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2,322,159

ANALYTICAL FURNACE

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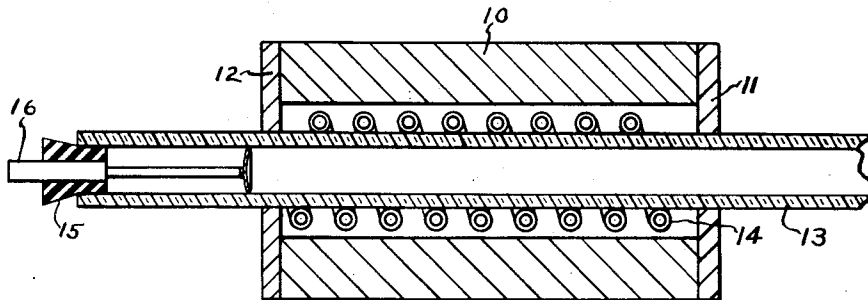


Fig. 1

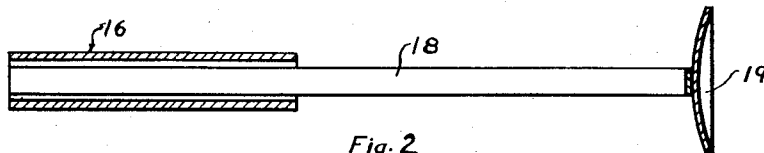


Fig. 2

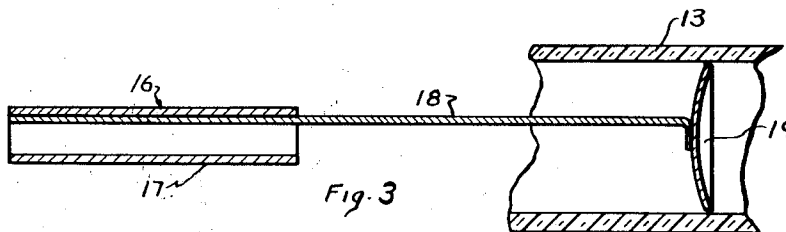


Fig. 3

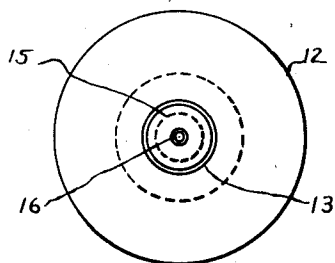


Fig. 4

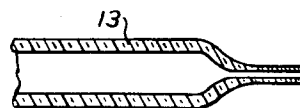


Fig. 5

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ANALYTICAL FURNACE

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7 Claims. (Cl. 23—253)

This invention relates to analytical furnaces and has for its object to provide, in such furnaces, improved means for protecting the organic closure (such as a rubber stopper) which is used to close the end of the specimen receiving tube.

A further object is to provide such protecting means making use of a reflector for the purpose of preventing heat from reaching such organic closure to an extent to destroy the same.

Other and more limited objects will appear from the following description and the accompanying drawing in which Fig. 1 is a diagrammatic section taken longitudinally through a furnace embodying the invention; Fig. 2 is an enlarged, detail, longitudinal section taken through the reflector unit which, and the combination of which, with the other parts of the furnace constitute the novel features of this invention; Fig. 3 is a longitudinal section taken through the reflector unit at right angles to the view of Fig. 2; Fig. 4 is an end view of the furnace looking from left to right in Fig. 1; and Fig. 5 is a fragmentary view completing Fig. 1.

In the drawing, the numeral 10 indicates a cylindrical, refractory furnace wall and 11 and 12 indicate complementary end walls. Passing through the walls 10, 11 and 12 is a tube 13, which may be of quartz, and which is adapted to receive the sample. Surrounding the tube 13 is an electrical resistance heating element which it will be understood is connected to a suitable current source.

Received in the left hand end of the tube 13 is a rubber stopper 15 through which extends the tubular portion 17 of the reflector element 16. A reflector support 18 is received within and attached to the tubular element 17 as by spot welding at the ends of the element 17. Attached to the free end of the reflector support 18 is a reflector element 19 presenting a concave reflecting surface toward the center of the furnace. The reflector element 19 may be composed of metal, as iron or steel and may have a brilliant surface such as resulting from plating with copper, then nickel and then chromium. The reflector support 18 may be composed of sheet metal, as iron or steel. It should be either resilient (spring steel) or easily deformable (soft iron) or of intermediate properties. Various metals are suitable, e. g., copper, brass, iron, steel, etc., for making the reflector unit or parts thereof. A high melting point metal is desirable, soft steel plated as above indicated being preferable for all parts of the reflector unit.

Metal construction is much to be preferred over glass, clay or the like materials as being less subject to breakage.

The mirror may have a reflecting surface of part spherical shape, or of a shape which is flatter than spherical centrally and curved more sharply than spherical near the edges, the depth of the concavity, however, being preferably small as compared to the diameter of the reflecting surface. Suitably, the maximum depth of the concavity of the reflecting surface may be from 5% to 15% of the diameter of the reflecting surface.

The diameter of the reflector 19 should nearly but not quite equal the diameter of the tube 13.

It should be understood that in use, the furnace illustrated will form a part of a train of chemical apparatus, a rubber tube being attached to the element 17 at one end and to the reduced portion of the tube 13 on the other end. The sample to be tested, e. g., a piece of carbon steel, will be placed centrally of the tube 13. Oxygen will be admitted through the element 17, will pass over the heated sample in the tube 13 oxidizing the sample to iron oxide and CO₂. The CO₂ will pass out and be absorbed in a suitable medium. From the gain in weight of the said medium the percentage of carbon in the steel can be determined.

Obviously, the tube 13 must be open for insertion of the sample and it must be possible to close it for the determination. Rubber stoppers are most convenient for this purpose. But, if the rubber stopper gets too hot, it will oxidize and form CO₂ thus interfering with the determination and giving inaccurate results.

Clay tubes with enlarged ends have been used in the relation in which we use our reflector units 16, but these have proved unsatisfactory since they are readily breakable, do not reflect radiant heat to a great degree, are expensive and not durable.

While we have shown and described the present embodiment of our invention, it is to be understood that variations can be made and we, accordingly, do not wish to be limited to the illustrative embodiments but only in accordance with the appended claims.

We claim:

1. In an analytical furnace in combination with an open-ended refractory tube and heating means associated therewith and external thereto, a seal for the open end of said tube composed of organic material, a tubular element extending through said seal, a metallic reflector support attached to said tubular element and a reflector carried by

said reflector support and presenting a reflecting surface toward the end of said refractory tube remote from said seal.

2. The invention as defined in claim 1, said reflector having a concave reflecting surface presented toward the end of said refractory tube remote from said seal.

3. In combination, a tubular element, a flexible metallic reflector support secured to the inside of said tubular element, having a cross-section small as compared with the lumen of said tubular element and extending longitudinally thereof and projecting beyond one end thereof, a reflector secured to said tubular element and having a reflecting surface extending transversely to the axis of said tubular element and adapted to reflect radiant heat away from said tubular element.

4. In combination, a metallic tube, an elongated, flexible, flat metallic reflector support secured to the inside of said metallic tube, being small in cross-section as compared to the lumen of said tube and projecting beyond one end of said metallic tube in the general direction of the axis thereof, a reflector carried by said reflector

support and presenting a concave reflecting surface extending transversely to the axis of said metallic tube and facing away from said metallic tube.

5. A reflector assembly associated with a furnace tube and organic closure therefor, said reflector assembly comprising a tubular element extending through said organic closure and forming a conduit for passage of gas, an elongated metal element secured to said tubular member and carrying a reflector having a reflecting surface facing away from said organic closure and being of a size to obstruct most of the lumen of the furnace tube but leaving sufficient space to permit easy insertion and to permit gas to flow through the furnace tube.

6. The invention as defined in claim 5, said reflector having a concave reflecting surface.

7. The invention as defined in claim 5, said elongated metal element being secured to the inner surface of said tubular element.

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