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INDUCTIVELY HEATED ELECTRICAL CONTACT
FURNACE WITH PREHEATER
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Fig.1

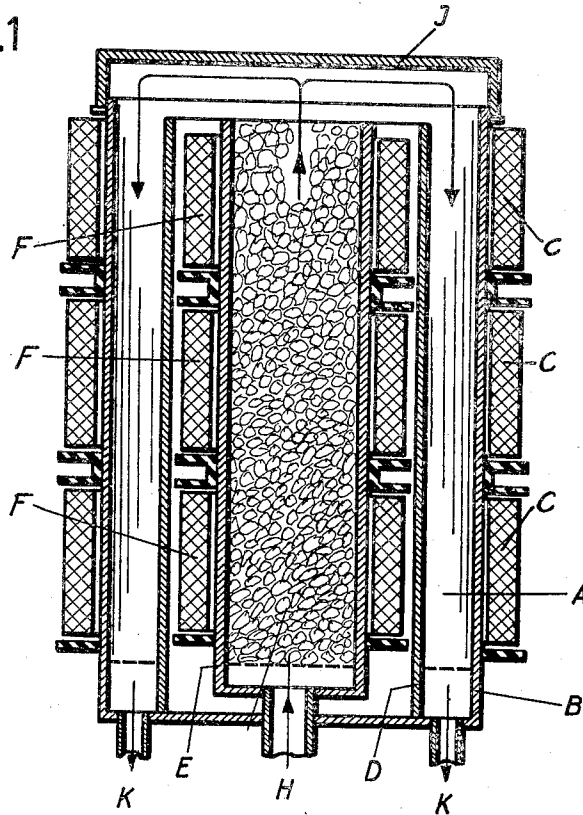
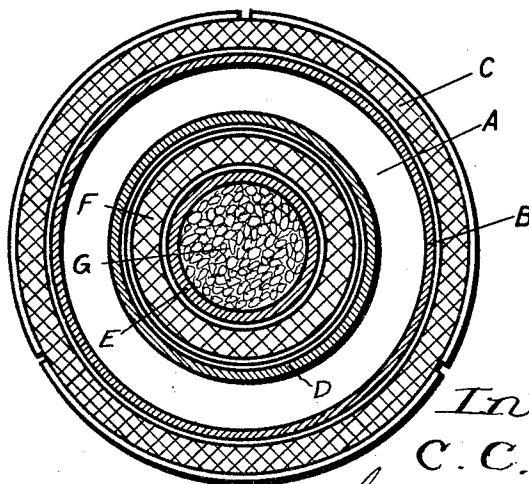


Fig.2



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INDUCTIVELY HEATED ELECTRICAL CONTACT FURNACE WITH PREHEATER

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1 Claim. (Cl. 219—47)

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In contact furnaces having annular shaped reaction chambers for carrying out the chemical reactions, it is frequently the case that useful space is lost by taking in at too low a temperature of the gases which are to carry out the reaction in the furnace, and which first must be raised to the temperature at which the reaction takes place.

Attempts have been made to avoid this difficulty by conducting the gases through a separately arranged pre-heater, wherein same are raised to approximately the reaction temperature, before they enter the reaction furnace itself. This method, it is true, accomplished the desired results, in production operation, but it unavoidably resulted in the disadvantages that the furnace and pre-heater structure became more complicated, required more space, and a greater capital expenditure. It has also been attempted to avoid these disadvantages by providing the heated furnace with a short circuited secondary winding consisting of a coiled pipe, wherein the gases were raised to approximately the reaction temperature by inductive heating before they entered the reaction chamber of the furnace. In this way, it was perhaps the case that a simple and somewhat inexpensive structure was provided. The disadvantage still existed, however, that there was a fixed ratio of heat transfer capacity between the primary and secondary components, that is, between the furnace and the pre-heater, whereas in actual practice this ratio is required to be variable within wide limits, a result that cannot be attained with the simple structure according to this arrangement.

According to the present invention the desired result may be attained by constructing in the inner space of the annular chamber of a reaction furnace an electrically energized pre-heater, which is preferably heated according to the induction heating principle.

The arrangement according to the present invention is shown in vertical section in Figure 1; and,

Figure 2 is a cross-sectional view of the structure shown in Figure 1.

Referring now to the drawing in detail, the reference character A represents the annular reaction chamber of the contact furnace, wherein the reactions take place. The exterior wall B of the furnace is inductively heated by the heat resistant windings C, which are energized by the respective phases of a polyphase alternating current power system. A central conduit E

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is positioned in the inner part of the annular space, which latter is bounded on its outer periphery by the wall D. Heat resistant coils F are positioned intermediate the central conduit E and the wall D and are respectively connected to the different phases of a polyphase electrical power system to effect heating by the inductive heating principle. The space between the wall D and outer surface of the conduit E is determined so that the exciting coils F exactly fit there. As thus positioned, they are equally effective in heating the wall D. The electrical energy converted into heat must be sufficient for equalizing the heat differential between the wall D and conduit E.

The interior G of the central conduit E constitutes the pre-heater chamber and this is normally filled with granular material. The gases are admitted to the pre-heater chamber G through a central tube H, which is connected to the central conduit E, and are raised in the pre-heater chamber to the reaction temperature or approximately thereto. They leave the pre-heater chamber G under the cover J and pass to the annular chamber A, where the reaction takes place. From the annular chamber A they are conducted from the furnace by pipes K.

For the purpose of obtaining the desired relative variations in the temperatures of the pre-heater chamber G and the annular reaction chamber A, it is desirable that the coils F for the pre-heater chamber and the coils C for the reaction chamber be separately energized.

The operation of the combined contact furnace and pre-heater according to the present invention may be varied according to the load demands within wide limits. When carrying out exothermic processes, the superfluous heat, which is not used for carrying out the reaction is used for pre-heating; when carrying out endothermic processes, the heating from the inductor coils on both sides of the annular reaction chamber effects a very uniform reaction process. The heat resistant exciting windings, which effect the inductive heating, are put in and around the furnace in the usual manner. Automatic controllers (not shown) may be provided for maintaining the thermal equilibrium.

If the chemical reaction process to be carried out should so require, the pre-heater chamber and the annular reaction chamber may be interpositioned, the latter being placed on the outside of the furnace and the former axially thereof, without departing from the principle of the invention. Also, the reaction process to be carried

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out may be the inverse of that described, that is, the gases may be directed from the top into the pre-heater chamber and from below into the reaction chamber.

The electrical heating could also be accomplished by resistance coils. Since, however, there is always present the danger of explosion in carrying out most production operations heating by the inductive effect is the preferred form.

Having now fully described my invention, what I claim as new and useful and desire to secure by Letters Patent of the United States:

In an electrical heating furnace for carrying out high temperature exothermic and endothermic reactions, a central pre-heating chamber, a central conduit connected to said pre-heating chamber for conducting gases thereto, a plurality of inductor coils adapted to be connected, respectively, to the various phases of a poly-phase power system closely surrounding said pre-heating chamber in aligned relationship, an an-

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nular reaction chamber surrounding said pre-heating chamber closely positioned with respect to the coils therearound, a cover over the central pre-heating chamber and the annular reaction chamber for directing the heated gases from the former reversely through the latter, and a plurality of inductor coils adapted to be connected, respectively, to the various phases of a poly-phase power system closely surrounding said annular reaction chamber in aligned relationship.

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