Aug. 7, 1923. 1,464,190

H. J. WEBSTER

FURNACE GRATE BAR

Filed March 30, 1922

Fig. 1.

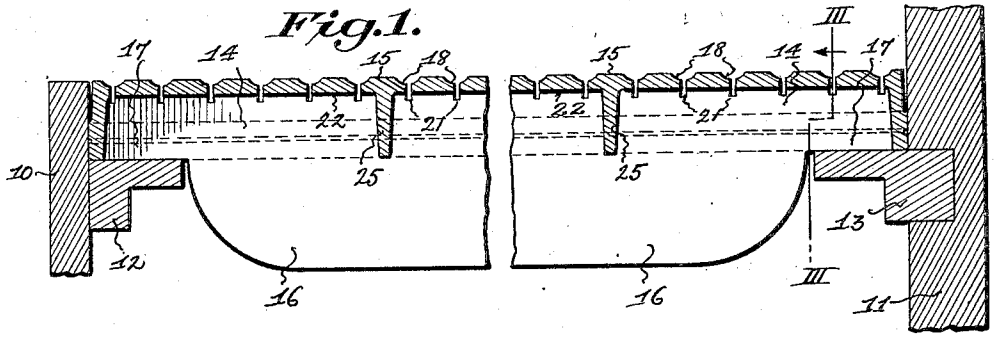


Fig. 2.

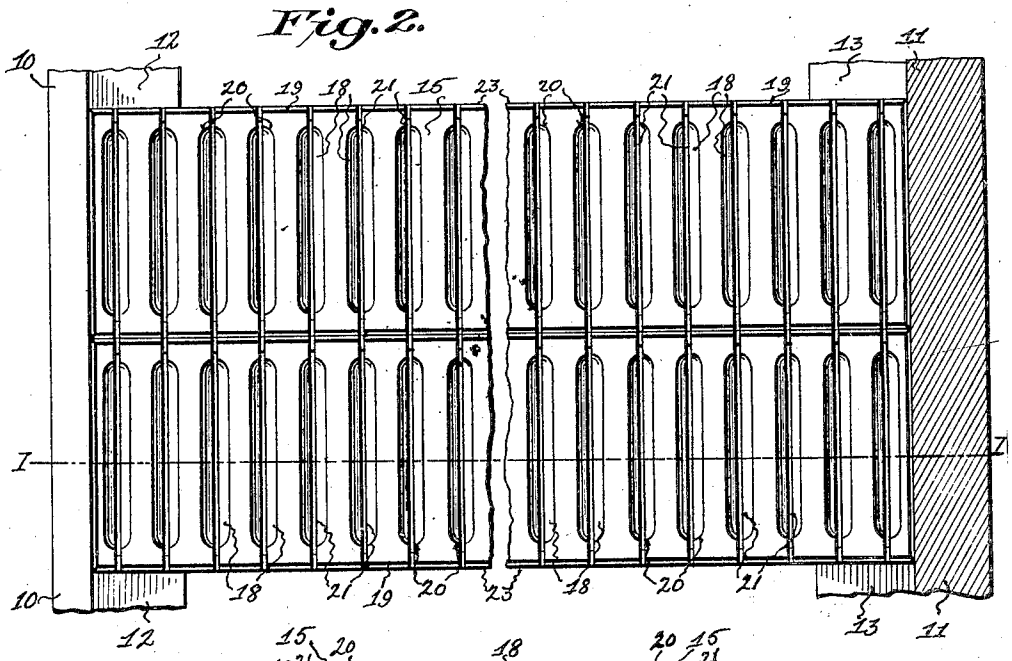
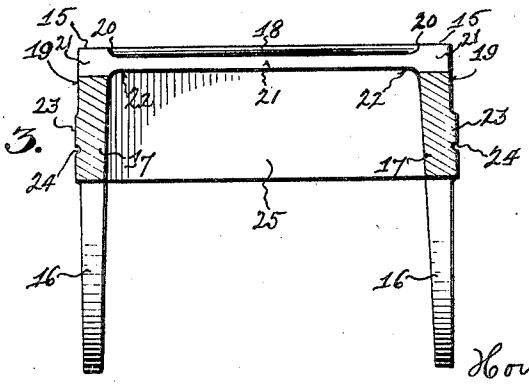


Fig. 3.



ventor

Howard J. Webster,

By M. Fehrenbow.

Attorney

WITNESS:-

Chas. L. Griebauer

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UNITED STATES PATENT OFFICE.

HOWARD J. WEBSTER, OF PHILADELPHIA, PENNSYLVANIA.

FURNACE GRATE BAR.

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To all whom it may concern:

Be it known that I, HOWARD J. WEBSTER, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Furnace Grate Bars, of which the following is a specification.

This invention relates to grate bars for fuel chambers of furnaces.

The objects of the invention are:

First, to construct a grate bar which is particularly adapted for burning smaller sizes of anthracite and other low grade fuel at a high rate of combustion.

Second, to so construct and arrange a series of slits within recesses formed in the upper surface of the grate bar as to produce and deliver a series of separated fan-shaped jets of air through the fuel bed which do not in any way elevate a low grade fuel above said bed and supply the requisite amount of air for a high rate of combustion.

Third, to so construct and arrange the recesses or depressions in the upper grate bar surface and the slits within the recesses as to not only give the fan-shaped air delivery jets a greater distance to spread before meeting the fuel bed but at the same time the ash pockets formed by said recesses properly protect the upper surface of the grate bar adjacent the highly heated fuel supported by said grate bar.

Fourth, to construct and dispose the recesses in the upper surface of the grate bar and arrange the slits in said recesses so that the action of a slicing bar or other furnace firing device upon the fuel will not force, pack or embed the fine dust of the fuel or ashes into said slits or recesses, thereby destroying the proper combustion of the fuel and efficient operation of the furnace.

Fifth, to so construct and arrange the elements comprising the grate bar, in order to eliminate the commonly used pin hole nozzle arrangement and consequent diverging projected jet action of the air through the fuel bed, which projected jets of air set up a reverse vortex action causing the light fuel to be elevated far above the fuel bed level and into the combustion space and forming a series of geysers until finally sections of the fuel bed burn into holes without fuel, thereby destroying the uniform, maximum and efficient combustion of said fuel for a given area of grate surface.

Sixth, to construct a grate bar which will tend to preserve a uniform thickness of fuel bed throughout the grate area, and at the same time a constant air pressure in the ash pit, and said air pressure being only varied to change or control the rate of combustion of the fuel.

Seventh, other objects and advantages of the invention will appear from the detailed construction and arrangement of parts and mode of operation to be hereinafter given.

The invention consists of structural characteristics and relative arrangement of elements as will be hereinafter more fully described and particularly pointed out in the appended claims.

In the drawings, in which similar reference characters indicate the same parts in the several figures:

Figure 1 is a longitudinal vertical section on line I—I of Figure 2 of a portion of a furnace fuel chamber provided with the improved grate bar.

Figure 2 is a top plan view of a furnace with the improved grate bar, and

Figure 3 is an enlarged sectional view taken on line III—III of Figure 1.

Referring to the drawings, 10 and 11 are respectively the front and rear walls of a fuel chamber provided with the usual grate bar supports 12 and 13 commonly used in connection with this class of devices, and form no part of the present invention.

14 is the improved grate bar sustained on said supports 12 and 13 and having the upper or fire surface section 15 and the longitudinal ribs 16 for strengthening and stiffening said bar 14, said ribs 16 being cut away at their outer and under edges to form ledges 17 adapted to rest on said supports 12 and 13.

In the upper or fire surface section 15 of the grate bar are provided a plurality or a series of separated and elongated narrow depressions or recesses 18 which are preferably arranged transversely of the longitudinal axis of said grate bar 14, and extend to within a short distance of the upper edges of the sides 19, 19, as shown. Said recesses or depressions 18 are also preferably semi-circular in cross section in a longitudinal

plane normal to the upper surface 15, and rounded at their ends 20 as illustrated.

At each of said depressions or recesses 18 is provided a slit or elongated opening 21 extending transversely and entirely across the upper or fire surface section 15 and from the bottom of each of said depressions or recesses 18 to and through the underside surface or face 22 of the upper fire surface section 15 for purposes to be hereinafter described.

The sides 19, 19 of the grate bar are provided with a narrow or slight projection 23 having a longitudinal groove 24, as shown in Figure 3, for properly spacing adjacent grate bars with respect to each other and forming an air space between the sides 19 and ribs 16 of the bars.

25, 25 are a series of separated webs or ribs depending from the underside 22 of the fire surface section 15 and extending transversely of and the entire width of the grate bar between the upper portion of the longitudinal ribs 16. This construction and arrangement of ribs or webs 25 not only strengthens the grate bar but at the same time assists to convey the heat down from the upper fire surface section 15 into a space provided with cool air, thereby reducing the expansion of the top surface of the grate bar to a minimum lower average temperature and at the same time pre-heating the air passing through the fuel bed.

The parts being constructed and arranged as shown with a bed of fuel resting on the upper or fire surface section 15, when a draft of air is passing from the ash pit and upward through the slits 21 in the grate bar, said air issues from the slits and is delivered in fan-shaped jets through the fuel bed without disturbing or raising the low grade or fine fuel from the grate bar, and at the same time insuring a proper and uniform supply of oxygen over the entire grate for a high and quick rate of combustion, thereby effecting a greater capacity or horsepower per square foot of grate surface than with grate bars in which the air is fed through circular openings or pin hole nozzles.

The arrangement of the sides 19, projections 23, grooves 24 and slits 21, also prevents surface expansion of the upper grate surface and reduces the transverse and longitudinal expansion of the grate bar to a minimum, thereby increasing not only the life of the grate but also the parts forming the fire chamber of the furnace.

It will also be seen that when a slicing bar or other firing tool is applied to the fuel bed, said bar will necessarily be required to rest on the upper surface of the grate bar and will thereby be prevented from forcing, packing or embedding the fine fuel or ashes into the slits 21 or recesses 18, thereby insuring a constant and uniform feed of air and combustion of fuel at all times throughout the entire area of the grate surface.

From the foregoing description of the construction and arrangement of parts and mode of operation, it will be readily seen that a grate bar has been devised which comprises a minimum number of highly efficient cooperating elements of simple construction, which can be cheaply manufactured and readily installed or assembled or disassembled or renewed at a minimum of expense and without the use of skilled labor or special tools.

It will also be seen that all the objects and advantages recited in the statement of invention have been fully carried out, and while the preferred form has been shown and described, it is to be understood that many changes will suggest themselves without in any way changing the material features of construction or departing from the spirit of the invention as expressed in the claims.

What I claim is:—

1. A furnace grate bar having a fire surface section provided with a series of separated depressions or recesses in its upper face, and a continuous slit in each of and extending the entire length of the depressions or recesses of the fire surface section and extending through the under face of the fire surface section.

2. A furnace grate bar having a fire surface section provided with a series of separated elongated depressions or recesses in its upper face, and a slit in each of the depressions or recesses of the fire surface section and extending from the bottom of the depressions or recesses through the under face of the fire surface section.

3. A furnace grate bar having a horizontal fire surface section provided with a series of separated elongated and narrow depressions or recesses in its upper face, and a slit in the bottom of each of the depressions or recesses of the fire surface section and extending from the bottom of the depressions or recesses through the under face of the fire surface section.

4. A furnace grate bar having a horizontal fire surface section provided with a series of separated elongated depressions or recesses in its upper face and arranged transversely to the longitudinal axis of the grate bar, and a slit in the bottom of each of the depressions or recesses of the fire surface section and extending from the bottom of the depressions or recesses through the under face of the fire surface section.

5. A furnace grate bar having a horizontal fire surface section provided with a series of separated elongated depressions or recesses in its upper face and semi-circular in cross section, and a slit in and substan-

tially the entire length of each of the depressions or recesses of the fire surface section and extending from the bottom of the depressions or recesses through the under face of the fire surface section.

6. A furnace grate bar having a horizontal fire surface section provided with a series of separated elongated depressions or recesses in its upper face and semi-circular in cross section in a plane passing through the longitudinal axis of the grate bar, and a slit in and substantially the entire length of each of the depressions or recesses of the fire surface section and extending from the bottom of the depressions or recesses through the under face of the fire surface section.

7. A furnace grate bar having a horizontal fire surface section provided with a series of separated elongated depressions or recesses in its upper face and arranged transversely to the longitudinal axis of the grate bar and extending to near the side edges of said bar, and a slit in the bottom of each of the depressions or recesses of the fire surface section and extending from the bottom of the depressions or recesses through the under face of the fire surface section.

8. A furnace grate bar having a horizontal fire surface section having a spacing projection on each of its sides and provided with a series of separated elongated depressions or recesses in its upper face, and a slit in each of the depressions or recesses of the fire surface section and extending from the bottom of the depressions or recesses through the under face of the fire surface section.

9. A furnace grate bar having a fire surface section provided with a series of separated depressions or recesses in its upper face, and a slit in each of the depressions or recesses of the fire surface section and extending across the upper face and through the under face of the fire surface section.

10. A furnace grate bar having a fire surface section provided with a series of separated elongated depressions or recesses in its upper face, and a slit in each of the depressions or recesses of the fire surface section and extending across the upper face of the fire surface section and from the bottom of the depressions or recesses through the under face of the fire surface section.

11. A furnace grate bar having a horizontal fire surface section provided with a series of separated elongated and narrow depressions or recesses in its upper face, and a slit in the bottom of each of the depressions or recesses of the fire surface section and extending across the upper face of the fire surface section and from the bottom of the depressions or recesses through the under face of the fire surface section.

12. A furnace grate bar having a horizontal fire surface section provided with a series of separated elongated depressions or recesses in its upper face and arranged transversely to the longitudinal axis of the grate bar, and a slit in the bottom of each of the depressions or recesses of the fire surface section and extending across the upper face of the fire surface section and from the bottom of the depressions or recesses through the under face of the fire surface section.

In testimony whereof I affix my signature.

HOWARD J. WEBSTER.