M. GARL.

COMBINED FIRE ALARM, TELEGRAPH, AND TELEPHONE SYSTEM.

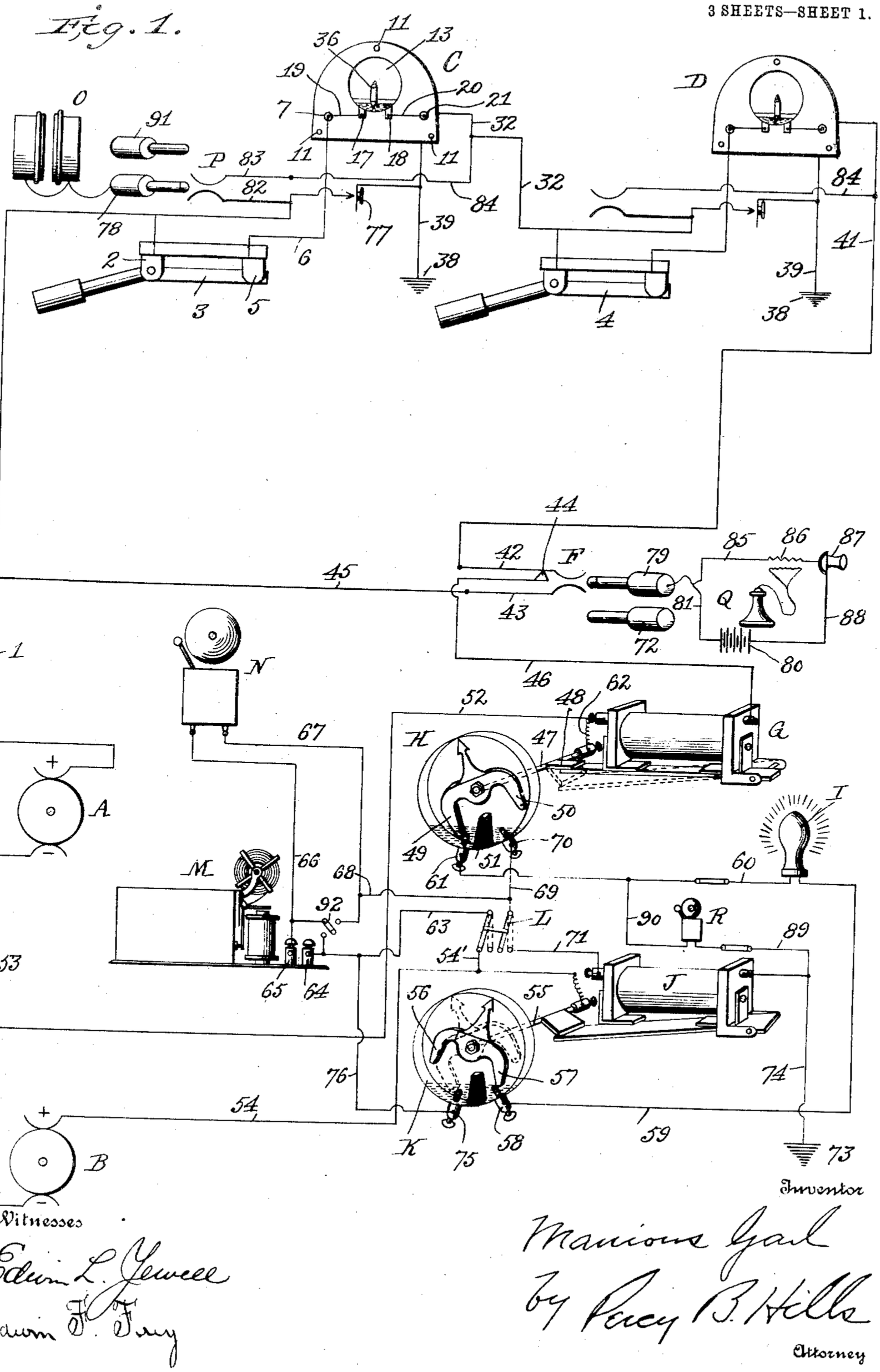
APPLICATION FILED JULY 23, 1907.

916,142.

Patented Mar. 23, 1909.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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3 SHEETS—SHEET 2.

Fig. 2.

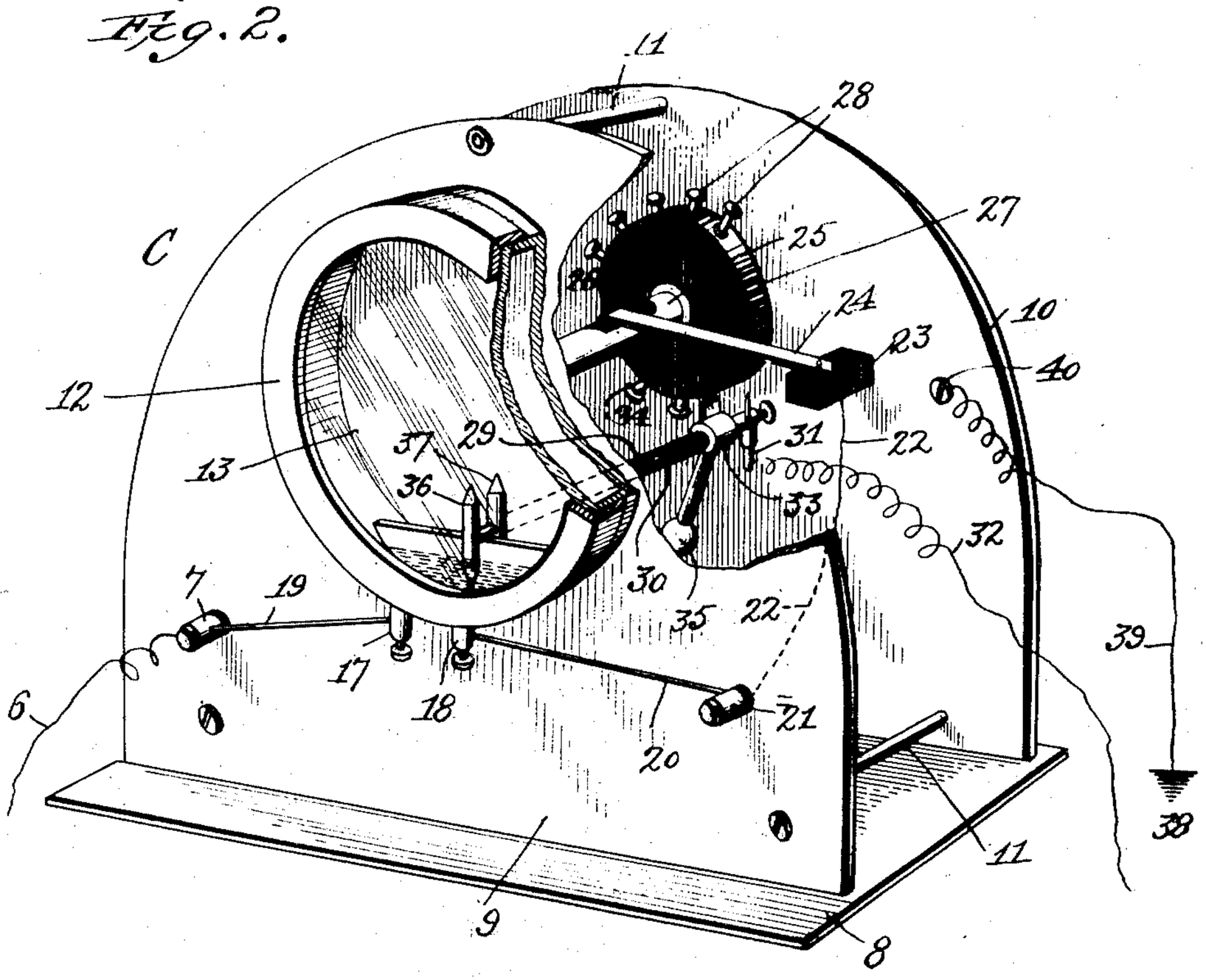
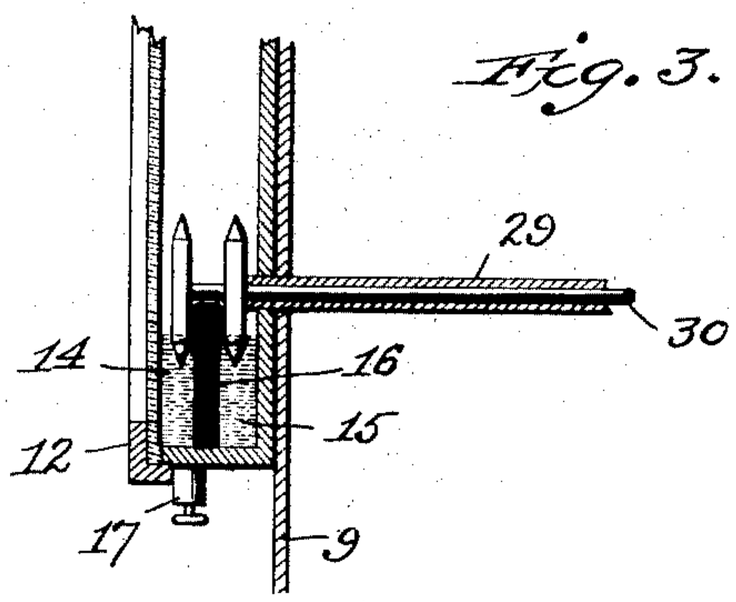


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 4.

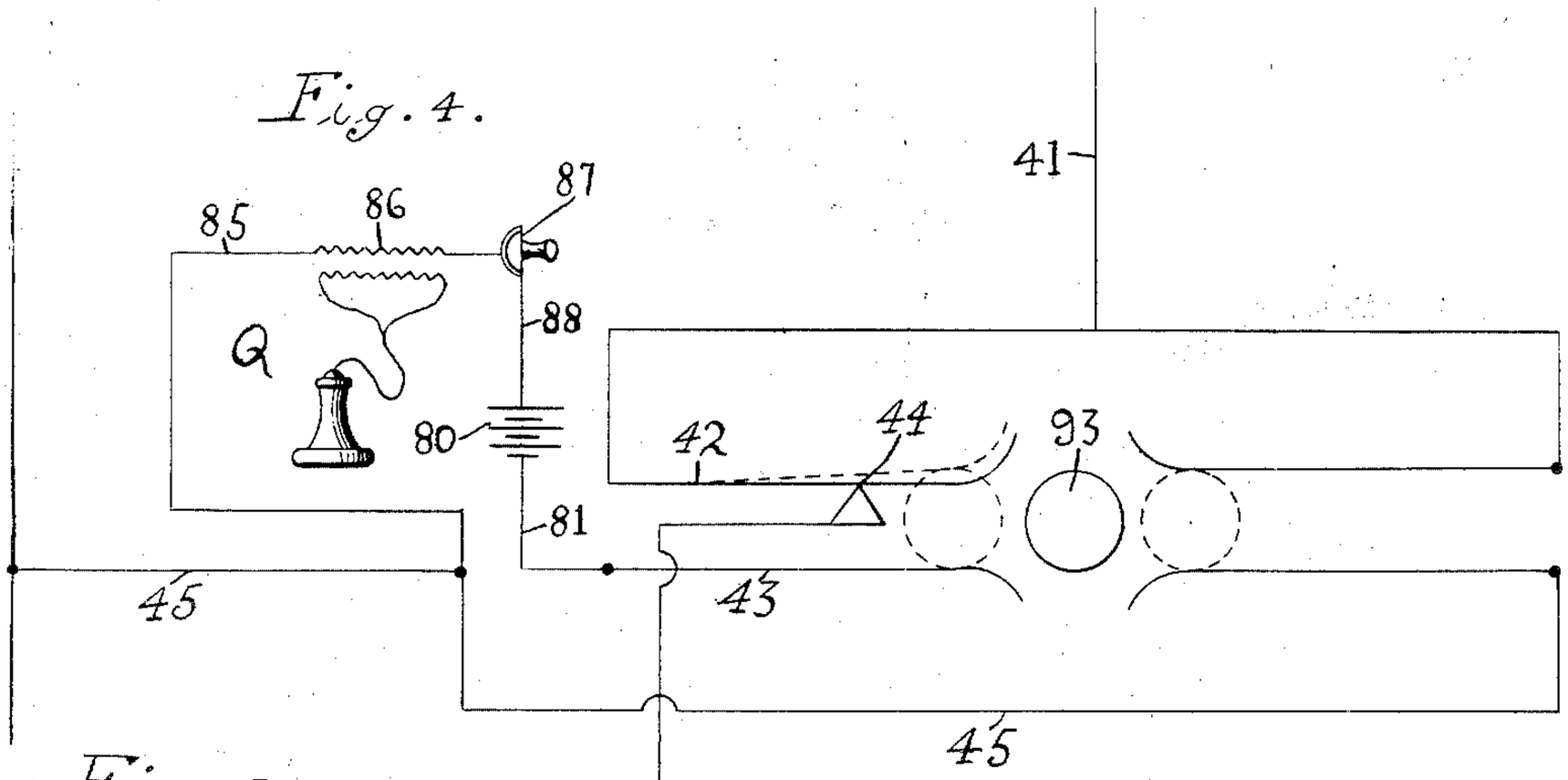


Fig. 5.

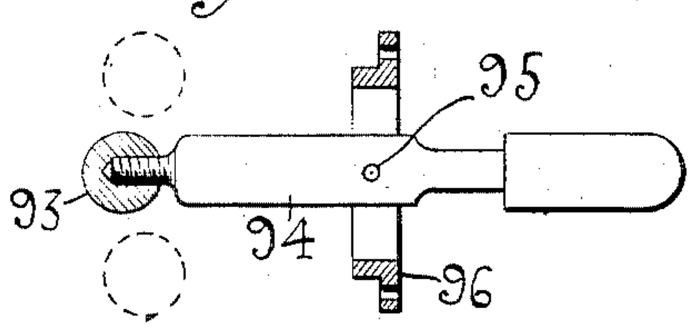
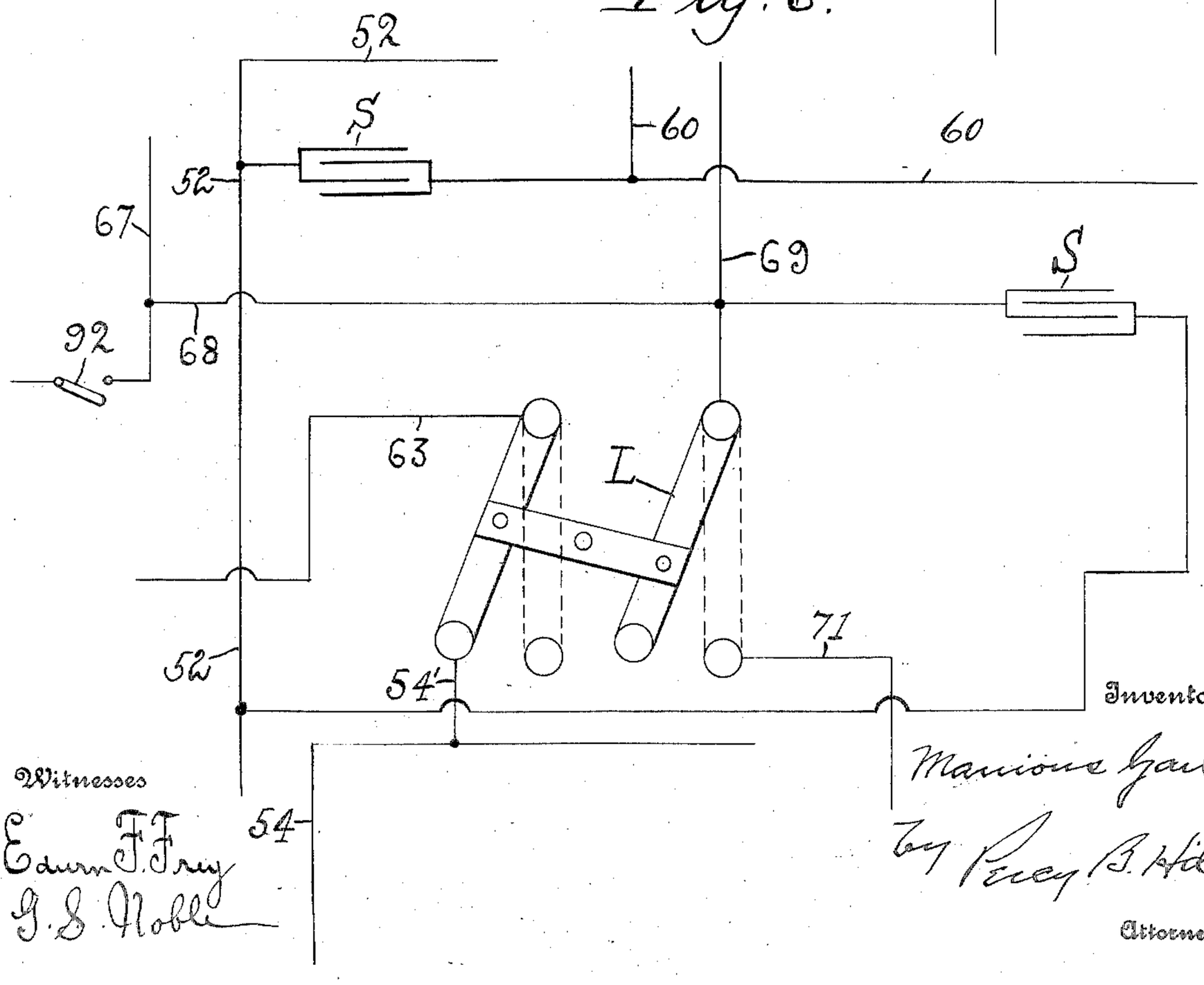


Fig. 6.



UNITED STATES PATENT OFFICE.

MANIOUS GARL, OF AKRON, OHIO.

COMBINED FIRE-ALARM TELEGRAPH AND TELEPHONE SYSTEM.

No. 916,142. Specification of Letters Patent. Patented March 23, 1909.

Application filed July 23, 1907. Serial No. 385,115.

To all whom it may concern:

Be it known that I, MANIOUS GARL, a citizen of the United States, residing at Akron, in the county of Summit, State of Ohio, have invented new and useful Improvements in a Combined Fire-Alarm Telegraph and Telephone System, of which the following is a specification.

My invention relates to combined fire alarm telegraph and telephone systems, and has for its object to provide certain improvements in the arrangements and operation of the same, as will be hereinafter more definitely pointed out and claimed, reference being had to the accompanying drawings, in which:

Figure 1 is a diagrammatic view of my improved system complete. Fig. 2 is an enlarged detail perspective view, partly broken away, of a preferred mechanism in one of the fire alarm boxes. Fig. 3 is a detail transverse sectional view through a portion of said box, showing the mercury chambers therein. Fig. 4 is a diagrammatic view of a portion of the system, showing a slightly modified construction. Fig. 5 is a detail view of the metal cam ball of Fig. 4 and its support. Fig. 6 is also a diagrammatic view of a portion of the system, showing a condenser therein.

Similar characters of reference denote corresponding parts in the several views.

In the said drawings the reference letters A and B indicate two separate generators, both of which are located at the central station. Leading from one pole of generator A is a line wire 1, that connects with one contact 2 of a knife switch 3, said switch being located in the first of a series of fire alarm boxes located on the line, two of said boxes C and D being shown in Fig. 1, it being understood that each of said boxes is similarly provided with a knife switch, that of box D being shown at 4. From the other contact 5 of switch 3 a wire 6 leads to an insulated binding post 7 on the casing of box C. These boxes C, D, etc., are identical in structure, and a description of one of them, as specificially shown in Figs. 2 and 3, will suffice for all, as follows: Mounted on a base plate 8 are the front and rear metal walls 9 and 10 of the box, spaced apart and retained in position by transverse rods 11. Fixed in the front wall 9 is a receptacle 12, constructed of insulating material, and having preferably a glass front 13. In the bottom thereof and dividing the same into two chambers 14 and 15 is an insulating partition 16, and in each of the chambers formed by said partition is a mercury bath. Connected with the mercury bath in chamber 14 is a binding post 17, while similarly connected with the mercury bath in chamber 15 is a similar binding post 18. An insulated wire 19 connects posts 7 and 17, while a similarly insulated wire 20 connects post 18 with a binding post 21 insulated from the front wall 9 and passing therethrough, from whence leads an insulating wire 22 to an insulated block 23 mounted on the rear wall 10 of the casing. Fixed to said block 23, and electrically connected with wire 22, is a spring arm 24 that contacts at its free end with a shaft 25 mounted in the box, and set in said shaft is a piece of insulating material 26, upon which said spring arm 24 rests when the parts are in their normal position, whereby the circuit is normally broken at this point. Said shaft 25 is otherwise electrically connected with the rear wall 10 of the box, and near its rear end has mounted thereon a dial 27 of insulating material provided on its periphery with suitable pins 28 (or they may be notches) corresponding in number and relative location with the box number, the same being in this instance twenty five. It will be understood that said dial 27 is connected in the usual manner with a suitable actuating means (not shown), such as a clock train, or a gear train driven by a weight, whereby, when an alarm is turned in from said box, the shaft 25 and dial 27 are given at least one complete revolution, though this may be repeated as many times as desired to repeat the alarm.

Mounted beneath the shaft 25 is a shaft 29 of insulating material having a conducting core 30 therein that at its rear end is connected electrically with a pin 31 passed through said shaft, and to which is attached an insulated wire 32 that leads therefrom to the switch 4 of the next box in the line circuit. Said shaft 29 has fixed thereon a sleeve 33 carrying a projection 34 that lies in the path of travel of the pins 28 on dial 27, whereby during the rotation of the latter

said shaft 29 will be rocked once for each pin 28, a counterweight 35 on the sleeve 33 serving to instantly return said shaft to its normal position after contact with each pin 28. Mounted on the other end of shaft 29 are two pins 36 and 37, preferably platinum tipped, and in electrical contact with the core 30 of said shaft, said pins being so positioned that they straddle the partition 16, and in the normal position of shaft 29 each dips into one of the mercury baths in the receptacle 12 on opposite sides of said partition 16. Electrically connecting the wall 10 to ground at 38 is a wire 39 connected to said wall 10 at the binding post 40, it being understood that all the parts of the box are in this ground connection except those parts specifically described as insulated.

Leading from the last of the alarm boxes is a line wire 41 corresponding to the wire 32 of the box above specifically described, which leads to a jack F at the central station, comprising spring arms 42 and 43 and fixed contact 44, the arm 42 being connected to wire 41, the arm 43 with line wire 1 through wire 45, and the contact 44 being connected, through wire 46, with a relay G, hereinafter described, it being seen that with the jack plug removed from jack F the arm 42 and contact 44 are in circuit, while the contact between arms 42 and 43 is broken. The relay G may be of any well known construction adapted, when energized, to rock shaft 47 through arm 48 to the position shown in Fig. 1, it being understood that, when said relay is deënergized, said shaft 47 will turn to the position indicated in dotted lines by said arm 48. Said shaft 47 carries at its outer end two dip contacts 49 and 50 located in a fixed mercury container H containing two mercury baths separated by an insulating partition 51, the position of said dip contacts 49 and 50 being such that, when contact 49 is in its mercury bath, which it will be when relay G is energized, the contact 50 will be withdrawn from its bath, and vice versa. Leading from the relay G is a wire 52 that connects with a wire 53 common to the return sides of both generators A and B, whereby the normal metallic circuit to generator A is completed, as will be hereinafter described.

The local signal circuits will now be described as follows: With the main line circuit normally closed, a closed local circuit will be established from generator B through lamp I, as follows: From generator B through wire 54 to the shaft 55 in operative relation to a relay J and carrying dip contacts 56 and 57 in a fixed mercury container K, said shaft, relay and container being identical in construction with that of relay G, said relay, however, being under these conditions deënergized, as will be hereinafter described. As shown in Fig. 1, the circuit of lamp I is through said shaft 55, contact 57 and its mercury bath to a binding post 58 connected with said bath, thence through wire 59 to lamp I and from said lamp, through wire 60, to binding post 61 of container H that connects with the mercury bath for dip contact 49. Through said contact 49 the circuit completes through shaft 47, wires 62, 52 and 53 to the return side of generator B. The lamp I, when in circuit, as it is normally, will be constantly lighted, but when said circuit is broken, as hereinafter described, it will be extinguished. In place of said lamp a voltmeter or a single stroke bell may be used.

It will be observed that with the parts in their normal position, and the main line circuit intact, there will be a broken circuit, as follows: From generator B through wires 54 and 54′ to a switch L, which is normally in the position shown in full lines in Fig. 1, thence through wire 63 to the binding post 64 of a register M of any suitable construction, thence through binding post 65 and wire 66 to bell N, and from said bell, through wires 67, 68 and 69, to binding post 70 of container H that connects with the mercury bath therein for dip contact 50. Here the circuit is normally broken, through the raised position of contact 50, and continues through shaft 47, and wires 62, 52 and 53 to the return side of the generator B.

With the metallic line circuit in normal operative condition, the operation in turning in an alarm, say from box C, is as follows: Said box being pulled, the dial 27 therein is rotated, and, when the contact of the first pin 28 thereon with projection 34 on shaft 29 occurs, the latter is rocked thereby and pins 36 and 37 are thus withdrawn from their mercury baths. This temporarily breaks the metallic line circuit at this point, which results in deënergizing relay G, permitting shaft 47 and dip contacts 49 and 50 to rock to the dotted line position in Fig. 1, thus breaking the mercury contact through dip contact 49 and establishing the same through 50. It follows that the normally closed circuit through lamp I will be broken, and said lamp will be extinguished. At the same time the normally broken local circuit, through register M and bell N, hereinbefore described, will be closed through binding post 70, mercury bath and dip contact 50, whereby a registering impulse will be imparted to register M, and bell N will be sounded. Now, as the first pin 28 of dial 27 leaves projection 34 the releasing of the latter permits the counterweight 35 to rock shaft 29 back to its normal position, thus causing pins 36 and 37 to again dip into their respective mercury baths, thus again establishing the metallic line circuit and reën-

ergizing relay G to return all of the parts to their normal position, which again closes the circuit of lamp I and breaks the circuit of register M and bell N. This operation is repeated once for each pin 28 and the signal of the box pulled, in this case twenty five is sounded on bell N and recorded by register M.

It is essential in a fire alarm system to provide means for receiving signals from all the boxes, even should a break in the metallic line circuit occur, which I accomplish in the following manner: Assuming that the line wire 32 connecting boxes C and D is broken, the immediate result is to deënergize relay G, thus breaking the local circuit through lamp I, which will be extinguished, thus notifying the central station of trouble in the line circuit. By now shifting switch L to the dotted line position in Fig. 1 the connection between wires 54′ and 63 is broken, and a connection between wire 69 and a wire 71, leading to relay J, is completed. At the same time a plug 72 must be inserted in jack F at the central station, which results in breaking the connection between arm 42 and contact 44, and in establishing connection between arms 42 and 43, thus connecting line wire 1, through wire 45, with the return wire 41 of the system. By this means a circuit is maintained to box C and all other boxes on that side of the break in the line direct through wire 1, while a reverse circuit is provided for box D and all the other boxes on that side of the break, through wires 1 and 45, arms 43 and 42 of jack F, and wire 41. Now, should the box C be pulled, the first result of the rotation of its shaft 25 will be to cause insulated part 26 to pass under spring arm 24, and as said shaft is connected to ground through wall 10 and wire 39 a connection to ground will be made from line wire 6, as follows: through binding post 7, wire 19, and binding post 17, to mercury bath of pin 36, through said pin and core 30 to pin 37, through its mercury bath to binding post 18, and from thence through wire 20, binding post 21 and wire 22 to spring arm 24. It will be observed that the relay J is connected to ground at 73 through wire 74, so that a ground circuit will thus be completed from box C through said relay J, wire 71, switch L, wire 69, binding post 70, dip contact 50 (relay G being deënergized), shaft 47, and wires 62, 52 and 53 to the generator A. This results in energizing relay J, raising dip contact 57 out of contact with its mercury bath, and causing dip contact 56 to make contact with its bath, as shown in dotted lines in Fig. 1. A closed local circuit from generator B through register M and bell N is thus established, as follows: through wire 54 to shaft 55 of relay J, and through dip 56, binding post 75, wires 76 and 63 to register M, and from thence over wire 66 to bell N, and from said bell through wires 67, 68 and 69 to binding post 70, thence through dip 50, shaft 47, and wires 62, 52 and 53 to generator B. This will impart a recording impulse to register M and will sound bell N. Now, upon the further rotation of shaft 25 and dial 27 in the alarm box C the contact of the first of the pins 28 with projection 34 will rock shaft 29, thus lifting pin 37 out of its mercury bath, and thus breaking the ground circuit, deënergizing relay J, and breaking the local signal circuit through register M and bell N just described. It results, therefore, that a series of signals corresponding to the number of pins 28 on dial 27 will thus be transmitted to register M and bell N, though in a sense reversely from those transmitted when the metallic line circuit is intact, it being observed that in the latter case the local signal circuit is completed by the breaking of the line circuit, and while the pins 28 are tilting shaft 29, while with the grounded circuit the local alarm circuit is established by the closing of said ground circuit and while shaft 29 is in its normal position. When the shaft 25 completes its rotation, which has completed its box signal, it will come to rest in the position shown in Fig. 2 with the insulating portion 26 beneath spring arm 24, thus breaking the ground circuit.

When an alarm is turned in from the box D, or any other of the boxes on that side of the break in the line, the ground circuit is completed in the reverse direction through said box, as follows: from generator A, wires 1 and 45 and arms 43 and 42 of jack F to wire 41 (which corresponds with wire 32 in the box shown in Fig. 2), and thence through pin 31 and core 30 of shaft 29 to pin 37, through its mercury bath to binding post 18, and from thence through wire 20, binding post 21, wire 22, spring arm 24, shaft 25 (when said shaft begins to rotate) to wall 10 to ground through wire 39. It will thus be seen that the system provides for a normal alarm through a local circuit controlled by a metallic line circuit; and, when a break in the metallic line circuit occurs, for an alarm through said local circuit controlled by ground circuits passing either directly or reversely through the boxes according to the location of said boxes with respect to the break in the line.

The telephone circuit and call will now be described as follows: When it is desired to telephone the central station from any one of the boxes, the key 77 at said box is closed temporarily, which grounds the circuit through wire 39. Connected to wire 74 leading from ground at 73 to relay J is a wire 89 leading to a bell R and from thence, through wire 90, to wire 60, which, when the circuit is grounded at a box by its key 77, completes a

ground circuit to generator A through mercury container H and wires 52 and 53. This sounds bell R, thus notifying the central station, and the signal may be repeated as often as may be desired by closing and opening key 77. At the same time, however, no signal is transmitted to register M and bell N, for the reason that there is established no ground return to generator 1 through said register and bell, said ground circuit being broken at switch L. Upon thus signaling central station the operator at the box inserts the plug 78 of a suitable portable telephone O into jack P, and opens switch 3. At the same time the operator at central station inserts the plug 79 of a telephone Q into jack F, which completes a telephone circuit as follows: from the positive side of battery 80 of the telephone Q through wire 81, wire 43 of jack F, wires 45 and 1 to arm 82 of jack P, through portable telephone O to arm 83 of jack P, to wire 84, thence to wire 32 (or wire 41, according to the box being used), thence through the rest of the alarm boxes in the circuit, over wire 41, arm 42 of jack F and wire 85, through primary 86 of the telephone induction coil, through transmitter 87 to the negative side of battery 80, through wire 88.

At the same time that the operator at central station plugs in his telephone Q he must shift switch L to contact with wire 71, which prepares the system for the reception of an alarm from any of the boxes over the ground while the telephone circuit is completed. Thus, if the telephone is in use at box C, and box D is pulled, the circuit is over line wire 1 from generator A, through portable telephone O, wires 84 and 32 to box D, to ground at 38, and thence through ground at 73 to relay J, over wire 71, switch L, wire 69, through binding post 70, dip 50, (relay G being deënergized), shaft 47, and wires 62, 52 and 53 to generator A. If, on the contrary, the telephone is in use at box D, and box C is pulled, the current goes both ways through the boxes, passing from generator A through wires 1 and 45, telephone Q, wire 41 to wire 84 of box D, and thence through wire 32 to box C to ground at 38, and through wire 1 direct to switch 3, wire 6, box C to ground at 38, completing the ground circuit through relay J as just described. It will be understood that the telephones O and Q are both of low resistance and will not interfere with said ground circuit, though as the pulsations of the alarm coming in will be noticed by the telephone operators, they can at once remove their plugs and shift switch L, which, however, is not at all necessary.

An important feature of my improved system is the facility offered for testing the various parts of the same, as follows: The bell R will serve as a constant alarm for a grounded circuit, either in the line or in the local, the same being connected to both generators A and B through wires 52 and 53, so that a ground in either circuit will sound said bell. Said bell will be wound nearly equal to the relays G and J, so that they will balance, working in multiple, part of the current taking care of said bell and part caring for the relay. Said bell will also sound alternately with bell N when an alarm comes in, but may be of low tone, or may be a buzzer, so that the two will not be confused.

To test out a box without interfering with the other boxes, insert a plug 91 into jack P of the box to be tested, which will short circuit through wires 83 and 84, thus cutting out said box and permitting the same to be tested without turning in an alarm.

In Fig. 4 I have shown a diagrammatic view of a slightly modified construction for cutting in telephone Q at central station, in which a metal cam ball 93 is employed in place of the plug 79, said cam ball being carried by an arm 94 pivoted at 95 in a fixed plate 96. As shown in Fig. 4, when said cam ball is shifted on its pivot 95 to the right, it performs the function of plug 72 in connecting wires 41 and 45, and when shifted to the left it cuts in telephone Q.

If desired, a switch 92 may be provided to cut out either register M or bell N, should occasion arise to make such an act necessary.

I have also found that by bridging condensers S between wires 60 and 69, on the one hand, and wire 52, on the other hand, as shown in Fig. 6, the arc in mercury container H will be stopped when an alarm is sent in with a heavy direct current. Similarly, mercury container K may be protected by bridging condensers between posts 58 and 75 and wire 54.

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

1. In a combined fire alarm telegraph and telephone system, a series of alarm boxes, a normally closed line circuit, a normally broken ground circuit from said boxes, means for cutting a telephone into said line circuit at each of said alarm boxes, means for placing a telephone at central station into a separate circuit with said alarm box telephones and simultaneously breaking said line circuit, and means for putting into operation said ground circuit through all of said boxes when said telephones are cut in.

2. In a combined fire alarm telegraph and telephone system, a series of alarm boxes, a normally closed line circuit, a normally broken ground circuit from said boxes, means for cutting a telephone into said line circuit at each of said alarm boxes, means for placing a telephone at central station into a separate circuit with said alarm box telephones and simultaneously breaking said

line circuit, and means for putting into operation said ground circuit in one direction through the boxes on one side of the cut-in box telephone and in the opposite direction on the opposite side of said cut-in box telephone.

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

MANIOUS GARL.

Witnesses:
R. E. JUS. KEEP,
JESSIE A. HAWKINS.