F. W. SPERR, Jr.

DISTILLATION TUBE.

APPLICATION FILED JAN. 25, 1917.

1,303,980. Patented May 20, 1919.

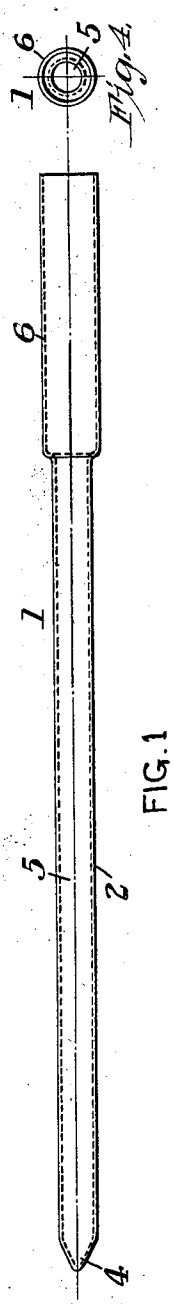


FIG. 1

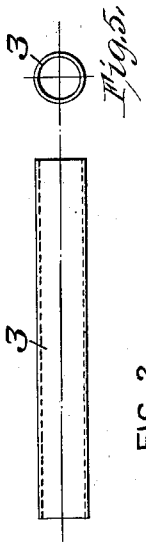


FIG. 2

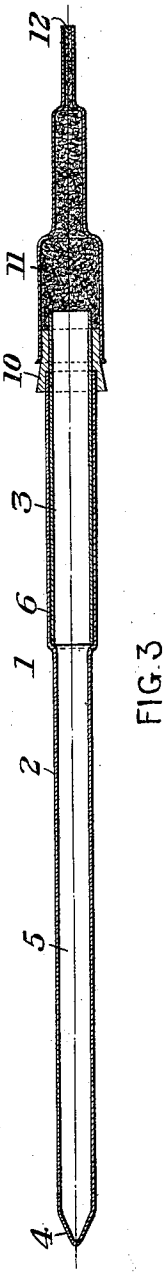


FIG. 3

Witnesses
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UNITED STATES PATENT OFFICE.

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DISTILLATION-TUBE.

1,303,980. Specification of Letters Patent. Patented May 20, 1919.

Application filed January 25, 1917. Serial No. 144,431.

To all whom it may concern:

Be it known that I, FREDERICK W. SPERR, Jr., a citizen of the United States, residing at Oakmont, Allegheny county, Pennsylvania, have invented a new and useful Improvement in Distillation-Tubes, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an elevation of the outer tube;

Fig. 2 is an elevation of the inner tube;

Fig. 3 is a sectional view showing the assembled tube complete;

Fig. 4 is an end view of the outer tube; and

Fig. 5 is an end view of the inner tube.

The present invention relates to distillation tubes, and more particularly to tubes for experimental coal distillation.

In the laboratory testing of coal, it has been the practice to distil a sample in a tube to determine the yield of the various by-products, such as gas, tar, ammonia, benzol, etc. Glass and metal distillation tubes have been used. Metal tubes have the disadvantage that the sample of coal is distilled under different conditions from those which obtain in actual practice. Uusually on a large scale, coal is distilled in fire clay retorts, in chambers, or ovens lined with fire brick or silica brick. Thus, almost always the distillation is carried on in the presence of some material of a silicious nature. Experience has shown that the gases and by-products are differently affected than is the case when they are in contact with other kinds of material, such as metallic surfaces. Since it is the purpose of making the laboratory tests to obtain on a small scale results which will represent or be comparative with those obtained on a large scale with the same kind of coal, it is essential that the laboratory apparatus be constructed of a material similar to the apparatus used on the large scale commercial practice. Thus, tubes made of glass, fire clay, quartz, etc., are satisfactory for experimental coal distillation. Glass tubes are the most readily obtainable, but it is difficult to obtain glass tubes of sufficient refractoriness to withstand the high temperatures at which the coal should be distilled. Very refractory glass tubes are costly, and become distorted in heating. In the method of testing, some of the tarry material derived from the coal will invariably condense within the tube itself near the open end. It has been the practice to determine the amount of the tar thus collected by cutting off the end of the tube in which the tar collects, weighing it, and then washing or burning off the tar and reweighing the tube. The rest of the tube usually has to be broken for the purpose of taking out the coke produced. In any event, it is rendered useless for a second distillation. This makes it impracticable to use tubes made of expensive material.

The object of the present invention is to provide a distillation tube which may be used repeatedly for many determinations.

With this object in view, the tube is made in two parts, an outer tube, and an inner tube fitting in the outer tube at the end in which the tar collects. The inner tube is removable so that it may be taken out and cleaned of the collected tar. Since the tube may be used repeatedly, it may be made of expensive refractory material, such as fused silica, quartz, porcelain, etc.

Referring to the embodiment of the invention illustrated in the drawings, the distillation tube 1 comprises an outer tube 2 and an inner tube 3. The end 4 of the outer tube 2 is preferably closed, but for some purposes may be left open. The sample of coal to be tested is placed in the portion 5 of the outer tube. The portion 6 of the outer tube is enlarged to receive the inner tube 3, as shown in Fig. 3. The inner tube 3 fits closely in the enlarged part of the outer tube, and its inner bore forms a continuation of the inner bore of the part 5 of the outer tube 2.

A stopper 10 of rubber or other material is placed at the end of the outer tube in such a way as to render the connection between the inner and outer tubes gas-tight. A tar filter 11 is fitted onto the stopper in such a way that one end of the inner tube 3 projects a little way into the filter. The filter is preferably filled with loose cotton or similar material.

To carry out an experimental coal distillation, the coal to be tested is placed in the end 5 of the tube. The tubes are connected as shown in Fig. 3, and the open end 12 of the tar filter is connected to a series of absorbing apparatus to remove the various volatile by-products. Heat is applied to the

end of the tube containing the coal. This is preferably done by first applying the heat under the reduced end portion of the tube 5 nearest the enlarged portion 6, and then successively heating the portion 5 toward the end 4. The method of heating, however, is not essential. Experience has shown that no tarry matter will condense between the outer wall of the tube 3 and the inner wall of the enlarged portion 6 of the outer tube 2, but the condensed tarry matter will accumulate inside of the tube 3. If desired, a portion of the tube 3 may be packed with a suitable filtering material such as asbestos.

After the distillation is completed the tubes are disconnected, taken apart and the various by-products determined as usual. To determine the amount of tar collected in the tube 3, the tube 3 is removed and weighed, after which it is washed or burned out and re-weighed. It may then be replaced in the outer tube for another distillation. The coke remaining in the part 5 may be simply shaken out, because such tubes, if made of highly refractory material are not distorted during the process of heating. While it is desirable to have the tube made of a highly refractory material with a low coefficient of expansion, the invention is not restricted to such materials. While the preferred embodiment of the invention has been specifically illustrated and described, it is to be understood that the invention is not limited to its illustrated embodiment, but may be embodied in other constructions of distillation tubes within the scope of the following claims.

I claim:

1. A distillation apparatus, comprising an outer tube in which the material to be distilled is placed, and a removable inner tube seated in the outer tube and forming a lining for the portion of the outer tube in which it seats, said inner tube forming a receptacle for the collection of at least a portion of the distillates, substantially as described.

2. A distillation apparatus, comprising an outer tube in which the material to be distilled is placed, and a removable inner tube seated in the outer tube in a manner to prevent leakage around the inner tube and forming a lining for the portion of the outer tube in which it seats, said inner tube forming a receptacle for the collection of at least a portion of the distillate, substantially as described.

3. A distillation apparatus, comprising an outer tube adapted to receive the material to be distilled and having an enlarged portion, and an inner tube removably seated in said enlarged portion and forming a lining therefor, said inner tube forming a receptacle for the collection of at least a portion of the distillates, substantially as described.

4. A distillation apparatus, comprising an outer tube in which the material to be distilled is placed, an inner tube removably seated in one end portion of the outer tube, a sealing stopper seated on the adjacent ends of both tubes, and a filter device secured by said stopper and into which the inner tube is arranged to discharge, substantially as described.

5. A tube for experimental coal distillation, comprising an outer tube of refractory silicious material adapted to receive the sample of coal to be distilled, and a removable inner tube fitting closely within one end of the outer tube for the collection of tarry distillates, substantially as described.

6. A tube for experimental coal distillation, comprising an outer tube for receiving the sample of coal to be distilled, a removable inner tube forming a lining for one end portion of the outer tube and projecting therefrom, and a tar filter at the ends of the tubes, the end of the inner tube projecting into the tar filter, substantially as described.

7. A distillation tube, comprising an outer tube adapted to receive the material to be distilled and having an enlarged portion and a removable inner tube received in said enlarged portion for the collection of a part at least of the distillates, and having substantially the same bore as the outer tube; substantially as described.

In testimony whereof, I have hereunto set my hand.

FREDERICK W. SPERR, JR.

Witnesses:
H. M. CORWIN,
GEORGE H. PARMELEE.