

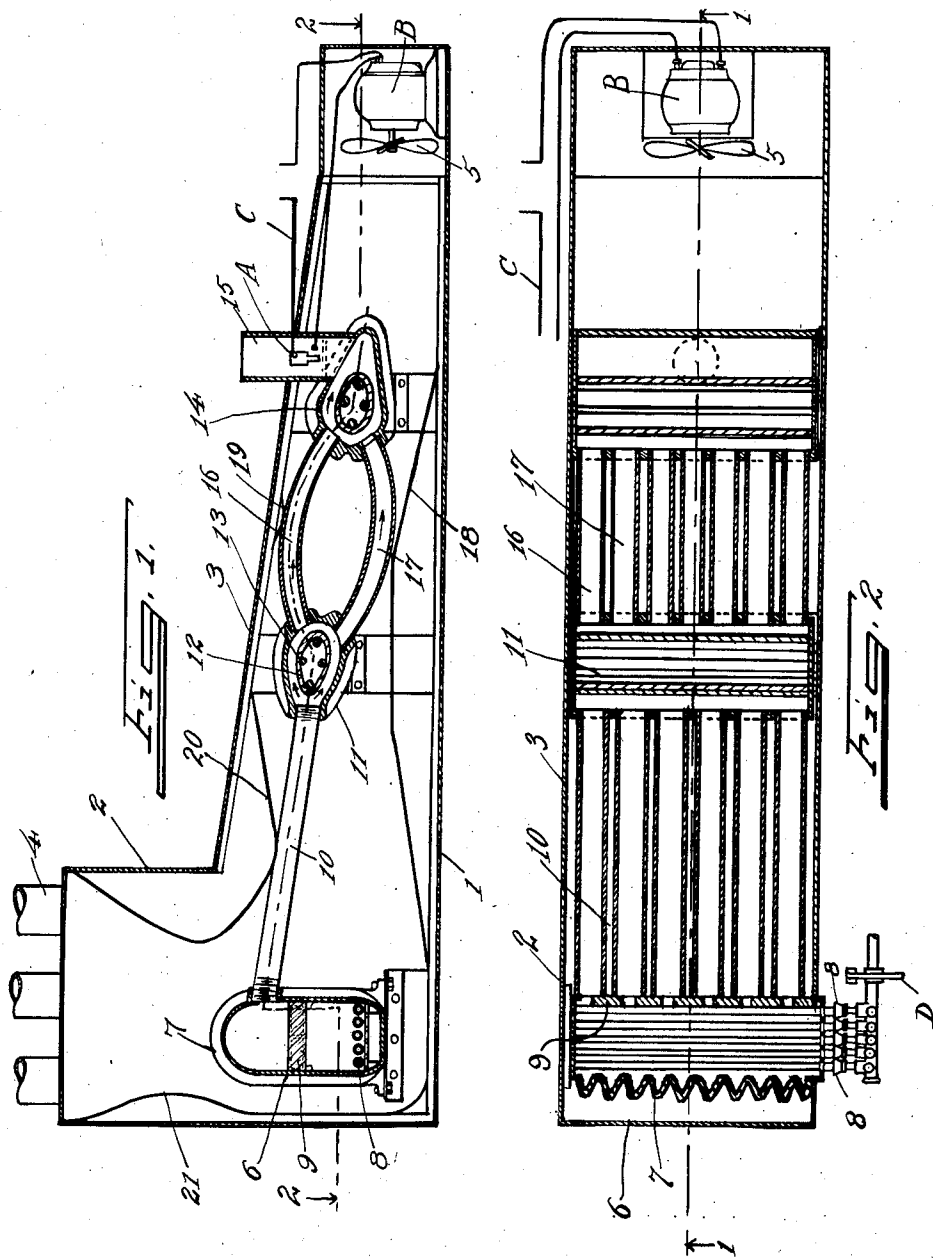
April 6 , 1926.

1,579,599

C. W. DE FOREST

GAS FURNACE

Filed May 22, 1922



INVENTOR:

Cornelius W. De Forest

BY

Allen & Allen
ATTORNEYS.

Patented Apr. 6, 1926.

1,579,599

UNITED STATES PATENT OFFICE.

CORNELIUS W. DE FOREST, OF CINCINNATI, OHIO.

GAS FURNACE.

Application filed May 22, 1922. Serial No. 562,679.

To all whom it may concern:

Be it known that I, CORNELIUS W. DE FOREST, a citizen of the United States, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Gas Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this application.

My invention relates to gas furnaces for hot air generation, more particularly for heating buildings.

In devices ordinarily employed for heating of buildings by means of gas, there is a large waste in available heat through the flues. One of the reasons for this is that a certain amount of flow of the products of combustion to the escape flue is necessary in order to insure against escape of the said products into the building being heated. Another of the reasons is that the furnaces are not so constructed that the incoming air is progressively heated by the products of combustion as said products are progressively cooled. With a method of air heating by counterflow of incoming and outgoing air and gases, as noted, the flow of the products of combustion need not be retarded so as to run danger of escape of fumes, and practically all available heat therein will be imparted to the incoming air.

I will in this specification endeavor to describe a structure embodying the principle of progressive heating and cooling of influx air and efflux gases, it being understood that this is merely a preferred construction illustrative of my invention.

Thus I accomplish the objects of my invention above stated, by that certain construction and arrangement of parts to be hereinafter more specifically pointed out and the novelty of the invention therein duly claimed.

In the drawings,

Figure 1 is a longitudinal vertical section of the device on the line 1—1 of Figure 2.

Figure 2 is a horizontal section through the device taken on the line 2—2 of Figure 1.

Referring to the illustrative embodiment of the drawings, the outer casing of the furnace is shown as having a base 1 with the sides and top of the casing forming a rectangular flat topped shell 2 and a somewhat tapering, elongated shell 3. From the shell portion 2 the hot air pipes 4 extend

upwardly as from the usual furnace dome.

At the outer end of the shell portion 3 the cold air to be heated is introduced, and a blower or fan 5 is located in this mouth or outer end so as to set up a forced flow of cold air, when desired.

The gas burner sections and conduits are specially shaped and arranged to fit the shell of the type shown.

The cast casing 6, having radiating fins 7, is set in the shell portion 2 in such a way as to extend across it at right angles to the shell portion 3. The casing 6 extends across the shell 2 and is rounded at the top. The burners 8, 8, in the form of pipes with jets in them of desired pattern are inserted into the casing from one end and a grate serving to mount suitable tiles 9 for heat retention, may be disposed in the casing above the burners.

From the casing 6 a series of fairly closely interspaced pipes 10 extend to an intermediate heater casing 11, said casing 11 being a casing with radiating fins. Hot-flue gas baffles 12, mounted on cross rods 13 may be disposed in the casing as indicated in Figure 1. The casing 11 may be wholly or partially filled with pottery balls of refractory nature instead of baffles or in addition thereto.

There is also a third heater casing 14 from which the flue pipe 15 extends to the user's chimney, this casing 14 also extending across the shell portion 3, and having radiating fins and baffles, as in the case of the casing 11.

Extending from the casing 11 to the casing 14 I preferably arrange the conductor pipes in a series of upwardly curved pipes 16 and downwardly curved pipes 17, said pipes being fairly closely interspaced, and, if desired, staggered relative to each other in the two series.

In connection with the shell portions 2 and 3 I provide a series of baffles for the area to be heated. These are arranged so as to cause the air to pass through the various piping systems and flow around the three casings.

Thus at the entrance an inclined baffle 18 is provided which extends clear across the shell portion 3 and begins approximately beneath the casing 14 and thence inclines upwardly until it reaches its greatest height about at the center of the downwardly curved pipes 17, whence it inclines down

again and terminates approximately at the inner end of the casing portion 6.

A small baffle 19 is provided which extends across the shell portion 3 and contacts with the upwardly curved pipes 16 at about their highest points.

A baffle 20 is provided which begins approximately above the casing 11 and thence inclines down until it contacts substantially with the pipes 10 at their middle point from whence the baffle curves upwardly again and terminates at the top of the shell portion 2.

The last baffle 21 begins at the top of the portion 2 opposite the baffle 20 and thence curves outwardly from the shell wall above the casing 6 and thence recedes toward the shell portion 2 again.

Following the incoming air it will be noted that it is forced to travel around the casing 14, thence through the curved pipe assembly and around the casing 11 and thence down and around the pipe assembly 10 and around the casing 6 and thence upwardly around the top of the casing 6 to the conductor pipes 4.

The gases are burned in the casing 6, thence flow through the pipes to the casing 11 and thence through the pipes to the casing 14 and thence to the flue.

The coldest air strikes the outgoing gases, so that a large difference of temperature is preserved at the incoming end between the product to be heated and the generated hot products. As the incoming air becomes more heated, it is constantly striking hotter and hotter heat radiating elements, with the hottest point of contact just before the said air gets to the conductor pipes.

I have found in a furnace constructed according to the drawings, that the flue gases in the last casing are reduced to such a low temperature that condensation of the steam in the gases takes place, thereby liberating much latent heat.

Where re-circulation of air is employed in heating rooms, the flow of cold air through the furnace will not be so rapid, and as the heat radiating and baffle system tends to retard the flow, it is desirable for best results to operate the fan.

The fan operation may be regulated by the user so that the volume of air necessary to keep the rooms heated at desired temperature is sent through the conductor pipes.

I have found by exhaustive tests, however, that the blower may be automatically maintained.

It will be recognized without illustration that the user of the gas can determine what quantity of gas should be burnt at the burner jets to get the best effect in his building. Thus some houses can be best kept at proper temperature by a three-quarter opening of the burners, which, operating together with

some accepted thermostat located in the rooms, will turn on and off the gas when the rooms come above and below the correct temperature. I have indicated a gas regulating valve control arm on the gas in-flow pipe at D.

This leaves the furnace as a unit to operate as perfectly as possible, i. e., to impart to the incoming air the most heat possible from the burned gases. This is accomplished by keeping the flue temperature at some figure below 212° F. so that latent heat of condensation is used, and so that the best counterflow heating relation is maintained.

For this reason I can locate in the outlet flue pipe 15 thermostat A and utilize this thermostat in the position indicated by the member illustrated in Figure 1 and marked to close the circuit C to the fan motor B whenever the flue temperature goes above some selected temperature, for example, 200° F.

Thus with a gas turn-on-and-off thermostat and a fan off-and-on thermostat I am enabled to gain great efficiency in a gas furnace and bring it down within an economy range of actual cost of fuel and electric current, equal or below cost of coal without considering the labor cost of maintenance and the theoretical loss in greater ranges of temperature change in the rooms to be heated, taking into consideration also the more recent increases in cost of fuel gas.

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

1. In a furnace, a shell, hot air conductor pipes extending therefrom, a flue, a combustion chamber within said shell, means for conducting the products of combustion through said shell to the flue, means for introducing air to be heated into said shell, said shell, gas conducting means and air introduction means being so arranged that the flow of products of combustion and air are opposite to each other, the incoming air being introduced to the shell beyond the flue exit with the hottest conducting means being located closest to the hot air conductor pipes.

2. In a furnace, a shell, hot air conductor pipes extending therefrom, a flue, a combustion chamber within said shell, means for conducting the products of combustion through said shell to the flue, means for introducing air to be heated into said shell, said shell, gas conducting means and air introduction means being so arranged that the flow of products of combustion and air are opposite to each other, the incoming air being introduced to the shell beyond the flue exit with the hottest conducting means being located closest to the hot air conductor pipes, and a means for controlling the flow of incoming air.

3. In a furnace, a shell, hot air conductor
pipes extending therefrom, a flue, a combustion
chamber within said shell, means for
conducting the products of combustion
5 through said shell to the flue, means for
introducing air to be heated into said shell,
said shell, gas conducting means and air
introduction means being so arranged that
the flow of products of combustion and air
10 are opposite to each other, the incoming air
being introduced to the shell beyond the
flue exit with the hottest conducting means
of gases being located closest to the hot air
conductor pipes, and a means for controlling
15 the flow of incoming air, said means being
automatically operated thermostatically from
the flue temperature of the outgoing products
of combustion.

4. In a furnace, a shell, hot air conductor
20 pipes extending therefrom, a flue, a combustion
chamber within said shell, means for
conducting the products of combustion
through said shell to the flue, means for
introducing air to be heated into said shell,
25 said shell, gas conducting means and air introduction
means being so arranged that the
flow of products of combustion and air
are opposite to each other, the incoming air
being introduced to the shell beyond the
30 flue exit with the hottest conducting means
of gases being located closest to the hot
air conductor pipes, and a blower for creating
a forced draft of incoming air, and
means for thermostatically controlling the
35 blower to preserve the outgoing temperature
of the products of combustion below condensation
point.

5. In a furnace and flue for burning gases
and heating incoming air for conduction to
a point to be heated, a thermostat for controlling
40 the introduction of gas and a thermostat in the
flue for controlling the introduction of air to be
heated, and means for setting up a counterflow of
incoming air and outgoing flue gases comprising a
casing 45 extending from the furnace to the flue with
separate air and gas conduits in which incoming
air and flue gases are adapted to flow in opposite
directions therein to cut
50 down flue temperatures.

6. In a furnace, a shell having a hot air
conductor pipe portion and an extension
away therefrom, a gas burner and casing in
the conductor pipe portion, a series of interspaced
pipes extending therefrom through 55 the shell
extension to a terminal casing, said last named casing
being in communication with a flue, baffling means
arranged with relation to the conductor pipes to
cause air within the shell to flow in contact with
60 interspaced pipes and a blower for introducing
air into the shell beyond the terminal casing.

7. In a furnace, a shell, heat radiating
means in the shell within which gases are
burned and conducted to a flue, a flue, hot
air conductor pipes, and means for introducing
air to be heated into the shell at the flue
portion thereof, and means for automatically
controlling said air introduction to maintain
70 the flue temperature below the condensation
point.

CORNELIUS W. DE FOREST.