E. R. GILL.

SELECTIVE SIGNALING SYSTEM.

APPLICATION FILED SEPT. 4, 1908. RENEWED DEC. 13, 1910.

1,003,250.

Patented Sept. 12, 1911.

3 SHEETS—SHEET 1.

Fig. 1

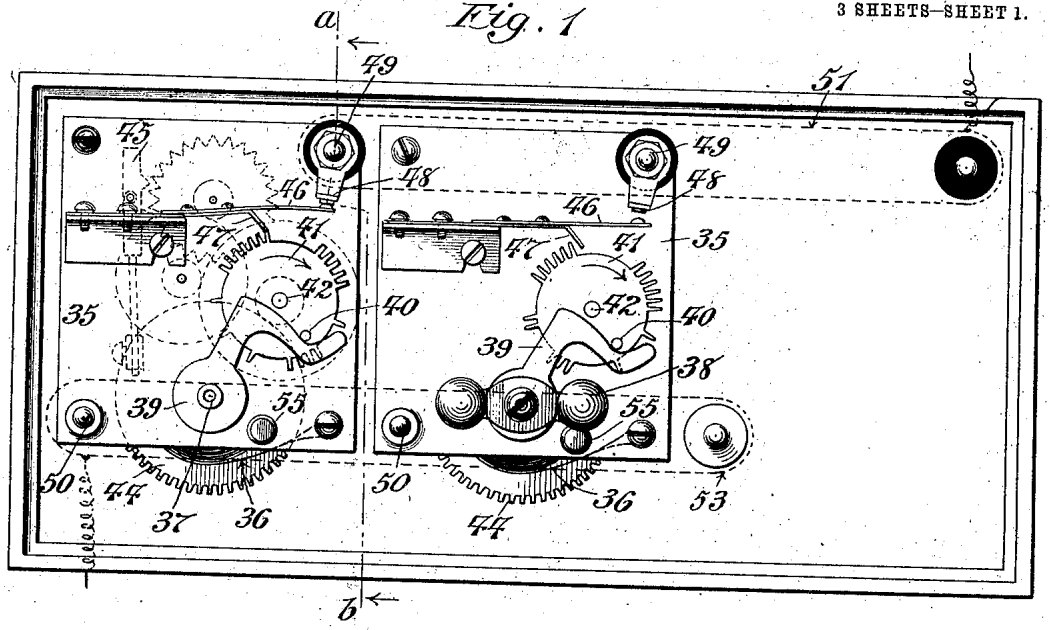

Fig. 2.

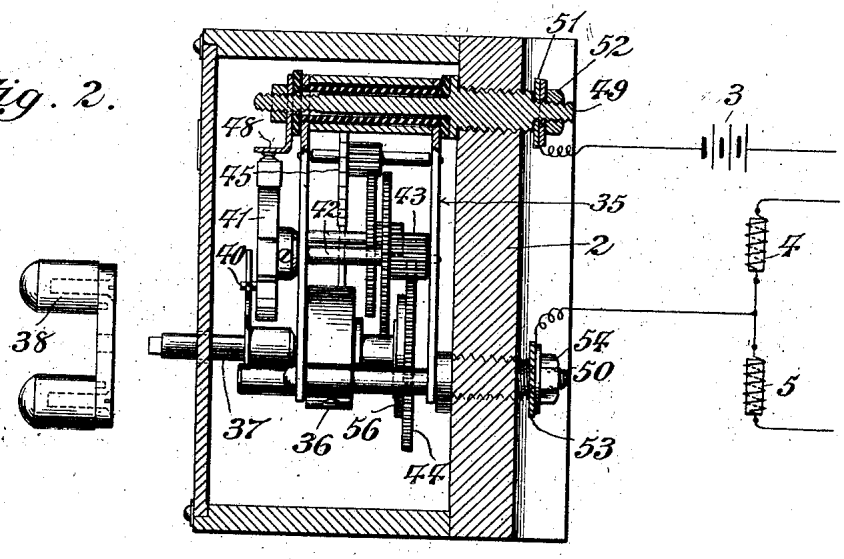

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Fig. 4.

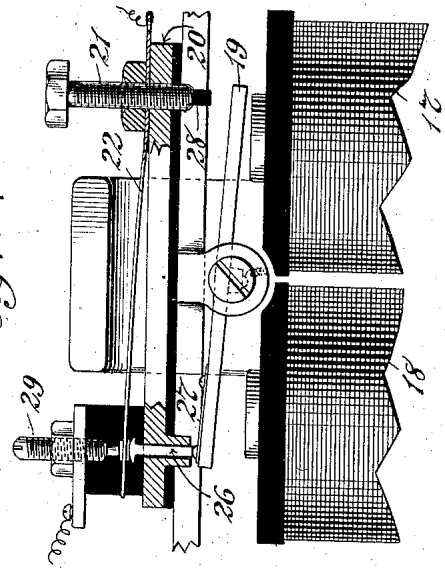


Fig. 5.

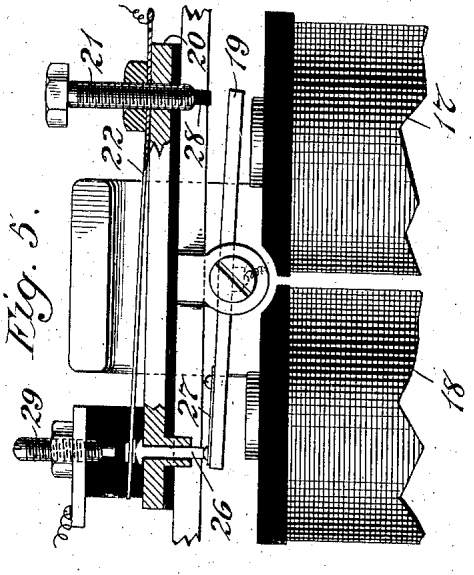
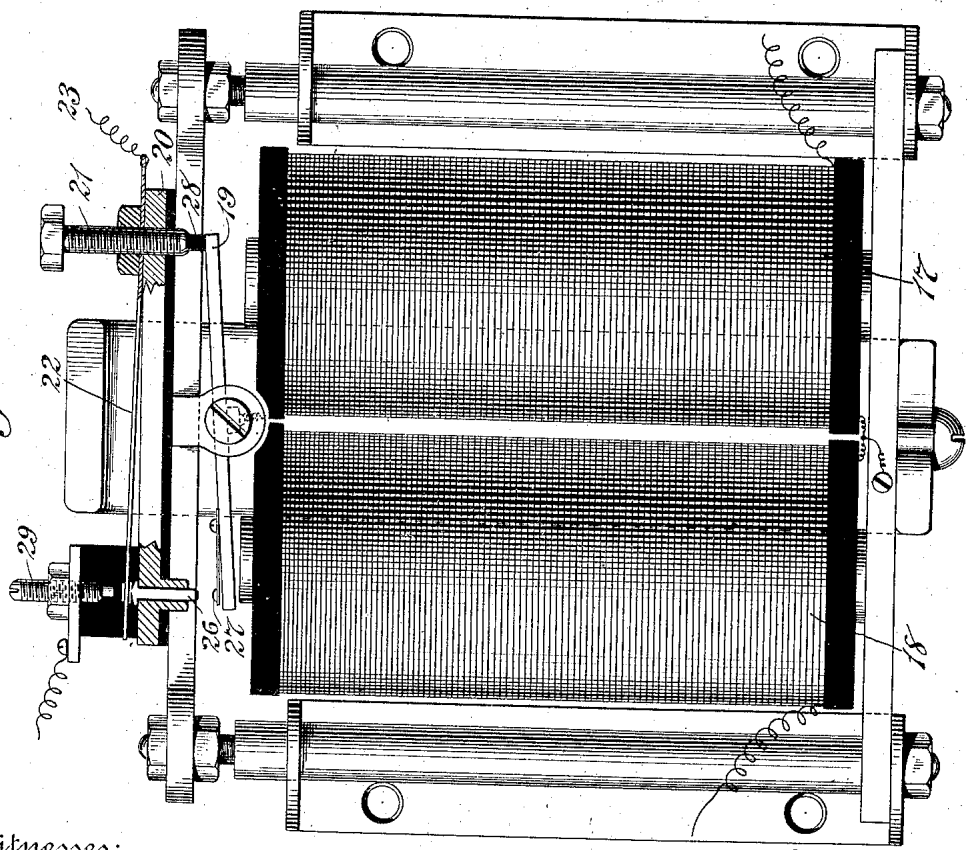


Fig. 3.



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3 SHEETS—SHEET 3.

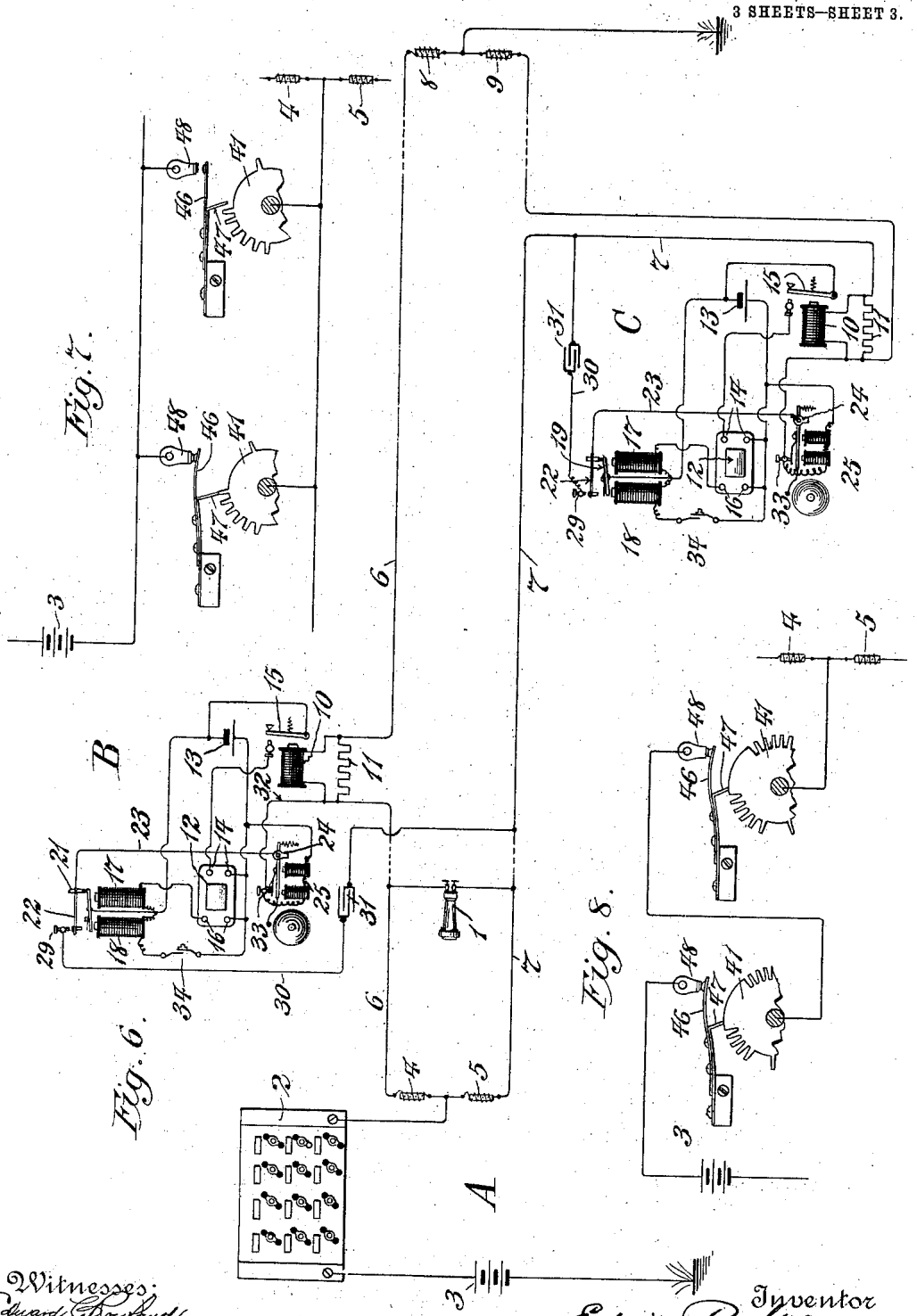

Fig. 6.

Fig. 7.

Fig. 8.

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UNITED STATES PATENT OFFICE.

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SELECTIVE SIGNALING SYSTEM.

1,003,250. Specification of Letters Patent. Patented Sept. 12, 1911.

Application filed September 4, 1908, Serial No. 451,663. Renewed December 13, 1910. Serial No. 597,148.

To all whom it may concern:

Be it known that I, EDWIN R. GILL, a citizen of the United States, residing in the city of Yonkers, county of Westchester, and State of New York, have invented a certain new and useful Improvement in Selective Signaling Systems, of which the following is a specification.

My present improvement has relation to an improved system for automatically sending selective signals to individual stations of a group, whereby the necessary combinations of electric impulses may be quickly produced with a minimum of attention and liability to mistake.

My invention also relates to an improved answer-back device whereby one who sends a signal is at once made aware of his success in producing the same.

My invention also relates to an improved and highly convenient means whereby the party who is called may interrupt the signal preparatory to receiving another.

The present improvement is illustrated in the accompanying drawings, wherein—

Figure 1 is a front elevation of an automatic signal box partly equipped, Fig. 2 is a vertical section on the plane *a—b* in Fig. 1, Fig. 3 is an elevation partly in section of the polarized circuit controller, Figs. 4 and 5 are like views of a portion of the same, showing different positions of the armature, Fig. 6 is a diagram of the equipment for a sending station and two receiving stations, and Figs. 7 and 8 are diagrams of circuits described hereinafter.

My invention may be used in connection with any system of communication and is well adapted to all kinds of telegraphic and telephonic systems. It is particularly useful, however, in connection with telegraphic or telephonic train despatching, and I have therefore illustrated the same in that connection herein. I do not limit myself, however, to use of my improvement in connection with any particular system of communication.

In Fig. 6 of the accompanying drawings I have shown my system as applied to a telephonic system on which standard telegraphic relays and sounders can be used without interfering with telephones. Such a system is not herein claimed broadly because it forms the subject matter of my pending application for patent Serial No. 415,513, filed Feb. 12th, 1908. A sufficient explanation thereof will be given here to make clear the application thereto of my present improvement.

At A in Fig. 6 is the train despatcher's equipment, comprising, among other apparatus a telephone, the receiver of which is at 1, and a group of automatic selective calls in a box 2. These calls (hereinafter described) are connected on one side to ground through a battery 3 and on the other side between two appropriate impedance coils 4, 5, to the line. The opposite sides of the coils 4, 5, are connected to the two sides of a through telephone-telegraph circuit, 6, 7, whereby the despatcher's office A is placed in communication with the various stations along the road, two of which are indicated at B, C. The opposite ends of the wires 6, 7, are grounded through appropriate impedance coils 8, 9. Other circuit arrangements may be provided in this connection without departing from my invention.

At each signal station along the line 6, 7, there is provided a proper relay 10 in shunt with a non-inductive resistance 11. Such relay may or may not be used in connection with telegraphic instruments. At each station is placed any appropriate selective signal instrument, 12, responsive to electric impulses properly timed. These selective instruments may be of any well known construction as, for instance, that shown in my Patent No. 906,523, dated Dec. 15th, 1908. The local circuit for operating each instrument 12 is provided by a local battery 13 and is connected to the instrument by terminals 14. This local circuit is closed by the armature 15 of the relay 10 coming in contact with the forward contact piece. Operation of the selective instrument brings the two terminals 16, into momentary electrical connection with each other. The details whereby this may be accomplished are well known in a variety of instruments and forms no part of the present invention. When the terminals 16 are thus connected, circuit from local battery 13 will be closed through one coil 17 of a polarized electro-magnet 17, 18 the details of which are shown in Figs. 3 to 5. The poles of this magnet are placed close to an armature 19, pivoted between them, which armature tilts one way or the other according to which of the two coils 17, 18 is energized.

One side of both coils, 17, 18, and the armature 19 are in permanent connection with the frame of the magnet and with one pole of the battery 13. Insulated from this framework, a supporting plate 20 is placed over the armature 19, and carries a binding post 21 to which is fastened a long contact spring 22 which is permanently connected by wire 23 to one terminal 24 of the ordinary bell 25, or other appropriate signaling device. The free end of the spring 22 bears upon a vertically movable pin 26 which passes through the plate 20. One end of the armature 19 carries a small spring 27 adapted to bear upon the pin 26 when that end of the armature is raised. This spring is useful in preserving firm contact with the pin 26, in spite of the vibration caused by the bell 25, or other disturbance. The opposite end of the armature, when raised bears upon insulation 28 on the binding post 21, or any other appropriate stop.

Supported upon the plate 20 and insulated from it is a terminal post 29 against which the free end of the spring 22 is adapted to bear when lifted by the pin 26. This post 29 is connected by wire 30, through a condenser 31, to one side of the main line circuit 6, 7. In the arrangement shown at station B the other side of the line is connected by wire 32 to that terminal of the bell at which circuit is automatically broken in the usual way. In the arrangement shown at C, both the terminal 33 and the post 29 are connected to the same side, 7, of the main line, but they are connected on opposite sides of the resistance 11. In either case the construction operates substantially as hereinafter described. Either of these specific arrangements may be used in an entire system.

As before stated, one side of the magnet coil 18 is connected to the framework and to one side of the battery 13. The opposite pole of said battery is connected to the opposite end of the coil 18 through the push button 34 or an equivalent device.

The operation of so much of my invention as is above described is as follows—When the appropriate impulses are sent over the line 6 or 7 to the relays thereon, the instrument 12 at the proper station operates to close circuit through the coil 17 at that station. This causes the armature 19 to take the extreme position shown in Fig. 4, whereby the pin 26 is lifted against the spring 22, which it pushes against the post 29. Two independent circuits are thus made—one leading from the battery 13 through the frame of the magnets 17—18, spring 22, wire 23, to the terminal of the signal 25, thence through the armature of the signal 25, terminal 33 and the coils of the signal back to the battery 13. The closing of this circuit actuates the signal 25 from the battery 13. The other circuit leads from the battery 13 through the frame of the magnets 17—18, armature 19, pin 26, terminal 29, wire 30, and condenser 31 to the side 7 of the line; thence through wire 32 to the terminal 33 of the local signal; thence through the coils of the local signal and back to the battery 13. This latter circuit connects the coils of the local signal across opposite sides of the main line and the momentary opening and closing thereof produces an audible humming or buzzing in the answer-back receiving instrument located in the calling station. Inasmuch as the closing of circuit between the terminals 16 of the selective instrument 12 is only momentary, the coil 17 is deënergized very shortly after it has acted and then the resilience of the spring 22 and the weight of the pin 26 act to bring the armature 19 into the position shown in Fig. 5. This opens the circuit through 29 and thus interrupts the answer back buzzing at the telephone 1, leaving the despatcher free to use the line. The circuit through the bell 25, however, is still maintained at the station called, because the spring 22 still bears on the pin 26, which is still in contact with the armature 19. When the attention of the operator at the station called has been attracted and he wishes to discontinue the action of such signal, he closes the circuit through the magnet coil 18 at the switch 34, which may occupy any convenient location. This causes the armature 19 to take the position shown in Fig. 3, breaking the bell circuit at 26, 27, and leaving the entire apparatus in condition for a repeated operation.

It is within the scope of my present invention to operate the various selective devices 12 by hand, but I prefer to use as a part of the equipment at the despatcher's office a number of calling instruments, by operating one or another of which, one or another selective instrument 12 may be exclusively operated. A variety of devices may be used in this connection, but the preferred construction for this purpose is shown in Figs. 1, 2, 7 and 8. As shown, the box 2, preferably made of insulating material, contains a number of calling instruments side by side, which are connected electrically as hereinafter described. Each calling instrument comprises a suitable framework 35, supporting a main spring 36 on the main axle 37. This spring can be wound up by a suitable handle, 38, preferably removable from the squared end of the axle 37. A stop sector 39 is fixed on the axle 37 so as to turn with it, and the outer circular edge of this sector lies normally in the path of a pin 40, on the make-and-break wheel 41. The wheel 41 is mounted upon a shaft 42 carrying the pinion 43 which meshes with the gear 44 on the shaft 37. The movement of the make and break wheel when released is controlled by the escapement 45, or equivalent retard-

ing means, connected to the shaft 42 by a train of gears, substantially as shown. A long movable contact spring 46 is fixed over the wheel 41 and is in permanent electric connection with the framework 35. It is provided with an angle-piece 47 whose tip extends into the path of movement of the teeth on the make and break wheel 41, so that as this latter revolves in the direction of the arrow in Fig. 1, the spring is recurrently lifted into contact with the fixed terminal 48.

My improvement may be used either on a normally open circuit system or a normally closed circuit. Where used with a normally open circuit the parallel arc arrangement of the various instruments shown in Fig. 7 will be used. With normally closed circuit, on the contrary, the instruments are connected in series as shown in Fig. 8.

Where the instruments are used in multiple arc, the arrangement will be substantially as shown in Figs. 1 and 2. In this form, two diametrically opposite corners of each framework are secured to the box 2 by the long bolts 49, 50, the bolt 49 being insulated from the framework and from all the parts except the terminal 48, while the post 50 is in direct electrical connection with said framework. Under or behind the box 2 all the bolts 49 are mutually connected as by a metal band or strap 51, secured to said bolts by nuts 52. A similar connecting band 53 is secured to all of the posts or bolts 50, by the nuts 54. One of said bands should be connected to the battery 3 and the other to the wire which leads to the coils 4 and 5. (See Fig. 6.) Where it is desired to use a normally closed circuit system the bands 51 and 53 can be connected accordingly by obvious modifications of their arrangement for connection in series as shown in Fig. 8.

The teeth on the make and break wheel of the various calling instruments in a group at the despatcher's office will be respectively arranged in such positions that, the current impulses set up by contacts between 46, 48 in each instrument will correspond to those necessary for exclusively operating one of the selective instruments 12. Each instrument 12 will correspond to an appropriate calling device in the box 2.

In operating any one of the automatic calls, the shaft 37 is turned by the handle 38 so as to wind the spring 36 and, at the same time withdrawing the sector 39 from in front of the pin 40, liberates the wheel 41. The stop 55 provides a limit of movement for the shaft and sector. By means of the spring pawl and ratchet, common in clocks and watches and indicated at 56 in Fig. 2, the initial spring-winding movement of the shaft 37 is not transmitted to the gear wheel 44, but, when the handle 38 is released, the spring 36 acts through said gear and the pinion 43 to turn the make and break wheel 41 in the direction of the arrows in Fig. 1, while at the same time the shaft 37 returns to its initial position so that the sector is in place to receive the impact of the pin 40 and stop the train of wheels. Thus a single revolution of the wheel 41 is produced, and the corresponding makes and breaks between 46 and 48 act to cause operation of the corresponding signal 12.

By providing a separate calling instrument for each station, arranged substantially as described, all thought on the part of the operator is made unnecessary and it is only necessary for him to turn the handle corresponding to the station desired.

Various changes may be made in my devices without departing from the scope of my present invention, and I do not limit myself to the details herein shown and described.

What I claim is—

1. A calling instrument, a main line circuit, a local circuit and an answer back receiving instrument near said calling instrument; in combination with a number of selective signaling instruments along said main line adapted to produce momentary closure of said local circuit, an electric signaling device on said local circuit, an answer back branch circuit connected with said signaling device and with said main line, and means controlled by operation of said selective signaling instrument for momentarily closing said answer back branch circuit, substantially as described.

2. In combination, a selective signaling instrument, a local signal circuit, an answer-back circuit, a momentary circuit closer in said answer-back circuit, a permanent circuit closer in said local signal circuit, and a common motive means for said two circuit closers controlled by said selective signaling instrument.

3. In combination, a selective signaling instrument, an electro-magnetic signaling device, a local generator, a circuit for the signaling device including said local generator, an answer back circuit including said local generator and the coils of the electro-magnetic signaling device, and means controlled by said selective signaling instrument for operating both said signaling device and said answer back circuit.

4. In combination, a signal circuit including a local battery, an answer back circuit, a movable armature and an electro-magnetic coil, means associated therewith for causing it to move said armature in one direction and to cause it to produce a momentary closure of said answer back circuit and a prolonged closure of said signal circuit, and a second electro-magnetic coil adapted to move said armature in the opposite direction to open said signal circuit.

5. In combination, a local battery, a local signal connected therewith, an armature also connected therewith, a movable contact arm connected with said signal and having its free end in the path of movement of said armature, an answer back circuit including a contact terminal near said arm, an electro-magnetic coil arranged to move said armature to press said arm against said contact and a selective instrument for momentarily energizing said electro-magnetic coil, substantially as described.

6. In combination, a signal circuit including a local battery, an answer-back circuit, a movable armature and an electro-magnetic coil, means associated therewith for causing it to move said armature in one direction and to cause it to produce a momentary closure of said answer-back circuit and a prolonged closure of said signal circuit, and a second electro-magnetic coil adapted to move said armature in the opposite direction to open said signal circuit.

7. In combination, a local battery, a local signal connected therewith, an armature also connected therewith, a movable contact arm connected with said signal and having its free end in the path of movement of said armature, an answer-back circuit including a contact terminal near said arm, an electro-magnetic coil arranged to move said armature in one direction to press said arm against said contact, a selective instrument for momentarily energizing said electro-magnetic coil, a second electro-magnetic coil for moving said armature in the opposite direction, and means for closing circuit through said second electro-magnetic coil, substantially as described.

8. A local signal circuit, a branch answer back circuit, and a selective instrument for controlling both; in combination with a two-coil magnet having one coil in operative relation with said selective instrument, means for closing circuit through the second coil, an armature pivoted in the middle with its two ends opposite the two coils of said magnet, a long spring having its free end opposite one end of said armature, a fixed contact terminal behind said spring, said local signal circuit and answer-back branch being in circuit with said armature, spring and fixed terminal, substantially as described.

9. In combination, a selective signaling instrument, a local generator and a signal circuit including the same, an answer back circuit including the local generator and a part of the signal circuit, said answer back circuit being connected with the main line, and means controlled by said selective signaling instrument for causing momentary closure of said answer back circuit.

10. In combination, a source of current supply, a selective signaling instrument, a circuit for the local signal, a local signaling device therein adapted to set up undulatory electric impulses when operated, an answer-back circuit adapted to receive said undulatory electric impulses, and means controlled by said selective signaling device for momentarily closing said answer-back circuit and permanently closing the circuit for the local signal.

11. In combination with a signal circuit and an answer-back circuit; a spring, a movable armature arranged to close said signal circuit when in contact with said spring, a terminal in said answer-back circuit, and an electro-magnet adapted to cause said armature to push said spring against said terminal when energized and to let the spring and armature move together away from said terminal when deënergized, substantially as described.

12. In combination, a main line circuit, a local signal circuit, a signaling device in said local circuit adapted to produce when operated rapid changes of potential at its terminals, an answer-back circuit connecting the terminals of said signaling device to said main line, means operatively connected to said main line circuit for closing the said answer-back circuit, and a device for receiving answer back signals connected to said main line, substantially as described.

13. In combination, a main line circuit, a selective signaling instrument adapted to be controlled over said main line circuit, a local signaling circuit controlled by said selective signaling instrument, a signaling device in said local circuit producing when operated rapid changes of potential across its terminals, an answer-back circuit connecting the terminals of said signaling device to the main line, a device for receiving answer back signals connected to said main line and an automatic switch in said answer-back circuit, substantially as described.

14. In combination, a main line circuit and local signal circuit, a generator in said local circuit, a signaling device in said local circuit adapted to produce when operated rapid changes of potential at its terminals, an answer back circuit including the generator and the coils of said signaling device, said answer back circuit being connected with the main line, and a device for receiving answer back signals connected to said line.

15. In combination, a main line circuit and local signal a circuit for the local signal including a generator, selective signaling means connected in the main line adapted to close the circuit of said local signal, an answer back circuit including the local generator and the coils of the signaling device, and a device connected in the line for receiving such answer back signals.

16. A signaling system, comprising a main line, selective apparatus operated from

the main line, an electro-magnetic signaling device, a circuit for said signaling device, an answer back circuit including the coils of said signaling device operatively connected to said main line to impress thereon undulatory electric impulses resulting from the operation of said electro-magnetic signaling device, and a circuit closer operated by said selective device for closing the signaling circuit.

17. A signaling system comprising in combination a line, selecting means connected in said line, a local signal and a generator in circuit therewith, an answer back circuit, including the generator and said local signal, connected with the line and adapted to be closed by said selecting means whereby the operation of the local signal will cause impulses of variable potential to be impressed upon the main line to produce an answer back signal, and answer back receiving means.

18. In a signaling system, the combination with a line connecting a calling and a called station, of an instrument at the calling station for impressing signaling impulses upon the line, selective apparatus operated from the main line in accordance with the signaling impulses impressed thereon by said instrument, an electro-magnetic signaling device, a circuit for said signaling device, including a local generator, a circuit closer operated by said selective device for closing said signaling circuit, and an answer back circuit including the local generator and coils of the electro-magnetic signaling device connected with the main line, adapted to transmit thereto impulses of variable potential when said local signal is operated, and answer back receiving means.

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