J. H. SANGREE.

HOT AIR FURNACE.

APPLICATION FILED SEPT. 12, 1907.

904,230.

Patented Nov. 17, 1908.

2 SHEETS—SHEET 1.

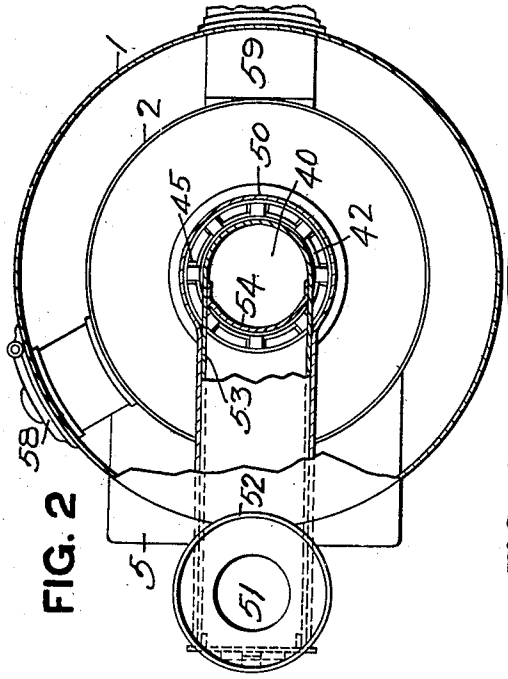

FIG. 2

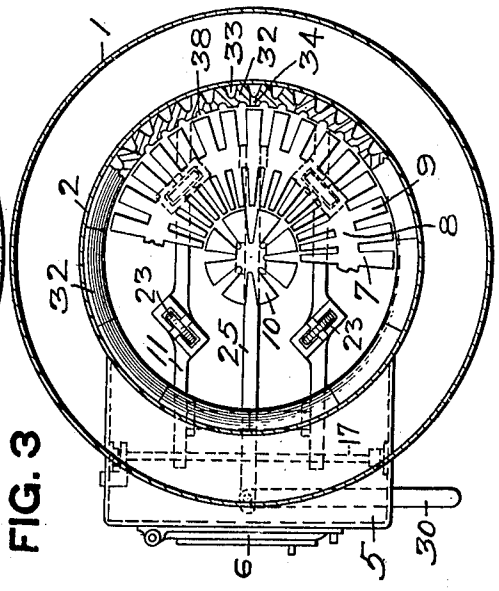

FIG. 3

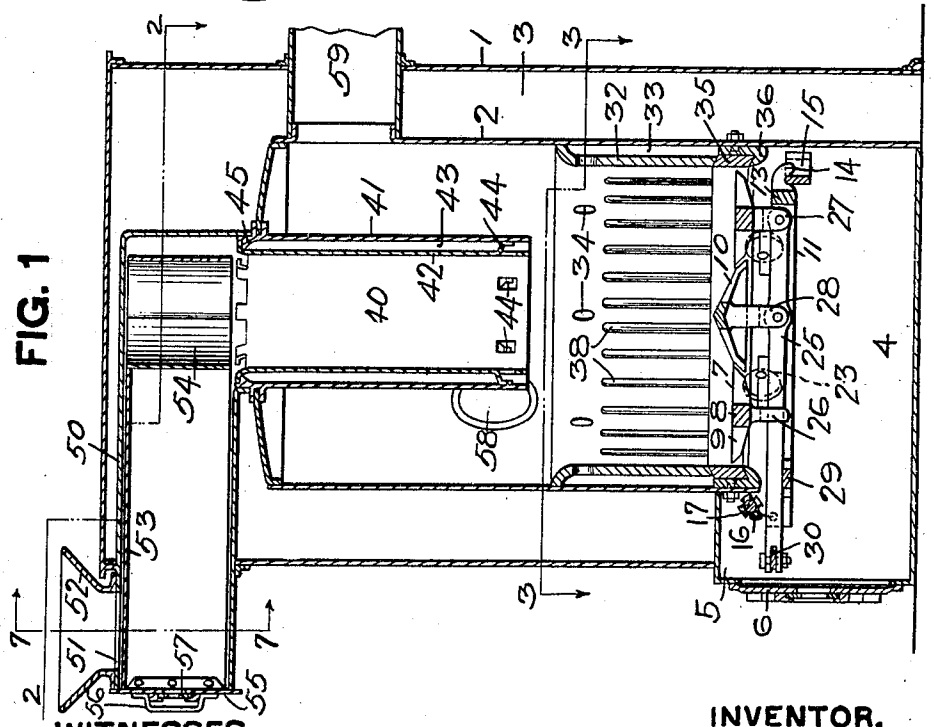

FIG. 1

WITNESSES.

J. R. Keller

Robert C. Totten

INVENTOR.

James H. Sangree

By Kay Totten & Winter

Attorneys

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2 SHEETS—SHEET 2.

FIG. 5

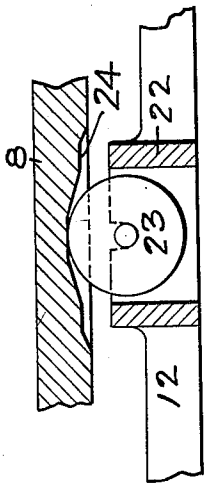



FIG. 6

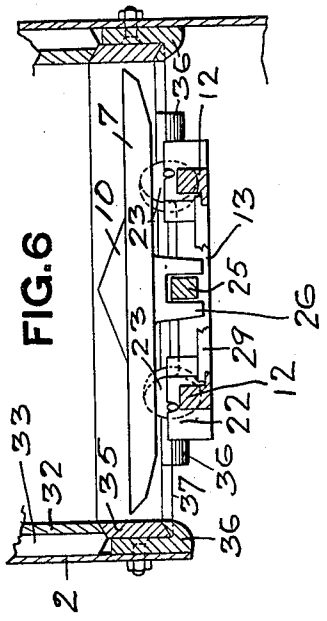



FIG. 4

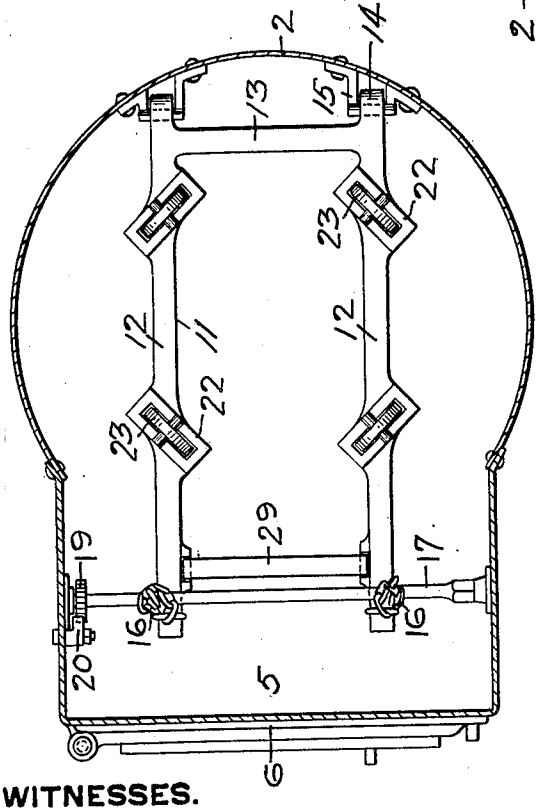
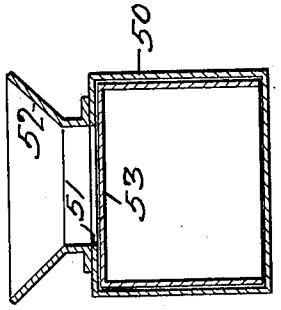



FIG. 7

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attorneys

# UNITED STATES PATENT OFFICE.

JAMES H. SANGREE, OF GLENSHAW, PENNSYLVANIA.

## HOT-AIR FURNACE.

No. 904,230. Specification of Letters Patent. Patented Nov. 17, 1908.

Application filed September 12, 1907. Serial No. 392,518.

*To all whom it may concern:*

Be it known that I, JAMES H. SANGREE, a resident of Glenshaw, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Hot-Air Furnaces; and I do hereby declare the following to be a full, clear, and exact description thereof.

This invention relates to hot air furnaces heated by coal or other solid fuel.

The object of the invention is to improve such furnaces in details hereinafter described and claimed.

In the accompanying drawings Figure 1 is a vertical section through my improved furnace; Fig. 2 is in part a plan view and in part a horizontal section on the line 2—2, Fig. 1; Fig. 3 is a similar section on the line 3—3, Fig. 1; Fig. 4 is a horizontal section showing the grate support in plan; Figs. 5 and 6 are detail sections showing the grate, and Fig. 7 is a vertical section on the line 7—7, Fig. 1.

My furnace comprises a suitable outer casing 1 and inner shell or body 2 forming between them the air chamber 3, as is usual in hot air furnaces. The shell or body 2 may be a casting but preferably will be of plate metal as shown the top thereof forming the dome. At the bottom is the ash pit 4, this having extension 5 projecting out slightly beyond the outer casing 1, said extension being provided with the ash removing opening adapted to be closed by a door 6, having the usual draft register. The grate comprises an annular portion 7 formed of the continuous solid ring 8 and radial bars 9, and a central dome-like portion 10, independent of the annular portion 7. The annular portion 7 of the grate is mounted upon a suitable support 11 comprising side members 12 and cross connecting member 13. This grate support at its rear end is hinged to the shell, by providing the side bars 12 with hooks 14 resting on brackets 15 secured to the casing 2. The forward or outer end of the grate support is adapted to be supported by any suitable means permitting the forward end to be lowered in order to tilt the grate and permit clinkers to be raked out. As shown, the forward end of the support has connected thereto chains 16 adapted to be wound upon a shaft 17 mounted in the extension 5 of the ash pit and adapted to be operated by any suitable means, such as a lever, not shown, and being provided with means to prevent backward rotation thereof, such as ratchet 19 and pawl 20.

The grate is mounted on this support for rotary movement in a horizontal plane. For this purpose the support 11 is provided with bearings 22 in which are mounted rollers or wheels 23 arranged as shown in Fig. 4 so as to be practically in a circle. The continuous ring member 8 of the grate section 7 rests upon these rollers, thereby permitting the grate to be given a rotary movement on said rollers. In order to assist in shaking out the ashes the ring member 8 is provided on its under surface with cam faces 24 which rest upon the rollers 23 so that when the grate is rotated in either direction it is also given an up and down movement due to the cam faces riding over the rollers 23. The grate is rotated by means of a bar 25 passing through lugs 26 and 27 formed on the ring member 8 of the grate section 7. The central grate section 10 is secured to this bar through a suitable support 28. The central portion 10 is adapted to be tilted independently of the annular portion 7 in order to permit the removal of clinkers and ashes, this being accomplished by pivoting the rear end of the bar 25 in the lug 27, as clearly shown in Fig. 1, and forming the lug 26 so that it is open on the bottom, thereby permitting the forward end of the bar 25 to be dropped to thereby lower the central grate section 10. The forward end of the bar 25 is normally held in its raised position by resting upon a cross bar 29 removably held by the forward end of the grate support 11. An operating member 30 is attached to the forward end of the bar 25 and projects out through the side of the extension 5 of the ash pit so that by reciprocating the member 30 the bar 25 is operated to rotate the grate.

In order to clean the fire the grate can be rotated by suitably operating the bar 30 which also causes an up and down jarring movement, while, by removing the bar 29 the central section 10 of the grate can be lowered to allow of the cleaning of the central part of the fire, while by unwinding the chains from the shaft 17 the entire grate can be tilted in order to permit the insertion of a poker above the grate to permit the removal of clinkers on the annular section 7. The annular portion 7 of the grate is agitated more than the central portion 10 and the latter may, if desired, be imperforate. Consequently the fire does not burn mostly

at the center as is the case with most furnaces.

The fire chamber is lined by suitable cast plates 32 and these are so constructed as to conduct air into the fuel near its upper surface. As shown, these plates are provided on their rear or outer faces with grooves 33 tapering slightly upwardly and communicating with the front face of the plates through openings 34 formed near the upper ends of the plates so that the grooves cannot clog with ashes, etc. These plates are supported upon a ring 35 spaced from the casing 2 by means of hangers 36, thereby forming air passages 37 from the ash pit 4 to the lower ends of the grooves 33. The inner faces of the plates are also grooved, as shown at 38, so that air can pass up on the inner faces of the plates. In this way the fire is supplied with air not only through the grate but also near the top of the bed of fuel through the grooves 33 and openings 34.

The furnace is provided with a central feeding reservoir 40 into which the fuel is fed and supplied to the fire in the ordinary way of feeding reservoirs of this character. This reservoir is made of an outer shell 41 and an inner shell 42 so as to leave between the same an air space 43 through which air flows and is supplied at the lower end of the reservoir to the surface of the fire. The outer shell is suspended from the dome of the furnace shell by a flange on said outer shell, as shown in Fig. 1. The lower ends of the shells 41 and 42 are suitably spaced by spacing members 44 and the upper end of the inner shell is flanged and supported on lugs 45 formed on the outer shell at intervals so as to leave spaces between the lugs through which the air may enter the passage 43 between the shells.

The outer shell 41 of the reservoir projects up beyond the top of the furnace body 2 and has connected to one side thereof a tube 50, shown as square or rectangular in cross section. This tube is open at its outer end and in its top wall near the outer end is provided with an opening 51 over which is a hopper 52. In this tube is a slide 53 preferably comprising a top wall and two side walls having a fairly close fit in the tube and at its inner end carrying a vertical feeding member or tube 54 which is open at top and bottom, being slightly smaller than the reservoir 40 and arranged when the slide is drawn outwardly to come underneath the opening 51 for receiving a charge of coal from the hopper 52, and when the slide is pushed inwardly is brought above the reservoir 40 so as to feed the coal into the reservoir. The top wall of the slide 53 acts as a valve to shut off the hopper 52 when the slide is moved inwardly. Attached to the outer end of the slide 53 is a cover 55 for closing the outer end of the tube 50, said cover being provided with a handle 56 for operating the slide and with an air register 57 through which air may enter in order to supply the air going down through the space between the two shells of the reservoir.

Ordinary hot air furnaces are provided with feeding doors directly above the ash door. Consequently there is in such furnaces a sort of pocket formed in the air chamber 3 between the ash door extensions and the feeding door extensions, in which pocket there is very little circulation of air, causing the same to overheat and burning the inner shell at this point. I provide one or more doors 58 which may, if desired, be used for feeding but which ordinarily serve only for cleaning purposes or poking the fire. Such door or doors I do not locate directly above the ash door but at one side thereof, as shown in Fig. 2, thus preventing the formation of dead air pockets and permitting a free circulation of air in all parts of the air space 3. The furnace is also provided with the usual smoke outlet 59.

The construction and operation of the furnace will be clearly understood from the foregoing description. By means of the construction described the fire is supplied with air at three points, at the bottom through the grate, near the top through the openings 34, and at the surface of the fire through the space 43 in the reservoir. The furnace is provided with feeding means for supplying a constant stream of fuel to the fire and this is so constructed that no doors need be opened during feeding, thereby preventing the escape of gas and in no manner disturbing the draft through the fire. The grate is of simple construction and can be readily cleaned.

What I claim is:

1. In a furnace, the combination of a furnace chamber, a feeding reservoir extending down into the same and provided in its walls with air passages opening into the furnace chamber, a casing providing a passage connected to the upper end of the reservoir and communicating with the air passages in the latter, and a feeding receptacle opening at its top and bottom and slidably mounted in said passage.

2. In a furnace, the combination of a shell with a dome, a grate therein dividing the space in the shell into an ash pit and a combustion chamber, a lining inside the shell above the grate and provided with air passages communicating at their lower ends with the ash pit and extending upwardly and communicating with the combustion chamber, a feeding reservoir projecting down into the combustion chamber and provided in its wall with air passages extending therethrough and opening into the furnace chamber at the extreme lower end of said reservoir, a casing providing a passage con-

nected to the upper end of said reservoir above the dome of said shell and communicating with the air passage therein, a closure for said passage, and an air register in said closure.

3. In a furnace, the combination of a furnace chamber, a reservoir extending down into the same, a tubular passage connected to the upper end of said reservoir, a hopper, a feeding receptacle open at its top and bottom and slidably mounted in said tubular passage, the opening at the top of said receptacle adapted to co-incide with said hopper, whereby when the feeding reservoir is reciprocated a charge of fuel is transferred from the hopper to the reservoir.

4. In a furnace, the combination of a furnace chamber, a reservoir extending down into the same, a tubular passage connected with the upper end of the reservoir and provided with an opening in its top near its outer end, a hopper, a feeding reservoir open at the top and bottom and slidably mounted in said tubular passage, the openings at the top of said passage and receptacle adapted to co-incide with said hopper, whereby when the feeding receptacle is reciprocated a charge of fuel is transferred from the hopper to the reservoir.

5. In a furnace, the combination of a furnace chamber, a reservoir extending down into the same, a horizontal passage connected with the top of the reservoir and provided with an opening in its top wall near the outer end, a slide mounted in said passage and provided with a top wall arranged to close the opening in the top wall of the horizontal passage, and a feeding receptacle open at top and bottom and connected to the inner end of said slide.

6. In a furnace, the combination with the shell, of a grate therein dividing the space in the shell into a combustion chamber and an ash pit, a lining inside of the shell above the grate and provided with air passages communicating at their lower ends with the ash pit and extending upwardly and communicating with the combustion chamber, a feed reservoir projecting down into the combustion chamber and provided in its walls with air passages opening into the combustion chamber at the lower end of the reservoir, a tubular passage connected with the upper end of the reservoir and communicating with the air passages in the walls of the latter, a feeding receptacle slidably mounted in said tubular passage, and a closure for said tubular passage carried by the feeding receptacle and provided with an air register.

In testimony whereof, I, the said JAMES H. SANGREE, have hereunto set my hand.

JAMES H. SANGREE.

Witnesses:
F. W. WINTED,
ROBERT C. TOTTEN.