Dec. 10, 1935. L. LITHMAN 2,023,602

HEATING, AIR CONDITIONING, OR COOLING APPARATUS

Filed Jan. 13, 1934 2 Sheets-Sheet 1

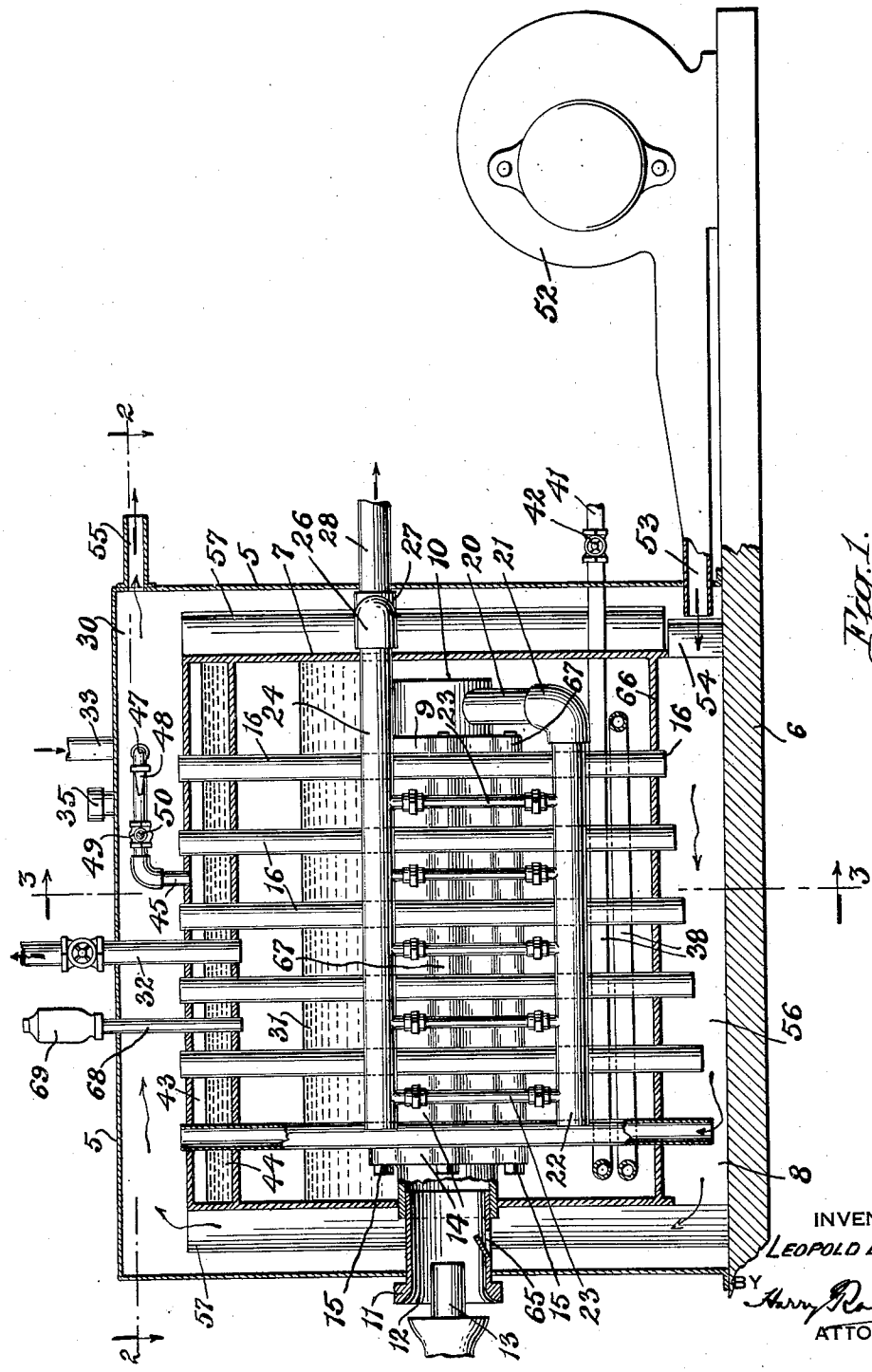

Fig. 1.

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Fig. 2.

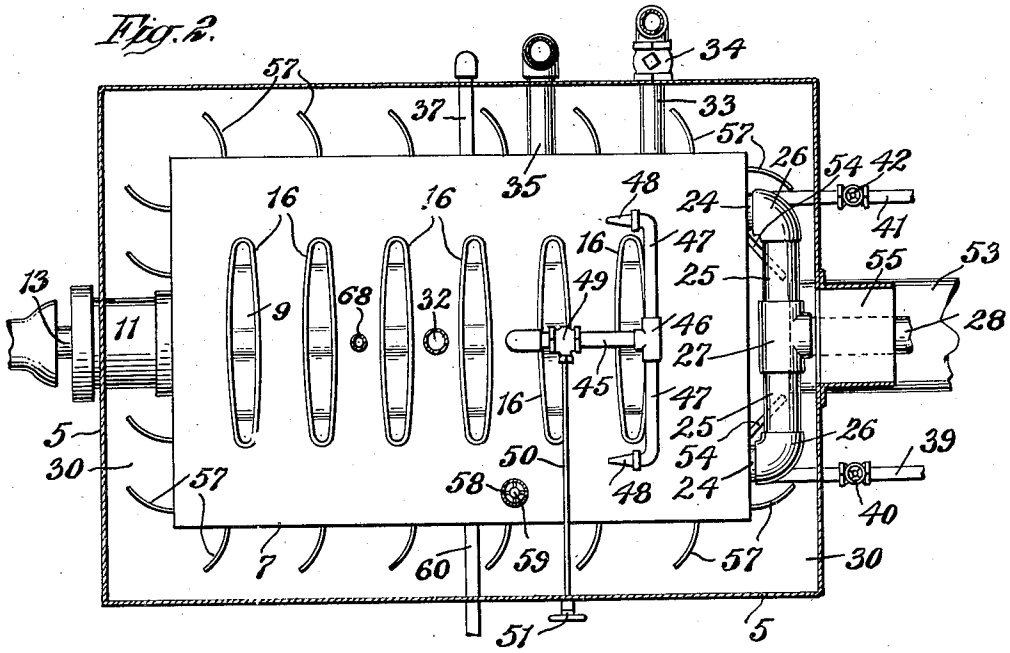


Fig. 3.

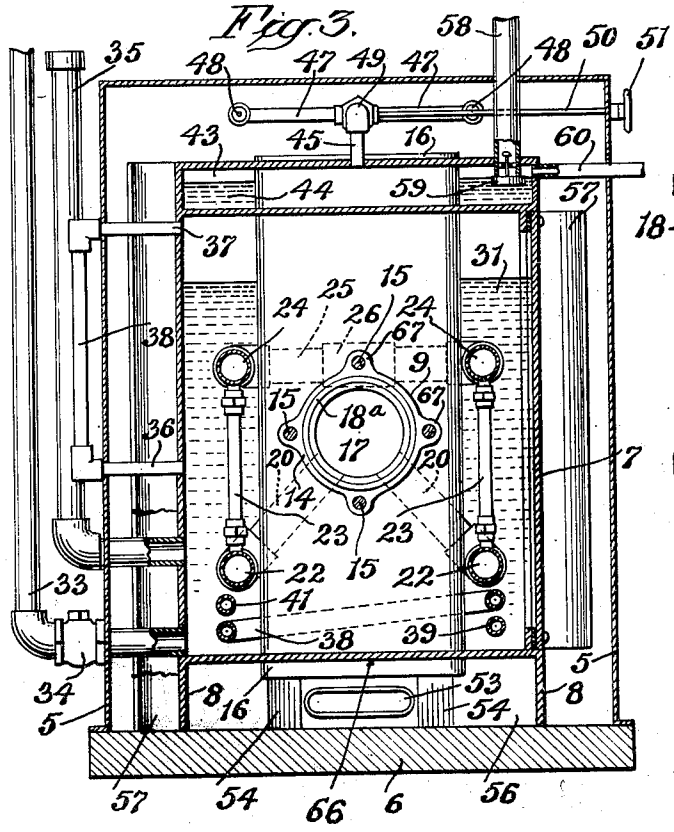
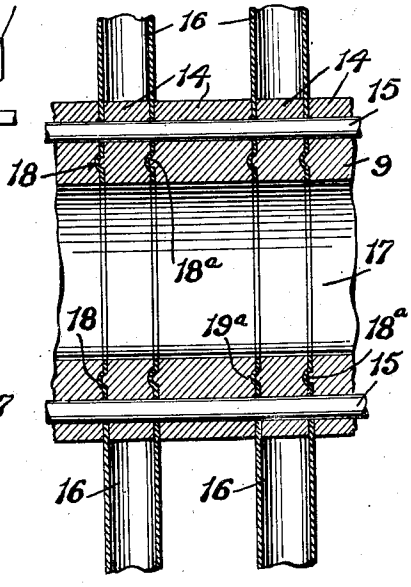


Fig. 4.



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HEATING, AIR-CONDITIONING, OR COOLING APPARATUS

Leopold Lithman, New York, N. Y.

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7 Claims. (Cl. 126—101)

This invention relates to a heating, air-conditioning or cooling apparatus, and has for its object to provide a relatively simple, sturdy and efficient device which will operate successfully and continuously under various conditions of service.

More particularly, the invention contemplates the production of a single unit which is used for heating, air-conditioning and cooling, according to which of these services is required. The device operates with a minimum of fuel consumption and with maximum efficiency.

In the accompanying drawings, wherein an embodiment of the invention is shown, Fig. 1 is a vertical sectional view through the apparatus; Fig. 2 is a sectional view on the line 2—2 of Fig. 1, looking in the direction of the arrows; Fig. 3 is a sectional view on the line 3—3 of Fig. 1, looking in the direction of the arrows; and Fig. 4 is a sectional view through a portion of the heating chamber.

The apparatus is provided with an outer casing or jacket 5 which rests upon a base or support 6. Located within the outer casing 5, and spaced from the walls thereof, is an inner casing or boiler 7 having a pair of downwardly extending flanges 8 (Fig. 3) which rest upon the base 6 to support the boiler and which provide a passage 56 between the bottom 66 of the boiler and the upper face of the support 6. Located within the boiler at a substantially central position therein, is a combustion chamber in the form of a tubular member 9. The combustion chamber is closed at its inner end 10 and has its opposite open end connected to a tube 11 which has a flared open end 12 projecting outside of the outer casing 5. A heating device, such as an oil burner, gas burner or the like has its nozzle or jet 13 extending into the tube 11 so that the flame from the nozzle is directed into the tube 11 and into the combustion chamber 9 to heat the same. The tube 11 has an opening 65 to furnish draft for the heat supply means. Chamber 9 is composed of a number of connected tubular elements 14 (Fig. 4) held together by lengthy bolts 15 extending through the ears 67 formed on the members 14. Clamped between the tubular elements 14 are the walls of flat, tubular flue pipes 16 which are apertured to register with the central openings in the members 14 so that a continuous and uninterrupted passage 17 is provided through the connected members 14 and through the walls of the flues 16, as clearly shown in Fig. 4. To provide an effective liquid-tight joint between the members 14 and the flue walls, the flue walls are beaded as shown at 18 (Fig. 4) which beaded portions fit between ribs 18a and complementary grooves 19a provided in the faces of the elements 14.

The construction just described is such as to provide a tubular combustion chamber located centrally within the boiler and surrounded thereby, the combustion chamber carrying vertically extending, tubular open-ended flues 16, the lower ends of which project below the bottom 66 of the boiler and the upper ends of which project out of the top of the boiler, as clearly shown in Fig. 1. These flues constitute air passages as will be hereafter described. As will be seen in Fig. 1, the lower ends of the flues 16 are staggered, which aids in directing air upwardly through them.

Extending diagonally downward from the combustion chamber 9, adjacent to its closed end 10, are pipes 20 which have their lower ends connected by elbows 21 to a pair of longitudinally extending pipes 22. These pipes 22 connect to a plurality of vertically extending tubes 23 whose upper ends are joined to longitudinally extending pipes 24. Pipes 24 project out of one end of the boiler 7 and are joined to a pipe 25 by elbows 26. Pipe 25 is connected to a T-fitting 27 which connects to an exhaust pipe 28 that projects outside of the outer casing 5. The ends of the pipes 24, the elbows 26, pipe 25 and T-fitting 27 are situated outside of the boiler 7 and are positioned in the space 30 located between the outer casing 5 and the outside of the boiler.

From the foregoing, it will be seen that the combustion chamber consists of a tubular casing formed of a plurality of connected elements 14 between which are situated the flat, tubular flues 16, and heat is conveyed from the chamber through the pipes 20, 21, tubes 23 and pipes 24. The combustion chamber and the piping just referred to, are wholly enclosed within the boiler and surrounded by the water 31 contained therein. The heating means generates steam which is carried upward from the boiler through a pipe 32 to radiators in the conventional way. The boiler is provided with a pipe 68 carrying a safety valve 69.

The return pipe from the radiators is shown at 33, the same being provided with the conventional return valve 34. For filling or replenishing the supply of water in the boiler, a filling pipe 35 is provided. The pipes 36 and 37 leading from the boiler through the outer casing 5 support a gauge glass 38 enabling the amount of water in the boiler to be determined. The hot water supply is obtained by means of a coil shown at 38, located within the boiler, near the bottom 66 of the

same. The coil is provided with a lead-in pipe 39 having a shut-off valve 40 as well as a return pipe 41 provided with a valve 42.

Should the apparatus be used for cooling or refrigerating, the coil 38 may be used for receiving a cooling or refrigerating liquid, instead of hot water. At its upper end or top, the boiler is provided with a supplemental chamber or tank 43 which holds water 44 for humidifying or "air-conditioning" purposes. Leading from the top of this chamber 43 is a pipe 45 which is connected by a T-fitting 46 to laterally extending pipes 47 terminating in jets or spray nozzles 48. A valve 49 is located in the pipe 45 and is provided with an elongated stem 50 which extends across the top of the boiler and projects outside of the casing 5 where it is secured to a hand-wheel 51. By means of this valve, the supply of vapor from the tank 43 to the spray nozzles 48 is regulated.

At 52 is shown a blower which is secured on the base 6 and has its exhaust 53 extending inside of the outer casing 5. The blast of air from the exhaust 53 is directed by means of deflector plates 54 into the passage 56 below the boiler 7 and some of the air will ascend through the heated flues 16 to above the boiler where it will mix with vapor emanating from the jets 48 and, moisture laden, will finally pass into a pipe 55 which is connected to flues or pipes leading to outlets in the rooms to be "air-conditioned". Some of the air from the blower 52 will pass through the passage 56 below the boiler and ascend through the space or passage 30 situated between the outer casing 5 and the outside of the boiler. The boiler is provided with a plurality of laterally extending fins 57 which radiate heat from the boiler and the air impinging against these heated fins on its upward travel toward the top of the casing 5 and toward the outlet 55, will be heated by the fins.

The chamber or tank 43 is filled through a pipe 58 in which is located a float valve 59. In cases where the pressure of water through pipe 58 is greater than that in chamber 43, a different valve than that shown at 59 may be used to shut off the flow from pipe 58. The tank is also provided with an overflow pipe 60.

Briefly, the operation of the heating and air-conditioning apparatus is as follows:

Flame projected in through the tube 11 will reach the interior 17 of the combustion chamber and will heat the same, as well as convey heat through the piping extending therefrom, comprising the connected pipes 20, 22, tubes 23, and pipes 24, so that the water supply 31 contained in the boiler will be generated into steam. The flues 16 are also heated as well as the heat-radiating fins 57 projecting from the outside of the boiler. The heating coil 38 contained within the boiler will furnish a supply of hot water as will readily be understood. Air projected into the casing 5 by the blower 52, and ascending through the flues 16 will be heated. That portion of the air passing around the outside of the boiler will be heated by passing over the heated fins 57. The heated air rising through the flues 16 and that passing upward about the outside of the boiler becomes humidified by moisture from the jets 48 and is forced by the blower pressure out through the pipe 55 and through such network of piping or flues as may be connected to the outlet pipe 55.

The water supply 44 in the supplemental tank 43 of the boiler 7 is heated and generated into a steam vapor which is forced out of the nozzles 48 into the space 30 between the outside of the boiler and the outer casing 5. This vapor, mixing with the air flow as the air flow is on its way to the outlet 55, adds moisture or humidity to the air supply so that the air passing out through the outlet 55 carries the requisite amount of moisture or is suitably "conditioned". The amount of moisture transmitted by the jets 48 is regulatable by means of the valve 49, as heretofore explained, so that the conditioning of the air may be governed.

When the device is not used as a heating device, it may well be used for cooling purposes by dispensing with the heat supply and utilizing the coil 38 for containing a cooling medium or liquid. A separate coil may also be used for cooling. Such coils will keep the water in the boiler cool and the air forced inside the casing 5 and through the flues 16 by the action of the blower will then be cool air.

What I claim is:

1. An apparatus of the character described comprising, a water-holding boiler, a combustion chamber contained within and surrounded by the water in the boiler, a plurality of open-ended flues surrounding the outside of the combustion chamber and extending above and below the boiler, a casing surrounding and spaced from the boiler so that an air passage is provided between the boiler and casing in which the opposite open ends of the flues are located, heat-radiating fins on the boiler extending into the air passage, an outlet pipe leading from said passage, and means for directing an air flow through the flues and through the passage.

2. In an apparatus of the character described, three casings situated one within the other, the inner casing constituting a combustion chamber, the intermediate casing constituting a boiler and containing water which surrounds the inner casing, flues in the intermediate casing supporting said inner casing in heat exchange relation thereto and communicating with the space between the intermediate and outer casing, the outer casing constituting a jacket enclosing the boiler and being spaced therefrom so that an air passage is formed between the boiler and the outer casing, the flues opening into said air passage and the boiler being provided with fins projecting into said air passage.

3. An apparatus of the character described comprising, a water-holding boiler, a combustion chamber contained within and surrounded by water contained in the boiler, flues secured to and surrounding the combustion chamber and forming vertical passages extending about the exterior of said chamber, said flues opening above and below the boiler, a casing surrounding and spaced from the boiler so that an air passage is provided into which the opposite ends of the flues are located, said passage being situated between the boiler and casing, an outlet pipe leading from the passage, and means for directing an air flow through the passage.

4. An apparatus of the character described comprising, three casings situated one within the other and spaced from one another, the innermost casing constituting a combustion chamber, the intermediate casing constituting a boiler containing water which surrounds the innermost casing, flues attached to the innermost casing in heat exchange relation thereto and communicating with the space between the intermediate and outer casing, said flues being closed at their points of connection to the innermost casing, the

outermost casing constituting a jacket enclosing the boiler and being spaced therefrom to form an air passage between it and the outer casing, the flues opening into said air passage at points above and below the boiler.

5. An apparatus of the character described comprising, a water-holding boiler, a combustion chamber contained within the boiler and surrounded by water contained therein, flues secured to and projecting from the combustion chamber and forming vertical passages extending about the exterior of said chamber, the flues being closed to the combustion chamber at the points of connection therewith, said flues having open ends situated above and below the boiler, a casing surrounding and spaced from the boiler so that an air passage is provided into which the open ends of the flues are located, and means for directing an air flow through the passage.

6. In an apparatus of the character described, an outer casing, a boiler contained within and spaced from said casing, a combustion chamber located within the boiler, said combustion chamber provided with a plurality of flues, said chamber passing through and secured to the flues, said flues surrounding the outside of the combustion chamber and having opposite open ends communicating with the space between the boiler and the outer casing at points above and below the boiler.

7. In an apparatus of the character described, an outer casing, a boiler contained within and spaced from the outer casing, a combustion chamber located within the boiler, a plurality of flues through which the combustion chamber transversely passes, said flues having their opposite ends communicating with the space between the boiler and the outer casing at points above and below the boiler, an outlet leading from the space between the boiler and the outer casing, and means for forcing air through the flues and through the space between the boiler and outer casing toward the outlet.

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