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PATENTED JULY 30, 1907.

G. G. BUTTLER.

DEVICE FOR LOCATING DEFECTS IN TELEPHONE AND TELEGRAPH LINES.

APPLICATION FILED SEPT. 11, 1906.

2 SHEETS—SHEET 1.

Fig. 1.

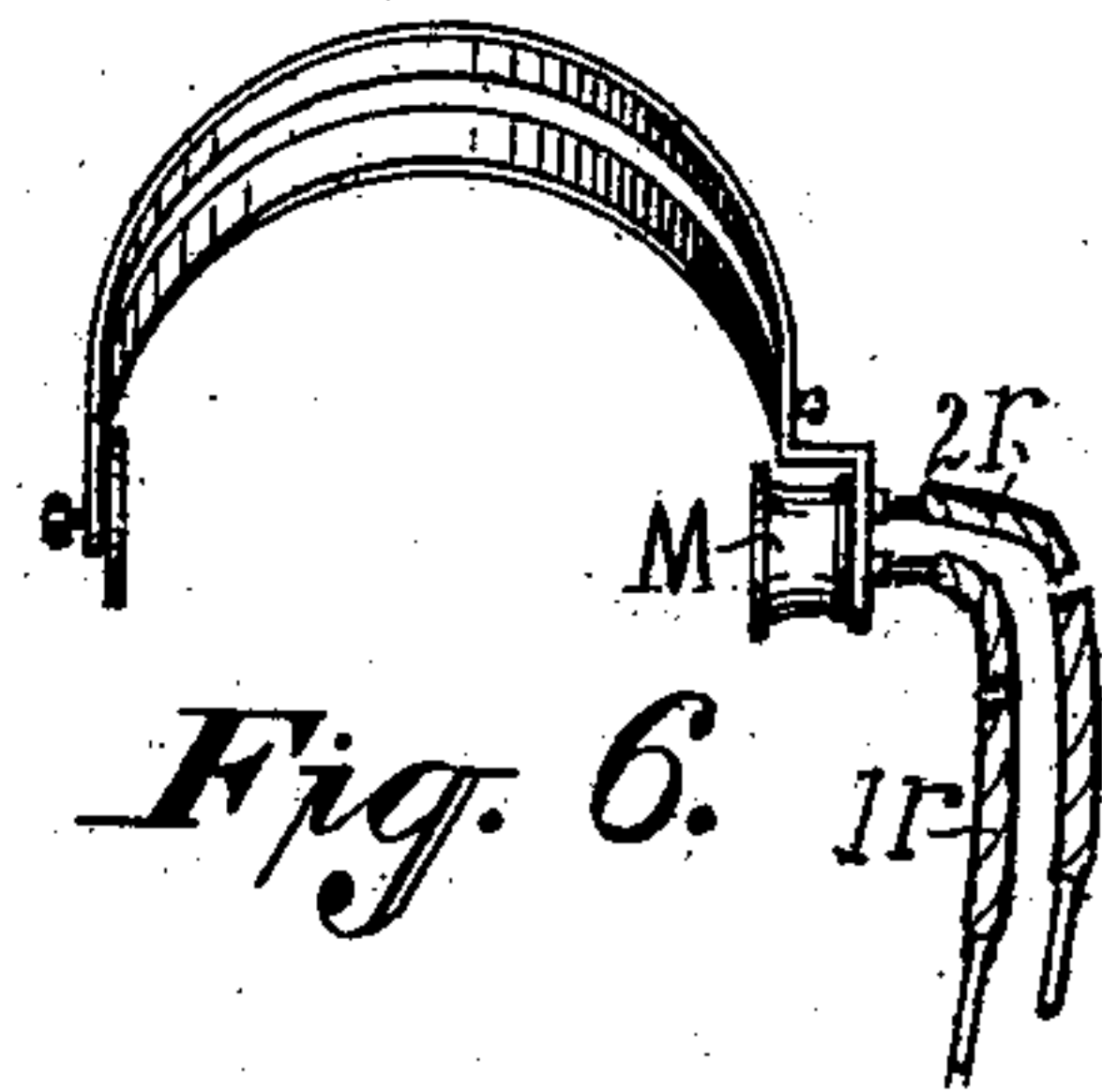
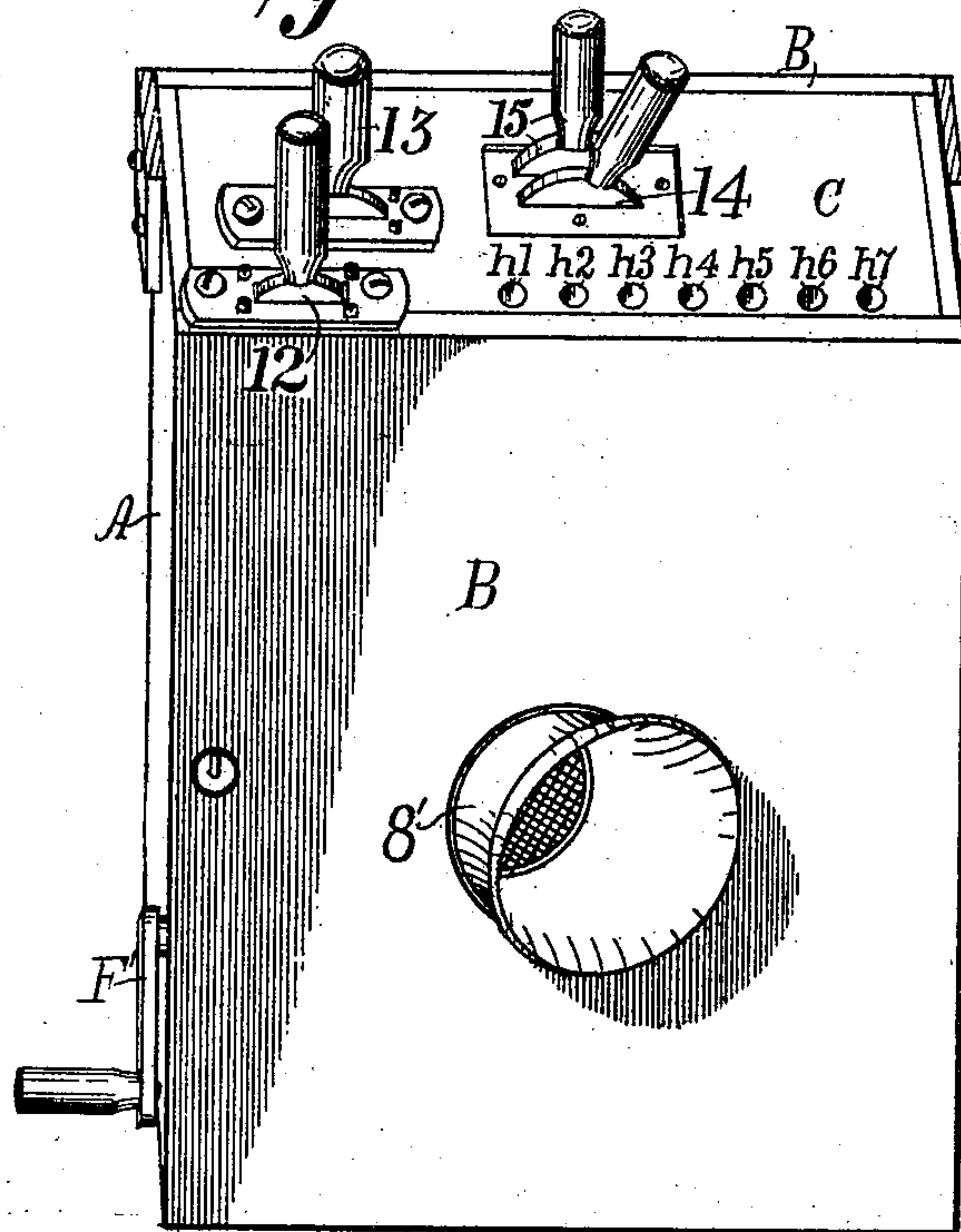


Fig. 6.

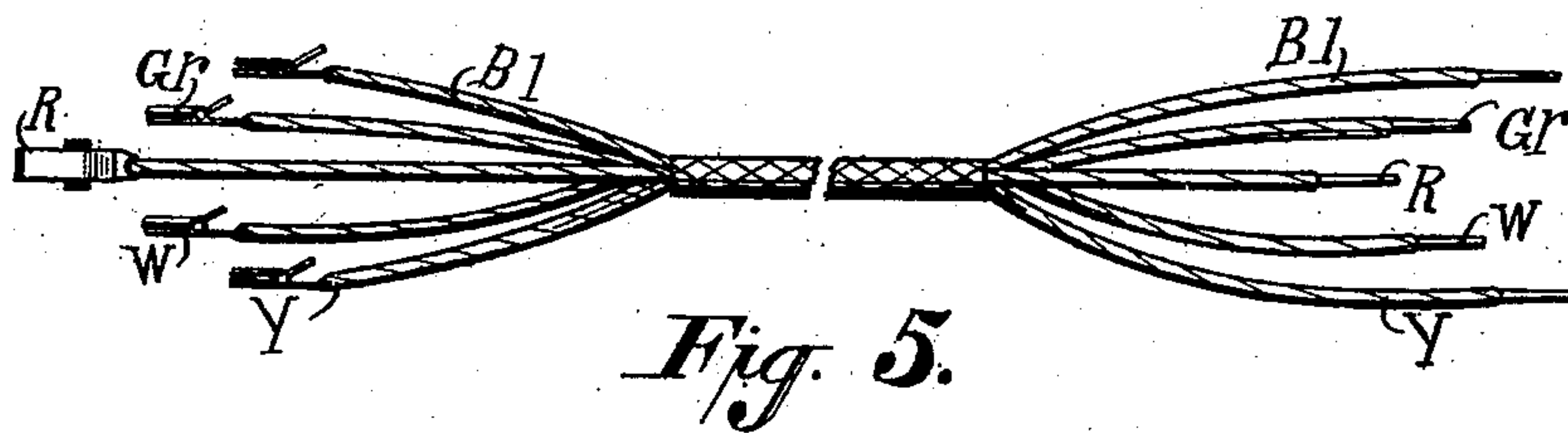


Fig. 5.

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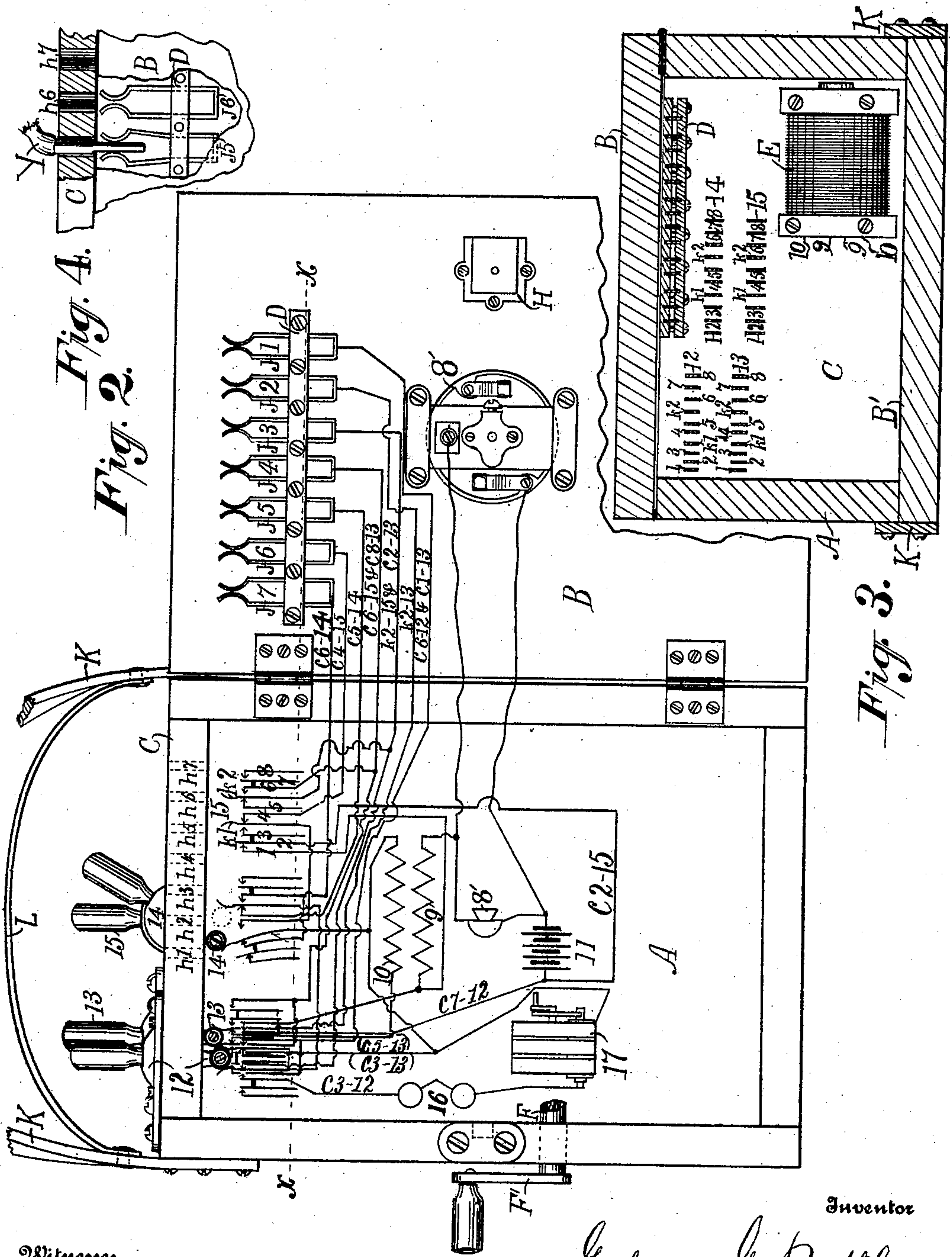
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2 SHEETS--SHEET 2.



Witnesses

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GIDEON G. BUTTLER, OF OKLAHOMA, OKLAHOMA TERRITORY, ASSIGNOR OF ONE-HALF
TO A. D. MARBLE, OF OKLAHOMA, OKLAHOMA TERRITORY.

DEVICE FOR LOCATING DEFECTS IN TELEPHONE AND TELEGRAPH LINES.

No. 861,357.

Specification of Letters Patent.

Patented July 30, 1907.

Application filed September 11, 1906. Serial No. 334,118.

To all whom it may concern:

Be it known that I, GIDEON G. BUTTLER, a citizen of the United States, residing at Oklahoma City, in the county of Oklahoma and Territory of Oklahoma, have invented certain new and useful Improvements in Devices for Locating Defects in Telephone and Telegraph Lines, of which the following is a specification.

My invention relates to an apparatus or a device to aid in detecting and locating defects in telephone and telegraph lines and consists of a housing or box designed to be carried by the operator and having located therein, a generator, a ringer, an induction coil, four multi-contact switches, a battery and the necessary wire connections; and a series of jacks; to the upper end of the housing or box, and to the outer surface is secured the said switches all of which extend through and into the interior of the box where the wire and other connections are made; to the door of the box is secured a transmitter, projecting outwardly; all of which will be described in the specification sufficiently clear to enable a person skilled in the line to which it pertains to construct and operate the device.

The objects of my invention are; first, to provide a device or an apparatus by the aid of which the operator can readily detect and locate a defect in a telephone or a telegraph line; second, that the apparatus be of minimum dimensions and of maximum capacity; third, to provide an apparatus or device which will save to the "trouble hunter" time, annoyance and labor; fourth, that it shall be so constructed as to be little liable to get out of order. I accomplish these objects by the mechanism illustrated in the accompanying drawings, forming a part of this specification, in which—

Figure 1, is a perspective view of the apparatus as complete and embodying the elements of my invention; Fig. 2, is a front elevation of the apparatus or device having its door opened exposing to view interior parts and their connections, a portion of the door being broken away; Fig. 3, is a cross section on line *x x* Fig. 2, the door of the device being closed, the view being an elevation of the open portion and in addition to a sectional view it shows the position of the induction coil, also, as being secured to the under surface of the box-top; Fig. 4, is a partial sectional detail in elevation of the apparatus showing how the jacks are plugged; Fig. 5, is a plan view of the five-way cord used in manipulating the device; Fig. 6, is an elevation of the receiver.

Similar letters, figures and characters refer to similar parts in the several views.

Referring to the drawings, A is the box or housing of the apparatus or device, of which B is the cover, C is the top or upper end section, D is the jack clamp,

firmly secured to the upper-inner surface of the door, E is the induction coil, secured to the under surface of the top section of the box, F is the generator crank shaft by which the generator is operated; 1 2 3 4 5 6 7 8 including k^1 and k^2 constitute the key and other contacts of switch number 15 and be it understood that switches number 12, 13, 14 & 15 are of the same style and type, but not necessarily so, and all numerals or other characters of reference which applies to the contacts or the keys of one of the switches applies to all four of them; 8' is the transmitter; 9 is the primary and 10 is the secondary of the induction coil; 11 is the battery; 16 is the ringer or buzzer.

Having constructed the box A in a substantial manner of hard wood (3/8" preferably) of outside dimensions, approximately, 4 x 6 x 7 1/2 inches, leaving the back B' to be secured in place by screws; in the top section C of the box bore the series of plugging holes $h^1 h^2 h^3 h^4 h^5 h^6 h^7$ and fit in and secure to the top section the switches 12, 13, 14 & 15, approximately as indicated in Figs. 1 & 3; to the under surface of the said top section C, secure the induction coil as indicated in Fig. 3; secure the ringer approximately where shown in Fig. 2; to the inner surface of the door B secure, as indicated by Fig. 2, the jack clamp D, the transmitter 8' and the lock H; the jacks J¹, J² &c. are constructed of thin metallic strips about 3/16" wide which may be in two separate parts or formed of a single piece like a staple as indicated in Fig. 2 and secured firmly in place in the clamp D of wood or other non-conducting material; and secured to the door B in such position that the plugs or tips of cords B¹, Gr, R, W, and Y, also of the cords 1r & 2r of the transmitter will engage the jacks when passed through holes $h^1 h^2$ &c. as indicated in Fig. 4.

The magneto-electric generator 17 is secured in position within the box A, with its crank or handle outside and at the left. In making the wire connections as indicated in Fig. 2, make the rear connections first, then secure the back B' in place; observe that the left pole of the generator 17 connects with the ringer and thence with contact 3 of switch 12 and the right pole connects with 3 contact of switch 13, also the right end of the secondary coil 10 the left end connecting with 5 contact of switch 13; the left end of the primary 9 connects with contact 8 of switch 12 and contact 1 of switch 15; the right end being connected with the transmitter 8'; the left pole of the battery 11 is connected with the contact 7 of the switch 12 and contact 2 of switch 15; the right pole being connected with the transmitter 8'; jack J⁷ connects with contact 6 switch 14; jack J⁶ connects with contact 4 of switch 15; jack J⁵ connects with contact 5 of switch 14; jack J⁴ connects with contacts 6 of switch 15 and 8 of switch 13; jack J³ connects with k^2

of switch 15 and contact 2 of switch 13; jack J² connects with k² of switch 13; jack J¹ connects with contact 6 of switch 12 and contact 1 of switch 13.

Having made all the connections as shown and directed, close the door B and lock it; secure the carrying strap K firmly to the box A, near its upper end and to its right and left sides, the said strap being about 3 ft. long and having a buckle or other means of adjusting its length and having secured to it the short hand strap L serving as a handle to the apparatus.

In describing the operation of my apparatus or device, for the sake of brevity, let it be understood that S. H. 12, S. H. 13, S. H. 14 and S. H. 15 signify switch (or key) handle 12, 13, 14, 15, and while the connecting cords are distinguished by their color as blue (Bl), green (Gr), red (R), white (W), yellow (Y) and each color is equivalent to a number as the operator may choose to designate but to facilitate this explanation let it be understood that cords 1 2 3 &c. signify that they are the cords belonging to, and to be plugged into holes h¹, h², h³ &c. and into the corresponding jacks.

To locate a short circuit on a telephone line the operator should first see that all the switch or key handles are in their normal or vertical position; next, plug the receiver cords r¹ & r² into the receiver M and into their jacks J¹ and J²; next take the five-way cord and plug into the jacks 3 4 5 6 & 7, attach the snaps of cords 5 & 6 to the line to be tested and move S. H. 14 to the right, this cuts the generator 17 into the line; now, turn the generator crank and if the line is short circuited the ringer will buzz strong and loud; if the line is not short circuited and the phone rings metallic the buzzing will be moderate, indicating that the line is not short circuited.

To locate a ground on a telephone line, snap cords 5 & 6 to the line to be tested and cord 7 must be attached to some permanent ground wire, move S. H. 12 & 14 to the right, this cuts the generator onto line number 5 grounded; now, turn the generator crank and if this side of the line is grounded the ringer will make a loud buzzing sound, and if the line is clear of the ground the ringer will be silent; the operator should next move S. H. 12 to the left and 14 to the right, turn the generator crank which will ring out on cord number 6 to ground; if this side has a ground the ringer will buzz loud, no ring means not grounded. To locate a swinging ground operate the same as for a dead ground, and if it is swinging the ringer will buzz at intervals, only. For a swinging short circuit operate the same as for a dead short circuit and if the line is swinging short circuited the ringer will buzz only while the lines are in contact.

To locate an open circuit in a line, the operator knows that both sides of the line are grounded at the central office and to determine which direction from him the open circuit is he must open both sides of the line and connect with the end toward the office with cords 5 & 6, and with 7 to a dead ground wire, move S. H. 12 & 14 to the right and ring out with the generator; if this side of the line is open the ringer will not buzz; to test the other side of the line move S. H. 12 to the left and turn the generator crank, if the ringer responds the line is closed and if not it is open. If it is desired to test toward the subscriber, first, try to ring him up by ringing out metallic on the line, if his bell fails to re-

spond "look" for a ground; next, move S. H. 12 to the right and ring again, if this fails to get the "phone" move S. H. 12 to the left and ring again, this rings on the other side of the line, and no response indicates that the line is open; the line may be open and still get a response on one side of the line grounded, but, in a case of this kind the operator can tell when the subscriber answers whether the line is open by trying to ring out while the receiver is down, if one side of the line is open he cannot ring out metallic, but, if the line is good between him and the subscriber the ringer in the testing apparatus will buzz.

When working on a central energy system use switches 13 & 15 to operate the battery current, the transmitter being dead in lines cut off from the central office. To test a line of this system, the operator will snap cords 3 & 4 to some working line and move S. H. 13 & 15 to the right, call "central" and ask that the plug remain in and that he be undisturbed while testing the line. Next, return S. H. 13 to vertical and move S. H. 15 to the left and snap cords 5 & 6 to the line to be tested, move S. H. 14 to the left and ring out metallic or to ground sufficient to ring the subscriber's bell then move S. H. 14 to the right, 13 to the left and 12 & 15 vertical, this cuts the two lines in series and changes the battery current from 3 & 4 to 5 & 6 making alive the transmitter and enabling the operator to communicate with a person at the other end of the line. If the operator desires to ring back on the line again and still hold 3 & 4 move S. H. 15 to the left and 14 to the right with 12 & 13 vertical. With S. H. 12 & 14 vertical and 13 to the right and 15 to the left cuts the set clear from 5 & 6 and on to 3 & 4, in this position S. H. 13 controls the supervisory lamp at "central." On a local battery system where the supervision is through the ground S. H. 14 controls the supervisory lamp. To detect a defect in the line known as "the heat coil being out" open the line in the cable box connect the apparatus with the end toward the office as if testing for a dead ground, if both sides of the line are "grounded" it is quite evident that the heat coils are out; to determine positively, call in over another line and ask the operator if the signal of the defective line stays in.

This device or apparatus is adapted to all systems of telephones and telegraph lines, the principles in operation of both being the same.

Be it understood that I do not confine myself to the exact form and size of parts shown and described as slight deviations may be desired and made without departing from the spirit of my invention, which, having thus described, what I claim as new and useful and desire to secure by Letters Patent, is—

In the combination of a device or apparatus for detecting and locating defects in telephone and telegraph lines, the following essential instrumentalities; the rectangular housing A including its door B hinged thereto; a transmitter secured in said door; the jack-clamp D secured to said door; the series of U shaped jacks secured in said clamp; the battery 11 electrically connected with the transmitter; the generator 17 having a shaft F extending through the wall of the housing and having a crank F' secured thereon for rotating said shaft; the ringer 16 electrically connected with the generator, both being secured to the interior of the housing walls; the first member 12 of the first pair of the multi-contact switches secured in the roof of said housing and electrically connected with said ringer for the purpose of signaling, and to the

first member of the series of jacks; the induction coil E
secured to the inner surface of the housing roof and
electrically connected with the said battery, and to the
said transmitter; the second member 13 of the first pair
5 of multi-contact switches secured in the roof of the hous-
ing and being electrically connected with the said induc-
tion coil, the battery, the generator and the first four of
the series of said jacks; the first member 14 of the second
pair of multi-contact switches secured in the roof of the
10 housing and electrically connected with the generator, the
induction coil, the ringer, the transmitter, both members
of the first pair of said multi-contact switches and the
fifth and seventh of the series of jacks; the second mem-
ber 15 of the second pair of multi-contact switches elec-

trically connected with the induction coil, the battery, 15
the second member of the first pair of switches, the first
member of the second pair of switches and 4 & 7 of the
series of jacks; the series of plugging holes constructed
in the roof of the said housing to register with the said
jacks, means being provided for connecting said jacks 20
with the main lines of the telephone and telegraph sys-
tems, substantially as shown and described.

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

GIDEON G. BUTTLER.

Witnesses:

H. V. HOUGH,
L. J. TERRELL.