Dec. 11, 1934. J. N. LEWELLEN 1,983,620

AIR HEATING AND CONDITIONING SYSTEM

Filed June 23, 1932 2 Sheets-Sheet 1

FIG. 1

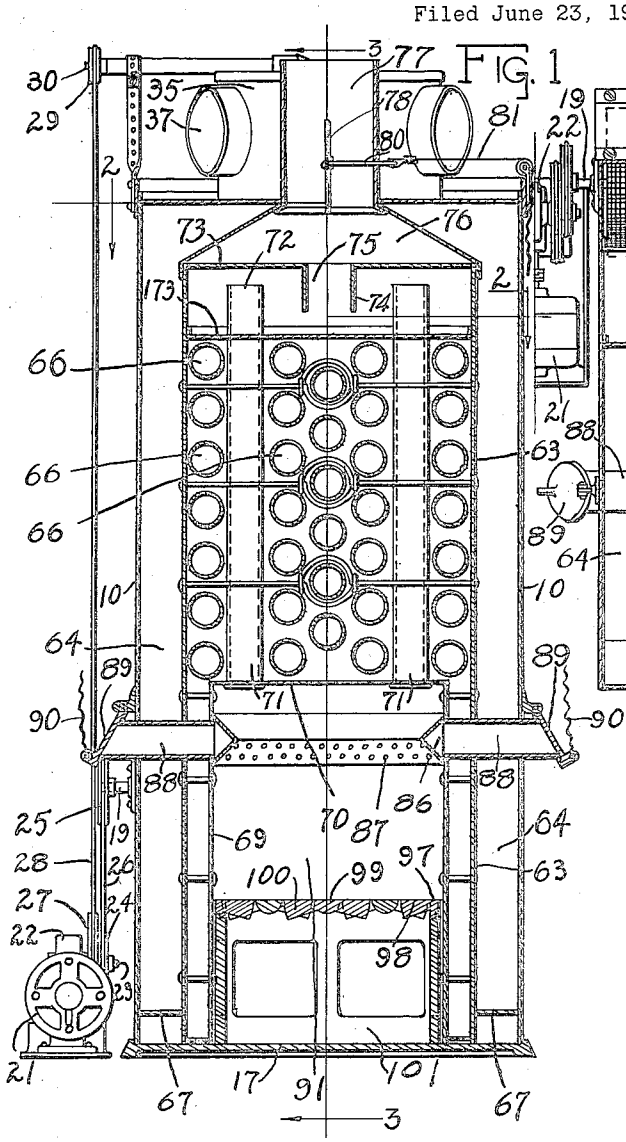
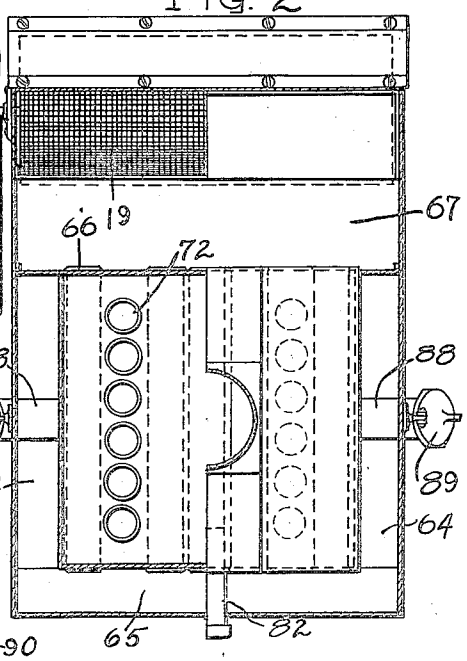


FIG. 2



INVENTOR.
JESSE NOBLE LEWELLEN.

BY Lockwood Lockwood Goldsmith & Galt
ATTORNEYS.

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FIG. 3

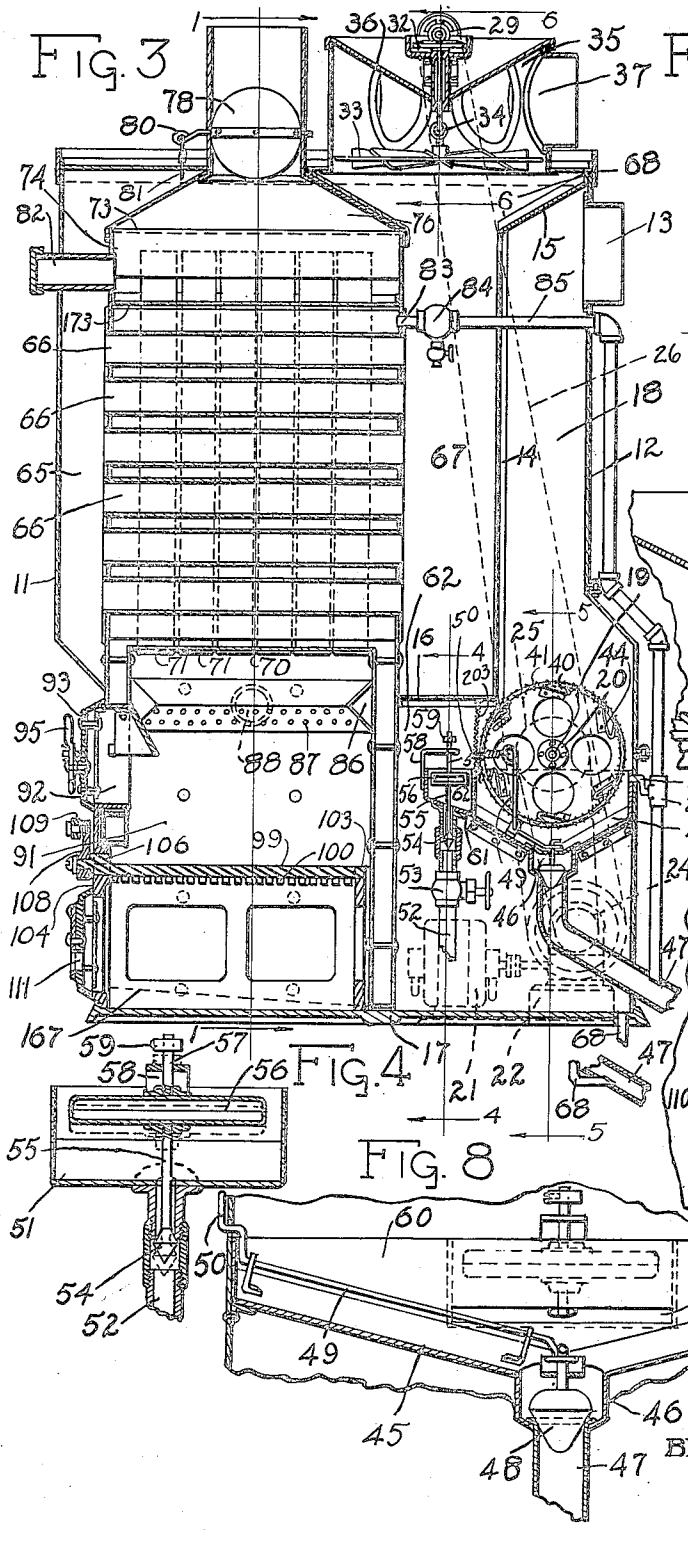


FIG. 5

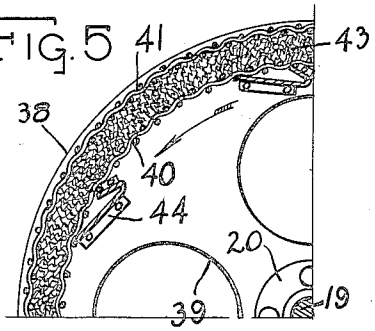


FIG. 6

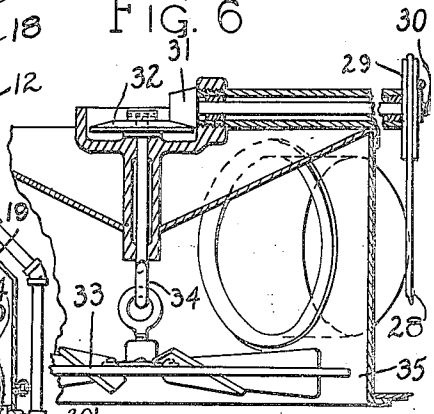


FIG. 7.

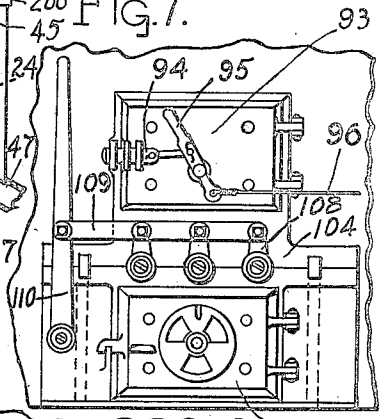


FIG. 4

FIG. 8

INVENTOR.
JESSE NOBLE LEWELLEN.
BY Lockwood Lockwood Goldsmith & Galt.
ATTORNEYS.

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AIR HEATING AND CONDITIONING SYSTEM

Jesse Noble Lewellen, Indianapolis, Ind.

Application June 23, 1932, Serial No. 618,862

5 Claims. (Cl. 183—9)

This invention relates to an apparatus for heating and ventilating.

The chief object of this invention is to provide apparatus of the character indicated, which will efficiently humidify the air in a building structure equipped with said apparatus and which will efficiently heat said air if and when heat is desired.

The chief feature of the invention consists in the novel arrangement of the apparatus for accomplishing the aforesaid object.

Other features of the apparatus will appear more fully hereinafter.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

In the drawings, Fig. 1 is a vertical sectional view and approximately a central sectional view.

Fig. 2 is a partially plan and partially sectional view and is taken in the plane 2—2 of Fig. 1 and in the direction of the arrows.

Fig. 3 is a vertical side sectional view of the apparatus.

Fig. 4 is an enlarged sectional view of the water supply automatic control apparatus.

Fig. 5 is an enlarged sectional view of a quarter of the rotary filter.

Fig. 6 is an enlarged sectional view of the air circulating mechanism and the power means therefor and is taken on line 6—6 of Fig. 3 and in the direction of the arrows.

Fig. 7 is an enlarged front view of the fuel supplying portion of the apparatus.

Fig. 8 is an enlarged sectional view of the drain structure embodied in the ventilating portion of the device.

In the drawings, 10 indicates the two opposite sides of the outer casing of the heating and ventilating structure. 11 indicates the front of said casing and 12 the rear of said casing. Near the upper end of the rear of said casing is an air intake 13. Positioned forwardly thereof is a partition 14 having a forward and upwardly directed portion 15 and a lower rearwardly directed portion 16, the latter being spaced above the base 17.

Positioned beneath the channel 18 formed between the rear wall 12 of the casing and the partition 14 is a rotary screen or filter 20 carried by shaft 19. A motor 21 drives a suitable reduction unit 22 and said reduction unit has a shaft 23 which mounts a driving pulley 24 in turn driving the shaft 19 through the pulley 25, and belt 26.

Said shaft 23 also mounts a pulley 27 driving a belt 28 which drives another pulley 29 carried by the shaft 30, said shaft 30—see Figs. 3 and 6—terminating in a bevel pinion 31 driving a bevel gear 32 for rotating an air impeller 33 supported as at 34 and driven by said support.

The device is shown as of the suction type. However, the blast or pressure type may be preferred. When utilized it would be mounted in the intake 13 instead of the outlet 35 of the air system. Blast or pressure type does not have the disadvantage that with a leak in the combustion chamber, tubes, etc., the exhaust and heated gases would foul or contaminate the circulating air. In the claims, the term "impeller" contemplates either type.

The air impeller 33 is positioned in a chamber 35 and said chamber includes a downwardly directed conical portion 36 and the peripheral side wall of the chamber is provided with a plurality of outlets 37 from which the moistened, and if desired, heated air is discharged to the various rooms of the building structure.

The rotary screen—see Figs. 2, 3 and 5—includes a pair of side plates 38 and the same are supported by the shaft 19 adjacent the side walls 10 of the outer casing and said shaft 19 may project through both sides of the casing and does project through one side of the casing, as shown in the lower middle left hand portion of Fig. 1.

Each side plate or circular disc 38 may be provided with the openings 39 to lessen the weight of the rotary screen or filter. Connecting the side plates 38 is a pair of spaced concentric cylindrical metal screens 40 and 41 and therebetween is included a suitable material 43. This may be in the form of copper wool, asbestos fibre, felt, or other suitable fibre. Extending between the plates 38 and supported at each end thereby, is a plurality of buckets arranged in spaced relation and indicated by the numeral 44 of Fig. 5. These buckets are arranged to trap a certain proportion of the moistening liquid and carry it upwardly in the rotation of the rotary screen or filter and discharge the liquid to the fibrous filter for maintaining the same moist.

Positioned beneath the rotary filter and closing the lower end of the air intake channel 18—see Fig. 3—is a trough 45 and said trough is of hopper formation and the inclined sides at the lower level terminate in a well 46 and communicating therewith is a waste or discharge line 47. The communication between the well and the discharge line 47 is controlled by a valve 48 actuated by an arm 49 having an exposed end 50 which may be either manually operated and directly or remotely or may be periodically and

mechanically operated by a time control mechanism of suitable character.

Positioned at one side of the trough is a chamber 51, the lower end of which communicates with a supply pipe 52 manually controlled by a valve 53 and automatically controlled by a valve 54, the stem 55 of which mounts a float 56, said float having an extension 57 slidably supported in the bracket 58 and mounting upon its upper end a stop 59. The common wall 60 between the chamber 51 and the trough or reservoir 45 includes an elongated aperture 61 which insures that the level of the liquid in chamber 51 is the same as that in the trough or reservoir 45.

The screen or filter structure, as will be apparent from Figs. 2 and 3, is mounted in the reservoir or trough 45 and completely blocks the lateral passage 62 positioned immediately beneath partition portion 16 and the upper edge of the trough, the trough forming the bottom of the air intake passage 18 as before set forth. The filter structure rotates in the trough and, therefore, is maintained moist and the air is sucked through the filter from the intake 18 and thence is sucked out from the interior of the screen into passage 62. The heavier particles, such as dust and dirt, are deposited on the screen and are held by the moistened fibre and in the rotation of the screen, said particles are washed therefrom while that portion of the screen is immersed in the liquid in the trough or reservoir. The clean air passes into the screen, as before mentioned, and then passes out through the same. So that, as it passes through, it takes up moisture and the air is humidified so that moist air is supplied to the passage 62. Whenever the level of the liquid falls, the level of float 56 falls until such time as valve 54 opens the line 52, providing valve 53 has been opened and the supply has been regulated. As soon as the desired level has been reached by the incoming liquid supply—such as water under pressure—the float which has risen with the level of the water, closes the valve 54 and cuts off further supply to the reservoir.

If and when desired or automatically at predetermined intervals, as previously set forth, the handle 50 may be actuated and the dump valve 48 opened to dump or completely discharge the water or liquid in the reservoir. This is required because the water becomes dirty and muddy and the screen would not be self cleaning for long operation. The dirt and grit which is separated by the screen or filter and is then washed therefrom, slides from the inclined sides 45 and collects in the well 46 so that the initial dumping action secures the removal of this accumulated sediment and the continued discharge of the trough water including the suspended dirt, fully cleans the well. Of course, while valve 48 is opened, valve 54 would be opened but since the rate of flow is not equal, it may be considered that the entire reservoir contents are discharged. When the valve 48 is closed, the valve 54 will remain open until the previous predetermined level is obtained in the reservoir.

While the direction of rotation is indicated as being toward the outlet of the air intake, the direction may be reversed and then the buckets would be reversed, and in this instance, the air passing into the rotary screen would pass out through it after the deposited dirt had been washed from the screen surface. Either form will operate satisfactorily and both are contemplated as a part of this invention.

Moistened air that is supplied to intake 62 passes along two sides of the fire box, indicated generally by the numeral 63, and into the side passages 64. Side passages 64 are connected at the front of the furnace structure by the passage 65. The air in the passages 64 contacts the sides of the superheater unit indicated by the numeral 66. Condensate from the air collects on the inclined bottom 167 and discharges through an outlet 68 to the drain or waste 47. Any suitable type of trap may be included in the line 68. The air after passing from passage 62 through the passages 64 and into the forward uniting passage 65, passes rearwardly through the superheater unit through a plurality of parallel and horizontally arranged spaced conduits 66 and into an upwardly directed passage 67 which communicates at its upper end 68 with the chamber 35 before mentioned—see Fig. 3.

The fire box 63 includes an inner shell 69 and the same constitutes the heat producing chamber. The top is formed by the sheet 70 and extending upwardly therefrom is a plurality of fire tubes 71. The fire tubes 71 terminate at 72 immediately beneath a sheet or blocking plate 73, the latter having downwardly directed baffles 74 defining a passage 75 that communicates with a chamber 76 thereabove. Said chamber terminates in a smoke pipe 77 controlled by a check valve 78 operated by arm 80 and the cable 81 which is connected to the draft damper on the furnace proper. These may be manually controlled as is customary with hot air furnaces or thermostatically and automatically controlled as well as time controlled as is also customary in hot air furnaces, said controls forming no portion of said device, but being supplied for use therewith when desired or required.

The chamber formed between portions 69 and 63 and within the portion 63 superposed above plate 70, constitutes a heat transferring chamber and is adapted to receive water which constitutes in a sense insulation for the fire box and also constitutes a superheater arrangement in that the water is heated by heated gases rising or escaping from the fire box, the heat in the gases passing directly to the water through the walls of the fire tubes 71. The heat from the water is abstracted by the air in the passages 65 and 64 and by the air in the tubes 66 as well as the air in the passage 67.

Direct passage of the flue gases—see Fig. 1—is not possible from tube 72 to smoke pipe 77, but must engage plate 73 and pass out through passage 75. Whatever ash deposit accumulates below plate 73 and above plate 173 may be removed through the clean-out opening 82—see the upper right hand portion of Fig. 3. The water supply to the superheating chamber is not shown herein. However, it may be manually or automatically controlled.

To comply with underwriter requirements, a vent 83 is provided controlled by a relief valve 84 and the same discharges by line 85 to the waste 47—see lower right hand portion of Fig. 3.

Also, to prevent accidental flooding, an overflow outlet 201 from the trough is provided—see Fig. 1—which connects to a T fitting 200 in the waste line 85.

The foregoing constitutes the air cycle and in the summer time or when heat is not desired in the building, this air cycle arrangement is employed and since the impeller 33 is provided, the air in the building structure may be positively

circulated and thus the air in the building is maintained at a lower temperature and a relatively fixed humidity.

The following constitutes a description of the heating cycle associated with the fire tube 72 and the smoke pipe 77 and its connections.

In the upper part of the fire box chamber or combustion chamber and along two sides and the rear thereof, is a channel 86 and said channel is comprised of two inwardly directed plates, the lower of which is provided with a plurality of perforations 87. Said plates form the passage 86 and herein a pair of conduits 88 communicate at their inner ends with said passage 88 and their outer ends are provided with flap valves 89. These may be controlled as by the mechanism 90, in turn controlled manually or by a thermostat controlled mechanism. When a hot fire is desired, the valves 89 are opened and complete combustion takes place and the rate of burning is accelerated. When a low fire is desired, the valves 89 are closed and the fire is just maintained.

To prevent excessive humidification, a depending screen 203 is interposed in the air intake passage and drains into trough 60. Surplus moisture is removed from the air.

The combustion chamber is indicated at 91 in Fig. 3 and an opening 92 thereto is closed by a door 93. This door mounts a bolt 94 controlled by a lever 95. Lever 95 is connected to a cable 96, see Fig. 7, which cable is connected (not shown) to the damper 78 by the line 81, see Fig. 1, and is also adapted to be connected to the arm 50 of the flush or dump valve so that every time the furnace is fired, the flush valve will be opened for dumping and the damper will be closed.

The front plate 104 of the furnace includes openings 105 through which the circular bearings 106 extend. Each terminates in a squared portion 107 and said squared portions are associated with crank arms 108 and herein a common cross member 109 is connected to the free ends of each crank arm and said cross member is reciprocated by a lever 110. When the lever 110 is oscillated, bar 109 is reciprocated and all of the crank arms 108 are simultaneously oscillated.

Since each of the lugs 98 and 100 are of segmental formation, all of the movable grate bars will move in the same direction and the lugs of adjacent bars will pass each other or will pass the stationary lugs of the stationary grate bars. However, there is no possibility of the fuel getting under any lug from an adjacent grate bar because of the depth or segmental character of the lugs. The fuel bed, when the lever 110 is oscillated, is agitated and the fine ash is broken up and sifts through the spaces between the interlocking or intermeshing lugs on the adjacent grate bars. The fine ash collects in the ash pit and may be withdrawn through the ash door 111.

The invention claimed is:—

1. In apparatus of the character described, the combination of an air supply passage, a rotary tubular filter therein, a trough in which the filter rotates and arranged to close the passage so that air passing through the intake must pass twice through the filter periphery, and means interposed in the passage beyond the filter for removing surplus moisture from the air.

2. In apparatus of the character described, the combination of an air supply passage, a rotary tubular filter therein, a trough in which the filter rotates and arranged to close the passage so that air passing through the intake must pass twice through the filter periphery, a drain for the trough and means interposed in the passage beyond the filter for removing surplus moisture from the air, and draining to said trough drain.

3. In apparatus of the character described, the combination of an air supply passage, an absorbent rotary tubular filter therein, a trough in said passage forming a part thereof, said filter being nested in the trough and completely closing the passage above the trough and extending entirely across the same for compelling air passage into, through and out of said filter, and bucket means within the filter and positioned near the periphery thereof to discharge trough liquid to the absorbent portion of the filter above the liquid in the trough, and in the filter rotation.

4. In apparatus of the character described, the combination of an air supply passage, an absorbent rotary tubular filter therein, a trough in said passage forming a part thereof, said filter being nested in the trough and completely closing the passage above the trough and extending entirely across the same for compelling air passage into, through and out of said filter, bucket means within the filter and positioned near the periphery thereof to discharge trough liquid to the absorbent portion of the filter above the liquid in the trough, and in the filter rotation, means for supplying liquid to the trough, float valve means for controlling the same, other and larger valve means for quickly discharging the trough contents, the discharge being at a greater rate than the supply thereto whereby upon substantial emptying of the trough the float valve controlled supply flushes the trough until said other valve means is closed.

5. In apparatus of the character described, the combination of an air supply passage, a rotary tubular filter therein, a trough in said passage forming a part thereof, said filter being nested in the trough and completely closing the passage above the trough and extending entirely across the same for compelling air passage into, through and out of said filter, means for supplying liquid to the trough, float valve means controlling the same, other and larger valve means for quickly discharging the trough contents, the discharge being at a greater rate than the supply thereto whereby upon substantial emptying of the trough the float valve controlled supply flushes the trough until the said other valve means is closed.

JESSE NOBLE LEWELLEN.