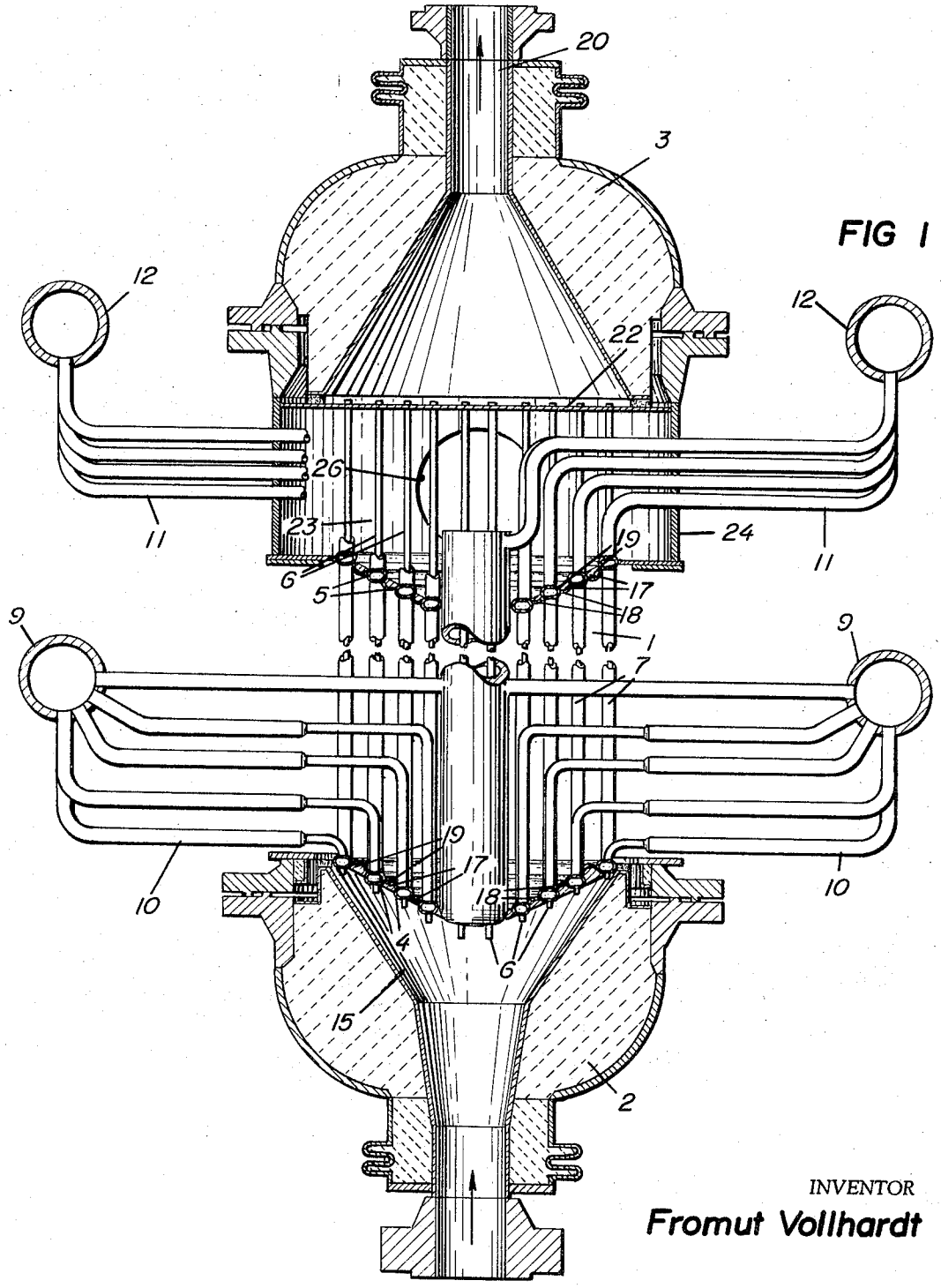
Feb. 28, 1967 F. VOLLHARDT 3,306,351

HEAT EXCHANGER FOR COOLING CRACKED GASES BY MULTIPLE MEDIA

Filed April 15, 1965 2 Sheets-Sheet 1

FIG 1



INVENTOR

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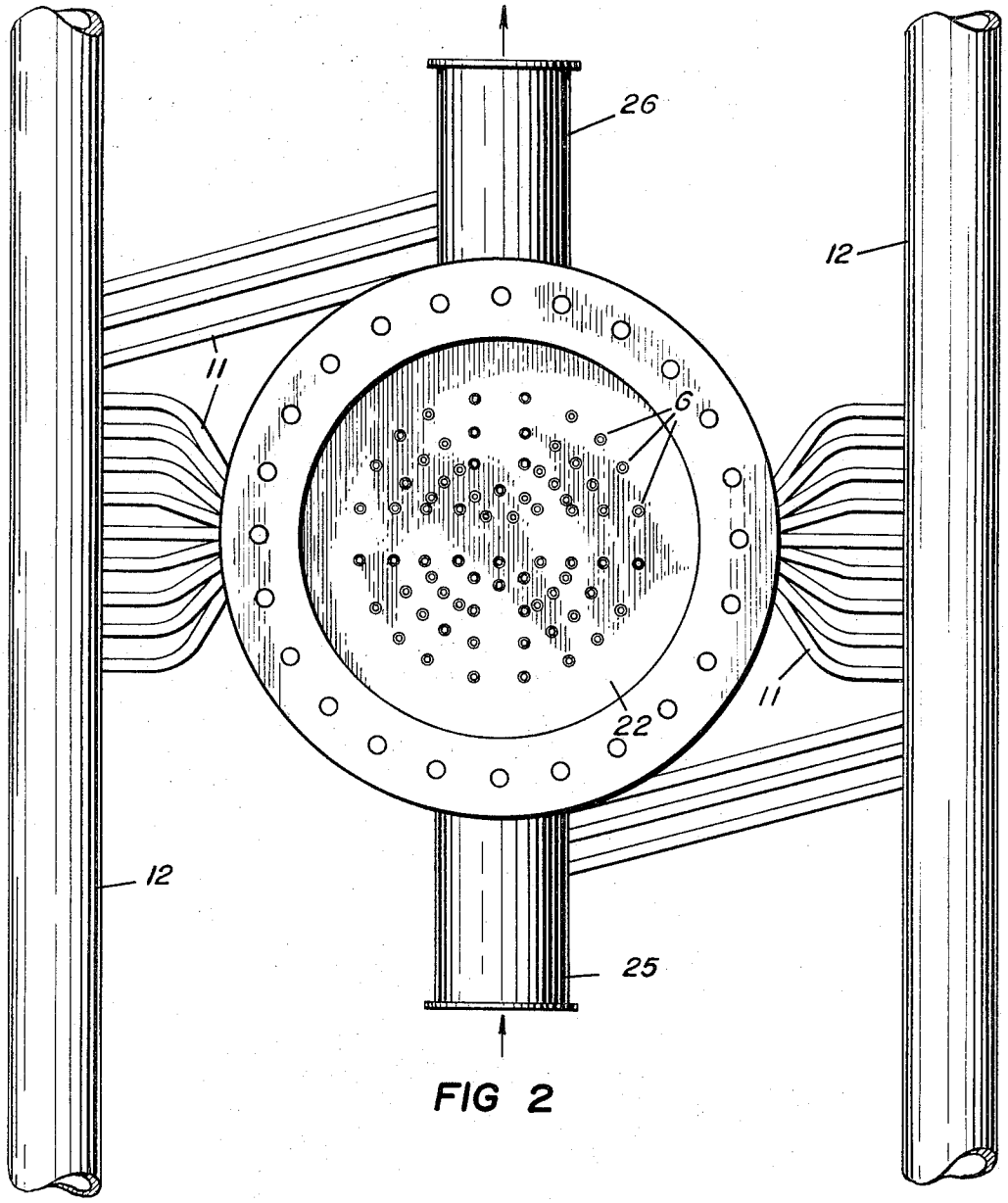

FIG 2

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HEAT EXCHANGER FOR COOLING CRACKED GASES BY MULTIPLE MEDIA

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1 Claim. (Cl. 165—140)

This invention relates to a heat exchanger particularly for the cooling of freshly cracked gases or the like wherein essentially straight pipes are mounted with their ends in chambers and with heating pipes extending therethrough.

The present invention is an improvement of the invention set forth in my Patent 3,144,080 granted August 11, 1964, entitled Heat Exchanger for the Cooling of Freshly Cracked Gases or the Like, wherein a gastight plate is positioned at the gas intake end and is covered by a guiding hood in such a manner that the wall thereof forms an acute angle with the mean slope of the stepwise arrangement of the chambers.

An object of the present invention is to extend the flue gas pipes at the gas outlet end after they pass through the chambers of the gastight plate and they are then fixed to a flat tube plate through which they pass which is arranged above and in spaced relation to the gastight plate formed at the chambers. A mantle or jacket provided with intake and outlet pipes for the supply and discharge of a medium to be heated surrounds the space traversed by the flue gas pipes between the above-mentioned plates.

A further object of the invention is to provide an arrangement of a tubular heat exchanger whereby it is possible to secure in addition to a perfect cooling of the cracked gas a simultaneous preheating of another operating medium such as feed water or combustion air and thereby securing a supplemental heat exchange.

A still further object of the invention is to provide a simpler and more reliable construction of the heat exchanger so that it is possible to lead the discharge tubes for the water condensate from the chambers constituting the gas tight plate without any inconvenient sealing means so that such discharge tubes are not positioned in the outflowing stream of flue gas and do not constitute an undesired obstruction.

A still further object of the invention is that the uncooled extension of the flue gas pipes beyond the gas tight plate formed by the stepwise arranged chambers allows a cooler section wherein the temperature of the outflow flue gas is within a range which eliminates any expectation of difficulties with respect to the material employed. This temperature range, however, makes possible the further utilization of the sensible heat still present in the flue gas for effectively heating further operating media and thereby makes it possible to achieve an increase in the thermal efficiency of the heat exchanger.

A preferred embodiment of the invention is shown in the drawings wherein—

FIGURE 1 is a central longitudinal section through a tubular heat exchanger, and

FIGURE 2 is a top view of the gas outlet end of the heat exchanger with the gas outlet end removed.

Similar reference characters are applied to like parts in the various views.

The tubular heat exchanger **1** comprises the gas input head **2** with the guiding hood **15** and the gas discharge head **3**. In the gas input head **2**, the annular chambers **4** are concentrically arranged so that they descend stepwise relative to each other from the outside toward the interior. Similar chambers **5** are correspondingly provided at the gas outlet end. The chambers **4** and **5** are secured together to form gastight plates. This is achieved by covering the spaces **17** between each pair of successive chambers **4** or **5** by welding therebetween a correspondingly annular semi-cylindrical tube **18** in a gastight manner which is filled with a plastic mass **19** forming a filling means. The gastight plates formed by the chambers **4** and **5** are interconnected by the cylindrical jacket tubes **7** through which the flue pipes **6** extend.

The flue gas pipes **6** extend through the chambers **4** and **5** and are extended at the gas outlet end **3** beyond the plate formed by the chambers **5** and the ends of these pipes are secured to a flat tube **22** through which they penetrate so that the flat plate **22** is disposed in spaced relationship to the plate formed by the chambers **5**. The tube plate **22** is covered by the gas outlet end **3**, through which the gas outlet pipe **20** passes through which the flue gas leaving the flue gas pipes **6** flows.

The chamber **23** thus formed is traversed by the flue gas pipes **6** and is located between the plate formed by the chambers **5** and the plate **22**.

The chamber **23** is surrounded by a mantle or jacket **24** which is provided with a supply pipe **25** and a discharge pipe **26** for the supply and discharge of a further operating medium to be heated.

The supply of cooling medium to the chambers **4** is effected through distribution conduits **10** which come from manifold **9**. The discharge of water condensate mixture from the chambers **5** is effected through discharge conduits **11** which terminate in manifold collector **12**.

It is thought that the invention and its advantages will be understood from the foregoing description and it is apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing its material advantages, the form hereinbefore described and illustrated in the drawings being merely a preferred embodiment thereof.

I claim:

Heat exchanger particularly for cooling cracked gases or the like comprising a gas input head having a gas inlet port, a gas discharge head having an exhaust port, concentric cooling chambers located in said heads in stepwise relationship from the outside toward the center, means interconnecting said chambers to form a bottom wall in said gas input head and a top wall in said gas discharge head, cooling pipes extending between said chambers in said gas input head and said gas discharge head, flue pipes located in said cooling pipes extending through said chambers connecting said gas input head to said gas discharge head, a gas guiding hood located

in the interior of said gas input head extending from said gas inlet port over said flue pipes with said hood forming an acute angle with the central plane of the stepwise chamber arrangement, said flue gas pipes at the gas discharge head extending beyond said top wall, a flat tube plate through which said flue pipes pass fixed to said extended flue pipes, said tube plate being arranged above and in spaced relation to said top wall to form a heating chamber, a casing at said gas discharge head covering said tube plate, and a jacket provided with an intake and an outlet for the supply and discharge of a medium to be heated surrounding said heating chamber.

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