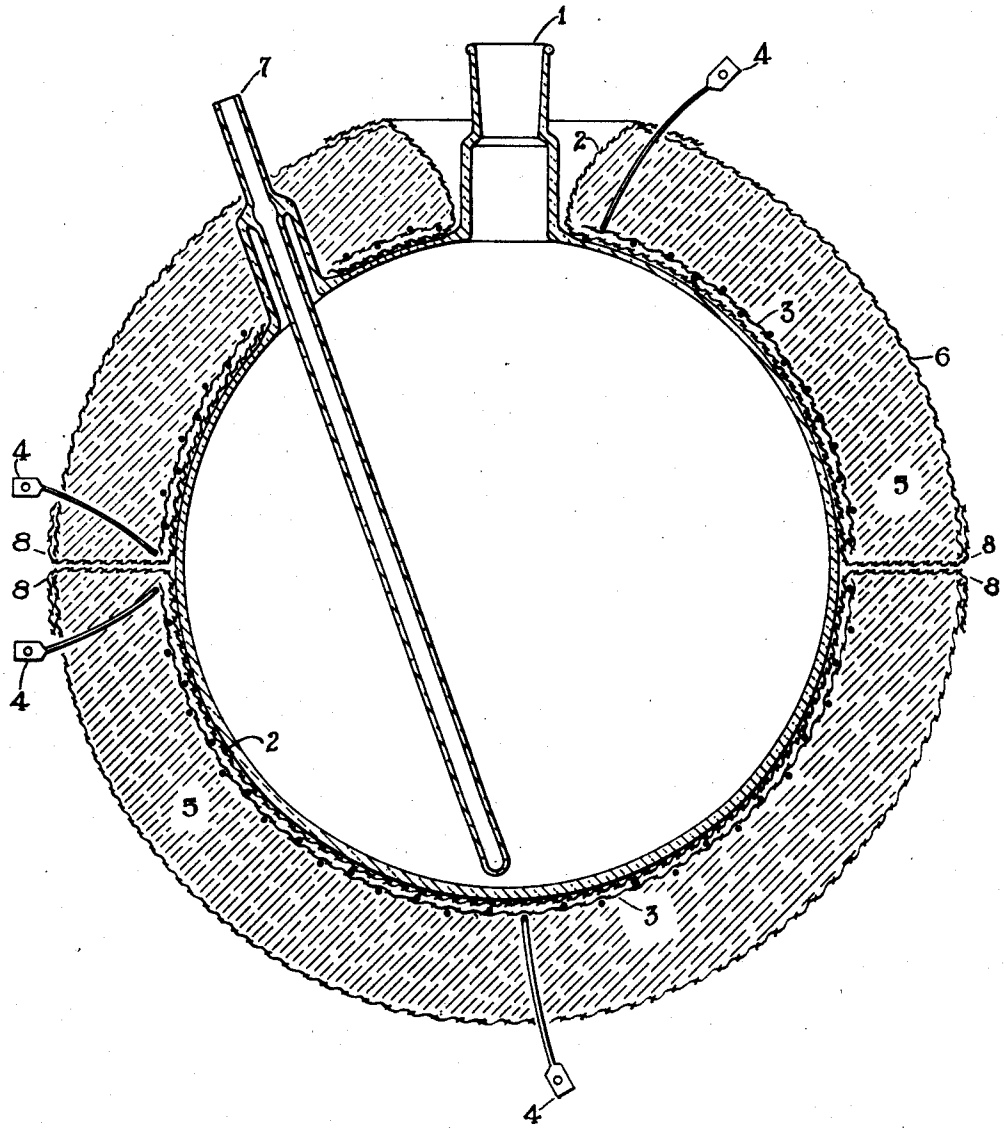
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ELECTRICAL HEATING DEVICE

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ELECTRICAL HEATING DEVICE

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8 Claims. (Cl. 219—44)

My invention relates to a new an useful heating device. More particularly, it relates to an electrical heating apparatus for containers constructed of glass, metal, earthen ware, or the like.

There is a wide range of operations in which containers or flasks are utilized in the heating of liquids or liquids containing solid materials. As, for example, such vessels may be employed as digesters, as kettles for fractionating columns, as kettles in which liquids are kept refluxing for long periods of time, etc.

Such containers are heated in a variety of ways, for example, by the use of oil baths heated with open flames, hot plates, electrical immersion heaters, sand baths, steam jackets, etc. In numerous operations, in particular where containers are used as kettles for fractionating columns, a very exact control of the heat input is highly desirable, and in some cases imperative. In the absence of exact heat control, flooding and derangement of packing in the column often occurs, resulting in faulty fractionation and considerable loss of time. This is especially true when the fractionation is carried out at greatly reduced pressures. Such methods mentioned as hereinbefore disclosed, do not furnish this exact control.

Among the most serious disadvantages in certain of the methods previously employed for heating flasks, are the possibility of fires, and other hazards. This is particularly true of oil baths which are heated with open gas flames. Costly fires, and even loss of life have many times occurred when oil baths are heated with open flames. In many laboratories, and other establishments, large volumes of volatile and inflammable solvents are used, and the presence of an open flame in such places is therefore highly objectionable.

I have now discovered that the above-mentioned difficulties may be overcome by utilizing my new electrical heating device, some of the details of which I have already described in an article entitled: "Improved Method of Heat Input Control in Glass Fractionating Columns," which appeared in the Analytical edition of Industrial and Engineering Chemistry, vol. 30, page 531, September 1938.

My invention consists broadly of an electrical heating device in which fabrics woven of materials, such as glass or asbestos fibers, are employed in a plurality of layers, in combination with suitable heating elements, in such a manner as to permit of exact heat input control. If desirable, a suitable insulating material, such as rock wool, glass wool, asbestos fibers, or the like, may be placed between the heating elements and one or more of the outer layers of fabric.

My invention may be more particularly described by referring to the accompanying drawing, in which a glass flask 1, such as that employed as a kettle for fractionating columns, is covered with a mantle 2 of a fireproof fabric woven of asbestos or glass fibers. The fabric may be fitted closely to the flask by cutting a suitable pattern and sewing it on to the flask. Preferably the fabric should be woven in the form of a hemispherical mantle which covers approximately half the surface of the flask 1. Two such hemispherical mantles cover the entire surface of the flask except for openings cut into the mantle where desired. This first mantle 2, in the accompanying drawing, protects the flask from direct contact with the electrical heating elements. Over this first mantle (layer or covering) another mantle 3 is fitted. The mantle 3 is also woven of asbestos or glass fibers, wherein electrical heating elements, having terminals 4, may be woven or sewn into the fabric per se, or disposed between the fabric layers in any convenient manner. Over the mantle 3, suitable insulating material 5 is fitted. This insulating material may consist of glass wool, asbestos fibers, rock wool, or other suitable material. Over the insulating material is fitted an external mantle 6 of fabric also woven of asbestos, glass fibers, or the like. A light well 7 is fitted into the flask by means of a seal, or by means of a ground glass joint, by which observations within the flask can be made, when desired, by the use of a suitable electrical lighting device. The electric light employed for this purpose is mounted on a suitable rod, which is calibrated in such a manner so that it is possible to determine the volume of the contents of the flask at any desirable interval. The whole assembly of mantles, heating elements, and insulating materials is preferably constructed in the form of two hemispherical members, as shown in the drawing. The hemispherical segments may be held together on the flask by any convenient interlocking means such as by means of sewing, by hooks and eyes, clamps or the like. However, I have found it advantageous to employ a Zipper for this purpose, said Zipper encircling the assembly at the boundary 8 of the two hemispherical members. If the flask is accidentally broken, the heating device can then be quickly removed and transferred to another flask. The heating cur-

rent may be accurately controlled by variable transformers (variacs), or by an external resistance.

It may be desirable to heat only a portion of the surface of the flask, as in the case of liquid phase chlorinations, at or near boiling temperatures, and which require light as a catalyst; or in instances where a refluxing operation is necessary, it is preferred to employ only the lower member of the heating device, since conditions of this type favor a condensation of the liquid, whereas such operations would be considerably retarded if the upper hemispherical member were present. This arrangement is similarly more siutable for digestions and extractions requiring long periods of time, such as, for example, in the extraction of alkaloids from natural sources. The lower portion of my new heating device may be placed in any suitable support, such as a stamped or molded metal form, and the liquid container placed therein. This modification is particularly applicable to operations in which it is desirable to heat quantities of material in a short period of time in a removable container. Likewise, my invention may be employed in heating containers of any shape, provided the design of the heating device utilized fits the contours of the container.

Flasks heated in this manner are seldom broken because of the thick protective covering offered by the heating device. Fractionating columns whose kettles are heated in this manner may be controlled so exactly that they will operate for hours, or even days, with but very little attention.

Having now described my invention, what I claim is:

1. In a heating device, the combination comprising two hollow hemispherical members comprising a plurality of fireproof fabric layers containing electrical heating elements in and between at least one of said layers, and an interlocking means for joining the two said hollow hemispherical members.

2. In a heating device, the combination comprising two hollow hemispherical members comprising a plurality of fireproof fabric layers containing electrical heating elements in and between at least one of said layers, and a Zipper device by which two said hollow hemispherical members are held in combination.

3. A heating device adapted to be detachably fitted to a glass vessel for heating the same, comprising a plurality of layers of flexible woven fireproof fabric formed into a pliable, resilient structure adapted to protect said vessel from mechanical shock and shaped to conform closely to the exterior of said vessel and to cover the bottom and at least a portion of the side walls thereof, and an electrical heating element interposed between layers of said fireproof fabric and affixed to the woven structure of one of said layers in spaced and non-shorting relationship.

4. A heating device adapted to be detachably fitted to a glass vessel for heating the same, comprising a plurality of layers of flexible woven glass fabric formed into a pliable, resilient structure adapted to protect said vessel from mechanical shock and shaped to conform closely to the exterior of said vessel and to cover the bottom and at least a portion of the side walls thereof, and an electrical resistance wire heating element interlocked in the woven structure of an intermediate layer of said glass fabric in spaced and non-shorting relationship.

5. A heating device adapted to be detachably fitted to a substantially spherical glass flask for heating the same, comprising a plurality of layers of flexible woven fireproof fabric formed into a pliable, resilient structure forming a substantially spherical segment adapted to conform closely to the exterior of the lower portion of said flask, and an electrical heating element interposed between layers of said fireproof fabric and affixed to the woven structure of one of said layers in spaced and non-shorting relationship.

6. A heating device adapted to be detachably fitted to a substantially spherical glass flask for heating the same, comprising a plurality of layers of flexible woven glass fabric formed into a pliable, resilient structure forming a substantially spherical segment adapted to conform closely to the exterior of the lower portion of said flask, and an electrical resistance wire heating element interlocked in the woven structure of an intermediate layer of said glass fabric in spaced and non-shorting relationship.

7. A heating device adapted to be detachably fitted to a substantially spherical glass flask for heating the same, comprising an inner layer of flexible woven fireproof fabric, an adjacent layer of flexible woven fireproof fabric having attached thereto, in spaced and non-shorting relationship, an electrical heating element, and an outer layer of flexible woven fireproof fabric, the said layers being formed into a substantially hemispherical, pliable, resilient structure adapted to conform closely to the lower half of said flask, and to protect the same from mechanical shock.

8. A heating device adapted to be detachably fitted to a substantially spherical glass flask for heating the same, comprising an inner layer of flexible woven glass fabric, an adjacent layer of flexible woven glass fabric having interlocked in its woven structure, in spaced and non-shorting relationship, an electrical resistance wire heating element, and an outer layer of flexible woven fireproof fabric, the said layers being formed into a substantially hemispherical, pliable, resilient structure adapted to conform closely to the lower half of said flask, and to protect the same from mechanical shock.

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