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(12) Patent:

(54) COOLING APPARATUS FOR PRODUCING SYNTHETIC HYDROCARBONS

(54) APPAREIL REFROIDISSEUR A PRODUCTION D'HYDROCARBURES SYNTHETIQUES

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(70) Inventor's name:
 (70) Inventor's address: N/A
 (70) Inventor's country: Unknown

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S P E C I F I C A T I O N

TO WHOM IT MAY CONCERN:

Be it known that we, Heinrich Dorndorf, whose permanent address is 33, Krumme Strasse, Witten-Ruhr, Germany, Max Kelting, whose permanent address is 23, Jahnstrasse, Mülheim-Ruhr, Germany, and Heinrich Tramm, whose permanent address is 22, Holzstrasse, Oberhausen-Holten, Germany, having invented certain new and useful "Cooling apparatus for producing synthetic hydrocarbons", do hereby declare that the following is a full, clear, and exact description of the same:-

The present invention relates to cooling apparatus for effecting the synthesis of hydrocarbons from hydrogen and oxides of carbon in the use of solid contact substances.

To render cooling apparatus suitable for this process it is necessary to have a high specific heat utilisation, that is to say, large cooling surfaces; and furthermore, it must be possible to maintain not only definite uniform temperatures in all parts of the apparatus but also the relative positions of the parts of the apparatus when it is in operation. These requirements are met by apparatus consisting of numerous - not less than five - rows of cooling tubes lying one above the other at small intervals (each row having numerous - not less than five - round tubes) and of numerous vertically disposed ribs of sheets of smooth metal disposed at intervals of a few millimetres, for example 7m.m., the tubes passing through each rib. It is preferable that there should be at least twice as many tubes superposed as there are tubes juxtaposed, and the tubes of one row staggered in relation to the tubes of the next row, so that the

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spaces shall be small. The tubes are pressed tightly against the ribs, thus forming complete heat insulation, as can be produced, for example, by widening the tubes which are disposed in the holes in the ribs.

For ensuring the spacing of the sheets, these may be provided with wart-like protuberances, or members of suitable form may be interposed, to be removed if desired after the widening of the tubes.

All the tubes may terminate in headers or common chambers for the admission and discharge of the cooling liquid. In the cooling apparatus according to the invention several tubes are connected together by double elbows or U-pieces, to produce coils terminating in the headers. The coils may be of the same dimensions or of different dimensions within one and the same cooling apparatus; it is thus possible to provide within one cooling apparatus zones of different heat utilisation or to adapt the heat utilisation to the degree of cooling required in the individual zones.

During operation, cooling apparatus experience, as the result of the working temperatures differing from room temperature, a change in dimensions. The changes in length render it almost impossible to produce a gastight jacket or to obtain, during working, a complete seal. Leakiness commences usually at the head ends, that is to say, on the metal jackets which are provided at right angles to the axes of the tubes and through which the tubes pass.

According to the invention the edges of the rigid resistant sheet metal jackets are so tapered that the metal sheets can give, like diaphragms, when the tubes change in length. The resilience in the metal sheets completely protects the rolled-in parts of the tubes - which may be welded - and the joints at the edges of the metal sheets from injurious stresses under the action of heat.

The invention is diagrammatically illustrated in the accompanying drawings.

Figure 1 is a front elevation of the apparatus.

Figure 2 is a side elevation,

Figure 3 is a plan,

Figure 4 illustrates one of the metal sheets through which the tubes pass, and

Figure 5 illustrates a section of a head-end taken from the apparatus.

Referring to the drawings, 1 are the metal sheets which are held fast to the tubes by the expansion of the latter. The tubes, which are shown in the drawings only by the centre line 2, are joined together by elbows to form coils of different sizes. Figure 1 shows such coils with different numbers of tubes. The cooling liquid flows through headers 3 by way of the distributing tubes 4 to the cooling coils, returning through the tubes 5 to the headers 6.

The position of the individual tubes is shown in Figure 4, partly by circles and partly - in order to render the drawings simple - by the points of intersection of the centre lines.

As compared with Figures 1 to 4, the parts shown in Figure 5 are on a much larger scale in order that the traces of the metal sheets acting as diaphragms can be clearly recognised. The drawing shows clearly the large number of rows of tubes and the large number of tubes in each row, there being always at least five to the row. In practice there are considerably more, for example, as illustrated, twenty-seven rows, nine tubes one above the other, and ten or eleven tubes in each row. The cooling area ratio is thus very large.

Figure 5 shows the staggered position of the tubes. The ribs, which are disposed vertically, form closed hollow shafts and are spaced apart only a few millimetres, for example 7 mm., whereby a very uniform and considerable removal of the heat is effected. The ribs are preferably formed of sheets of smooth metal in order to avoid the danger of the shafts being obstructed.

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We claim:

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1. Gas reaction apparatus, particularly for precise temperature control as required for the synthetical production of benzine hydrocarbons from hydrogen and a carbon oxide, comprising in combination, a gas-tight casing having opposed end walls defining a catalytic chamber, a plurality of superposed rows of cooling tubes extending substantially horizontally through said casing and through the end walls thereof, thin heat conductive plates extending in closely spaced juxtaposition through the whole length of said catalytic chamber in the direction of flow of the reaction gas and substantially throughout the entire width of said chamber substantially at right angles to and traversed by said cooling tubes, said plates forming heat abducting elements and defining narrow shafts, thin layers of a catalyst arranged within said shafts intermediate said plates, and means for passing the gas to be reacted through said apparatus in the direction of said plates.

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2. Gas reaction apparatus, particularly adapted for precise temperature control as required for the synthetical production of benzine hydrocarbons from hydrogen and a carbon oxide, comprising in combination, a gas-tight casing having opposed end walls defining a catalytic chamber, a plurality of superposed rows of cooling tubes extending substantially horizontally through said casing and through the end walls thereof, the outer ends of several pluralities of adjoining tubes being connected to form several coils, thin heat conductive plates extending in closely spaced juxtaposition through the whole length of said catalytic chamber in the

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direction of flow of the reaction gas and substantially throughout the entire width of said chamber substantially at right angles to and traversed by said cooling tubes, said plates forming heat abducting elements and defining narrow shafts, thin layers of a catalyst arranged within said shafts intermediate said plates, and means for passing the gas to be reacted through said apparatus in the direction of said plates.

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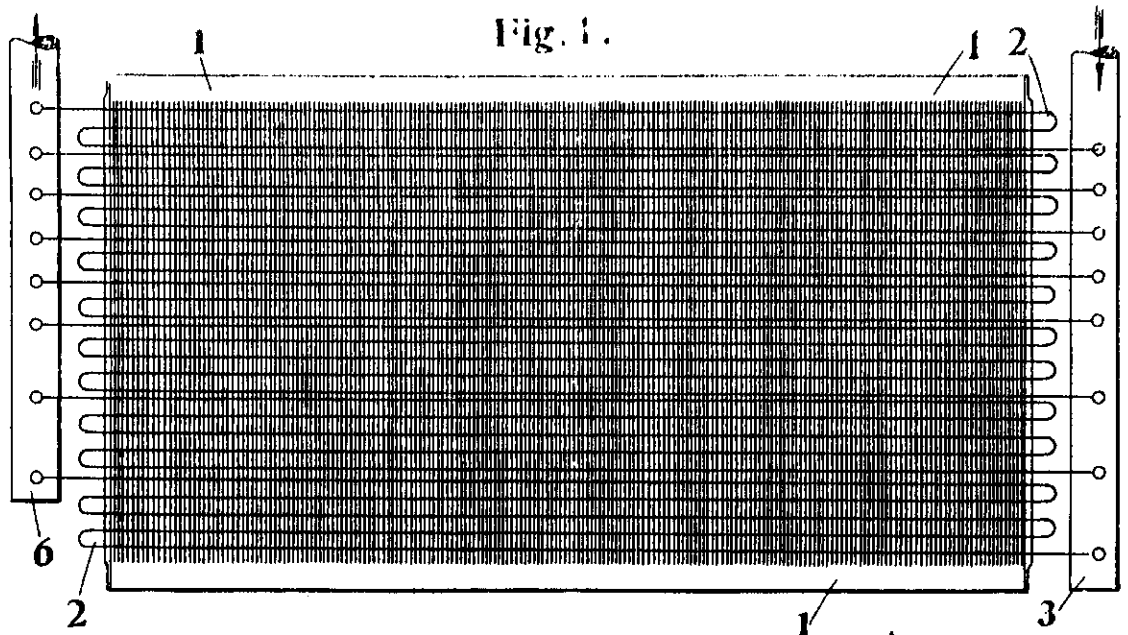


Fig. 1.

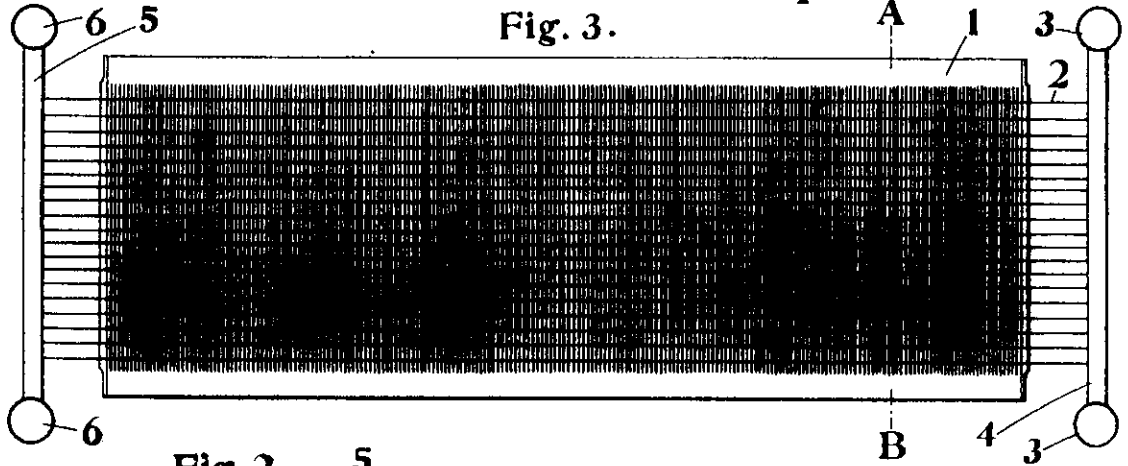


Fig. 3.

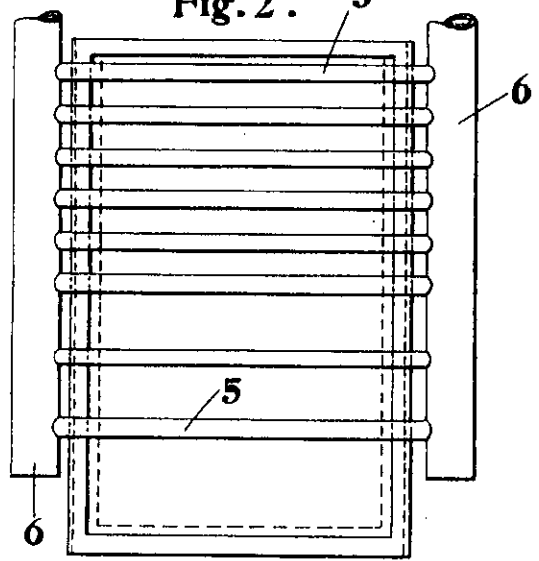


Fig. 2.

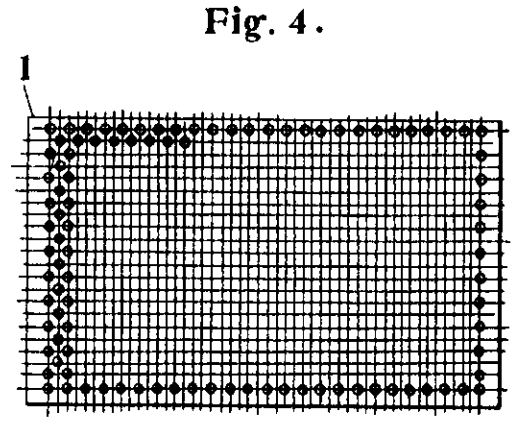


Fig. 4.

Certified to be the Drawings referred to in the specification herewith annexed.

London, the 13th day of June 1890.

By *J. H. ...*

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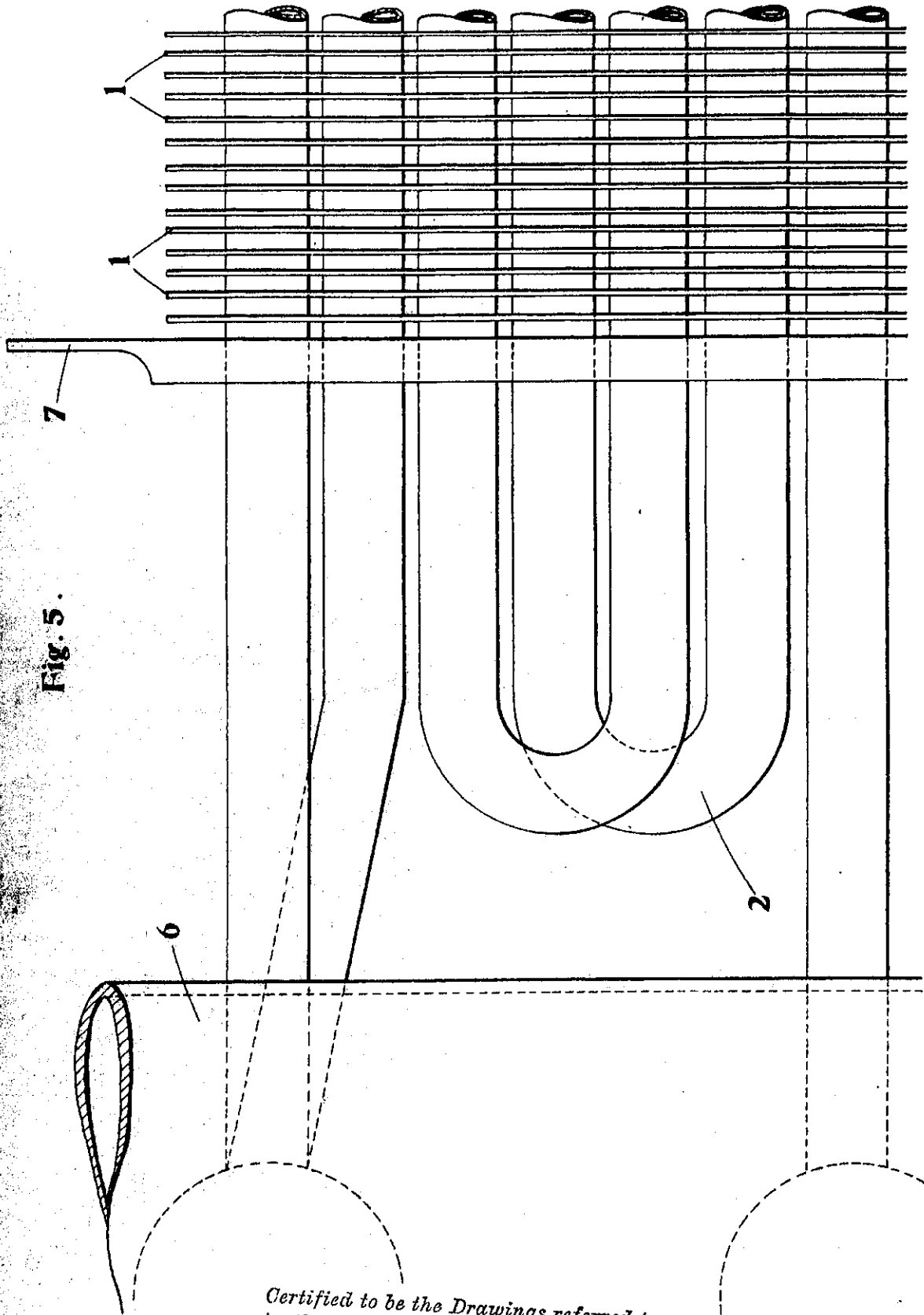


Fig. 5.

*Certified to be the Drawings referred to
in the Specification hereunto annexed.*

London, the 13th day of June 1936
H. DORNDORF ET AL.
By *[Signature]* Attorney