June 4, 1929. J. E. McLAUGHLIN 1,715,376

ELECTRODE INSTALLATION FOR ELECTRIC FURNACES

Filed April 29, 1925

Fig. 1

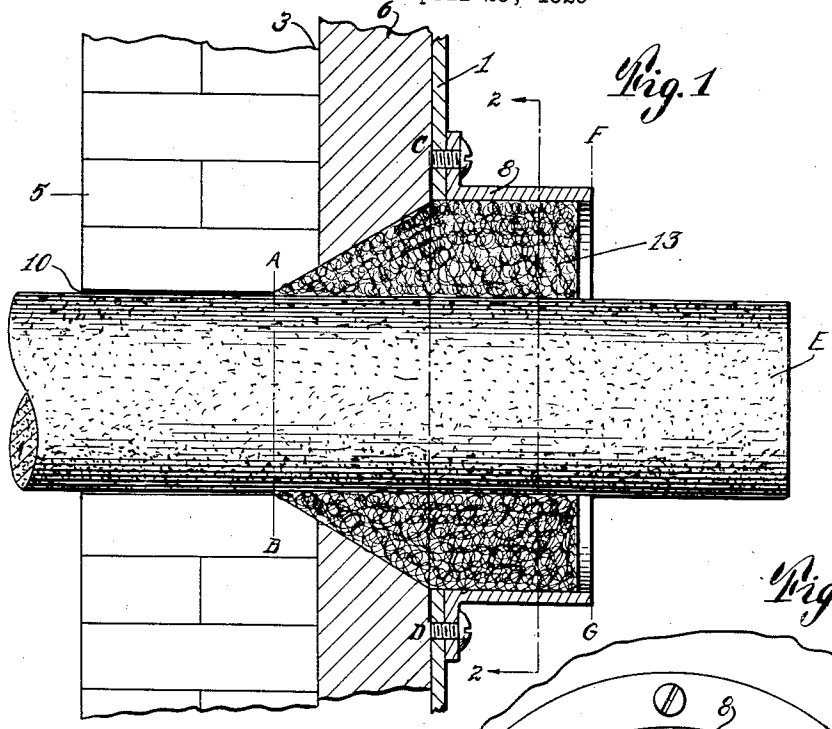


Fig. 2

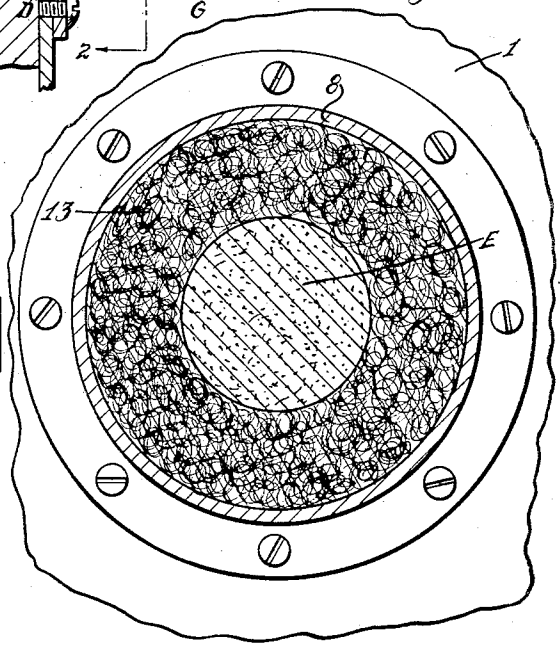


Fig. 3

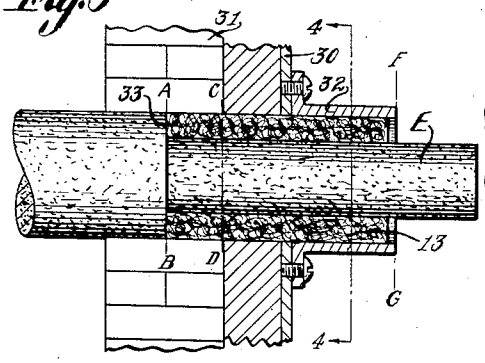
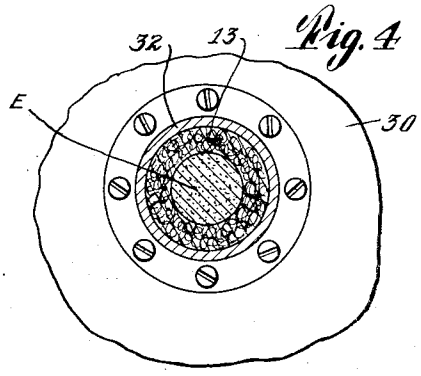


Fig. 4



Inventor;

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by

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UNITED STATES PATENT OFFICE.

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ELECTRODE INSTALLATION FOR ELECTRIC FURNACES.

Application filed April 29, 1925. Serial No. 26,640.

This invention has relation to the installation of electrodes for electric furnaces and is especially applicable to that type of furnace where gases or vapors are introduced into the reaction shaft, or where gaseous reaction products result.

In such cases the reaction shaft is usually surrounded by furnace construction comprising a refractory wall enclosed in a gas-tight iron or steel shell. The electrodes, which are usually graphite or hard-baked carbon cylindrical bars varying from 3 to 10 inches in diameter, must be so inserted in the reaction chamber that a substantially gas-tight joint is formed with the furnace construction, and must be effectively insulated from the iron or steel shell.

In the past, the practice has sometimes been to insert the electrode in the reaction chamber through a stuffing box of the conventional type, suitably secured to a flange which is bolted to another flange forming a part of the furnace shell structure, with a gasket of sheet insulating material, such as mica, between the flanges, and to provide the fastening bolts for the flange with insulating sleeves. The integrity of such insulation is difficult to maintain, and, in a furnace where more or less chemically active materials are employed or result from the reaction in the furnace shaft, the ordinary packing material used in the stuffing box deteriorates quite rapidly. Especially where chemically active vapors are present, as in the manufacture of carbon bisulphide from carbon and sulphur, has this been true, because the common materials used in the stuffing box quickly harden, probably owing to reaction with the sulphur, so that leakage frequently occurs through the box.

The object of the present invention is to dispense with electrode stuffing box construction and provide electrode installation in an electric furnace which will be simple, economical, and highly effective. The manner in which this object is attained, and advantages incident to this invention, will be readily gained from the following description thereof when taken in connection with the accompanying drawing, in which—

Figure 1 is a detailed sectional view of electrode installation in accordance with this invention.

Figure 2 is a section on the line 2—2 of Figure 1.

Figure 3 is a similar view of a somewhat modified installation.

Figure 4 is a section on the line 4—4 of Figure 2.

In Figure 1 is shown one form of electrode installation which has been found to be highly satisfactory. The usual electrode E is inserted into the reaction chamber 10, through a hole extending through the furnace shell 1 and the furnace lining or wall 3. The wall 3 may consist of two layers or thicknesses,—the fire brick refractory layer 5, and the heat-insulating layer 6 constructed of a heat-insulating and refractory material, such as kieselguhr brick or powder. The hole may be considered as comprising three sections; the section extending exteriorly from the reaction shaft of the furnace to the line A—B is cylindrical and of a diameter slightly greater than that of the electrode E; the section from the line A—B to the line C—D gradually increases in diameter, and is frusto-conical in shape; the section extending from the line C—D to the line F—G is cylindrical and of a diameter equal to that of the diameter of the base of the frusto-conical section, and is formed by a collar 8 extending exteriorly from the furnace shell 1.

The electrode E may be easily pushed through the hole into the reaction chamber 10,—a small clearance being left between the electrode and the furnace wall 3 in the section bounded by the reaction chamber 10 and the line A—B. A conical annulus is formed between the lines A—B and C—D, between the electrode E and the furnace wall 3; and a cylindrical annulus between the lines C—D and F—G, between the electrode E and the collar 8. Both these annuli are caulked full with a comminuted refractory non-conducting and inert packing material 13, such as asbestos fiber or the dry mixture of magnesia and asbestos fiber known as 85% magnesia.

It is not essential that the space between the electrode E and the furnace wall 3, between the lines C—D and F—G, should be a conical annulus. It may be a cylindrical annulus and at the same time be a continuation of the annulus formed between the collar 8 and the electrode E, as illustrated in the

modified electrode installation shown in Figure 2. In this installation the electrode comprises two portions of different diameters, whereas the hole extending through the furnace shell 30 and the furnace wall 33 is of the same diameter throughout,—slightly larger than the diameter of the larger portion of the electrode E. The electrode may be easily inserted into the reaction chamber through the hole, until the end face 33 of the larger diameter portion is in alinement with the line A—B of the furnace wall 31. A cylindrical annulus is left between a collar 32 extending from the furnace shell 30 and the electrode, and the wall 31 and the electrode, to the line A—B. This annulus may be caulked full with the dry mixture of magnesia and asbestos fiber as described in connection with Figure 1.

In both installations the fibrous mixture is driven tightly into the annular space by suitable caulking implements, and being compressible is so tightly packed and compressed as to effect a gas-tight joint between the electrode and the surrounding sleeve and between the electrode and the furnace wall construction. The asbestos fibers maintain the integrity of the packing, when driven and compressed in place, and the packing itself is impermeable by the gas. It may be desirable to use asbestos fiber only, or asbestos mixed with such a refractory powder as finely divided alundum, in case the temperature of the refractory furnace-wall is so high as to cause calcination and shrinkage of the basic magnesium carbonate which is one of the components of "85% magnesia."

In both constructions, the packing surrounds and supports the electrode for a considerable portion of its length,—the extension support afforded by the collars permitting the packing to be positioned where high temperature does not interfere with the stability of the packing. The constructions described are simple and are designed so that it is a very easy matter to remove or insert electrodes into the reaction chamber. The magnesia-asbestos packing is gas-tight, very durable, and is a substantially perfect insulator.

What I claim is:

In an electric furnace, the combination of a refractory wall surrounding a reaction chamber, a metallic shell enclosing said wall, an electrode extending into said chamber through said shell and wall, said wall being recessed about said electrode from an inner portion of the wall through said shell, a metallic collar projecting outwardly from said shell about said electrode, and a gas-proof, electrical non-conducting, heat-insulating packing material in said recess in contact with said refractory wall and electrode and filling the space between said collar and electrode.

In testimony whereof I have affixed my signature.

JAMES E. McLAUGHLIN.