J. McFELL.

SELECTIVE SIGNALING SYSTEM.

APPLICATION FILED JULY 6, 1909.

Patented Jan. 21, 1913.

1,051,148.

3 SHEETS—SHEET 1.

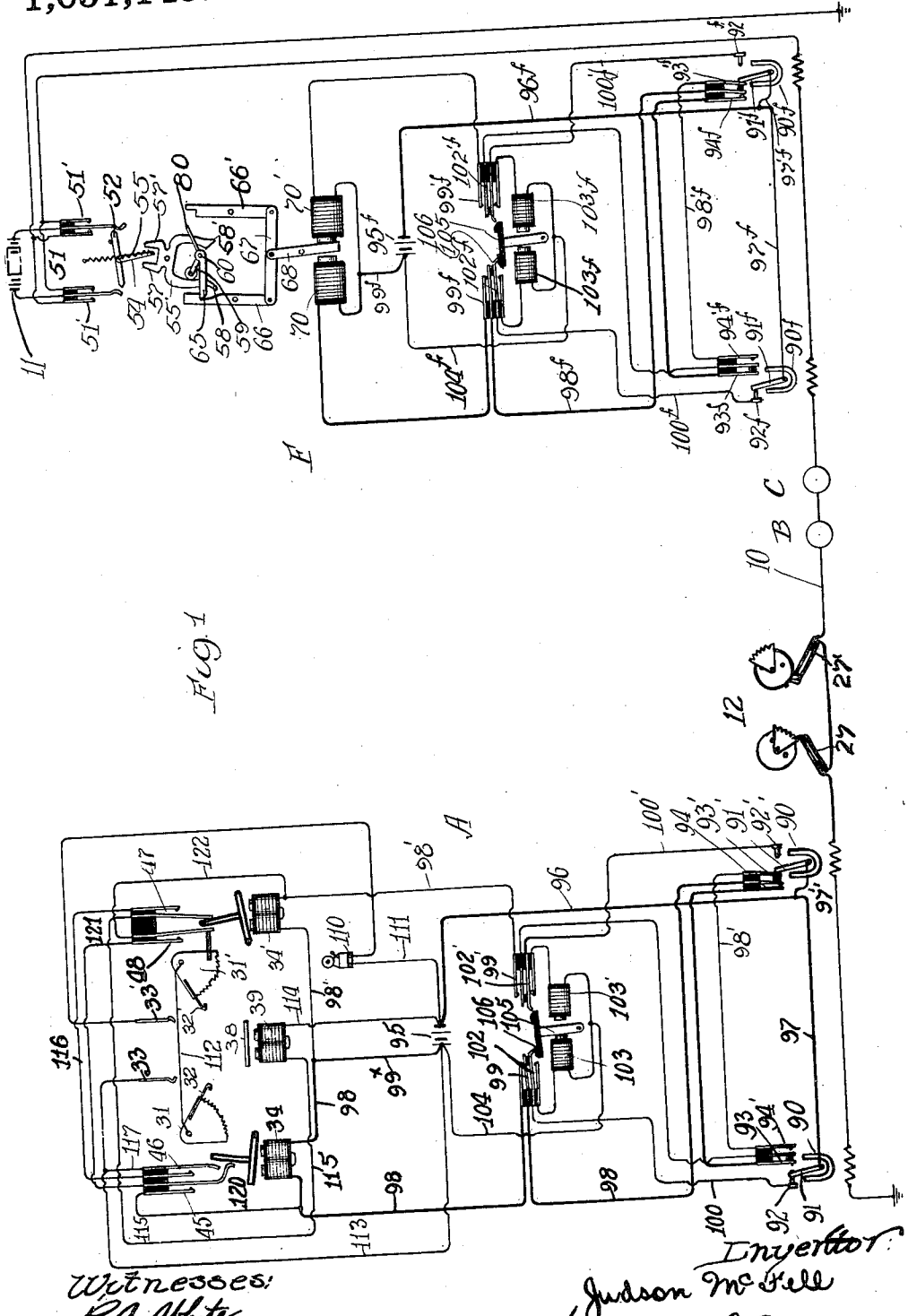

Fig. 1

Witnesses:
R. A. White.
H. R. Lewis

Inventor:
Judson McFell
By Dodge Barnes & May Atty's.

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3 SHEETS—SHEET 2.

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Fig. 2.

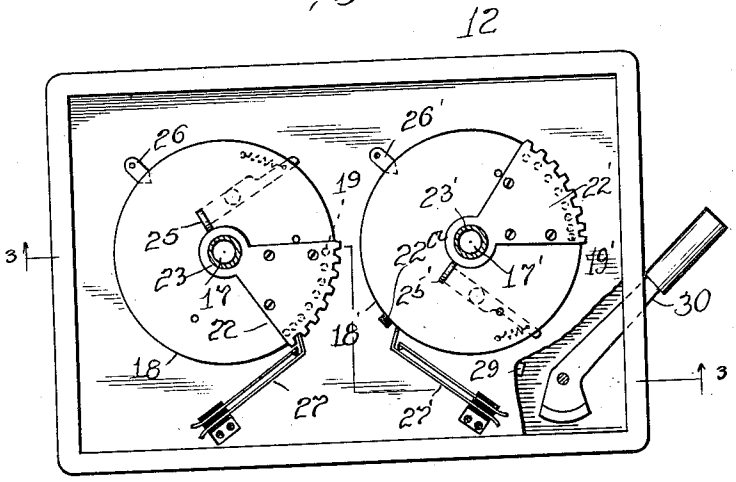
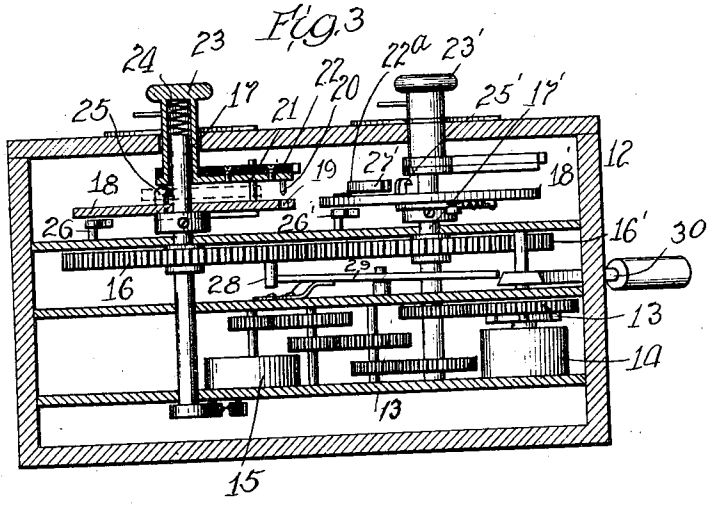


Fig. 3.



Witnesses:
R. A. White.
H. R. L. White

Inventor:
Judson McFell
By Foree Bain and Mary
Attys

J. McFELL.

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3 SHEETS—SHEET 3.

1,051,148.

Fig. 4

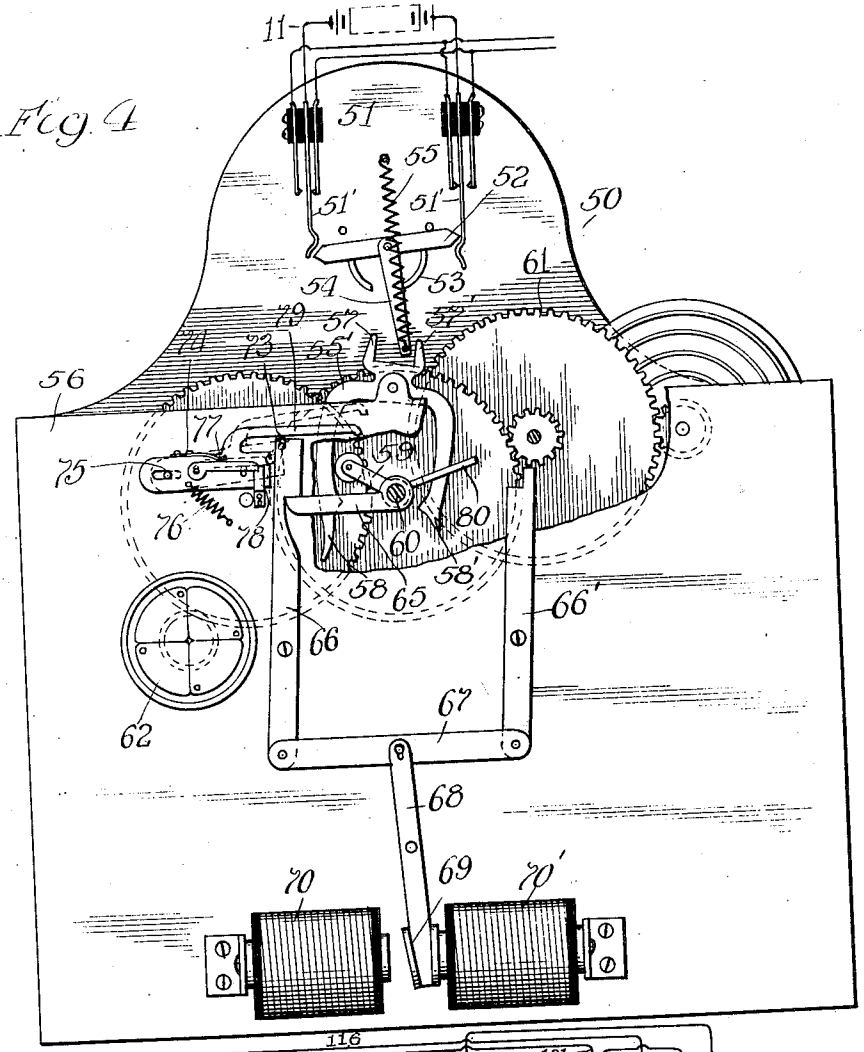
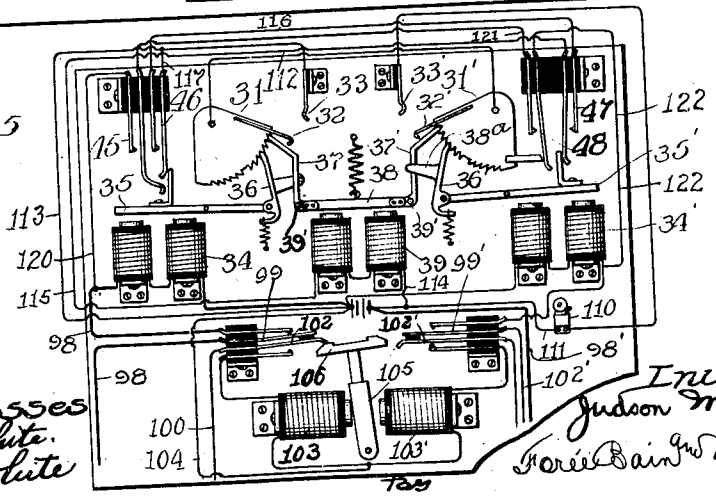


Fig. 5



Witnesses
F. A. White.
H. P. Wolcott

Inventor:
Judson McFell
Foster Bain & Mann Atty's

UNITED STATES PATENT OFFICE.

JUDSON McFELL, OF CHICAGO, ILLINOIS.

SELECTIVE SIGNALING SYSTEM.

1,051,148. Specification of Letters Patent. Patented Jan. 21, 1913.

Application filed July 6, 1909. Serial No. 506,130.

To all whom it may concern:

Be it known that I, JUDSON McFELL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Selective Signaling Systems, of which the following is a specification.

My invention relates to improvements in selective signaling systems, and has for its general object to provide a party line common-battery system wherein a plurality of selectors at each individual station may be operated determinately in accordance with impulses generated in the line at any signaling station and wherein the control of the selectors is accomplished through chronological timing of pole-changing devices appurtenant to the line battery and the signal initiating devices.

The nature of my invention may best be ascertained from the following description taken in conjunction with the accompanying drawings, and the particularly claimed features thereof are set forth in the appended claims.

In the drawings, Figure 1 is a diagrammatic view showing the circuit connections of suitable devices embodying an embodiment of my invention; Figs. 2 and 3 illustrate in plan and section a signal initiator for use in connection with my invention; Fig. 4 is an enlarged view of a timed pole-changing instrumentality suitable for embodiment in my system; and Fig. 5 is a detail view of the mechanical construction and electrical arrangement of a selector for the practice of my invention.

In the embodiment shown, I provide a single signaling wire 10, having its extremities connected for suitable return through ground at both ends, provided with a single source of current supply, such as the battery 11. Along the line are arranged any number of signaling stations, A, B, and C, etc., and a pole changing station F somewhere along the line where the battery 11 may happen to be located. The apparatus for each signaling station may be of uniform construction, preferably comprising a selectively operable signal initiator adapted to send in chronologically timed relation a plurality of distinct signal elements, each of which comprises one or more interruptions in the line, or impulses, as I will term them. The signal transmitter herein shown is adapted to send three signal elements, the first a selective "tens" number; the second a selective "units" number; and the third a single break or impulse for the purpose of restoring the apparatus to normal position, or which I will term the restoration element; the operations of the initiator being so timed that each signal element is transmitted within a predetermined chronological period in the cycle of operation of the transmitter. At each signaling station there is also arranged a plurality of selectors, adapted for successive operation in response to the "tens" and "units" signal-elements, and arranged by their collocation in predetermined position to condition for operation an electro-responsive calling device, such as a bell, the operating mechanism for the selectors being arranged in purely local circuits, dominated by polarized relays associated with the line to potentiate the selectors alternatively according to the line polarity, and to operate the potentiated selector according to the number of signal impulses in the line.

At the pole changing station there is a pole changer for the line battery 11, and controlling mechanism therefor so chronologically timed in relation to the signal initiating devices, and so responsive thereto, that the pole changer will be set in operation at the commencement of the tens and units signal-elements and will functionally operate to change the polarity after the completion of the transmission of each such signal-element but before the commencement of the succeeding signal-element. Means are also provided in connection with the pole changer for insuring that after the release of the selectors occasioned by the restoration signal-element, the pole changer will stand in position to impress such polarity on the line as was initially effective. This latter condition is preferably insured by providing the pole changer with an automatic disabling device which prevents it from functionally operating in response to a single break of the line which effects the restoration of the selectors to normal position.

Thus briefly to state the operation provided for, the battery, 11, normally will be connected to impress one polarity on the line and the polarized relays at each station will stand in one relation. The polarized relay at each station, responsive to the normal

polarity of the line, will normally maintain the tens selector at each station potentiated or in operative condition, while disabling the units selector, so that in response to interruptions in the line constituting the tens number signal, a line relay will so vibrate in response to the interruptions as to be instrumental in causing the tens selector to move a like number of steps. The controlling devices for the pole changer will also respond to the first circuit breaking operation, and the chronological motor for operating the pole-changing switch will be set in operation. The timed relation between the signal-initiator motor and the pole-changer motor is such that the signal initiator will complete the transmission of the tens element of the signal before the pole change is completed; then the pole change will be effected during the chronological interval preceding the commencement of transmission of the units element of the signal, and such pole change will cause such response of the polarized relays at each station as to disable the tens selector from further operation and to potentiate the units selector for operation. Next, in chronological sequence, the units element of the signal will be transmitted by the signal initiator, the first line breaking operation starting the pole changer again in operation, but its chronological motor retarding the completion of the operation until after the units element of the signal has been completely transmitted. The operation of the units selector in harmony with the units element of the signal will condition the bell, or other translating device at the station corresponding with the signal number, for operation, and such operation will continue until the selectors are released for restoration to initial position. The time of such ringing operation is determined by the signal initiator, and at its expiration the signal initiator occasions a single brief interruption in the line which is instrumental in causing the restoration of the selectors, but which has no operative effect upon the pole-changing device by reason of the provision of a disabling instrumentality which prevents the pole changer from acting for the time-being.

To the full understanding of the particular embodiment shown, the construction and operation of certain mechanical devices employed will be explained, although in many particulars these devices are only suggestive of any appropriate mechanism for the purposes described.

The signal initiating mechanisms at each station, as illustrated in Figs. 2 and 3, provide in general line-breaking switches and motor-driven means adapted to be set to open said switches for the successive transmission of selective tens and units elements of the signal, and a subsequent restoration signal-element within predetermined chronological periods during a cycle of operation. Specifically, the signal initiator 12 comprises a clock train 13, driven by a winding spring 14 and chronologically governed by a governor mechanism 15, said train driving in unison through companion spur-gears 16 and 16′ a pair of shafts 17 and 17′, each of which carries an adjustably-toothed signal wheel. The signal wheel 18 is a disk upon the shaft, having near its periphery a series of holes 19, any one of which may be engaged by a pin 20 carried by the sector 21, carrying a toothed fiber sector 22, and which is carried by a handle 23, rotatably and vertically movable upon the shaft 17 and interiorly provided with a spring 24 bearing upon the end of said shaft to hold the toothed sector normally raised from the disk 18. When the handle 23 is moved down to bring the sector close to the disk 18, it is automatically latched and held in depressed position by a latch 25, spring-pressed toward latching position and arranged, in the rotation of the disk 18, to strike a releasing tooth 26 which operates to unlatch the handle 23 and permit the latter to rise to inoperative position under the pressure of its spring 24. With the disk 18 is associated a line switch 27 arranged to coöperate with the teeth of the sector 22 when the sector is depressed, but to lie outside of the plane of operation of the said teeth when the sector is in raised position. A similar construction is provided for the shaft 17′, with the sole exception that the disk 18′ is provided with a permanent tooth 22ª, definitely positioned thereon for coöperation with the switch 27′ during each rotation of the disk.

The relative positions of the parts described is such that the handle 23 may be set to bring any desired number of teeth of the sector 22 back of the switch 27 for passage thereby during that portion of rotation of the disk which is allotted for the transmission of the tens element of the signal, and such operation occurring before the latch 25 is released by the part 26, while the sector 22′ may be set always to commence operation upon its switch 27′ during a period allotted to the transmission of the units element of the signal and separated by an interval of time from the allotted period for the tens signal element, the releasing point 26′ for the sector-latch 25′ being arranged to effect a release of the sector for movement to disabled position just as the selected number of teeth of the sector have passed the switch 27′. The time interval between this releasing operation and the passage of the single tooth 22ª past the switch 27′ constituted a ringing interval and the tooth 22ª does not coöperate with the switch 27′ until near the termination of a complete cycle of rotation of the disks 18 and 18′. The disks

are normally held in predetermined rotative position by engagement of a pin 28 upon gear 16 with a movable stop 29, arranged to be moved to releasing position by the functional operation of the winding handle 30 for the clock motor.

The particular device described for signal initiating purposes forms the basis of a co-pending application for patent therefor filed by me, but is here illustrated simply for purposes of full disclosure.

At each subscriber's station is also provided a pair of selectors which may be of mechanical construction, as best shown in Fig. 5. 31 and 31′ indicate the selectors, the former constituting a segment, spring-pressed downward and carrying a movable contact 32 for coöperation with fixed contact 33, such selector 31 having an operating-magnet 34, the pivoted armature 35 of which carries a live or moving pawl 36. The other selector 31′ is similarly arranged, and said selectors have respective holding pawls 37 and 37′, mounted pivotally as at 39′ and connected to opposite extremities of the armature 38 for a releasing magnet 39, each such holding pawl being so pivoted that each time the armature 38 moves downward in response to the attraction of its magnet, it pulls the holding pawl out of engagement with its sector-teeth and at the same time, through mechanical connections 38ª, withdraws the corresponding live pawl 36 or 36′ from its sector. The armature 35 is arranged to close, with each attraction, two switches 45 and 46; and the armature 35′ for the units magnet 34′ is arranged correspondingly to close one switch 47. The sector 31′ is arranged normally to hold open a switch 48 and to permit the latter automatically to close with the first movement of the units selector. The mechanical construction of such selector is not of my invention and I do not claim it *per se*, but show it merely as a convenient instrumentality for the purpose of practising my invention.

The pole-changing mechanism, shown in Fig. 4 at 50, consists of a usual six-bladed pole-changing switch 51 of well known construction, with springs disposed normally to stand in one position with its long blades 51′ in connection with an inner pair of contacts and to have such blades moved into connection with the outer contacts by an arm 52 provided with pins 53 adapted to receive a swinging link 54 retained under tension by a center spring 55, which is adapted to pull the arm 54 in either direction according as the latter is swung to one side or the other of the center of oscillation of the lever 54.

The lever 54 is thrown from one side to the other by a rocking member 55′, pivotally mounted below the front plate 56 of the pole-changer frame, said rocking member providing two fingers 57 and 57′ for coöperation with the lever 54, and two arms 58 and 58′ embracing a crank 59 mounted on a shaft 60 of a chronological motor train. The motor train, generally indicated at 61, is spring-driven and is governed by a centrifugal friction governor 62 or other suitable speed controlling device. The time interval between the commencement and the completion of any functional operation of the pole changer is accurately timed in relation to the interval between the commencement and the completion of signaling operations of the signal initiator. Upon the shaft 60 is mounted a stop-arm 65 arranged for alternative coöperation with diametrically opposed stop-levers 66 and 66′ connected by a link 67 operated by a lever 68, which bears the common armature 69 for two opposing magnets 70 and 70′. The relative arrangement of the mechanical parts described is such that, initially, the operating parts are set as shown in Fig. 4, with the stop-arm 65 engaging the stop-lever 66, and thereby holding the clock train under restraint. Movement of the armature 69 under attraction of the magnet 70 throws over the stop-lever system, so that (unless it is disabled from such movement) the stop-lever 66 moves out of the path of the arm 65 while the stop-lever 66′ moves into such path, thereby freeing the clock train for a half revolution of the shaft 60. During the first part of such half revolution of the shaft, the crank arm 59 travels idly between the arms 58 and 58′, but just before the stop-lever 66′ brings the mechanism to rest, the said crank-arm 59 engages the arm 58′ of the rocking mechanism, throwing it over in such a way as to move the lever 54 quickly past dead center, so that its spring 55 causes it to snap the bar 52 up to position to throw over the switch blades 51′, 51′, into engagement with their outer contacts, thereby to reverse the battery connections with the circuit and to cause a change of polarity on the line.

In conjunction with the mechanism described, I provide means for disabling the stop-lever arm 66 from releasing the stop 65, upon the first impulse which occurs in the magnet 70, following a complete cycle of rotation of the shaft 60. To this end, I mount on the lever 66 a pin 73, and arrange upon the plate 56 a locking member 74 having a pin-slot connection 75 with the plate 56, so that the lock may be raised or lowered and advanced or retracted. When in its lowered position, as shown in full lines in Fig. 4, the lock is below the path of movement of pin 73 and does not interfere therewith, but when raised, as shown in dotted lines, it stands with its end in the path of the pin 73. A spring 76 tends to pull the

lock both forward and downward, but a spring-pressed latch 77 is mounted on the lock 74 for coöperation with a stud 78 in such fashion as to engage either the edge or the top of the stud, thereby to hold the lock retracted when it is lowered, and to hold it in raised position when the lock is elevated and forward. The lock 74 bears a projecting extension 79, provided with downturned ends, arranged for coöperation with a finger 80 projecting from the shaft 60, and so located that, when the lock 74 is down or in normal position shown in full lines in Fig. 4, and the arm 65 engages lock-lever 66′, the finger 80 may engage the extension 79 to lift the lock extension early in the half revolution following the release of the rotating arm 65 by the said lever 66′.

Now it will be apparent that, with the parts standing normally in the position shown in Fig. 4, energization of magnet 70 will free the train for a half revolution of shaft 60; a subsequent energization of magnet 70′ will free the shaft for another half revolution, during the early stages of which, however, the finger 80 will strike the extension 79, raising it, and lifting the latch 77 above the end of the stud 78, thereby enabling the spring 76 to pull the lock forward and throwing the latch 77 over the top of the stud 78, as shown in dotted lines in Fig. 4. Consequently, the first subsequent energization of magnet 70 does not act to release the arm 65, because the play of the lever 66 is so restricted by the lock 74 that the arm 65 is not tripped, and the movement of said lever 66 merely serves to push the lock backward until its latch 77 is laterally beyond the stud 78, so that as soon as the impulse is over the spring 76 may pull the lock downward, throwing its latch 77 back to original position in engagement with the edge of the stud 78, thereby freeing the lever system from its disability for full movement and conditioning the pole changer for functional operation in response to the next energization of the magnet 70. It will be apparent in the further description of the system, that this disabling action is effective to prevent the single restoration impulse transmitted over the line for the purpose of restoring the selector mechanism to initial position, from effecting a polarity change on the line.

It will now be apparent that the apparatus employs at each subscriber's station two selectors having independent operating magnets, one of which should respond to the tens element of a signal and the other of which should respond to the units elements of the signal, while the pole-changing station has two pole-changer operating magnets, one of which should respond to the first impulse of the tens element of a signal and the other to the first impulse of the units element, so that it will be apparent that the devices used for controlling the potentiation of the respective tens and units operating magnets of the selectors may be duplicated for control of the corresponding pole-changer magnets, which I may term the tens and units magnets of the pole changer. I will, therefore, describe the operating and controlling circuits for the tens and units selector magnets 34 and 34′ of a party station, and it will be understood that each mechanical- and circuit-part thus described may be duplicated at the pole changer as part of the controlling and operating circuit connections of magnets 70 and 70′ respectively, the indicia employed in connection with the pole-changer station being identical with those employed for the party station distinguished by the exponent "f."

The operating and controlling circuits of the selectors are purely local, but are controlled by the condition of the line circuit (both as to polarity and as to continuity) through the agency of two polarized relays 90 and 90′, which I will term respectively the tens and units relays. Each said polarized relay has its coil in the line 10, so that throughout the entire line all of the instrumentalities therein may be in series. Each relay provides an armature 91, a front contact 92, a back contact 93, and a switch 94′ associated with the back contact and arranged to be closed when the armature engages said back contact. The two polarized relays are arranged to act oppositely under any polarity on the line, the arrangement being such that when the line is under normal polarity—say positive—relay armature 91 is attracted to its front contact, while armature 91′ is unattracted and rests against its back contact, closing the switch 94. Reversal of polarity reverses these conditions in the polarized relays.

The operating circuit for the two operating magnets 34 and 34′ comprises a common battery 95, connected by wire 96 and parallel branches 97 and 97′ with the line-relay armatures 91 and 91′, the back contacts of said respective armatures having connected thereto branch wires, 98 and 98′, which respectively include companion switches 94 and 94′; companion switches, 99 and 99′, of a controlling device to be described; and the respective magnets 34 and 34′; said two branch wires having a common return connection by wire 99× back to the negative terminal of the battery 95. Thus when the armatures 91 and 91′ are against their back contacts, one or the other of the selector-operating circuits will be closed, according to the condition of the controlling switches 99 and 99′, which are arranged for alternative operation, one only being closed at a time.

The controlling circuit for the electro-

responsive devices which control the switches 99 and 99′ may be supplied from the common battery 95, there being provided corresponding connections 100 and 100′ from the front contacts 92 and 92′ of the relays 90 and 90′ respectively to include self-controlling switches, 102 and 102′, and controlling magnets, 103 and 103′, said wires being connected in common by wire 104 with the negative terminal of the battery 95. The controlling magnets 103 and 103′ have a common armature 105 provided with a switch block 106 coacting with the switches 102 and 102′, and 99 and 99′, so that when the armature is attracted by the magnet 103, switch 99 is closed and switch 102 opened, while switch 99′ is opened and switch 102′ closed, reverse movement of the armature just reversing these conditions.

Now it will be apparent that, with the parts standing in the position shown in Fig. 1, if a series of breaks be effected in the line 10, each break will cause the relay 90 to free its armature 91 for return to its back contact, thereby to complete the operating circuit branch 95, 96, 97, 91, 98, and 99ˣ, such circuit including the closed switches 94 and 99, and the operating magnet 34. Reversal of polarity on the line will not cause any energization of either operating magnet 34 or 34′, because as the armature 91 moves toward its back contact the armature 91′ will move away from its back contact, opening the switch 94 at or prior to the time that the armature 91 contacts with point 93. The reversal of the line polarity, however, establishes a controlling circuit 95, 97′, 91′, 92′ (this connection having just been established as the result of the pole change), 100′, and 104, such circuit including the closed switch 102′ and the units controlling magnet 103′, so that the armature 105 is thrown over, in its movement closing the switch 99′ as it opens switch 99, and opening 102′ as switch 102 is permitted to close. Thus it will be apparent that, at any time, a pole change on the line causes a reversal of the controlling device, which will shift the circuit connections through the operation of switches 99 and 99′, to potentiate the theretofore disabled operating magnet and disable the previously potentiated operating magnet, and by the same movement to open the momentarily established controlling circuit and condition the opposite controlling circuit for closure upon the next pole change, this last effect being produced through the operation of switches 102 and 102′.

Since the pole-changing construction has exactly similar controlling and operating circuits and devices for its two magnets 70 and 70′, it will now be apparent that a series of interruptions in the line constituting the tens element of the signal, causes vibrations alike of armatures 91 and 91′, which will act equally on the respective selector and pole-changer operating magnets 34 and 70, thereby effecting a release of the pole-changer chronological motor as soon as the transmission of the tens signal element is commenced and the response of the selector part controlled by the magnet 34 begun. As has before been described, the interval of time that it takes the signal initiator to transmit a tens signal is completed before the pole change so initiated occurs, and after the tens element of the signal has been completed a pole change will occur and the rotating arm of the pole-changing device will come to rest in engagement with the stop-lever 66′. The change of pole will throw over the controlling devices of all of the stations, thereby potentiating the operating circuits for magnets 34′ and 70′ of the signaling station and the pole-changer station respectively, and then the subsequent transmission of the units element of the signal will act equally on magnets 34′ and 70′ through the agency of relays 90′ and 90′′. Accordingly, at the commencement of the units element of the signal, the pole changer is again tripped or released and its mechanism runs during the interval that the units element of the signal is being completed, effecting a pole change back to normal or original condition after the completion of the units element of the signal. Further, it will be remembered, that, during this half of the revolution of the pole-changer mechanism, the finger 80 coöperates with the extension 79 to throw the lock 74 into locking position with respect to the arm 66, thereby disabling the pole-changer controlling mechanism to respond to the first impulse which thereafter shall be sent through the magnet 70. As will be later described, the single interruption of the line which is caused by the tooth 22ª of the signal-initiating device just before the initiator comes to rest, occasions the release of the selector devices, but it has no effect upon the polarity of the line, as it does not trip the pole changer for functional operation but only causes the locking member 74 to be pushed back into unlocking position, as has been heretofore described. Thus at the completion of a signaling round consisting of a group of line interruptions constituting a tens element of the signal, a succeeding group constituting the units element of the signal, and a single interruption constituting the restoration element of the round, the line circuit stands closed with the same polarity exhibited therein that initially existed.

The wiring details of the selector devices do not constitute a part of my present invention but are pertinent thereto in combination with the system heretofore described. I will, however, describe a wiring arrange-

ment of the selector devices for purposes of full disclosure.

The translating device, preferably a bell, 110, arranged for operation by predetermined collocation of the selectors, is connected in a wire 111, leading to the fixed units selector contact 33′; the two movable contacts 32 and 32′ of the selector are connected, as shown at 112, as through their supporting frame, and the stationary contact 33 has a connection, 113, to the negative terminal of the battery, so that as soon as both selectors are moved to bring their movable contacts into connection with their stationary contacts, the bell circuit is closed by path 111, 33′, 32′, 112, 32, 33, 113, and back to battery. The releasing magnet 39 is connected in a circuit such that both the magnets 34 and 34′ must be energized in order to close the release-magnet circuit. Such circuit may be provided by wire 114, extending from the positive terminal of the battery to the release magnet 39; wire 115, extending from thence to switch 47; wire 116, extending from switch 47 to switch 46; and wire 117, connected between said switch 46 and wire 113, for return therethrough to the negative terminal of the battery. Arrangement is further made so that after the selector 31′ has been operated, its operating magnet 34′ will receive current each time the tens operating magnet 34 is energized. To this end, a shunt is established by wires 120, switch 45, wire 121, switch 48, and wire 122, so that when the switches 45 and 47 are closed, the operating magnets 34 and 34′ are paralleled. Obviously, the switch 45 closes every time the magnet 34 is energized and opens again upon deënergization of the magnet, and the switch 48, normally held open by the sector of the units selector 31′, closes only when the selector is first operated and then remains closed continuously until the selector is restored to normal position. Thus it will be apparent that when, following the controlling operation of the system which has been described, resulting in the advancement of both tens and units selectors a certain number of steps, a single impulse occurs in the line, causing a single brief energization of the magnet 34, the closure of switch 45 establishes parallel connection 98′, 34′, 122, 48, 121, 45, 120, around the operating magnet 34, causing magnet 34′ to close its switch 47 and thereby establishing the releasing circuit 95, 114, 39, 115, 47, 116, 46, 117, and 113, back to battery 95, so that the restoration magnet may pull the holding pawls from both of the sectors, conditioning them to drop to normal position as soon as the brief restoration impulse is over.

While I have herein described in some detail an operative embodiment of my invention, it will be apparent that numerous changes in the details of construction and arrangement might be made without departure from the spirit and scope of my invention.

What I claim is:

1. In a selective signaling system, a line; means for energizing said line with either polarity; and at each station means for initiating signals on the line; a plurality of selectors; an operating magnet for each selector; and means, responsive to the polarity of the line, to potentiate said operating magnets alternatively for operation, and responsive to changes in continuity in the line to cause the potentiated magnets to operate.

2. In a selective signaling system, a line, a source of current supply therefor, a pole-changing switch, automatic operating means for said pole-changing switch comprising a chronological motor requiring a predetermined time for the completion of a pole-changing operation, signal initiators in the line comprising means adapted to be set to send impulse group signals completed within chronological periods less than the operating period of the pole-changer motor, a plurality of selectors, means controlled by the polarity of the line for potentiating said selectors, and means controlled by the operation of the signal initiating devices for operating said selectors.

3. In a selective signaling system, a line; a source of current supply; pole-changing means connected with the source of current supply; a chronological motor for said pole-changing means having a predetermined time of operation after release; electro-responsive releasing means for said motor; means responsive to interruptions in the line for occasioning the operation of said electro-responsive means; signal-initiating line interrupters, arranged to occasion groups of interruptions constituting tens and units elements of a signal; chronological-motor means for operating said signal initiator, limiting the operation of said initiator to proper intervals with respect to the intervals of operation of the pole-changing motor; and at each station tens and units selectors adapted for response to the tens and units signal elements, translating means operable by predetermined collocation of the selectors, and means responsive to line polarity alternatively to potentiate the selectors for operation and responsive to interruptions of the line to operate the potentiated selector.

4. In a selective signaling system, a line; a source of current supply; pole-changing means connected with the source of current supply; a chronological motor for said pole changer having a predetermined time of operation after release; electro-magnetic releasing means for said motor; means responsive to interruptions in the line for

occasioning the operation of said electromagnetic means; signal-initiating line interrupters, arranged to occasion groups of interruptions constituting tens and units elements of a signal; chronological-motor means for operating said signal initiator, limiting the operation of said initiator to proper intervals with respect to the intervals of operation of the pole-changer motor; at each station tens and units selectors intended for response to the tens and units elements of a signal, translating means operable by predetermined collocation of the selectors, polarized relays operatively associated with the line, local circuits controlled by said polarized relays, and electro-responsive means in said local circuit controlled by the polarized relays for potentiating different selectors for operation in accordance with the polarity of the line, and for operating the potentiated selector in response to interruptions of the line.

5. In a selective signaling system, a line circuit, a source of current supply therefor, pole-changing means, and at each station two polarized relays operatively associated with the line, local operating circuits controlled by said polarized relays, local controlling circuits also controlled by said polarized relays, local means of current supply for said local circuits, a plurality of independent selectors, independent operating-means for each said selector arranged in a local operating circuit, and means in said controlling circuits for conditioning said operating-circuits alternatively for completion by the operation of their respective polarized relays.

6. In a selective signaling system, the combination with a line and a source of current supply therefor; of pole-changing means comprising a chronological motor timed in its operation, and electro-responsive releasing means for said motor; means for disabling said releasing means from operating in response to a restoration signal-element; signal initiating means comprising line breaking means, and operating means therefor arranged to be determinately set to transmit separate number signal elements and a restoration signal-element in successive order; a chronological motor for operating the transmitter and appropriately timing its intervals of operation with respect to the intervals of operation of the pole changer; and at each station two selectors, operating means in an operating circuit, controlling means for potentiating said selectors for operation in a local controlling circuit, and polarized relay-means associated with the line controlling said local operating and controlling circuits.

7. In a selective signaling system, a line, a source of current supply therefor, means for changing the polarity of the line, signal-initiating means in the line, two independently operable selectors, electro-responsive operating means therefor, local-circuit operating means, polarized relays corresponding with said selectors, and circuit connections whereby both relays are instrumental in completing the circuits for causing the operation of the selectors.

8. In a selective signaling system, a line, signal initiating means therefor, and at a station a plurality of step-by-step selectors, a translating device operable by predetermined collocation of the selectors, an operating magnet for each selector, and automatic means for conditioning said magnets successively to operate in response to line signals.

9. In a selective signaling system, a line, signal initiating means therefor, and at a station a plurality of selectors, a translating device operable by predetermined collocation of the selectors, a plurality of operating magnets for the several selectors, switching means controlling said magnets, and means for automatically operating said switching means to successively condition said magnets to operate in response to successive signals.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

JUDSON McFELL.

In the presence of—
W. LINN ALLEN,
MARY F. ALLEN.