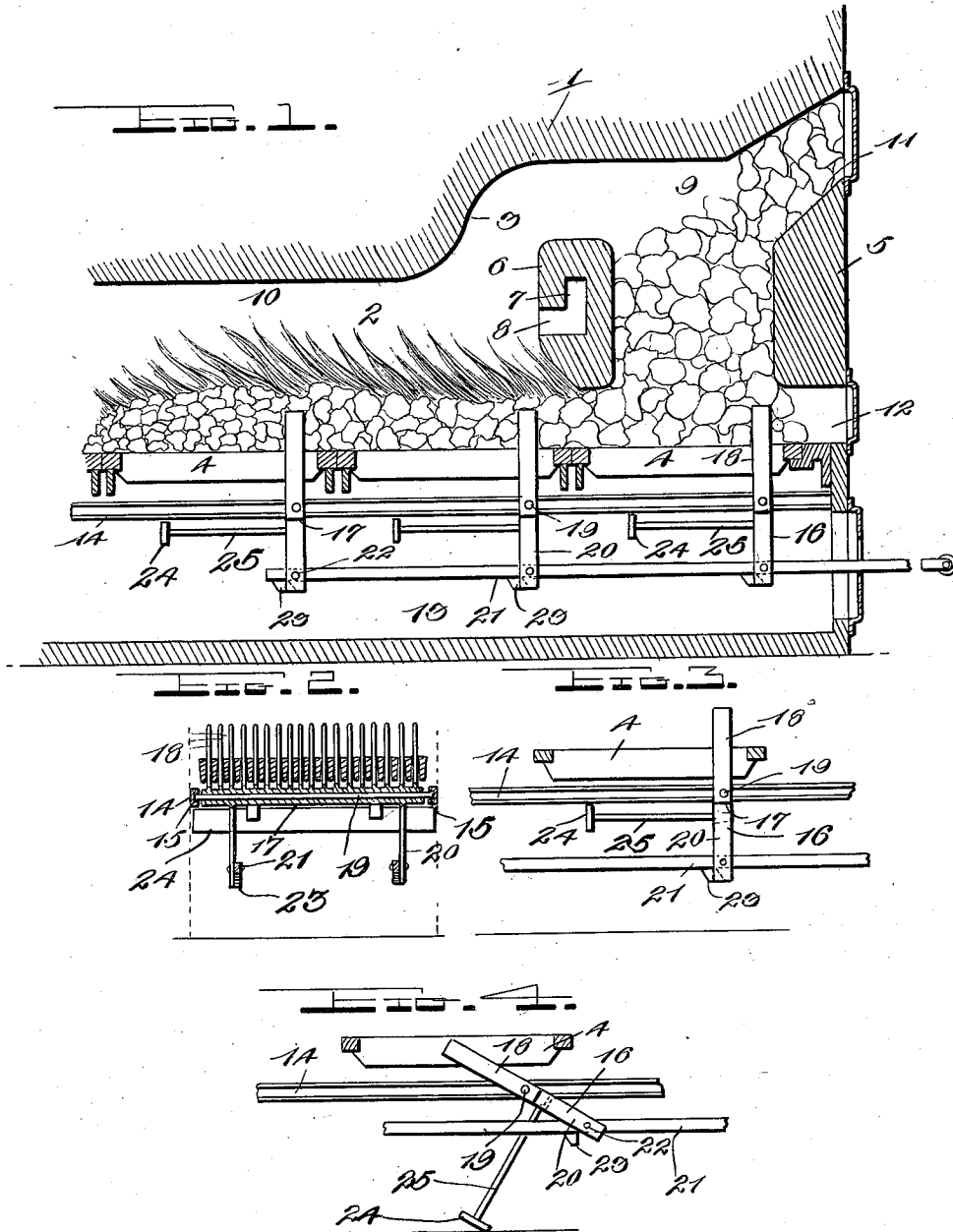


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GRATE.
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To all whom it may concern:

Be it known that I, OTTO H. KRUEGER, a subject of the Emperor of Germany, residing at Los Angeles, in the county of Los Angeles and State of California, have invented certain new and useful Improvements in Grates, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to improvements in furnaces for burning heavy, coking coal, and has for its primary object an improved raking and ash removing mechanism, the invention consisting in the construction, combination and arrangement of parts hereinafter described and claimed.

In the accompanying drawings: Figure 1 is a vertical longitudinal sectional view of a portion of a furnace constructed in accordance with my invention; Fig. 2 is a detail transverse sectional view taken through one of the grate sections of the furnace and also showing one of the fuel feeding rakes and the guides in which it operates, the guides also being shown in transverse section; Fig. 3 is a detail elevation of one of the rakes and its connections and also showing one of the guides in which the rake is mounted for longitudinal movement and for vertical angular movement, the grate section with which the rake is associated being shown in longitudinal section and the rake being shown in vertical position; and Fig. 4 is a similar view of the same, showing the rake in lowered, inclined position.

In accordance with my invention, the furnace, a portion of which is shown at 1 in Fig. 1, is provided with a fire box or chamber 2 which is vertically enlarged at its front end so that the roof of the fire box presents a downwardly and rearwardly extending shoulder 3 which forms a baffle. The grate is here shown as comprising a series of removable grate sections 4 which are supported in the usual manner and by the usual means and form the bottom of the fire box. At a suitable distance from the front wall 5 of the furnace there is a partition wall 6 which is also spaced above the grate and below the roof of the front portion of the fire box and is disposed at a suitable distance in front of the baffle or shoulder 3. This partition wall is hollow and is formed with a transverse air inlet flue 7. This partition wall divides the fire

box into a front, feeding and coking chamber 9 which is also a primary combustion chamber and into a rear, secondary combustion chamber 10. The transverse air inlet flue 7 of the partition wall 6 is in communication with the rear, secondary combustion chamber 10, as indicated at 8 in Fig. 1. An inclined feed chute 11 is formed in the front wall 5 of the furnace and leads downwardly from a suitable hopper or other fuel feeding means, not shown, and discharges at its lower end, by gravity, into the primary combustion chamber 9. A stoke hole 12 is also formed in the lower portion of the wall 5, immediately above the level of the grate and, in practice, is closed at its outer end as by means of a suitable door.

The fuel which is fed to the primary chamber 9 is caught and held by the partition wall 6 and prevented from moving directly into the secondary chamber 10. The coal in the primary combustion chamber is heated, some of it is directly consumed on the front portion of the grate, but the major portion of the coal in the primary combustion chamber is converted into coke, the gases passing therefrom over the partition wall and being deflected and directed downwardly and rearwardly over the incandescent fuel in the secondary combustion chamber 10 by the shoulder or baffle 3 in the roof of the fire box. Hence these gases are consumed in the combustion chamber 10 and are utilized in heating the furnace and prevented from escaping unburned, hence effecting a great economy in the fuel, by utilizing the gases given out thereby during the process of combustion. The partition wall 6, which is intensely heated, heats the air which passes through the flue 7 and this highly heated air is discharged from the flue 7 through the openings 8 directly into the front portion of the secondary combustion chamber 10, the heated air becoming commingled with the gases from the fuel in the primary combustion chamber 9 and hence greatly promoting the combustion of said gases. The incandescent fuel from the lower portion of the primary combustion chamber 9 is fed therefrom into the secondary combustion chamber 10 along the grate and under the partition wall 6 and only such fuel as is incandescent is thus fed from the primary combustion chamber to the secondary combustion chamber and hence practically all the volatile and light

products of combustion are consumed in the furnace as they pass from the primary combustion chamber 9 through the secondary combustion chamber 10 over the glowing mass of fuel in the latter.

I will now describe means for feeding the fuel from the lower portion of the primary combustion chamber into the secondary combustion chamber.

Below the grate and in opposite sides of the ash pit 13 of the furnace are longitudinally disposed guiding and supporting bars 14 which are channeled in their opposing sides, as at 15. Associated with each section of the grate is a fuel feeding rake 16 which comprises a bar or head 17 having tines 18 which project from one side thereof and are adapted to operate in the spaces between the grate bars. This head 17 is here shown as tubular and a shaft 19 extends therethrough, the ends of the said shaft projecting from those of the head and being fitted in the channels 15 of the bars 14 so that each rake is mounted for longitudinal movement and also for vertical angular movement. In the lower side of the head 17 of each rake projects a pair of arms 20. Operating bars 21 which extend longitudinally in the ash pit are pivotally connected to the arms 20 of the rakes as at 22 and are provided with laterally widened stop shoulders 23 which, while permitting the rakes to tilt or incline in one direction, prevent them from tilting or inclining in the reverse direction. These bars 21 thus also serve to connect the rakes together and may be operated by any suitable means. When the operating bars 21 are pushed rearwardly they first turn the rakes to a vertical position, so that their tines project upwardly above the grate sections and into the mass of burning fuel on the grate sections, and continued rearward movement of the bars 21 causes the rakes to move with them so that the rakes serve to move the burning fuel rearwardly on the grate, the spent fuel being shaken from the grates at the rear end of the furnace and the fresher fuel being fed, in an incandescent condition, from the lower portion of the primary combustion chamber into the lower portion of the secondary combustion chamber, every such rearward movement of the

rakes serving to move all the fuel rearwardly in the secondary combustion chamber and to supply a fresh mass of incandescent fuel from the primary combustion chamber into the secondary combustion chamber, as will be understood. Reverse, forward movement of the operating bars 21 causes the rakes to tilt or incline rearwardly so that the rakes slide forwardly under and without moving the fuel on the grate sections, as will be understood.

Ash rakes 24 are operated by the linked rods 25 which are connected directly and integrally to the heads of the fuel feeding rakes 16. As each fuel feeding rake turns to a vertical position, prior to moving rearwardly as hereinbefore stated, the ash rake carried thereby is elevated above the body of ashes in the bottom of the ash pit, and as each fuel feeding rake turns to an inclined position and starts to move forwardly its ash rake is dropped to the bottom of the ash pit and scraped forwardly thereon, carrying the ashes with it, so that the ashes are thus kept clear from the ash pit and the operations of feeding the fuel rearwardly in the furnace and drawing the ashes forwardly from the ash pit are successive.

Having thus described my invention I claim:

In a furnace, a grate, a transverse shaft mounted underneath the grate, longitudinally disposed supporting bars extending underneath the grate and in which the ends of the shaft are mounted for a longitudinally sliding movement, a tubular head mounted to turn on said shaft and provided with upwardly projecting tines designed to rake the grate and with a downwardly projecting arm, an actuating bar pivotally connected to said arm, means for limiting the pivotal movement of said arm relative to the bar in one direction, rods connected to said head and projecting downwardly therefrom in angular relation to the tines, and a rake carried by said rods.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

OTTO H. KRUEGER.

Witnesses:

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