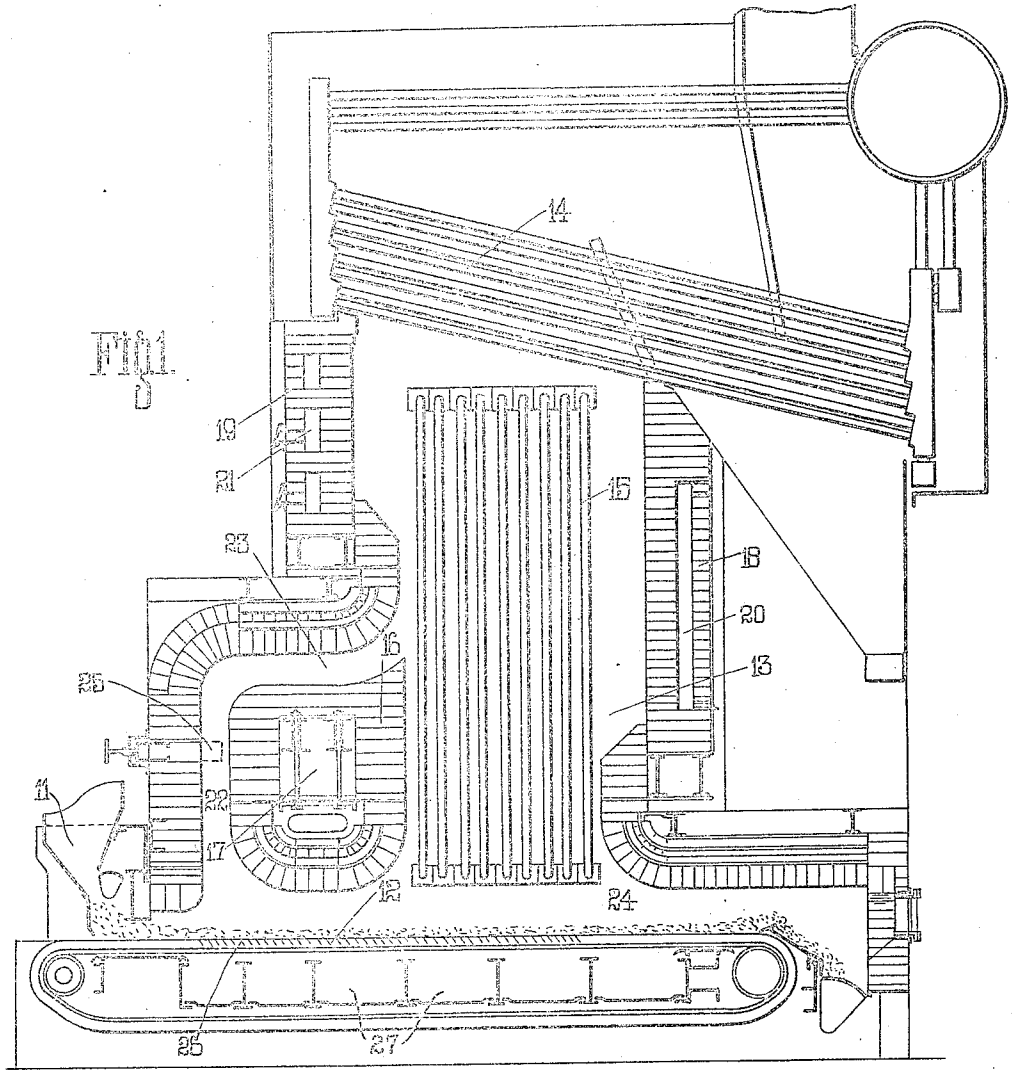
April 2, 1929. A. W. BENNIS 1,707,893

FURNACE

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Fig1.



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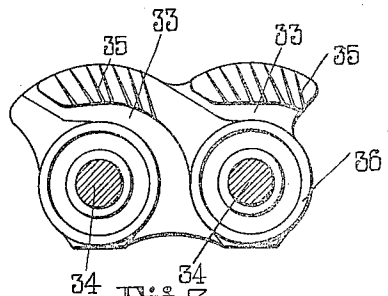


Fig. 3.

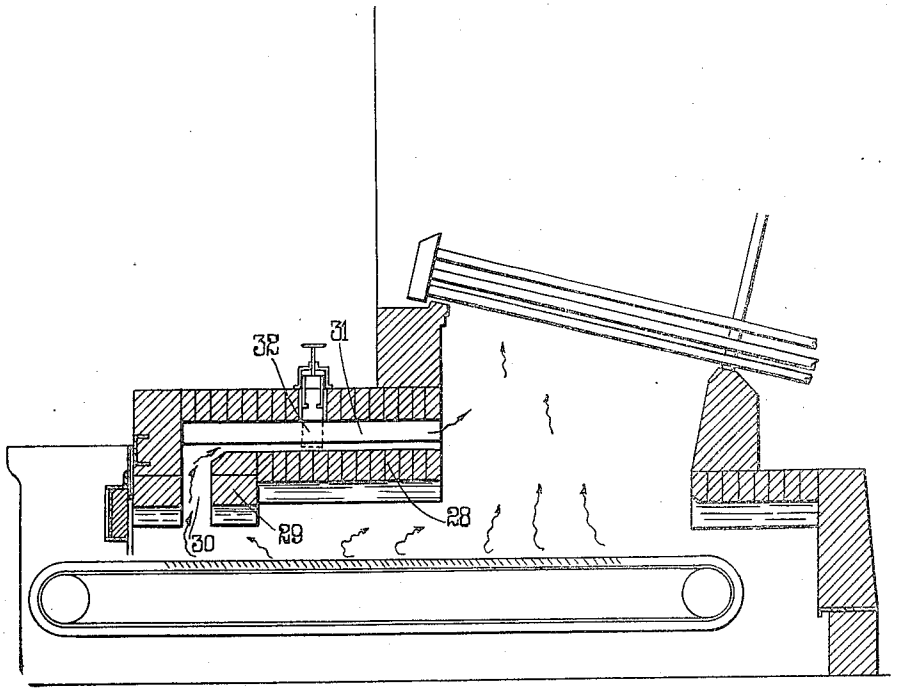


Fig. 2.

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UNITED STATES PATENT OFFICE.

ALFRED WILLIAM BENNIS, OF BOLTON, ENGLAND.

FURNACE.

Application filed December 21, 1927, Serial No. 241,554, and in Great Britain December 30, 1926.

This invention relates to improvements in furnaces in which the fuel is fed by or supplied to a chain or other form of grate which is used in combination with a refractory arch or arches over the chain or other form of grate and has for its object promoting the ignition and subsequent efficient combustion especially of low grade fuels which may be high in moisture content or high in comparatively incombustible matter or both and also other fuels of low calorific value or low volatile content such as coke breeze, coke ballast or fuel such as anthracite or semianthracite coals.

Heretofore various means have been attempted to promote the ignition and subsequent combustion of such or other fuels as aforesaid on chain or other form of grates by which a portion of the heated gases of combustion arising from the burning fuel has been induced to pass forward from the furnace or from under the incandescent refractory arch over the grate or part thereof over the incoming new fuel. For this purpose a flue connecting initially with the forward portion of the furnace has been provided as for instance in or through the refractory arch over the incoming fuel bed, the said flue having been finally connected at the point of exit for the gases to the combustion chamber as for instance at the rearward end of the refractory arch over the grate or else the said flue has been connected to a draught or other chamber and sometimes to the chimney or to a conduit controlled by a fan.

The present invention as to its main characteristics is designed to materially assist the projection of gases of combustion forward over the incoming fuel and into the before mentioned flue or flues, hereinafter called the "front furnace flue" by the combination with said front furnace flue of grate bars or chain grate links or the like constructed and arranged with inclined air ports or spaces designed to project a portion or a considerable portion of the air required for combustion in a forward direction towards the incoming fuel. Such a form of combined device acting in the manner described has not hitherto been employed. For the purpose of accomplishing the aforesaid result any type of links or grate bars may be employed so long as they are designed and arranged in a manner to project the air required for combustion towards the front of the furnace by means of forwardly inclined air ports or spaces.

In order to increase the steam generating capacity of the boiler and in order to minimize repairs to the refractory lining of the furnace or portions of said linings, steam or air cooled walls such as would constitute a portion or a considerable portion of the walls enclosing the combustion chamber of the furnace are combined with the front furnace flue and grate bars arranged as aforesaid. In this case the cooling medium may be carried in suitable conduits, such as batteries of pipes in accordance with arrangements now well known and employed in the design of furnaces and combustion chambers.

A further feature of the present invention consists in the combination with grate bars or grates arranged with forwardly directed air ports used in conjunction with a front furnace flue of a cellular or compartment type of grate through the cells of which the air may be passed to the air ports or spaces of the grate or grate bars.

The invention is more particularly described with reference to the accompanying drawings, in which:—

Figure 1 is a diagrammatic view showing one type of furnace having a front flue and grate bars or chain grate links with forwardly inclined air ports or spaces.

Figure 2 is a diagrammatic view of a modified form of furnace, whilst

Figure 3 shows one form of chain grate link suitable for adoption in the construction of the present invention.

In the drawings, more particularly in Figure 1 a hopper 11 is provided through which fuel is fed on to a grate 12. A combustion chamber is indicated at 13, the water tubes of the boiler at 14 and water or steam tubes 15 cooling the side walls of the combustion chamber. A brick arch 16 is provided which has a space 17 formed therein and open to the atmosphere for cooling such arch. The opposite walls 18 and 19 of the combustion chamber are also provided with air spaces 20, 21 for cooling purposes.

An upwardly directed flue 22 is provided in the brick arch which leads from the front end of the furnace to a horizontal portion 23 of the flue which merges into the combustion chamber at a point where the draught is greater than it is immediately at the rear end of the furnace, for example at 24.

It will be seen from the construction described that a portion of the heated gases is caused to pass towards the front end of the grate and through the flues 22, 23 so that in their progress towards the point of incoming fuel admission, such fuel may be lighted up.

In order to regulate the amount of forwardly passing gases through such flues a damper 25 is provided, preferably in the vertical portion 22 of the flue. This damper is preferably of the air cooled type of any suitable design.

In order to assist in the forward projection of the gases the grate 12 is formed with links so provided with inclined air ports diagrammatically illustrated at 26 in Figure 1, that the whole or a considerable portion of the air required for combustion is directed through such links in a forward direction towards the incoming fuel.

Any type of grate may be used so long as the air is projected forwardly as described. Such grate may be of the type described in my British patent specification No. 275290, or alternatively it may consist of links of the type described in my British patent application No. 23731/27. In the construction shown in Figure 1 a cellular or compartmental type of grate is provided through the cells 27 of which the air is passed to the inclined air ports or spaces 26 of the grate.

In a modified form of construction as shown in Figure 2 a brick arch is shown at 28 and a downwardly directed ignition arch is shown at 29. The gases are caused to pass towards the front of the grate and thence in an upward direction through a vertical flue 30 and a horizontal conduit 31 leading from said flue into the upper portion of the combustion chamber. The horizontal conduit 31 is provided with a damper 32 which may be of any suitable form in order to regulate the amount of gases passing along such conduit.

Figure 3 describes one of the numerous forms of link which may be utilized in the grates of the generator or other furnace of the present invention. These links are provided with a pair of inclined air ports 33 and, as shown in the drawings, these air ports are situated directly above and partly around the respective pivotal centres 34 of the links. If desired however, these air ports may be formed as described in my British Patent No. 222537 X.

In addition to the air ports 33 a plurality of comparatively small grooves 35 may also be provided in order to facilitate the passage of air upwardly and forwardly through the links. These air ports 33 and small grooves 35 may be formed in either or both faces of each link but preferably are formed in one face only.

In addition to the inclined air ports 33 and grooves 35 air spaces may be formed between adjacent links placed side by side. These air spaces are formed by constructing each link so that its transverse width at its upper end is of a dimension intermediate that of each link at its boss portion 36 and at those portions forming the air ports 33. By such a construction, passage of the air between adjacent links placed side by side is considerably facilitated.

It will be seen that by combining the grate through which air is caused to pass in an inclined direction towards that point at which the fuel is fed on to the grate, with flues formed at the front end of the grate leading from the grate to a point in the combustion chamber or other suitable part of the furnace where the draught is greater than on the grate, efficient ignition of the fuel at the front end of the grate takes place, and enables such fuels as anthracite, which is comparatively incombustible, fines or duffs to be burnt, hundreds of thousands of tons of which are at present lying around the anthracite collieries.

I declare that what I claim is:—

1. The combination of a furnace adapted to admit fuel at its front and including a combustion chamber, with a travelling chain grate comprising a plurality of links each provided with air passages all of which are inclined upward toward the furnace front and a flue having its inlet over the front portion of the grate and its outlet at a point which is remote from said front portion and is at a lower pressure than that at said front portion.

2. The combination of a furnace adapted to admit fuel at its front and including a combustion chamber, with a travelling chain grate comprising a plurality of links each provided with air passages all of which are inclined upward toward the furnace front, a refractory arch, and a flue leading through said arch from its inlet over the front portion of the grate to its outlet at a position in the combustion chamber which is remote from said front portion of the grate and is at a lower pressure than that at said front portion.

3. The combination of a furnace adapted to admit fuel at its front and including a combustion chamber, with a travelling endless chain grate comprising a plurality of compartments between the upper and lower runs of said chain and a plurality of links each provided with air passages all of which are inclined upward toward the furnace front, a refractory arch, and a flue leading through said arch from its inlet over the front portion of the grate to its outlet at a position in the combustion chamber which is remote from said front portion of the grate and is at a lower pressure than that at said front portion.

4. The combination of a furnace adapted to admit fuel at its front and including a combustion chamber, with a travelling chain grate comprising a plurality of links each

provided with air ports and relatively smaller air passages all of which ports and passages are inclined upward toward the furnace front, a refractory arch, and a flue leading through said arch from its inlet over the front portion of the grate to its outlet at a position in the combustion chamber which is remote from said front portion of the grate and is at a lower pressure than that at said front portion.

5. The combination of a furnace adapted to admit fuel at its front and including a combustion chamber, with a travelling chain grate comprising a plurality of links each provided with air passages all of which are inclined upward toward the furnace front, a flue having its inlet over the front portion of the grate and its outlet at a point which is remote from said front portion and is at a lower pressure than that at said front portion and control means within said flue for regulating the amount of gas passing through said flue.

In witness whereof, I have hereunto signed my name this 5th day of December, 1927.

ALFRED WILLIAM BENNIS.