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FLUID LEVEL INDICATOR AND LEADING-IN ARRANGEMENT FOR ELECTRODES IN HOT HIGH PRESSURE ROOMS

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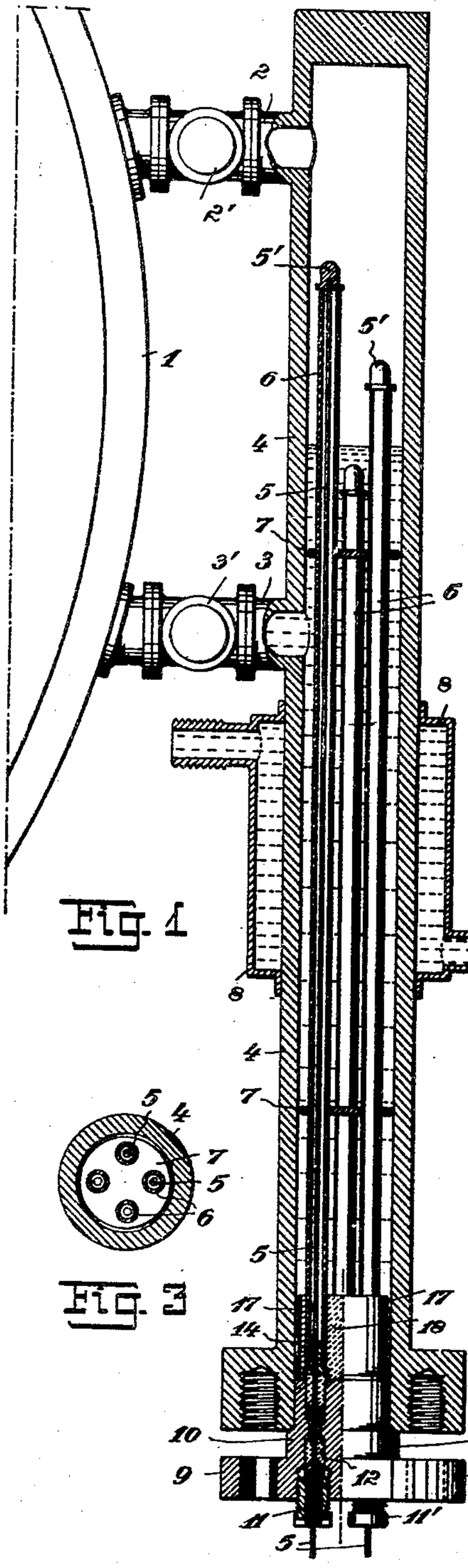

Fig. 1

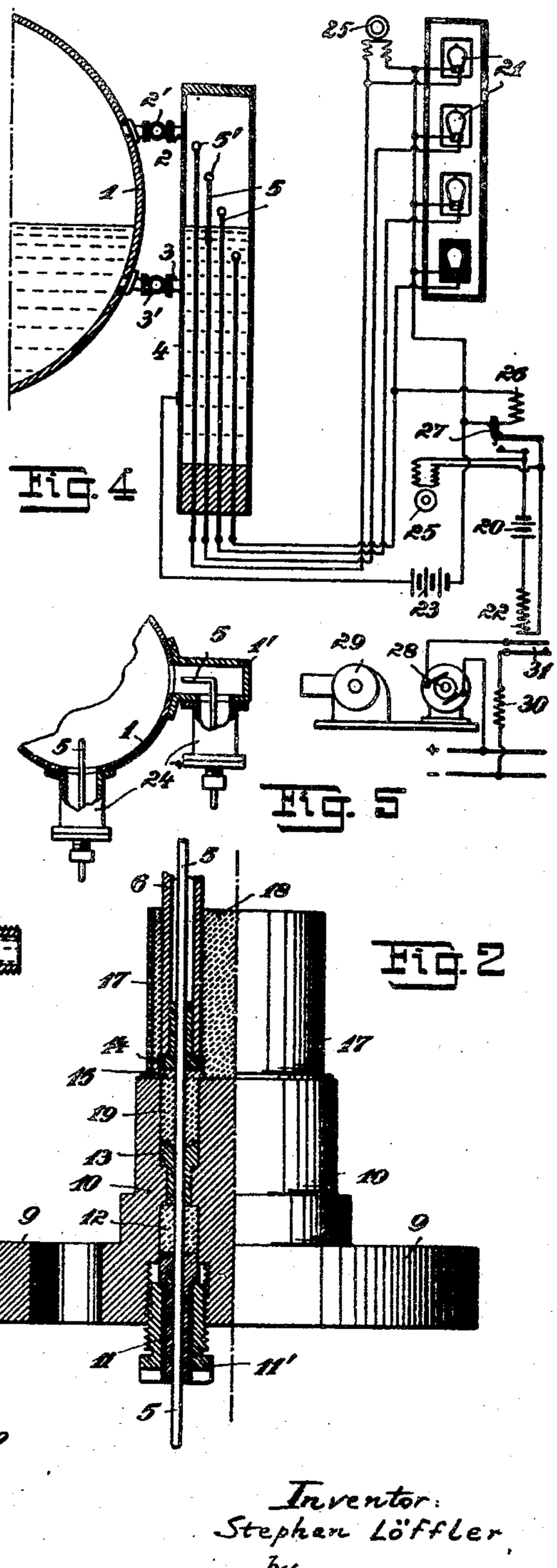

Fig. 4

Fig. 5

Fig. 3

Fig. 2

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FLUID-LEVEL INDICATOR AND LEADING-IN ARRANGEMENT FOR ELECTRODES IN HOT HIGH-PRESSURE ROOMS.

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The present invention relates to improvements in fluid-level indicators of the type wherein the fluid completes the circuit across a pair of electrodes arranged in circuit with a distant indicator and more especially to the leading in of the electrodes for highly heated high-pressure chambers or spaces such as, for instance, high-pressure steam boilers, which today are working with pressures from 50 up to 200 atmospheres. In boilers of this kind the temperatures are also very high amounting in fact up to 500° C., and unless special measures are taken for indicating, the known electric insulating materials will be destroyed. In accordance with the present invention a special arrangement is resorted to, by means of which the temperature at the ducts of the electrodes is kept sufficiently low so that it becomes possible to employ the known insulating materials for packing the electrodes and thereby to secure a lasting and efficient packing. This arrangement is not only suited for electrodes serving for the indicating of fluid levels, but also for other kinds of electrodes or electrical conductors, which are to be introduced into a boiler, as for example electrodes for the heating of steam boilers. Finally, the duct for the electrodes is not only suited for spaces or chambers filled with a fluid, but also for chambers containing steam or gases.

According to the invention a series of electrodes is arranged in a vessel or compartment which communicates with the high-pressure boiler boiler or chamber. The electrodes are arranged in such a manner that as the fluid level varies it successively completes or breaks the circuit across them. Upon the making of each contact a special circuit is closed, which contains a suitable optical signalling device, for instance glow-lamps or electromagneticaly operated flags. When these devices are arranged perpendicularly one above the other the operation of the same will illustrate the fluid-level in the pressure chamber. Some of the signal circuits may also, by means of relay arrangements, be used for automatic control of certain operations, for example the starting and stopping of the feed-water pump of the boiler.

As the leading-in place of the electrodes must not be exposed to the hot temperature of the pressure chamber, if the packing thereof is to be protected, such place is therefore arranged in the vessel communicating with the high-pressure chamber and in a part of the said vessel which permanently is filled with a fluid having a temperature which has no disadvantageous effects upon the packing or the insulation of the electrical conductor.

A constructional form of the invention is shown by way of an example in the accompanying drawing.

Fig. 1 is a vertical section through a preferred embodiment of the invention.

Fig. 2 is an enlarged sectional view of the packing place.

Fig. 3 is a cross section through Fig. 1.

Fig. 4 is a diagram showing the electrical connections.

Fig. 5 shows a further example of the employment of the inlet device for the electrodes.

A cylindrical vessel or compartment 4 for the control of the fluid-level is connected to a high-pressure steam boiler 1 by means of short tubes 2 and 3 which can be opened or closed by means of valves or cocks 2′, 3′. The lower end of the vessel 4 extends considerably below the inlet tube 3 and the tubes 2 and 3 are arranged in such a manner that the proper level of the surface of the boiler water is intermediate the two tubes. As will be seen from Figs. 1 and 4 four rod-shaped electrodes 5 are introduced through the lower end 6 of the vessel 4 and terminate at different heights in the upper end of the vessel. The electrodes are insulated up to their points, which are equipped with conducting heads 5′. Outside of the vessel 4 each electrode is connected to one of a series of electrical circuits each of which includes a glow-lamp 21, there being one lamp 21 for each electrode and said lamps being arranged one above the other on an indicator board. The vessel 4 and one pole of each glow lamp are connected respectively to the opposite poles of a battery 23, while each of the electrodes 5 is connected to the other pole of its respective lamp.

As soon as the fluid column in the vessel 4 comes into contact with the conducting head 5′ of one of the electrodes the circuit of the corresponding signal lamp 21 is closed through the fluid and the lamp will light

up, as will be readily understood. The illuminated fields of the indicator board will thus at any time indicate the momentary level of the fluid in the vessel 4 and the boiler 1.

Besides the optical signalling means audible signalling means such as an alarm 25 may also be employed, which preferably is arranged to come into operation at the uppermost and the lowermost fluid-levels.

To the circuit of the lowermost of the electrodes 5 a relay 26 may be connected, the armature 27 of which when said circuit is closed keeps the starting circuit of a motor 28 open, which operates a feeding pump 29 for the boiler 1. As soon as the boiler water sinks below the point of the lowermost electrode, the lowermost signal lamp will be extinguished and simultaneously the relay 26 will drop its armature so that the circuit of the motor 28 is closed over a resistance 30 and the armature contact 31, whereby the boiler feeding-pump 29 is started.

The insulation of the rod-shaped electrodes 5, which must cover the entire length of the same except for the exposed conducting head 5′, consists primarily of a coating of any suitable insulating material. In addition, each coated electrode is arranged in a tube 6 of a refractory material as for example quartz, glass, or porcelain, which extends up to the metallic conducting head or button 5′. This button 5′ rests on the edge of the insulating tube 6, which thus will take up the axial pressure exerted by the fluid pressure within the vessel upon the electrode. The insulating tubes 6 at their lower ends are arranged in such a manner in the packing devices for the electrodes that they are held in a fully fluid-tight state. By means of spacing discs 7 the insulating tubes 6 are held in proper spaced relationship.

According to Fig. 3 four electrodes 5 with their insulating tubes 6 are provided and are preferably arranged circularly. The number of electrodes may be smaller or greater in accordance with the accuracy of control desired.

The part of the vessel 4 lying below the tube 3 is kept filled with water, because the water contents of this part being in a dead space or pocket, can not flow out even if the boiler 1 is emptied. As this lower part of the vessel 4 is of a considerable length and no circulation of the water takes place in the same, its temperature will be substantially the same as the temperature of the surrounding atmosphere. At such temperatures packings with stable insulation may easily be obtained. In addition a cooling device having a cooling jacket 8 may be arranged above the packing part of the vessel. This cooling device may be continuously in activity or it may be employed only when heating the boiler, because during the heating under certain circumstances water of a temperature injurious to the insulation may pass from the boiler to the vessel.

On account of the low temperature at the bottom of the vessel 4 the packing may even be of a relatively simple kind. The vessel is at this end closed by a metal body 10 which is connected to the vessel by means of bolts (not shown) which pass through the apertured flange 9 of said body and screw into threaded apertures provided in the vessel 4 in the same manner as the usual packing gland. The body 10 is also provided with four apertures, through which the electrodes 5 are passed.

As will be best seen from Fig. 2 the electrodes are enclosed by a packing box which is inserted from the outside and consists of an insulating part 11 and a threaded metallic pressure body 11′. The packing box coacts with an insulating packing, preferably a rubber ring 12 which is seated against an insulating sleeve 13 inserted in the plug body 10 from the inside. On the inner side of the body 10 insulating supporting sleeves 14 for the quartz tubes 6 are arranged. The lower ends of the quartz tubes are formed with radial notches 15 or the like. All four tubes are arranged within a sheet metal cylinder 17. The interior of the cylinder 17 has a filling of an insulating mass 18 such as is employed when filling cable junction boxes. By means of this mass each quartz tube 6 is packed against the supporting flange of its sleeve 14 and the electrodes 5 are packed against the body 10 as the filling mass penetrates into the space 19 above the sleeves 13 through the notches 15. The pressure in the vessel 4 will press the packing material between the several parts to be packed with great force. The arrangement of the inlet place in a compartment which is filled with a comparatively cool fluid may be carried into practice in many ways. For example as shown in Fig. 5 the electrodes 5^a for heating the boiler 1^a may be located in cylindrical bodies 24, which are connected to the bottom of the boiler 1^a or to special boiler parts 1′. The cylindrical bodies 24 communicate with the interior of the boiler.

The arrangement by which the electrode packing is located at a cooled place may also be employed for pressure chambers which are filled with gases. In such cases the vessel containing the packing place must be kept filled with a condensing fluid. In such cases a special fluid-filling may also be located in the electrode containing vessel. In some cases, such as where the electric insulating and packing materials may be affected or attacked by the contents of the boiler, it is advisable to fill the vessel containing the electrodes with a fluid which is heavier than the fluid in the high-pressure chamber. If however a cooling fluid is used

which is lighter than the fluid in the high-pressure chamber, the inlet places may then be arranged at the top of the vessel. Such a construction is especially suited for use in connection with heating electrodes.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A liquid leved indicator for fluid containing chambers in which a high temperature and a high pressure exists, comprising a vessel and connections therefrom to said chamber, said vessel having a terminal portion thereof extending beyond the joints of said connections to said vessel in a direction such that said portion will form a dead space through which there will be no circulation of the fluid from said chamber, an electrical conducting liquid contained within said vessel, a cooling jacket for said vessel, an electrode passing through the end of said portion, extending into said vessel and terminating adjacent to said joints, and packing for forming a liquid tight, electric insulating joint at the passing-in place of said electrode.

2. A device of the character described comprising in combination a chamber containing fluid at high temperatures and high pressures, and a vessel connected with said chamber, said vessel having a terminal portion extending a sufficient distance below the point of its connection to said chamber to provide a dead space through which circulation of the fluid from said chamber will not occur, whereby the temperature of the end of said terminal portion will be maintained at a relatively low degree, a cooling jacket for said vessel, an electrode passing through the lower end of said terminal portion and terminating in an exposed conducting head adjacent to the connection of said vessel to said chamber, an electric conducting liquid in said vessel, a liquid tight, electric insulating, packing surrounding said electrode at its passing-in place, and insulation covering said electrode from said packing to said exposed conduction head.

3. A liquid level indicator for chambers containing fluid at high temperatures and high pressures, comprising a vessel and connections therefrom to said chamber arranged at different heights, said vessel having a terminal portion extending a sufficient distance below the lower one of said connections to provide a dead space through which circulation of the fluid from said chamber can not occur, whereby the temperature of the end of said terminal portion will be maintained at a much lower degree than that of said chamber, a cooling jacket for said vessel, a plurality of electrodes passing into said vessel through the lower end thereof and terminating in exposed conducting heads at different heights adjacent to said connections, and packing means at the passing-in joint of said electrodes to form a liquid tight joint between said electrodes and the lower end of said vessel.

4. A liquid level indicator for a chamber containing fluid at high temperatures, comprising a vessel and connections therefrom to said chamber arranged at different heights, said vessel having a terminal portion extending a sufficient distance below the lowermost one of said connections, to provide a dead space through which circulation of the fluid from said chamber will not occur, whereby the temperature adjacent to the lower end of said terminal portion will be maintained at a much lower degree than the temperature within said chamber, a plurality of electrodes passing through the lower end of said terminal portion and terminating within said vessel in exposed contacts at different heights adjacent to said connections, an electric conducting liquid in said vessel, a liquid tight, electric insulating, packing surrounding said electrode at the place where said electrodes pass into said vessel and insulation covering said electrodes between said exposed contact and said packing.

5. A liquid level indicator for a chamber containing fluid at high temperatures, comprising a vessel and connections therefrom to said chamber arranged at different heights, said vessel having a terminal portion extending a sufficient distance below the lowermost one of said connections, to provide a dead space through which circulation of the fluid from said chamber will not occur, whereby the temperature adjacent to the lower end of said terminal portion will be maintained at a much lower degree than the temperature within said chamber, a plurality of rod shaped electrodes passing through the lower end of said terminal portion and terminating within said vessel at different heights adjacent to said connections, an electric conducting liquid in said vessel, packing surrounding the electrodes at the place where said electrodes pass into said vessel, a conducting head secured to the end of each of said electrodes and an insulating tube of refractory material surrounding each electrode from said conducting head to said packing, said tube serving as a support for said head and preventing exial movement of said electrode outwardly of said vessel.

6. A liquid level indicator for a chamber containing fluid at high temperatures, comprising a vessel and connections therefrom to said chamber arranged at different heights, said vessel having a terminal portion extending a sufficient distance below the lowermost one of said connections, to provide a dead space through which circulation of the fluid from said chamber will not occur, whereby the temperature adjacent

to the lower end of said terminal portion will be maintained at a much lower degree than the temperature within said chamber, a plurality of rod shaped electrodes passing through the lower end of said terminal portion and terminating with said vessel at different heights adjacent to said connections, an electric conducting liquid in said vessel, packing surrounding the electrodes at the place where said electrodes pass into said vessel, a conducting head secured to the end of each of said electrodes, an insulating tube of refractory material surrounding each electrode from said conducting head to said packing, said tube serving as a support for said head and preventing axial movement of said electrode outwardly of said vessel, and means to hold said electrodes in spaced relationship within said vessel.

7. A liquid level indicator for a chamber containing fluid at high temperatures, comprising a vessel and connections therefrom to said chamber arranged at different heights, said vessel having a terminal portion extending a sufficient distance below the lowermost one of said connections, to provide a dead space through which circulation of the fluid from said chamber will not occur, whereby the temperature adjacent to the lower end of said terminal portion will be maintained at a much lower degree than the temperature within said chamber, a plurality of rod shaped electrodes passing through the lower end of said terminal portion and terminating within said vessel at different heights adjacent to said connections, an electric conducting liquid in said vessel, packing surrounding the electrodes at the place where said electrodes pass into said vessel, a conducting head secured to the end of each of said electrodes, and an insulating tube of refractory material surrounding each electrode from said conducting head to said packing, said tube serving as a support for said head and preventing axial movement of said electrode outwardly of said vessel, and said packing comprising a filling of insulating material such as the filling mass for cable boxes.

8. A liquid level indicator as set forth in claim 5 in which the packing includes a stuffing box, a sleeve surrounding each electrode and secured in said stuffing box and insulating material interposed between said electrode and sleeve.

9. A liquid level indicator as set forth in claim 5 in which the packing comprises a stuffing box having a hollow sleeve like extension at the inner end thereof into which the insulating tubes extend, a sleeve surrounding each of the electrodes, a packing interposed between each sleeve and electrode, and a mass of insulating material such as the filling mass of cable boxes contained within said sleeve-like extension and surrounding said tubes.

In testimony whereof I affix my signature.

STEPHAN LÖFFLER.