

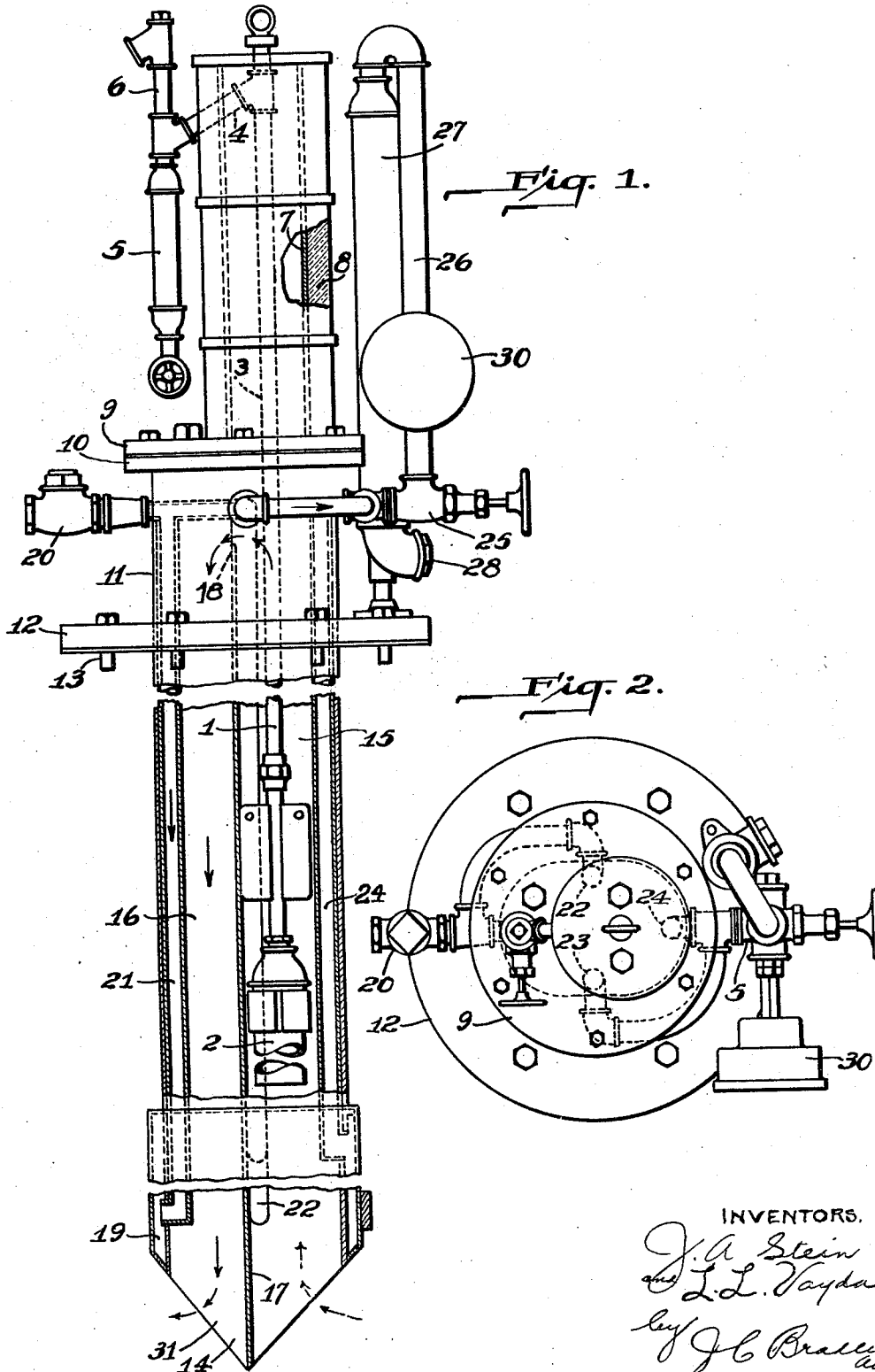
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SAMPLING TUBE

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SAMPLING TUBE

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The invention relates to sampling tubes for use in the periodic or continuous analysis of gaseous products in furnaces, kilns and flues. It is common to withdraw a gas sample by a small diameter pipe, either open at its free end or capped with a filtering device, such pipe being usually installed approximately vertically or horizontally. The present invention relates to installations of the vertical type. Where very high temperatures exist in the furnace or flues in which the apparatus is installed, difficulties attend the use of the device, and often prohibit the use of a filtering device at the free end of the tube. The present invention has for its principal objects the provision of an improved construction which will always permit the use of the filtering device regardless of high temperature conditions, and which will function in an enduring manner under conditions of high temperature, dirty gases, dirt or dust carried thereby and excessive moisture content. One embodiment of the invention is illustrated in the accompanying drawing, wherein:

Figure 1 is a partial side elevation and partial section of the apparatus. And Fig. 2 is an end view.

Referring to the drawing, 1 is the sampling pipe or tube for collecting gas provided at its lower end with the usual cap 2 of porous filtering material to permit the passage of gas to be sampled and exclude dust and dirt, such tube being connected at its upper end to the extension 3 which in turn leads to the fitting 4 provided with connections 5 and 6, one of which acts to drain away any condensation, and the other of which is connected to an aspirator for withdrawing the gas. The upper portion of the pipe 2 lies in a casing 7 of sheet metal covered with the insulation 8. The casing is provided with a flange 9 bolted to the flange 10, such flange 10 being welded to the upper end of the casing 11.

The casing 11 which acts to protect the sampling tube 1 and its filter 2, has welded near its upper end a flange 12 adapted to fit against the wall of the furnace or flue carrying the gas to be sampled to which the flange is secured by the bolts 13. The casing 11 is of

circular cross section, with its end cut so as to form the peak 14, and is divided into two passageways 15 and 16 by the partition 17 which extends from a point at the peak 14 to the point 18 adjacent to the top of the casing, leaving a space above the partition for the passage of gas from the passageway 15 to the passageway 16. The passageway 15 carries the sampling tube 1 and its cap 2.

The lower end of the casing is provided with the annular cooling chamber 19, and water is supplied thereto from the connection 20 by means of the two pipes 21 and 22. Such water is returned to the upper end of the casing by the pipes 23 and 24. The pipes 21, 22, 23 and 24 and the partition 17 are all welded to the walls of the casing thereby adding materially to its stiffness. The pipes 23 and 24 are connected at their upper ends to the fitting 25 in turn connected by means of the pipe 26, the sight feed 27, and the elbow 28 to a drain. A safety device 30 may be used in the line of piping with a temperature operated switch for giving warning in case the circulating water reaches too high a temperature.

In operation a portion of the gaseous products of combustion traveling as indicated by the arrows (Fig. 1), due to the draft action of a stack or fan, impinge on the lower end of the partition 17 creating an impact pressure at this point. Certain other portions of the gases traveling past the lower end of the peak 14 create a suction effect at the oblique opening 31. Thus a circulation of gases is promoted upward through the passageway 15, across the top 18 of the partition and down the passageway 16, the flow being due to the difference in pressure at the oblique openings on opposite sides of the partition at the lower end of the casing. As the gases flow past the filter 2 a very small sample is diverted through its porous walls and through the sampling tube 1. The pores of the filter permit only the gas to pass, dust or suspended matter being excluded.

Most of the gases which enter the casing on one side of the partition 17 pass out at the oblique opening 31 on the opposite side of the partition, portions of such hot gases ris-

ing by convection into the insulated casing 7, so that the filter and tube 1 and its extension 3 are surrounded by gas having a much higher temperature than the boiling point of water, so that no moisture can condense in the tube and run down into the filter and in either case cause trouble.

The hot gases entering the oblique opening at the bottom of the casing 11 are partially cooled by the water cooled surfaces of the chamber 19, thus reducing the temperature of such gases and preventing the detrimental effect incident to the exposure of a filter to unduly high temperatures. The filter, at the same time, is prevented from cooling excessively due to radiation from the adjacent portion of the casing wall since the casing above the chamber is only partially water cooled by the four pipes 21, 22, 23 and 24. This is sufficient, however, to prevent mechanical weakness due to overheating, and prevents undue susceptibility to corrosive and erosive action of the gases and suspended matter. The cooling effect of the four pipes is also insufficient to cause condensation of moisture from gases inside or outside the casing.

What we claim is:

1. In combination with an approximately vertical sampling tube provided at its lower free end with a filter, a protecting casing surrounding the tube extending below the free end thereof, and open at its free end, and a vertical partition dividing the interior of the casing into two passageways in one of which the free end of the tube with its filter lies, said partition extending above and below the filter.

2. In combination with an approximately vertical sampling tube provided at its lower free end with a filter, a protecting casing surrounding the tube extending below the free end thereof, and open at its free end, and a vertical partition dividing the interior of the casing into two passageways in one of which the free end of the tube with the filter lies, said partition extending a substantial distance above the filter and to a point below the side edges of the casing.

3. In combination with an approximately vertical sampling tube provided at its lower free end with a filter, a protecting casing surrounding the tube extending below the free end thereof, with its lower end open and bevelled to form a peak, and a vertical partition dividing the interior of the casing into two passageways with its lower end extended down into said peak and with its upper end extending above said filter.

4. In combination with an approximately vertical sampling tube provided at its lower free end with a filter, a protecting casing surrounding the tube extending below the free end thereof, and open at its free end with a cooling chamber around said end, means for

circulating a cooling fluid along the casing walls to and from said chamber, and a vertical partition dividing the interior of the casing into two passageways in one of which the free end of the tube with its filter lies, said partition extending above and below the filter.

5. In combination with an approximately vertical sampling tube provided at its lower free end with a filter, a protecting casing surrounding the tube extending below the free end thereof, and open at its free end with a cooling chamber around said end, pipes extending along the inner sides of the walls of the casing for circulating a cooling fluid to and from said chamber and a vertical partition dividing the interior of the casing into two passageways in one of which the free end of the tube with its filter lies, said partition extending above and below the filter.

6. In combination with an approximately vertical sampling tube provided at its lower free end with a filter, a protecting casing surrounding the tube extending below the free end thereof, and open at its free end with a cooling chamber around said end, means for circulating a cooling fluid along the casing walls to and from said chamber, and a vertical partition dividing the interior of the casing into two passageways in one of which the free end of the tube with its filter lies, said partition extending a substantial distance above the filter, and to a point below said cooling chamber.

7. In combination with an approximately vertical sampling tube provided at its lower free end with a filter, a protecting casing surrounding the tube extending below the free end thereof, with its lower end open and bevelled to form a peak, a vertical partition dividing the interior of the casing into two passageways with its lower end extending down to said peak and with its upper end extended above said filter, an annular cooling chamber at the end of the casing just above said peak, and means for circulating a cooling fluid along the casing walls to and from said chamber.

In testimony whereof, we have hereunto subscribed our names.

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