds to the numbers "0" on the dial. Ordinary telephonic communication can then be had between the stations over the circuit 1 2. The pointing of the index 14 at the first section "0" at the left of the ring-off segment offers a convenient notification to all of the stations that the line is in use. When the pointer 14 at all of the stations is in this position, the cams 12 at each station will be in very close proximity to the pins 13, so that when the conversation is finished the pole-changing switch 34 may be once again operated to send a current of the desired polarity over the line to elevate all of the relay-armatures 25 and allow the clockwork mechanisms to operate. This movement carries the cam 12 at each station beneath the pin 13. When the pole-changing switch is again reversed to send a current of the opposite polarity over the line, the relay-armatures will return to their former positions into contact with the back stop 26; but the spring 20 cannot return the stop-levers 10 until the cams 12 have passed beneath the pins 13, after which the pin 9 will once again engage one of the notches 8 in the escape-wheel to lock the clockwork mechanism.

By employing the cam 12 for holding the stop-lever 10 elevated during the passage of the pointer 14 from one to the other side of the ring-off segment the operator is assured that all of the pointers 14 at the several stations will be brought to rest in the proper position, so that said cams and their coöperating pins constitute an effective unison device in the apparatus. All of the ring-off plates 33 are so placed on the disks 16 at the several stations that said plates will pass beneath the springs 18 as the pointer 14 at each station passes the ring-off plate. When the ring-off plate at each station is in contact with the spring 18, the battery 28 will be closed on the bell 31 to momentarily sound the same through the relay-armature 25, wire 30, and springs 18 and 32, as will be understood. A notification is thus offered to all the stations that the conversation has been finished and that the line is free for use.

The entire system is entirely certain in its operation, is durable in use, and can be installed at very low cost.

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

1. An improved selective signaling system, comprising a main line, a plurality of stations connected to said line, a clockwork mechanism at each station, a magnet controlling the clockwork mechanism, said magnet being controlled from the main line, a selective contact at each station operated by the clockwork mechanism, a signaling device adapted to be connected to the selective contacts successively at the several stations, and means for controlling the magnets at any station from the other station or stations whereby all the clockwork mechanisms of the stations

may be stopped and started simultaneously at any instant, substantially as and for the purposes set forth.

2. An improved selective signaling system, comprising a main line, a plurality of stations connected to said line, a clockwork mechanism at each station, a magnet controlling the clockwork mechanism, said magnet being controlled from the main line, a selective contact at each station operated by the clockwork mechanism, a signaling device adapted to be connected to the selective contact successively at the several stations, means for controlling the magnets at any station from the other station or stations whereby all the clockwork mechanisms of the stations may be stopped and started simultaneously at any instant, and a ring-off segment at each station operated by the clockwork mechanism and adapted to be connected to the signaling device simultaneously at all the stations, substantially as and for the purposes set forth.

3. An improved selective signaling system, comprising in combination a main line, a plurality of stations located on the main line, a clockwork mechanism at each station, a magnet for controlling the clockwork mechanism, a polarized relay at each station for controlling the magnet, said relays being connected to the main line, a signaling mechanism normally connected to the back stop of said relay at each station, a selective plate operated by the clockwork mechanism at each station and adapted to be successively brought into contact with the signaling device, and means at each station for operating the relays at the other station or stations, substantially as set forth.

4. An improved selective signaling system, comprising in combination a main line, a plurality of stations located on the main line, a clockwork mechanism at each station, a magnet for controlling the clockwork mechanism, a polorized relay at each station for controlling the magnet, said relays being connected to the main line, a signaling mechanism normally connected to the back stop of said relay at each station, a selective plate operated by the clockwork mechanism at each station and adapted to be successively brought into contact with the signaling device, means at each station for operating the relays at the other station or stations and a ring-off plate operated by the clockwork mechanism and adapted to be simultaneously brought into contact with the signaling devices at all stations, substantially as set forth.

5. An improved selective signaling system, comprising a main line, a plurality of stations connected to said line, a clockwork mechanism at each station, a magnet controlling the clockwork mechanism, said magnet being controlled from the main line, a selective contact at each station operated by the clockwork mechanism, a signaling device adapted to be connected to the selective contacts successively at the several stations, means for controlling the magnets at any station from the other station or stations whereby all the clockwork mechanisms of the stations may be stopped and started simultaneously at any instant, a source of electric supply at each station, and a pole-changing switch for connecting the source of supply at each station to the main line and to send onto the main line an impulse of the desired polarity, substantially as and for the purposes set forth.

6. An improved selective signaling system, comprising in combination a main line, a plurality of stations located on the main line, a clockwork mechanism at each station, a magnet for controlling the clockwork mechanism, a polarized relay at each station for controlling the magnet, said relays being connected to the main line, a signaling mechanism normally connected to the back stop of said relay at each station, a selective plate operated by the clockwork mechanism at each station and adapted to be successively brought into contact with the signaling device, means at each station for operating the relays at the other station or stations, a source of electric supply at each station, and a pole-changing switch for connecting the source of supply with the main line for sending onto the main line an impulse of the desired polarity, substantially as set forth.

7. In an improved selective signaling system, the combination of a main line, a plurality of stations located on the line, a clockwork mechanism at each station, a shaft rotated by said clockwork mechanism, a selective plate at each station corresponding thereto and operated by said shaft, a ring-off plate also operated by said shaft and similarly located at all the stations, a magnet for controlling the clockwork mechanism, said magnet being controlled from the main line, and a signaling device adapted to be connected at each station with the selective plate and the ring-off plate thereat, and means at each station for operating the controlling-magnet at all the other stations whereby all the clockwork mechanisms of the stations may be stopped and started simultaneously at any instant, substantially as set forth.

8. In an improved selective signaling system, the combination of a main line, a plurality of stations located on said line, a clockwork mechanism at each station, a shaft operated by said clockwork mechanism, a disk carried by said shaft, a selective plate and a ring-off plate carried by said disk, a polarized relay connected to the main line at each station, a magnet controlling the clockwork mechanism and connected to the front stop of said relay, a signaling device at each station connected to the back stop of said relay and adapted to be connected to the selective and ring-off plates, and a source of supply common to both the signaling device and the controlling-magnet, substantially as set forth.

9. In an improved selective signaling system, the combination of a main line, a plu-

rality of stations located on said line, a clockwork mechanism at each station, a shaft operated by said clockwork mechanism, a disk carried by said shaft, a selective plate and a ring-off plate carried by said disk, a polarized relay connected to the main line at each station, a magnet controlling the clockwork mechanism and connected to the front stop of said relay, a signaling device at each station connected to the back stop of said relay and adapted to be connected to the selective and ring-off plates, a source of supply common to both the signaling device and the controlling-magnet, and a pole-changing switch at each station, adapted to be connected to the source of supply to send impulses of the desired polarity onto the line, substantially as set forth.

This specification signed and witnessed this 3d day of February, 1900.

FRANK CARROLL EWING.

Witnesses:

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