No. 667,434. Patented Feb. 5, 1901.

W. F. FOLLETT.

SIGNALING SYSTEM.

(Application filed June 22, 1900.)

(No Model.) 3 Sheets—Sheet 1.

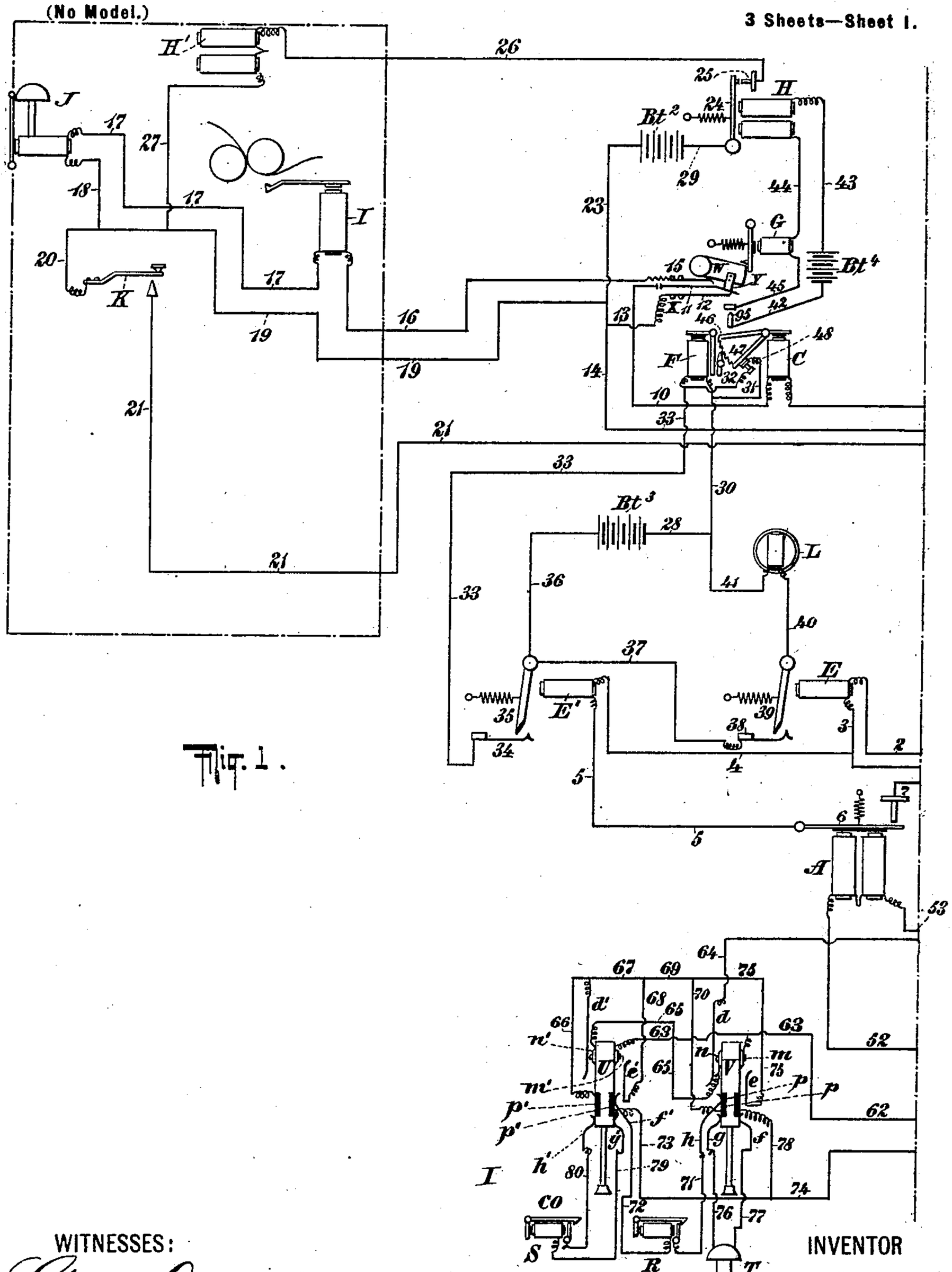

Fig. 1.

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Fig. 2.

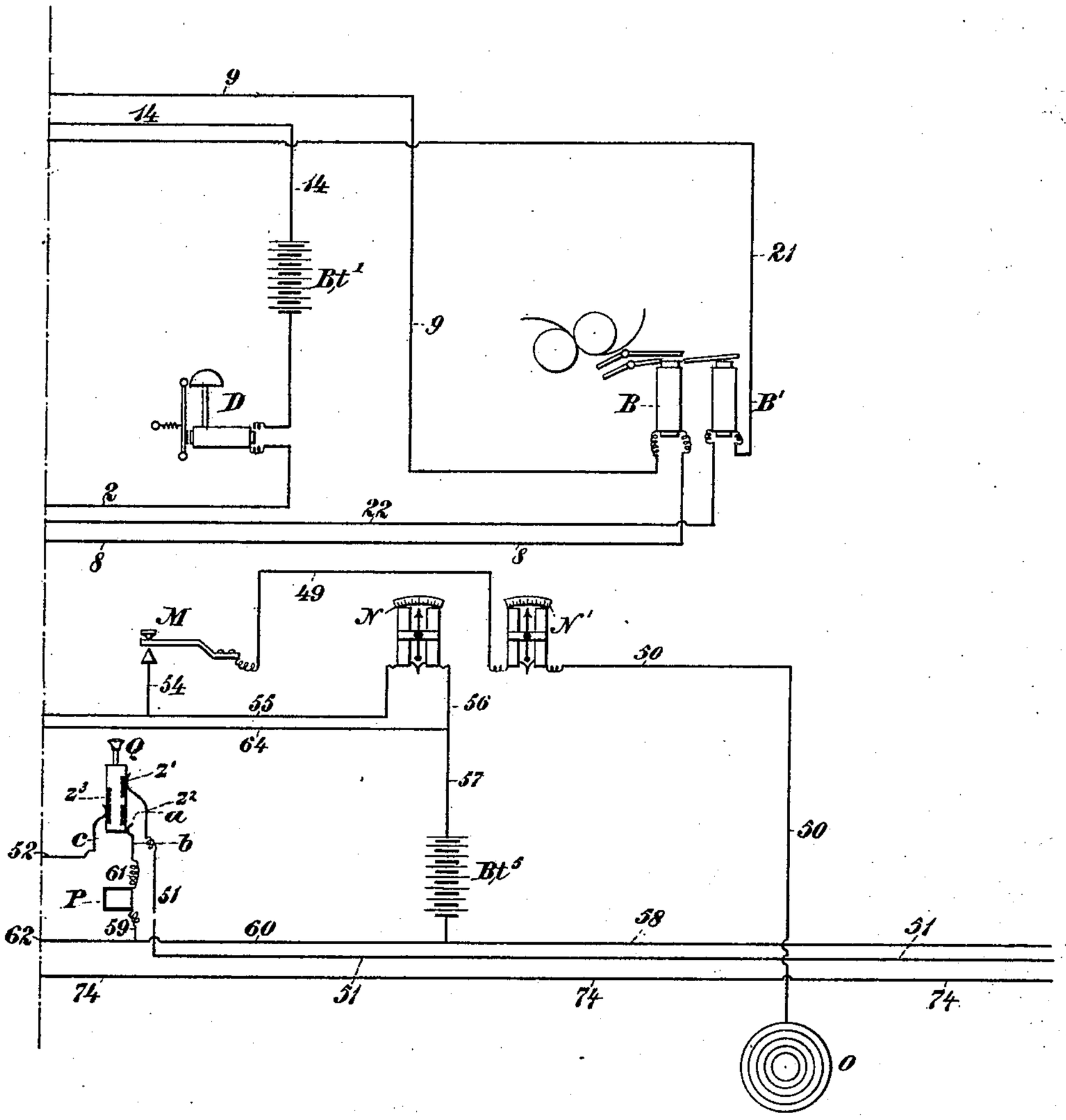

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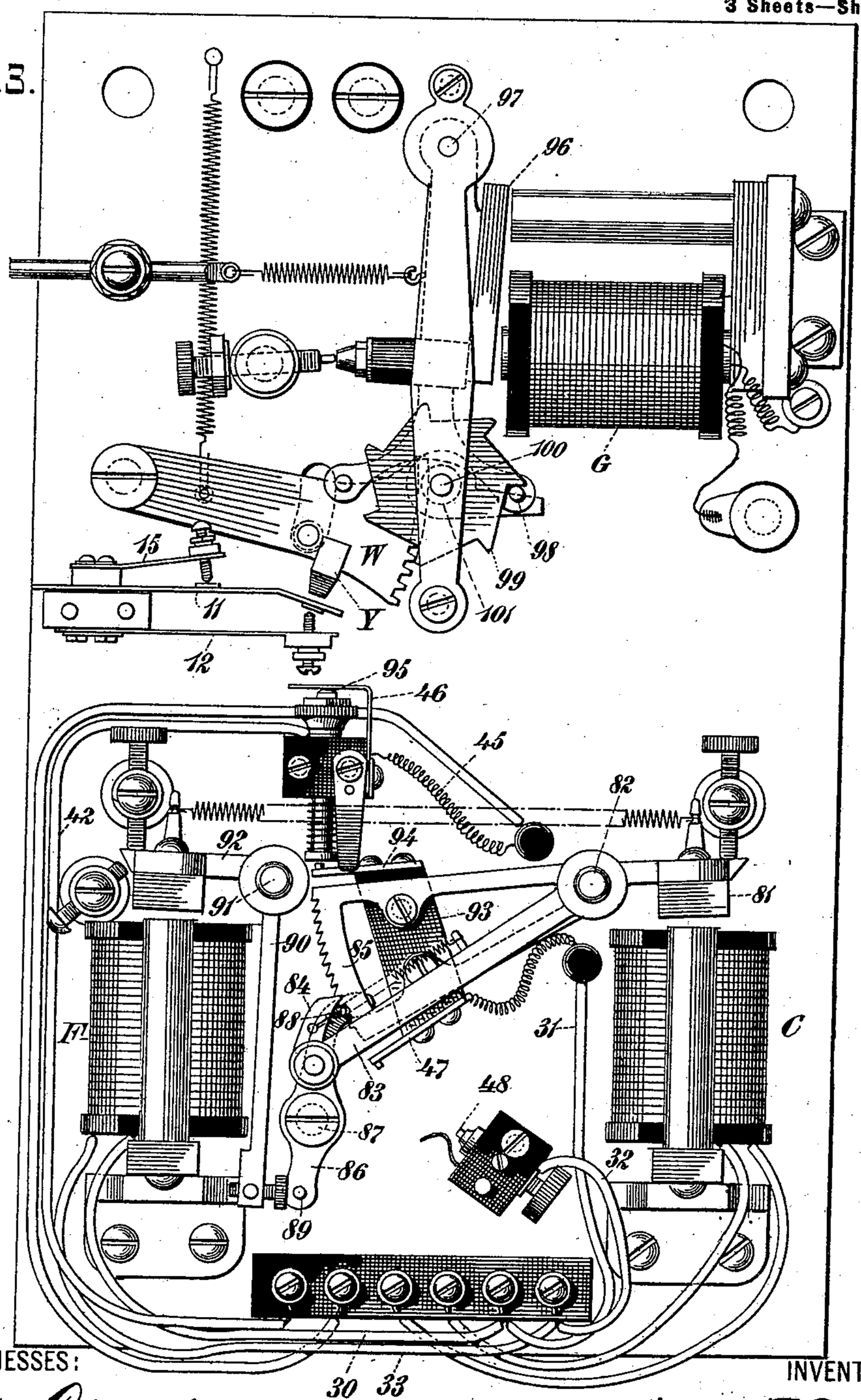
Fig. 3.



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SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 667,434, dated February 5, 1901.

Application filed June 22, 1900. Serial No. 21,165. (No model.)

To all whom it may concern:

Be it known that I, WALDO F. FOLLETT, a citizen of the United States, residing at New Haven, New Haven county, State of Connecticut, have invented certain new and useful Improvements in Signaling Systems, of which the following is a specification.

My invention relates to electrical signal systems adapted for fire-alarm and police or municipal telegraphs, and has for its object to produce a simple efficiently-acting signaling system.

To this end my invention consists in the special matters hereinafter pointed out in the claims.

In the accompanying drawings I have shown, more or less diagrammatically, a circuit and apparatus embodying my invention. It will be understood, however, that the system illustrated is shown merely by way of example and that I do not intend to limit myself to the construction shown and described.

In the drawings, Figures 1 and 2, taken together, illustrate a circuit and system illustrating my invention, in which the representation is more or less diagrammatic. Fig. 3 shows the structure by which the signals are visually indicated at the central station and telegraphed from the central station to the wagon-house and the apparatus by which the want-calls and the box-numbers are distinguished from each other, it being understood that two classes or kinds of signals are employed, one by which the patrolman or fireman indicates a want and the other by which the box-number or locality is designated.

In the drawings I have shown an apparatus especially adapted for use in police or municipal telegraphy, and the invention will be described in reference thereto.

Before proceeding to describe the detailed operation of the system I shall proceed to identify the various parts. At the central station I have shown a switchboard or telephone apparatus, which is indicated by the letter T, a main relay, which is indicated by the letter A, a retarding-repeater E, a time-stamp L, a retarding-repeater E′, a duplex receiving instrument composed of two magnets F and C and their adjunctive apparatus, a visual-signal indicator G, a gong and repeater H, a tap-bell D, a double register B B′, a strap-key M, and station-galvanometers N N′. To operate these various structures, I have provided a station-battery, (indicated at Bt^5,) a local battery Bt' for operating the station local circuit, a local battery Bt^3, and local batteries Bt^2 and Bt^4. At the wagon-house or stable I have shown a tap-bell J, an answer-back strap-key K, a register I, and a gong H′. The ground is indicated at O. The system described and shown is adapted to coöperate with a signal-box which is adapted to send short impulses, some of which indicate the integral parts of the box-numbers and others of which, in groups, constitute a complete want-signal. In practice I employ a predetermined number or group of short impulses to indicate each want-signal. Each predetermined group of short impulses is adapted when in proper number to actuate certain apparatus at the central station, whereby an indication will be given on a gong or other suitable signaling device. The main signaling lines or circuits 51 and 58 come into the central station, the signal-line 58 going to the station-battery Bt^5 and the signal-line 51 passing to the contact a of signaling-plunger Q, having three contact-plates z' z^2 z^3 connected together. The function of the plunger Q is to signal over the signaling-line from the central station without operating or disturbing the instruments at the central station. This operation is effected by opening the main signaling-line, thereby transmitting a signal to the boxes on the line and at the same time without breaking the circuit of the central-station apparatus cutting in an artificial line having a resistance corresponding to the normal resistance of the external circuit of the main signaling-line. Normally contact-spring a will rest upon contact-plate z', and contact-spring b, to which is connected the artificial line, consisting of the wire 61, resistance-coil p, and wire 59, rests upon the plunger Q just below and out of contact with contact-plate z^2. The plates z', z^2, and z^3 are electrically connected. In the position shown in Figs. 1 and 2, which is the normal position, the current passes from the

signaling-line 51 to the contact-spring *a*, thence by wire 52 to main relay, thence by wire 53 and wire 55 to the station-galvanometer N, and by wires 56 and 57 to the opposite pole of the station-battery Bt^5, which is connected to line 58. When the plunger Q is pressed down, contact-spring *b* connects with the plate z^2 and the contact-plate z' is disengaged from spring *a*, but not until the spring *b* engages with plate z^2. Thus the current through the relay A, galvanometer N, and battery Bt^5 is not broken by signaling with plunger Q, (contact-spring *c* always being in contact with plate z^3;) but the circuit of the main signaling-line outside of the station is broken, and the current of the station-battery instead of passing through the main signaling-line circulates through an artificial line made up of the wires 59 and 61 and the resistance P, which is approximately equal to the resistance of the exterior main signaling-line which has been broken and thereby cut out of the portion of the main signaling-line in the station. It will thus be seen that every movement of the plunger Q will not only break the main signaling-line, but will throw the artificial line into the main circuit at the station and, while signaling over the external main circuit, will prevent the station apparatus from responding. The telephone-wire 74 also comes into the central station and passes to the telephone apparatus, which will be described subsequently, the said telephone apparatus being of the same general type as that shown in United States Letters Patent No. 588,258, dated August 17, 1897, to Walter F. Banks. The station signal-receiving apparatuses are organized upon the general plan of providing means for indicating an extraordinary signal or want-call for every group of signals intended to represent wants or special signals and means for indicating signals which represent the box-number without actuating the apparatus for indicating the extraordinary signals. This is primarily effected by means of a step-by-step governing device or duplex receiving instrument, (shown in Fig. 3,) which governing device consists of a magnet C in the main local circuit of the station, which magnet is adapted by makes and breaks in the circuit or other abrupt current changes to swing an armature 81, which is pivoted at 82 and is provided with an arm 83, which carries a spring-pressed pawl 84, pivoted to said arm 83 at the end of said arm and adapted to be engaged with a tooth of a segment 85, which segment is also pivoted at 82 and moves freely independently of the arm 83. The pawl 84 is held into the segment 85 by a spring 84^a, connected at one end to the pawl and at the other to the part 85^a on an arm of the segment. A lever 86 is pivoted at 87 and provided with a pin 88, which is adapted when the lever 86 is in its normal position to engage behind a tooth of the segment 85 to act as a detent therefor to hold the same in the position into which it has been moved while the pawl 84 is executing its return stroke—viz., when the armature 81 is on its backward stroke. The pawl 84 bears against the pin 88, and its spring 84^a serves to force the pin 88 into the spaces between the teeth of the segment. A pin 89 on the arm 86 is adapted to receive the impact of an arm 90, pivoted at 91 and preferably integral with an armature 92 of a magnet F, which is connected in circuit with what I have called herein a "retarding-repeater" E'. (See Fig. 1.) Thus at each movement of the armature 81 caused by one signal of a group the pawl 84 will swing the segment 85 up the space of one tooth, and, falling back, the spring 84^a will force the pin 88 into position to hold the segment in its adjusted position. This step-by-step action will take place as often as the circuit of the magnet C is manipulated, the segment being stepped forward one step by the pawl 84 at each manipulation and caught and held from falling back by the pin 88. These operations will take place until the arm 90 is swung against the pin 89 to swing the lever 86 to remove the pin 88 from the segment 85 to allow the said segment to fall to its initial position. The segment 85 is provided with an insulating-block 93, which has an arm 94, adapted to contact with a spring-returned plunger 95, which is adapted to contact with a spring 46, which controls the circuit of the station visual-signal apparatus G and the station gong and repeater H. The retarding-repeaters E E', to which I have referred, are instruments of the character shown in Figs. 25 and 26 of United States Letters Patent to Walter F. Banks, No. 604,712, dated May 31, 1898, in which the armatures make electrical contact on the back stroke only. The station visual-indicating apparatus consists, preferably, of the magnet G, which acts upon an armature 96, which is pivoted at 97 and provided with a yoke and studs 98, which coöperate with a ratchet-wheel 99, as shown in United States Letters Patent to Banks, No. 587,693, dated August 10, 1897. The ratchet 99 is mounted upon an arbor 100 and is provided with a suitable pinion 101, which meshes with a toothed segment W, provided with a bock Y, adapted to manipulate a two-point switch, whose function is to switch the stable or wagon-house register and tap-bell circuit into the station main local circuit as soon as it becomes necessary to transmit a call to the stable. The switch also has the further function of cutting out the stable-circuit at the proper times. This switch consists of a suitable middle contact 11, which coöperates with a contact 15 and a contact 12, the middle contact having the tendency to remain in contact with the contact 15 and out of contact with contact 12, so that as soon as the pressure of Y, which rests against the said contact 11 in the normal operation of the system, has been released the contact 11, which is of a springy character, will move into contact with contact 15 and will leave contact 12, there being an instant

of time during which the said spring is in contact with both the contact 15 and the contact 12 in order that there may be no break in the continuity of the station local circuit. The arbor 100 also carries a suitable visual signal or pointer, as fully shown in the Banks patent, No. 587,693, just referred to. The segment 85 also carries upon the insulated block 93 a contact 47, which is adapted to contact with a contact 48, which, as will be seen, effects the short-circuiting of the release-magnet F through the wires 31 and 32, which, as may be seen from the drawings, are bridged across the circuit-wires 30 and 33 of the release-magnet F. The positions of these various structures just described will readily be found upon Figs. 1 and 3. The tap-bells and ink-registers may be of any suitable character, as well as the various gong-magnets, signaling-keys, galvanometers, the time-stamp, &c.

The station local circuit may be traced as follows: Beginning at the back contact 7 of the main relay A and passing by wire 8, magnet B of the double register, and wire 9 to the magnet C of the receiving instrument shown in Fig. 3, thence the circuit passes by wire 10 to the middle contact 11 of the change-over switch X and when the apparatus is at rest extends by the spring 12, wire 13, and wire 14 to and through the battery Bt', thence through the station tap-bell D, wire 2, retarding-repeater E for the time-stamp, and wires 3 and 4 to the retarding-repeater E′, which controls the circuit of the release-magnet F, and thence by wire 5 to armature 6 of the main relay A. The function of the change-over switch is to switch the stable-circuit into operation, which is shown in the present instance as adapted to be connected directly into the station local circuit. When the swinging segment W rises, the spring 11 rises with it and, coming into contact with 15, makes an extension of the station local circuit as follows: The current pursues the same path through the station local circuit as before, except that instead of returning directly through the spring 12 and the wire 13 of the change-over switch the current passes by the spring 15, wire 16, register I, wire 17, tap-bell J, wire 18, and wire 19 to the wire 14, where the circuit becomes merged in the station local circuit. The register and tap-bell at the stable or wagon-house are thus operated by this means. The gong at the stable is operated by the armature 24 of the station-gong and repeater H.

The circuit of the stable-gong, which I call the "local" signaling-circuit, is as follows: from the contact 25 of the station-gong and repeater H by wire 26 through gong-magnet H′, wire 27, wire 19, wire 23, battery Bt^2, and wire 29 to the armature 24. The station-gong and repeater circuit, which I call the "station" receiving-circuit, is operated by the contacts 95 and 46 of the duplex receiving instrument (shown in Fig. 3) through wire 42, battery Bt^4, wire 43, gong and repeater-magnet H, wire 44, visual-indicator magnet G, and wire 45. This circuit is actuated every time the step-by-step segment 85 has been actuated a sufficient number of times by a predetermined number of signals constituting a group. The time-stamp circuit includes the armature 39 of the retarding-repeater E, the wire 40, time-stamp L, wire 41, wire 28, battery Bt^3, wire 36, wire 37, and contact-spring 38. It will of course be understood that the time-stamp circuit is closed only on the back stroke of the retarding-repeater armature, which retarding-repeater armature 39 will fall back only on the completion of a call or message. The retarding-repeater E′, which is in the station local circuit, is so wound and calculated as to release its armature upon the completion of each group of signals in order to release the segment 85 by the action of the magnet F. The local circuit of the release-magnet F may be traced as follows: by armature 35, wire 36, battery Bt^3, wire 28, wire 30, magnet F, wire 33, and spring 34. I have also shown a means for getting an answer back from the stable, which answer-back signal is received on the station-register through the action of the magnet B′, which acts upon a separate pen indicating from stable. The answer-back signal is sent by a signaling device at the stable or wagon-house, shown in the present instance as a strap-key, the circuit being as follows: from the base contact of the strap-key by wire 21 to and through the magnet B′ of the station-register, then by wires 22 and 3 to and through the magnet of the time-stamp-retarding repeater E, thence by wire 2 through the tap-bell D, through battery Bt', wire 14, and wires 19 and 20, back to the key-lever. In addition to the circuits just described I prefer to also employ a ground test-circuit embracing wire 54, strap-key M, wire 49, galvanometer N′, wire 50, and ground O. The telephone apparatus is of the general character shown in United States Letters Patent to Walter F. Banks, No. 588,258, dated August 17, 1897. The telephone-circuits are as follows, working in connection with the signal-lines: Entering by line 74, the current passes through line 73 to contact-plate p' of plunger U, thence through contact-spring f', line 72, magnets R of call-drop, line 71, contact-spring h, contact-plate p of plunger V, thence through line 70 69 67 to contact-spring d', thence through contact n' of plunger U, thence through line 65 to contact-point n of plunger V, thence through contact-spring d, line 64 to line 57, thence battery Bt^5, and out over line 58 to point of connection outside. The call-drop R thus attracts attention of the operator, who pulls out plunger V, thus cutting in telephone set T. The circuit then runs as follows: through line 74 78 to contact-plate p of plunger V, thence through contact-spring f, line 77, telephone set T, line 76, contact-spring g, to contact-plate p of plunger V, thence through line 70 and 75 to contact-spring e, thence through contact-point m of

plunger V, line 63, 62, 60, and 58 to point of connection. In case it is required to make a cross connection through switchboard the operator will push in plunger V and pull out plunger U. The circuits will then run as follows: from line 74 73 to contact-plate p' of plunger U, thence through contact-spring g', wire 79, to magnets of ring-off drop S, thence through line 80, contact-spring h', contact-plate p' of plunger U, thence through line 66 67 68, to contact-spring e', to contact-point m' of plunger U, thence through line 63, 62, 60, and 58 to point of connection.

The operation of the system is as follows: A suitable signaling device is employed which is adapted to send one or more groups, each consisting of a predetermined number of signals, to indicate various wants or emergency calls and a series of signals indicating the locality or box-number. For instance, "fast wagon" might be indicated by three groups of ten signals each followed by a series of signals indicating the box-number. The number of teeth on the segment 85 will determine the number of circuit changes which will completely operate the duplex signal-receiving instrument—that is to say, which will cause it to be stepped forward far enough to operate the station receiving-circuit in which the station-gong is included. Thus a fast-wagon call might be produced upon the circuit by a signaling apparatus sending, let us say, three groups of makes or breaks, ten to each group, and then, let us say, a succession of six signals, makes or breaks, so spaced apart as to indicate, let us say, the box 33. The groups or signals would operate the apparatus as follows: Each impulse, by which I mean either a make or break or other change of the circuit of short duration, would be effective to step the segment 85 forward one step, the station local circuit in which the magnet C is located being manipulated by the armature 6 of the main relay A. When the predetermined number of signals of the group have been received, the sector 85, closing circuit between 95 and 46, will cause the gong and repeater H to be actuated, thereby, as explained, actuating the stable-gong. The group of signals will be registered upon the station-register and upon the wagon-house or stable register, the local signaling-circuit having been switched into the station local circuit by the first movement of the armature of the visual indicator G, which is actuated simultaneously with the station gong and repeater H. As soon as the group of signals have given their indication upon the station-gong and the stable-gong the armature 35 of the retarding-repeater E′ falls and makes contact with the spring 34. This has the effect of closing the circuit of the release-magnet F, thereby releasing the toothed segment 85 and allowing the same to fall, bringing contact 47 against contact 48 and short-circuiting the magnet F. This action is repeated for each group of signals making up an emergency-signal, and when the box-number comes in the sector 85 will be stepped forward; but as the number of impulses or signals necessary to operate the segment 85 into contact with the movable contact 95 to close the circuit is always greater than the predetermined number of impulses or signals constituting the box-number the segment 85 will not be stepped forward far enough to close contact between 95 and 46, so that the gong and repeater H will not be actuated by the coming in of the box-number. Upon the cessation of the box or locality signal the retarding-repeaters will release their armatures, thereby actuating the time-stamp and operating the release-magnet.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a signaling system, the combination of a central-office apparatus comprising in its structure the following instrumentalities in operative relation, to wit: a duplex receiving instrument responding to the conjoint action of a group of signals each of which alone is insufficient to elicit a full response from the duplex instrument combined with a station receiving-circuit adapted to give an indication upon the completion of a predetermined group of signals, substantially as described.

2. In a signaling system, a central-office apparatus comprising a duplex signal-receiving instrument, a station receiving-circuit under the control of the said signal instrument, means for operating the station receiving-circuit by the action of the duplex receiving instrument upon the receipt of a predetermined group of signals and an automatic release for the said duplex signal-receiving instrument.

3. In a signaling system, the combination of a central office provided with a duplex signal-receiving instrument, comprising in its structure a step-by-step device and a release device and a local circuit under the control of the step-by-step device, whereby a predetermined group of signals will be effective to effect the operation of the local circuit.

4. In an electrical signaling system, the combination of a local circuit controlling an audible alarm, a duplex signal-receiver comprising in its structure means responsive to a group of signals to manipulate the local circuit, a release device and a retarding-repeater under the control of the main signaling-circuit.

5. In an electrical signaling system, the combination of a main signaling-circuit, a duplex receiving instrument responding fully to the conjoint action of a predetermined group of signals which individually elicit a partial response from the duplex instrument, and means actuated from the duplex instrument for indicating such full response thereof, whereby certain groups of signals will be accompanied by an indication thereof.

6. In a signaling system, the combination

of a main signaling-circuit, a station local circuit and a local signaling-circuit and a duplex signal-receiving instrument comprising a step-by-step and a release device and a retarding-repeater in the station local circuit for operating the release.

7. In an electrical signaling system, the combination of a main signaling-circuit, a station local circuit, a plurality of retarding-repeaters in the station local circuit, and a duplex signal-receiving instrument in the station local circuit and also in a local circuit manipulated by one of the retarding-repeaters.

8. In a signaling system, the combination of a main signaling-circuit, a station local circuit, a station-receiving circuit and a duplex receiving device comprising in its structure apparatus which is made completely responsive only by the reception of a predetermined group of signals to operate the station receiving-circuit.

9. In a system of electrical signaling, the combination of a station local circuit containing a plurality of retarding-repeaters, a step-by-step signal-receiving device in the station local circuit, a release-magnet therefor in the circuit of one of the retarding-repeaters and a station receiving-circuit under the control of the step-by-step mechanism and a plurality of gongs one at the central station and the other at the stable or wagon-house under the control of the said station receiving-circuit.

10. In a system of electrical signaling, the combination of a main circuit, a station local circuit, a duplex signal-receiving device comprising in its structure a step-by-step device under the control of the station local circuit, a receiving-circuit under the control of the step-by-step device, the said step-by-step device being responsive to all signals and a retarding device responsive to the cessation of a group of signals and a release-magnet under the control of the retarding device.

11. In an electrical signaling apparatus, the combination in a station of a station local circuit, a duplex signal-receiver actuated by each signal received upon the station local circuit and a retarding device adapted to restore the duplex signal-receiver to its initial position upon the cessation of predetermined groups of signals.

12. In an electrical signaling system, the combination of a station local circuit, a duplex signal-receiving instrument under the control of the said station local circuit, and a release device for the said duplex signaling device operated upon the cessation of a predetermined group of signals and a gong or audible signal and a circuit therefor actuated by the duplex signal-receiving device upon the completion of a predetermined group of signals, substantially as described.

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