

(No Model.)

R. S. KENT.
AIR HEATING FURNACE.

No. 493,333.

Patented Mar. 14, 1893.

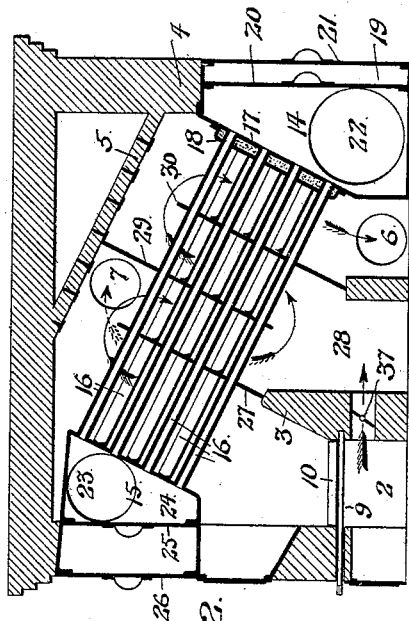


FIG. 2.

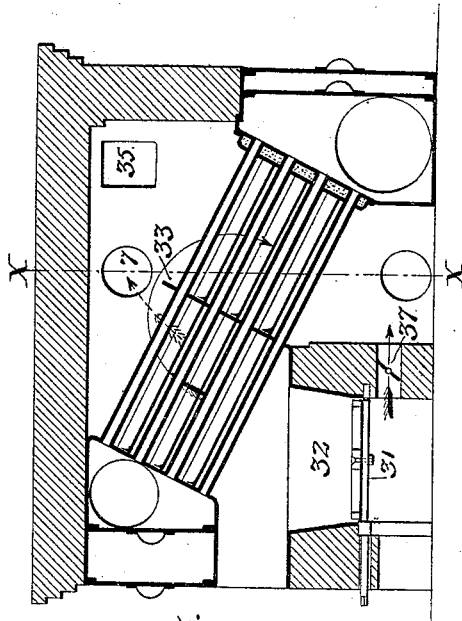


FIG. 3.

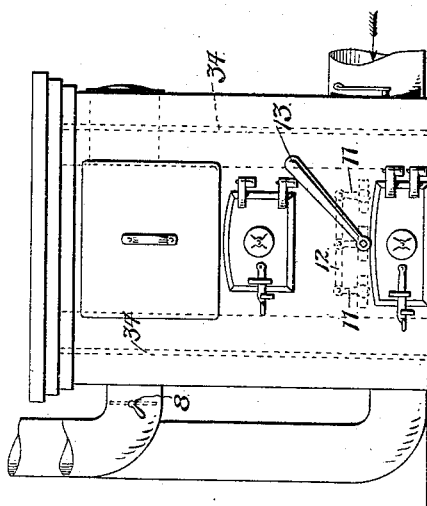


FIG. 1.

WITNESSES:

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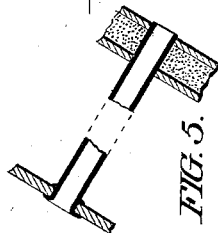


FIG. 5.

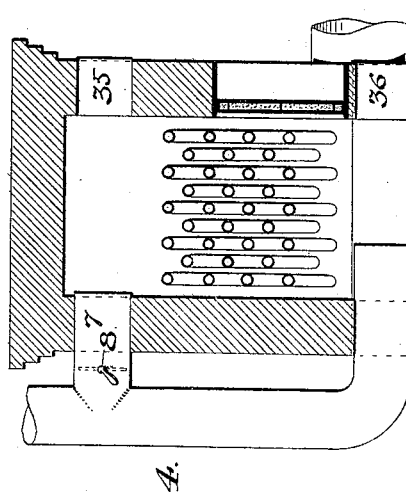


FIG. 4.

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UNITED STATES PATENT OFFICE.

ROBERT S. KENT, OF GLOUCESTER CITY, NEW JERSEY.

AIR-HEATING FURNACE.

SPECIFICATION forming part of Letters Patent No. 493,333, dated March 14, 1893.

Application filed February 23, 1892. Serial No. 422,338. (No model.)

To all whom it may concern:

Be it known that I, ROBERT S. KENT, a citizen of the United States, residing at Gloucester City, in the county of Camden and State of New Jersey, have invented certain new and useful Improvements in Air-Heating Furnaces; and I do hereby declare the following to be a sufficiently full, clear, and exact description thereof as to enable others skilled in the art to make and use the said invention.

This invention relates to furnaces for heating air for warming and ventilating buildings and has for its object the furnishing of a substantial furnace at low cost, of easy inspection in all of its parts and susceptible of repair without the renewing of any of the larger and most costly parts, together with a better facility of economic combustion of fuel, and an avoidance of such height of structure, as to limit injuriously the inclination of the hot air conducting pipes, required for distribution of the heated air in horizontal direction to different parts of a building from the same furnace.

To effect these desiderata this invention consists in a construction of inclined tubes combined with inlet and outlet air chambers, and a furnace with adjuncts for effectively applying heat thereto as hereinafter fully and particularly described and shown in the accompanying drawings in which,

Figure 1 shows a front elevation of a furnace embodying this invention, Fig. 2 a vertical central section thereof, Fig. 3 a like section of a modified form of furnace, Fig. 4 a vertical transverse section thereof in the plane indicated by the dotted line *xx* in Fig. 3 and Fig. 5 shows an enlarged view of the ends of one of the air heating tubes and parts of the air chambers illustrating the means for securing the tubes in the air chambers.

Referring to the drawings, 1 represents the front wall of the furnace chamber, 2 the ash pit, 3 the bridge wall, 4 the rear wall, 5 the roof, 6 the lower smoke flue to the chimney and 7, the upper smoke flue also leading to the chimney; the smoke flues 6 and 7 are only used alternately, the upper flue 7 being provided with a damper 8, which is only opened when the fire is started and until the chimney has acquired sufficient temperature to establish a sufficient draft to draw the pro-

ducts of combustion through the lower flue 6.

9 is the furnace grate made preferably of vibrating section 10, connected by levers 11, and links 12, and operated by a lever 13, so as to sift the ashes from the fuel by slight vibrations, or to dump the contents of the furnace into the ash pit by turning the sections edgewise.

The air heating portion of the apparatus consists of an inlet chamber 14, and an outlet chamber 15, connected by inclined tubes 16. The inclined tubes 16 are inserted in apertures in the outlet or delivery chamber 15 by being expanded therein, after the manner of the flues of a steam boiler. The lower ends, which are inserted in the inlet chamber 14, pass through the inclined surface 17 of the chamber 14, and are free to move lengthwise therein so that each tube 16, may expand and contract longitudinally without strain. To protect from any accidental leakage a plate 18, parallel with the surface 17, and also fitting the tubes 16, is placed on the furnace side of the plate 17, and the space, between the plates 17 and 18, is filled with sand sufficiently coarse not to pass between the tubes and the apertures in the plates 17 and 18; so that while the tubes are free to move longitudinally in the openings in the plates 17 and 18, they are effectually sealed against any air leaks or gas leaks.

Access to the chamber 14, for the purpose of inspection of the tubes, is had through an opening 19, closed by a plate 20, and these parts are protected from radiation by a cover 21. The air is admitted by a flue 22 to the chamber 14, so that no air can enter the apparatus and be heated excepting that which is passed through a conduit and opening 22. Air is discharged from the delivery chamber in a heated condition by the opening 23, from which conduits leading to the proper registers for discharging heated air are connected. The front of the box 15, has an opening 24, in it affording access to the tubes 16, for the purpose of inspecting them, and to permit of the introduction of the expanding tools to secure the tubes 16 in the chamber 15. The opening 24 is closed by a door 25, and protected from radiation by a cover plate 26, with an intervening air space.

The draft or direction of flow of the pro-

ducts of combustion from the fuel around the tubes is controlled by a partition or baffle plate 27, and is normally in the direction of the arrows marked in full lines, over the baffle plate, downward between and around the tubes 16 to the space 28, thence upward upon the rear side of another plate 29, and thence downward over a third baffle plate 30, to the outlet, 6, whence they pass to the chimney.

In lighting the fire, when the chimney and flues are cold and the furnace is cold, it is desirable to furnish the most direct draft to the chimney, and under these conditions, the damper 8 in the upper flue 7 is opened and the products of combustion pass in the direction indicated by the dotted arrow directly into the flue 7 to the chimney, which condition is maintained until the chimney becomes sufficiently heated to rarefy the air and gases contained in it to induce a draft from the lower flue 6, the damper 8 is then closed and the draft follows in the normal direction as indicated by the arrows in full line in Fig. 2.

The arrangement and construction of the tubes and mode of securing the tubes in the chambers 14 and 15 are illustrated in Fig. 5 on an enlarged scale. In Fig. 3 is shown a simpler form of heater adapted to smaller furnaces. In these cases a circular grate 31 and fire pot 32 are used, and a single baffle plate 33 above the bridge wall is employed. The same arrangement of damper 8 however is used in the upper flue 7, and the draft when lighting the fire passes in the direction of the dotted arrow to this flue. When the draft is once established in the chimney this flue is closed by the damper 8 and the draft flows in the normal direction as indicated by the full arrows.

Fig. 4 shows a transverse section and illustrates the position of the inclined tubes as they appear in the plane indicated by the dotted line xx in Fig. 3.

To better secure the walls of the furnace from leakage of gases they may be made double, as indicated by the dotted lines 34 in Fig. 1. The interstices being filled with sand and the supply of sand maintained at the top so that any air leaks, from cracking of the brick work or the mortar, are closed automatically from the furnace chamber. By inclosing the air in the hot chambers 14 and 15 and tubes 16, the combustion of the fuel can be conducted more effectually, because of the higher temperature that may be maintained in such construction of furnace, insures the better combustion of the carbonic oxide from the fuel, which becomes impracticable where the heat is abstracted too rapidly from the products of combustion, as is the case where

such products pass through smaller or more circuitous and long flues. All parts of the flues are susceptible of ready inspection, and the chamber of the furnace can be readily cleaned as can also the flues themselves by brushing, access being had through manholes or doors as shown in Figs. 3 and 4 marked respectively 35 and 36. A dust damper 37 is placed between the upper part of the ash pit and the flue or chamber back of the bridge wall, whereby when the fire is being raked, said damper being open, the fine particles of dust are drawn into chamber 28 and the annoyance from such dust in the furnace room is avoided.

Having described this invention, what I claim is—

1. In an air heating apparatus, a combustion chamber, a series of inclined air tubes, located therein, and connected to a low receiving chamber, and a higher discharging chamber, in combination with a fire box and ash pit located under the upper ends of said tubes; a gas outlet located below the lower ends of said tubes, a pair of doors having an intervening air space arranged to afford access to the interior of the air heating tubes at the upper end, through the air discharging chamber; and a pair of doors with intervening air space located next to the air inlet chamber affording access to the lower ends of the air heating tubes, all constructed and arranged as shown and described.

2. In an air heating furnace the chambers 14 and 24 connected by inclined tubes leading through a combustion chamber, the upper portion of said tubes and the chamber 14 being located above the fire box, and the lower portion of said tubes above the gas outlet 6, and the gas outlet 6 being located below the grate level and in the rear of the ash pit in combination with an upper gas outlet 7, arranged to be used alternately with the gas outlet 6, substantially as set forth and described.

3. In an air heating apparatus a combustion chamber, a series of inclined tubes located therein and connected to a low receiving chamber and a higher discharging chamber in combination with a fire box and ash pit located under the upper ends of said tubes, a gas outlet below the lower ends of said tubes, and a flue provided with a damper leading directly from the ash pit to the lower end of the combustion chamber substantially as shown and described.

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Witnesses:

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