(No Model.) 2 Sheets—Sheet 1.

W. J. WARD.

FURNACE FOR BURNING NATURAL GAS.

No. 342,487. Patented May 25, 1886.

FIG. 1.

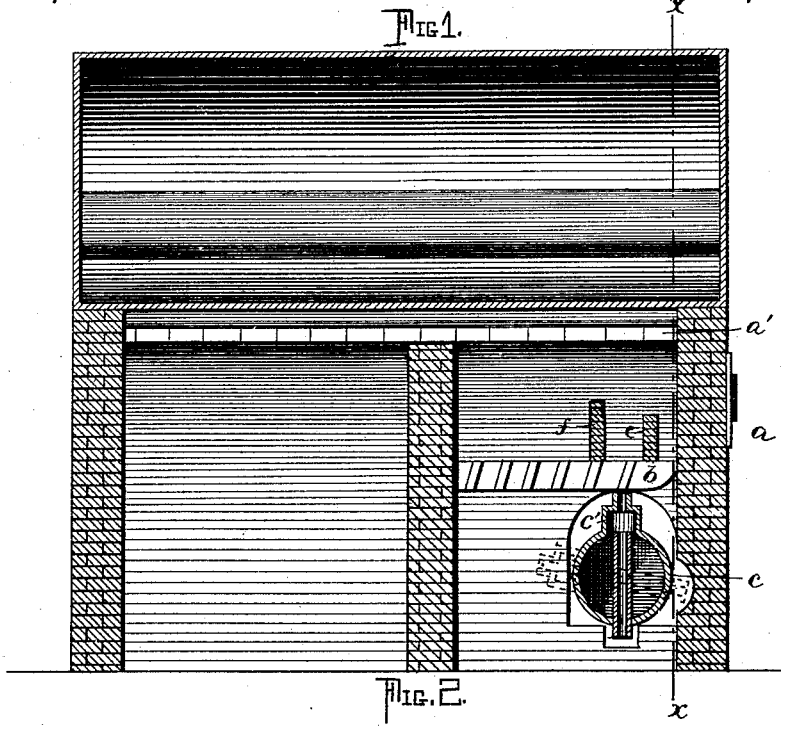
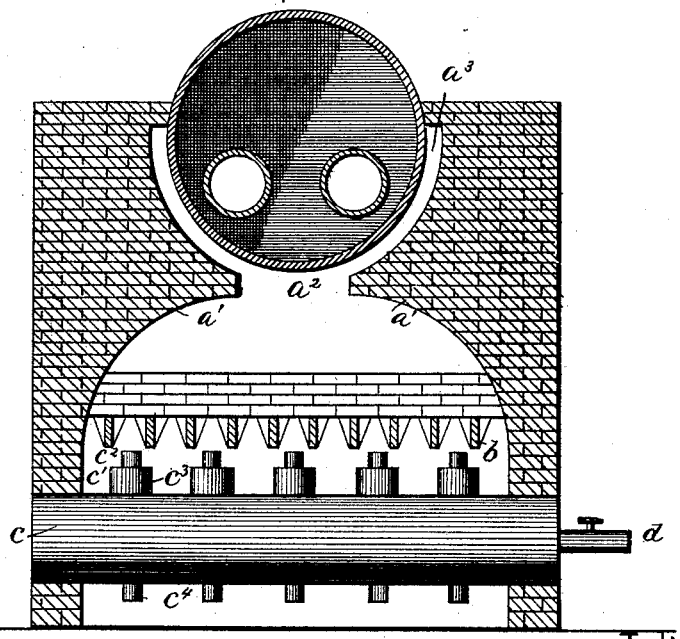


FIG. 2.



WITNESSES.
Wm. H. Rheem.
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(No Model.) 2 Sheets—Sheet 2.

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FIG. 3.

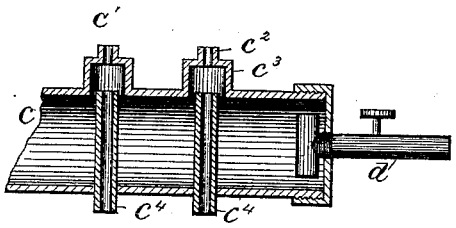


FIG. 4.

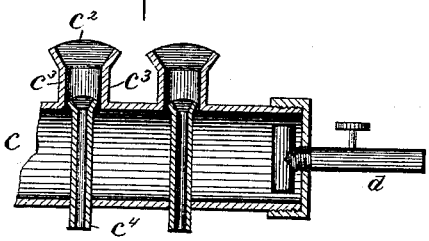
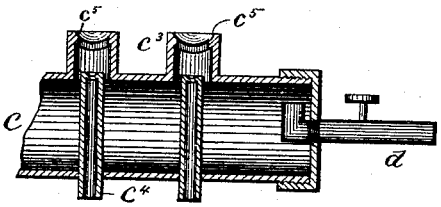


FIG. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM J. WARD, OF PITTSBURG, PENNSYLVANIA.

FURNACE FOR BURNING NATURAL GAS.

SPECIFICATION forming part of Letters Patent No. 342,487, dated May 25, 1886.

Application filed September 18, 1885. Serial No. 177,468. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. WARD, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Furnaces for Burning Natural Gas; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention has for its object to furnish an improved mechanism for burning natural gas; and it consists in the construction and arrangement of parts hereinafter described, and pointed out in the claims.

In the drawings, Figure 1 is a longitudinal section of the furnace and my improved burner applied thereto. Fig. 2 is a vertical section on the line X X, Fig. 1. Fig. 3 is a longitudinal section of a portion of the main pipe on an enlarged scale. Fig. 4 is a detail view of an oblong funnel-shaped burner and an oblong funnel-shaped air-pipe arranged within the burner. Fig. 5 shows a round funnel-shaped burner and a round funnel-shaped air-pipe arranged therein.

In my improvement I construct a furnace, *a*, having wing-walls *a'* arranged near to the boiler, the lower ends of said wings being brought nearly together below the said boiler so as to provide a throat, a^2, leading up from the furnace, and narrow flues a^3 a^3 between the boiler and the said wings. The purpose of this is to cause the flame to be distributed more evenly over the surface of the boiler. The flames arising from the burners need to be more confined than the heat and flame from coal. The construction shown will not prevent the use of coal as a fuel in the furnace *a*, though the wing-walls will of course offer some slight obstruction to the heat and flame from the said coal.

One object of my improvement is to provide such a construction as can be used either for natural gas or coal.

Below the front end of the grate-bars *b*, I arrange my gas-reservoir *c*, which is provided with a series of burners, *c'*. The burners *c'* are composed of the tip c^2 and the base c^3. The base is enlarged, as shown, so as to receive the upper end of the air-tube c^4 and have a space around and above the upper end of the air-tube c^4, as shown. Immediately over the reservoir I erect two bridge-walls, *e f*, the front one being slightly lower than the back one. The gas rises between the two walls, and the body of air will give it an upward draft toward the boiler. The base c^3 of the burner has its end plate, c^5, perforated to receive the tip c^2, as shown. The end plate, c^5, projects inward and over the space within the base, and serves as a check-plate to prevent the gas from blowing in a direct line from the main cylinder through the burner. The gas strikes the end plate, and is deflected to the tip, and as it enters the latter the air is mixed with it. The upper end of the air-pipe projects slightly into the lower open end of the base, and serves to prevent the gas from blowing through the burner.

Each air pipe or tube c^4 has its lower end secured in a suitable opening in the lower part of the main pipe *c*, and it extends across the said main pipe and into the lower end of the base of one of the burners. Its upper end projects slightly into the lower end of the base, so as to have a wide chamber between it and the top or end plate of the said base. The lower end of the air-tube may be set flush with the outer surface of the reservoir, or may be projected outward, as shown. By having the lower end of the air-tube open and communicating directly with the outer air, a better draft is secured than where the air is brought through long pipes to the said air-tube. The ends of the reservoir are closed, and tapped into one end is the inlet-pipe *d*. The reservoir and the inlet-pipe are made of relative diameters of eight to two. For all ordinary furnaces a reservoir eight inches in diameter, having a supply-pipe two inches in diameter, is large enough. The inner end of the supply-pipe is bent laterally, so as to throw the gas against the side of the reservoir. This breaks the momentum of the inflowing gas, and the latter is prevented from blowing past the first burners. The gas is thus freed from all currents, and the burners nearest the inlet-pipe will show the same colored blaze as those farthest removed. If this momentum

was not broken, the burners nearest the inlet-pipe would show a blue blaze, and those farthest away would show a white blaze. The blue blaze is caused by the too rapid movement of the gas, and it does not contain the heating properties of the white blaze.

I have shown a T-head on the inner end of the inlet-pipe. I prefer to make it thus. A single end would throw all the gas to one side, while the T end divides the inflowing gas, which is thereby more generally distributed into the reservoir. One of the great purposes to be accomplished in the burning of natural gas is to prevent currents or blowing.

It will be seen that by my construction no blowing can take place, while the needed pressure from the expansion of the gas is fully preserved. The gas is forced equally through all the burners. It is prevented from blowing through all the burners by the air-tube, which reduces the inlet-space into the base. After entering the base its course is broken, and it is thoroughly mixed with air in the open space above the air-tube, and it is then sent up through the tip by pressure alone.

I have arranged my improvements in connection with the ordinary furnace-grate. This is done so that in case of failure from any cause in the supply of gas a coal fire could be used.

I have so arranged the gas-reservoir that it can be turned part way from the grate-bars when a coal fire is employed. This saves the burners from injury.

In operation the flame from the burners is carried through the throat and against the wings, which serve as a deflector to throw the said blaze against the sides of the boiler. The wings also serve to distribute the blaze uniformly over the surface of the boiler, and thereby the latter is heated quicker and more uniformly. The action of the wings in distributing the flame prevents the boiler from being burned by too great a heat on any one part.

By the relative construction of the reservoir and inlet-pipe I secure a pressure of four ounces to the square inch, which is found to be maximum pressure under which natural gas will burn. A greater pressure gives a blue blaze, a less pressure gives a flickering and poor blaze.

In Fig. 4 I have shown the burner having its tip made oblong and slightly funnel-shaped, and the air-pipe made with corresponding form. This construction spreads the blaze and gives a very high degree of heat.

In Fig. 5 a round funnel-shaped tip and corresponding funnel-shaped air-pipe are shown. These also spread the blaze; but I prefer the construction shown in Fig. 5.

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

1. In a device for burning natural gas, the combination, with the reservoir, of a burner having an enlarged base and an air-pipe having its lower end secured in the lower portion of the reservoir and opening directly outward, and having its upper end projected slightly into the base of the burner, where a chamber is formed between the end of the said air-pipe and the upper end of the base of the said burner, substantially as set forth.

2. The combination, with a gas receiver or reservoir provided with an inlet-pipe at one end thereof, and having a series of burners arranged along the same, of a brake arranged within the reservoir near to and between the inlet-opening and the openings for the burners, whereby the impetus of the gas is checked and turned laterally against the sides of the receiver or reservoir, substantially as set forth, and for the purpose specified.

3. The combination, with the fire-chamber of an ordinary furnace, of a gas-reservoir provided with burners, said reservoir being journaled in the side walls of the furnace, beneath the grate-bars, whereby it may be turned part way from the grate-bars, substantially as shown, and for the purpose specified.

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

WILLIAM J. WARD.

Witnesses:
J. N. JARRETT,
HENRY SHOOK.