No. 703,777. Patented July 1, 1902.

H. W. FISHER.

CABLE TESTING APPARATUS.

(Application filed July 15, 1901.)

(No Model.)

Fig. 1.

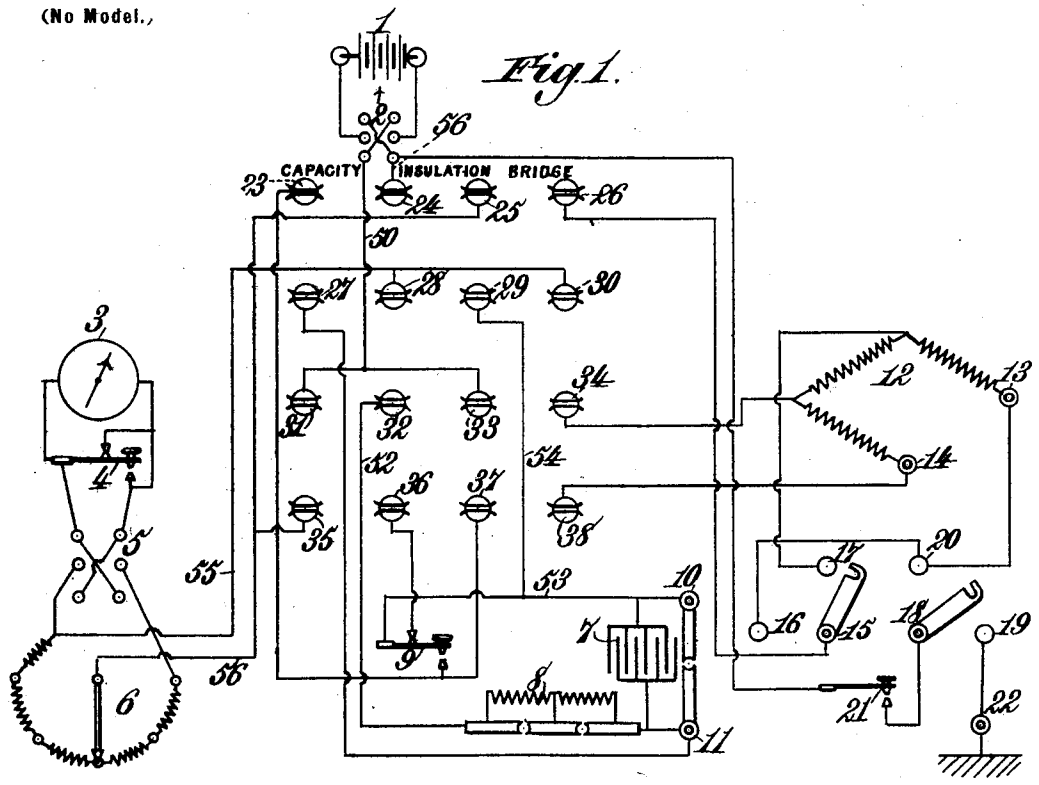


Fig. 2.

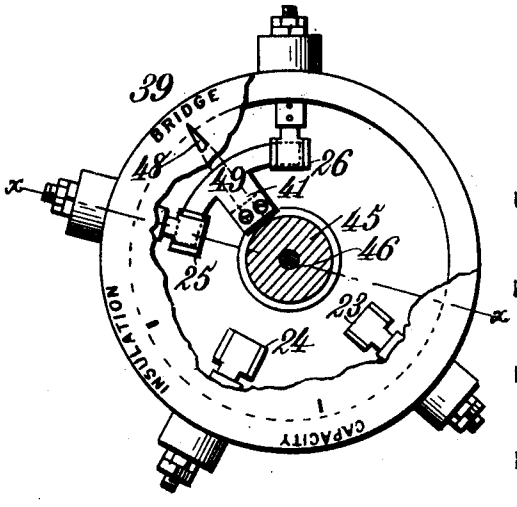
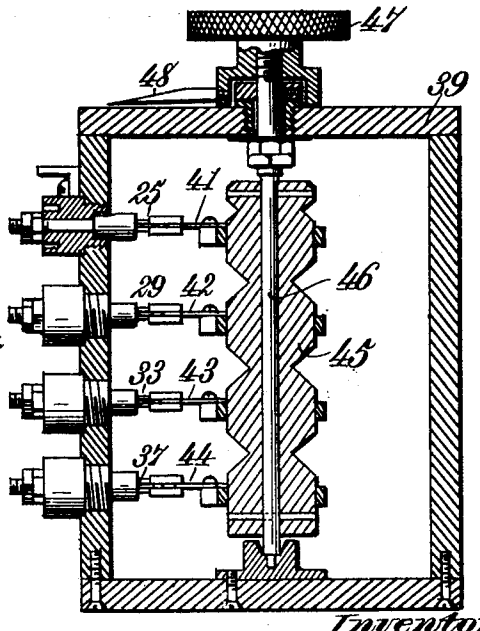


Fig. 3.



Witnesses.
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UNITED STATES PATENT OFFICE.

HENRY W. FISHER, OF PITTSBURG, PENNSYLVANIA.

CABLE-TESTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 703,777, dated July 1, 1902.

Application filed July 15, 1901. Serial No. 68,340. (No model.)

To all whom it may concern:

Be it known that I, HENRY W. FISHER, a citizen of the United States, residing at Pittsburg, county of Allegheny, and State of Pennsylvania, have invented certain new and useful Improvements in Cable-Testing Apparatus, of which the following is a specification.

Cable-testing apparatus, as is well known, consists of a standard high resistance, a Wheatstone bridge, a galvanometer and shunt, a standard condenser, a battery, and various keys and switches. To make the several tests, these different devices must be connected in different ways among themselves, and to make the different connections it is necessary with some forms of cable-testing apparatus to provide a number of flexible connectors. It not only requires time and is inconvenient to make these changes with that type of testing apparatus wherein flexible connectors are employed, but it is necessary in order to do so to carry in mind a rather complicated scheme of connections, which is somewhat difficult even for those thoroughly familiar with the theory of cable-testing. To avoid these inconveniences, I have provided a rotary switch, by means of which the changes in connection can be made with a single motion, the said switch being provided with a pointer which indicates when the desired connections are made.

My invention therefore consists of a plurality of contacts arranged in pairs and connected with the various instruments and a rotary switch provided with a plurality of contact-arms adapted to engage one set of said contacts when in one position to properly couple up the necessary instruments for one test and to engage another set of said contacts when in another position to properly couple up the instruments necessary for another test.

The details of my invention will be fully set forth hereinafter, and the novel features thereof will be defined in the claims.

In the drawings forming part of this specification, Figure 1 is a diagrammatic view of the different instruments comprising a testing set, showing the circuit connections between the same. Fig. 2 is a top plan view of the coupling-switch employed, with the upper end or cover of the casing in which the operative parts are mounted removed. Fig. 3 is a vertical section of a switch on the line x x of Fig. 2.

Like reference-numerals indicate like parts in the different views.

The parts comprising the testing set illustrated in Fig. 1 of the drawings are a battery 1, a battery-reverser 2, a galvanometer 3, a short-circuit key 4, a galvanometer-reverser 5, a shunt 6, a standard condenser 7, a standard high resistance 8, a key 9, cable connections 10 11, Wheatstone bridge 12, cable connections 13 14 for the Wheatstone bridge, contacts 15 16 17 18 19 20 for the resistance Varley-loop or Murray-loop test, a battery-key 21, a ground connection 22, and contacts 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, and 38 in circuit with the different instruments and adapted to be coupled in pairs by the switch 39. The contacts 23 to 38, inclusive, are preferably arranged substantially as shown and are connected with the casing 40 of the switch 39, as shown in Figs. 2 and 3 of the drawings. Coöperating with these contacts are the switch-arms 41, 42, 43, and 44, secured to a hollow block 45 of suitable insulating material, which block is itself secured to a central shaft 46, mounted in suitable bearings in the upper and lower ends of the switch-casing 40 and provided with an operating knob or handle 47. Secured to said knob or handle or to the projecting upper end of the shaft 46 is a hand or pointer 48, which moves in front of a dial upon the upper face of the top or cover of the casing 40. The said dial contains such terms as "Capacity," "Insulation," "Bridge," and when the pointer 48 is opposite one or the other of the words indicated it will show that the proper connections have been made by the switch for the test indicated. The switch-arms 41, 42, 43, and 44 are provided with segmental outer ends 49, each of sufficient length to bridge the circuit between two of the contacts, such as 23 and 24, 24 and 25, and 25 and 26. The connections between said switch-arms and said contacts are of the knife-and-jaw type, and consequently are perfectly reliable. The switch-contacts referred to are so arranged that when the pointer 48 is opposite "Capacity" the contacts 23 and 24, 27

and 28, 31 and 32, and 35 and 36 will be connected to each other. Likewise when the pointer 48 indicates "Insulation" the contacts 24 and 25, 28 and 29, 32 and 33, and 36 and 37 will be coupled together. Similar connections will be made between the remaining contacts when the pointer 48 is opposite the word "Bridge" on the dial.

Two copper straps are connected, respectively, to the contacts 15 18 and adapted to connect the contact 15 with the contact 16 or 17 and the contact 18 with the contact 19 or 20. When 15 and 16 and 18 and 19 are connected, the apparatus is in proper condition for the Murray-loop test. When 15 and 17 and 18 and 19 are connected, the connections are correct for the Varley-loop test, and when 15 and 17 and 18 and 20 are connected the connections are proper for resistance measurements.

As an illustration of the operation of my invention let it be assumed that the switch 39 is set for insulation, with the hand or pointer 48 opposite the word "Insulation," on the dial. As heretofore stated, 24 and 25, 28 and 29, 32 and 33, and 36 and 37 will be coupled together when the switch is in this position. The circuit from the battery 1 through the left side of the battery-reverser 2 passes through the wires 50 and 51 to the contact 33, thence through switch-arm 43 to contact 32, thence through wire 52, through the standard resistance 8 or the cable connected with the contacts 10 and 11, according to which is unplugged, and thence through the wires 53 54 to contact 29, thence across switch-arm 42 to contact 28, and thence through the wire 55, through the shunt 6 and galvanometer 3, and back to the battery through the wire 56, contact 25, switch-arm 41, contact 24, and wire 56. By tracing them out it will be found that all other circuits to which the current has access are broken. The circuit may be similarly traced when the switch is set for the capacity and bridge tests, but as the particular arrangement of the circuits forms no part of my invention and as they are familiar to those conversant with the practice of cable-testing, it is unnecessary to trace them out or allude to them specifically.

Of course in the particular form of testing set used by me I employ special constructions of the different apparatus and arrange them conveniently in a suitable box; but as these also form no part of my present invention it is not deemed necessary to show or describe them specifically.

Having now described my invention, what I claim is—

1. The combination with a plurality of instruments of a cable-testing set, a series of different circuits leading to and from said instruments and adapted to be connected up in different ways with said instruments for making various tests, contacts arranged in pairs in said circuits, of a switch comprising a rotary shaft carrying a plurality of contact-arms arranged to bridge the circuits between the different pairs of contacts in such manner that when said switch is in one position all the proper connections will be made with said instruments through some of said contacts for one test and when in another position all the proper connections will be made with said instruments through other contacts for another test.

2. The combination with a plurality of instruments of a cable-testing set and a series of different circuits leading to and from said instruments and adapted to be connected up in different ways for making different tests, of contacts in said circuits arranged in horizontal and vertical rows, the contacts being so arranged that when the circuit is closed between all the horizontal contacts in two adjacent vertical rows the apparatus will be set for one test and when closed between all the horizontal contacts in two of the other adjacent vertical rows the apparatus will be set for another test, and a rotary switch having a series of contact-arms thereon equal in number to the contacts in each of the vertical rows, the said arms being located one above the other in the same planes, respectively, as the horizontal rows of contacts and having segmental projections thereon adapted to bridge the circuit between the horizontal contacts in two adjacent rows, whereby when said switch is in one position all the proper connections with said instruments will be made for one test, and when in another position all the proper connections will be made with said instruments for another test.

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

HENRY W. FISHER.

Witnesses:
H. A. CROOKS,
D. W. CROOKS.