

Oct. 31, 1944.

F. R. SCHRAGE

2,361,796

GRATE

Filed June 17, 1940

2 Sheets-Sheet 1

FIG-1

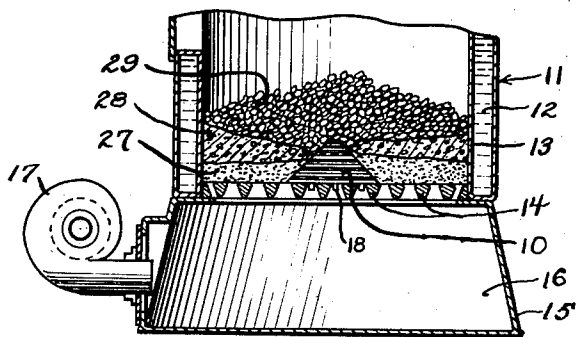
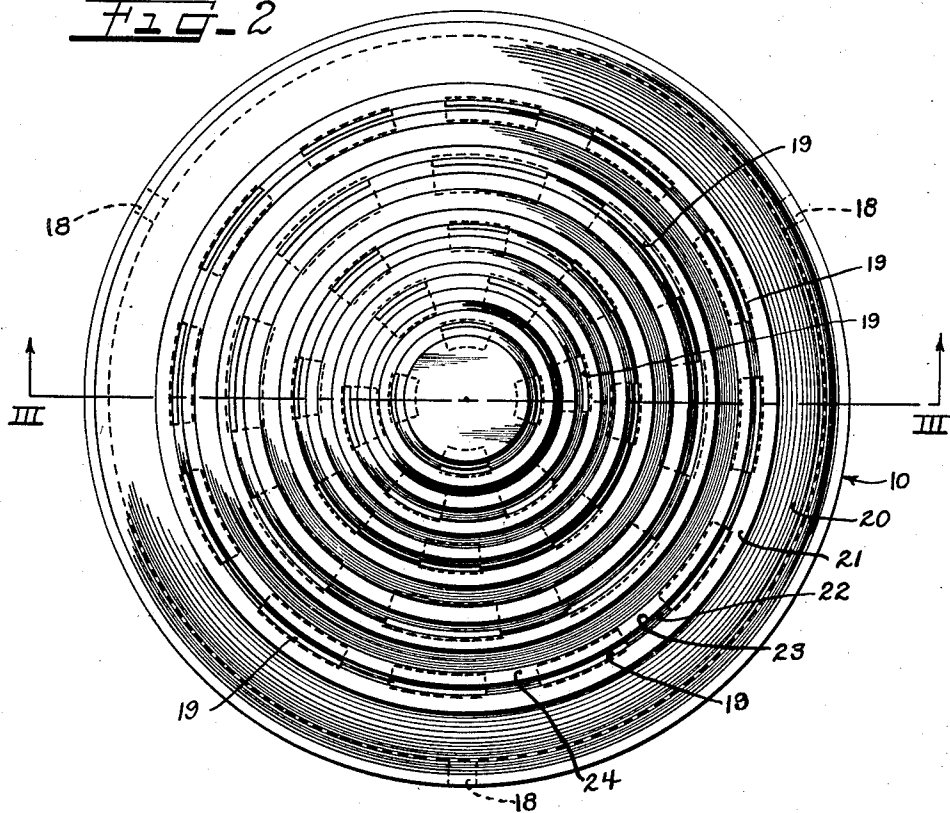


FIG-2



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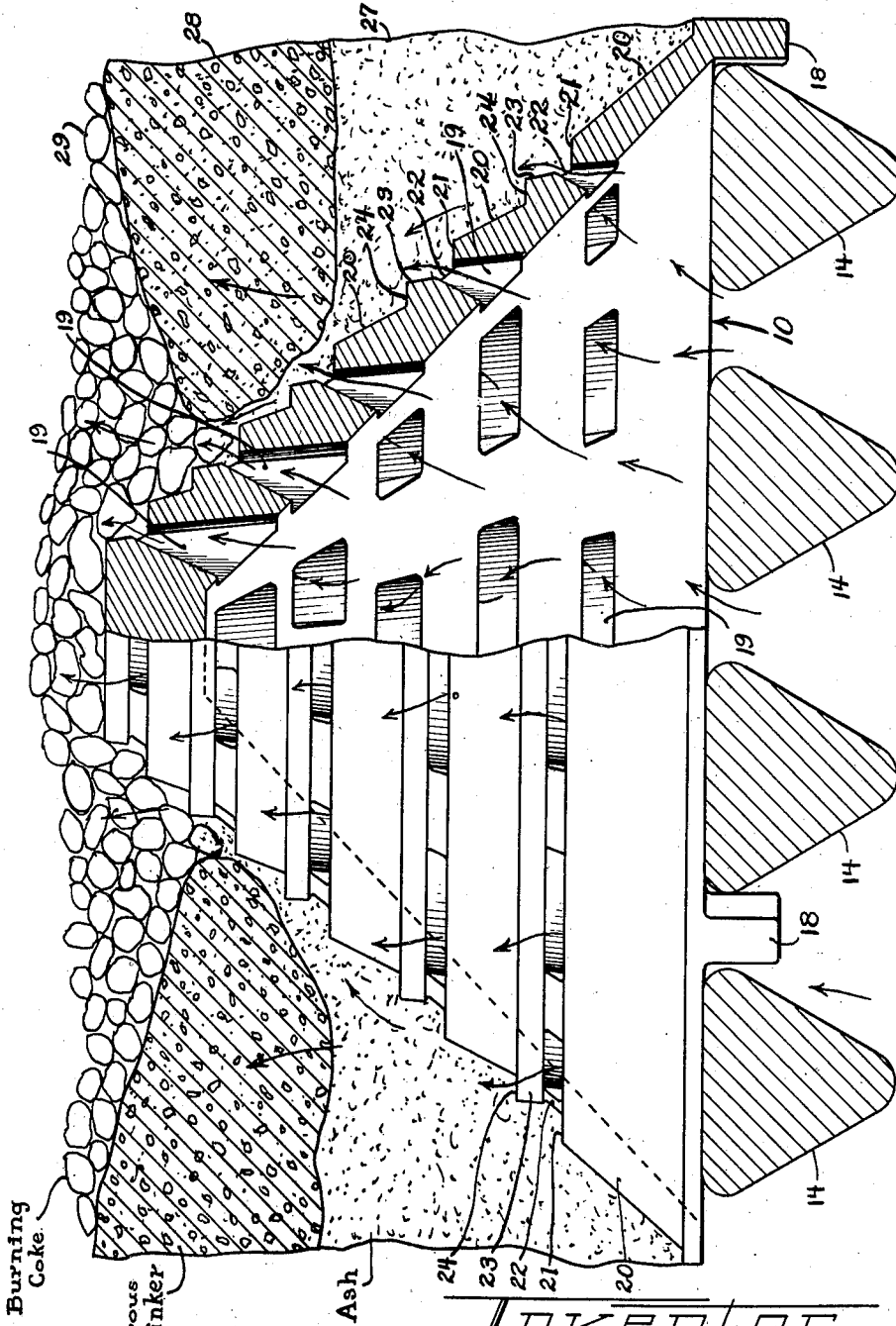
2,361,796

GRATE

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2 Sheets-Sheet 2

FIG-3



Burning Coke

Porous Clinker

Ash

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UNITED STATES PATENT OFFICE

2,361,796

GRATE

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Application June 17, 1940, Serial No. 340,972

1 Claim. (Cl. 126—163)

This invention relates to grates for furnaces, and more particularly to auxiliary grates designed to be placed on top of the ordinary flat grates of domestic furnaces in order to make the furnaces operate better, particularly with certain fuels, such as coke. In particular, this invention relates to auxiliary grates of the type which, although not indispensable, are desirable for use in the "Coke burning system" described in my copending application filed April 17, 1940, Serial No. 330,152, now Patent Number 2,344,328, March 14, 1944.

One of the principal objects of the present invention is to provide an auxiliary grate of the type described above and having air passages designed to preheat the air passing through the auxiliary grate to the coke being burned.

Another object of this invention is to provide an auxiliary grate whose outer or upper surface is constructed to support the fire bed and to prevent the ash or coke forming parts of the fire bed from sliding down the sides of the grate.

Another object of the present invention is to provide an auxiliary grate having the discharge openings of the air passages located in such a way as to minimize the falling of ashes or coke through them.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claim. My invention itself, both as to its organization and manner of construction, together with further objects and advantages thereof may best be understood by reference to the following description taken in connection with the accompanying drawings, in which:

Figure 1 is a cross section through an ordinary domestic furnace or boiler, showing one of the preferred forms of the invention in place;

Figure 2 is a plan view of the form of the invention shown in Figures 1; and

Figure 3 is a cross section on the line III—III of Figure 2 with a portion of the auxiliary grate shown in elevation and with the adjacent portions of the main grate and the fire bed also shown.

The auxiliary grate 10, which is shown in the drawings and which forms one of the preferred embodiments of the invention, may be employed, for example, in a conventional domestic boiler 11 having water spaces 12 surrounding the fire pot 13 and provided with grates 14 at the bottom of the fire pot. The grates 14 are of the common horizontal type formed of a plurality of bars adapted to support the fire bed.

The boiler 11 is provided with a base portion

15 containing the ash pit 16 below the grates, and means such as a blower 17, are preferably provided for raising the pressure of the air in the ash pit 16 slightly above atmospheric and thus providing a forced draft. The blower 17 is provided with conventional controls, as more fully described in my above mentioned copending application, for regulating the supply of air in accordance with the amount of heat desired. The boiler 11 may also be provided with an automatic stoker of the type adapted to feed fuel to the top of the fire, as disclosed in my above mentioned copending application, or the fuel may be fed by hand.

The auxiliary grate 10 is a thick conical cast iron shell formed with a plurality of feet 18 projecting down from its base or rim and having a plurality of air passages 19 extending up through it. The feet 18 fit down between the horizontal grate bars 14 and positively prevent lateral shifting of the auxiliary grate 10 on the main grate 14. They may also lock the main grate 14 so that it cannot be shaken.

The interior or lower surface of the auxiliary grate 10 is a smooth cone interrupted only by the openings or entrances of the air passages 19. The outer or upper surface of the grate 10 is formed in a plurality of similar sections, each of which comprises a steep conical surface 20, an annular horizontal step or shelf 21, a short steep conical surface 22, another short but very steep conical surface 23, and a second annular horizontal step 24, arranged successively one above the other as shown in Figure 3. This arrangement of successive conical and horizontal surfaces is repeated several times from the bottom of the grate to the top, so that there are several similar short steep conical surfaces 22 spaced up the side of the grate, the upper ones being smaller in diameter than the lower ones but all having substantially the same height and slope. The upper or outlet ends of the air passages 19 are located in the short steep conical sections 22 and occupy their entire width, so that these sections of the surface consist only of bridges joining the shelves 21 and the very steep conical sections 23. This particular feature is not essential, but it is desirable that the outlets of the air passages 19 be located in steep conical surfaces, such as the surfaces 22, and that there be at least one horizontal shelf 21 or 24 close to the openings.

When the grate 10 is in use, its lower portion is located in a bed of ashes 27 which supports a generally flat annular clinker 28. The clinker 28 and the upper portion of the grate 10 support

a bed of burning coke 29 or other fuel, although the grate 10 is designed particularly for use with coke. Some of the air for the combustion of the coke flows up through the air passages 19 in the upper portion of the auxiliary grate and directly into the bed of burning coke 29. Air also flows through the air passages 19 in the lower part of the grate 10 into the bed of ashes 27, up through the ashes and through the clinker 28, which is porous, thus reaching that portion of the coke 29 which is above the clinker 28, and enabling that portion of the coke 29 to burn. Air also flows up between the grate bars 14 around the auxiliary grate 10, through the bed of ashes 27 and the porous clinker 28 to support the combustion of that portion of the coke which lies near the side 13 of the furnace. As the combustion of the coke 29 proceeds over a period of several days, the clinker 28 grows in thickness and encroaches in more and more on the auxiliary grate 10. It then becomes necessary to break up the clinker and remove it, disturbing the remainder of the fire bed as little as possible while this is being done, as is explained more fully in my copending application referred to above.

It will be noted from the portion of the auxiliary grate 10 shown in section in Figure 3 that the air passages 19 are much larger at their lower or inlet ends than at their upper or outlet ends, and that their cross-sectional area thus decreases in the direction in which the air flows through them. It will also be noted that the iron casting which forms the auxiliary grate 10 is of substantial thickness, especially near the top. Because of this, the air flowing upwardly through the passages 19 is within the passages for a sufficient length of time to receive a substantial amount of heat from the sides of the passages, especially in the passages in the upper and thicker portion of the grate 10. The air is therefore preheated before it reaches the fire and it also serves to keep the grate, which is in direct contact with the fire, from being heated to too high a temperature. The greater thickness of the metal in the upper part of the grate 10 not only makes the air passages 19 therein longer so that more heat will be absorbed by the air flowing through the air passages but also provides more metal for conducting the heat to the lower and cooler portions of the grate 10.

It will be noted from Figure 3, that the annular horizontal steps 21 and 24 serve to carry a great part of the weight of the ashes and the pressure upon them caused by the weight of the clinker 28 and the coke 29. The ashes 27 also bear down upon the conical surfaces 20, 22 and 23, but very little of the weight of the ashes comes upon the conical surface 22 in which the air passages 19

open. Because of this, very little ash will fall into the air passages 19 thus making it easier to maintain a bed of ashes 27 of the desired thickness in the furnace. It will also be noted that all of the sides of the air passages 19 are either vertical or diverge down away from the vertical, so that any ash which may fall into one of the air passages 19 will fall clear through it and not cause any obstruction therein. Thus the air passages 19 will always be clear for air to flow freely through them.

The particular shape which I have given to the air passages 19 not only provides for improved preheating of the air and prevents their being clogged or partially clogged with ashes, but it also makes the manufacture of the grate more economical than would otherwise be possible. Because all of the sides of the air passages 19 are either vertical or diverge downwardly, it is practical to prepare a mold for casting the grate by using a simple one-piece pattern and without using any previously prepared cores whatsoever. The mold is prepared with the sand in the drag or bottom part of the molding flask extending up in the passages 19 to their upper ends, and these portions of the mold are well tamped and suitably reinforced with iron wires, if necessary, so that they will have the required strength.

From the above it will be seen that I have designed an auxiliary grate 10 which is especially well suited for the purpose for which it is designed, and which is also relatively inexpensive to construct. My invention, therefore, is not only efficient in operation but is simple and cheap to produce.

It will of course be understood that the particular form of my invention which has been described above and is shown in the accompanying drawings, is disclosed only by way of illustration and that the invention is not limited to this particular form. The invention includes not only this particular form but any form falling within the scope of the following claim.

I claim as my invention:

A generally conically shaped grate having an exterior surface provided with a series of annular ledges lying in vertically spaced horizontal planes and connected by conical wall portions which extend from the inner annular edge of one ledge to the outer annular edge of the next succeeding ledge thereabove, said grate having a plurality of ducts therethrough each of which emerges on the exterior side of the grate at the junctions of the conical wall portions and the inner edges of the ledges, said ducts having two segmental cylindrical wall portions which diverge obliquely downwardly from their respective exterior openings.

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