July 13, 1943. D. C. HUBBARD 2,323,996

HIGH VOLTAGE ELECTRICAL MEASURING INSTRUMENT

Filed Sept. 2, 1941

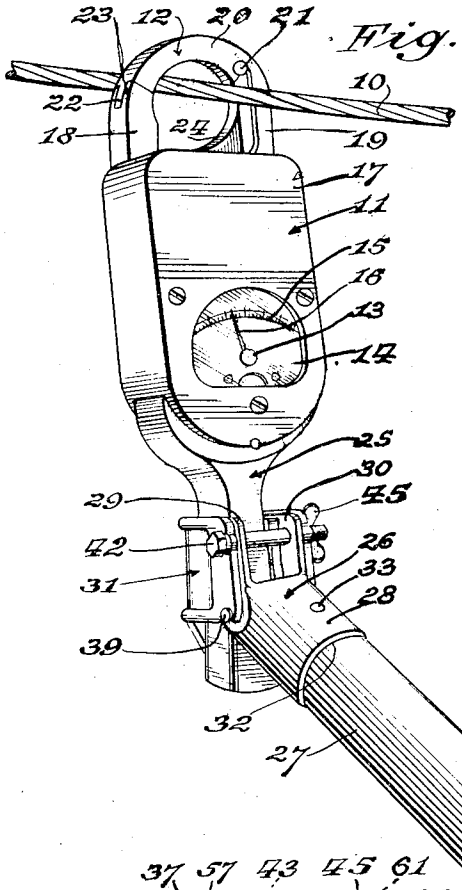


Fig. 1

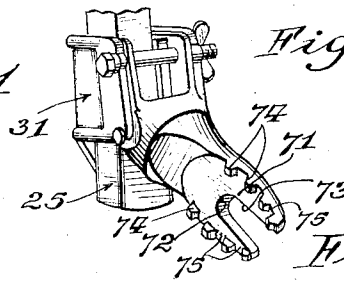


Fig. 5

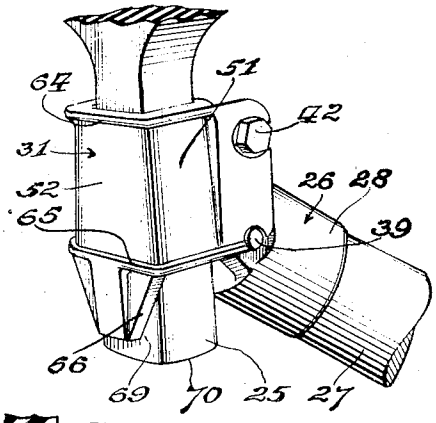


Fig. 2

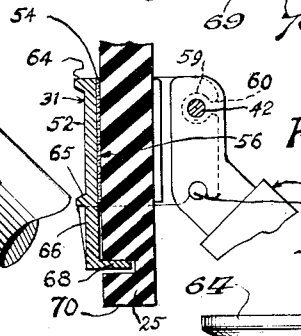


Fig. 6

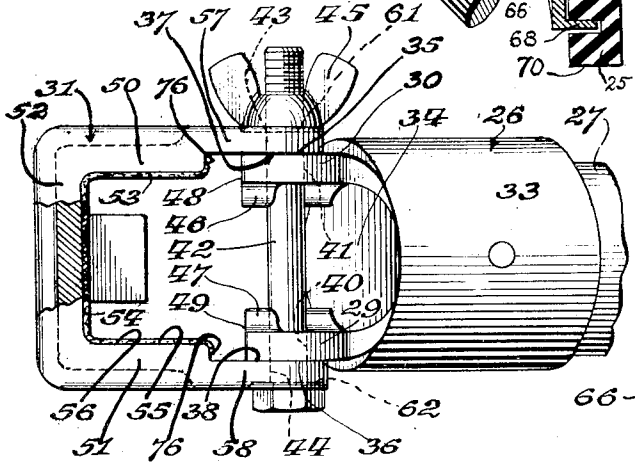


Fig. 3

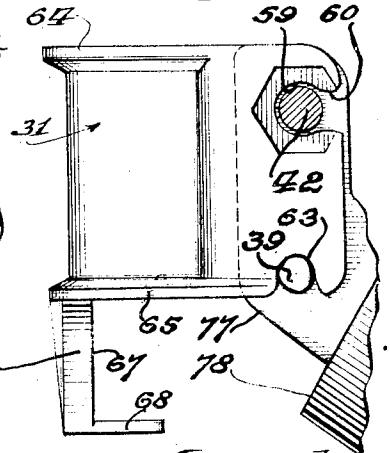


Fig. 4

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Patented July 13, 1943

2,323,996

UNITED STATES PATENT OFFICE

2,323,996

HIGH VOLTAGE ELECTRICAL MEASURING INSTRUMENT

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Application September 2, 1941, Serial No. 409,326

8 Claims. (Cl. 171—95)

The present invention relates to high voltage measuring instruments and is particularly concerned with volt ammeters of the type having a line conductor embracing member or loop adapted to be opened for application to the line. Such instruments are of the type involving a transformer action so that the single loop of the instrument acts like the secondary of a transformer, current being induced in it, which is indicated on the meter.

One of the objects of the invention is the provision of an improved electrical instrument of the class described which is provided with such an insulating handle that the instrument can be applied with perfect safety to the conductors of high voltage transmission lines.

Another object of the invention is the provision of an instrument of the class described which has its handle so arranged that it may be very quickly secured to a long pole of wood or other insulating material at such angle that the instrument can be applied to the line and can be read by the operator holding the pole.

Another object of the invention is the provision of an improved supporting pole for volt ammeters having an improved clamping arrangement which secures the instrument to the pole with absolute certainty at a predetermined angle and without any possibility of the instrument dropping off the pole.

Another object of the invention is the provision of such a supporting pole for volt ammeters or the like of the class described, which is adapted to hold the volt ammeter securely with a minimum number of fastening bolts or other devices so that the volt ammeter can be removed from the pole or applied thereto with a minimum expenditure of time and labor.

Another object of the invention is the provision of an improved volt ammeter supporting tool of the universal type which is adapted to be used on poles of all kinds having a universal fitting at the upper end, so that the volt ammeter and its universal holder may be carried in a tool box and utilized on the universal poles which every lineman has at his disposal.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawing, in which similar characters of reference indicate similar parts throughout the several views.

Referring to the single sheet of drawings accompanying this specification,

Fig. 1 is a view in perspective with the pole broken off showing the volt ammeter and its supporting pole constructed according to the invention, in the act of being applied to the conductor of a high voltage transmission line;

Fig. 2 is a fragmentary view in perspective showing the rear side of the holder;

Fig. 3 is a fragmentary top plan view of the holder with the ammeter removed;

Fig. 4 is a fragmentary side elevational view of the holder; and

Fig. 5 is a view on a smaller scale showing the holder in connection with the universal fitting for use on a universal pole.

Fig. 6 is a sectional view through the middle of the U-shaped stirrup, showing the details of its engagement with the handle of the meter.

Referring to Fig. 1, 10 indicates one of the conductors of a high voltage transmission line, and 11 indicates a volt ammeter or similar electrical measuring instrument of the type having a conductor loop 12 for embracing the line 10. The instrument 11 is suitably insulated for use at high voltages, and has its movement, which is indicated by the numeral 13, covered with a glass window 14 through which the dial 15 and pointer 16 are visible. The movement is preferably housed in a casing 17 of molded rubber.

The loop 12 is, of course, of suitable metal and comprises a pair of upwardly projecting lugs 18, 19 joined by a curved tong 20 which is pivotally supported on the lug 19 at 21. The tong or jaw 20 is preferably provided with a narrow extension 22 adapted to be received in the slot 23 of the lug 18 so as to effect an overlapping closure of the loop. The loop has its jaw 20 held closed by spring pressure, and it is of the type adapted to be moved to open position by pulling downward on the instrument 11 so that the conductor 10 engages the jaw 20 and pulls it open. The instrument has its jaw 20 provided with a spring snap action, so that it is adapted to be held in the open position and tripped to be moved to closed position by engagement of the conductor 10 with the trigger 24.

At its low end the instrument 11 is provided with a solid rubber handle 25 forming an integral part of the housing 17, and the handle 25 is preferably of substantially rectangular cross section with slightly rounded corners.

The handle 25 is so short that it circumscribes considerably the useful range of the volt ammeter on high voltage lines, because the high voltage might arc over to the user if the handle 25 were held in the hand when the instrument is applied to a high voltage line.

The instrument 11 has its handle 25 prefer-

ably mounted in a holder fitting 26, which may be carried by a long wooden pole 27, the length of the pole depending upon the voltage of the line to which the meter is to be fitted. These poles are made of kiln dried wood which is tested for high voltage, and which is protected by an insulating varnish.

The holder fitting 26 may consist of two parts, a ferrule 28 provided with a pair of upwardly projecting supporting flanges 29, 30 and a stirrup member 31. The ferrule 28 may consist of a cast metal member having a substantially cylindrical ferrule portion which is provided with a cylindrical socket 32 of substantial length for receiving the end of the wooden pole 27. The wooden pole has a tight frictional fit in the socket 32 and is additionally secured by a transversely extending metal rivet 33 which passes through both walls of the ferrule and through a registering hole in the pole 27.

At its upper or closed end 34 the ferrule 28 carries the parallel supporting flanges 29 and 30 previously described, and the flanges 29 and 30 extend longitudinally and laterally, that is diagonally, with respect to the axis of the pole 27. The angle at which these supporting flanges 29, 30 extend is such that when the pole 27 is held in the hands of the operator extending diagonally outward from the transmission line pole where the operator is standing, the face of the meter 11 extends transversely to the line of vision of the operator so that the instrument can be read most conveniently. Naturally this angle may be varied considerably, and there is disclosed herein a universal fitting which permits an additional adjustment of the angle of the holder so as to meet all conditions.

The diagonally extending supporting flanges 29, 30 are preferably provided with outer flat sides 35, 36 for engagement with the inner flat surfaces 37, 38 of the stirrup 31 (Fig. 3). At the lower end of each of the flanges 29, 30, that is, closest to the ferrule 28, each of these flanges is provided with an outwardly projecting lug 39, and the lug 39 is preferably of substantially cylindrical shape.

At the upper or opposite end of each of the flanges 29, 30 they are provided with a pair of transverse aligned apertures 40, 41 for receiving a bolt 42. The bolt 42 also passes through the apertures 43, 44 in the flanges of the stirrup 31, and the bolt 42 is preferably headed at one end and threaded at the other end to receive a wing nut 45.

In order to provide an increased bearing surface on the flanges 29, 30 for engaging the handle 25, these flanges are provided with oppositely disposed ribs 46, 47 adjacent their outer vertical edges, so as to provide these edges with a relatively wide bearing surface 48, 49 to engage the handle 25.

The stirrup 31 may comprise a cast metal member of substantially U-shape in plan, the U being of rectangular characteristics having a pair of legs 50, 51 joined by a yoke 52. The flanges 50, 51, 52, of which the legs and yoke are made, are preferably substantially rectangular in elevation, except that the yoke 52 may taper toward the top since the handle 25 may also taper toward the top. The inner surfaces 53, 54, 55 of these flanges 50—52 are substantially plane and flat, but in any event they are preferably substantially complementary to the surfaces of the handle 25. In some embodiments of the invention a stirrup of different shape might be provided for securement to a curved handle.

Surfaces 53—55 on the stirrup are preferably covered by a lining of felt 56 which is cemented to these surfaces and which provides a non-slipping gripping surface for engaging the rubber handle 25. The leg flanges 50, 51 of the stirrup 31 are preferably provided with the thinner extensions 57, 58 which are spaced from each other sufficiently so that their inner surfaces 37, 38 fit on the outer surfaces 35, 36 of the supporting flanges 29 and 30.

Extensions 57 and 58 are provided at the top with a circular bore 59 for receiving the bolt 42, and the bore 59 communicates with a slot 60 extending at the rear side of each flange 57 and 58. The flanges 57, 58 are also provided with substantially circular depressions 61, 62 adapted to receive the head of the bolt 42 and the base of the wing nut 45.

Although the bolt shank 42 will pass through the slot 60, the depressions 61, 62 do not have a corresponding slot to pass the head of the bolt 42 or the base of the nut 45. Thus the head of the bolt will be located in these depressions of sockets 61, 62 when the nut is driven home against the flanges of the stirrup. When the nut 45 is backed off the threaded portion of the bolt 42 by an amount equal to the depth of the two sockets 61, 62, then the head and nut are out of the sockets 61, 62 and the bolt 42 may pass out of the slot 60.

The extension flanges 57, 58 are also preferably provided at their lower edge with a substantially circular slot 63 at each side for engaging the cylindrical lug 39 carried by the flanges 29, 30 at each side. The lug 39 is thus adapted to secure the lower end of the stirrup 31 to the fitting 26, but it only performs those functions when the bolt 42 and nut 45 are tightened.

The walls 50, 51, 52 of the stirrup 31 may be relatively thin in order to save material, but are preferably provided at the top and bottom with the reinforcing ribs 64, 65. In order to secure the handle 25 positively against any possibility of axial movement in the stirrup 31, the stirrup is preferably provided with a depending arm 66, the inner surface 67 of which forms a continuation of the inner surface 54 of the yoke 52. Depending arm 66 preferably has an inwardly extending securing flange or lug 68 which may be of any desirable shape, but is preferably made of rectangular shape and plan in this embodiment of the invention.

The handle 25 is then preferably provided on its rear side with a socket 69 extending at right angles to the axis of the handle and located upwardly of its lower end 70 sufficiently so that the holder will grip the handle substantially at the middle of the handle. When the handle 25 is in the stirrup 31, the lug 68 is engaged in its transverse socket 69 in the handle 25, and there is no possiblity of the handle sliding longitudinally in the stirrup 31.

Referring to Fig. 5, which is a fragmentary view similar to Fig. 1, in which the ferrule 28 is replaced by a universal supporting flange 71. This universal supporting flange has a centrally located circular bore 72 which communicates with the outer edge of the flange 71 through a slot 73, so that it may be mounted on the bolt of a universal pole without removing the bolt. The flange 71 also has a regularly spaced laterally projecting lugs 74 supported by grooves 75, the

grooves receiving similar lugs on a similar supporting flange carried by the universal pole.

In this embodiment of the invention the flange 71 preferably extends in a plane which passes through the axis of the handle 25. That is, the aperture 72 for the supporting bolt on the universal pole extends transversely to the handle 25. This permits the adjustment of the angle at which the instrument 11 is held and, of course, the universal fitting 71 permits the use of the instrument on any kind of a universal pole so that it is not necessary to carry so many poles.

The method of manipulation and operation of the instrument and pole and holder is as follows:

The stirrup 31 may be removed from the holder 26 by loosening the nut 45 as previously described, until the bolt 42 will slide out of the slot 62. The stirrup 31 will then pivot about the lugs 39 on the circular slots 63 which serve as bearings for this movement. When the stirrup 31 has been pivoted sufficiently in a counterclockwise direction in Fig. 4 off the bolt 42 to move entirely out of the slot 60, then the stirrup 31 may be lifted from the lugs 39.

The stirrup 31 is first applied to the handle 25 by sliding the lug or flange 68 into its socket 69 in the handle. There is sufficient clearance between the shoulders 76 on the stirrup (Fig. 3) and between the handle when held in the stirrup and the surfaces 77, 78 (Fig. 4) on the ferrule 28 to permit the handle and stirrup to move pivotally when the slots 63 are placed on the lugs 39. The stirrup is then pivoted in a clockwise direction on the lugs 39 to the position of Fig. 2, the bolt 42 entering into the slot 60, and into the apertures 59. The nut 45 may then be tightened on the bolt 42 until the base of the nut 45 is in its socket 61 and the head of the bolt 42 is in socket 62. Thus one bolt 42 is adapted to secure the stirrup and the instrument to the fitting 26.

There is no possibility of the handle sliding in the fitting and no possibility of the instrument being dropped by the fitting. The instrument is held at such an angle that when it is applied to the line the dial 15 and needle 16 are readily visible to the holder. To apply the instrument to the line it is only necessary to open the jaw 20 by pulling on it, and then by means of the pole 27 the instrument is lifted until the line 10 is between the legs 18 and 19. When the line 10 engages the trigger 24 the jaw 20 will snap shut. Current passing in the line will induce a current in the loop 12, which will be indicated by the movement 13 of the instrument 11.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

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

1. In an electrical instrument for high voltage lines the combination of a current measuring instrument of the transformer type having a loop for embracing the conductor of the transmission line, said loop having a movable jaw and said instrument having a dial and an indicating needle actuated by a movement, a handle carried by said instrument and an elongated pole for supporting said instrument for use in making measurements on a high voltage transmission line, said pole having a fitting for engaging the handle comprising a stirrup embracing the handle, said stirrup having supporting flanges, a pair of supporting flanges carried by said pole for engaging the supporting flanges of said stirrup and connecting means for connecting said pairs of flanges.

2. In an electrical instrument for high voltage lines the combination of a current measuring instrument of the transformer type having a loop for embracing the conductor of the transmission line, said loop having a movable jaw and said instrument having a dial and an indicating needle actuated by a movement, a handle carried by said instrument and an elongated pole for supporting said instrument for use in making measurements on a high voltage transmission line, said pole having a fitting for engaging the handle comprising a stirrup embracing the handle, said stirrup having supporting flanges and a pair of supporting flanges carried by said pole for engaging the supporting flanges of said stirrup, and threaded means extending through the supporting flanges on said pole and stirrup for securing the flanges together.

3. In an electrical instrument for high voltage lines the combination of a current measuring instrument of the transformer type having a loop for embracing the conductor of the transmission line, said loop having a movable jaw and said instrument having a dial and an indicating needle actuated by a movement, a handle carried by said instrument and an elongated pole for supporting said instrument for use in making measurements on a high voltage transmission line, said pole having a fitting for engaging the handle comprising a stirrup embracing the handle, said stirrup having supporting flanges and a pair of supporting flanges carried by said pole for engaging the supporting flanges of said stirrup, and threaded means extending through the supporting flanges on said pole and stirrup for securing the flanges together, the said supporting flanges on said pole having laterally projecting lugs and the supporting flanges on said stirrup having grooves for receiving said lugs.

4. In an electrical instrument for high voltage lines the combination of a current measuring instrument of the transformer type having a loop for embracing the conductor of the transmission line, said loop having a movable jaw and said instrument having a dial and an indicating needle actuated by a movement, a handle carried by said instrument and an elongated pole for supporting said instrument for use in making measurements on a high voltage transmission line, said pole having a fitting for engaging the handle comprising a stirrup embracing the handle, said stirrup having supporting flanges and a pair of supporting flanges carried by said pole for engaging the supporting flanges of said stirrup, and threaded means extending through the supporting flanges on said pole and stirrup for securing the flanges together, the said supporting flanges on said pole having laterally projecting lugs and the supporting flanges on said stirrup having grooves for receiving said lugs, one of said pair of supporting flanges having an aperture for the threaded means and the other having a slot for the threaded means, said threaded means comprising a bolt with a head and a nut, said nut and head each engaging in a socket in one of said flanges.

5. In an electrical instrument for high voltage lines the combination of a current measuring instrument of the transformer type having a loop for embracing the conductor of the transmission

line, said loop having a movable jaw and said instrument having a dial and an indicating needle actuated by a movement, a handle carried by said instrument and an elongated pole for supporting said instrument for use in making measurements on a high voltage transmission line, said pole having a fitting for engaging the handle comprising a stirrup embracing the handle, said stirrup having supporting flanges, a pair of supporting flanges carried by said pole for engaging the supporting flanges of said stirrup, said stirrup having a transversely extending lug for engaging an aperture in said handle of said instrument to prevent longitudinal movement of the handle in the stirrup and connecting means for connecting said pairs of flanges.

6. A holder for electrical measuring instruments for high voltage lines comprising a metal fitting adapted to be secured to a pole, said metal fitting having a pair of parallel diagonally extending supporting flanges, and said flanges having registering apertures, a threaded member in said apertures and a stirrup comprising a U-shaped member having flanges engaging and overlapping the said supporting flanges, said threaded member also passing through said stirrup whereby the stirrup may be secured to the fitting, said stirrup comprising a pair of leg flanges and a yoke flange defining a substantially rectangular socket, and said stirrup having an anchoring lug adapted to extend into engagement with a handle in said socket.

7. In a transmission line measuring instrument, the combination of a holder for electrical measuring instruments for high voltage lines comprising a metal fitting adapted to be secured to a pole, said metal fitting having a pair of parallel diagonally extending supporting flanges, and said flanges having registering apertures, a threaded member in said apertures and a stirrup comprising a U-shaped member having flanges engaging and overlapping the said supporting flanges, said threaded member also passing through said stirrup whereby the stirrup may be secured to the fitting, said stirrup comprising a pair of leg flanges and a yoke flange defining a substantially rectangular socket, and said stirrup having an anchoring lug adapted to extend into engagement with a handle in said socket, and an electrical instrument having a handle of substantially rectangular shape adapted to be received in said socket, said handle having a socket for receiving said anchoring lug.

8. In a transmission line measuring instrument, the combination of a holder for electrical measuring instruments for high voltage lines comprising a metal fitting adapted to be secured to a pole, said metal fitting having a pair of parallel diagonally extending supporting flanges, and said flanges having registering apertures, a threaded member in said apertures and a stirrup comprising a U-shaped member having flanges engaging and overlapping the said supporting flanges, said threaded member also passing through said stirrup whereby the stirrup may be secured to the fitting, said stirrup comprising a pair of leg flanges and a yoke flange defining a substantially rectangular socket, and said stirrup having an anchoring lug adapted to extend into engagement with a handle in said socket, said supporting flanges on said fitting having oppositely extending pivotal lugs and said stirrup having grooves for receiving said pivotal lugs whereby the stirrup may be mounted on said lugs and pivoted into position to engage said bolt.

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