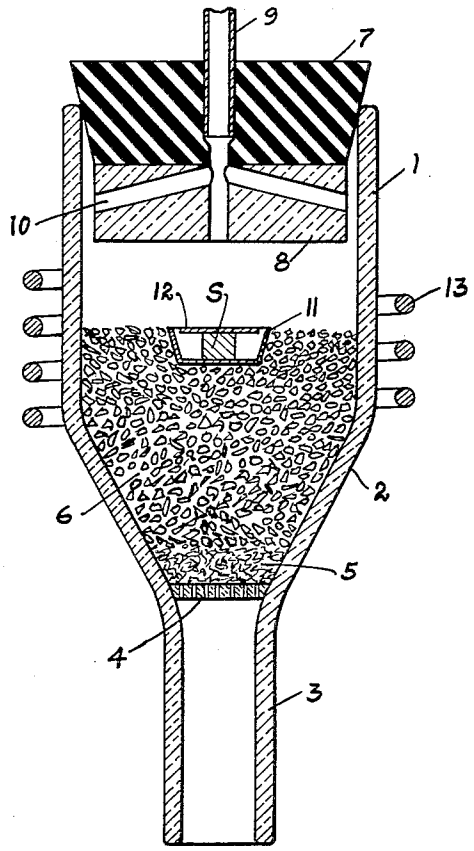
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COMBUSTION ANALYSIS METHOD AND APPARATUS

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COMBUSTION ANALYSIS METHOD AND APPARATUS

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4 Claims. (Cl. 23—230)

This invention relates in general to combustion apparatus for use in chemical analysis and in particular to a novel form of apparatus usable in the determination of the carbon and sulphur content of iron and steel.

Apparatus heretofore employed in such determination employed a combustion tube of refractory material, a crucible of ceramic material within the tube for reception of the sample to be analyzed, the whole mounted with a suitable furnace heated to the order of 2500° F. and a suitable gas such as oxygen passed through the tube in contact with the sample. Such apparatus was both expensive and fragile. During combustion of the sample the tube and crucible became coated with slag. The crucible and tube were subject to breakage necessitating replacement.

One object of the invention is to provide a novel form of low cost consumable crucible to both support the sample when being placed in the furnace and to expedite heating of the sample to combustion temperature.

Another object of the invention is to provide a new and novel form of apparatus for reception and support of the sample and crucible during the combustion thereof.

These and other objects will be made apparent from the following description and the drawing forming a part thereof in which the figure shows a cross section through the apparatus and crucible.

Referring now to the drawing, the ceramic housing 1 has a tapered portion 2 terminating in an outlet tube 3. Above the outlet 3 is a ceramic filter disc 4 and preferably a layer of ceramic wool 5 upon the disc. Within the housing and upon the disc is a filling of granular ceramic refractory material such as aluminum oxide 6, or other suitable refractory materials preferably of 60 to 100 mesh. The upper end of housing 1 is closed by a suitable stopper 7 such as rubber having a ceramic heat deflector 8 secured thereto. The under side of the deflector 8 being in spaced relation to the top of the granular ceramic refractory material 6. Extending through the stopper and deflector is a gas inlet tube 9. Preferably the heat deflector 8 is secured to the stopper 7 in spaced relation to the inner wall of the housing and branch outlets 10 extend transversely of the deflector 8 connecting with tube 9. Embedded in the refractory material 6 is a non-carbon bearing metallic crucible 11 so as to be flush therewith or may be wholly enclosed thereby. The crucible is formed of light gauge metal such as tin, aluminum, copper or other metals or alloys free of carbon having a lower melting temperature than the metal sample to be analyzed. Within the crucible is placed the sample S to be analyzed and a thin metal cover 12, of metal as in the crucible, placed over the sample and loosely fitting within the crucible. About the housing 1 and in the area of the crucible are disposed suitable induction heating coils 13 connected to a suitable source of electrical energy. When the coils are energized, the crucible and sample disposed between the coils are heated by the induction coils.

The capacity of the housing may be to suit requirements. I have found a housing tube of the order of 2" in diameter, having the heat deflector about 1¾" diameter and a total volume in the housing above the filter disc of about 150 ML, without deduction of the volume of granular ceramic material, to be satisfactory. In operation, while the temperature of the sample is being raised to a temperature of 2000 to 2500° F. the crucible and thin metal cover being of lower melting temperature are melted and thus accelerating the heating of the sample to combustion temperature. The gaseous products of combustion are drawn off through tube 3 for analysis in the usual manner. By reason of the channels 10 in the heat deflector, oxygen gas surrounds the deflector and maintains a sufficient heat barrier protecting the rubber of the stopper. The granular ceramic material supports the sample and melting crucible during combustion and readily passes the gaseous products thereof to tube 3. The ceramic wool is commercially available, one form being sold under the trade-name Fiberfrax. The wool separates the granular ceramic material from the filter disc to prevent clogging thereof.

The exact details of construction shown herein are for purposes of illustration and not limitation except as made necessary by the scope of the appended claims.

I claim:

1. A method of combustion analysis of ferrous metals comprising the steps of supporting a non-ferrous non-carbon bearing electrically conducting thin metal crucible having a melting point below 1500° F. upon a bed of granular ceramic material within a closed ceramic housing, mounting a ferrous metal sample in the crucible, and heating the sample to about 2000° F. by induction coils surrounding the housing, flowing oxygen gas into the housing into contact with the heated sample for combustion thereof, and removing the gaseous products of combustion from the housing for collection and analysis in the usual manner.

2. Apparatus for combustion analysis of carbon bearing metals comprising, a refractory ceramic tube having a restricted opening in one end thereof, a bed of granular ceramic material within the tube adjacent the restriction opening, a non-ferrous, non-carbon bearing metal crucible melting at temperatures below 2000° F. for supporting a combustible ferrous metal sample upon said bed, a rubber stopper for the opposite end of the refractory tube, a refractory heat deflector secured to the stopper in spaced relation to the inner walls of the tube and said crucible, an opening in said stopper and heat deflector passing oxygen gas to said sample, induction heating coils enclosing said tube and crucible, and an opening in the tube below said bed for removal of gaseous products of combustion.

3. Apparatus as defined in claim 2 wherein a ceramic filter is disposed between the granular ceramic bed and the restricted opening.

4. Apparatus as defined in claim 2 wherein additional gas conveying channels are provided in said heat deflector carrying oxygen to the periphery of the deflector disposed in spaced relation to the inner walls of the tube providing a volume of oxygen gas about the exposed inner end of the rubber stopper to serve as a heat insulator.

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