F. W. ADSIT.

SELECTIVE LOCK-OUT TELEPHONE SYSTEM.

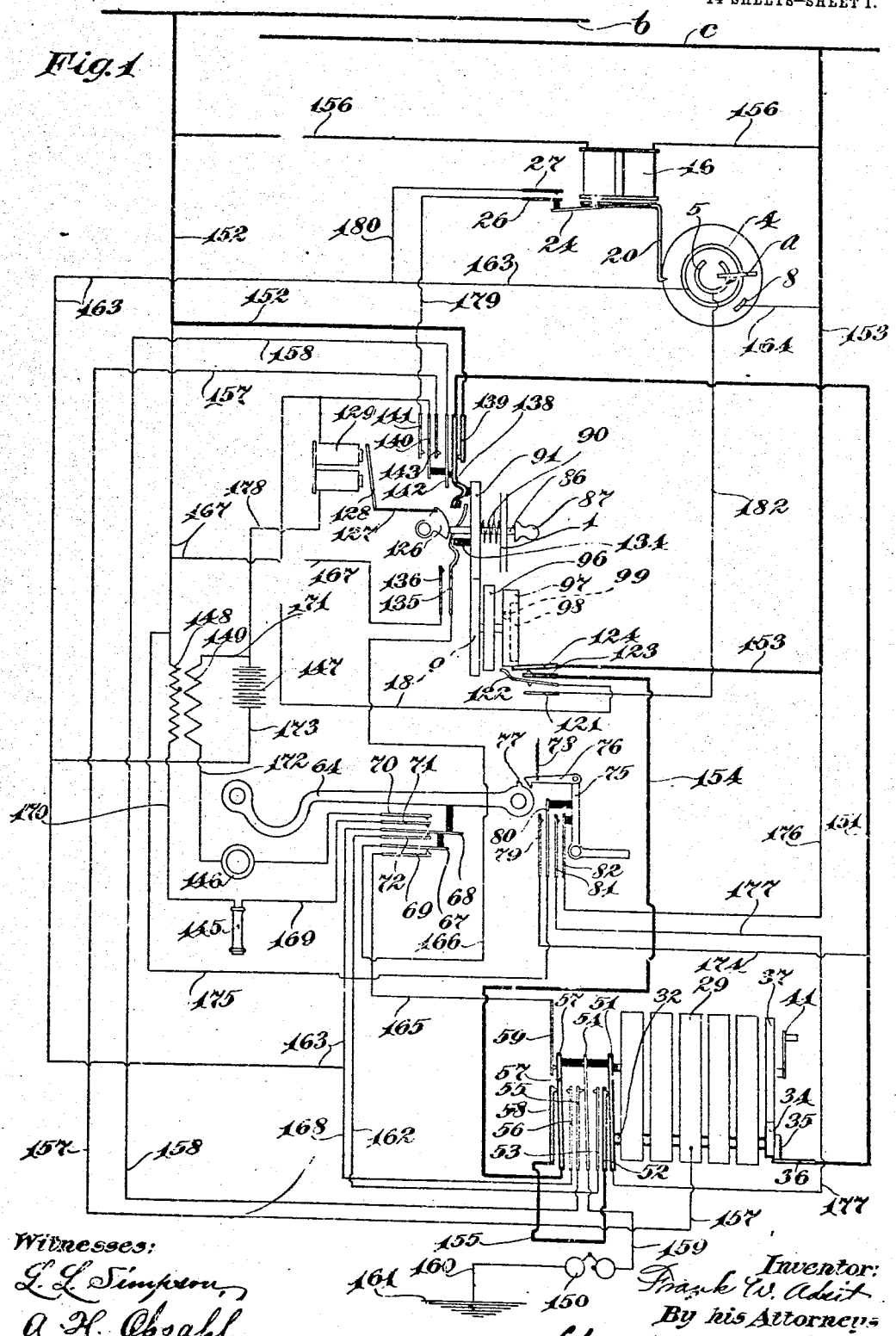
APPLICATION FILED NOV. 17, 1909.

986,260.

Patented Mar. 7, 1911.

14 SHEETS—SHEET 1.

Fig. 1



Witnesses:

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Inventor:

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14 SHEETS—SHEET 2.

Fig. 2

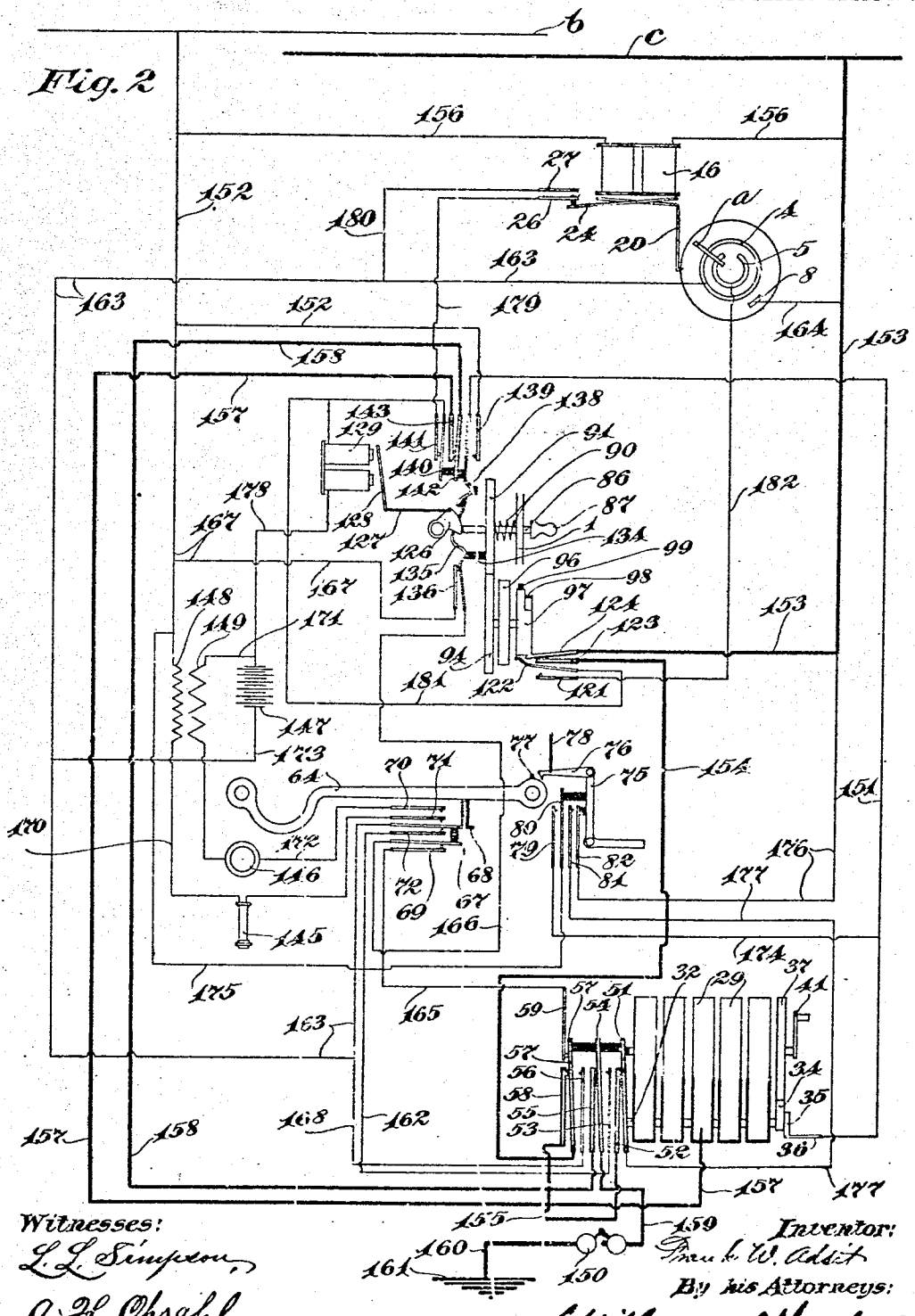

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Fig. 3

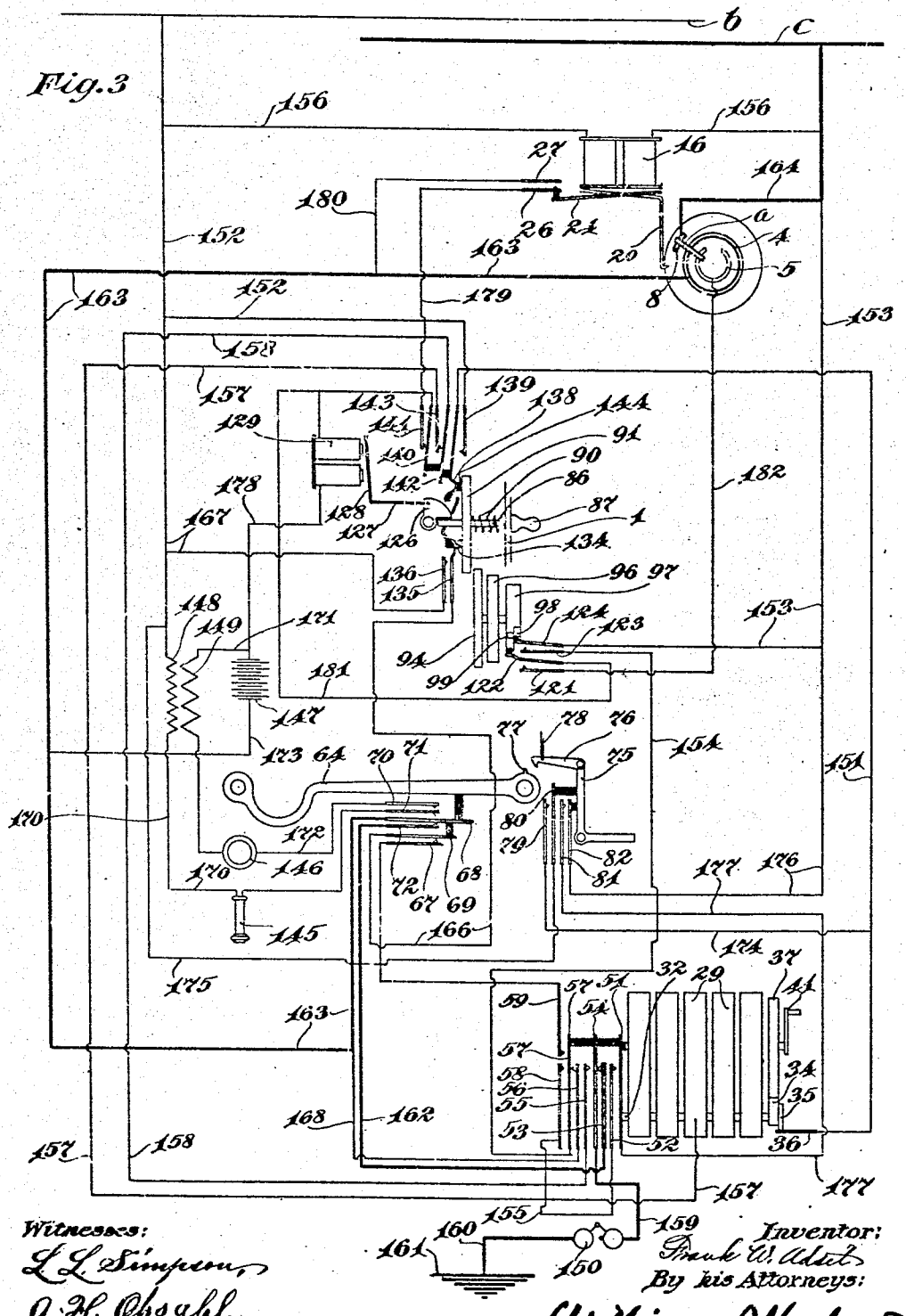

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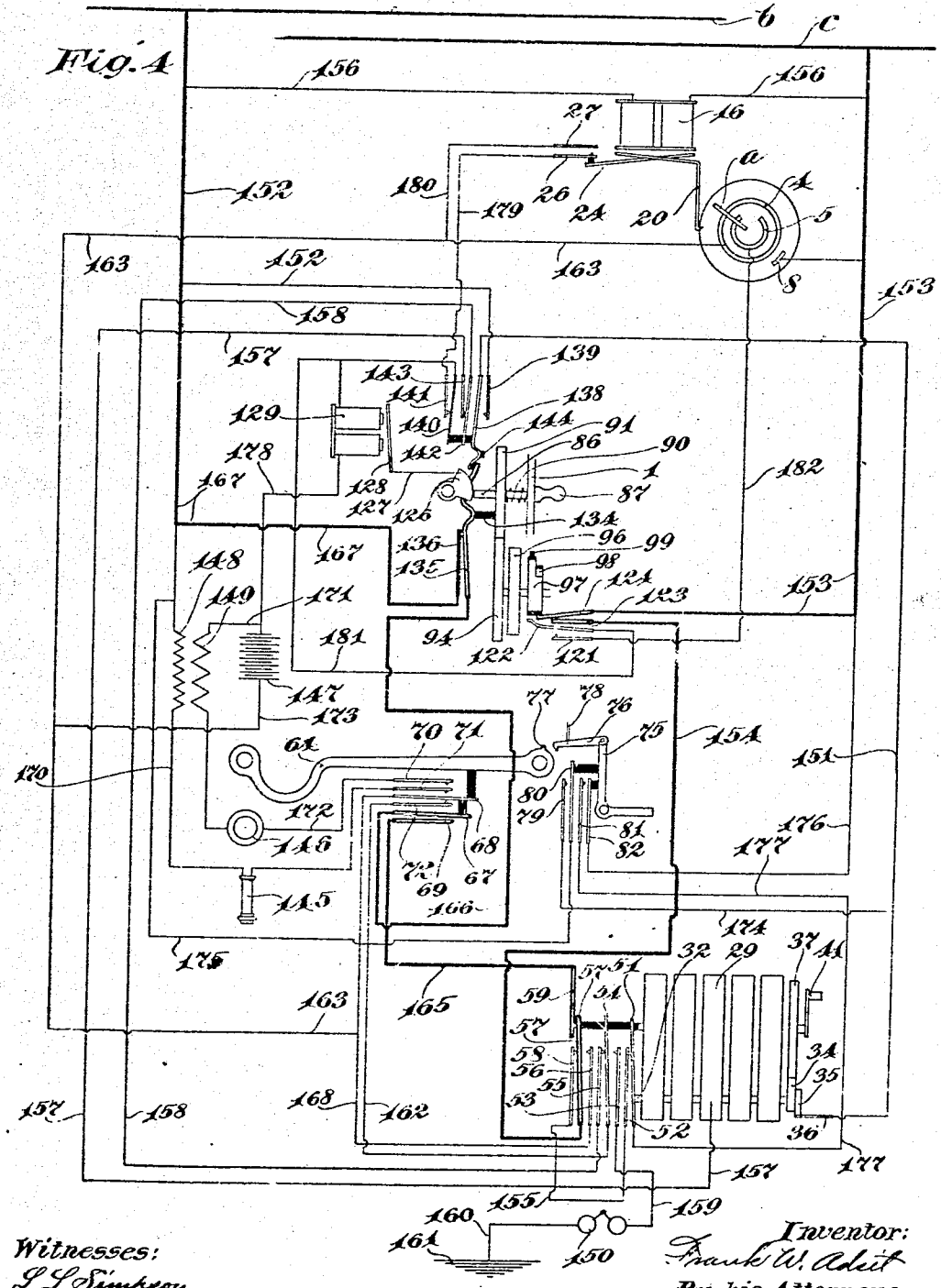
Fig. 4



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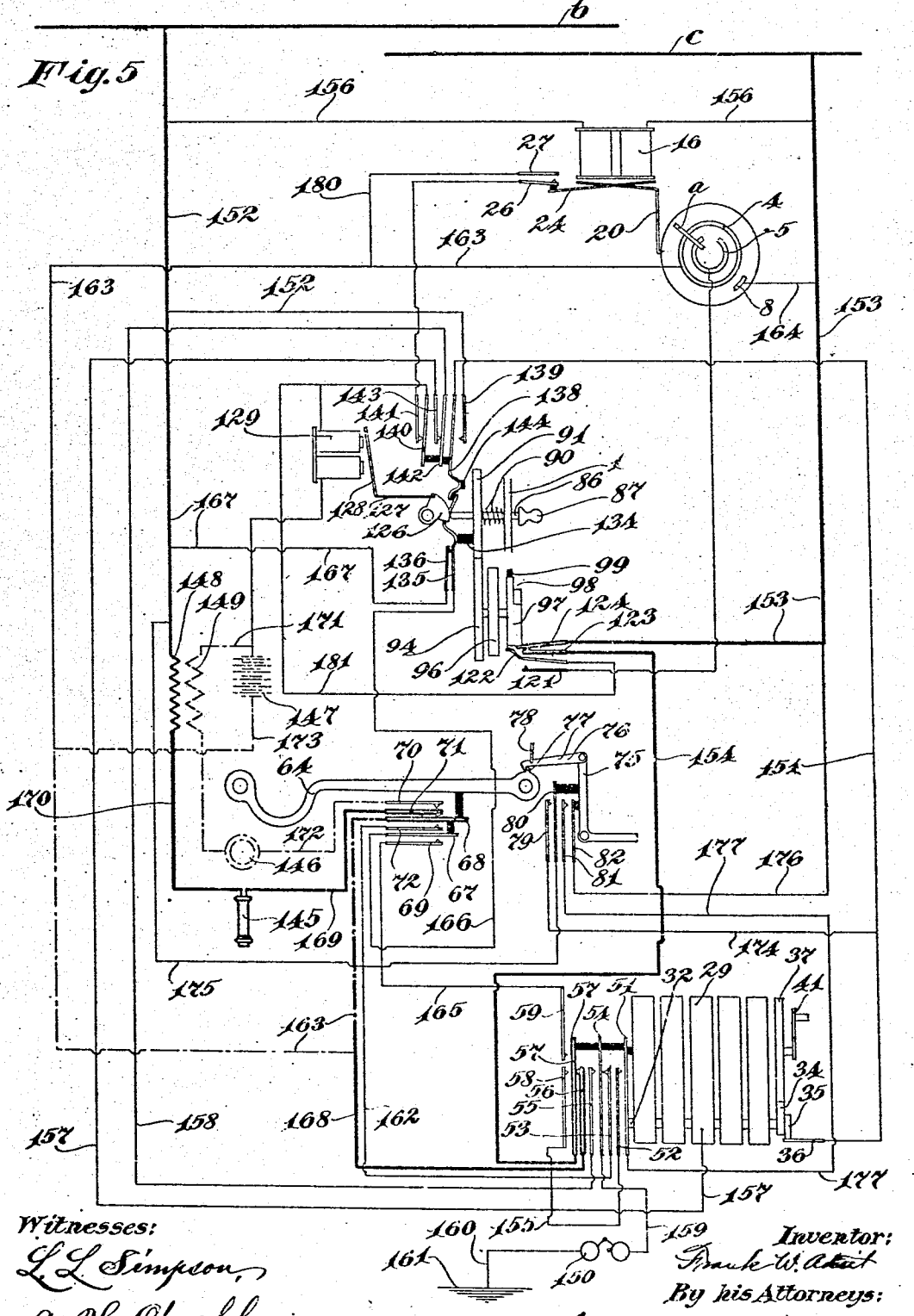
14 SHEETS—SHEET 5.

Fig. 5



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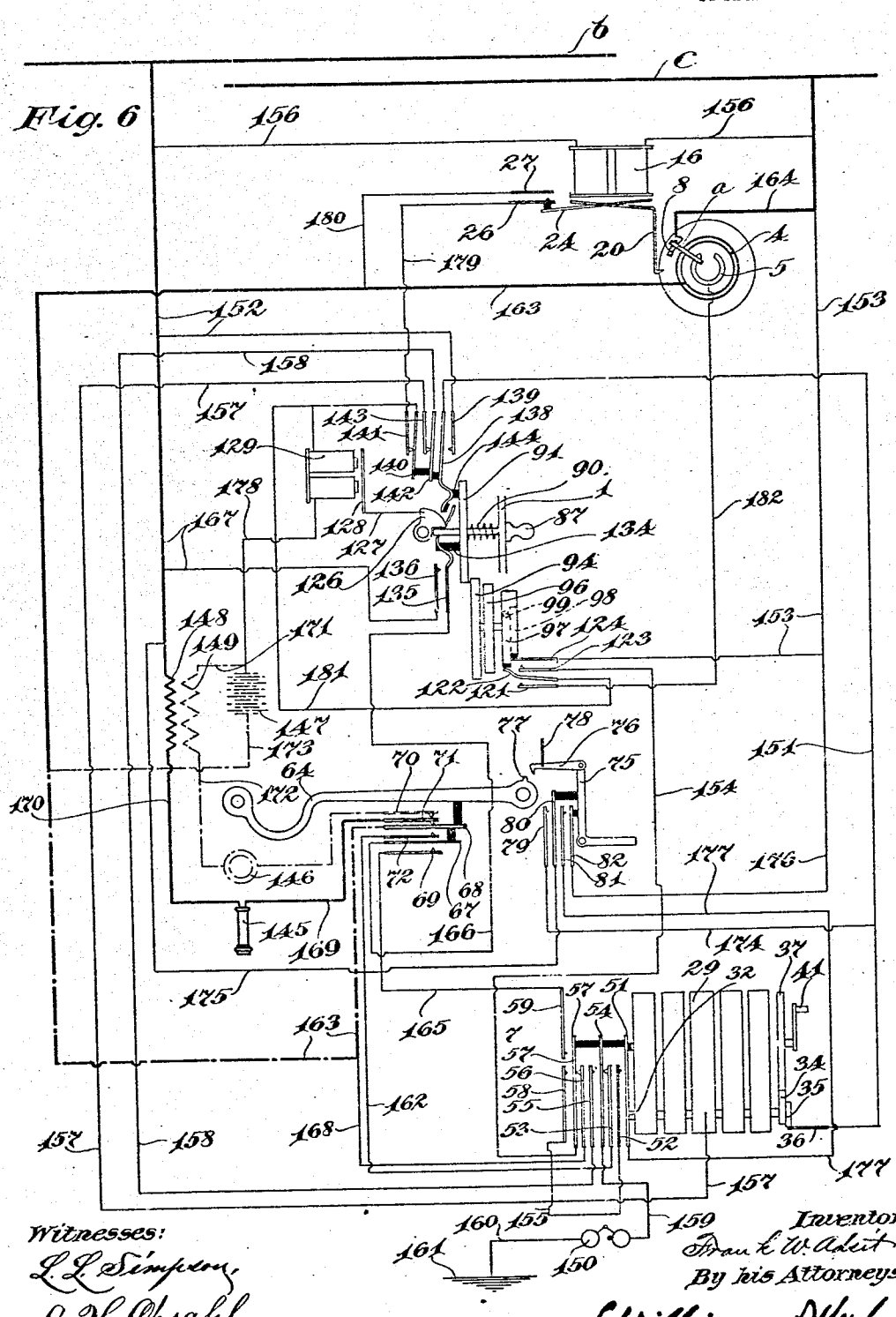
14 SHEETS—SHEET 6.

Fig. 6



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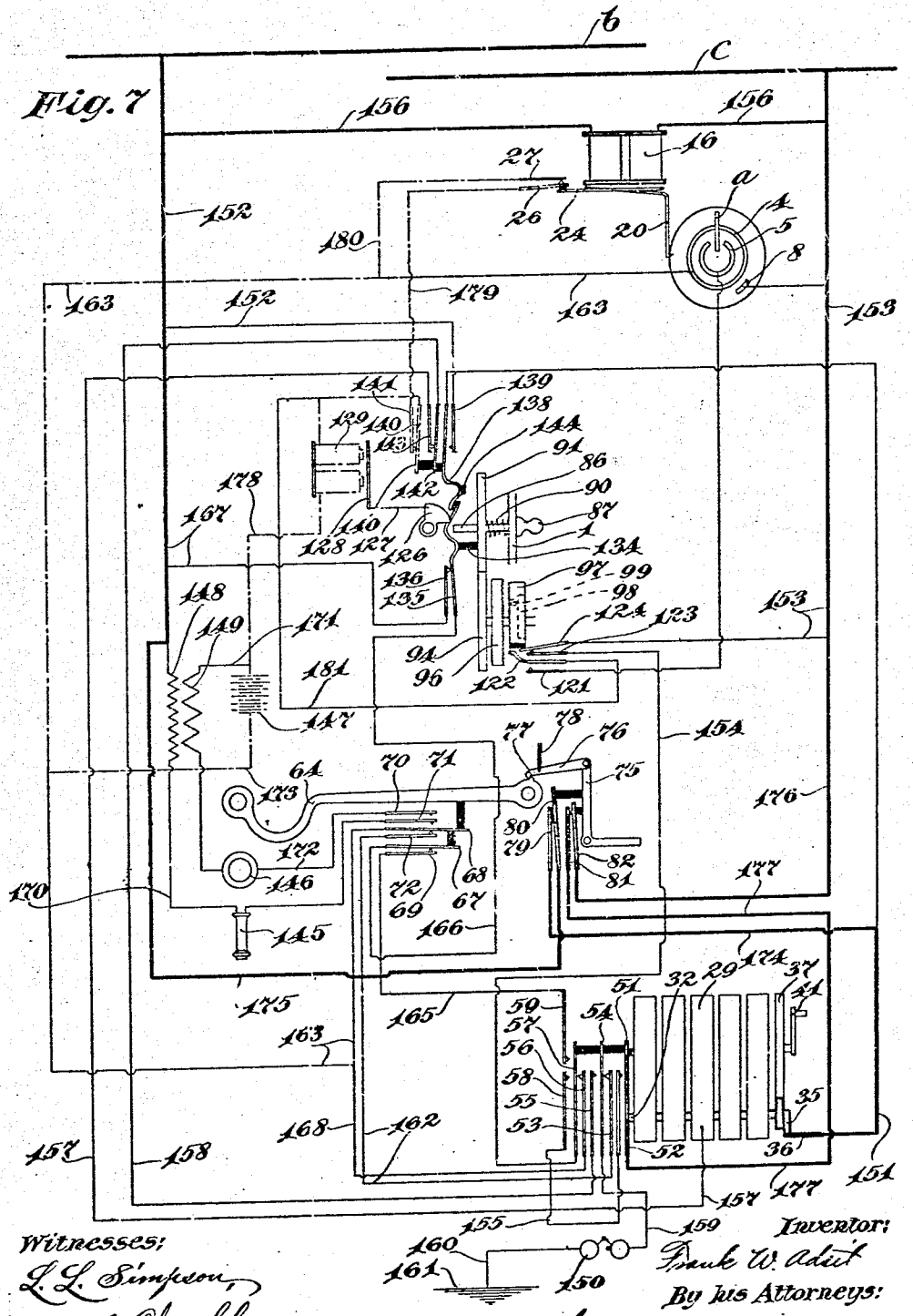
14 SHEETS—SHEET 7.

Fig. 7



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14 SHEETS—SHEET 8.

Fig. 8

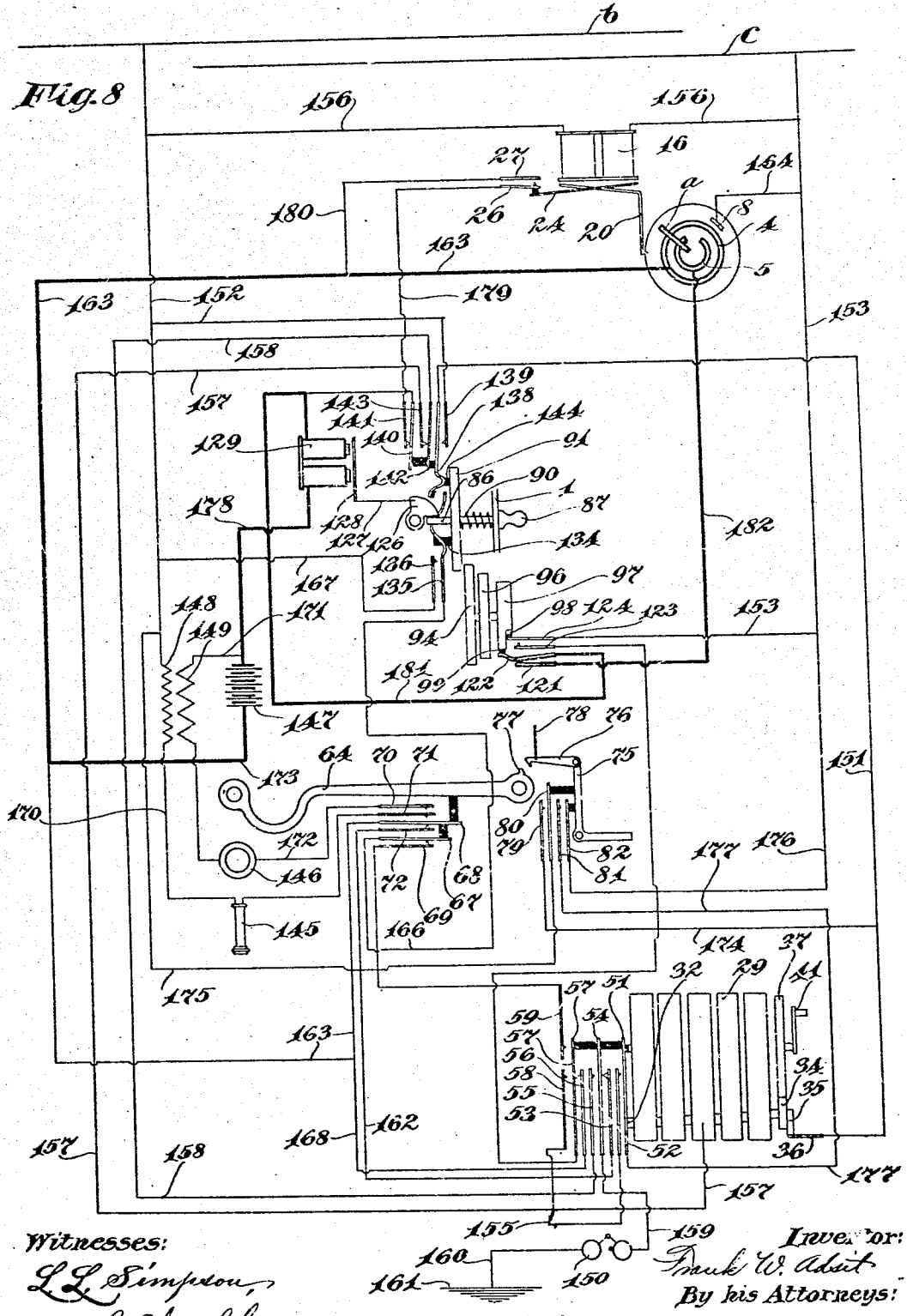

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Fig. 10

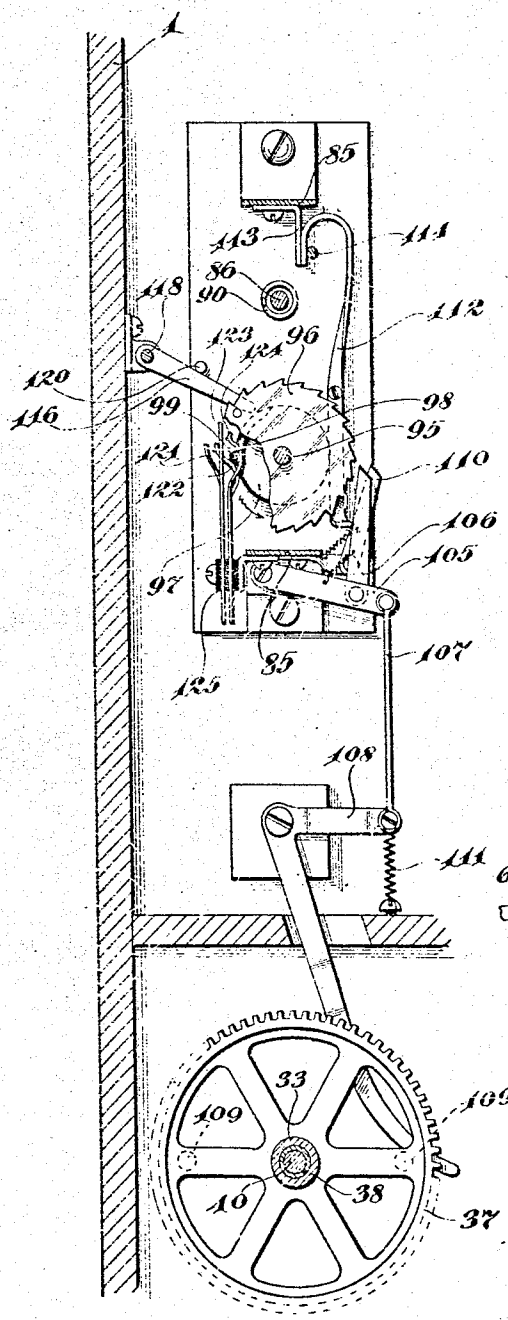
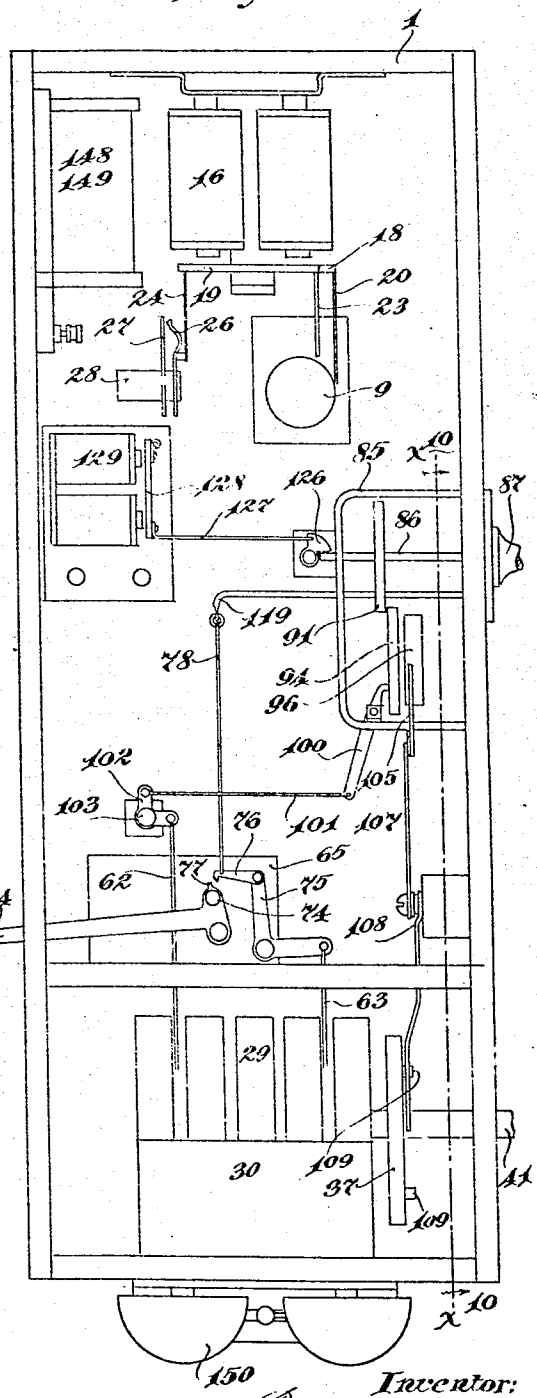


Fig. 9



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14 SHEETS—SHEET 10.

Fig. 12

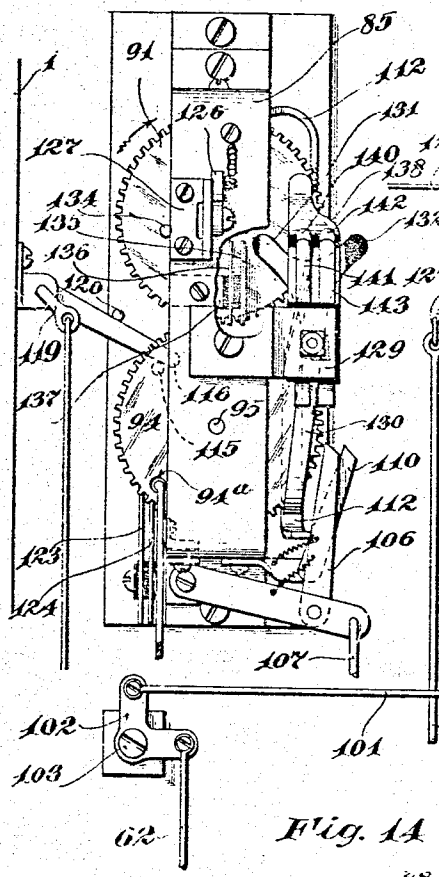

Fig. 11

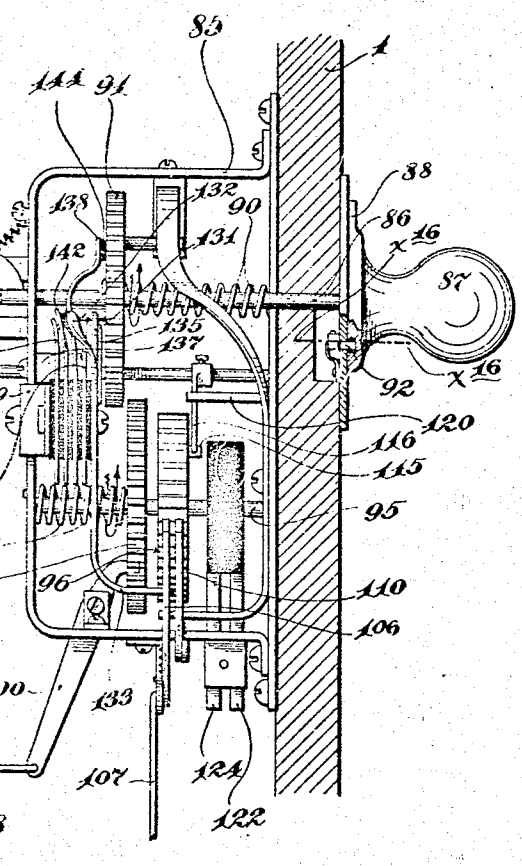

Fig. 14

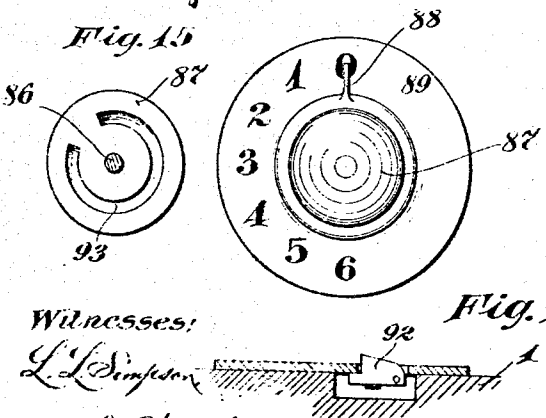

Fig. 15

Fig. 13

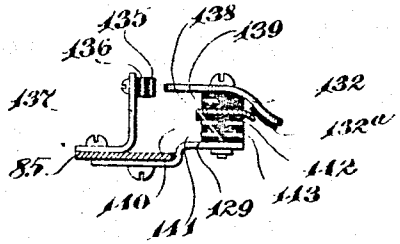

Fig. 16

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14 SHEETS—SHEET 11.

Fig. 18

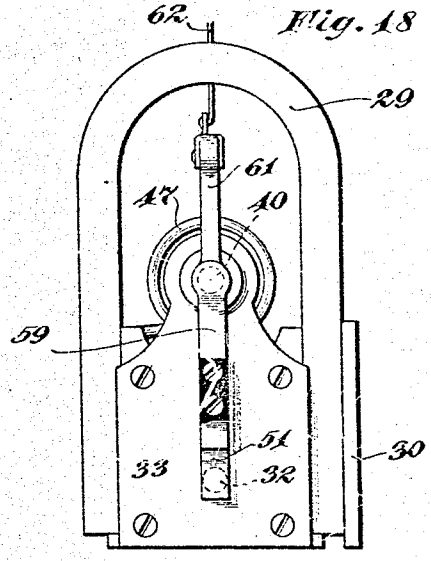


Fig. 20

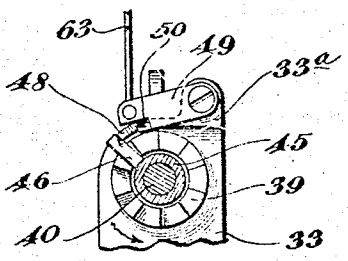


Fig. 17

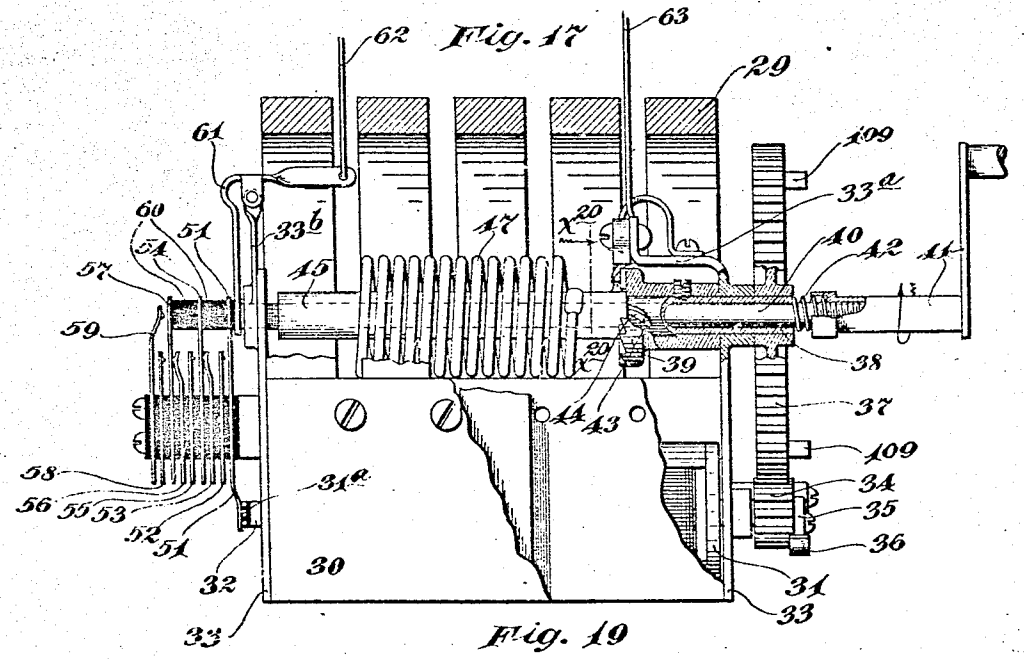
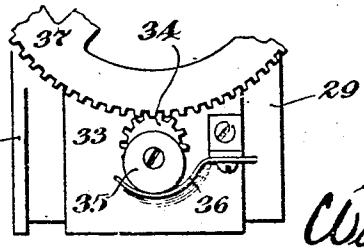


Fig. 19



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14 SHEETS—SHEET 12.

Fig. 22

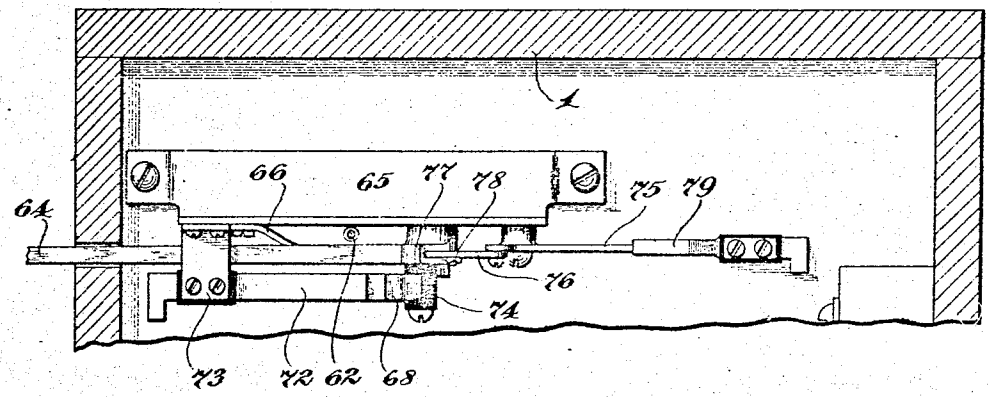
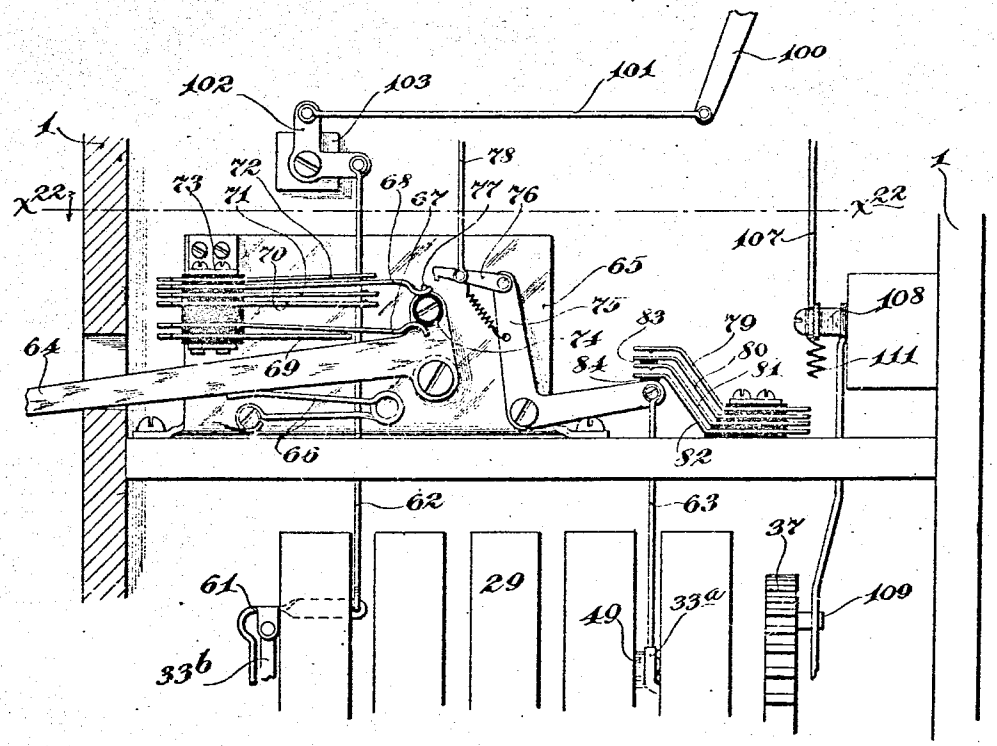


Fig. 21



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14 SHEETS—SHEET 13.

Fig. 23

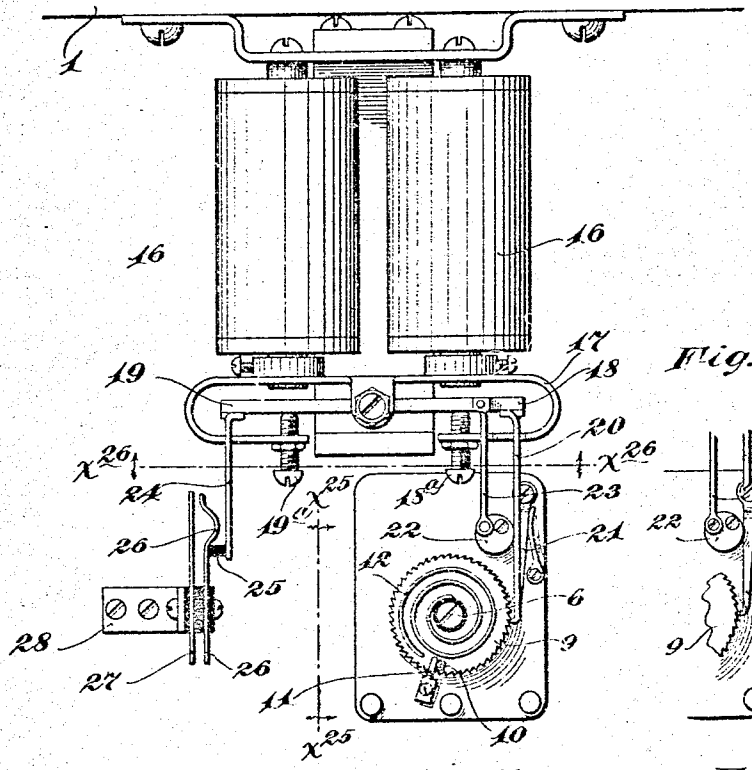


Fig. 24

Fig. 26

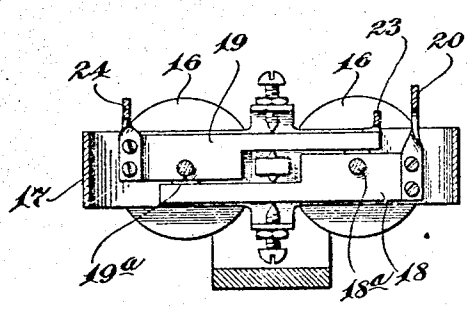


Fig. 25

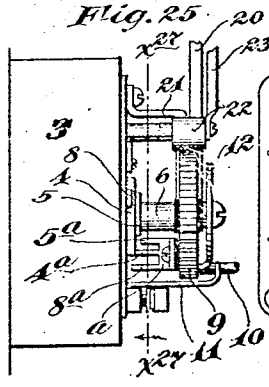
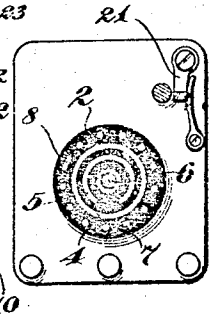


Fig. 27



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14 SHEETS-SHEET 14.

Fig. 28

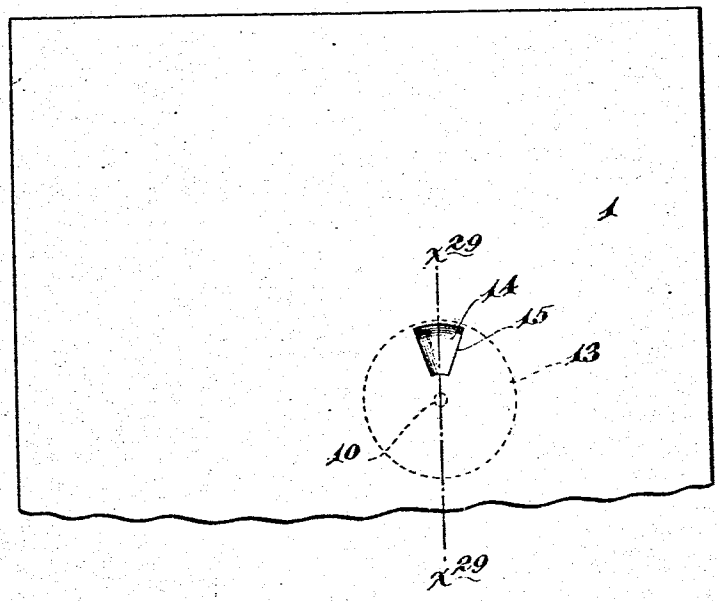


Fig. 29

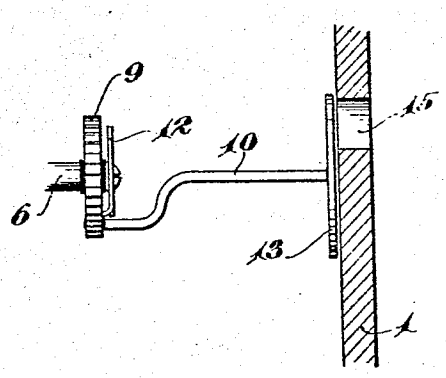
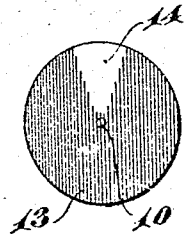


Fig. 30



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UNITED STATES PATENT OFFICE.

FRANK W. ADSIT, OF ST. PAUL, MINNESOTA.

SELECTIVE LOCK-OUT TELEPHONE SYSTEM.

986,260. Specification of Letters Patent. Patented Mar. 7, 1911.

Application filed November 17, 1909. Serial No. 528,436.

To all whom it may concern:

Be it known that I, FRANK W. ADSIT, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Selective Lock-Out Telephone Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its object to provide an improved selective lock-out telephone system especially adapted for use on rural telephone lines, and to this end, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims. The invention is, however, capable of a wide range of use in connection with telephone systems and other electrical communicating systems.

In the accompanying drawings, which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings, Figures 1 to 8, inclusive, are diagrammatic views illustrating the wiring of the improved system; Fig. 9 is a diagrammatic view in elevation, showing the relative arrangement of certain parts of the local instrument which, for convenience, are located within a suitable case; Fig. 10 is a vertical section taken on the line x^{10} x^{10} of Fig. 9, some parts being broken away and some parts being removed; Fig. 11 is a view chiefly in elevation but with some parts sectioned and some parts broken away, showing mechanism herein designated as the selector actuator; Fig. 12 is an elevation of the mechanism shown in Fig. 11 looking at the same from the left toward the right, some parts being broken away; Fig. 13 is a plan view showing a group of contact springs of the register actuator, some parts being sectioned; Fig. 14 is a front elevation of the knob and index plate of the selector actuator; Fig. 15 is an elevation looking at the inner end of the actuator knob; Fig. 16 is a section taken approximately on the line x^{16} x^{16} of Fig. 11; Fig. 17 shows the magneto and certain other cooperating parts of the local instrument. Fig. 18 is an end elevation of the magneto looking at the same from the left toward the right in respect to Fig. 17; Fig. 19 is a fragmentary view showing the lower portion of the said magneto looking at the same from the right toward the left; Fig. 20 is a detail in section on the line x^{20} x^{20} of Fig. 17; Fig. 21 is a fragmentary view, chiefly in side elevation, but with some parts sectioned, showing the upper portion of the magneto and certain parts of the local instrument, which are located immediately above the magneto; Fig. 22 is a horizontal section taken on the line x^{22} x^{22} of Fig. 21, some parts being broken away; Fig. 23 is a view in front elevation showing one of the party selectors, one of which is provided in each local instrument; Fig. 24 is a fragmentary view, in front elevation, of certain of the parts shown in Fig. 23, some parts being broken away and other parts being removed; Fig. 25 is a side elevation of those portions of the mechanism illustrated in Fig. 23 which are at the right of the line x^{25} x^{25} marked on Fig. 23; Fig. 26 is a horizontal section taken on the line x^{26} x^{26} of Fig. 23, looking upward; Fig. 27 is a vertical section taken on the line x^{27} x^{27} of Fig. 25; Fig. 28 is a view in front elevation with parts broken away, showing the indicator for indicating whether or not the line is in use; Fig. 29 is a vertical section taken on the line x^{29} x^{29} of Fig. 28; and Fig. 30 is a detail in elevation showing the indicator disk for the said indicator.

The principal parts of the local instrument, one of which is at each station, are the transmitter, the receiver, the local battery connection, a so-called party selector, a so-called selector actuator, a magneto, the receiver hook mechanism, the bell, and certain other auxiliary devices such as magnetic trip mechanism for releasing the selector actuator. These devices are, preferably, mounted within or upon a suitable case or cabinet 1 of any suitable construction.

Party selector.—The details of this device are best shown in Figs. 23 to 27, inclusive. As shown in Figs. 25 and 27, a stationary disk 2 is secured to a block 3, of wood or other suitable material, which, in turn, is secured to the back of the case 1. On its outer face, the insulating disk 2 is provided with a complete annular contact 4 and a nearly annular but segmental contact 5, which parts are concentric to a stud 6 secured to the block 3. Outside of the contact

ring 4 the insulating disk 2 is formed with a multiplicity of circumferentially spaced perforations 7, in any one of which the stem of a third contact 8 is adapted to be inserted. The perforations 7 must be evenly spaced and there may be any desired number thereof, but they represent each a different station and the adjustable contacts 8, at the different stations, must be set in different circumferential positions. Rotatively mounted on the outer end of the stud 6 is a ratchet wheel 9 which, as shown, has three times as many teeth as there are perforations 7 in the fixed disk 2. These ratchet teeth, however, may be arranged in any desired multiple, one or more, of the said perforations 7, but for clearness of description, it must be remembered that, as shown, three ratchet toothed movements of the said ratchet wheel 9 will produce a movement equal to the distance between adjacent perforations 7. The ratchet wheel 9 carries a contact piece *a* that is insulated therefrom and formed with three contact brushes 4^a, 5^a and 8^a, that are adapted to engage, respectively, with the above noted contacts 4, 5 and 8. Rigidly secured to and projecting outward from the ratchet wheel 9 is a crank-like rod 10 which is normally held against a fixed stop 11, by a coiled spring 12 attached at its outer end to said ratchet wheel and at its inner end to the projecting end of the stud 6. In the construction illustrated, the rod 10 has secured to its outer end an indicator disk 13 (see Figs. 28, 29 and 30) having a marked segment 14 that normally registers with a segmental opening 15 in the front of the case 1. Normally, also, the contact brush 5^a stands in the gap of the segmental contact ring 5 and only the contact brush 4^a maintains contact with its coöperating contact ring 4. For imparting the step by step movement to the selector ratchet wheel 9, I employ a polarized magnet indicated as an entirety by the numeral 16, and this is preferably secured to the top of the case 1, immediately above said ratchet wheel. The numeral 17 indicates a bracket which, as shown, is secured to the extended cores of the electro-magnets, as shown in Fig. 23. A pair of laterally offset armature levers 18 and 19 are intermediately pivoted to the said bracket 17 and stop screws 18^a and 19^a are arranged to limit, respectively, the downward movement of the righthand end of said armature lever 18 and the lefthand end of said armature lever 19. (See Figs. 23 and 26.) To the righthand end of the armature lever 18 is attached a depending spring ratchet pawl 20, the hooked lower end of which engages the teeth of the ratchet wheel 9, and which, under each upward movement of the righthand end of said lever 18, imparts one ratchet tooth of movement to said wheel. Backward movement of said ratchet wheel is normally prevented by a spring-pressed retaining pawl 21. Eccentrically pivoted to the block 3 in close engagement with the driving pawl 20 and ratchet pawl 21 is a pawl-releasing eccentric 22 that is connected by a link 23 to the righthand end of the armature lever 19. Secured to and depending from the lefthand end of said armature lever 19 is an arm 24 provided at its lower end with a block 25 of insulating material which is adapted to engage the curved portion of a spring contact 26, the free end of which is normally out of engagement with a companion contact 27. The two contacts 26 and 27 are insulated from each other but supported by a bearing 28 which, in turn, is secured to the back of the case 1. When the lefthand end of the armature 19 is raised, the eccentric 22 will force both of the pawls 20 and 21 out of engagement with the teeth of the ratchet wheel 9 and, simultaneously therewith, the free end of the contact 26 will be forced into engagement with the contact 27. The purpose of these actions will be more fully stated in the description of the operation.

Magneto construction.—This mechanism is best shown in Figs. 17 to 20, inclusive. Of the parts of the magneto proper, which may be of standard type, the numeral 29 indicates the permanent magnet connected to side plates 30, and the numeral 31 indicates the rotating armature, the shaft 32 of which is journaled in end plates 33 shown as secured to the outside magnet. The armature shaft 32, at its righthand end as shown in Fig. 17, is provided with a small spur pinion 34 that carries an eccentric contact 35. Once for each rotation of the pinion 34, the contact 35 is engaged with a spring contact 36 supported by the adjacent bearing plate 33. The pinion 34 meshes with a spur gear 37 secured to the outer end of a sleeve 38 journaled in the righthand bearing plate 33. To the inner end of the sleeve 38 is secured a ratchet wheel or hub 39 provided with ratchet teeth on its inner face. Extended through the sleeve 38 and journaled therein and in a bearing on the lefthand plate 33 is a crank shaft 40. Secured on the righthand end of the crank shaft 40, as shown, by threaded engagement, is an operating crank 41 between which and the righthand end of the sleeve 38 is interposed a short coiled spring 42 that normally holds the said shaft in its extreme position toward the right. The movement of the shaft 40 toward the right is limited by a cam pin 43 projecting radially from said shaft and working in a spiral cam groove 44 in the sleeve 38 (see Fig. 17). Loosely mounted on the shaft 40 and free for limited sliding movement thereon is another sleeve 45 having a radial pin 46 (see Figs. 17 and 20) that is adapted to engage the teeth of the ratchet

hub 39. A coiled torsion spring 47 surrounds the sleeve 45 and is secured thereto at one end and to one of the side plates 30 at its other end. This spring 47 yieldingly resists rotation of the sleeve 45 in the direction of the arrow marked on Fig. 20 and also exerts an endwise force tending to hold said sleeve in its extreme position toward the right in respect to Fig. 17. Otherwise stated, the said spring normally holds the pin 46 against a fixed stop 48 and in engagement with the ratchet teeth of the hub 39, as shown in Fig. 20. The stop lug 48, as shown, is secured on an upper extension 33ª of the righthand bearing plate 33, and on its righthand edge it is beveled to form a cam. Located immediately above the ratchet hub 39 and pivoted to the plate extension 33ª is a downwardly spring-pressed locking and releasing dog 49. At its free end, this dog has a beveled stop surface 50 with which the pin 46 is adapted to engage. The bevels of the lug 48 and of the surface 50 are in reverse directions, but the engagement of either thereof under the pin 46 forces or holds said pin out of engagement with the ratchet teeth 39. Supported by a suitable insulating block, on the lefthand bearing plate 33, and insulated from each other, is a group of spring contacts 51, 52, 53, 54, 55, 56, 57, 58 and 59. The lower end of the spring contact 51 constantly engages with an extended terminal 31ª of the armature coil, which terminal, as shown, projects at and is insulated from one end of the armature shaft 32. The free ends of the spring contacts 51, 54 and 57 are separated by insulating spacing blocks 60. The upper end of the innermost contact 51 is insulated from, but subject to movement of, the lower end of a bell crank 61 and the lefthand end of the operating shaft 40. The said bell crank 61 is shown as pivoted to an upper end extension 33ᵇ of the lefthand bearing plate 33 and the other arm of said bell crank is pivoted to the lower end of a connecting rod 62. It may be also here noted that the free end of the lock dog 49 is pivoted to the lower end of a connecting rod 63.

Receiver hook and associated parts.—The receiver hook 64 (see Figs. 21 and 22) is pivoted to a bearing plate 65 secured within the case 1 substantially the usual way, and is yieldingly pressed upward by a spring 66, the strength of which is not, of course, sufficient to raise the said hook when the receiver is applied on the hook. Located over the hook 64, but laterally offset therefrom, is a group of spring contacts 67, 68, 69, 70, 71 and 72, which contacts are insulated from each other and supported by an insulating block 73 secured to said bearing plate 65. The spring contacts 67 and 68 are longer than the other spring contacts and they are provided with curved ends adapted to be engaged and separated by an insulating hub 74 carried by the receiver hook 64.

Pivoted to the bearing plate 65, at the right of the hook 64, is a bell crank 75, the lower arm of which is pivotally connected to the upper end of the rod 63, which latter, as just noted, is connected to the tripping dog 49 of the magneto mechanism. A downwardly spring-pressed hook-ended dog 76 is pivotally connected to the upper arm of the bell crank 75 and its hooked end is adapted to engage with an upwardly extended pin or lug 77 on the receiver hook 64. The lower end of a tripping rod 78 is attached to the intermediate portion of the said dog 76.

A group of four spring contacts 79, 80, 81 and 82 are supported by the case 1 and insulated from each other. An insulating spacing block 83 is interposed between the free ends of the contacts 80 and 81 and the lower contact 82 is provided at its free end with an insulating block 84 which bears directly against and presses downward on the lower arm of the bell crank 75.

Selector actuator.—This mechanism is best shown in Figs. 9 to 16, inclusive. Mounted in a rectangular bearing frame 85, shown as secured to the side plate of the case 1, is an operating shaft 86 which extends through the said side of the case and, at its outer end, is provided with a rigidly secured operating knob 87 provided with a radially projecting pointer 88 that coöperates with a graduated party indicating dial 89 secured to the said case. This operating shaft 86 is capable of limited endwise movement, but is yieldingly pressed inward to its normal position, shown in Fig. 11, by a coiled spring 90 surrounding said shaft and reacting against said frame 85 and a spur gear 91 carried by the intermediate portion of said shaft. The said spring 90 also acts under torsion to yieldingly resist movement of the shaft and gear 91 in the direction of the arrow marked adjacent to the latter on Fig. 11 and, when said gear and shaft are released, imparts return or reverse movement thereto. In the dial 89 is a spring-pressed pivoted dog 92 (see Figs. 11 and 16) which normally engages with a segmental groove 93 in the hub of the knob 87. This dog 92 serves to limit an extreme possible movement of the knob and parts carried thereby, in the direction of the arrow marked in Fig. 11, while the said knob is engaged with the dial 89, but permits any desired or necessary amount of return or reverse movement. When the said knob 87 and parts carried thereby are drawn toward the right in respect to Fig. 11, the dog 92 is rendered entirely inoperative, and such movement carries the gear 91 laterally into mesh with a similar spur gear 94 carried by another

countershaft 95 journaled in the frame 85. This shaft 95 also carries a wide faced ratchet wheel 96 and a cam wheel or hub 97. This so-called cam wheel 97 is either made of entire insulating material or is provided with a rim portion of such material and, in its periphery, it is formed (see Fig. 10) with a segmental notch 98 and a projecting lug 99, which parts 98 and 99 are laterally offset from each other. Normally, the upper end of a lock lever 100, which is intermediately pivoted to the frame 85, engages a perforation 94ª in the gear 94 (see Figs. 11 and 12) and holds the latter and the shaft 95 and other parts carried thereby against rotation. The lower end of this lock lever 100 is connected by a rod 101 to one arm of a bell crank 102, the other arm of which is connected to the upper end of the rod 62 already noted. The bell crank 102 is shown as pivoted to a bearing 103 which is secured to the back of the case 1. A torsional spring 104 (see Fig. 11) is connected at one end to the frame 85 and at its other end to the gear 94, and exerts a yielding force which tends to resist rotation of the shaft 95 and parts carried thereby, in the direction of the arrow marked adjacent thereto in Fig. 11. Located below the ratchet wheel 96 and pivoted to the lower portion of the frame 85 is a lever 105 which carries a spring-pressed driving pawl 106 that acts upon the ratchet wheel 96. The free end of the lever 105 is connected by a rod 107 to the short upper arm of a bell crank 108 pivoted to a suitable bearing on the side of the case 1 and provided with a long depending curved arm that is adapted to be engaged by cam pins or projections 109 on the large gear 37 of the magneto (see Fig. 10). Backward movement of the ratchet wheel 96 is normally prevented by a spring-pressed retaining dog 110 that is pivoted to a bearing in the lower portion of the frame 85. As shown, a spring 111 yieldingly draws downward the rod 107 and parts connected thereto normally holding the same as shown in Fig. 10. Normally both of the dogs 106 and 110 are held in inoperative position, shown in Fig. 10, by the lower end of the dog releasing lever 112 that is intermediately pivoted to the frame 85, and the curved upper end of which lever is normally held against a fixed stop 113 on the upper portion of the frame 85 by a pin 114 carried by the gear 91. The stop 113, therefore, also limits the backward or return movement of said gear 91, under the action of the spring 90. Initial movement of said gear 91 from its normal position, however, renders said dogs 106 and 110 operative on the ratchet wheel 96. Normally, a projecting pin or lug 115 on the ratchet wheel 96 engages the arm 116 of a rock shaft 118 mounted in the frame 85 and provided at its projecting end with a crank 119 that is connected to the upper end of the hereinbefore noted connecting rod 78. The extreme upward movement of the arm 116 is limited by a stop 120 projected from the frame 85, and this stop also serves to limit the extreme backward or return movement of said ratchet wheel and other parts carried by the shaft 95. For coöperation with the insulated cam hub 97 is a group of four contact brushes 121, 122, 123 and 124, which brushes are insulated from each other and supported at their lower end by an insulating block 125 secured to the lower portion of the frame 85. The brushes 121 and 122 are in the plane of the cam lug 99 and the brushes 123 and 124 are in the plane of the segmental notch 98 of the cam wheel 97. Furthermore, the said brushes 122 and 124 have curved free ends that engage, respectively, with the cam lug 99 and notch 98 of said wheel. The operation of this cam wheel and the said brushes will be given in the summary of the operation. When the operating shaft or spindle 86 is drawn out endwise by the knob 87 far enough to engage the gear 91 with the gear 94, it will be temporarily locked in that position by a spring-pressed lock segment 126 (see Figs. 11 and 12) which, as shown, is pivoted to a bracket 127 on the frame 85. The lock segment 126 is connected by a rod 127ª to an armature 128, which latter is pivotally supported at one end and is subject to an electromagnet 129 (see Fig. 9). Intermediately pivoted to a bracket 129 on the frame 85 is a lever 130 having two short upper end arms 131 and 132 and a long laterally bent lower end 133, which latter underlies and is adapted to engage the driving pawl 106 but not the retaining pawl 110. The arm 131 is adapted to be engaged by a laterally projecting pin or lug 134 on the upper gear 91, when said gear is rotated to its extreme position from normal and while it is engaged with the gear 94. Said arm 131 has an insulated tip that is adapted to engage the upper end of a spring contact 135 (see Fig. 12) and force the latter into engagement with the upper end of a companion contact 136, which contacts are insulated from each other and supported by a bracket 137 on the frame 85 (see Fig. 13). The arm 132 of the lever 130 is curved laterally (see Figs. 11 and 13) so that it will act as a cam and its operative face is covered with insulating material 132ª. Supported by the bracket 129 and insulated therefrom and from the lever 130 is a group of spring contacts 138, 139, 140, 141, 142 and 143. The free upper end of the relatively long and wide contact 138 is normally engaged and pressed to the left in respect to Fig. 11 by an insulation 144 on the contact 138, this contact 138 has an insulating portion which normally engages the contacts 140 and 142 and press the

same respectively into engagement with the contacts 141 and 143. When the gear 91 is drawn toward the right in respect to Fig. 11, the contact 138 will spring into engagement with the contact 139 and the contacts 140 and 142 will spring out of engagement respectively with the contacts 141 and 143. When the gear 91 is moved laterally into mesh with the gear 94 and is then rotated to its extreme position, thereby causing the pin 134 to engage the arm 131 and rock the lever 130, as above described, the insulated curved arm 132 engages the contact 138 and thereby forces the said contact 138 out of engagement with the contact 139 and forces the contacts 140 and 142 again into engagement respectively with the contacts 141 and 143. This engagement of the arm 132 with the contact 138 establishes the normal relative positions and engagements of the whole group of contacts 138 to 143, inclusive, but does not break the engagement which is established between the contacts 135 and 136 by the above noted engagement of the arm 131 with the said contact 135. The importance of this relative arrangement and action will clearly appear in the general description of the operation. Attention is again called, however, to the fact that, when the lever 130 is rocked as above described, by engagement of the pin 134 with the arm 131, the driving pawl 106 will be moved and rendered inoperative on the ratchet wheel 96.

Other elements of the local instrument.—The numeral 145 indicates the receiver, the numeral 146 the transmitter, the numeral 147 the local battery, the numerals 148 and 149 the primary and secondary coils, respectively of the induction coil, and the numeral 150 the telephone bell, which latter is, preferably, a polarized bell. The wires of the metallic line circuit are indicated by the letters *b* and *c*.

Summary of operation.—When a person at one of the telephones wishes to call a party at another telephone of the system, he must first rotate the knob 87, without pulling outward on the same, until the pointer 88 thereof registers with the numeral on the dial 89, which indicates the party called or the station with which communication is desired, it being, of course, understood from the description already given that the selector contact 8 of each telephone of the system will occupy a different position and that the position of each of said contacts will be represented by correspondingly positioned numerals on the said dial 89. When the knob 87 has been rotated, together with its gear 91, to the proper selecting position above stated, the said knob is drawn outward, thereby throwing the gear 91 into mesh with the gear 94, and in this position the said parts will then be held by the engagement of the spring latch segment 126 with the inner end of the shaft 86. The gear 94 being locked, at this time, by the lock lever 100, neither of the engaged gears 91—94 can be rotated by manipulation of the knob 87. The selector actuator having now been set for definite predetermined action on the party selecting mechanism, it is thrown into action by a rotation of the crank 41 of the magneto operating shaft 40. The initial rotation of said shaft 40, in the direction of the arrow marked adjacent thereto in Fig. 17, causes the pin 43 to run in the oblique cam slot 44 and thereby move the said shaft endwise toward the left. This endwise movement of the shaft 40 is limited by engagement of the sleeve of the crank 41 with the hub of the gear 37, but is sufficient to cause the bell crank 61, through the connections 101 and 102, to move the lock lever 100 out of engagement with the gear 94 and thus release the latter. Also this limited movement of the shaft toward the left shifts the spring contacts 51, 54 and 57 into a position shown in the diagram view Fig. 1. Continued rotation of the shaft 40, in the direction stated, causes the ratchet hub 39, by engagement with the pin 46, to impart nearly one complete rotation to the sleeve 45, thereby winding up the spring 47. As already described, the pin 46, at the limit of its movement, will be disengaged from the ratchet teeth 39 and thrown into engagement with the beveled end 50 of the dog 49 by the cam 48, and this beveled end 50 will then hold said pin laterally out of engagement with said ratchet teeth 39. The purpose of winding up this spring 47 will be more fully stated in considering the action of ringing off or, more accurately stated, in restoring the line to normal condition. Under continued rotation of the said crank 41, the gear 37 drives the pinion 34 at an increased speed of six to one, so that the contact eccentric 35 will engage the contact 36 three times for each time one of the pins 109 of said gear 37 engages the depending arm of the bell crank 108. Hence, for each time the driving dog 106 is caused to impart a step of movement to the ratchet wheel 96 and gear 94 and cam wheel 97 which moves therewith and also to the gear 91 which is then in mesh with said gear 94, the magneto will send out on the line three electrical impulses. The armature is so positioned in respect to the eccentric contact 35, that the electrical impulses sent out through the contact 36 and other connections to the electromagnets 16 of the party selector, will all be in the same direction. Otherwise stated, the current sent from the magneto to said magnets 16 is an intermittent pulsating current in contra-distinction to an alternating current. Further, the magnets 16 are so wound that, when the electrical pulsations are sent out by rotation of the magneto crank 41, in

the direction of the arrow marked on Fig. 17 and as above described, the armature lever 18 will be vibrated and each vibration thereof, acting through the pawl 20 and ratchet wheel 9, will move the contact piece *a*, and three such movements will move the said contact piece *a* a distance corresponding to the spacing of the perforations 7 (see Fig. 27), which perforations represent the difference in circumferential spacing of the contacts 8 of the different telephones of the system. The current pulsations, which are generated in the armature of the magneto, are delivered onto the main line, through eccentric contact 35 (which is connected to one terminal of the armature winding), through contact 36, wire 151, contacts 138 and 139 (which contacts are engaged by movement of gear 91 toward the right), through wire 152 to line wire *b*, from line wire *c* through wire 153 and connected contacts 123 and 124, through wire 154 and connected contacts 57 and 58, wire 155 and connected contacts 51 and 52, back to the armature winding. As the electromagnets 16 of all of the telephones of the system are connected across the main line, through wires 156 and portions of wires 152 and 153, these electric impulses will be delivered to all of the magnets 16 of the telephone system and like movements will be imparted to the contact pieces *a* of all of the party selectors; but in view of the different positions of the contacts 8, the said movable contact *a* of only one of the party selectors will, at the termination of the selecting action, be left in contact with all three of the contacts 4, 5 and 8. The importance of this last stated fact will more clearly appear later on.

Figs. 2 and 3 illustrate diagrammatically the condition of the electrical connections, respectively, at the calling and the called telephone, at the time of ringing, and at which time the selector at the called station has been set with its contact *a* engaged with all three of the contacts 4, 5 and 8, as shown in said Fig. 3, and the driving dog 105 has been thrown into an inoperative position, by engagement of the pin 134 with the arm 131 of the lever 130, as fully stated in the earlier part of this description. Hence, by continued operation of the magneto, an alternating current may be sent through the bells of the instruments at the calling and called stations, through the following connections, to-wit: from one terminal of the armature of the magneto at the calling station (Fig. 2), through a wire 157 and connected contact 142 and 143 and wire 158 to connected contacts 54 and 55 and through wire 159 and bell 150 and wire 160 to ground 161. From ground 161 through wire 160 and bell 150 of called station, through wire 159 and connected contacts 54 and 53, through wire 162 and connected contacts 72 and 68, through wire 163 and connected contacts 4, *a* and 8 of the set party selector of the said called station, and through wire 164 and a portion of wire 153 to main line wire *c*. From the line wire *c* (Fig. 2) at the calling station, the circuit is closed back to the dynamo through wire 153, connected contacts 123 and 124, wire 154, through connected contacts 57 and 58, through wire 155 and through connecting contacts 52 and 51 back to the other terminal of the armature winding of said magneto at the calling station. In this way, the magneto, at the calling station, is caused to ring the bells both at the calling and at the called station or telephone, but the bells at all other stations are in normally broken circuits and, hence, will not be rung. It is desirable, while ringing, to prevent any possible flow of current from one line wire to the other, through the selector magnets 16 and, hence, I short-circuit both line wires, or in other words, connect the same by low resistance so that both line wires will be connected as a common wire or common side of the circuit, with the ground as the other side. The line wires are thus short-circuited through connections most easily traced on Fig. 4 and indicated by heavy lines. All of the contacts and other parts, shown in Fig. 4, are in the same position as shown in Fig. 2. The said short-circuiting connections are as follows: from line wire *c* to wire 153, contacts 123 and 124, wire 154, contacts 57 and 59, wire 165, connected contacts 67 and 69, wire 166, contacts 135 and 136, wire 167 and a portion of wire 152 to the other line wire *b*. It will, of course, be understood that the main lines are thus short-circuited only in the act of ringing. After the party at the calling telephone sends out the ringing signal, as above described, he first lets go of the dynamo crank 41, and this permits the shaft 40 to move toward the right, back to its normal position, thereby permitting the contacts 51, 54 and 57 to assume their normal position shown in Figs. 5 and 17. At this time, the spring 147 remains wound under tension, being held by engagement of the pin 46 with the beveled end 50 of the dog 49. Next, the said party calling and the party called take down their receivers 145, and this permits the respective hooks 64 to move upward, thereby electrically connecting the contacts 68, 70 and 71, at both of the said called and calling stations and breaking the circuit between contacts 68 and 72 and between contacts 67 and 69, as shown in Figs. 5 and 6. When this has been done, the receivers at the calling and called telephones, will be connected across the main line and will be in circuit with each other. The connection of the receiver at the calling station with the main line is from line wire *c*, contacts 123 and 124, wire 154, contacts 56 and 57,

wire 168, a portion of wire 163, contacts 68 and 71, wire 169, receiver 145, wire 170, secondary induction coil 148 and through portions of wire 167 and 152 to the other line wire *b*. The connection of the receiver at the called station (Fig. 6) with the main line is from line wire *c* through a portion of wire 153, through wire 164, contacts 8, *a* and 4, through wire 163, contacts 68 and 71 and wire 169, receiver 145, wire 170, secondary induction coil 148 and portions of wire 167 and 152 to the other line wire *b*. The local circuit from the batteries 147 through the transmitters 146 at the calling and called stations, while the hooks 64 are up, are as follows: from battery 147 through wire 171, primary induction coil 149, wire 172, transmitter 146, contacts 70 71 and 68, through a portion of wire 163, and through wire 173 back to said battery. At the calling station, when the receiver is removed from the hook 64 and the said hook moved upward, the pin 77 of said hook caught on the hook end of the dog 76, and when the person thus calling at the station again applies the receiver to said hook 64, thereby moving the same downward, the dog 76 moves the bell crank 75 and thereby connects the contact 80 to contact 79 and contact 82 to contact 81, as shown in Fig. 7. This movement of the bell crank 75, in the first place, raises the dog 49 and thus releases the spring 47, and this released spring imparts a backward movement to the shaft 40 and to the magneto armature 31, but does not impart endwise movement to the shaft 40. The backward movement of the armature 31 generates a pulsating current in a reverse direction from that generated in the selecting action, and this pulsating current is delivered on the main line through the following connections: from magneto contact 36 through a portion of wire 151, through a wire 174, contacts 79 and 80, wire 175, and portions of wires 170, 167 and 152 to line wire *b*. From line wire *c*, the current flows through a portion of wire 153, through a wire 176, contacts 81 and 82, a wire 177 and contact 51 back to the magneto armature. This reverse pulsating current on the main line acts on the magnets 16 of the party selectors of all the telephones and energizes the said magnets with a polarity which is reversed to the polarity thereof in the selecting action, and this reverse polarity raises the lefthand end of the armature lever 19 (see Figs. 7 and 23). This movement of the said armature lever 19 accomplishes two things, to-wit, first, through the eccentric 22, it releases both of the pawls 20 and 21 and permits the ratchet wheels 9 of the several selectors, together with their contact pieces *a*, to be restored to normal position, by their retracting spring 12. In the second place, the movement of the said armature lever 19 closes the local battery circuit through the tripping magnet 129 by forcing together the contacts 26 and 27. The tripping circuit thus closed is indicated by broken dotted lines in Fig. 7 and is as follows: from battery 147 through wire 178, magnet 129, contacts 141, 140, wire 179, contacts 26 and 27, wire 180, a portion of wire 163 and through wire 173 back to battery. When the tripping magnet 129 is energized, the segmental lock 126 is restored to normal position, thereby releasing the spindle 86 and permitting the same, together with the gear 91 carried thereby, to be moved laterally back to normal position under action of the spring 90. When the gear 91 is released by this lateral motion from the gear 94, the said spring 90, acting in torsion, rotates said gear 91 and back to its normal position, at the limit of which movement the pin 114 on said gear, acting on the lever 112, forces both of the dogs 105 and 110 into inoperative position as previously described, thereby releasing the ratchet wheel 96 and permitting the torsion spring 104 to rotate the shaft 95, ratchet wheel 96, gear 94 and cam wheel 97 back to their normal position. At the limit of the return movements of the said parts, the pin 115 strikes the arm 116 and through connections described again raises the dog 76 into an inoperative position, so that it cannot be caught by movements of the receiver hook 64; and simultaneously with this action the lock lever 100 again engages and locks the wheel 94. It should be understood that the actions just above described take place only in the selector actuator of the calling station and that the selector actuators at all the stations during all of the operations described remain in normal position.

In the diagram view Fig. 8 is illustrated connections for preventing persons at other than at the calling and called stations from getting any connection whatever with the main line, while the line is in use, either for the purpose of calling, listening or speaking. If the line is in use, in which case some movement will have been imparted to the ratchet wheel 9 of the party selectors, the contact *a* will connect the rings 4 and 5 of the selectors of all of the stations as, for instance, shown in the said diagram view Fig. 8. If now the third party attempts to call some other party on the line, he can connect the gear 91 of his selector actuator with the gear 94 and can lock the stem 86 by the lock segment 126 and he can also, by rotation of his magneto crank, start the rotation of the actuator shaft 95 and parts carried thereby, but the initial movement of the cam wheel 97 will cause the lug 99 on the cam wheel 97 to force the spring contact 122 into engagement with the contact 121 and, as this happens, while the free end of the spring

contact 124 is in the notch 98 of said wheel 97 and out of engagement with the coöperating contact 123, the local battery circuit will be closed through the trip magnet 129, thereby causing the lock segment 126 to release the spindle 86 and thereby permit the spring 90 to throw the gear 91 out of engagement with the gear 94 and back to normal position. The battery circuit through the tripping magnet 129, at the time of tripping just noted, is as follows: from battery 147 through a portion of wire 178 to trip magnet 129, thence through wire 181 and contacts 121 and 122, thence through the wire 182 and contacts 5, *a* and 4, thence through a portion of wire 163 and thence through a wire 173 back to battery. All this takes place before the contact spring 124 is out of the notch or slot 98 of the cam wheel 97 and at which time, therefore, the connections are not made between contact springs 123 and 124. Otherwise stated, the lug 99 of said cam wheel makes and again breaks the electrical connection between contacts 121 and 122 before the said cam wheel makes the electrical connection between the said contacts 123 and 124. Furthermore, the said electrical connection between the contacts 121 and 122 is always made and again broken before the connection is made between the rings 4 and 5, by the contact piece *a*, provided that the line was at normal at the time the third party attempted to use the line.

What I claim is:

1. In a lock-out telephone system, the combination with a transmission line, of a telephone, a party selector, a selector actuator and a magneto at each station, and electrical connections including said transmission line, whereby electrical impulses may be sent from a magneto at the calling station to the distant party selectors, and the said selectors at the different stations being arranged to be connected to the transmission line by one of the distant telephones, and means for automatically reversing the current in the main line when the calling telephone is restored to the normal condition substantially as described.

2. In a lock-out telephone system, the combination with a transmission line, of telephones, party selectors, selector actuators and magnetos at the several stations, which magnetos have electrical connections to the main line and are adapted to send electrical impulses in one direction to the distant party selectors, and means for automatically sending a reverse current over the main line when the calling telephone is restored to normal condition, substantially as described.

3. In a lock-out telephone system, the combination with a transmission line, of telephones, party selectors, selector actuators and magnetos at the several stations, all of which are capable of electrical connection to the main line, and which party selectors are adapted to be set to determine which distant telephone will be called under the action of the coöperating party selector, and yielding means arranged to be set by the initial action of said magneto, and operative to reverse the action of said magneto after the calling telephone has been restored to normal condition substantially as described.

4. In a lock-out telephone system, the combination with a transmission line, of telephones, party selectors, selector actuators and magnetos at the several stations, which magnetos are electrically connected to said main line but adapted to send electrical impulses to the distant party selectors and are provided with automatical means for sending a reverse current to the called station, and which latter means is rendered operative when the receiver hook of the calling telephone is restored to the normal position.

5. In a lock-out telephone system, the combination with a transmission line, of telephones, party selectors, selector actuators and magnetos at the several stations, which magnetos have electrical connections to said transmission line, and a current reversing device in the circuit connecting the said magnetos and transmission line, arranged to send a succession of current impulses in the same direction from a magneto at the calling station over the transmission line.

6. In a lock-out telephone system, the combination with a transmission line, of telephones, party selectors, selector actuators and magnetos at the several stations, which magnetos have electrical connections to said main line and are adapted to send electrical impulses to the distant party selectors, and provided with means for sending a reverse current, the action of said motor, including a spring adapted to be set by initial operation of the magneto of the calling station, to be released when the receiver hook at the calling station is restored to normal position.

7. In a lock-out telephone system, the combination with a transmission line, of telephones, party selectors, selector actuators, and magnetos at the several stations, which magnetos have electrical connections to the main line and are adapted to send electrical impulses to the distant party selectors and are provided with means for sending a reverse current to the called station, and means for automatically reversing the magneto at the calling station when the receiver hook at said calling station is restored to normal position.

8. In a lock-out telephone system, the combination with a transmission line, of

telephones having receiver hooks, party selectors, selector actuators at the several stations, and means operated by said receiver hooks for restoring the said party selectors at the several stations to normal positions when the receiver hook of the telephone at the calling station is restored to normal position.

9. In a lock-out telephone system, the combination with a transmission line, of telephones, party selectors, selector actuators and magnetos at the several stations, which magnetos have electrical connections to said main line, and are adapted to send electrical impulses to the distant party selectors, and means for reversing the action of said magnetos comprising a spring for each magneto, of means whereby initial operation of a magneto will set said spring under tension and connections operative by the receiver hooks of the telephones, arranged so that the magneto reverse spring at the calling station will be released when the receiver hook at said calling station is restored to normal position.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK W. ADSIT.

Witnesses:
HARRY D. KILGORE,
F. D. MERCHANT.