March 1, 1955 O. KOELLE 2,703,014

CAPILLARY MANOMETER

Filed March 14, 1951

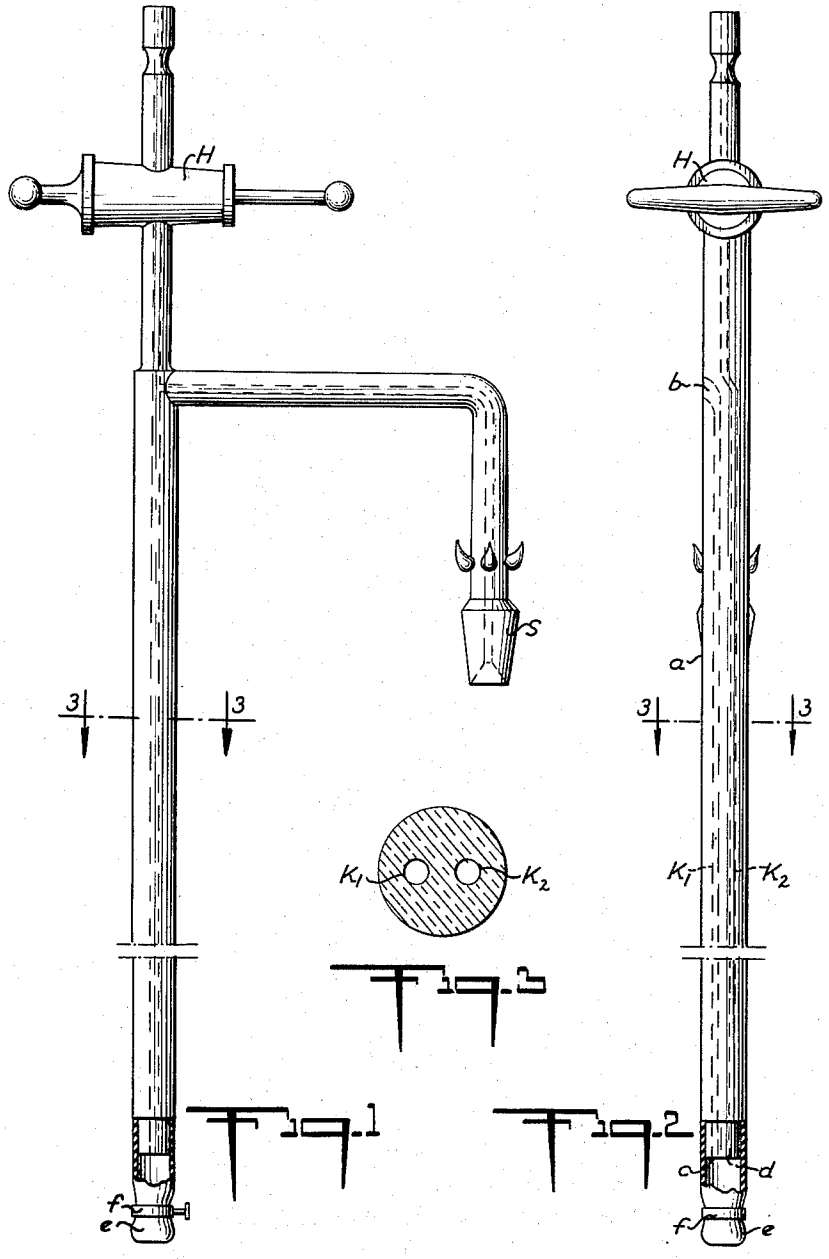


Fig. 3

Fig. 1

Fig. 2

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United States Patent Office 2,703,014 Patented Mar. 1, 1955

2,703,014

CAPILLARY MANOMETER

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Application March 14, 1951, Serial No. 215,501

Claims priority, application Germany March 20, 1950

2 Claims. (Cl. 73—401)

This invention relates to capillary manometers.

The manometer used in the manometric determination of gas changes with the help of Warburg apparatus consists essentially of a capillary tube bent U-shape of which one end is connected with the reaction chamber. The gas mixtures developed in or used up in the reaction chamber during the experiment undergo a change of pressure whilst maintained at constant volume and constant temperature of the gas system, which change in pressure can be read in the difference in levels of the closure or separating liquid of the U-tube, contained in the manometer in both limbs of the said U. The volume of the volume system limited by the upper surface of a column of separating liquid is kept constant in that for example on gas development so much separating liquid is pressed into the manometer capillaries from a squeezable tube disposed at the deepest part of the U-tube that the rise in pressure arising from the column of liquid introduced into the open topped limb corresponds to the rise in pressure brought about by the gas development in the reaction chamber.

The invention chiefly consists therein that two capillary tubes, running preferably parallel to each other, are provided in a rod. The straight rod may consist of any material, e. g. metal or artificial products preferably of glass or transparent artificial products, especially of a methacrylacid-methylester (Plexiglas) or of a polyvinylchloride (Astrolon). The tubes are connected on their lower ends in the usual way, i. e. they may be molten together in such a way that they communicate with each other or a squeezable tube made preferably of rubber is placed over the lower ends of the capillary tubes. Preferably the distance between the two capillary tubes is thus chosen that it is easily possible to state the levels of the liquids in both tubes by means of a scale placed between the two capillary tubes.

In the case of the use of materials which are not transparent the levels of the liquids may be stated in the following way: By the up- and down-movement of the liquid columns in the capillary tubes in the case of an electric or magnetic field a certain change of this field will take place which may be observed by means of corresponding measuring instruments, wire-coils or condensers, as all well-known per se.

Another possibility instead of applying a field of the mentioned kind to the apparatus consists in observing the change of the electrical resistance of a current running axially through the conductive liquids in the capillaries.

The accompanying drawings illustrate one embodiment of the invention by way of example merely.

Fig. 1 is an elevation;

Fig. 2 is an elevation at right-angles to Fig. 1;

Fig. 3 is a cross-section on an enlarged scale on line III—III of Fig. 2.

Instead of the U-shaped capillary manometer hitherto employed there is employed a double capillary tube in the form of a glass rod *a* with two capillary tubes k^1 and k^2 running parallel to the longitudinal axis of the glass rod. The capillary tube k^1 is blown out laterally at *b* at the upper end of the glass rod so as to form a preferably widened orifice and corresponds to the open topped limb of the usual U-tube manometer. The capillary tube k^2 communicates at its upper end in known manner through a cross capillary tube provided with conical grindings with the interior of the reaction chamber which is placed in communication with the smooth surfaced plug

s of the manometer. Through a short vertical piece of simple capillary tube the capillary tube k^2 is also connected with a three-way tap H. The lower outlet openings *c*, *d* of the capillary tube *a*, that is to say the glass rod, are not connected by blowing but are formed in the end of the rod *a* which here is made of smaller diameter than the body of the rod so that the orifices *c*, *d* provide communication between the capillary tubes k^1 and k^2 and a flexible or squeezable tube *e* pushed over this narrow end of the rod *a*. The flexible or squeezable tube is filled with separating liquid. The glass rod *a* can be provided with a backing or deposition of white colour for the better contrasting of liquid level in the capillaries k^1 and k^2 after the manner of a thermometer capillary tube. The glass rod *a* is provided in front with one etched scale for reading the difference in level of the two liquid columns.

Besides the advantage obtained owing to the external form in a higher mechanical rigidity, namely a greater security against breakage, owing to the assemblage of the two manometer limbs in a strong glass tube the possibility is also present in the embodiment proposed as distinguished from the embodiments of Warburg manometers hitherto known, of applying a common scale to both manometer columns. By this means contingent in accuracies are avoided which depend on a slight movement upwards of the scales on the left and right hand limbs of the manometer occurring as a possibility in manometers hitherto usual.

The two manometer capillary tubes in the embodiment described can lie close together and thus give rise to a more easier reading in contrast to the usual embodiment.

Owing to the great rigidity of the manometer it is possible to apply the manometer described without a strutting piece to the Warburg apparatus.

A suitably shaped clamp *f* for the squeezable tube serves in this present case in the known manner for altering the amount of intercepting liquid present in the capillaries.

Owning to the very closely adjacent capillaries k^1, k^2 a further advantage arises in that on rotary motion taking place about the longitudinal axis of the double capillary manometer amongst other things as is necessary in Warburg apparatus for the maintenance of the temporary absorption condition in the fluid of the reaction chamber, a reading of the alteration in pressure during the management or during the motion of the manometer is facilitated.

Having now particularly described the nature of the invention, what I claim is:

1. A Warburg manometer comprising a single straight rod of transparent material having two parallel capillary bores extending longitudinally therein and out through one end thereof, said end being dimensioned for receiving a flexible tube thereover to close said bores while allowing fluid communication therebetween, one of said bores terminating as an aperture near the other end of said rod, and means near said last-mentioned end for connecting the other said bore to a Warburg flask.

2. A Warburg manometer according to claim 1 including a flexible tube connected to the first mentioned end of the said rod in free communication with said bores and means for varying the volume of said tube to adjust the level of manometer fluid in said bores.

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