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CONTINUOUS HEATING FURNACE

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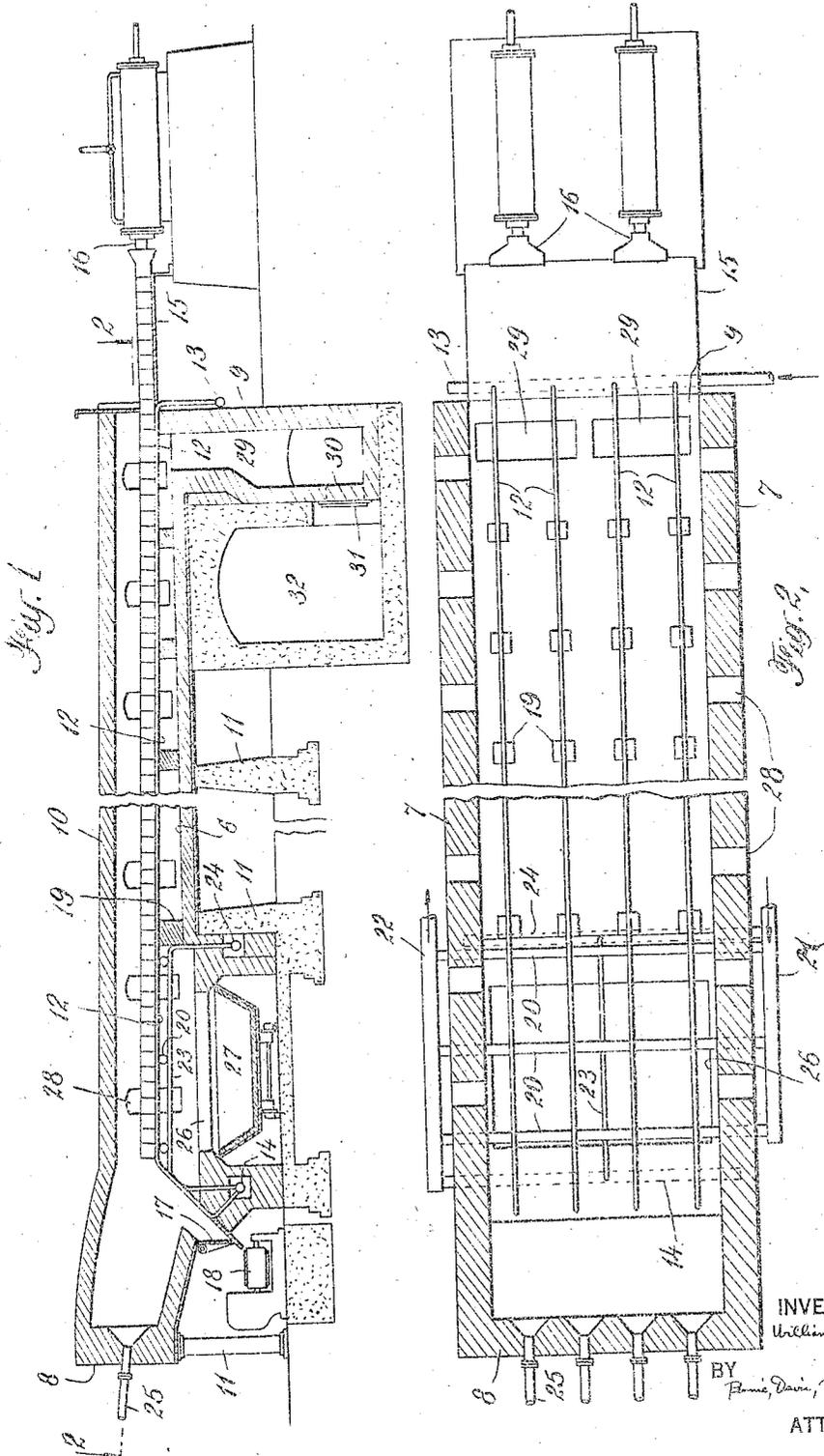


Fig. 1

Fig. 2

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CONTINUOUS-HEATING FURNACE.

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To all whom it may concern:

Be it known that I, WILLIAM HENRY FITCH, a citizen of the United States, residing at Allentown, in the county of Lehigh, State of Pennsylvania, have invented certain new and useful Improvements in Continuous-Heating Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to continuous heating furnaces and has for its object the provision of certain improvements in furnaces of this type whereby a finely divided carbonaceous fuel, such as pulverized coal, may be successfully employed.

Heretofore pulverized coal, or other finely divided carbonaceous material, has been used as a fuel in firing continuous heating furnaces although the refuse depositing in the furnace during the combustion of the coal very materially hampered its most successful operation. The difficulties encountered in the use of pulverized coal with a very low ash content may be partially overcome in some instances, but the use of a coal of high ash content heretofore has led to very unsatisfactory results, due to the necessity of stopping operation of the furnace for cleaning out slag. This results in much labor and naturally interferes with the quantity of steel rolled.

The disposition of ash is more or less of a problem according to the ash content of the coal used. The factors which must be considered are the melting point of the ash, the quantity of ash entering the furnace in a given time, and the manner in which the coal is prepared and applied to the furnace. While all the ash in the coal is projected into the furnace, only a comparatively small percentage of the ash is precipitated in molten form, the quantity deposited in a day's time usually being sufficient to cause its removal to be necessary in a continuous heating furnace of the type employed for heating billets of metal for rolling and the like; the major portion being deposited throughout the furnace hearth and flues in the form of dust.

The present invention contemplates certain improvements in the construction of a continuous heating furnace particularly adapted for the use of pulverized coal as a

fuel, and the provision of means for overcoming detrimental effects due to deposited refuse in the furnace. The furnace construction of the invention includes a chamber in close proximity to the combustion region for collecting and trapping refuse formed during combustion of the fuel. Preferably, this chamber is provided with an easily removable bottom portion which may be removed and replaced by another similar portion during the operation of the furnace. Additional means may be provided for displacing refuse deposited in other parts of the furnace. For example, one or more openings may be provided throughout the length of the furnace to permit the insertion of a cleaning iron or the like for displacing deposited refuse. Both liquid and dust ash may be removed without interference to further operation in a properly designed and operated furnace.

The furnace construction of the invention permits the maximum circulation of the hot gases around the material to be heated particularly in the region of high temperatures, thereby insuring the uniform heating of the material before being ejected from the furnace. For example, the rails traversing the furnace for guiding material to be heated through the furnace may be supported by a frame composed of hollow members to permit the passage therethrough of a cooling fluid, such as water or air. The rails also may be hollow to permit the passage therethrough of a cooling fluid.

Up to the present time practically all continuous heating furnaces have employed producer gas, or gasified coal as fuel. For this reason they have been constructed with recuperators for preheating of air for combustion. This is necessary where coal is gasified in order to produce the desired flame temperature and economical results. When pulverized coal is employed as a fuel, a recuperator is not required due to the high flame temperature obtainable with air at atmospheric temperature.

Very low grade coals may be employed satisfactorily in the furnace construction of the present invention. The cost of construction and the operating cost of a furnace embodying the present invention is very much less than that of former general practice. I have operated a furnace of this construction with a fuel consumption as low as 90 pounds

of pulverized coal per ton of billets heated. The fuel consumption, however, will vary slightly with the temperature and weight of the charge.

5 These and other features of the invention will be more clearly understood by reference to the following description in conjunction with the accompanying drawings; in which—

10 Fig. 1 is a sectional elevational view of a furnace embodying the invention; and Fig. 2 is a plan view in section taken along the line 2—2 of Fig. 1.

A continuous heating furnace comprising a floor 6, side walls 7, end walls 8 and 9, and a top or roof 10 of appropriate refractory material is supported at a suitable height by columns 11 of any structural material, such as brick or steel. Guiding rails 12 of a track traverse the interior of the furnace and serve to guide material to be heated through the furnace. The rails 12 are preferably hollow and communicate at one end with an inlet pipe 13 for supplying a cooling fluid, such as water or air, the other end leading to an outlet pipe 14 secured to one of the supporting columns 11. A platform 15 is provided at the charging end of the furnace for holding a supply of billets, or other material to be heated, from which they are forced through the furnace by any appropriate means, such for example as a hydraulic ram 16, and are discharged from the other end through a hinged door 17 on to a conveyor 18 for transfer to the mill.

The guiding rails 12 may be supported within the furnace by refractory blocks 19. But in the region of high temperature I provide a supporting frame composed of hollow cross members 20 supported by the side walls 7 of the furnace, and communicating at one end with an inlet pipe 21 for supplying a cooling fluid, such as water or air, the other end communicating with an outlet pipe 22. The cross members 20 of the supporting frame rest upon a longitudinally disposed hollow supporting member 23 communicating at one end with a cooling fluid inlet pipe 24, supported in a column 11, and at the other end with the outlet pipe 14. This construction permits the free circulation of the hot gases in the region of high temperature around the material to be heated.

A burner 25 is provided in the end wall 8 of the furnace, and is adapted for supplying a finely divided coal and air to the furnace for combustion. An opening 26 in the floor 6 of the furnace leads to a chamber for collecting and trapping refuse formed during combustion of the fuel. This chamber may comprise a car 27 placed below the opening 26 so as to make a substantially air tight connection. The side walls 7 contain

a plurality of openings or apertures 28, which normally are closed but which may be opened at any time during the operation of the furnace to permit the insertion of a cleaning iron for displacing dust.

A flue 29 adjacent the end wall 9 of the furnace leads to the stack, and is provided with an opening 30 normally closed by a door 31. The opening 30 leads to a chamber 32 to provide room for the operator to clean the stack flues.

The furnace is brought to a sufficiently high temperature and maintained by the combustion of suitably prepared pulverized coal injected through the burner 25 together with an appropriate supply of air, or other combustion supporting gas. Material to be heated is then charged into the furnace from the platform 15 by the ram 16, and is heated to the desired temperature by progressive passage along the rails 12 to the opposite end of the furnace where it is discharged through the door 17 into a conveyor 18 for transfer to another part of the mill.

During combustion of the coal considerable molten and powdered refuse ash may be formed; substantially all the molten ash and a large portion of the powdered ash settles and is collected and trapped in the chamber or car 27; other portions being precipitated throughout the furnace from the hot gases while passing through the furnace to the stack. The apertures or openings 28, which are normally closed, may be opened at any time to permit the insertion of a cleaning iron, or the like, for removing refuse depositing in the furnace. If the stack flues become burdened with refuse to an objectionable extent the operator may gain access thereto at any time through the opening 30 and door 31 leading from the chamber 32.

While the furnace is in operation, a flow of cooling fluid, such as water or air, is maintained through the rails 12, and through the hollow members 20 and 23 of the supporting frame. The supporting frame is so positioned in the furnace as to permit the gases of highest temperature to circulate freely around the material being heated so as to insure the uniform heating of the material in the furnace. Generally, the supporting frame spans the opening 26 to the chamber or car 27 because the refuse collecting car 27 is usually positioned adjacent the combustion zone or region of highest temperature.

I claim:

1. A continuous heating furnace comprising a heating chamber, a combustion chamber adapted for burning pulverized fuel, means operatively associated with the combustion chamber for collecting and trapping refuse formed during combustion of

the fuel, said means forming a portion of the bottom of the combustion chamber and being adapted for easy removal.

2. A continuous heating furnace comprising a heating chamber, a combustion chamber adapted for burning pulverized fuel, a large opening in the bottom of the furnace, and a removable car adapted to close said opening, said opening and said car being so positioned in the bottom of the furnace as to collect and trap a relatively large portion of the refuse formed during combustion of the fuel.

3. A continuous heating furnace comprising a heating chamber, a combustion chamber adapted for burning pulverized fuel, means operatively associated with the combustion chamber for collecting and trapping refuse formed during combustion of the fuel, said means forming a portion of the bottom of the combustion chamber and being adapted for easy removal, and means permitting removal of refuse deposited in the heating chamber.

4. A continuous heating furnace comprising a heating chamber, a combustion chamber adapted for the burning of pulverized fuel, and a chamber in close proximity to the combustion region for collecting and trapping refuse formed during combustion of the fuel, said chamber having an easily removable bottom portion.

5. A continuous heating furnace comprising a heating chamber, a combustion chamber adapted for the burning of pulverized

fuel, a track in the heating chamber for guiding material to be heated, a supporting frame for the track traversing the region of high temperature within the heating chamber to permit the free circulation of hot gases around the material to be heated, said track and frame being composed of hollow members to permit the flow through of a cooling fluid, and a chamber below the region of high temperature of the heating chamber for collecting and trapping refuse formed during combustion of the fuel, said chamber having an easily removable bottom portion.

6. A continuous heating furnace comprising a heating chamber, a combustion chamber adapted for the burning of pulverized fuel, a track in the heating chamber for guiding material to be heated, a supporting frame for the track traversing the region of high temperature within the heating chamber to permit the free circulation of hot gases around the material to be heated, said track and frame being composed of hollow members to permit the flow through of a cooling fluid, a chamber below the region of high temperature of the heating chamber for collecting and trapping refuse formed during the combustion of the fuel, said chamber having an easily removable bottom portion, and means permitting the removal of refuse deposited in the heating chamber.

In testimony whereof I affix my signature
WILLIAM HENRY FITCH.