Nov. 27, 1962 G. GERARD 3,065,741

FURNACE CONSTRUCTION

Filed Oct. 14, 1959 3 Sheets-Sheet 1

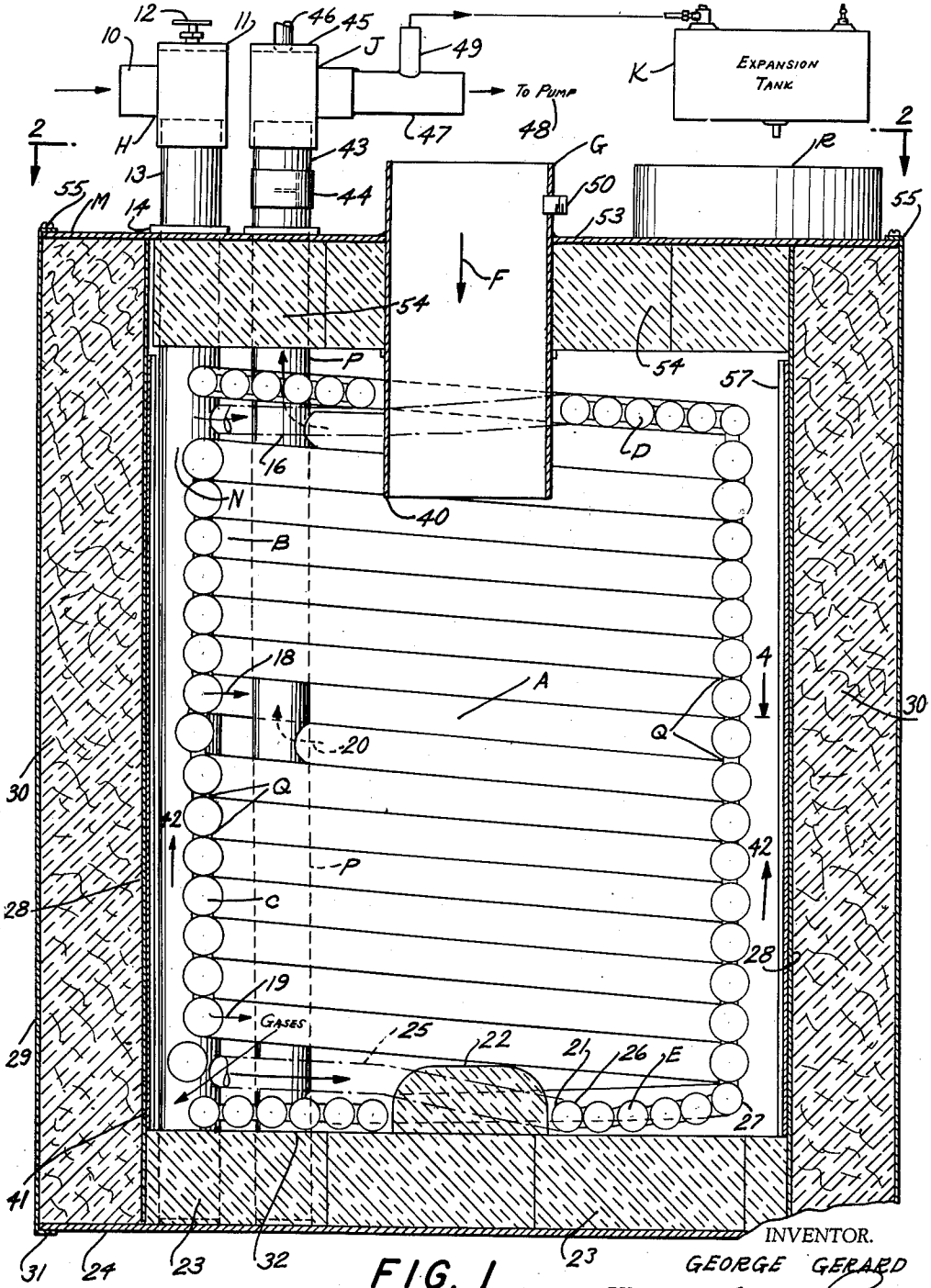


FIG. 1

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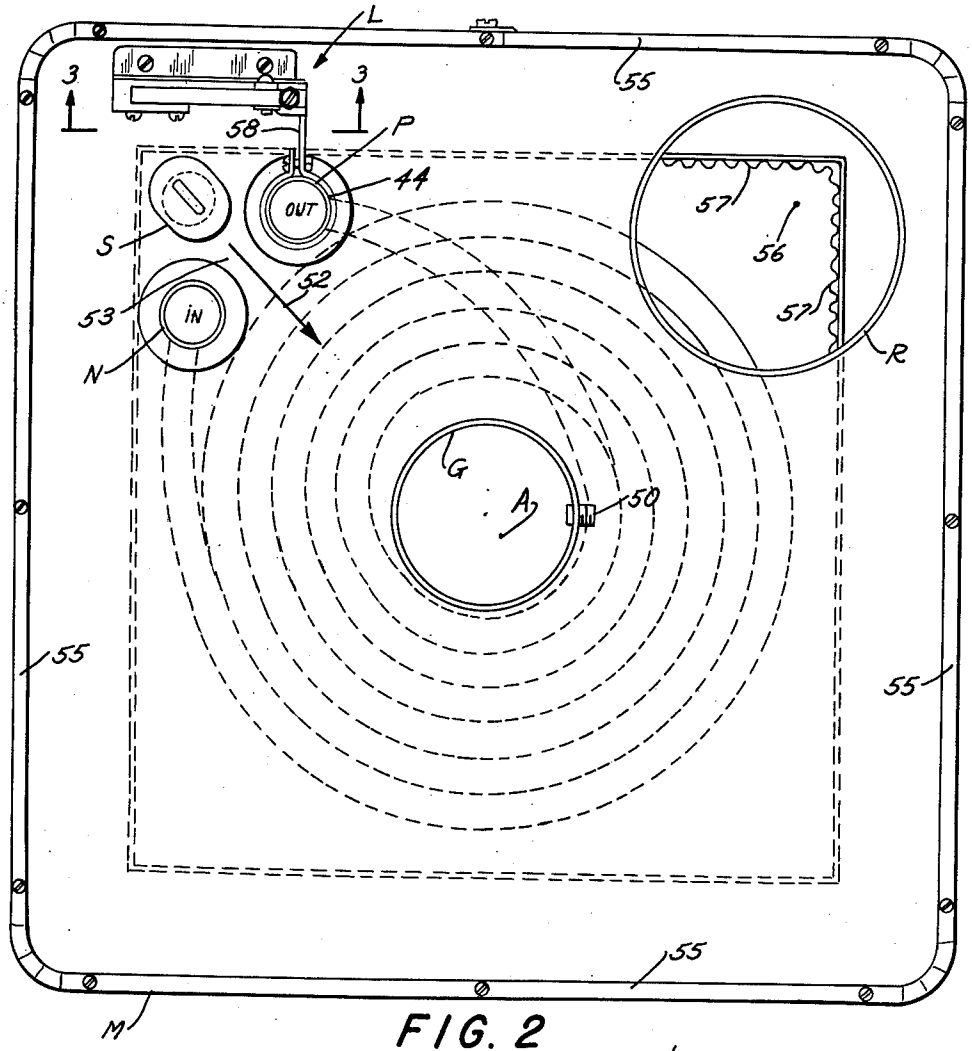


FIG. 2

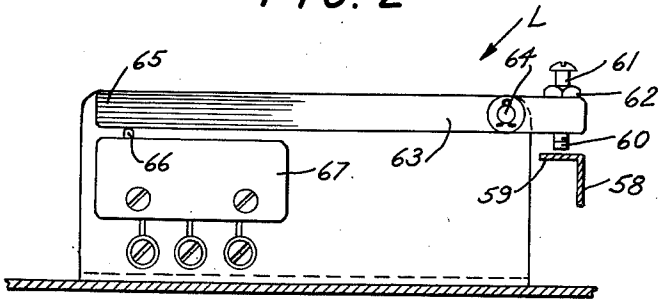


FIG. 3

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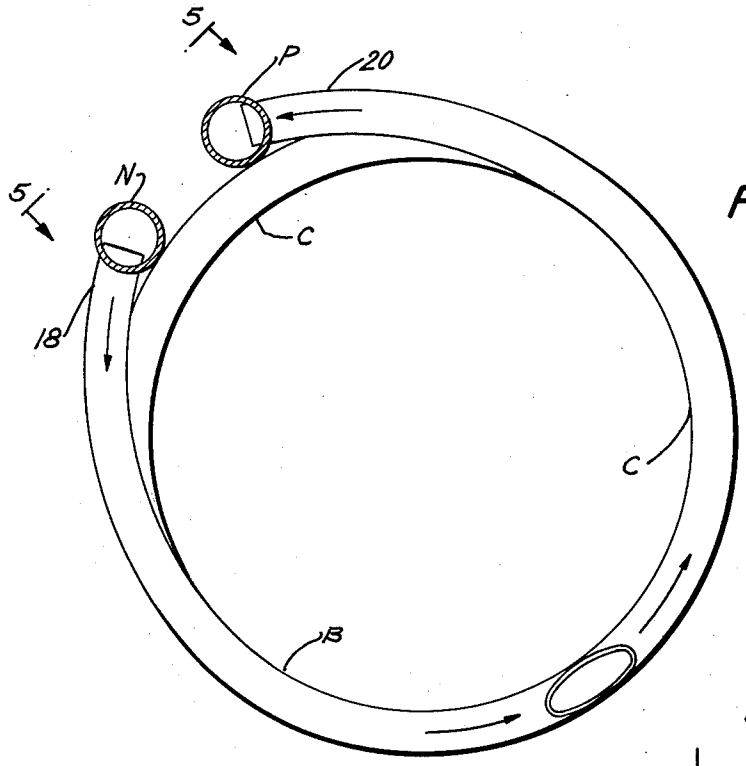


FIG. 4

FIG. 5

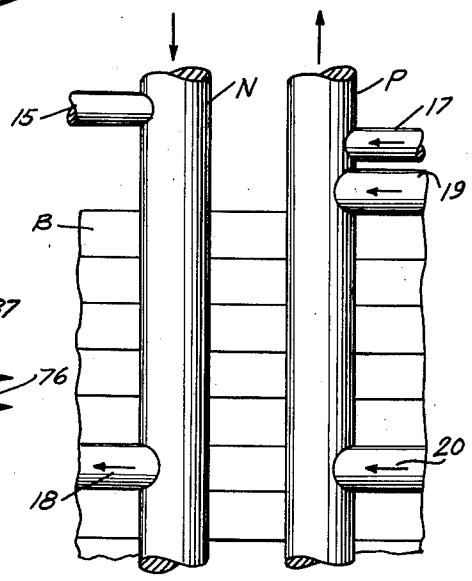
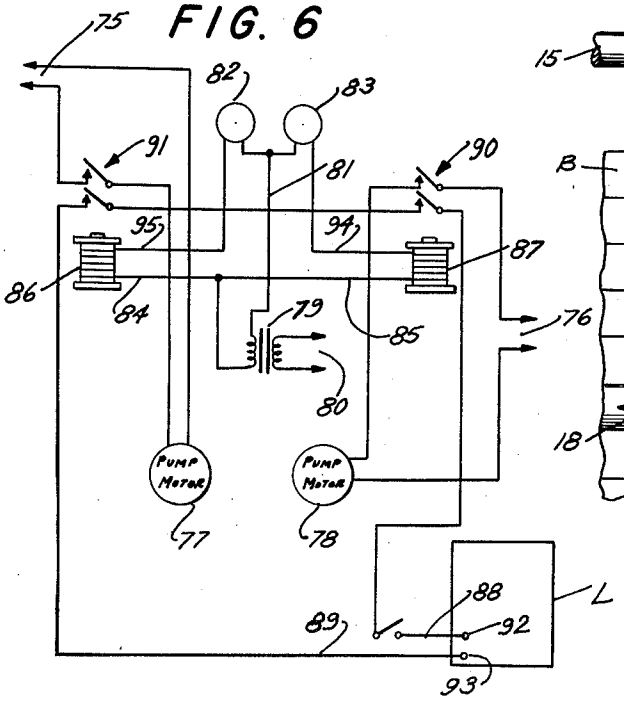


FIG. 6



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FURNACE CONSTRUCTION

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2 Claims. (Cl. 122—250)

The present invention relates to a furnace construction and it particularly relates to a small, compact, high capacity furnace construction.

It is among the objects of the present invention to provide a simple furnace construction which will make most economical utilization of combustion gases in a minimum space and which will achieve maximum heating effect per unit weight of fuel.

Still further objects and advantages will appear in the more detailed description set forth below it being understood, however, that this more detailed description is given by way of illustration and explanation only and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

In accomplishing the above objects it has been found most satisfactory to form a furnace of a substantially cylindrical enclosure formed by closely contacting or welding together convolutions of piping, with the sides, top and bottom of the firebox or enclosure being formed of the closely contacting coiled arrangement.

Desirably, the hot combustion gases are fed downwardly into the center of the enclosure, with the insulated cylindrical box member enclosing the coils and providing connections for the inlet and outlet of the liquid to be heated, as well as the combustion gases.

It is an important feature of the present invention that the inside coils receive the direct heating effect of the combustion gases and that the flame is projected within the enclosure.

The use of liquid carrying coils instead of a refractory lining permits maximum heat take-up and maximum efficiency and cause the coils to be directly affected by the hot combustion gases.

The liquid to be heated may consist of a high boiling point oil or liquid having a boiling point substantially above the boiling point of water.

Desirably, the top and bottom are formed of separate coil systems, while the upper and lower sides are also formed of independent coil systems, each having their independent inlets and outlets and with all coils being connected and parallel to each other.

The oil which may be employed may be a light or medium bodied oil and it may be circulated through the tubing and then through into the space or to the radiators in which the heat is to be given up.

With the foregoing and other objects in view, the invention consists of the novel construction, combination and arrangement of parts as hereinafter more specifically described, and illustrated in the accompanying drawings, wherein is shown an embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which fall within the scope of the claims hereunto appended.

In the drawings wherein like reference characters denote corresponding parts throughout the several views:

FIG. 1 is a transverse sectional view through the entire furnace construction, according to the preferred embodiment of the present invention.

FIG. 2 is a top plan view taken upon the line 2—2 of FIG. 1.

FIG. 3 is a side elevational view of an element of the device, taken upon the line 3—3 of FIG. 2 and upon an enlarged scale as compared to FIG. 2, showing the thermostat arrangement.

FIG. 4 is a diagrammatic top plan view taken upon the line 4—4 of FIG. 1, to show the tubing connections without showing the other associated parts.

FIG. 5 is a fragmentary elevational view taken from the line 5—5 of FIG. 4, showing the manner of connection of the coils to the headers.

FIG. 6 is a diagrammatic circuit lay-out of the wiring diagram.

Referring to FIG. 1, there is shown a central firebox or chamber A having the side coil sections B and C and the top and bottom coil sections D and E, which coil sections form a complete enclosure for the combustion gases or flames which are projected downwardly, as indicated at F, through the vertical cylindrical member G.

The liquid to be heated, which may consist of a light, medium or heavy oil, is fed in through the inlet H and in parallel to the tube sections B, C, D and E forming respectively the sides, top and bottom of the enclosure A. The hot oil then passes out throught the out-take connection J.

The out-take connection J is provided with an expansion tank K. The temperature control or thermostat unit L is positioned at one corner of the enclosure casing M.

The headers N and P, as shown in FIGS. 4 and 5, will connect with the coils B, C, D and E and will feed the liquid to be heated or the oil in parallel to the coils.

Referring to the tubing connections, as shown in FIGS. 4 and 5, the inlet header N and the outlet header P constitute vertically cylindrical members, which extend the full height of the casing adjacent one corner thereof, as shown in FIG. 2.

Referring to FIG. 1, the inlet connection A has the pipe 10 and a T 11 with a lead cock 12. The downwardly extending member 13 leads into the header N through the sealing unit or flange 14.

The header N will have an inlet connection at 15 to the initial coil 16 of the top coil D and the header P will have the outlet connection at 17 (see FIG. 5).

The larger diameter top vertical coil B will have the inlet connection as indicated at 18 in FIG. 5 and the outlet connection as indicated at 19 in FIG. 5, so that the heating oil will be circulated upwardly through the upper coil section B.

Similarly the lower coil section has an inlet connection at the bottom of the furnace, as indicated by the arrow 19 in FIG. 1 and an outlet connection as indicated by the arrow 20 in FIGS. 1 and 5.

The lowermost or bottom coil E will similarly have inlet and outlet connections to the main headers N and P, which extend the full height of the interior of the structure of the furnace.

The bottom coil E has a central opening 21 which may receive the fire brick, or rather the insulating and fire resistant material 22.

The coil E will substantially rest upon the bottom 32 on top of the insulating material 23, which is positioned upon the bottom 24 of the furnace (see FIG. 1).

As is shown best in FIG. 1, the inlet connection 25 to

the bottom coil E will extend to the central convolution 26 and the outlet will be from the outermost convolution 27.

The sides of the furnace consist of a rectangular box having inside walls 28 and outside walls 29 and the filler material 30 may consist of glass wool. The bottom 24 and the outside walls 29 are joined together by means of the overlapping connections as indicated at 31 or by welding.

The side walls formed by the coils B and C consist of tubing elements which are silver soldered together as indicated at Q to form substantially a solid wall which will hold the coils in position and connect them to one another and form a substantially impermeable wall for the hot gases.

The hot gases or the flame will be fed downwardly, as indicated by the arrow F, through the bottom end 40 of the tube G. The hot gases will pass down through the enclosure between the spiral tubes, out through the opening 41 and then up through the space as indicated at 42 around the outside of the coils B, C and D and out through the chimney R at the top of the structure.

Tho hot oil will also pass up through the header B and out through the extension 43 having the clamp 44. It will then pass through the T joint 45 having the thermometer connection 46.

The outlet connection 47 leads to the pump 48 and it also has a by-pass 49 to the expansion tank K (see FIG. 1).

Referring to the top of the unit as shown in FIG, 2, the set screw 50 enables a telescoping pipe or flame connection to be fitted into the tubular member G.

The peephole or sight element S permits the view directly into the fire box A, as indicated by the arrow 52, through the space 53 between the two headers N and P.

The top of the furnace is formed by the top plate 53, on the lower face of which is carried the insulating material 54.

The plate 53 at its edges is connected to the side walls 29 by means of the seaming of edging member 55. The exhaust or chimney connection R is positioned at the opposite corner 56 from the gas outlet, as indicated at 41 in FIG. 1, so that the gases will flow around the outside of the spiral cylindrical tubular members B and C.

It will be noted, referring to the chimney outlet R, that the walls may be lined with corrugated material, as indicated at 57, to lessen the noise, which corrugated material, which may be of fluted asbestos, is attached to the inside wall 28 by means of a heat resistant adhesive.

Referring to the thermostat arrangement shown in FIG. 2, this thermostat arrangement may be connected by means of the clamp 44 and the bar 58 to the outlet header B.

The bar 58 has an outstanding flange 59 (see FIG. 2) which fits under the end 60 of the bolt or screw 61 held in position by the nut 62.

The screw 61 provides an adjustment and the pad or flange 59 will act upon the lower end of said screw to move the lever bar 63, which is pivotally mounted at 64. The end 65 of the bar 63 will act upon the contact element 66 of the micro-switch 67.

The micro-switch 67 will act to actuate or close off the furnace, depending upon a small differential of the heat which causes movement of the flange or pad 59 at the end of the bar 58.

Connected to the clamp 44 around the outlet header is the extension 43. The type of a direct acting thermostat will shut off on a 5° F. differential and will give a very accurate control of the temperature of the hot oil passing outwardly through the outlet connection J.

Referring to the circuit diagram as shown in FIG. 6, there is shown 110 volt sources 75 and 76, which are respectively connected to the pump motors 77 and 78.

The low voltage transformer 79 will also have 110 volt source 80 and it will have a connection at 81 to the wall thermostats 82 and 83, as well as connections at 84 and 85 to the double pole relays 86 and 87.

There will be circuit connections, as indicated at 88 and 89, from the relay switches 90 and 91 to the connections 92 and 93 of the micro-switch arrangement L, which will control the burner, turning it on or turning it off, depending upon the temperature of the oil flowing out through the outlet header P.

The relay coils 86 and 87 will also be connected to the wall thermostats by means of the connections 94 and 95.

The arrangement shown permits direct combustion and flame or electric heating sources in a furnace to act upon a continuous coil box through which can pass a light or medium oil at the rate of about ¾ to one gallon per hour to 10 gallons per minute or more to give adequate heating for a large size house.

The coils absorb all of the heat, with very little lost to the refractory at the side of the furnace.

The position of the four series of coils will assure a maximum utilization and taking up of the heat generated by the hot gases or flame, and, by connecting the top and bottom horizontal plate coils as well as the top and bottom cylindrical coils in parallel, most effective utilization of the available heat is achieved.

Red hot electrically heated members may also be employed for heating purposes.

The thermostat, as shown in FIG. 2, depends upon the contraction and expansion of the metal and not upon any gas or liquid-filled bulb, and it will be much more effective.

For a very small space, a most effective home heater may be obtained. For example, in a preferred construction the height of the furnace may vary from 1 to 4 feet, with a width of 1 to 2 feet.

The silver soldering of the coils together will achieve a closed box construction and the top and bottom coils, if desired, may be dished so that they will be concave inwardly. If desired, the headers N and P may be made concentric, but separate headers are preferred.

With a 40 inch internal diameter and a 40 inch height for the internal coil box, it is possible to have a flow of about 10 gallons per hour. The furnace is inexpensive to manufacture, readily installed, and is most effective in operation.

As many changes could be made in the above furnace construction, and many widely different embodiments of this invention could be made without departure from the scope of the claims, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

Having now particularly described and ascertained the nature of the invention, and in what manner the same is to be performed, what is claimed is:

1. A furnace construction for circulating a high boiling point heated liquid composed of an outer insulated enclosure and an inner coiled tubular enclosure separated and spaced at the sides and top from the outer enclosure and forming a central heating chamber, said inner enclosure being formed by four sets of parallel flow contacting spiral tubing arrangements consisting of top and bottom horizontal pancake contacting circular spirals forming the top and bottom of the central chamber and upper and lower cylindrical spirals of the same diameter as each other and of the same diameter as the outer diameter of the pancake spirals forming the side walls of the inner enclosure, a tubular hot gas inlet member projecting downwardly centrally through the top of the outer enclosure and the top pancake, an outlet for the hot gases being provided at the junction of the lower cylindrical spiral and the bottom pancake and parallel vertical spaced inlet and outlet tubular conduits at one side of the outer enclosure and extending vertically between the outer and inner enclosures to supply the liquid

to and remove it from the upper and lower pan spirals and the upper and lower cylindrical spirals in parallel simultaneously.

2. The construction of claim 1, the lower bottom of the outer enclosure having a projection through and into the central part of the lower pancake spiral to center the lower inner tubular enclosure, an expansion tank connected to one of the parallel spaced tubular conduits above the top of the outer enclosure and a thermostat connected to the upper end of the outlet tubular conduit to regulate the flow of heat and the flow of hot liquid.

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