(No Model.) 2 Sheets—Sheet 1.

T. E. MARTIN.

HOT AIR FURNACE.

No. 489,192. Patented Jan. 3, 1893.

Fig. 1.

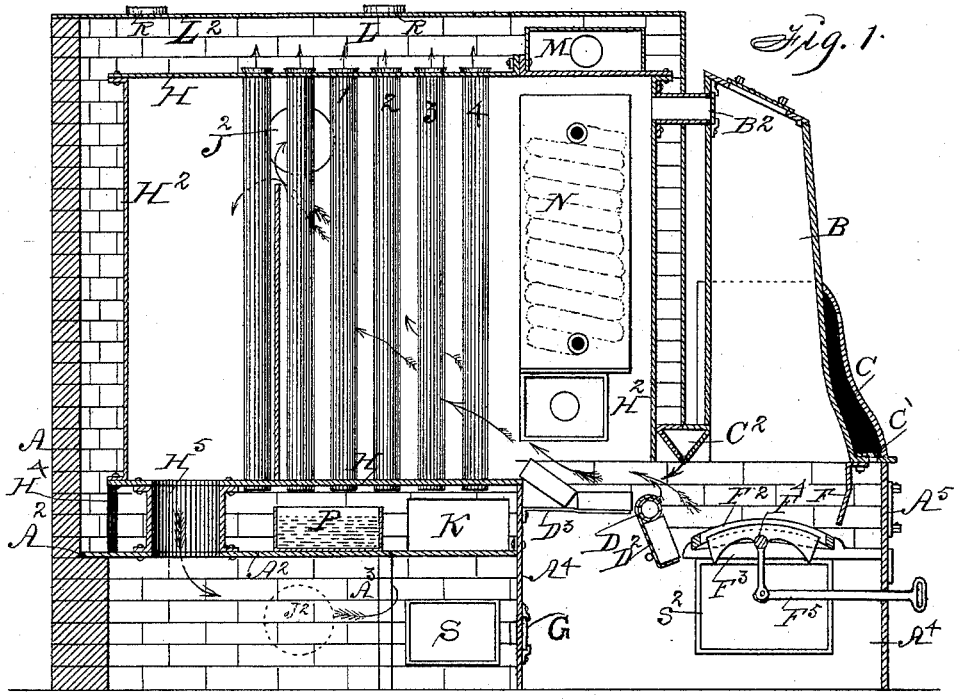


Fig. 2

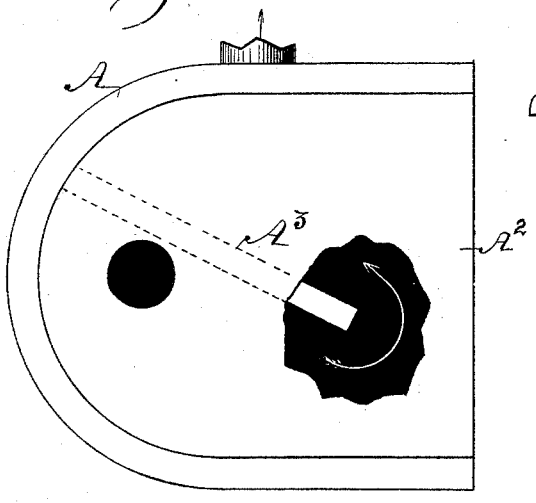
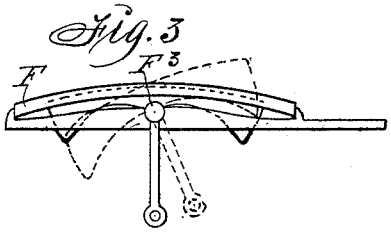


Fig. 3



Witnesses:
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R. H. Orwig.

Inventor:
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By Thomas G. Orwig, Attorney.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

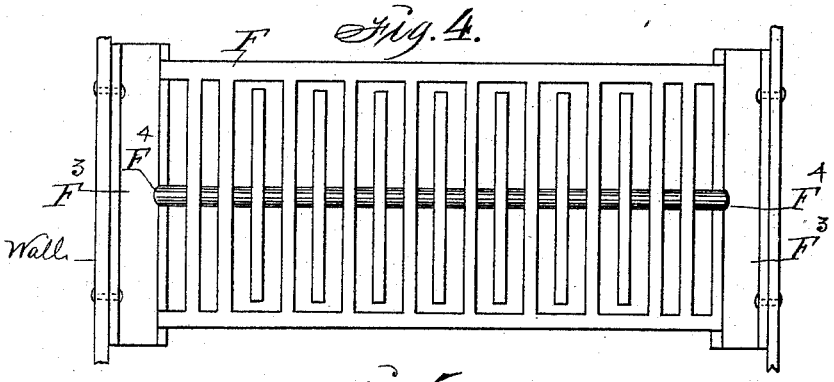
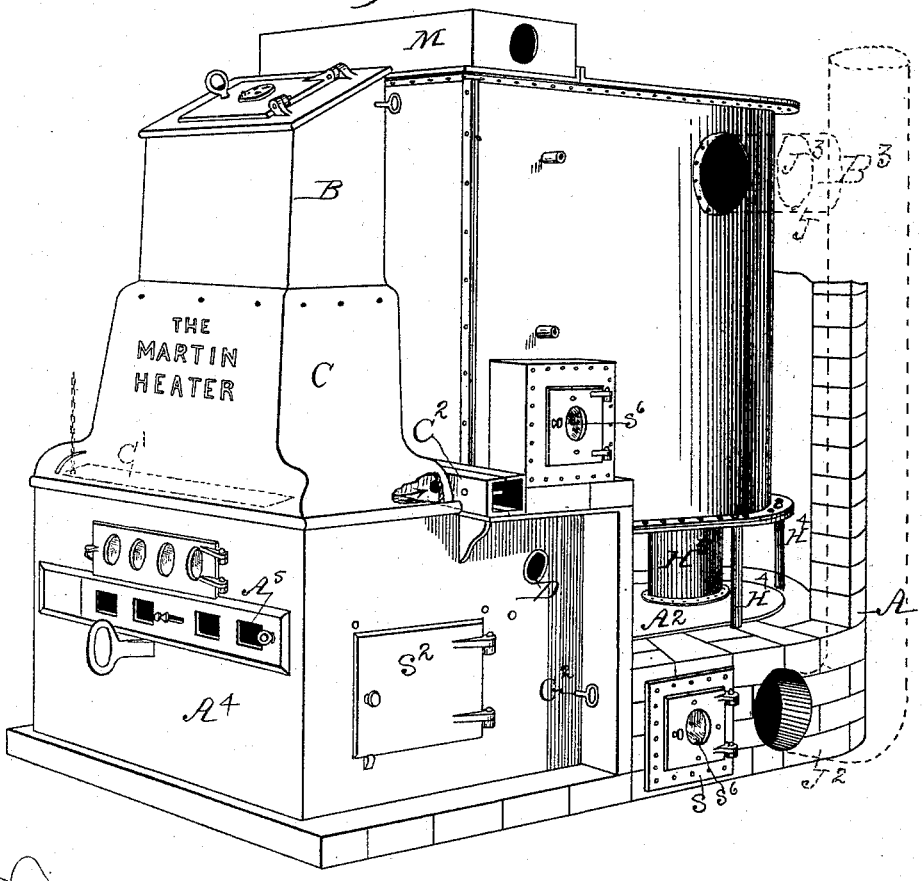


Fig. 5



Witnesses:
R. H. Orwig,
J. L. Sweet.

Inventor:
Thomas E. Martin,
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UNITED STATES PATENT OFFICE.

THOMAS E. MARTIN, OF DES MOINES, IOWA, ASSIGNOR OF ONE-HALF TO ISAAC T. MARTIN, OF SAME PLACE.

HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 489,192, dated January 3, 1893.

Application filed July 26, 1890. Serial No. 359,978. (No model.)

To all whom it may concern:

Be it known that I, THOMAS E. MARTIN, a citizen of the United States of America, and a resident of Des Moines, in the county of Polk and State of Iowa, have invented an Improved Hot-Air Furnace for Heating Buildings, of which the following is a specification.

My object is to prevent the annoyance, waste of fuel, and difficulties incident to the use of furnaces that produce soot and smoke, and to economize labor and space in building a furnace.

My invention consists in the construction, arrangement and combination of a fuel magazine, a jacket for the fuel magazine, a grate, a bridge wall, air conducting tubes, registers, a boiler for heating and circulating water, two combustion chambers, a cold air chamber, a hot air chamber, a foul air chamber, a series of open-ended tubes detachably connected with flanged plates that produce the top of the cold air chamber and the bottom of the hot air chamber, as hereinafter set forth, pointed out in my claims, and illustrated in the accompanying drawings in which—

Figure 1 is a vertical sectional view of the furnace. Fig. 2 is a plan view of the lower combustion chamber. Fig. 3 is an end view of the grate. Fig. 4 is a top view of metal plates adapted to support fire brick and the grate, and the grate resting thereon. Fig. 5 is a perspective view of the furnace from which parts are broken away.

A represents the outside wall, preferably made of brick.

A^2 is a flat metal plate that extends on or into the side walls and has a vertical flange at its front edge and serves as the top of the lower combustion chamber and the bottom of a cold air chamber.

A^3 is a wall that extends diagonally from the rear end of the wall A forward and serves as a partition to direct the products of combustion as indicated by arrows.

A^4 are metal plates bolted together to produce the base of the front of the furnace and the wall of the ash pit.

A^5 represents a register in the front wall to admit cold air.

B is a fuel magazine made of cast metal or, other suitable material. Its walls flare outward at its bottom and it is connected with the top of the wall A^4. A hinged door at its top allows fuel to be placed therein and a register in the door admits cold air on top of the fuel.

B^2 is an open-ended tube extending from the top portion of the magazine into the chamber in rear of the magazine to convey odors or gas arising from the fuel into the chamber that has communication with an escape flue, B^3, at the rear of the furnace.

C is a metal jacket fitted to the front of the fuel magazine B to produce an air-chamber. Perforations in its top admit air. It has communication with an open-ended tube, as shown in Fig. 7, and also with the ash pit, as shown in Fig. 1.

C′ is a damper from which a chain is extended to a room above the furnace for the purpose of regulating the draft.

C^2 is an open-ended tube, preferably made of two mating parts. Its end portions correspond in shape and size with a brick and are adapted to be laid in the parallel side walls A. The central portion of the tube is V-shaped in its cross section, as shown in Fig. 4, and perforations or a continuous slot in the bottom allows air to escape downward to promote the combustion of the fuel at the lower end and rear part of the fuel magazine. In place of making the tube in two parts, as shown in Fig. 1, a course of fire brick may be substituted for the front part.

D is an open-ended tube, perforated on one side, that extends parallel with the tube C^2 and also through the parallel side walls so that the air injected through the two tubes, C^2 and B, will mingle with the products of combustion at the precise point relative to the fuel as required to prevent the formation of soot and smoke by the consumption of all the carbon liberated by the burning of the fuel.

D^2 is a metal plate that has hooks on its ends and rear edge adapted to engage the tube D in such a manner that the plate can be suspended in an inclined position to extend forward and downward to rest upon bricks, or other supports, projecting inward from the side walls. The front edge has a flange extending upward to support a series

of fire brick on top of the plate in such a manner that the plate and brick will jointly serve as a bridge wall.

D^3 is a flanged plate fixed to the rear wall of the ash chamber to support fire brick as required to form a roof over the rear part of the ash pit.

F is the front portion of the grate consisting of a metal plate that has integral perforated flanges or projections at its ends and top adapted to be fixed to the bottom portion of the front part of the fuel magazine B, by means of rivets or bolts. A series of bars project inward and downward from its lower edge.

F^2 is a concavo-convex grate supported upon flanged end pieces F^3 adapted to be fixed to the side walls of the ash chamber, by means of bolts, to support fire brick.

F^4 is a rock shaft in bearings formed in the fixed grate supports F^3. It has an integral projection at its bottom and center to which a rod F^5 is attached in such a manner that the grate can be rocked as required to stir the fuel on top of the grate and drop the ashes into the ash pit. The arms or bars of the rocking portion of the grate, that project at right angles and in opposite directions therefrom, are convex on their tops and conform in size and shape with the fixed bars of the fixed grate F, but their top edges do not rise as high as the fixed bars of the grate F^2, as clearly shown in Fig. 1, and consequently they can be vibrated vertically to shake down ashes without lifting the fuel supported upon the grate F^2. By thus constructing a grate having a convex top surface the fuel in the magazine is allowed to descend at the front and rear sides of the magazine and to become loosened from the packed mass that is supported by the central and elevated portion of the grate, and consequently the fuel is automatically fed from the magazine to the lower and end portions of the grate and a free circulation of air and gas is maintained through the grate and fuel as required to successfully operate the complete furnace.

G is a register connected with the rear plate or wall of the ash pit in such a manner that air can be allowed to pass rearward from the ash pit for the purpose of regulating the draft and fire. A rod G^2 connected with this sliding register extends out through the wall A.

H are the top and bottom, and H^2 the front and rear plates of a combustion chamber supported upon posts H^4 that rise from the plate A^2. A cold air chamber is thus produced between the two combustion chambers.

H^5 is an open-ended tube that connects the two combustion chambers and allows the products of combustion to pass downward as indicated by arrows in Fig. 1.

The chamber produced by the plates H and H^2 is connected with the smoke flue B^3 by an open ended tube J at the top, and a corresponding tube J^2 at the bottom extends from the chamber under the plate A^2 to the same smoke flue B^3. A damper J^3 in the tube J affords means for controlling the draft and regulating the fire. When the damper is closed the products of combustion descend and circulate in the lower chamber and aid in heating and circulating air admitted into the cold air chamber located between the two combustion chambers.

K is an opening through which cold air is conducted from outside of the building into the cold air chamber to rise and to envelop the upper combustion chamber and to ascend through the open ended series of tubes, fixed to the plates H and H, to enter a hot air chamber L at their top ends.

The series of open ended tubes 1, 2, 3, 4, are made flaring at their top ends in such a manner that they can be inserted in coinciding perforations in the plates H and H and suspended therein to be subjected to the products of combustion and to circulate and heat air admitted from the cold air chamber. Air tight joints will be maintained in the upper plate H by the force of gravity of the suspended tubes as required to overcome the contraction and expansion occasioned by the heat, and the perforations in the lower plate, immediately above the cold air chamber, allow vertical motions to the tubes, and the cold air prevents gases from descending from the combustion chamber.

M is a foul air chamber made of plate metal and fixed to the front and top of the metal plate H. The chamber thus produced and located has openings in its ends for connecting pipes therewith in such a manner that foul air in a building can be conducted into one end of the chamber to be subjected to heat and thereby pressed out at the other end and conveyed to a chimney.

L^2 is the roof of the chamber L fixed to the outside wall. It may be flat or arched and formed of plate metal or any other suitable material, and fastened to the wall in any suitable manner.

N represents a boiler made of plate metal, or in the form of a coil or other shape, supported by the parallel side walls in such a manner that it will be subjected to the furnace heat so that water can be heated therein and conveyed to a radiator, by means of a pipe connected with the top of the boiler, and the water returned from the radiator to the boiler by a pipe extending from the radiator to the lower part of the boiler, as required to circulate hot water, for heating a building or other purposes for which hot water can be utilized in a building.

P is a water reservoir placed on top of the plate A^2 in such a manner that water will be evaporated therefrom to moisten the air in the chamber before it enters the hot air chamber and is distributed therefrom through tubes R that extend from the top of the hot air chamber to various parts of the building.

S is a door in the side wall through which access is gained to the lower combustion chamber.

S^2 is a door opening into the ash pit. By means of the doors thus constructed to admit air to pass inward in rear of the fuel magazine and grate and to prevent the mica from becoming smoked, the air so admitted is mingled with the products of combustion that rise from the grate and the transparency of the mica in the doors is maintained so that the condition of the fire will always be visible through the doors and the successful operation of the complete furnace facilitated by the use of the doors adapted to admit air and to reveal the condition of the fire from a point of view in rear of the grate and fuel magazine.

From the foregoing description of the construction and operation of the different parts, the operation of the complete furnace will be readily understood by persons familiar with furnaces for heating buildings.

I claim as my invention—

1. In a furnace, the combination of a fuel magazine that has an open flaring bottom, with parallel side walls that extend forward from the combustion chamber, an air distributing tube extending from the side walls at the bottom of the rear plate of the magazine, a grate at the open bottom of the magazine, and a bridge wall, or its equivalent, at the rear edge of the grate, and an air-distributing tube extended parallel with the top of the bridge wall and a chamber in rear of the said air-distributing tubes into which the products of combustion pass rearward, between the two parallel air-distributing tubes, in the manner set forth for the purposes stated.

2. The furnace wall A, the ash pit composed of the plates A^4, the magazine B, having a door and register at its top, rising outside and in front of the combustion chamber, the tube B^2 having a damper, the open-ended tube C^2, the tube D, the plate D^2 supporting a series of brick, the plate D′, and a grate, arranged and combined to operate in the manner set forth for the purposes stated.

3. The plate D^2 having hooks on its ends and a flange projecting upward from its edge, in combination with a tube or its equivalent, to produce a bridge wall in a furnace, in the manner set forth, for the purposes stated.

4. An improved hot air furnace composed of an outside wall, an ash pit made of plates fixed to the front and bottom of the outside wall, metal plates having fixed open-ended tubes connected with the top and bottom portions of the wall, two combustion chambers, a cold air chamber between the combustion chambers, a fuel magazine fixed on top of the ash pit to project upward in front of the combustion chamber at some distance therefrom, a grate at the open bottom of the fuel magazine, a bridge wall at the rear edge of the grate, an air conveying tube located above the rear edge of the grate to discharge air upward, a roof over the top of the outside wall, a register to admit cold air under the grate in front, and a smoke flue and dampers at the rear, to operate in the manner set forth for the purposes stated.

5. An open ended tube that is rectangular at its end portions and has a V-shaped bottom and a slot in the bottom, in combination with the parallel side walls of a furnace, for the purposes stated.

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