Dec. 8, 1925. 1,564,840

G. S. FABER

ELECTRICAL CONTACT

Filed March 28, 1924 3 Sheets-Sheet 1

Fig. 1.

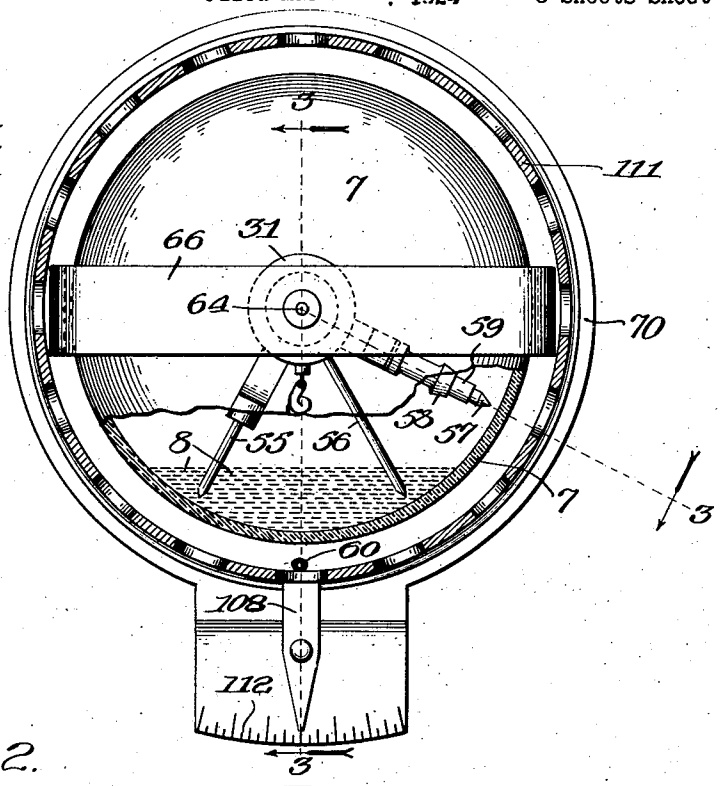
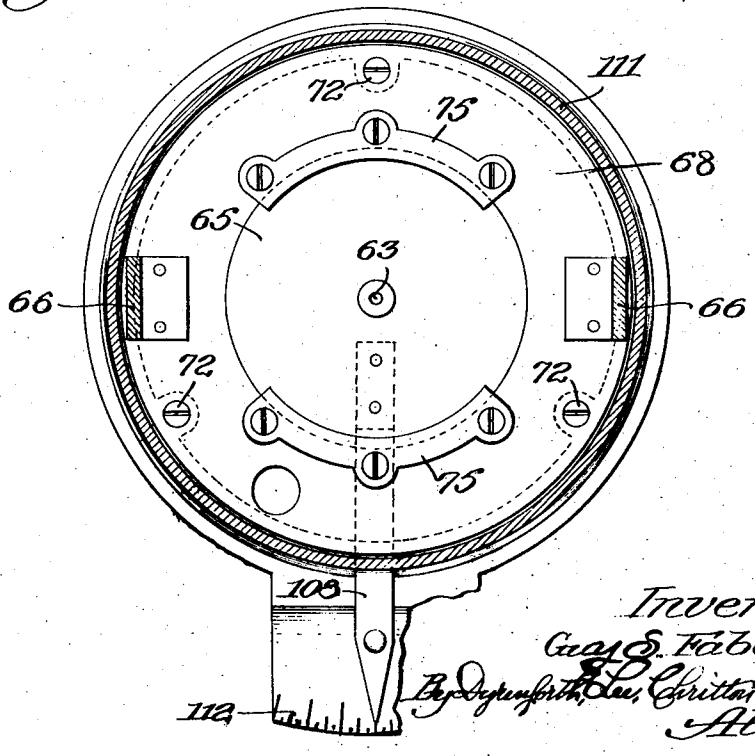


Fig. 2.



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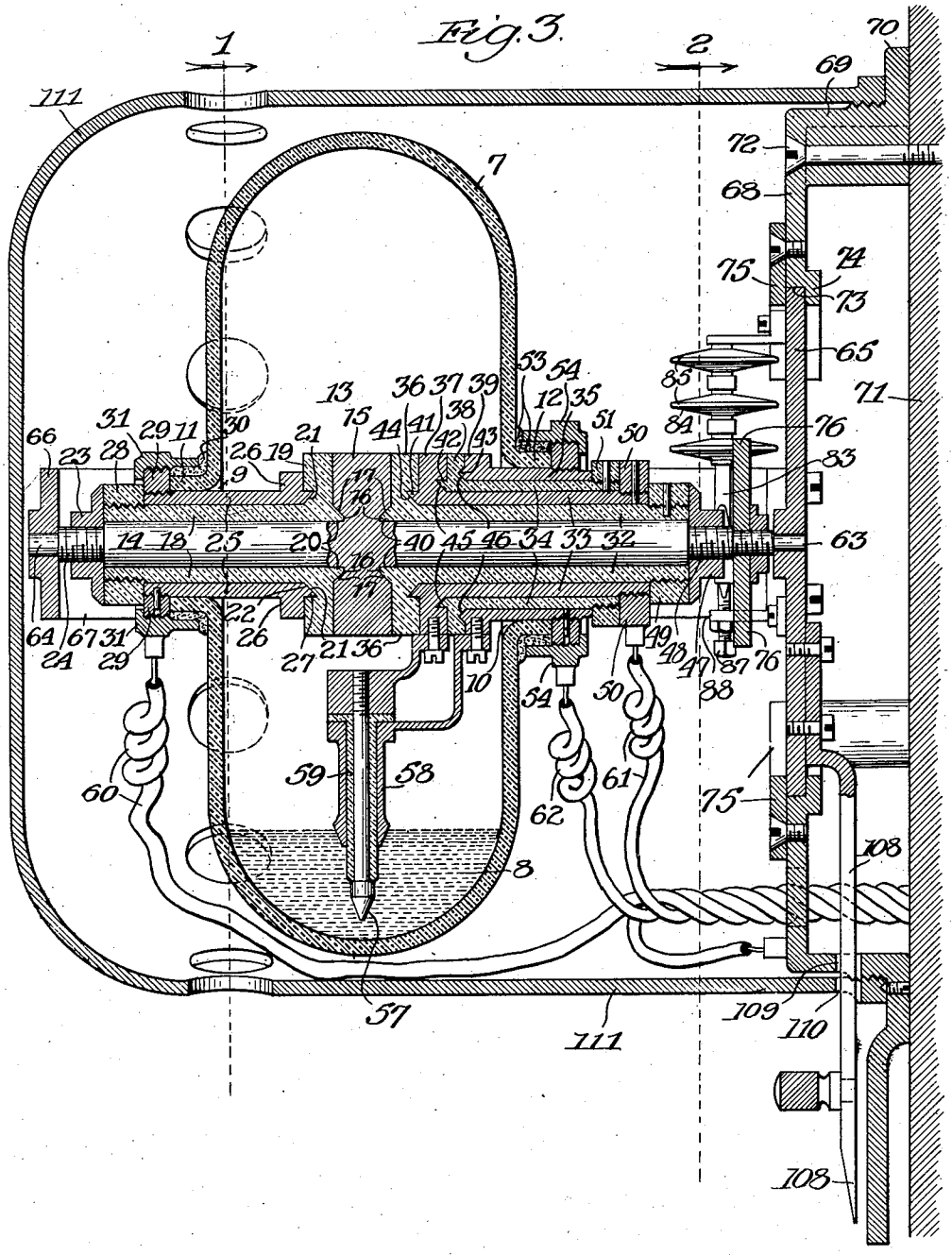
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Filed March 28, 1924 3 Sheets-Sheet 2

Fig. 3.



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ELECTRICAL CONTACT

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Fig. 4.

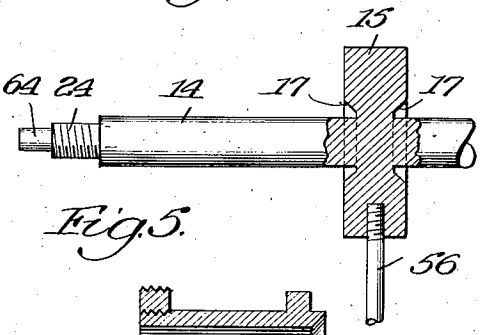
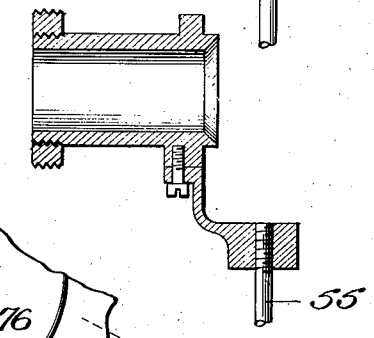


Fig. 6.

Fig. 5.



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Patented Dec. 8, 1925. 1,564,840

UNITED STATES PATENT OFFICE.

GUY S. FABER, OF CHICAGO, ILLINOIS.

ELECTRICAL CONTACT.

Application filed March 28, 1924. Serial No. 702,573.

To all whom it may concern:

Be it known that I, GUY S. FABER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Electrical Contacts, of which the following is a specification.

My invention relates, more particularly, to electrical contact devices comprising a receptacle for a flowable mass of current-conducting material, as for example mercury, and a contact-device, or devices, adapted to co-operate with the mercury, the parts of the structure being so constructed and arranged that the contact-device or devices, and the mercury may be caused to be relatively moved to control the electrical contacting of the mercury with contact-devices; devices of this character being adapted for use in a wide range of situations, as for example for temperature control, humidifying purposes, pressure-control, etc.

My primary object is to provide a novel, simple and economical construction of contact making and breaking device of the general type above stated. More especially, my objects are to provide a construction whereby, where a plurality of contacts for engagement with the flowable mass are provided, the several contacts may be adjusted relative to each other; to provide, in connection with the relative adjustment just referred to, for the bodily adjustment of the contacts relative to the flowable mass; to eliminate the location of the contact device in the wall of the receptacle in which the flowable mass is located, which is of a special advantage where the receptacle is formed of glass, this being the most desirable material, and more especially where vacuum or a particular gas, other than air, is to be maintained in the receptacle, inasmuch as the provisions of the contact devices in the wall of the receptacle involves considerable expense as these contact-devices are required to be "sealed-in" the wall and furthermore, especially in the use of heavy currents, the contact-devices become heated and under the ensuing expansion and contraction the joints between the contact-devices and the receptacle-wall become impaired and furthermore undesirable electrolytic action is produced effecting undesirable corrosion of the metal at the joints; and to reduce, to the minimum, the number of openings required to be sealed in the receptacle.

Referring to the accompanying drawings: Figure 1 is a face view of a contact making and breaking device constructed in accordance with my invention and constituting one of the embodiments thereof, with a certain portion of the construction shown in sections, the section being taken at the line 1 on Fig. 3 and viewed in the direction of the arrow. Figure 2 is a section taken at the line 2 on Fig. 3 and viewed in the direction of the arrow with certain parts omitted. Figure 3 is an enlarged view of the device in longitudinal sectional elevation, the sections being taken at the line 3 on Fig. 1 and viewed in the direction of the arrow. Figure 4 is a broken view in side elevation of a portion of the supporting member for the receptacle containing the mercury. Figure 5 is a view in longitudinal sectional elevation of one of the current-conducting sleeves forming a portion of the supporting member referred to; and Figure 6, a view in the nature of a diagram showing the contact portions of the device, mechanism for shifting the receptacle and contact-devices, and devices controlling steam lines and in turn controlled by the position of said contact-devices.

As a preface to the following description of the mechanism shown, it may be stated that I have chosen to illustrate my invention as embodied in a contact device for use in connection with the controlling of the flow of fluid, as for example steam, from two separate sources, to its point of use, as for example for heating purposes, where it is desired to maintain a temperature within a certain range, but as will be readily understood, the invention is not limited to its use in such a connection, nor to its embodiment in the particular construction shown.

Referring first to the illustrated construction of contact making and breaking device, it comprises a receptacle forming portions represented at 7 for receiving and confining the flowable mass, as for example mercury represented at 8. The receptacle 7 is preferably of the shape shown and by preference, is formed of glass, the opposite side walls of which are apertured, as indicated at 9 and 10, respectively, at which portions the

side walls are provided with outwardly-extending cylindrical bosses or flanges 11 and 12, respectively. The receptacle 7 is mounted upon a supporting member 13 which extends at its opposite ends through the apertures 9 and 10 and the bosses 11 and 12. The member 13, in the construction shown, comprises an inner shaft 14 of current-conducting material provided at the central portion of the receptacle 7, with an annular flange 15 the opposite side walls of which are annularly grooved, as represented at 16, to afford the inclined annular surfaces 17. A sleeve 18 of insulating material surrounds one end of the shaft 14 and is provided with an annular flange 19, which abuts the adjacent face of the flange 15, the sleeve 18 being provided with an annular flange 20 which extends into the adjacent groove 16 and is of substantially the same cross-section shape as this groove. The opposite face of the flange 19 contains an annular groove 21 affording the inclined wall portion 22. The sleeve 18 is securely held in place on the shaft 14 by a nut 23 which screws upon the reduced, threaded, portion 24 of the shaft 14. Surrounding the sleeve 18 is a sleeve 25 of current-conducting material provided with an annular flange 26 which abuts the outer face of the flange 19 and is provided with an annular flange 27 which extends into, and is of substantially the same cross-sectional shape as, the groove 21, this sleeve being rigidly secured to the sleeve 18 by means of a nut 28 screwing upon the outer end of the sleeve 14 and against the outer end of the sleeve 25. The receptacle 7 is mounted at its boss 11 directly on the sleeve 25, the outer edge of this boss being engaged by a nut 29 which screws upon the outer end of the sleeve 25, the boss 11 being surrounded by any suitable packing material represented at 30, which is compressed about the boss by means of a gland 31 of current-conducting material screwed upon the nut 29. The other end of the shaft 14 carries 4 sleeves 32, 33, 34, and 35 nested as shown, the sleeves 32 and 34 which constitute current-conducting sleeves being formed of any suitable current-conducting material and the sleeves 33 and 35 which are insulating being formed of any suitable insulating material. The inner ends of the sleeves 33 to 35 inclusive are provided with abutting flanges 36, 37, 38 and 39, the sleeve 32 containing an annular flange 40, as explained of the sleeve 18, which extends into the adjacent groove 16 of the shaft 14, and the sleeves 33, 34 and 35 containing annular flanges 41, 42 and 43 which extends into registering grooves 44, 45 and 46 in the faces of the flanges 36, 37 and 38, respectively, one surface of each of these flanges and the opposing surface of the groove into which it extends being tapered as shown and as described of the flange 27 and the groove 21. The sleeve 32 is held to the shaft 14 by a nut 47 screwing on the reduced, threaded, portion 48 on the shaft 14, and the sleeves 33, 34 and 35 are held in the assembled positions shown by means of nuts 49, 50 and 51 screwing upon the threaded, outer, ends of the sleeves 32, 33 and 34 respectively, and against the outer ends of the sleeves 33, 34 and 35 respectively. It may be here stated that the provisions of the nuts 23, 28, 49, 50, 51 and 47, and the flanges of the sleeves 18, 25, 32, 33, 34 and 35 co-operating with the opposing grooves in the members adjacent thereto, permits of the holding of the several parts forming the supporting member 14, sufficiently tightly together to effect a hermetic seal between these parts, preventing the entry therethrough of air into the receptacle 7 where a vacuum is provided in the latter, or the escape of gas from the receptacle, or its dilution, where the receptacle is charged with gas other than air.

The boss 12 surrounds the sleeve 35 and is engaged at its outer end by a nut 52 screwing upon the outer end of the sleeve 35, packing 53 surrounding the boss 12 and being compressed, to form a tight joint, by a gland 54 screwed upon the nut 52.

In forming the structure described, the receptacle 7 is preferably provided in sections, the joint between which would extend cross-wise of the axes of the receptacle and substantially equi-distant from the opposed flat walls of the latter and in such condition assembled with the structure 13, the joint between the sections of the receptacle being afterwards closed, as by fusing together their opposed edges. Where it is desired that a vacuum exist in the receptacle, or where the receptacle is to contain a gas other than air, the air in the receptacle would be exhausted, in any suitable manner, as for example by providing an opening in the wall of the receptacle for communication with the vacuum-producing apparatus, and the gas-introducing apparatus where gas is to be introduced into the receptacle, and thereafter sealing such opening. In this connection it may be stated that by constructing the apparatus as shown and described the various joints between its parts are rendered hermetically sealed.

The sleeves 25, 33, and 35 and the shaft 14 form supports for contact devices represented at 55, 56, 57 and 58 adapted to be moved into and out of the mercury 8, in the rotation of the member 13, the contacts 55 and 56 being spaced apart and disposed in different angular positions about the member 13 and in spaced relation, and in different angular positions relative, to the contacts 57 and 58 which, in the construction shown occupy the same angular posi-

tion on the member 13, but are of different lengths. The contact 58, which surrounds the contact 57 but is maintained out of contact therewith by the interposed sleeve 59 of insulating material, is in the form of a sleeve which reaches short of the lower end of the contact 57 which is of a length sufficient to cause it to contact with the mercury 8 in the rotation of the member 13 to a certain position. The current-conducting wires for the contacts 55, 57 and 58, are represented at 60, 61 and 62 and are connected with the outer ends of the sleeves 25, 33 and 35 respectively, the wire 60 being connected with the gland 31, the wire 61 with the nut 50 and the wire 62 with the gland 54, it being noted that all of these electrical connections are exterior of the receptacle 7. The shaft 14, in the particular arrangement shown is grounded through the portions of the apparatus at which the supporting member 13 is supported as hereinafter described.

The extremities of the shaft 14 are in the form of journals represented at 63 and 64 at which this shaft is mounted in a disk 65 and the front, cross, member 66, respectively, of a yoke 67 rigidly secured at its rearwardly-extending arms to the plate-portion 68 of a cup shaped member 69 provided at its open end with an annular flange 70 at which this member bears against the support to which it is to be attached, as for example, a wall 71 of a room, the member 69 being shown as secured thereto as through the medium of screws 72. The central portion of the plate 68 is cut away to provide a circular opening 73 into the plane of which a rearwardly off-set annular flange 74 of the plate 68 extends. The disk 65 is located, and rotatable in the opening 73 and is held against lateral displacement therein by the flange 74, and segments 75 secured to the plate 68 to overlap the forward face of the disk 65. In the preferred, illustrated, embodiment of my invention provision is made for rocking the supporting member 13 responsive to changes in the temperature of the air surrounding the contact device. The particular mechanism shown for this purpose comprising a disk 76 rigidly secured to the shaft 14 to rotate therewith, this disk being provided with an eccentrically-disposed pin 77 extending into a slot 78 in an end of a lever 79 connected at its opposite end with a coil spring 80 tending to swing this lever in clockwise direction in Fig. 6. The upper and lower surfaces of the lever 79 contain V-shaped notches 81 and 82 which are off-set relative to each other in the direction of the length of the lever. The recess 81 co-operates with the knife-edge extremity 83 of a device 84, carried by the disk 65. The device 84 is of such construction that upon the rise in temperature of the air surrounding the apparatus, it expands and forces the portion 83 downwardly, and upon the lowering of the temperature of the air the device contracts and raises the portion 83. The particular illustrated device 84 is of a type commonly provided for temperature regulation and involving inter-communicating lengthwise expansible bellows-chambers 85 in which a highly volatile liquid, such as ether is located. The recess 82 co-operates with the upper cone-shaped extremity 86 of a fulcruming device 87 shown as in the form of a screw mounted in a lug 88 on the disk 65 for vertical adjustment thereon, it being understood that the lever 79, in response to the expanding of the device 84 in opposition to the spring 80, and under the action of the spring 80 in the contracting of the device 84, rocks upon the fulcrum 86 and thereby rotates the disk 76 together with the member 13 and the parts carried thereby in one direction or the other, depending upon the direction in which the part 83 is moved, whereby the several contact-devices are caused to be moved into different positions relative to the mercury 8.

Referring now to the particular use to which my invention is shown as applied, namely, to the supplying of steam, as for example, for heating purposes, from two different sources to maintain a substantially constant temperature: two steam lines are represented at 89 and 90, these lines being provided with valves 91 and 92 respectively, the stems of which are equipped with armatures 93 and 94 respectively for co-operation with electro-magnets. The armature 93 co-operates with electro-magnets 95 and 96 and the armature 94 with electro-magnets 97 and 98, the energizing of the magnets 96 and 98 operating to move the valves 91 and 92 to the closed position shown in Fig. 6 wherein the supplying of steam through the pipes 89 and 90 is arrested, and the energizing of the magnets 95 and 97 operating to rotate the valves 91 and 92 to open position in which steam flows through these pipes.

In the particular arrangement shown a source of current supply, shown as a battery, is represented at 99, from one terminal of which leads a wire 100 electrically connected with the shaft 14, and consequently the contact device 56, by grounding this wire, it being noted that the shaft 14 is grounded. The other terminal of the battery 99 connects with a wire 101 which latter is connected with one of the terminals of the winding of the magnet 97 the other terminal of this winding being connected, with the wire 62 and thus with the sleeve 35. A wire 103 connects with the wire 101 and with one of the terminals of the winding of the magnet 96, the other terminal of which connects with a wire 104 joined to

the wire 60 which latter is connected with one of the terminals of the magnet 98, the other terminal of which connects, by a wire 106, with the wire 101. A wire 107 connects at one end with the wire 101 and at its opposite end with one of the terminals of the winding of the magnet 95, the other terminal of which connects by a wire 61 and thus with the sleeve 33.

In the normal position of the part shown in the drawings, the contacts 55 and 56 are shown as extending into the mercury 8, and the device 84 is represented in expanded condition, the expanding of this device having rotated the member 13 and the parts supported thereby to a position in which the contacts just referred to engage the mercury, with the result of energizing the magnets 96 and 98 which effects rotation of the valves 91 and 92 to the "off" position shown in the drawings. As the temperature of the air surrounding the apparatus decreases, the device 84 contracts, with the result of the lever 79 being rocked in counterclockwise direction in Fig. 6 under the action of the spring 80, this lever swinging on the fulcrum 87 and rotating the member 13 in clockwise direction in Figs. 1 and 6. Thus rotating the member 13 causes the contact 57 to engage the mercury 8, whereupon the magnet 95 is energized which causes the valve 91 to move to open position, whereby steam flows through the line 89 to its point of use. If conditions are such that the supplying of steam through the pipe 89 is required to be augmented by supplying steam through the pipe 90 to produce the desired temperature, the member 13 will continue to rotate in the direction stated and cause the contact 58 to engage the mercury 8 whereupon the magnet 97 becomes energized and opens the valve 92 and permits steam to flow through the pipe 90 to the point of use. The valves 91 and 92, the latter in case conditions are such that it has opened, remain open until the device 84 by reason of the heating of the atmosphere surrounding it, expands sufficiently to rotate the member 13 in counterclockwise direction in Figs. 1 and 6 to a position in which the contact-device 55 engages the mercury 8, whereupon both of the magnets 96 and 98 become energized with the result of closing the valves 91 and 92 thus shutting off the flow of steam through both pipes 89 and 90.

It will be understood from the foregoing that the current for all of the separate contact-devices, is led into the receptacle 7 through the axially disposed member 13, as distinguished from leading the current into the receptacle 7 through openings especially provided for this purpose. This feature of the invention is of special advantage where a vacuum, or a special gas, is to be maintained in the interior of the receptacle, and especially when the latter is of glass. Regardless of the number of separate contact-devices employed the only openings necessary to be provided in the walls of the receptacle 7 and which would be required to be hermetically sealed where vacuum, or a particular gas, is to be maintained in the receptacle, are the two openings in the opposite side walls of the receptacle and through which the member 13 extends. Not only is the cost of producing the structure thereby reduced, but it is rendered more durable, and less liable to impairment.

Furthermore while the structure is shown as provided with a certain number of contact-devices, it will be readily understood that the number thereof may be increased, or decreased, as desired.

The feature of rotatably mounting the disk 65, which form a support for the structure comprising the receptacle 7 and the member 13, the disk 65, being shown as provided with an arm 108 which extends through openings 109 and 110 in the member 69 and in a housing-globe 111 screwed upon the member 69, the lower end of the arm 108 being in the form of a pointer, is of advantage inasmuch as it permits of the bodily adjustment of the various contact-devices, as a unit, as distinguished from the adjustment of these contact-devices relative to each other which is very desirable when the device is used in certain situations, as for example, for temperature control, where the ranges of temperature to be maintained are to be varied, as desired, and to the end of facilitating the proper adjustment of the parts as stated, a scale 112 may be provided on the members 69 for co-operation with the pointer 110.

The arrangement of the parts of the member 13 is such that while leakage into or out of the receptacle 7 is prevented, the various sleeve-devices carrying the contacts may be rotated independently of each other for the relative adjusting of the contact-devices, either for the setting of the contacts at the desired angular positions with respect to each other, in the initial assembly of the parts, or for subsequently adjusting them, the construction shown lending itself to the easy adjustment of the contacts relative to each other.

While I have illustrated and described a particular construction embodying my invention and have shown it as applied to a particular use, I do not wish to be understood as intending to limit it thereto, as the same may be modified and altered without departing from the spirit of my invention.

What I claim as new, and desire to secure by Letters Patent, is:

1. In a contact-making-and-breaking device, the combination of a rock-member, a

glass receptacle having an opening therein and provided at said opening with an outwardly extending boss, a flowable mass of current-conducting material in said receptacle, a rock-member extending into said boss, means hermetically sealing the joint between said boss and rock-member, and a contact device on, and movable with, said rock-member into and out of engagement with said mass.

2. In a contact-making-and-breaking device, the combination of a rock-member, a glass receptacle having openings therein at its opposite sides and provided at said openings with outwardly extending bosses, a flowable mass of current-conducting material in said receptacle, a rock-member extending into said bosses, means hermetically sealing the joints between said bosses and said rock-member, and a contact device on, and movable with, said rock-member into and out of engagement with said mass.

3. In a contact-making-and-breaking device, the combination of a receptacle, a flowable mass of current-conducting material in said receptacle, a rock-member, and contact-devices on said rock-member and movable into and out of engagement with said mass, and adapted to be adjusted into different positions relative to each other, said receptacle, rock-member and contact-devices being adjustable as a unit to vary the position of said contact-devices relative to said mass.

4. In a contact-making-and-breaking device, the combination of a receptacle, a flowable mass of current-conducting material in said receptacle, a rock-member, current-conducting sleeves insulated from each other and nested on said rock-member, and contact devices on said sleeves movable into and out of engagement with said mass.

5. In a contact-making-and-breaking device, the combination of a rockably mounted receptacle, a flowable mass of current-conducting material in said receptacle, and a plurality of nested sleeve members extending into said receptacle, certain of said sleeve members being of current-conducting material and adapted to extend into said mass, and certain thereof of insulating material, said sleeves having flanges adjacent ones of which are in flatwise contact.

6. In a contact-making-and-breaking device, the combination of a rockably mounted receptacle, a flowable mass of current-conducting material in said receptacle, and a plurality of nested sleeve members extending into said receptacle, certain of said sleeve members being of current-conducting material and adapted to extend into said mass, and certain thereof insulating material, said sleeves having flanges adjacent ones of which are in flatwise contact, and means for forcing said flanges into tight joint-forming condition.

7. In a contact-making-and-breaking device, the combination of a rock-member, a receptacle supported thereon and into which said rock-member extends, a flowable mass of current-conducting material in said receptacle, a flange on said rock-member within said receptacle, nested sleeve members mounted on said rock-member, said sleeve members being of current-conducting material and current-insulating material, respectively, flanges on adjacent ends of said sleeve members and opposing said flange on said rock member, and means for clamping said flanges flatwise together.

8. In a contact-making-and-breaking device, the combination of a rock-member, a receptacle supported thereon and into which said rock-member extends, a flowable mass of current-conducting material in said receptacle, a flange on said rock-member within said receptacle, nested sleeve members mounted on said rock member, said sleeve members being of current-conducting material and current-insulating material, respectively, flanges on adjacent ends of said sleeve members and opposing said flange on said rock-member, and means exterior of said receptacle for exerting clamping pressure for drawing said flanges into close flatwise contact.

9. In a contact-making-and-breaking device, the combination of a receptacle, a flowable mass of current-conducting material in said receptacle, a rock-member, sleeves of current-conducting material and current-insulating material, respectively, nested on said rock-member, and contact-devices adapted to be moved into and out of engagement with said mass, one of said contact devices being on said sleeve of current-conducting material.

10. In a current-making-and-breaking device, the combination of a receptacle, a flowable mass of current-conducting material in said receptacle, a rock-member extending into and through said receptacle, sleeves of current-conducting material mounted on said rock-member at opposite sides of said receptacle and extending into the latter, means insulating said sleeves from said rock-member, and contact devices on said sleeves movable into and out of engagement with said mass.

11. In a contact-making-and-breaking device, the combination of a rockably mounted receptacle, a flowable mass of current-conducting material in said receptacle, and a plurality of nested sleeve members extending into said receptacle, certain of said sleeve members being of current-conducting material and adapted to extend into said

mass, and certain thereof of insulating material.

12. In a contact-making-and-breaking device, the combination of a rockably mounted receptacle, a flowable mass of current-conducing material in said receptacle, a member of current-conducting material extending into said receptacle and adapted to extend into said mass, and a plurality of nested sleeves surrounding said member and of current-conducting material and insulating material, respectively, said sleeve of insulating material being interposed between said member and said sleeve of current-conducting material and said sleeve of current-conducting material being adapted to extend into said mass.

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