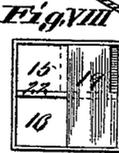
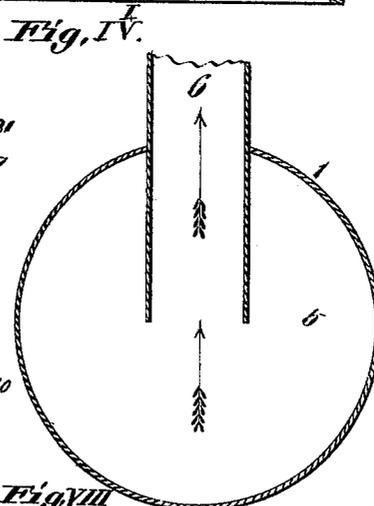
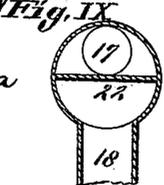
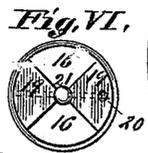
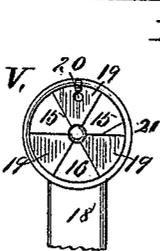
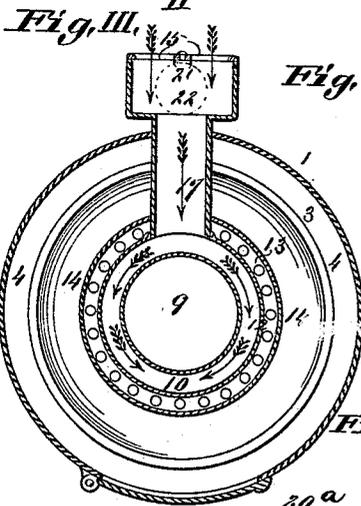
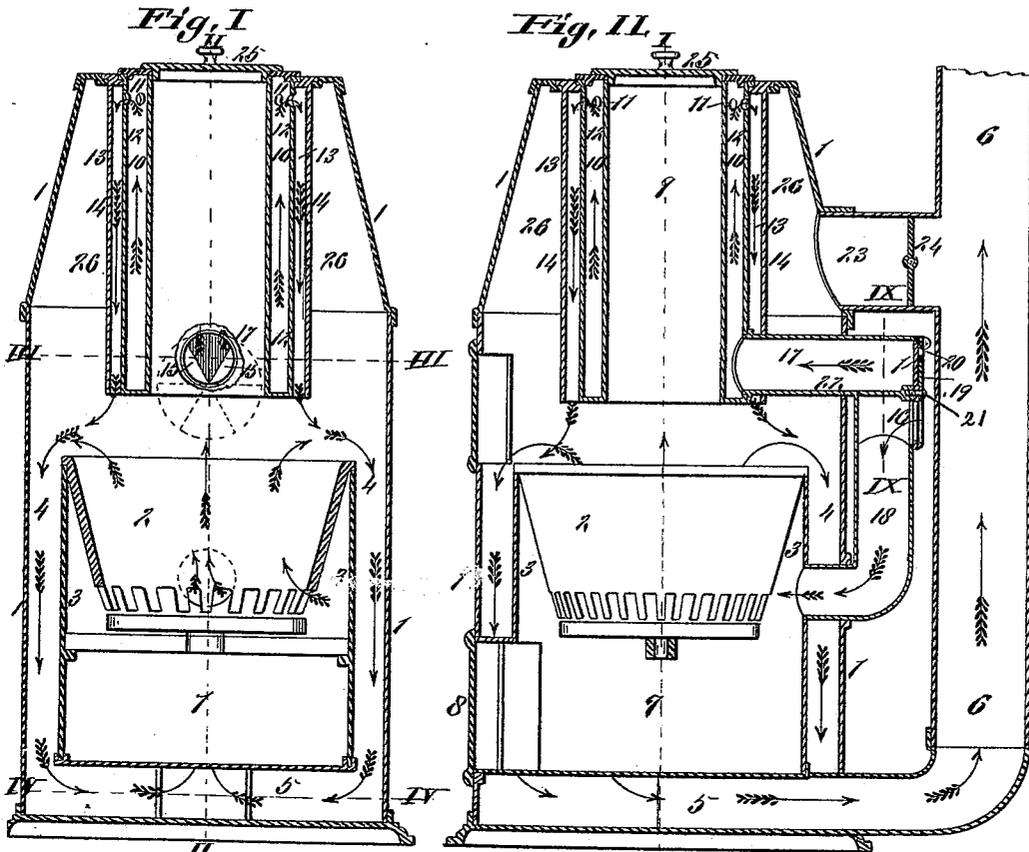


J. S. WILLIAMS.  
STOVE OR FURNACE.

No. 392,899.

Patented Nov. 13, 1888.



Attest, *Fig VII*  
*W. B. Knight*  
*Emma Arthur*

Inventor:  
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*W. B. Knight*  
*Atty.*

(No Model.)

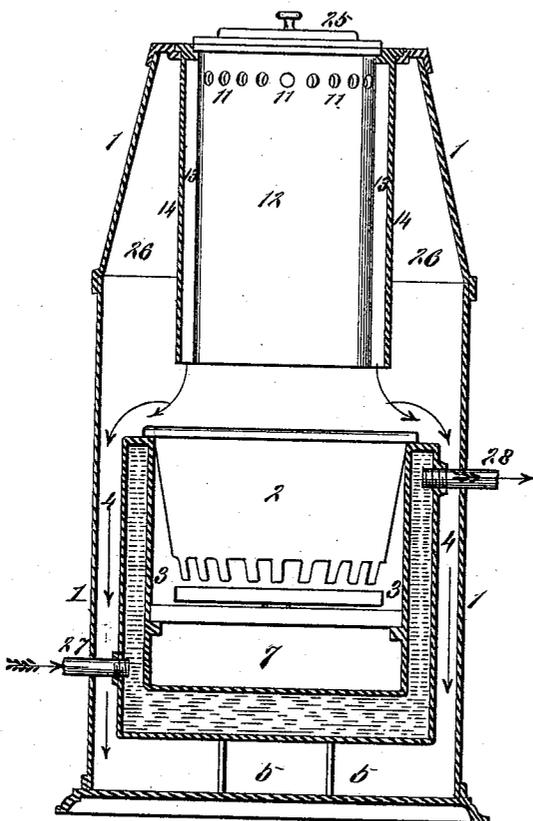
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STOVE OR FURNACE.

No. 392,899.

Patented Nov. 13, 1888.

*Fig. X.*



*Attest;*

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STOVE OR FURNACE.

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Fig. XI

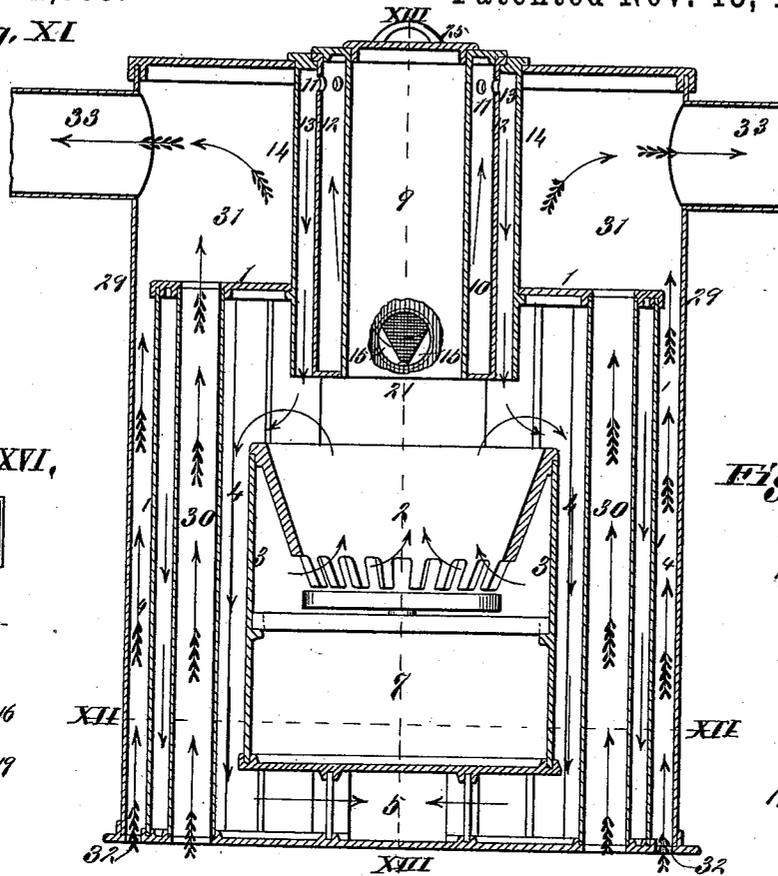


Fig. XVI,



Fig. XV

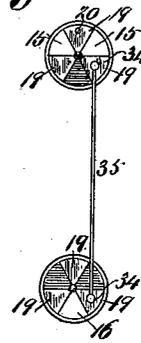
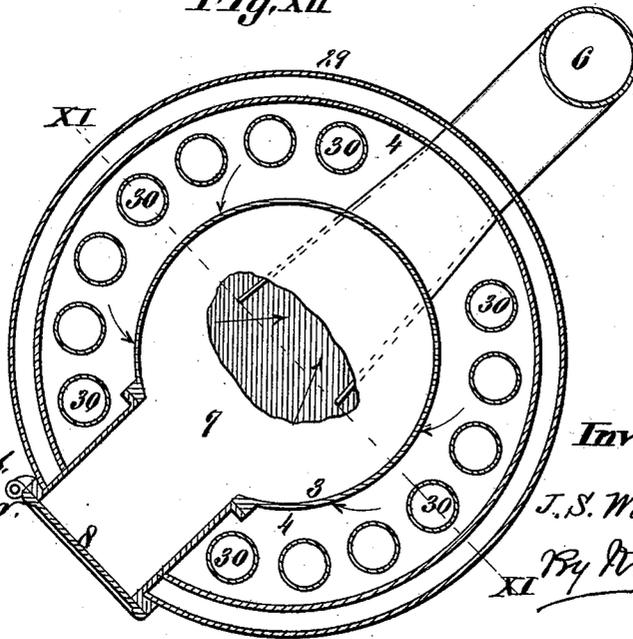


Fig. XII



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(No Model.)

4 Sheets—Sheet 4.

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STOVE OR FURNACE.

No. 392,899.

Patented Nov. 13, 1888.

Fig. XIII

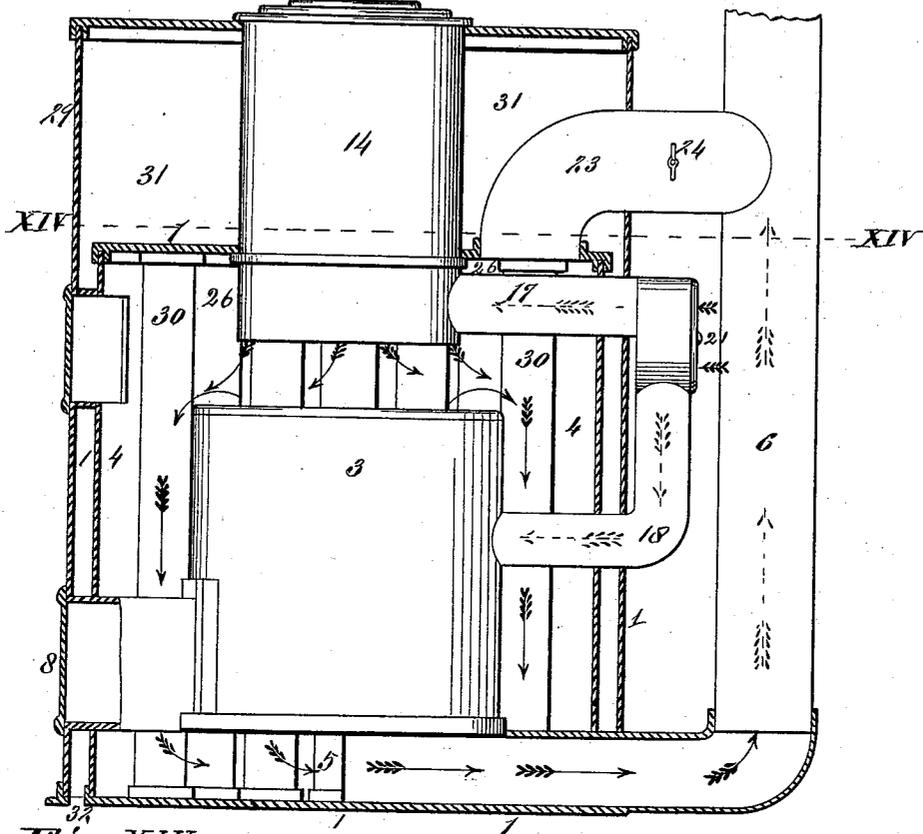
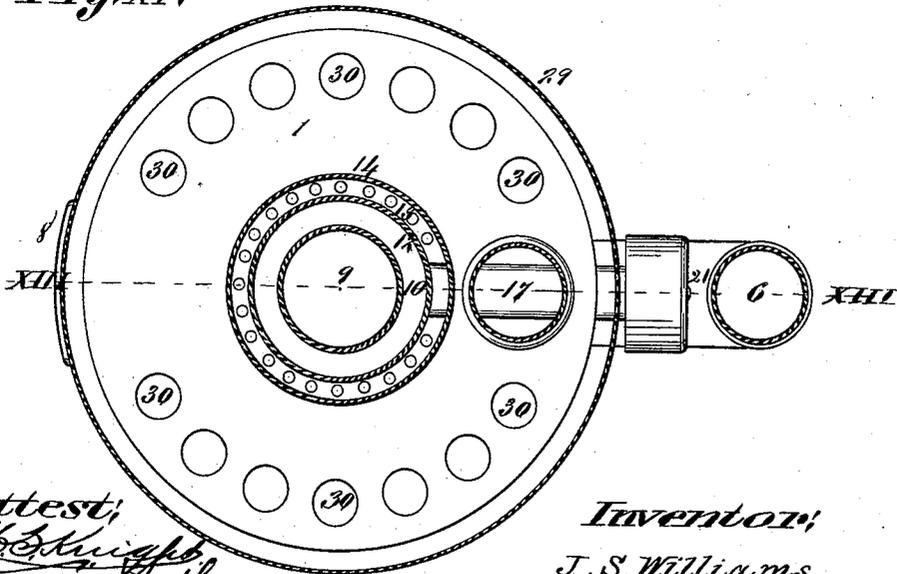


Fig. XIV



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 Emma Arthur.

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# UNITED STATES PATENT OFFICE.

JACOB S. WILLIAMS, OF ST. LOUIS, MISSOURI.

## STOVE OR FURNACE.

SPECIFICATION forming part of Letters Patent No. 392,899, dated November 13, 1888.

Application filed January 31, 1887. Serial No. 226,077. (No model.)

*To all whom it may concern:*

Be it known that I, JACOB S. WILLIAMS, of the city of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Stoves and Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, and in which—

Figure I is a vertical section of a heating-stove at I I, Fig. II. Fig. II is a vertical section at II II, Fig. I. Fig. III is a horizontal section at III III, Fig. I. Fig. IV is a horizontal section at IV IV, Fig. I. Fig. V is a front view of the register or damper by which the air is admitted to the fire when bituminous coal is used, and Fig. VI is a similar view showing the damper constructed for use on an anthracite-coal stove. Fig. VII is a modification of the damper shown in Fig. V, and Fig. VIII is a modification of the damper shown in Fig. VI. Fig. IX is a detail vertical section at IX IX, Fig. II. Fig. X shows a water-heating chamber surrounding and extending beneath the fire-pot, the figures being an axial section of the stove. Figs. XI to XIV, inclusive, show the improvements applied to an air-heating furnace. Fig. XI is a vertical section at XI XI, Fig. XII. Fig. XII is a horizontal section at XII XII, Fig. XI. Fig. XIII is a vertical section at XIII XIII, Fig. XIV, except that the drum surrounding the magazine is shown in elevation. Fig. XIV is a horizontal section at XIV XIV, Fig. XIII. Figs. XV and XVI show modifications of the register.

The invention will be described in the order of the figures.

1 is the outer shell of the stove.

2 is the fire-pot, which may be of any suitable construction. The fire-pot is supported on a wall, 3, between which and the outer shell is the downtake 4, through which the products of combustion descend to the base-chamber 5.

6 is the chimney communicating with the base-chamber 5.

7 is the ash-pit, and 8 the ash-pit door.

9 is the magazine for fuel, (the stove being of the class known as "base-burners," the combustion taking place at the base of the magazine.) The air supplying the oxygen

for combustion enters through a register or compound damper, a portion entering the ash-pit and a portion entering the annular chamber 10, surrounding the magazine. The air enters the bottom of chamber 10 and flows upward to holes 11 in the outer wall, 12, of the chamber, through which it passes into an outer annular chamber, 13, whose outer wall, 14, extends from the stove-top to the level of the magazine-bottom. The chamber 13 is open or perforated at bottom, so that the air is projected downward upon the burning fuel in the fire-pot, and, having become heated in its passage through the chambers 10 and 13, causes very complete combustion of the combustible gases arising from the fire. The register is constructed so as to apportion the quantity of air entering the stove to meet the exact requirements.

It is evident that, as bituminous coal contains a larger proportion of volatile combustible matter than anthracite coal, a greater quantity of combustible gases will be burned, if at all, at or above the top of the fire than in the case of anthracite coal, and for this reason a larger proportion of the air should be supplied at this point than if anthracite coal were used. To make this clear it will be assumed that soft or bituminous coal is used, and that it consists of one-third volatile and two-thirds fixed carbon, (omitting the hydrogen.) It is evident that one-third of the oxygen would be required to consume the volatile and two-thirds to consume the fixed carbon, and as the volatile matter would be distilled from the fresh coal coming from the magazine or at the top of the fire-pot the oxygen, to consume it, must be supplied at that point. As, also, the combustion of the fixed carbon in the fire-pot can be only incomplete, carbonic oxide, or CO, being produced, an equal quantity of oxygen must be mingled with it at the top of the fire-pot to produce thorough combustion or to convert the carbonic oxide into carbonic acid, (CO<sub>2</sub>.) Thus it will be seen that one-third of the oxygen would require to be introduced beneath the fire-pot and two-thirds above the same. To insure this the register is made with an upper opening or openings, 15, of larger area in the aggregation than the lower opening, 16, the opening or openings 15 communicating with a pipe, 17, leading to the chamber 10,

and the opening 16 communicating with a pipe, 18, leading to the ash pit or chamber 7. One style of these registers or valves is shown in Fig. V, where the openings 15 and 16 in the shell 1 are in the form of sectors, each one-sixth of a circle, and where the wings 19 of the damper are of substantially the same size, so that the openings may be closed with the damper. Practically there would at all times be some supply of air through the pipe or passage to cause the combustion of the gases arising from the incandescent fuel and from the fuel in contact with it at the lower end of the magazine and to keep the magazine cool. This air may be supplied through an opening, 20, made in one or both of the wings 19, which close the openings 15. The pin 21, on which the damper turns, is fixed in the edge of the diaphragm 22, which separates the passages 17 and 18. In the register or valve shown in Fig. VII the same end is gained by a sliding damper, 19, working in front of the openings 15 and 16, the opening 15 being double the area of 16, so that in all positions of the damper, except when it is closed, the proportion of the openings remains the same, (as it does in the form shown in Fig. V.) The damper 19, Fig. VII, has a small part, 20<sup>a</sup>, removed, which leaves a small opening for the entrance of air in the passage or pipe 17 when the opening 16 is completely closed.

If hard (or anthracite) coal is used, the openings or apertures 15 16 may be made of about the same size, as such coal contains but a small amount of volatile carbon; but the same provision would be made for keeping the magazine cool and causing the combustion of gases arising from the incandescent fuel—namely, by a small supply of air into the pipe or passage 17 when the register would be otherwise closed.

23 is a direct-draft pipe extending from the chamber 26 to the chimney, and having a damper, 24, which would be closed ordinarily, but would be opened when first starting the fire.

25 is the cover of the magazine.

26 is an annular space between the wall 14 and the shell 1.

In the modification shown in Fig. X there is a circular water-chamber surrounding the fire-pot and extending beneath it and the ash-pit. 27 is the induction water-pipe, and 28 the eduction-pipe from the chamber. In other respects the stove is similar to that before described.

In Figs. XI to XIV the invention is shown applied to an air-heating furnace. The shell 1 of the stove is surrounded by an outer case, 29, which may be of metal, as shown, or may be of brick or any other suitable material. In this modification the case 1 does not extend to the top of the magazine, and is made of increased diameter, so that the annular chamber surrounding the fire-pot and ash-pit has sufficient size to receive a circular series of air-heating pipes, 30, which are open at the bot-

tom to the atmosphere and at the top to the part of the hot-air chamber 31 between the magazine-drum and the outer case, 29. The outer air also enters the heating-chamber 31 through opening or openings 32 in the bottom of the chamber 31. The heated air escapes through the pipes 33.

It is evident that the modification of the stove shown in Fig. X might be used in combination with the air-heating chamber 31.

I have described the air-passages leading, respectively, to the bottom and top of the fire-pot as governed by a single damper or valve, whose movement, while regulating the size of the openings, preserved substantially a like relative proportion between them. It is evident that a full equivalent would be found by supplying the two pipes or openings with separate valves connected together so as to move simultaneously and in a manner to accomplish the same result—namely, for the preservation of the relative proportion in the size of the openings 15 and 16, leading, respectively, to the top and bottom of the fire-pot.

The chief advantage of cooling the magazine at the lower part (by the air entering through the pipe 17) is found when bituminous coal is used, for as long as the magazine is kept below a given temperature the coal does not cling to it in such a way as to prevent the downward feed of the coal.

In Figs. XV and XVI are shown modifications of the register, there being two distinct register valves or dampers, one governing the opening 15 of the pipe 17 and the other governing the opening 16 of the pipe 18.

In Fig. XV the dampers are made to turn, and are connected by eccentric wrist-pins 34 and a rod, 35, connecting them, so that they turn simultaneously and equally, and the proportional size of the openings 15 and 16 is always the same in all positions of the dampers.

In Fig. XVI the dampers are made to slide vertically, and as the upper opening, 15, has a different breadth of the lower opening, 16, the proportion between them will be maintained while the dampers are moved to increase or diminish the size of the openings. 35 is the connecting-rod between the two dampers.

I claim as my invention—

1. The combination, in a stove or furnace, of a fire pot or basket, a chamber above and a chamber below said fire-basket, and supply-passages for atmospheric air communicating, respectively, with the two chambers, and governed by a single damper or by dampers connected together and having simultaneous movement, substantially as and for the purpose set forth.

2. The combination, in a stove or furnace having a fire-basket, a chamber below and a chamber above the fire-basket, and separate air-supply for each chamber, of a damper appliance governing the air-supply in both pipes simultaneously, substantially as and for the purpose set forth.

3. The combination, in a feeding-magazine

for stoves and furnaces, of inner, central, and outer walls, forming in the sides of the magazine two chambers—one each side of the central wall or partition—communicating together at top, and the pipe or flue conducting air to the inner chamber, the inner chamber closed at bottom except for orifice for entrance of atmospheric air, and the outer chamber communicating at bottom with the fire-chamber, for the purpose set forth.

4. The combination, in a stove or furnace, of a feeding-magazine having two chambers—one each side of a central wall or partition—closed at top except for orifices by which they communicate together, the outer chamber open at bottom to the fire-chamber and the inner chamber closed at bottom except for air-supply orifice, and air-pipes discharging respectively into the lower part of the inner magazine-chamber and beneath the fire-pot, and a valve or connected valves moved simultaneously, controlling the passage of air through

the air-pipes, substantially as and for the purpose set forth.

5. The combination of the outer shell, 1, of the stove, wall 3, forming with the outer shell the downtake 4, the fire-pot 2, air-pipes 30, passing through the downtake, magazine 9, inner wall having openings in the upper portion, forming an inner air-chamber around the magazine closed at the top and at the bottom, an outer wall forming an outer air-chamber around the inner wall closed at the top and open at the bottom, air-pipes discharging, respectively, above into the inner chamber and beneath the fire-pot, and a valve or connected valves moved simultaneously, controlling the passage of air through the pipes, substantially as described.

JACOB S. WILLIAMS.

In presence of—  
SAML. KNIGHT,  
EDW. S. KNIGHT.