

(No Model.)

2 Sheets—Sheet 1.

G. W. BLAKE.

WATER HEATING APPARATUS.

No. 372,249.

Patented Oct. 25, 1887.

Fig. 2.

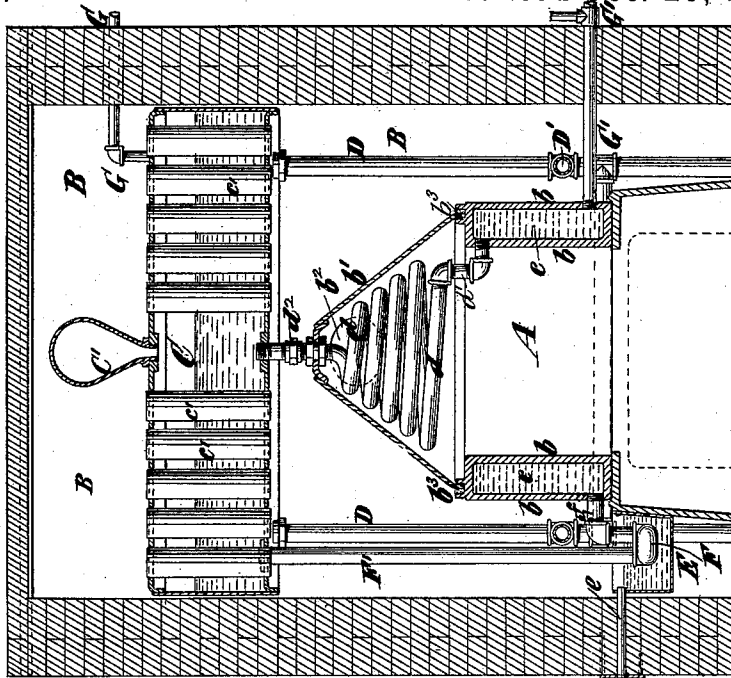
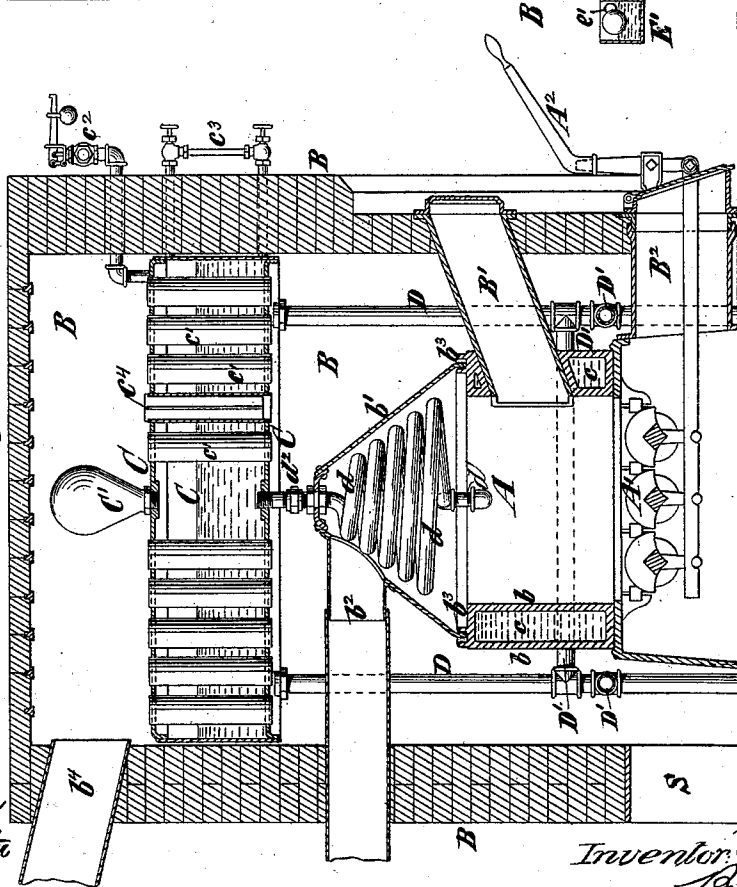


Fig. 1.
c' ⊕ c''

Fig. 1.



Witnesses:
O. Sundgren
Emil Hertz

Inventor: Geo. W. Blake
By [Signature]
Brown & Hall

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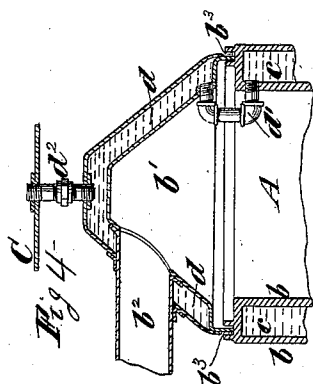
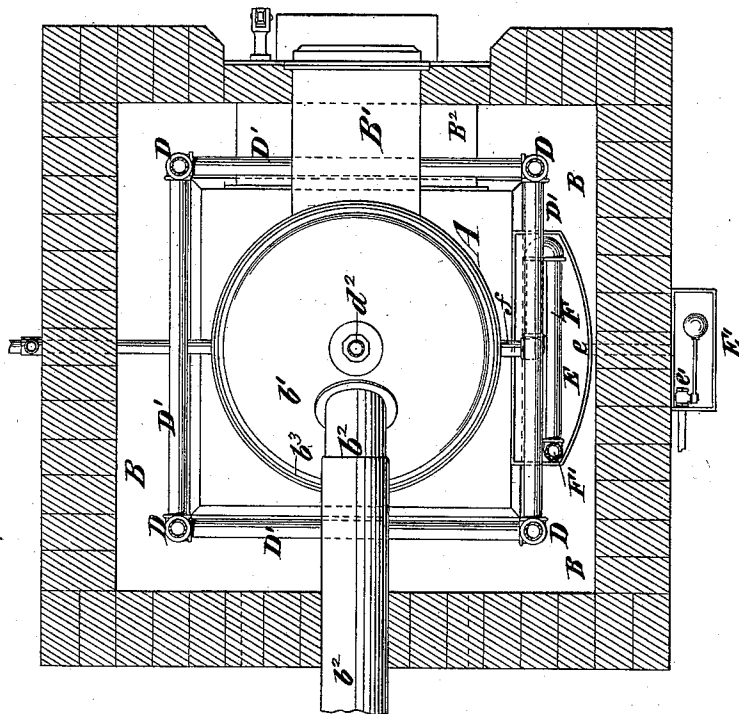


Fig. 3



Witnesses:

Edmund Sundgren
and Herbert

Inventor:

Geo. W. Blake
by his attys
Brown & Hall

UNITED STATES PATENT OFFICE.

GEORGE W. BLAKE, OF NEW YORK, N. Y., ASSIGNOR TO RUTZLER & BLAKE,
OF SAME PLACE.

WATER-HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 372,249, dated October 25, 1887.

Application filed April 15, 1886. Serial No. 198,930. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. BLAKE, of the city and county of New York, in the State of New York, have invented a new and useful Improvement in Hot-Water Heating Apparatus, of which the following is a specification.

The object of my invention is to provide a hot-water heating apparatus for dwellings or other buildings or apartments which is simple, compact, and inexpensive in construction and effective in its operation.

In carrying out my invention I employ as essential elements of the apparatus an upright casing provided at the lower and upper parts, respectively, with a cold-air inlet and a heated-air outlet, and a water-drum comprising upright air tubes or flues, and substantially cutting off communication between the lower and upper parts of the casing, save for the passage afforded by the tubes or flues of the drum, a furnace also arranged within the casing, a heater exposed to the heat of the furnace and connected with the drum for circulation, and an escape-pipe, whereby the products of combustion are conducted from the furnace without passing through the tubes of the drum. I prefer to construct the furnace with an upright hollow wall forming a water-space, which is connected directly with the drum, and which is also connected with the coil or other heater arranged within the furnace or subject to the heat thereof. I also provide within the casing and external to the furnace a water-evaporating pan, in which is immersed a coil or return pipe depending from the water-drum, whereby the hot water in its passage from the water-drum to the water-space in the furnace will heat the water in the evaporating-pan, so as to cause it to give off a sufficient amount of moisture to moisten the air entering the casing. With this construction, the hot water entering the lower part of the external casing is heated first by contact with the exterior of the furnace and smoke-pipe leading therefrom and then by passage through the air tubes or flues of the water drum. To increase the air-heating surface in the air tubes or flues of the water-drum I may arrange within each tube or flue a spider or core of cast metal, which will become heated by

contact with the air tube or flue, and which will transmit its heat to the air passing through the tube or flue.

The invention consists in novel combinations of parts, which are hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical section of a heating apparatus embodying my invention. Fig. 1* represents an end view of one of the end tubes or flues of the water-drum and the spider which is arranged therein. Fig. 2 is a sectional elevation of the heater in a plane at right angles to the plane of Fig. 1. Fig. 3 is a plan of the heater and a horizontal section of the casing, the upper water-drum being removed in order to show more clearly the parts beneath it; and Fig. 4 illustrates a modification hereinafter described.

Similar letters of reference designate corresponding parts in all the figures.

A designates a furnace, which, as here represented, has double upright walls *b*, forming a water-space, *c*, surrounding the fire-pot. The furnace also comprises an upper portion, *b'*, from which leads the smoke-pipe *b''*, and which may advantageously be made of conical form and connected by a sand or other joint, *b'''*, with the upright or cylindric walls of the furnace.

The furnace is surrounded by a casing, B, which may be of brick or other material, and from the exterior of this casing to the furnace A leads a chute or mouth, B', for the supply of fuel, and a second chute or mouth, B'', communicating with the ash-pit. Any suitable description of grate may be employed. I have here represented a shaking-grate, A', which may be operated by a handle or lever, A².

Above the furnace A and within the external casing, B, is a water-drum, C, which is of cylindric form, having a vertical axis. This drum C contains a large number of air tubes or flues, *c'*, extending through it vertically, and it is provided with an expansion chamber or vessel, C', to provide for the expansion of the water contained therein when subjected to heat. It may also be provided with a safety-valve, *c''*, and a gage-glass, *c'''*, to prevent the formation of a dangerous pressure of steam and to indicate the level of water therein.

The casing B is provided with an air-inlet, *s*, in its lower part or below the drum C, and above the drum is provided with an air-outlet, *b'*.

5 The drum C substantially cuts off communication between the lower and upper parts of the casing, save through the tubes or flues *c'*, and hence the cold air entering the bottom of the casing must pass through the tubes to reach
10 the escape-pipe for hot air. These tubes being vertical, their whole surface is utilized or available in heating the air passing through them. The cold air enters through the inlet *s*, and after being heated by contact with the
15 exterior of the furnace A passes upward through the tubes or flues *c'*, from the surfaces of which it obtains further heat and finally escapes at the hot-air outlet *b'*. In order to increase the amount of air-heating surface in
20 the flues or tubes *c'*, I insert into them metal spiders or cores *c'*, which are heated by contact with the flues or tubes and increase the hot surface with which the air comes in contact. These spiders or cores may be of cast
25 or wrought metal, and are represented in Fig. 1 and also in Fig. 1*.

The drum C may be supported in any suitable manner, and, if desired, upon the brick-work of the setting or casing B. For this purpose I have shown legs or columns D of pipe,
30 which are connected by horizontal braces or stretchers D', and which support the drum.

In the upper conical portion, *b'*, of the furnace I have represented a conical coil of pipe,
35 *d*, which constitutes a pipe-heater for water, and which depends from the lower side of the drum C. This coil is at its lower end connected by a pipe, *d'*, with the water-space *c* of the furnace, and at its upper end is connected
40 by a pipe, *d''*, with the bottom of the drum. In the pipe *d''* is a union-joint, which provides for readily disconnecting the coil *d* from the drum in case it becomes burned out and is to be renewed. The casing B may be provided
45 with an opening in its side, through which the portions of the furnace and the coil *d* may be removed, when desired, for repair.

The heating-coil *d* and the upper part, *b'*, of the furnace may be disconnected and removed
50 and new parts substituted without disturbing any other parts of the furnace.

Within the casing B and external to the furnace I have represented an evaporating-pan, E, which may be supplied with water through
55 a pipe, *e*, from an outside tank, E', which contains a ball-cock, *e'*, through which it is supplied with water. Within the evaporating-pan E is arranged a coil or return portion of pipe, F, which is connected by a pipe, F', with
60 the drum C and by a pipe, *f*, with the water-space *c* of the furnace.

In the operation of the furnace the water in the coil or heater *d* of course becomes heated to a high degree and produces an upward circulation therein to the drum C. This causes
65 the water to flow down the pipe F' through the return or coil F and pipe *f* to the water-

space of the furnace, and from thence through the coil *d* to the drum C.

The cold air entering through the air-inlet *s* is heated, first, by contact with the exterior
70 of the furnace and the smoke-pipe *b''*, and takes up the moisture which is evaporated from the water in the pan E, and is afterward still further heated by its passage through the air
75 flues or tubes *c'* of the drum C, and from the upper part of the casing above the drum the hot air passes through the escape-pipe *b'*, one or more of which are provided to suit circumstances.
80

In lieu of arranging a coiled pipe-heater, *d*, within the upper part, *b'*, of the furnace, I may make the said upper part, *b'*, with double walls and an intervening water-space, which constitutes a heater, *d*, subject to the
85 heat of the furnace, as shown in Fig. 4. This heater will then be connected by a pipe, *d'*, with the water-space *c* in the upright wall of the furnace and with the bottom of the drum C by a pipe, *d''*, containing a union-joint, as
90 shown in Fig. 4.

The drum C may be full of water and the apparatus will then constitute a hot-water heater, heating the air by indirect radiation, and the water in passing through the return
95 or coil F immersed in the water in the pan E will be cooled to such an extent as to prevent the generation of steam, although the circulation will be very rapid.

If the water be withdrawn from the drum
100 C to about the level shown, the heater will generate steam, which may be conducted away through a pipe, G, to a radiator or system of radiators, (not here shown,) and the water of condensation will return through the pipe G',
105 which may also constitute the feed-pipe.

It will be observed that the drum C is of the simplest possible form and is not itself in any part exposed to the direct heat of the fire. It is important to have the drum C arranged in
110 the upper part of the casing and the furnace entirely below the drum, because the air entering the casing can circulate freely around the furnace below the drum and receive heat from the furnace before passing through the
115 tubes of the drum. By the employment of a pipe or analogous heater arranged below the drum and subjected to the heat of the furnace a small body of water only is subjected to the direct heat of the fire, and as the circulation
120 through the heater will be very rapid the entire body of water in the drum may be heated more quickly and effectively than by smoke flues or tubes extending through the drum, and the heater can at any time be replaced at
125 small cost and without disturbing any part of the drum. The drum will not be likely to need any repair, it being the most durable part of the apparatus, because at no point is it subjected to the direct heat of the fire.
130

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with an upright casing, B, provided at the lower and upper parts, re-

spectively, with a cold-air inlet and a heated-air outlet, and a water-drum, C, having upright flues or tubes arranged near the upper part of the casing and substantially cutting off communication between the upper and lower parts of the casing, save for the passage afforded by its tubes or flues, of a furnace in the air space of the casing entirely below the drum, so that air entering the casing may circulate around it, a heater exposed to the heat of the furnace, arranged below the drum and connected with the drum for circulation, and an escape-pipe whereby the products of combustion are conducted from the furnace without passing through the tubes of the drum, substantially as herein described.

2. The combination, with an upright casing, B, provided at the lower and upper parts, respectively, with a cold air inlet and a heated-air outlet, and a water-drum, C, having upright air tubes or flues arranged near the upper part of the casing and substantially cutting off communication between the upper and lower parts of the casing, save for the passage afforded by its tubes or flues, of a furnace arranged in the air space of the casing entirely below the drum, so that air entering the casing may circulate around the furnace to be heated, a conical heating-coil arranged within the furnace entirely below the drum and connected with the drum for circulation, and an escape-pipe whereby the products of combustion are conducted from the furnace below the drum without passing through the tubes of the drum, substantially as herein described.

3. The combination, with the upright casing B, provided at the lower and upper parts, respectively, with a cold-air inlet and a heated-air outlet, and a water-drum, C, having upright tubes or flues arranged near the upper part of the casing and substantially cutting off communication between the lower and upper parts of the casing, save for the passage afforded by its tubes or flues, of the furnace arranged within the air space of the casing and entirely below the drum, so that air entering the casing may circulate around the furnace, and comprising an upright wall or fire-pot and a separate upper portion, b' , a pipe-heater depending from the drum within the furnace and connected with the drum by a union-joint,

whereby provision is afforded for the removal of the pipe-heater and the upper part of the furnace without disturbing other parts of the furnace, and an escape-pipe, b^2 , leading from the upper portion, b' , of the furnace, and through which the products of combustion may escape from the furnace without passing through the tubes of the drum, substantially as herein described.

4. The combination, with the upright casing B, provided at the lower and upper parts, respectively, with the cold-air inlet and the heated-air outlet, and a water-drum, C, having air tubes or flues c' , arranged in the upper part of the casing and substantially cutting off communication between the lower and upper parts of the casing, save for the passage afforded by said tubes, of the furnace arranged within the air-space of the casing and entirely below the drum, so that air entering the casing may circulate around the furnace, the furnace having a hollow wall to form a water-space, c , a pipe-heater, d , depending from the water-drum and arranged entirely below the drum and within the furnace and connected with the water-space c thereof, a pipe, F, connecting the drum directly with the water-space c of the furnace, and the escape-pipe b^2 , whereby the products of combustion are conducted from the furnace without passing through the tubes of the drum, substantially as herein described.

5. The combination, with a water-drum having air tubes or flues and a casing containing the drum and provided below it with an inlet for cold air and above it with an outlet for heated air, of a furnace arranged within the casing, a heater exposed to the heat of the furnace and connected with the drum for circulation, an evaporating-pan contained in the casing external to the furnace, and a hot-water pipe or coil depending from the drum and to be immersed in the water in said pan, and an escape-pipe whereby the products of combustion are conducted from the furnace without passing through the flues or tubes of the drum, substantially as herein described.

GEO. W. BLAKE.

Witnesses:

ENOCH RUTZLER,
C. HALL.