Sept. 15, 1925. 1,553,922

O. ARAM

MEANS FOR FACILITATING FUEL PASSAGE THROUGH FURNACES

Filed Feb. 7, 1922

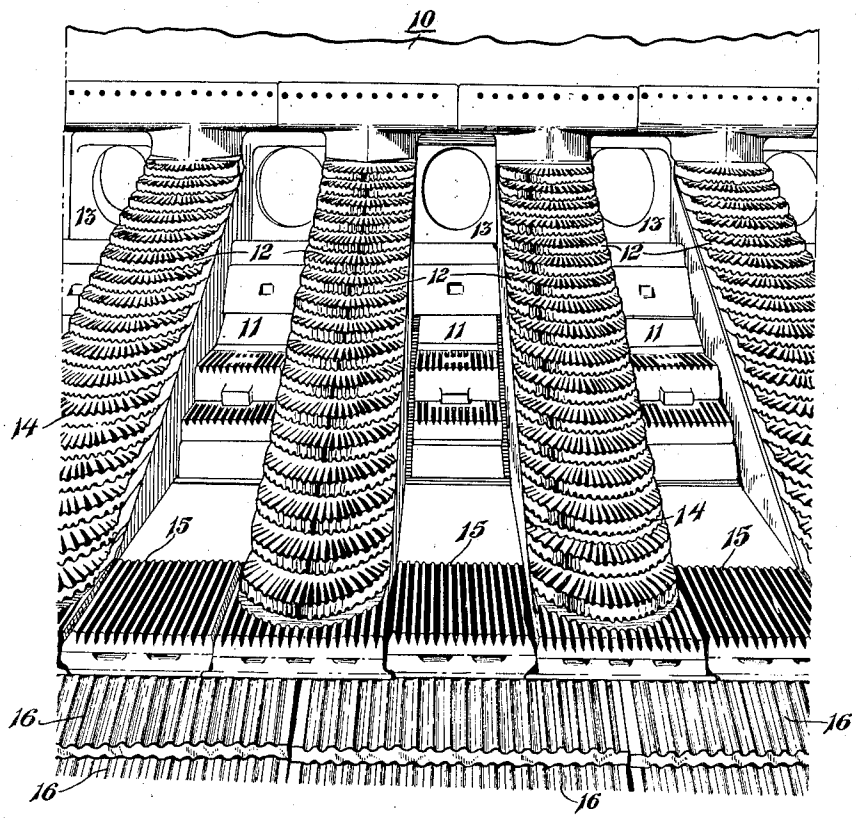


Fig. 1.

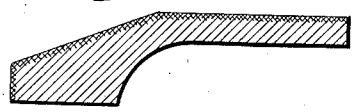


Fig. 2.

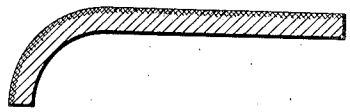


Fig. 3.

WITNESSES:

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UNITED STATES PATENT OFFICE.

OTTO ARAM, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

MEANS FOR FACILITATING FUEL PASSAGE THROUGH FURNACES.

Application filed February 7, 1922. Serial No. 534,722.

To all whom it may concern:

Be it known that I, OTTO ARAM, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Means for Facilitating Fuel Passage Through Furnaces, of which the following is a specification.

This invention relates to furnaces and particularly to furnaces of the high-duty type, and it has for an object to provide in connection with apparatus of the character designated a novel method for facilitating the passage of burning fuel and hot clinker over the fuel-supporting castings of the furnace, and for preserving the iron of such castings. It has for a further object to provide, for furnaces of the character designated, castings having fuel-supporting surfaces to which the burning fuel and hot clinker do not readily adhere and which protect the castings from the rapid deterioration.

These and other objects are made more manifest in the following detailed description of my invention, reference being had to the accompanying drawing in which Fig. 1 is a perspective view of a common type of mechanically-operated furnace to which my invention may be advantageously applied, and Figs. 2 and 3 are views in section of fuel-supporting castings which have been constructed according to the present invention.

Mechanically-operated furnaces employed in steam power plants of central power stations, are subjected to severe operating conditions which arise chiefly from the high furnace temperatures normally maintained, and the low fusibility of the fuels commonly employed. These conditions are conducive to the formation in the burning fuel of clinker, composed largely of silica. Since highly heated silica or slag has a strong affinity for iron oxide, clinker adheres to the cast iron fuel-supporting members, checking the desired uniform progression of the burning fuel and residuum over such castings toward the ash discharge of the furnace. Moreover, when clinker is broken free from the iron castings, it carries with it a scale of the iron, resulting in a gradual sloughing off of the iron and causing a rapid deterioration of the furnace castings.

The purpose of the present invention is to overcome these difficulties commonly experienced in the operation of high-duty furnaces, by providing metallic fuel-supporting members over which hot slag or clinker passes without adhering thereto, thus enabling the maintenance of a fuel bed which may have a uniform progressive movement over the fuel-supporting casting.

I have found by experiment that burning fuel and hot refuse may be facilitated in their passage over iron furnace castings, such as tuyères, dead plates, dump grates and aprons, which are ordinarily in contact with highly heated clinker by utilizing castings whose exposed surfaces have been coated with a material less adherent to fused silica than iron. An example of such material is found in metallic aluminum, to which the fused slag or clinker does not adhere as it does to cast iron, and hence the fuel bed slides freely over the aluminum-coated castings as though these parts were greased, rather than adhering as in the ordinary furnace.

The surface coating of non-adherent material may be applied to the castings to be treated by any of the various well known processes of coating, and the coating may be applied either before the several castings are assembled in the furnace, or after assemblage in their operative positions within the furnace. The surface coating should, however, preferably be intimately associated with the iron of the casting so as not to be readily broken away.

Where aluminum is employed, a satisfactory coating consists of a "solid solution," or alloy, of the iron and aluminum at the exposed surfaces of the casting, the aluminum being nearly pure at the surface and the iron content of the alloy increasing and the aluminum content decreasing toward the inner extent of the surface layer of alloy. A coating of this character may be effected by heat treating the castings with aluminum in a reducing atmosphere in a manner similar to that employed in the well known "calorizing" process, and is preferably applied before the castings are assembled.

Experimentation has demonstrated that satisfactory results may also be obtained by applying the aluminum coating by means of a spray gun. In this process, the aluminum is fed to the blast of the gun in the form of

wire and molten metal is carried by the blast out of the nozzle of the gun with a high velocity directly onto the surface of the casting to be coated. The coating is continuous, may be of any desired depth, and is exceedingly intimate. The heating of the coated castings in the operation of the furnace assists in the formation and maintenance of a "solid solution" coating upon the surfaces thus treated. This process also has the advantage of being adapted for application after the stoker has been assembled, or a stoker already in operation may be reconditioned by cleaning the exposed surfaces and applying the aluminum coating with a suitable spray gun. Where other materials are used for coating the iron casting, methods suitable to the surface coating to be employed should be used in effecting the surfacing of the castings.

The drawings illustrate one type of high-duty furnace in connection with which the method of facilitating the passage of clinker or slag over the fuel-supporting castings as defined in the present invention may be advantageously employed. In Fig. 1, an underfeed stoker is indicated at 10, which comprises alternate series of fuel retorts 11 and tuyère banks 12, the fuel being fed from beneath into the forward ends 13 of the retorts as is the usual practice. Air for the purpose of supporting combustion is supplied to the fuel through the tuyère blocks 14, only after the fuel has emerged from the retorts. It results from this method of combustion that the tuyère blocks 14 and the lower fuel-supporting castings, as for example, the coal plates 15, and overfeed grates 16, are subjected to contact with the highly heated burning fuel and residuum, the slag or clinker content of which would adhere to the iron castings were it not for the non-adhesive coating upon the exposed surfaces thereof. The detailed views, Figs. 2 and 3, show some of the coated castings in section, the surface coating being indicated thereon by means of double-cross hatching.

It is to be understood, however, that the above described constructions and methods of surface coating the furnace castings are merely illustrative of applicant's inventive idea, and that the invention is not limited to any specific type of furnace or furnace castings, or to any special method of coating the fuel-supporting castings. The essence of the invention consists in facilitating the movement of the burning fuel and the residuum therefrom over the fuel-supporting castings by providing thereon a surface coated with a material to which the slag or clinker in the burning fuel and residuum, does not readily adhere, and over which the fuel bed may pass with an even forward movement, and also in the surface coated castings which enable this beneficial result to be attained.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited but is susceptible of various other changes and modifications, without departing from the spirit thereof and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:—

1. A fuel-supporting member for a furnace formed of ferrous material and having a highly intimate surface coating of aluminum thereon.

2. A fuel-supporting member for a furnace composed of an iron body portion and a highly intimate coating of aluminum on such surfaces as are exposed to contact with hot fuel or clinker masses.

3. In a furnace, a fuel-supporting grate structure over which fuel travels during combustion, the surfaces of said grate structure disposed to contact with the burning fuel being coated with aluminum, whereby the hot fuel slides over the grate structure without adhering thereto.

4. In a progressive feed furnace, a grate structure over which said fuel travels during combustion of the fuel, the surfaces of the grate structure adapted to contact with the burning fuel being coated with aluminum, whereby the hot fuel slides over the grate structure without adhering thereto.

5. A furnace member subject to contact with moving burning fuel and with moving fused slag, said member being formed of ferrous material and having a highly intimate surface coating of aluminum thereon.

In testimony whereof, I have hereunto subscribed my name this 2nd day of February, 1922.

OTTO ARAM.