(No Model.) 2 Sheets—Sheet 1.

D. S. WHITE.

HEATER.

No. 564,402. Patented July 21, 1896.

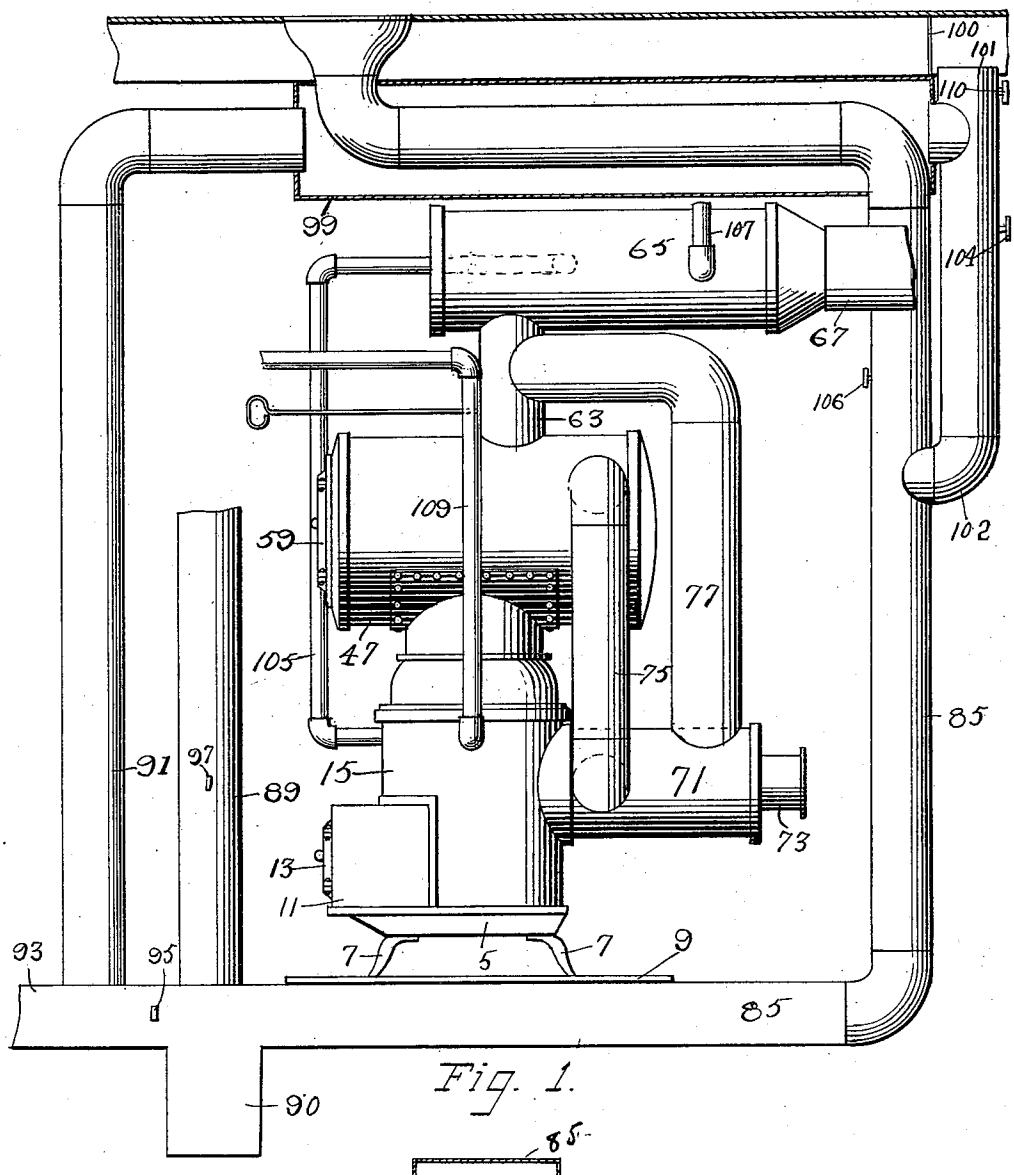

Fig. 1.

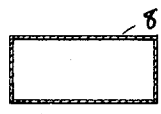

Fig. 8.

Witnesses
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

D. S. WHITE.

HEATER.

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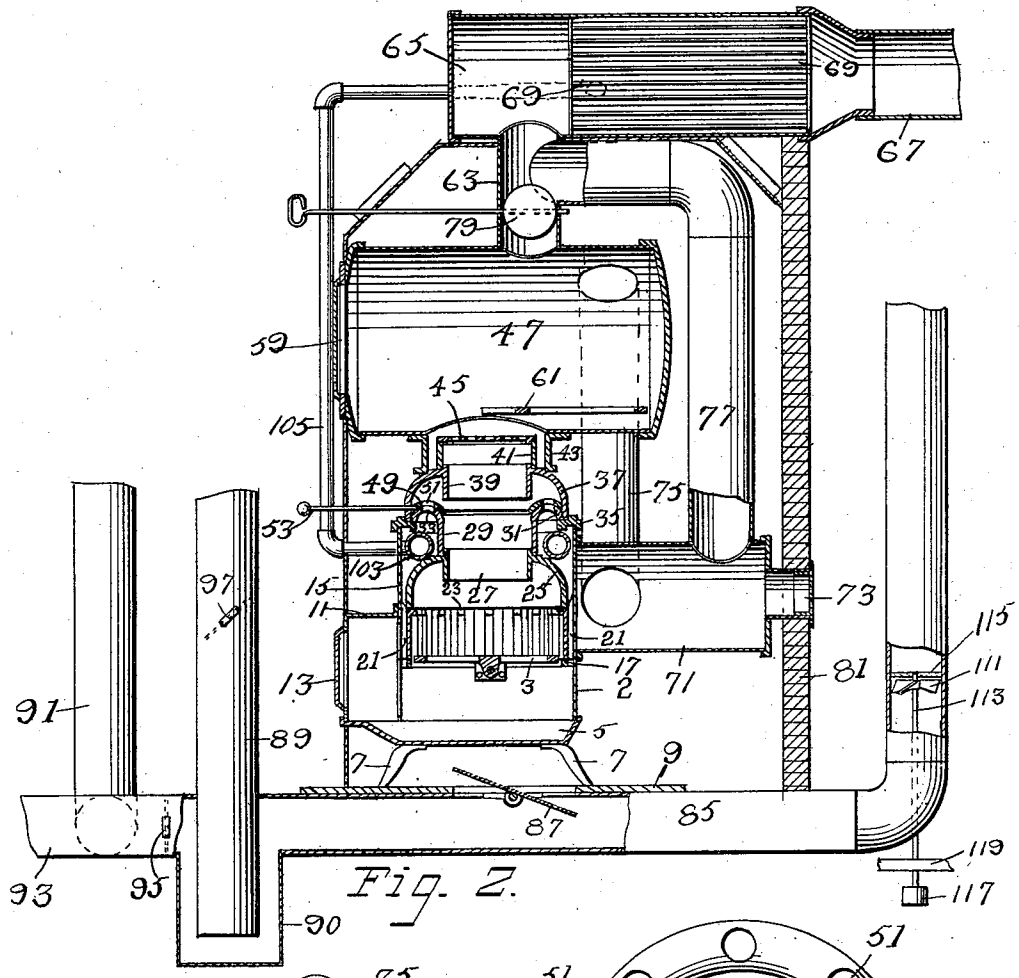

Fig. 2.

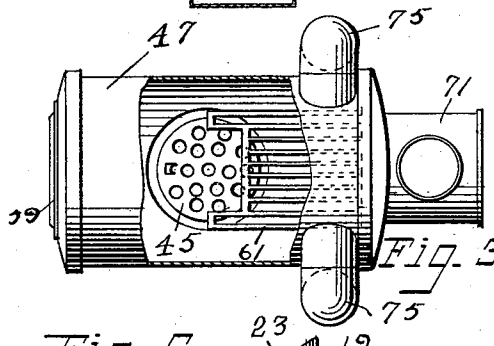

Fig. 3.

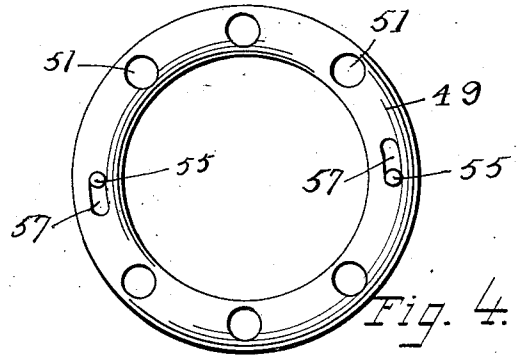

Fig. 4.

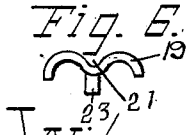

Fig. 6.

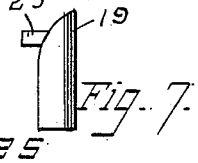

Fig. 7.

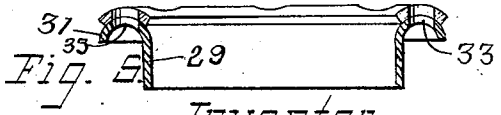

Fig. 8.

Witnesses
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Richard Paul

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

DAVID S. WHITE, OF NORTHFIELD, MINNESOTA.

HEATER.

SPECIFICATION forming part of Letters Patent No. 564,402, dated July 21, 1896.

Application filed January 14, 1896. Serial No. 575,444. (No model.)

To all whom it may concern:

Be it known that I, DAVID S. WHITE, of Northfield, Rice county, Minnesota, have invented certain new and useful Improvements in Heaters, of which the following is a specification.

My invention relates to improvements in heaters, and the objects I have in view are to provide an improved heater which shall be simple and inexpensive in construction, which shall secure a complete combustion of the fuel, and which shall be capable of heating a large volume of air with a small amount of fuel.

To these ends my invention consists, generally, in the constructions and combinations hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a side elevation of my improved heater, the outer wall or casing being removed. Fig. 2 is a sectional elevation of the same, the outer casing being shown in section. Fig. 3 is a plan view, partly in section, of the secondary combustion chamber or drum. Fig. 4 is a plan view of the ring-damper. Fig. 5 is a detail section of one of the castings forming the fuel-chamber, showing the ring-damper in position thereon. Figs. 6 and 7 are details of the brick surrounding the fire-pot, and upon which the castings forming the fuel-chamber are supported. Fig. 8 is a cross-section of the foul-air pipe.

In the drawings, 2 represents the lower or main part of the furnace or heater, within which is located a suitable grate 3, of any preferred construction, the bottom 5 of which forms the ash-pan. Suitable legs 7 support the heater, which preferably rests upon a broad plate or base 9. An extension 11 is provided in front of the grate and ash-pan, which is provided with a suitable door 13, by means of which access may be had to the grate and to the ash-pan. The wall 15 of the heater surrounding the grate and the ash-pan and extending some distance above the grate is preferably formed of sheet metal.

A suitable ring 17 is arranged within the wall 15 and surrounding the grate, and upon this ring rests a series of fire-brick 19. (Shown in detail in Figs. 6 and 7.) These brick are provided with channels 21 upon their rear faces and with the inwardly-projecting lugs 23. A ring-casting 25 of arch form in cross-section and provided with a vertical central flange 27, projecting both above and below the wall of the ring 25, is arranged to rest upon the lugs 23, and upon this casting is arranged a second ring-casting 29, provided with a curved flange 31 at its top, in which is a series of holes 33. (See Figs. 2 and 5.) A ring 35 rests upon the top of the wall 15 and supports the casting 29, and also supports a third casting 37, similar to the casting 25 and having a central ring-flange 39, and upon the casting 37 are the two rings 41 and 43, the former being preferably provided with a perforated lid 45 and the latter supporting the secondary sheet-metal combustion chamber or drum 47.

A ring-damper 49, provided with a series of holes 51 and with an operating-rod 53, which extends through the outer casing, rests upon the flange 31 of the casting 29. Lugs are provided on the flange 31, and they project into oblong slots 57 in the ring 49, and serve to retain it in position and limit its movement.

The drum 47 extends to the front of the outer casing, hereinafter described, and is provided with a suitable door 59. This drum is also preferably provided with a suitable grate 61. A pipe 63 leads from the top of the drum 47 to another drum 65, the rear end of which may be supported on the rear wall of the outer casing, as shown in Fig. 2. To this drum a smoke-pipe 67 is preferably connected. A series of flues 69 may, if preferred, be arranged in the drum 65, as shown in Fig. 2. The rear part 68 of the drum 65 thus forms a hot-water heater. This drum may, however, be entirely omitted and the smoke-pipe be connected directly to the drum 47.

For the purpose of forming a diving-flue and more thoroughly heating the air within the outer casing, I provide a drum 71, located in the rear of the fire-pot and having, preferably, a clean-out cap 73 at its rear end outside of the outer casing. A diving-flue 75 leads from the drum 47 to the drum 71 and connects with the pipe 63, a damper 79 being provided in the pipe 63 below its junction with the flue 77.

I preferably form the outer casing by a brick or masonry wall 81 at the rear and sheet-metal front, side, and top walls 80, as shown in Fig. 2. Suitable pipes (not shown) are arranged in the usual way to conduct the hot air from the interior of the outer casing to the several rooms to be heated. Any suitable arrangement of pipes for conducting fresh air to the furnace and leading cold air from one or more of the rooms to the furnace may be provided.

I prefer the arrangement shown in the drawings. As here shown, a pipe 85 (see Fig. 1) leads from the floor of one of the rooms and passes beneath the plate 9 of the heater. The plate 9 is provided with an opening, and the pipe 85 is provided with a valve 87 arranged therein. This pipe is also extended beyond the furnace and is provided with the well or depressed portion 90. The pipe 97 projects into the pipe 85 and has its open end extending in the lower part of the well 90. The pipe 89 is provided with the damper 97. This pipe leads to a ventilating stack or chimney. A pipe 93 extending from a point where fresh air is obtained is joined to the end of the pipe 85, the damper 95 being provided for the purpose of closing the connection between the pipes 93 and 85. The pipe 91 leads from the pipe 93 to a pipe 99 arranged above the furnace, and this drum is connected by a pipe 101 that extends to a ventilating-pipe 100, by means of which fresh air may be supplied to any of the rooms. The pipe 101 is provided with a damper 110, and a pipe 102, also connected to the drum 99, connects with the pipe 85. A valve or damper 104 is provided in the pipe 102, and a valve or damper 106 is provided in the pipe 85 above the connection of the pipe 102. I also prefer to provide in connection with the hot-water heater formed in the drum 65 a hollow ring 103, which is arranged inside of the wall 15 and surrounding the fuel-chamber of the heater, as shown in Fig. 2. To this ring is connected a pipe 105, which connects with the hot-water heater formed in the drum 65. A pipe 107 also extends from the drum 65 to the radiators or coils in the rooms to be heated, and a return-pipe 109 is connected to the ring 103. I also prefer in some instances to provide in the pipe 85 a fan 111 mounted upon a suitable shaft 113, that is supported in a suitable cross-bar 115 arranged in said pipe. The shaft 113 extends outside of the pipe 85 and is mounted in a suitable bearing 117, and is provided with the pulley 119, by means of which power may be applied to drive said fan from an electric motor or other suitable source of power.

The operation of my improved heater is as follows: Fire being started upon the grate 3, the door 59 is opened in the drum 47 and the lid 45 removed, and additional fuel is supplied through the opening thus provided. The lid 45 is preferably kept in position, except when fuel is being supplied, although this lid may be removed at any time if desired. The products of combustion rising through the fuel-chamber are met at a point immediately below the flange 39 by heated air, which passes up through the space between the castings 25 and 29 in the wall 15, coming out through the openings 33 in the casting 29. This heated air mixing with the gases at this point furnishes sufficient supply of oxygen to form practically a complete combustion of the fuel at this point. Upon the grate 61 in the secondary combustion-chamber 47 I prefer to maintain a wood fire. As this drum is closely shut, and as no oxygen is supplied except that which is unconsumed in the heater below, it results that the wood is very slowly burned and the fire at this point is maintained for a great length of time, keeping the drum 47 at a very high temperature for a very long time. The products of combustion, except when the fire is first started, pass through the diving-flue 75, into the drum 71, and back through the flue 77, through the drum 65, and into the smoke-pipe. The cold air from the rooms is drawn down through the pipe 85, said pipe passing through the fresh-air drum 99 and being cooled therein, so as to cause a downward draft through said pipe, and such air passes beneath the heater. As the heavier part of the air passes along close to the bottom of the pipe 85 in its horizontal portion, the lighter or purer air will be near the top and will pass up above the valve 87 and into the interior of the heater-casing, the remaining impure air passing along the pipe 85 falls to the bottom of the well 90, and then passes out through the pipe 89 to the ventilating-chimney. The damper 95 being closed, the fresh air entering through the pipe 93 passes up through the pipe 91 into the drum 99, and through the pipe 101 into the flues 100, from which it is distributed to the rooms of the house. When it is desired to do so, the damper 110 in the pipe 101 may be closed, the damper 104 opened, the damper 106 closed, and the fresh air passed from the pipe 91 into the pipe 85, and thence directly to the heater; or, when it is not convenient to use the fan 111, the damper 95 may be opened and the fresh air from the pipe 93 will pass directly below and into the heater.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a furnace the combination, with the base, of the casing supported thereby, the grate arranged within said casing, the rings supported above said grate, a combustion-chamber supported upon the upper ring of said series, a second grate arranged within the same, and means for permitting the air to pass around the lower grate and into said combustion-chamber, substantially as described.

2. In a furnace, the combination, with the base, of the casing supported thereby, the grate arranged within said casing, the ring surrounding said grate, the fire-brick supported by said ring and provided with verti-

cal passages, the rings 25, 29 and 37 arranged above said grate, the ring 29 being provided with a series of openings in its upper surface, a register or ring for covering or uncovering said openings, a combustion-chamber supported above said rings, and a second grate arranged within said chamber, for the purpose set forth.

3. In a furnace, the combination, with the base, of the casing supported thereby, the grate, the ring provided with air-passages surrounding said grate, the castings 25, 29 and 37 arranged one above the other, and each provided with a central opening and depending flange, said casting 29 being provided with a series of openings leading to the air-passages surrounding said grate, means for closing said openings, the cover arranged to close the opening in said casting 37, said cover being provided with a series of perforations, and the combustion-chamber arranged above said casting 37, and provided with an opening leading to the chimney, substantially as described.

4. In a furnace, the combination, with the base, of the grate supported thereby, the fire-brick arranged around said grate and provided with vertical passages 21 and outwardly-projecting lugs 23, the ring-casting supported upon said lugs, the ring-castings 29 and 37, said casting 29 being provided in its curved upper surface with a series of openings, a revolving ring for covering said openings, said ring 37 being provided with a flange 41, a perforated cover for covering the top of the same, a combustion-chamber connected with the chimney, and a grate arranged in said chamber above said perforated cover, for the purpose set forth.

5. The combination, with the furnace of the cold-air box, the intake-pipe 93, the pipe 91 connecting said intake-pipe with the cold-air box, the pipe leading from the cold-air box to the register in the room above, the return-pipe extending through said cold-air box and along beneath the furnace and connected with said intake-pipe, and the short pipe connecting said return-pipe with the pipe which discharges pure air into the room, for the purpose set forth.

6. The combination, with the furnace, of the cold-air box, the intake-pipe, the pipe 91 connecting said intake-pipe with the cold-air box, means connecting said cold-air box with the room above, the pipe 85 extending through said cold-air box and beneath the furnace, the ventilating-pipe leading to the chimney, and the valve 87 arranged in said pipe 85 beneath the furnace for the purpose set forth.

7. The combination, with the furnace, of the cold-air box, the intake-pipe, means connecting said intake-pipe with said cold-air box, the pipe connecting said cold-air box with the rooms above, the return-pipe 85, the valves arranged therein the short pipe connecting said pipe 85 with the pipe leading to the rooms, the valves arranged therein, and the fan arranged in said return-pipe 85, substantially as described and for the purpose set forth.

In testimony whereof I have hereunto set my hand this 6th day of January, A. D. 1896.

DAVID S. WHITE.

In presence of—
A. C. PAUL,
RICHARD PAUL.