E. L. THOMAS.

FURNACE GRATE BAR.

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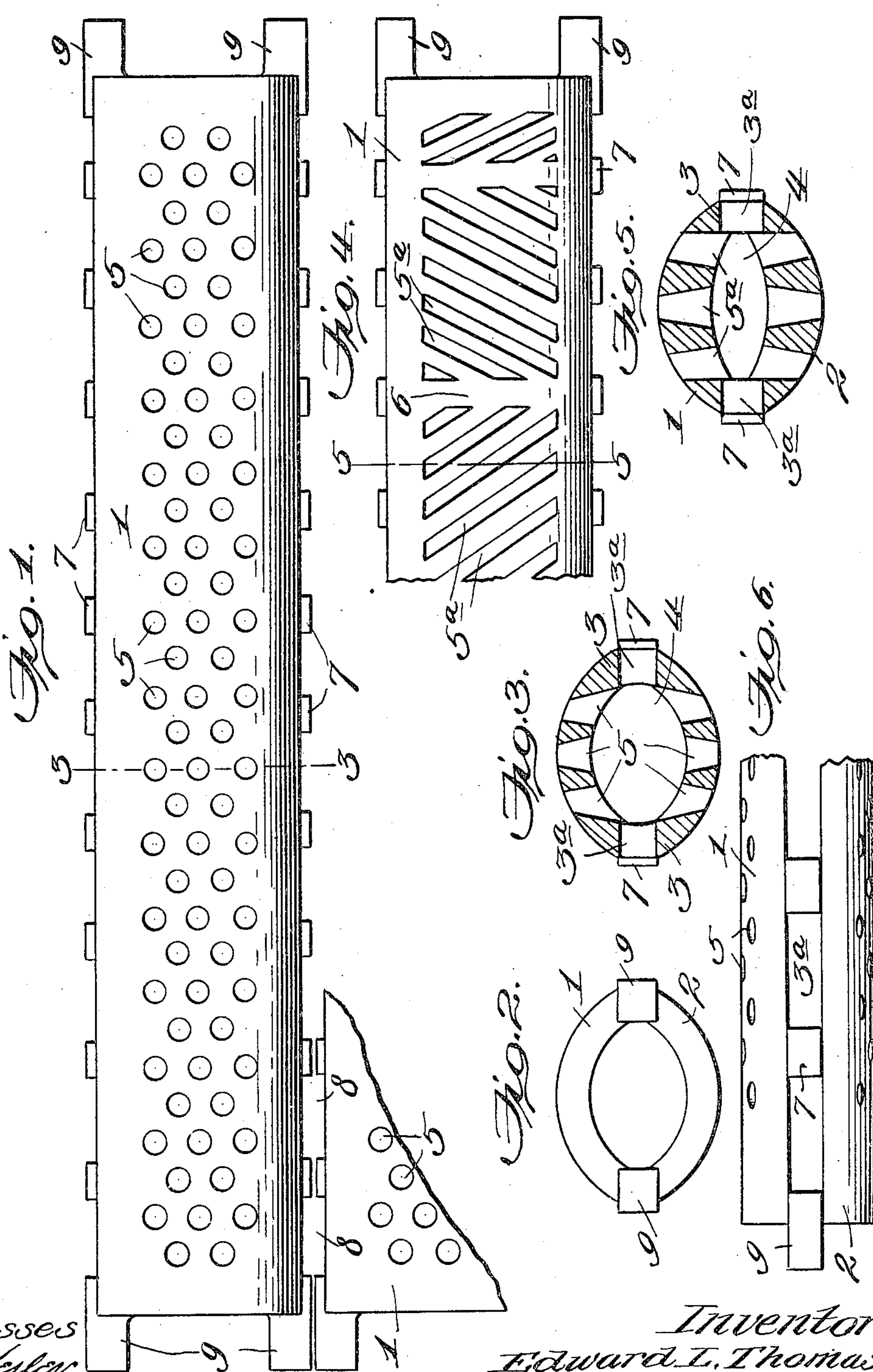
949,639. Patented Feb. 15, 1910.



Witnesses

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FURNACE GRATE-BAR.

949,639. Specification of Letters Patent. Patented Feb. 15, 1910.

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To all whom it may concern:

Be it known that I, EDWARD L. THOMAS, a citizen of the United States, residing at Valdosta, in the county of Lowndes and State of Georgia, have invented new and useful Improvements in Furnace Grate-Bars, of which the following is a specification.

This invention relates to new and useful improvements in grate bar units for furnaces and fire boxes and it proposes a hollow grate bar unit of elliptical or oval cross section, the structure of which provides for two oppositely located, transversely convex portions having air circulation openings, either or both of which may be constructed as fuel supporting portions.

The primary object of the invention is the provision of a grate bar unit wherein sagging and warping are rendered practically impossible and at the same time the circulation of air for the purpose of cooling the bar and of promoting combustion is induced.

A further object of the invention is the provision of a grate bar unit which is capable of use in connection with every type of furnace or fire box and without the necessity of in any way modifying the construction of the unit or of the furnace or fire box or its rigging. That is to say, the units as originally produced at the factory may be submitted to the trade through the usual channels and used by manufacturers without any modification on their part in connection with any type of furnace or fire box desired.

A further object of the invention is the provision of a grate bar unit which will preserve its points of advantage in connection with every kind of fuel. The units are manufactured for different kinds of fuel but the only variation in providing for the use of different kinds of fuel, is in the form of circulation openings which are provided in the fuel supporting portions. The basic principles of construction are preserved in all instances.

A further object of the invention is to provide a bar in which the basic principles of structure and operation are the same, irrespective of the type of grate in connection with which the bar is used and in which provision is made for reversing the bar. Such reversibility provides for the use of a new and unworn fuel supporting portion when the originally used portion becomes unduly worn after long continued service.

A further object of the invention is the provision of a grate bar unit of such construction that the assembled grate may be self-cleaning as to the fuel supporting surfaces and as to the ashes of combustible matter and molten clinker making matter. As above stated, such a grate may be either of the stationary or rocking type. In the case of a stationary grate, ashes are discharged through the spaces between the units and impurities or extraneous matter, such as slate or stone, are shed from the fuel supporting portions containing the circulation openings to readily accessible positions between the units, from which positions the said impurities are readily removed in the operation of cleaning the grate. In the case of a rocking grate, the removal of the impurities or extraneous matter is accomplished by manipulating the grate bars to increase the dimensions of the spaces occurring therebetween to allow the impurities to drop into the ash pit.

A further object of the invention is the provision of a grate bar unit of such construction that the battery of units forming an assembled grate provides for a perfect and natural circulation of air and dispenses with the necessity for expensive and complicated draft-inducing accessories or other smoke-consuming apparatuses or arrangements.

A grate bar unit by means of which the foregoing advantages are attained, embodies the following features of specific novelty. It consists of a tubular member of elliptical or oval cross section having the transversely convex portions aforesaid and having an internal longitudinal pre-heating space. The portions are continuous and uninterrupted except as to the provision of the circulation openings which are in communication with the pre-heating space. They are connected integrally at each side by a series of spaced lugs, which lugs project slightly beyond the sides of the bar unit and serve the two-fold purpose of spacing the fuel supporting portions of each unit from one another and of spacing the mutually adjacent units from one another. Between the lugs are circulation openings which extend transversely

through the sides of each unit and communicate with the pre-heating space. The purpose of these transversely extending openings will presently appear. The units thus constructed attain the advantages set out in view of the following facts.

The convex arched form of the fuel supporting portions is intrinsically stronger than any other fuel supporting portion now known to the art. Furthermore, it provides for such dimensions that the provision of the circulation openings is without any weakening effect and that any form of circulation opening desired, in consideration of the kind of fuel for which the bar is designed, may be employed. Furthermore, the form of the fuel supporting portions and the manner of connecting the same provides for the internal pre-heating chamber. The arrangement of the spacing lugs in spaced relation and projecting slightly beyond the sides of the units provides for circulation spaces between the mutually adjacent units as well as for circulation spaces in the sides of the units themselves. Consequently, by virtue of the arrangement of the spacing lugs in the manner noted and in combination with perforated arched or convex fuel supporting portions, a five-fold object is attained, viz., (1) provision for shedding ashes and molten clinker-making matter from the fuel supporting surfaces of the bars through the spaces between the bars into the ash pit; (2) provision for the circulation of air from the ash pit through the spaces between the bars; (3) provision for preventing the transmission of heat from the upper unit to the lower unit; (4) provision for a perfect and continuous circulation of air which not only promotes perfect combustion, resulting in less fuel and more power, but also, at all times, cools the unit as an entirety, thereby prolonging its life and lessening the wear thereon; and (5) provision for supporting the impurities shed from the fuel supporting surfaces in such manner that they do not become wedged between the bars but on the contrary are readily accessible and may be readily removed in the cleaning operation. It is of particular importance in this connection that provision is made for accessibly supporting the impurities shed from the supporting surfaces since, if the impurities were not readily removable, an efficient cleaning operation would be practically impossible and in time such an accumulation of impurities would result that the spaces between the bars would not only become choked so as to retard the circulation of air in the manner stated but would also afford an engaging surface for the molten clinker-making matter, the ultimate result of which would be the formation of a destructive clinker, bridging and eventually spreading over the major portions of the fuel supporting surfaces and seriously interfering with, if not rendering impossible, the efficient use of the grate.

In the accompanying drawings I have illustrated a preferred and advantageous embodiment of the invention, the structural details of which will be set forth at length in the following description while the novel features by which the invention is distinguished from the prior art will be recited in the claims appended at the end of the description.

In the said drawings: Figure 1 is a plan view of a grate bar constructed in accordance with the present invention. Fig. 2 is an end elevation thereof. Fig. 3 is a cross section thereof on the line 3—3 of Fig. 1. Fig. 4 is a plan view of the bar showing a modified arrangement of the air openings. Fig. 5 is a cross section on the line 5—5 of Fig. 4, and Fig. 6 is a fragmentary side elevation illustrating the openings in the side webs.

Similar characters of reference refer to corresponding parts throughout the several views.

The grate bar unit forming the subject matter of the present invention is preferably of elliptical cross section and cast integral. Such a unit comprises two oppositely curved supporting portions, as 1 and 2, which are connected by longitudinal side portions, as 3. In this connection an elliptical bar is preferred because it provides supporting surfaces of increased area and of moderate curvature, an air circulating chamber of efficient dimensions and side portions of vertical thickness amply sufficient to resist all stress which may be incident to the use of the bar. The supporting portions 1 and 2 and the side portions define an interior longitudinal air chamber 4 which communicates with the exterior by means of openings 5 in the supporting portions 1 and 2 and by means of slotted or other openings 3^a in the side portions. The openings 5 may be in the form of simple perforations suitably spaced, as shown in Fig. 1, or they may be of the form shown at 5^a in Figs. 4 and 5, the openings 5^a being in the nature of parallel slots which are suitably spaced. In the form shown in Figs. 4 and 5 it is preferred to arrange the slots 5^a as series, and between each pair of series of adjacent slots an intervening imperforate reinforcing web, as 6, occurs. A bar having the perforations 5 may be advantageously used with fine fuel or with fuel which gives fine ashes, such as wood or smaller grades of coal and a bar having the openings 5^a may be advantageously used with heavier grades of coal.

While I have shown two forms of openings 5 and 5^a, it will be understood that these forms are shown merely by way of

example and are not obligatory. The particular character of the openings may be varied as the conditions warrant.

The openings 3^a aid materially in promoting the circulation of air through the bar, especially in case the openings 5 should become clogged or choked. Said openings 3^a are also of advantage in dividing the bar, in effect, into two supporting units and in interrupting or materially minimizing the transmission of heat from the upper unit to the lower unit. The latter is thus kept comparatively cool by virtue of which sagging and warping are prevented and the life of the bar prolonged. The openings 3^a are arranged at intervals so as to provide a proper number of spaced intermediate spacing lugs, as 7 which space the fuel supporting portions of each unit from one another and are of such vertical thickness that they will not become strained or distorted by reason of any degree of weight of the fuel resting on the bar. The lugs 7 project slightly beyond the sides of the units and abut the correspondingly arranged lugs on the adjacent units, as shown in Fig. 1, thereby spacing the mutually adjacent units from one another in such a manner that a series of separated air spaces, as 8, is afforded. The portions 3 are, in the example shown, provided at their ends with axially extended projections, as 9, which rest upon the supporting ledges and which are of sufficient thickness to efficiently take up the stress upon the ends of the bars.

The spaces 8 provide for an efficient circulation of air between the units in addition to the air circulation through the openings 5 or 5^a, as the case may be, in the fuel supporting portions. The projecting portions on the lugs 7 are of advantage in that they afford supports to receive the impurities or extraneous matter, such as slate or stone, which are shed from the fuel bearing surfaces out of the path of the circulating openings thereof and from which supports said impurities may be readily removed in the cleaning operation.

Either of the portions 1 or 2 may be used to directly support the fuel bed and when one portion has been worn down the bar may be reversed and the fuel bed supported on the other portion. In this manner the life of the bar is materially prolonged.

The provision of the chamber 4 is of advantage in that the air is not admitted in sudden drafts to the fuel bed but is collected in said chamber and evenly distributed. The air which is collected in the chamber 4 also is subjected to a slight initial heating which promotes combustion.

The form of the bar allows of the air openings 5 or 5^a as the case may be, being arranged within limits which are comparatively narrow to provide for the proper vertical and transverse thickness of the webs 3 but which at the same time are sufficiently wide to provide for the efficient circulation of air.

Having fully described my invention, I claim:

1. A grate bar unit for furnaces or fire boxes comprising an integral, hollow, elliptical body having an internal, longitudinal pre-heating space and provided at opposite sides with continuous uninterrupted supporting portions convex in cross section and having circulation openings communicating with the pre-heating space, the supporting portions being connected by vertically disposed spacing lugs arranged at intervals and projecting slightly beyond the sides of the units, the said sides having openings extending transversely therethrough and communicating with the interior pre-heating space.

2. A grate bar unit for furnaces or fire boxes comprising an integral, hollow body having an internal longitudinal pre-heating space and having a continuous uninterrupted upper supporting portion convex in cross section and having also a continuous uninterrupted lower portion, the upper and lower portions each having openings communicating with the pre-heating space and being connected by vertically disposed spacing lugs arranged at intervals and projecting slightly beyond the sides of the units, the said sides being formed with transversely extending openings between the lugs and communicating with the interior pre-heating space.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

EDWARD L. THOMAS.

Witnesses:
C. S. Fox,
J. H. Shippey.