R. DEIBEL.

TERMINAL INSULATOR IN JUNCTION BOXES OR THE LIKE.

APPLICATION FILED APR. 29, 1909.

1,027,404.

Patented May 28, 1912.

3 SHEETS—SHEET 1.

Fig. 1

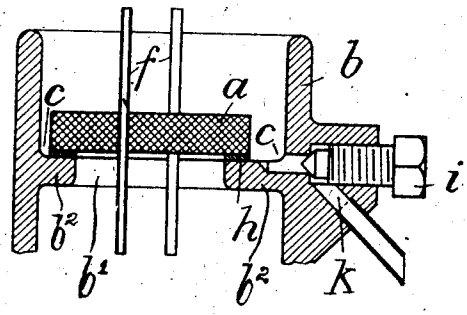


Fig. 3

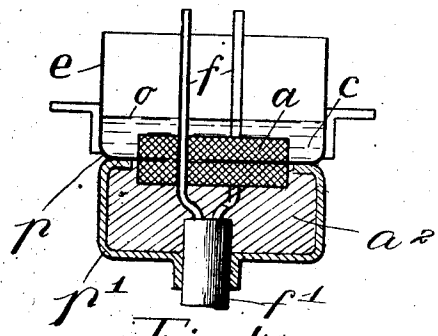


Fig. 4

Fig. 2

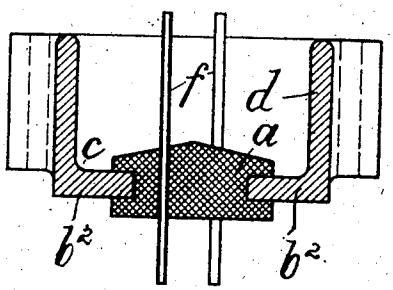
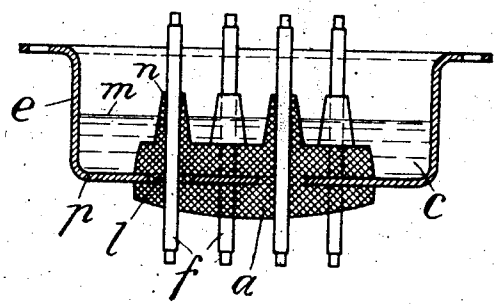
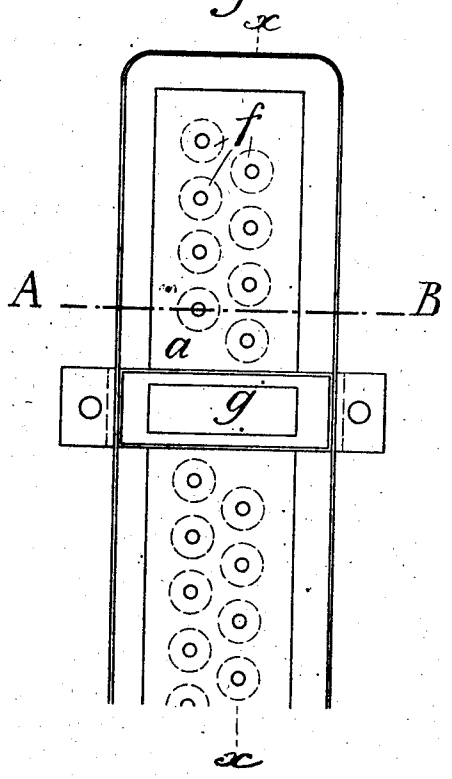


Fig. 5





Witnesses

H. H. Knight

Ray J. Ernst.

Inventor

Robert Deibel

by Knight Bros

his attorneys

R. DEIBEL.

TERMINAL INSULATOR IN JUNCTION BOXES OR THE LIKE.

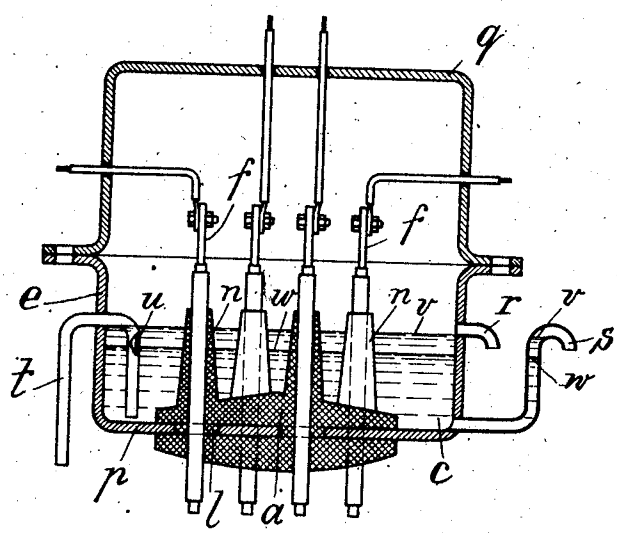
APPLICATION FILED APR. 29, 1909.

1,027,404.

Patented May 28, 1912.

3 SHEETS—SHEET 2.

Fig. 6



Witnesses.

H. H. Knight

Ray T. Ernst.

Inventor

Robert Deibel

by Knight Bros

his attorneys

R. DEIBEL.

TERMINAL INSULATOR IN JUNCTION BOXES OR THE LIKE.

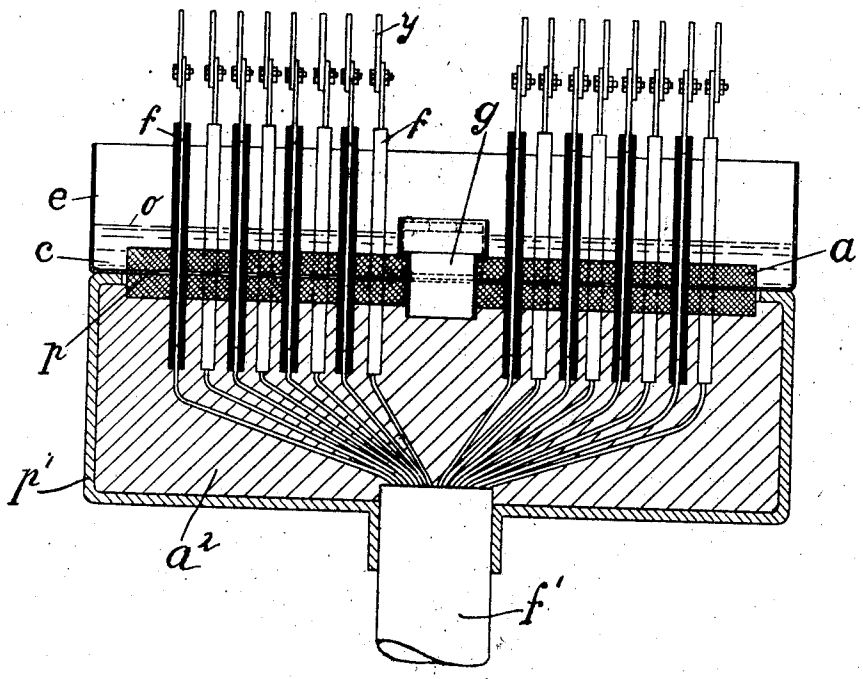
APPLICATION FILED APR. 29, 1909.

1,027,404.

Patented May 28, 1912.

3 SHEETS—SHEET 3.

Fig. 7.



Witnesses:
H. Alfred Jaenke
H. H. Knight

Inventor
Robert Deibel
by Knight Bros
his attorneys.

UNITED STATES PATENT OFFICE.

ROBERT DEIBEL, OF CHARLOTTENBURG, GERMANY, ASSIGNOR TO SIEMENS & HALSKE AKTIENGESELLSCHAFT, OF BERLIN, GERMANY, A CORPORATION.

TERMINAL INSULATOR IN JUNCTION-BOXES OR THE LIKE.

1,027,404. Specification of Letters Patent. Patented May 28, 1912.

Application filed April 29, 1909. Serial No. 492,949.

To all whom it may concern:

Be it known that I, ROBERT DEIBEL, a subject of the German Emperor, and residing at Charlottenburg, near Berlin, Germany, have invented certain new and useful Improvements in Terminal Insulators in Junction-Boxes or the Like, of which the following is a specification.

The subject matter of my invention refers to means for obtaining high surface insulation of the terminal-plates of cable heads, end sleeves, distribution or junction boxes or like apparatus for conductors for electric current of any kind in which a plurality of terminals or junctions are arranged closely beside one another on a plate or the like.

The terminal-plates or similar means employed heretofore have the defect that the moisture precipitated on the surface of the plates causes shunt connections. Also the surface of the plates which generally consists of ebonite or the like is gradually destroyed owing to the separation of sulfur due to the action of the air and light, and consequently the resistance of the insulation is considerably diminished. The above mentioned precipitate of moisture is particularly noticeable in the devices placed in cable pits and in the open air, on account of the great differences in temperature which occur. Now it has already been proposed for overcoming such disadvantages to inclose the junction elements in special receptacles filled with oil so that they are entirely covered by oil. Such covering, however, has the disadvantage, particularly apparent when used for junctions carrying small currents, that the oil adhering to the individual junction elements seriously interferes with alterations of connections and particularly with all soldering operations which may be desired later on. In addition such means heretofore employed do not suit the requirements of the modern art using small currents. It is also common to arrange T-junction boxes for power current cables in such manner that safety devices, interpolated in the branch, are located above the insulating medium, whereas the remaining principal junction elements are arranged in the latter, so that if this arrangement were employed for small current apparatus the above described defects would exist just the same. In addition, these T-junction boxes are usually filled with an insulating medium heavier than water, so that the maintenance of a surface insulation is obviously impossible. Lastly it has also been proposed, for increasing the surface insulation, to coat the terminal-plates or the like with varnish, but this plan is, of course, entirely abortive as the moisture even creeps over the film of varnish.

Now a primary object of my invention is to do away with these defects by placing the terminals and bare conducting parts which I shall altogether call hereafter "junction elements" in the air above the terminal-plate and by covering the terminal-plate with a layer of light oil for assuring good surface insulation, provision being made that the surface of the oil cannot rise under any circumstances to such portions of the bare junction elements at which they are to be connected with other elements of the circuit. Since only oil which is lighter specifically than water is employed, it is impossible for moisture to pass from one connection part to another.

In the new arrangement of the terminal-plates the plate, consisting preferably of a plastic insulating material carrying the terminals or other electrically connecting elements, forms the bottom or a portion of the bottom of a trough-like receptacle, the latter being made of a material to which adheres only very slightly, such as sheet iron and the like. Recesses which serve for collecting the moisture which has precipitated through the oil, are preferably formed by the terminal-plate projecting above the bottom surface of the trough-like receptacle in such manner, that a channel is formed around the plate. The particular materials preferably used for the receptacle and terminal-plate have the advantage that, firstly by employing for the terminal-plate a material which can be worked in plastic condition such as ebonite, a tight fit of the plate to the box bottom and at the terminals or other conducting parts extending through it is obtained, and that, secondly, the oil which protects the plate from the weather and the terminals from leakage of electricity is prevented from creeping over the side walls of the receptacle.

In order that my invention may be clearly understood I will now describe the same with reference to the accompanying draw-

ings in which three constructional forms are represented by way of example.

In said drawings: Figures 1 and 2 are vertical sections through two different constructional forms. Fig. 3 is a like view of a modified form taken in the plane A—B in Fig. 4. Fig. 4 is a top plan view of the form shown in Fig. 3, and indicates also the general arrangements of the other forms, whereas Fig. 5 is a vertical section through another modified form, and Fig. 6 is a vertical section through a closed form provided with overflow devices. Fig. 7 is a vertical section of the form shown in Figs. 3 and 4, taken on the line x—x in Fig. 4 and seen from the left.

Referring to the drawings, the modification shown in Fig. 1 represents a junction box, cable sleeve or the like having the side walls b and the bottom portion b_2 integral therewith, and within walls b the terminal strands f, which form the junction elements by which connection is made with the conductors leading away from the box (as for instance shown in Fig. 6). The bottom of the box or receptacle has an open portion b_1 which is covered by a plate a of insulating material through which the terminal or junction elements f pass and in which they are suitably fastened. The opening b_1 is in this particular case so large that the only remaining portion of bottom b_2 is merely a rim on which plate a rests with a suitable packing material such as for instance india rubber or asbestos h interposed to insure a tight joint, which prevents leaking of the insulating fluid such as oil through the joint. The plate a may be fastened to bottom b_2 in any suitable manner not shown in the drawings. Between the plate a and wall b is left a clear space which forms the channel c. The screw i serves for draining the water which in the course of time collects there. When the screw is loosened a little, water will flow through the hole k and as soon as oil is seen to flow through the same the screw is tightened again. In the other constructional forms a special oil-tight joint in the bottom of the receptacle as in Fig. 1 at h is unnecessary.

In the form shown in Fig. 2 the terminal-plate a is pressed into the open bottom portion against or around the bottom flange b_2 of box d composed of metal, such as cast-iron for example. The channel c is formed, similarly as in the form shown in Fig. 1, by leaving a suitable clear space at the periphery of the plate. The sloping of the surface of the plate a as clearly shown facilitates any moisture flowing into the channel.

In the form shown in Figs. 3 and 4 the box e is made of sheet metal having several openings or perforations in its bottom p, as clearly shown, for the passage of conductors f. The plate a of initially plastic insulating material is pressed against both sides of the bottom of the box. Here also a channel c is left around the periphery of the plate. The holes in the bottom of the box are of sufficiently large diameter to prevent the current jumping from the conductors f to the metallic bottom p of the box. o designates the layer of oil.

The hollow space in a junction box or end sleeve for example, below the terminal-plate formed by the casing p' (Figs. 3 and 7) may be filled up with insulating material in known manner besides providing oil above so that disturbances or troubles in insulation owing to moisture are also not to be feared on the under side. For this purpose the inlet g is provided as shown for instance in Figs. 4 and 7, which leads to the underside of the receptacle bottom; and Fig. 7 clearly shows how the strands f run to their individual places in plate a and how they are embedded in the insulating material a^2. Moreover this figure also shows how conductors y are connected above the oil to strands f.

In order to prevent any oil from creeping through the ebonite plate along the conductors, the material of the plate may be raised tubularly around the terminals to form bosses as shown in Fig. 5. The receptacle is then filled with oil only so far that the ends of these small tubular bosses n project beyond the level m of the oil and consequently the conductors do not contact at all with the oil, as clearly shown in Fig. 5.

In order to keep the level of the oil always below a predetermined maximum level special provisions must be made. If the receptacles are open, as shown in Figs. 1 to 5, the maximum level is determined by the height of the side wall. If there are several distribution boxes they may preferably be placed beside one another and so arranged that overflowing oil from one receptacle runs into less filled receptacles. In closed vessels an overflow r (Fig. 6) must be provided at a suitable height. This simple overflow r has, however, the disadvantage that the insulating oil flows away and, should the rise of the level of the oil have been caused by water flowing in, only water eventually remains in the receptacles. This is prevented when one or more communicating tubes s are provided, the bottom ends of which are arranged close above the bottom of the receptacle, as clearly shown in Fig. 6. These tubes are then always filled with the fluid which collects at the bottom of the receptacle, and only the oil is lost which was in the tubes when they were first filled. A siphon t arranged in like manner acts more certainly and better, said siphon being provided above the normal level w of the oil with an opening u in order to interrupt the outflow of oil by admitting

air when the level *w* is reached. In this manner both the maximum and the minimum levels *v* and *w* of the oil are determined; accordingly the water which has flown in is periodically and automatically completely discharged. When siphons and communicating tubes are employed, as shown in Fig. 6, the arrangement of a channel or groove *c* such as shown in the drawings, into which the water is drained from the top of plate *a* is of particular advantage.

I claim:

1. In a junction box, of the character described, the combination of a receptacle having a portion of its bottom formed of insulating material hermetically attached to the remainder of the bottom and extending a suitable distance above said remaining bottom, to produce a channel between the receptacle walls and the material, said receptacle containing oil of specific weight less than that of water, and electrically conducting junction elements secured in and extending through said insulating material above the surface of the oil, said elements having their junction points located above the surface of the oil.

2. In a junction box, of the character described, the combination of a receptacle having a portion of its bottom formed of initially plastic insulating material hermetically attached to the remainder of the bottom and extending a suitable distance above said remaining bottom, to produce a channel between the receptacle walls and the material, said receptacle containing oil of specific weight less than that of water, and electrically conducting junction elements secured in and extending through said insulating material above the surface of the oil, said elements having their junction points located above the surface of the oil.

3. In a junction box, of the character described, the combination of a receptacle having a portion of its bottom formed of initially plastic insulating material hermetically attached to the remainder of the bottom to overlap it above and below and extending a suitable distance above said remaining bottom, to produce a channel between the receptacle walls and the material, said receptacle containing oil of specific weight less than that of water, and electrically conducting junction elements secured in and extending through said insulating material above the surface of the oil, said elements having their junction points located above the surface of the oil.

4. In a junction box, of the character described, the combination of a receptacle having a portion of its bottom formed of initially plastic insulating material hermetically attached to the remainder of the bottom and extending a suitable distance above said remaining bottom, to produce a channel between the receptacle walls and the material, said receptacle containing oil of specific weight less than that of water, and electrically conducting junction elements secured in and extending through said insulating material above the surface of the oil, said elements having their junction points located above the surface of the oil, and means for draining moisture from the bottom of said channel.

5. In a device of the character described, the combination of a receptacle of suitable material having a bottom formed partly of a plate of insulating, initially plastic material, said plate overlapping the receptacle bottom above and below and of sufficient thickness to protrude into the receptacle and to form with the receptacle wall a channel surrounding said plate, said receptacle containing oil of specific weight less than that of water, and electrically conducting junction elements fixed in said plate and extending above the surface of the oil.

6. In a device of the character described, the combination of a receptacle of suitable material having a bottom formed partly of a plate of insulating initially plastic material, said plate overlapping the receptacle bottom above and below and of sufficient thickness to protrude into the receptacle to form with the receptacle wall a channel surrounding said plate, the upper surface of said plate slanting from the center toward the edges, said receptacle containing oil of specific weight less than water, and electrically conducting junction elements fixed in said plate and extending above the surface of the oil.

7. In a device of the character described, the combination of a receptacle of suitable material having a bottom formed partly of a plate of insulating, initially plastic material, said plate overlapping the receptacle bottom above and below and of sufficient thickness to form with the receptacle wall a channel surrounding the plate, said receptacle containing oil of specific weight less than that of water, said plate having upward extending bosses protruding above the surface of the oil, and an electrically conducting junction element fixed in and extending through each of said bosses.

8. In a device of the character described, the combination of a receptacle of suitable material having a bottom formed partly of a plate of insulating, initially plastic material, said plate overlapping the receptacle bottom above and below and of sufficient thickness to form with the receptacle wall a channel surrounding the plate, the upper surface of the plate slanting from its center toward the edges, said receptacle containing oil of specific weight less than that of water, said plate having upward extending bosses protruding above the surface of the oil, and

an electrically conducting junction element fixed in and extending through each of said bosses.

9. In a device of the character described, the combination of a receptacle of a suitable material having a bottom formed partly of a plate of insulating, initially plastic material, said receptacle containing oil of specific weight less than that of water, and electrically conducting junction elements carried by and extending through said plate above the surface of the oil, and means for preventing the oil from exceeding the desired maximum level.

10. In a device of the character described, the combination of a receptacle of suitable material having a bottom formed partly of a plate of insulating, initially plastic material, said receptacle containing oil of specific weight less than that of water, and electrically conducting junction elements carried by and extending through said plate above the surface of the oil, said receptacle having a tube for conveying fluid out of it and into an adjoining receptacle, said tube extending from the bottom of the receptacle upward slightly above the normal oil level and slightly downward again, substantially as shown to prevent the oil from exceeding the desired maximum level.

11. In a device of the character described, the combination of a receptacle of suitable material having a bottom formed partly of a plate of insulating, initially plastic material, said receptacle containing oil of specific weight less than that of water, and electrically conducting junction elements carried by and extending through said plate above the surface of the oil, and a siphon tube in said receptacle extending from near the bottom thereof to the height of the maximum oil level and out through the wall of the receptacle, said siphon tube having an opening inside of the receptacle at the height of the minimum oil level to break the siphon action when the oil level has fallen to the minimum level to prevent the oil from exceeding the desired maximum level.

In testimony whereof I have signed my name to this specification in the presence of two witnesses.

ROBERT DEIBEL.

Witnesses:
HENRY HASPER,
WOLDEMAR HAUPT.