

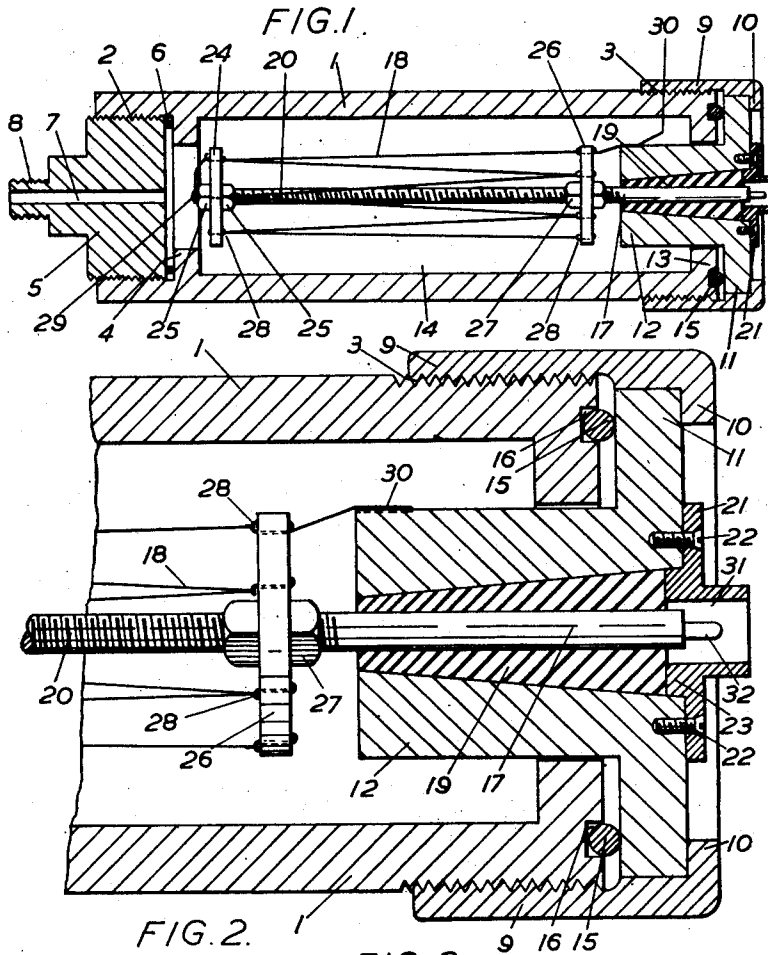
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VACUUM GAUGE OF THE PIRANI TYPE

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VACUUM GAUGE OF THE PIRANI TYPE

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4 Claims. (Cl. 201—63)

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In using a vacuum gauge of the Pirani type observation is made of changes of resistance, potential difference or current of a hot wire placed in a chamber connected with an evacuated space. The variable quantity examined is the rate of loss of heat by a fine gauge wire through which the current flows, this rate depending upon the degree of vacuum which exists in the space between the wire and the surrounding wall of its container. The wire is generally a filament of platinum, which is carried on suitable supports to minimise loss of heat from it by conduction. In the usual construction the wire is mounted after the manner of the filament of an electric lamp in a cylindrical glass container, having the current leads sealed in the glass and brought through to two contacts projecting from a base cap attached to one end of the container. At the other end the glass wall is extended to form a tube for making connection with an appropriate point in the evacuated system. The heated wire is a fragile filament and breakage is not uncommon. The replacements, which are thus frequently needed, may be inconvenient since they involve operations not readily performed and resources and technique not always available at the place of use.

It appears to have been assumed that the glass container construction is a necessary condition for the maintenance of satisfactory operation of the device. We have, however, satisfied ourselves that this is not the case. The present invention provides an improved construction which permits easy dismantling and replacement of the wire in its container. In this construction the wire is carried on a frame supported by a base which is connected by a mechanical joint and seal with one end of a barrel of metal which takes the place of the usual glass container. This barrel is connected at its other end, preferably by another mechanical joint and seal, with a fitting which can be screwed or otherwise inserted in an aperture in the wall of the vacuum system.

The frame which supports the wire has as its main member a central rod which passes through a compression seal of rubber or equivalent material located in the base and serves as one of the electrical connections to the wire, the other connection being by way of the metal body of the base. The rod carries projections such as arms

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or discs over which the wire is distributed, being suitably insulated thereon, one end of the wire being taken to the rod and the other to the metal of the base. The wire is preferably distributed so that it is at substantially uniform distance from the wall of the barrel at practically all points.

The invention will be further described with reference by way of example to a form of construction illustrated in the accompanying drawing wherein:

Figure 1 is a sectional view of the device;

Figure 2 is an enlarged view of part of Figure 1, and

Figure 3 is a view of a detail as seen from the left of Figure 1.

In this arrangement the container is a cylindrical metal barrel 1 provided at one end, hereinafter called the upper end, with an internal screw thread 2 and at the other or lower end with an external screw thread 3. At the base of the internal screw thread 2 there is formed integral with the wall of the barrel 1 an inwardly projecting ring 4. An externally screw-threaded plug 5 engages within the internal screw thread 2. Between the plug 5 and the internal ring 4 is a sealing ring 6 of rubber or equivalent material. This ring 6, being preferably of initially circular cross-section, forms a compression seal between the plug 5 and the upper end of the barrel. From a reduced, externally-screw threaded end 8 of the plug 5 a central aperture 7 extends to the inside of the barrel 1. The screw-threaded part 8 forms a standard pipe fitting for screwing into a hole in the wall of an evacuated chamber, the internal pressure of which it is desired to measure.

Over the external screw thread 3 at the lower end of the barrel 1 is fitted an internally screw threaded base cap 9. The cap 9 is formed with an inwardly projecting annular end wall 10 which is adapted to hold against the end wall 13 of the barrel a flange 11 carrying a central cylindrical body 12. The cylindrical body 12 extends into the interior 14 of the barrel through an aperture in the end wall 13. The base cap 9, flange 11 and central upstanding cylindrical body 12 are together hereinafter referred to as the base cup. A compression ring 15, of rubber or equivalent material, accommodated in an annu-

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lar groove 16 in the outer face of the end wall 13, is compressed between the flange 11 and the end wall 13 to form a seal between the base cup and the lower end of barrel.

Through the upstanding cylinder 12 within the base cup is a passage for the lower end 17 of the rod 20 carrying the wire 18 and for its insulating and packing member 19. The passage is cylindrical and tapers throughout its length to a minimum diameter at the upper end. Within this passage is located the sealing and insulating body 19 which is a truncated cone of rubber or rubber-like material having extending completely through it an axial hole in which the lower end 17 of the rod is a good fit. This part 17 of the rod is provided with a smooth surface against which the material of the packing member 19 may be compressed to provide a gas-tight seal.

An annular metal packing plate 21, arranged co-axially with the cylinder 12, is adapted to be held against the outside of the base cup by means of screws 22. The inner face of the packing plate 21 carries an annular projection 23 adapted to enter the end of the aperture within the cylinder 12 and to engage the lower end face of the packing member 19. By tightening the screws 22, the annular projection 23 is pressed against the packing member 19 to compress the packing member and cause it to make a good joint both with the wall of the passage and with the central rod.

In an alternative arrangement, the lower part of the aperture for the packing member may be cylindrical and internally screw-threaded to enable it to be engaged by an externally screw-threaded projection on the packing plate, the screws 22 being eliminated. A metal washer is forced against the end face of the packing by screwing the packing plate into the aperture, thereby compressing the packing.

The rod 20 extends along the axis of the barrel 1 up to the neighbourhood of the upper plug 5. It is screw-threaded throughout its length above the packing member 19. Near its upper end, it carries a disc 24 of insulating material, the disc being centrally apertured (33, in Figure 3) for the passage of the rod 20 and being fixed in position by a lock-nut 25 on each side. Also at a point just above the sealing member 19 the rod 20 carries another disc 26 of insulating material, similarly fixed on the rod by means of lock-nuts 27. Each of the discs 24 and 26 carries near its periphery a number of equally placed small hooks 28, projecting on the opposed faces of the discs. The wire 18, a platinum filament, is connected at one end 29 to the upper end of the central rod 20 and from there is strung between the two sets of hooks 28 so as to form an open-work envelope of zig-zag pattern around the space between the discs 24 and 26, being at all points substantially the same distance from the internal surface of the wall of the barrel. The other end 30 of the filament is connected to the inner end of the upstanding cylindrical part 12 of the base cup.

A cylindrical extension 31 of the packing plate 21, and the lower end 32 of the rod 20 projecting beyond the packing member 19, together form the outer and inner conductors respectively of a suitable connection for a co-axial cable by means of which the gauge is connected with an appropriate measuring circuit.

With this construction the filament with its support can readily be removed from the barrel

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by unscrewing the base cap 9. Alternatively, the barrel 1, complete with the filament and its support, can be taken away from the upper plug 5. The passage to the evacuated chamber with which the central aperture 7 communicates can be effectively sealed by means of either a screw cup applied to the external thread 2 of the plug 5 to compress the sealing ring 6, or by a screw cap engaging over the external screw thread 3 at the lower end of the barrel 1 and compressing the other sealing ring 15.

What I claim is:

1. A vacuum gauge comprising a metal barrel, coupling means for connecting the interior of the barrel with a vacuum system, a removable metal base in one end of the barrel, a conducting mechanical joint and a gas-tight seal for the base in the end of the barrel, a single metal rod extending axially within the barrel and through an axial aperture in the base, a gas-tight electrically insulating joint between the rod and the base, electrically insulating projections on the rod within the barrel, a metal filament attached to the projections, a conductive connection between one end of the filament and the rod, another conductive connection between the other end of the filament and the base and said filament, projections and rod being removable as a unit with said base from said barrel.

2. A vacuum gauge comprising a metal barrel, coupling means for connecting the interior of the barrel with a vacuum system, a removable metal base in one end of the barrel, a conducting mechanical joint and a gas-tight seal for the base in the end of the barrel, a single metal rod extending axially within the barrel and through an axial aperture in the base, electrically insulating projections on the rod within the barrel, a metal filament attached to the projections, a resilient gas-tight compression seal of insulating material surrounding the part of the rod within the aperture in the base, a packing plate compressing the seal into gas-tight engagement with the rod and base, conductive connections from each end of the filament to the rod and base respectively and said filament, projections and rod being removable as a unit from said barrel with said base.

3. A vacuum gauge comprising a metal barrel, two removable metal closures one at each end of the barrel, a conducting mechanical joint and a gas-tight seal between each closure and the barrel, a pipe coupling in one closure for connecting the interior of the barrel with a vacuum system, an insulating filament-supporting frame extending axially within the barrel, a single metal rod carrier for the frame, said rod extending through and being supported in a central insulating bushing the other closure, a metal filament attached to said frame, conductive connections from one end of the filament to the rod and from the other end to said other closure respectively, and said filament, frame and rod being removable from said barrel as a unit with said other closure.

4. A vacuum gauge comprising a metal barrel, coupling means for connecting the interior of the barrel with a vacuum system, a removable metal base in one end of the barrel, a conducting mechanical joint and a gas-tight seal for the base in the end of the barrel, a single metal rod extending centrally within the barrel and through a central aperture in the base, a filament-supporting insulating frame attached to the rod

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within the barrel, a metal filament attached to the frame, a resilient gas-tight compression seal of insulating material surrounding the part of the rod within the aperture in the base, a packing plate of metal compressing the seal into gas-tight engagement with the rod and base, conductive connections from each end of the filament to the rod and base respectively, said rod, frame and filament being removable as a unit with said base and said barrel, a cylindrical extension of the packing plate projecting externally of the barrel and concentric with the end of the rod, and the end of the rod and the cylindrical

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extension together constituting a co-axial cable coupler.

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