Claims:

1. Reformer tube for converting hydrocarbon-containing feeds, preferably natural gas, into a synthesis gas product containing carbon oxides and hydrogen under steam reforming conditions in a reformer furnace, comprising

(a) a reaction chamber comprising an outer, pressure-bearing casing tube which is heated from the outside, where the casing tube is demarcated at its one end from an adjacent outlet chamber by means of a separating plate and is closed at its other end by means of a closure device,

(b) at least one structured packing which is arranged in the reaction chamber and contains a catalyst which is active for steam reforming,

(c) an inlet for the feed gas stream containing the feed arranged on the reaction chamber, where the inlet is arranged at the end of the reaction chamber closest to the separating plate and is in fluid communication with the gas inlet into the structured packing,

(d) a heat exchanger tube which is arranged within the reaction chamber and within the structured packing and whose inlet end is in fluid communication with the gas outlet from the structured packing and whose outlet end is in fluid communication with the outlet chamber, where the feed gas stream flows, after entry into the reaction chamber, firstly through the structured packing and subsequently in countercurrent through the heat exchanger tube and the heat exchanger tube and the synthesis gas product stream flowing through this are in a heat exchange relationship with the structured packing and the feed gas stream flowing through the latter,

(e) a collection conduit for the synthesis gas product which is in fluid communication with the outlet chamber, where

(f) the outlet end of the heat exchanger tube passes through the separating plate, opens into the outlet chamber and is in fluid communication with the collection conduit so that the synthesis gas product can go from the reaction chamber via the outlet chamber into the collection conduit, wherein

(g) the casing tube and the heat exchanger tube have a circular cross section and the structured packing has an annular cross section, and

(h) the casing tube, the structured packing and the heat exchanger tube are arranged coaxially and concentrically, wherein

(i) the structured packing being arranged between the inner wall of the casing tube and the outer wall of the heat exchanger tube so as to form an essentially gastight closure, wherein

(j) the reformer tube is arranged upright, with the reaction chamber being arranged in the upper region and the outlet chamber being arranged in the lower region and the feed gas stream flowing from the bottom upwards through the structured packing, and

(k) the reformer tube is arranged in a freely suspended or freestanding manner in the interior space of the reformer furnace, where the part of the casing tube encompassing the reaction chamber is arranged in the interior space and the part of the casing tube encompassing the outlet chamber is passed at least partly through the lid or the bottom of the reformer furnace.

2. Reformer tube according to any of the preceding claims, characterized in that both the structured packing and the heat exchanger tube consist of individual modules or segments, with each heat exchanger tube segment being equipped with a support or bearer device for the associated packing segment.

3. Reformer tube according to any of the preceding claims, characterized in that the reaction chamber comprises at least one region which contains a bed of a particulate, solid catalyst which is active for steam reforming.

4. Reformer tube according to Claim 3, characterized in that the region containing the catalyst bed is formed by the corresponding packing segment being left out but the associated heat exchanger tube segment being present.

5. Reformer tube according to any of the preceding claims, characterized in that the heat exchanger tube is at least partly filled with a bed of inert bodies or is provided on its inside with guide plates.

6. Reformer furnace comprising a lid, a bottom and walls clad or lined with refractory material and an interior space formed thereby, characterized in that at least one reformer tube according to any of Claims 1 to 5 and at least one burner for heating the reformer tube are arranged in the interior space or in a secondary space which is in fluid communication with the interior space in respect of the burner flue gases.

7. Reformer furnace according to Claim 6, characterized in that the at least one reformer tube is arranged upright in the interior space, where the part of the reformer tube encompassing the reaction chamber is arranged at least partly in the interior space and the part of the reformer tube encompassing the outlet chamber is arranged at least partly outside the interior space.

8. Reformer furnace according to Claim 7, characterized in that the inlet for the feed gas stream comprising the feed is also arranged outside the interior space.

9. Reformer furnace according to any of the preceding claims, characterized in that a plurality of reformer tubes and burners are arranged in the interior space and in that the longitudinal axes of the flames produced by the burners are directed parallel to the longitudinal axes of the reformer tubes.

10. Process for producing synthesis gas by catalytic steam reforming of hydrocarbon-containing feeds, preferably natural gas, under steam reforming conditions in the presence of a solid catalyst which is active for steam reforming in a reformer furnace, comprising the following steps:

(a) provision of a feed gas stream containing the feed and addition of reforming steam,

(b) catalytic conversion of the feed under steam reforming conditions into a synthesis gas product containing carbon oxides and hydrogen,

(c) discharge and optionally work-up of the synthesis gas product,
characterized in that the catalytic conversion in step (b) is carried out in a reformer tube according to any of Claims 1 to 5.