March 18, 1952 W. H. HOLCROFT 2,589,811

GAS ATMOSPHERE GENERATING MEANS FOR HEAT-TREATING FURNACES

Filed April 5, 1948 2 SHEETS—SHEET 1

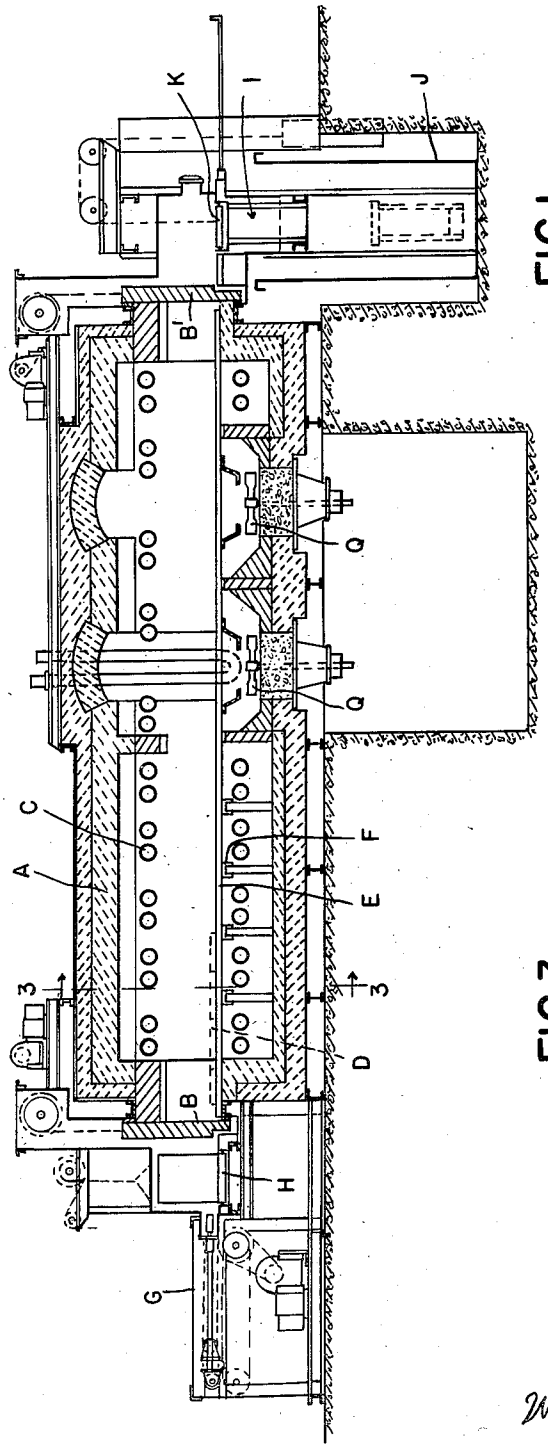


FIG. 1.

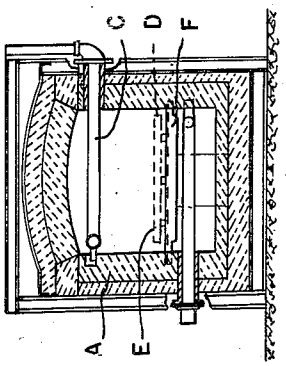


FIG. 3.

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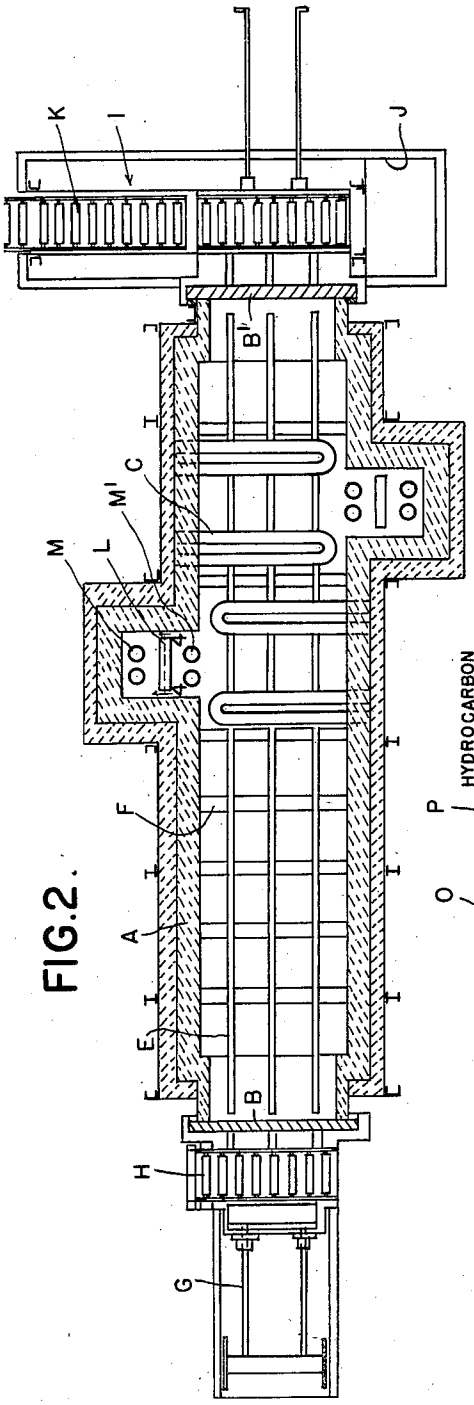


FIG.2.

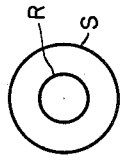


FIG.5.

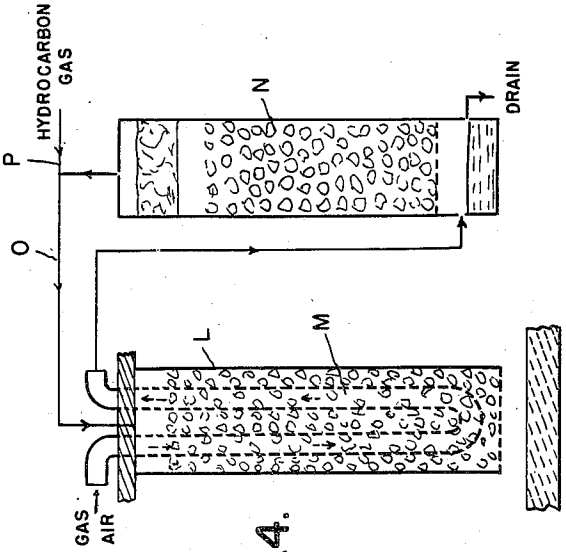


FIG.4.

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GAS ATMOSPHERE GENERATING MEANS FOR HEAT-TREATING FURNACES

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Application April 5, 1948, Serial No. 19,144

1 Claim. (Cl. 263—15)

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The invention relates to heat treating furnaces of that type in which the work travels through the furnace from one point to another thereof and is enveloped in a gas atmosphere during such travel.

It is the object of the invention to obtain a construction of furnace of this type in which the gas is generated by the action of a catalyst which is located within the furnace chamber. To this end the invention consists in the construction as hereinafter set forth.

In the drawings:

Fig. 1 is a vertical longitudinal section through my improved heat treating furnace;

Fig. 2 is a horizontal section therethrough;

Fig. 3 is a cross-section on line 3—3, Fig. 1;

Fig. 4 is a section on line 4—4, Fig. 2, illustrating diagrammatically associated elements of the apparatus;

Fig 5 is a cross-section through a modified form of catalyst heating means.

The heat treating furnace may be of any suitable construction but, as illustrated, A is an elongated refractory lined casing, or tunnel, having closure doors B and B' at its opposite ends. Within the tunnel are upper and lower series of horizontally extending U-tubes C within each of which active combustion of gaseous fuel occurs to produce radiant heat. The work preferably placed in pans D is supported on longitudinally extending rails E, which latter are mounted on cross beams or spacers F extending transversely of the furnace above the level of the lower series of U-tubes. At one end of the furnace is a mechanism G which, when the door B is raised, successively pushes loaded pans into the furnace chamber. While at the opposite end of the furnace, these pans are successively ejected when the door B' is raised. A roller conveyor H feeds the pans laterally into the furnace. At the opposite end is an elevator mechanism I for lowering the pans into a quenching well J from which they are withdrawn by a suitable conveyor K.

As has been stated it is the object of the invention to provide means for developing the gas atmosphere by the action of a catalyst located within the furnace chamber. Inasmuch, however, as the reaction produced by the catalyst is endo-thermic it is necessary to supply additional heat to keep the catalyst at the required temperature. This I preferably accomplish by providing one or more pockets in the side walls of the furnace but in full communication with the furnace chamber in which pockets are located,

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the catalyst container and the supplemental heating means therefor. As shown the catalyst is enclosed within a casing L of oblong rectangular cross-section. The upper end of this casing passes through the roof of the furnace, while its lower end is in gas communication with the furnace chamber. U-tubes M and M' extend vertically adjacent, respectively, to the outer and the inner sides of the casing L, said tubes being similar in construction to the tube C and being heated by the combustion of gaseous fuel therein. The products of combustion from one of these tubes, such as M, may if desired be used as a constituent of the gaseous mixture which is subjected to the action of the catalyst. Thus, as shown diagrammatically in Fig. 4, the products of combustion from the discharge end of the U-tube M pass to the lower end of a water tower or cooler N, which extracts therefrom the greater portion of the water vapor. The products then pass into a conduit O in which they are commingled with a proportionate quantity of hydrocarbon fuel from a conduit P and the mixture then passes into the upper end of the casing L for the catalyst. Here an endo-thermic reaction takes place which converts the CO_2 and H_2O to CO and H_2. The original nitrogen content of the air is also a constituent of the mixture which may be expressed as $2.2CO—2.6H_2—7.5N_2$.

For the most effective catalytic action, the temperature of the catalyst should be higher than that of the gas amosphere within the furnace chamber. This can be readily accomplished by the construction described as the radiant heat from the U-tubes M and M' impinges directly against the casing L in which the catalyst is held. By suitably proportioning these parts, the rate of heat generation in the tubes M and M' is sufficient to supply the heat required for the endo-thermic reaction and also to maintain the temperature of the catalyst at the desired point such as 1600° F., the temperature of the gas atmosphere within the furnace chamber being only 1500° F. Fans, such as Q, may be used for commingling the newly formed gas with that previously within the furnace chamber.

Instead of heating the catalyst by the U-tubes, as above described, any other suitable heating means may be used such, for instance, as by arranging a combustion tube R within a surrounding tube S which latter contains the catalyst, this being shown in Fig. 5.

While I have described the use of products of combustion from one of the U-tubes as the source of the CO_2 element of the mixture conducted to

the catalyst, it is also true that air and hydrocarbon gas may be passed through the catalyst to secure a suitable gas low in CO_2 and water vapor.

What I claim as my invention is:

Gas generating means for a heat treating furnace supplied with a gas atmosphere and having means conveying work to be heat treated longitudinally through the furnace chamber, said furnace having a pocket in a vertical side wall thereof out of the path of the work, comprising a container of an oblong cross-section extending across said pocket and longitudinally thereof, said container having a catalyst therein, means for passing through said container the products of combustion of a carbonaceous fuel commingled with a proportionate quantity of hydrocarbon gas to subject the mixture to the action of the catalyst and to discharge the gaseous products into said pocket, a pair of U-tubes extending through the top of said furnace chamber into said pocket on opposite sides of and in proximity to said container, and means for heating said U-tubes by the combustion of a mixture of hydrocarbon fuel and air therein to supply heat for the endo-thermic reaction within the container and to maintain the temperature of the catalyst at a temperaure above that of the gaseous atmosphere within the furnace, the products of combustion from at least one of said tubes supplying one constituent of the aforesaid gaseous mixture passed through said container.

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