

E. C. WILEY.
GRATE.

APPLICATION FILED OCT. 4, 1909.

1,015,527.

Patented Jan. 23, 1912.

3 SHEETS—SHEET 1.

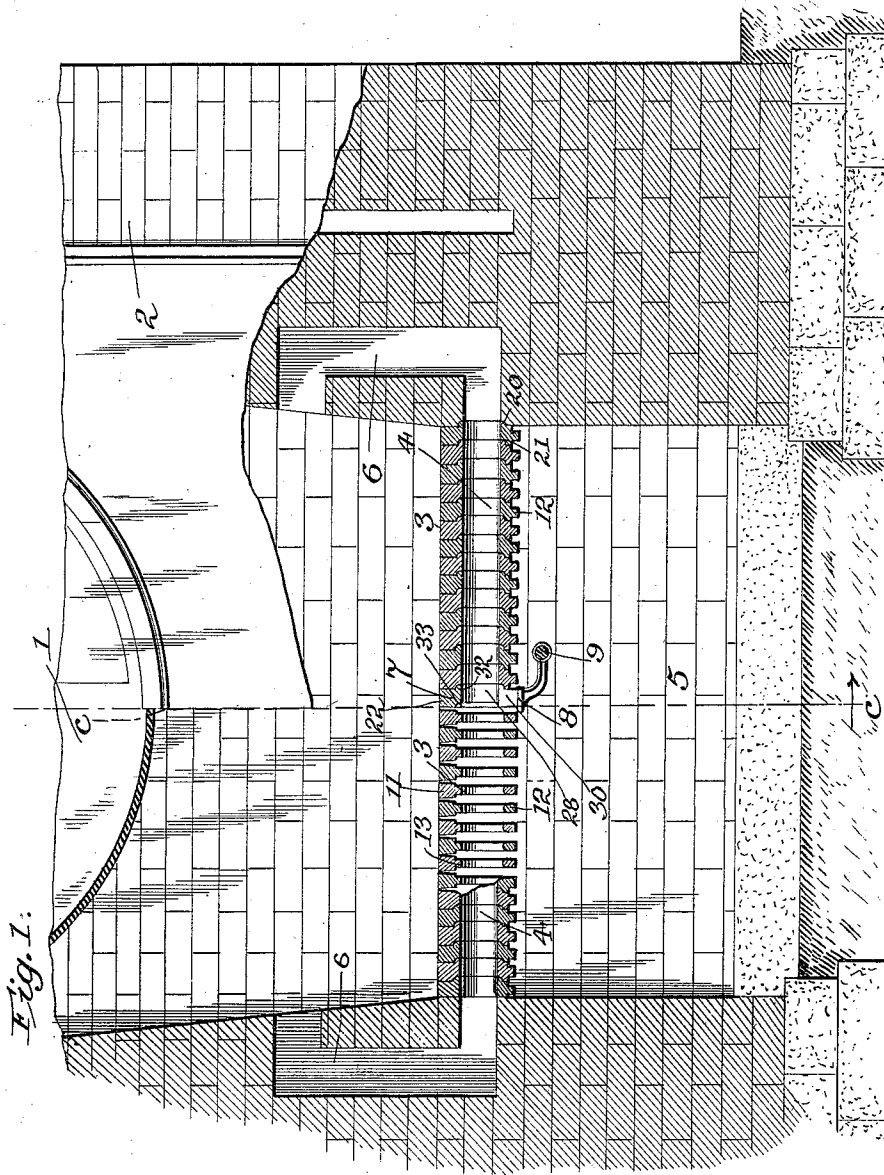


Fig. 1.

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Attorneys

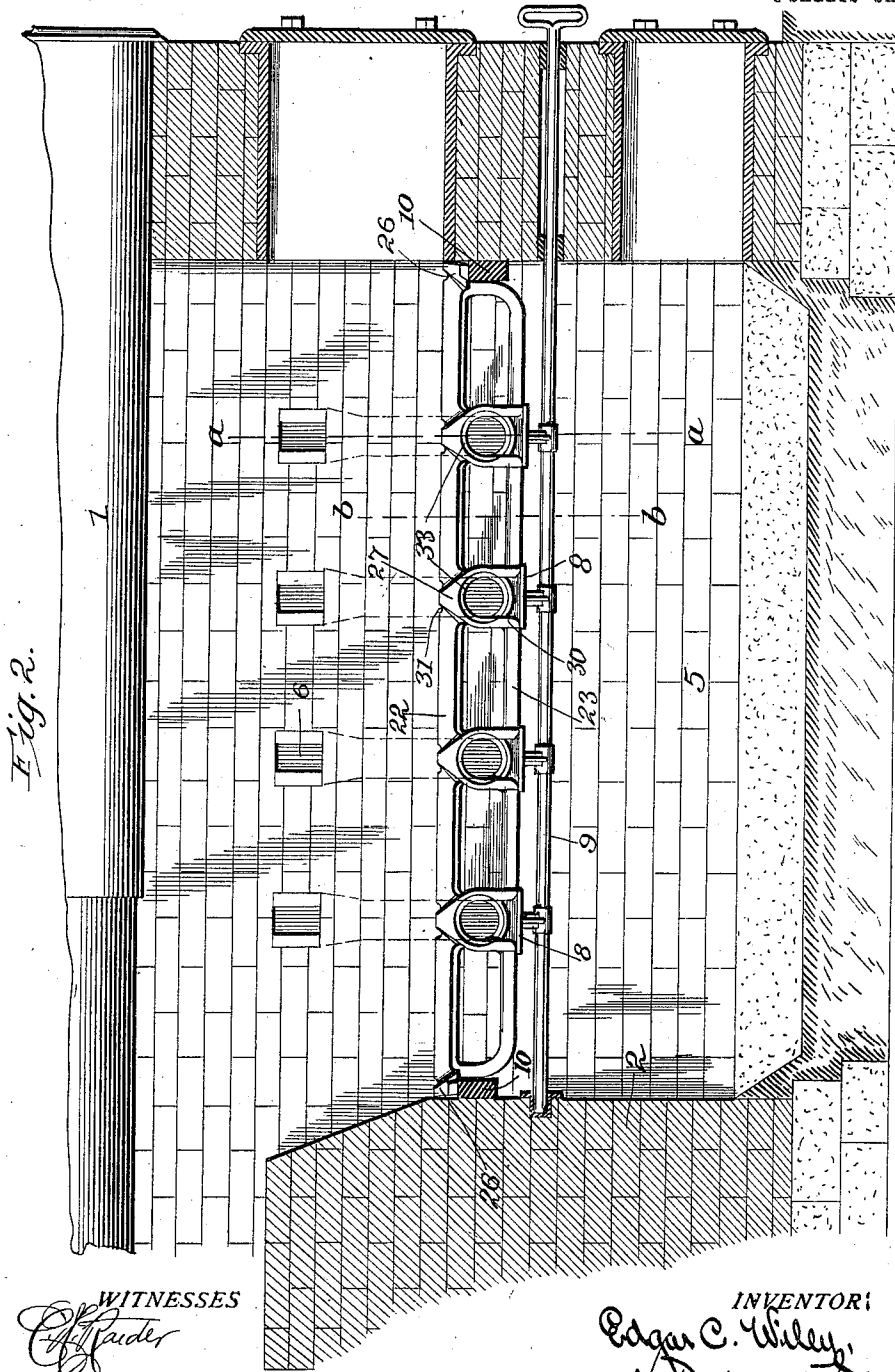
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3 SHEETS—SHEET 2.



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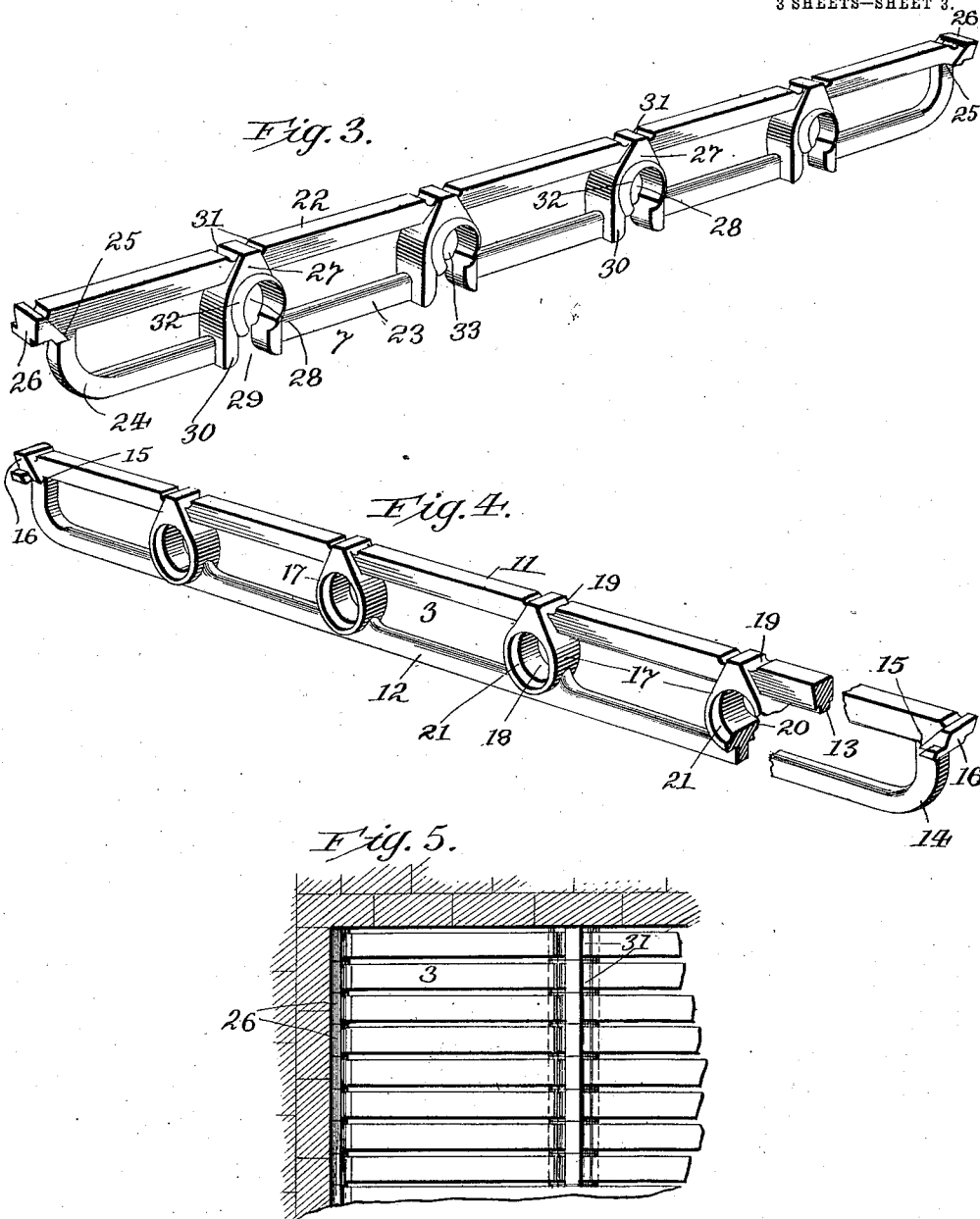
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

EDGAR C. WILEY, OF LYNCHBURG, VIRGINIA.

GRATE.

1,015,527.

Specification of Letters Patent.

Patented Jan. 23, 1912.

Application filed October 4, 1909. Serial No. 520,819.

To all whom it may concern:

Be it known that I, EDGAR CLARENCE WILEY, a citizen of the United States, residing at Lynchburg, in the county of Campbell and State of Virginia, have invented certain new and useful Improvements in Grates, of which the following is a specification.

My present invention relates to grates intended particularly for the burning of finely divided fuel, and is particularly adapted to that type of furnaces in which a portion of the air is caused to pass directly upward through the fire, while other air is caused to pass through passages formed in the grate bars and is then discharged in its highly heated condition above the fire, to effect the complete combustion of any unburned gases.

The invention resides in the particular form of the bar and in the use therewith of a second type of bar adapted to admit air direct from the ash pit to transverse ducts formed by the assembling of a series of bars.

By my particular construction I secure a bar of truss or girder form, giving a peculiarly even distribution of draft throughout the entire area of the grate and cooled by the air passing through the above mentioned ducts at points where the bars are likely to be highly heated.

The invention will be described in detail in connection with the accompanying drawings, wherein,

Figure 1 is a transverse vertical sectional elevation of the boiler setting and grate, the latter being shown in section throughout, the end portions being taken upon the line *a-a* of Fig. 2, while the central section is taken upon the line *b-b* of said figure; Fig. 2 is a longitudinal vertical section of the same, the plane of section being taken on the line *c-c* of Fig. 1; Fig. 3 is a perspective view of a special bar used to admit air to the ducts in the bars as above mentioned; Fig. 4 is a perspective view of a regular grate bar, and Fig. 5 is a plan view on a slightly enlarged scale of a portion of the grate assembled as illustrated in Figs. 1 and 2.

Like numerals refer to like parts throughout the drawings.

Referring to the drawings, 1 represents the boiler shell and 2 the brickwork of the setting.

3 is the assembled grate and 4 one of the ducts formed therein, conveying air from

the ash pit 5 by the passages 6 to a point above the fire. The special bar 7 is illustrated as furnishing the inlets from the ash pit 5 to the ducts 4, and a series of dampers 8 mounted upon a damper shaft 9 is furnished to vary the opening leading to the ducts, 4. The grate bars are supported at their ends upon bearing bars 10 carried by the masonry of the setting.

Having described the manner of assembling and supporting the bars in the furnace, it now remains to describe the particular forms of the regular and of the special bars. By reference to Fig. 4 the form of the regular bar can be best understood. The bar is cast in one piece and comprises two chords 11 and 12, practically parallel with each other throughout their length. The upper chord 11 is practically straight and is of trapezoidal cross section with a reinforcing rib 13 on its under side. In this way this upper member 11 is wider at the top than at the bottom, so that ashes falling between the bars when assembled in the grate will be given ready clearance. The lower member 12 is approximately rectangular in form but slightly rounded on its upper face to prevent the collection of ashes falling between the upper members. The chord 12 is practically straight throughout its length but curves upward at its ends as at 14, and joins the upper chord 11 at 15. The upper chord 11 projects beyond this point of juncture 15, and forms a foot or lug 16 at each end of the bar, intended to support the grate bar upon the bearing bars when in position in the furnace. Intermediate the point of juncture 15 and preferably at regular intervals is a series of enlargements 17 connecting the upper and lower chords with which they are cast integrally. These enlargements have approximately the form of cylinders with their axes transverse to the bar, and are formed with openings 18, which, when a series of the bars is assembled, register and form the continuous ducts 4 already mentioned. These enlargements measured in the direction transverse to the bars are slightly wider than the widest part of the chords 11, so that when a series of bars is assembled, with these enlargements in contact, an interval exists between the upper chords of adjacent bars. These intervals or slots are interrupted only at the enlargements 17, so that when a series of bars is assembled there is

between each pair of bars an interrupted slot like air opening. To obviate as much as possible the obstructive effect of these interruptions in the air openings at the enlargements 17, and to prevent over heating, transverse grooves 19 are formed in the upper faces of the members 11, adjacent these enlargements. In this way, air coming up through the air openings is caused to flow over the top surface of the bar at these points.

To secure accurate register of the openings 18 and form continuous and approximately air tight ducts 4, the enlargements 17 are formed with annular projections or bosses 20 and corresponding recesses 21, upon opposite sides so that the projections on one bar shall engage the recesses upon its neighbor. (See Fig. 1.)

As will be seen by reference to Fig. 3 the special bar is essentially identical with the regular bar just described. It has an upper chord 22 of the same cross section as the upper chord 11. The lower chord 23 is of the same cross section as the lower chord 12, but differs from it in that it is interrupted at several points in its length as will be described in detail. The lower chord curves up at its end portions 24 and joins the upper chord 22 at 25, the upper chord extending beyond this point of juncture to form feet or lugs 26 identical with the lugs 16. Intermediate the points of juncture 25 are enlargements 27 designed to register with the enlargements 17 in the regular bars when the two styles of bar are assembled.

The enlargements 27 are provided with openings 28 transverse the bar, but these openings 28 are cut away at their lower side as at 29 so that the ducts 4 described as formed by the assembling of a plurality of bars may be connected through 29 with the ash pit 5. Aside from the cutting away of the lower portion the enlargements 27 differ from the enlargements 17 of the regular bars only in having depending lips or projections 30 of suitable thickness. This is for the purpose of giving increased strength at these points, required because of the cutting away of the chord 23. Grooves 31 identical in form and function with the grooves 19 are formed in the upper chords adjacent the enlargements 27, and annular bosses 32 and recesses 33 similar to the bosses and recesses 21 and 22 are provided.

In the practical use of my grate bars a plurality of regular bars is assembled in the furnace with the lugs 16 resting upon the bearing bars 10 and the bosses 20 of the bars engaging the recesses 21 of adjacent bars. The ducts 4 thus formed are caused by the design of the boiler setting to connect directly with the passages 6. Together with these bars is assembled an appropriate num-

ber of special bars preferably grouped together at one place so as to form a single inlet for the air to the ducts 4, though if desired for any reason, these bars may be distributed throughout the grate surface. Obviously the bosses 27 and recesses 28 of the special bar engage the recesses 21 and bosses 20 of the regular bars. The shaft 9 is properly located to bring the damper 8 to its correct position. The damper 8 is moved away from the openings 29 at the lower side of the special bar by a partial rotary movement of the shaft 9. As clearly shown in Fig. 5 the assembled bars form a grate consisting of a series of narrow bars having a large number of narrower slots extending practically uninterruptedly from one end of the furnace to the other, so that an even distribution of draft is secured throughout the furnace.

In the manner above set forth I secure a grate bar simple in form and adapted to withstand any load that can ordinarily be brought upon it. The bars when assembled are interlocked so as to assist in maintaining each other in position. The flow of air through the grate to the fire is in no manner obstructed and yet I am enabled to use the heated condition of the grate to furnish highly heated air to the combustion chamber thus securing more perfect combustion than can otherwise be had. An incidental advantage is that the air drawn from the ash pit tends to cool the grate bar, and that this cooling occurs at the point where strength in the bar is required.

I am aware that the system of passing air through grate bars to be subsequently liberated in the combustion chamber is well known, but in all such bars where the air has been taken from the ash pit the bars are of a most complicated and unsatisfactory form. By my construction, however, made possible by the use of the special bar, I secure a bar of extremely simple form, having ducts open to the ash pit and hence requiring no special piping or the like.

The number of the ducts 4 is a function of the length of the bar and of the general design of the furnace. Under certain conditions one might be sufficient; but in large furnaces having intensely hot fires a larger number than the four illustrated may be found desirable.

Having thus described my invention, what I claim is:—

1. A grate bar, comprising in combination, an upper chord; a lower chord; and a connection between said chords provided with a transverse duct.

2. A grate bar comprising an upper chord; a lower chord; and connections between said chords provided with transverse air ducts.

3. A grate bar comprising an upper

chord of trapezoidal cross section; a lower chord of narrower cross section; and connections between said chords, provided with ducts transverse to said bars.

5 4. A grate bar comprising an upper chord of trapezoidal cross section; a lower chord; and connections between said chords of greater transverse width than said chords and having transverse ducts.

10 5. A grate bar comprising an upper chord; a lower chord; and connections between said chords of greater transverse width than said chords and having transverse ducts.

15 6. A grate bar comprising an upper chord; a lower chord; connection between said chords of greater transverse width than said chords and having transverse ducts; and means comprising interengaging projections and recesses for securing accurate register and connection of said ducts, when a plurality of bars is assembled.

20 7. A grate bar comprising in combination an upper chord of trapezoidal cross section grooved on its upper face; a lower chord; and connections between said chords provided with ducts transverse to the bar.

25 8. A grate bar comprising in combination an upper chord, grooved on its upper face; a lower chord; and connections between said chords provided with ducts transverse to the bar.

9. A grate bar comprising in combination a straight upper chord; a lower chord curved and united therewith at its ends; and 35 a series of members connecting the upper and lower chords and having transverse apertures.

10. A grate bar comprising in combination a straight upper chord; a lower chord 40 curved and united therewith at its ends; and a series of members of greater transverse width than said chords connecting the chords and having transverse apertures.

11. In combination with a furnace having 45 an ash pit, a combustion chamber and passages leading from the grate level into the combustion chamber, a grate comprising a plurality of bars each formed with an upper chord, a lower chord, and apertured 50 members connecting said chords and forming transverse ducts in the grate in communication with said passages, the connecting members of one of said bars opening into the ash pit. 55

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDGAR C. WILEY.

Witnesses:

KATIE JENNINGS,
GRACE H. MAHOOD.