Aug. 9, 1955 A. A. PFINGSTEN 2,715,177

SPACE HEATER ATTACHMENT

Filed March 18, 1953 2 Sheets-Sheet 1

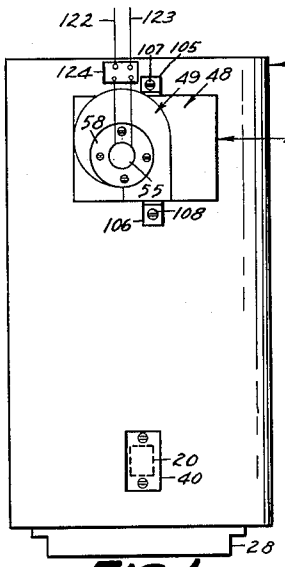


FIG. 1

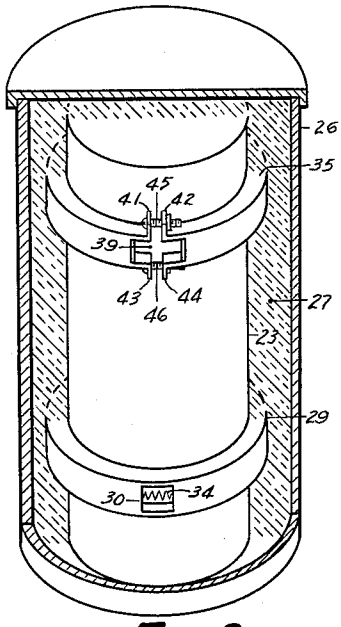


FIG. 2

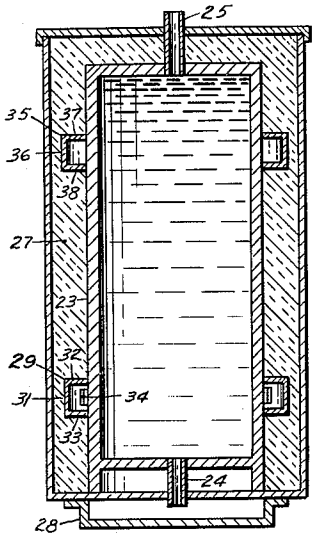


FIG. 3

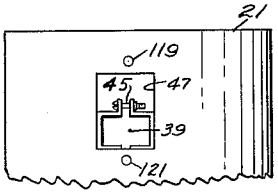


FIG. 15

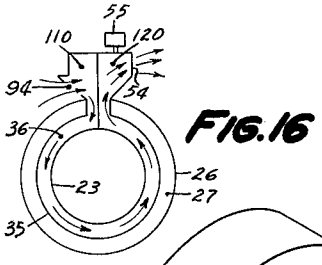


FIG. 16

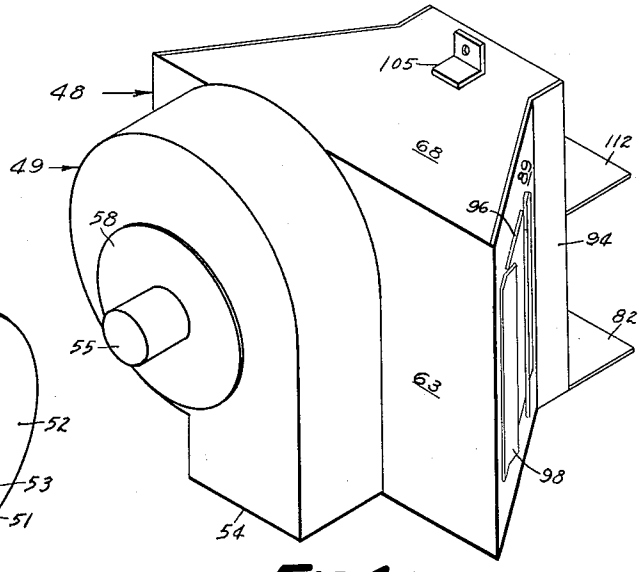


FIG. 4

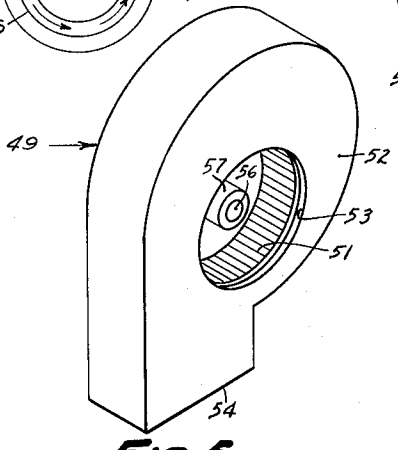


FIG. 5

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SPACE HEATER ATTACHMENT

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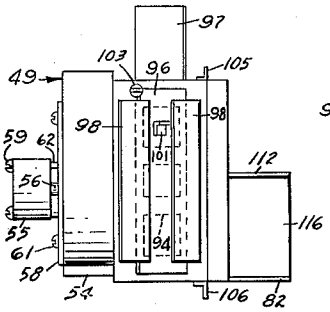


FIG. 11

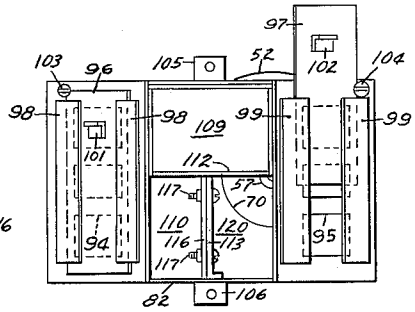


FIG. 9

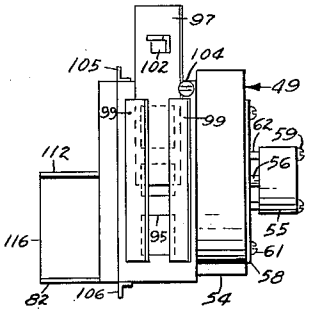


FIG. 10

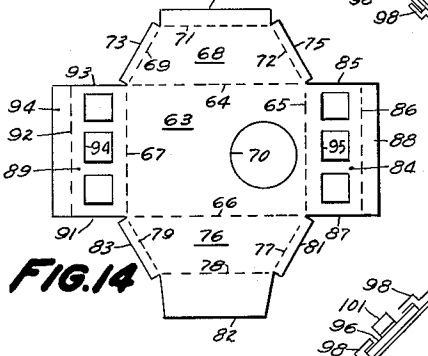


FIG. 14

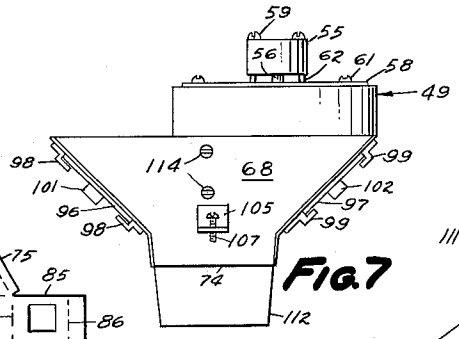


FIG. 7

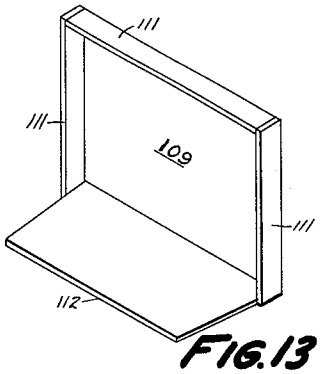


FIG. 13

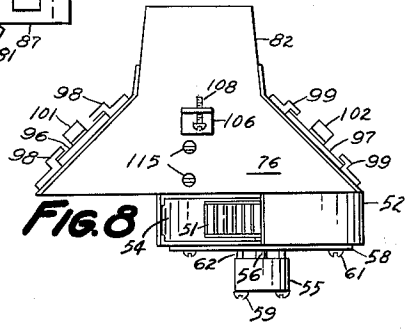


FIG. 8

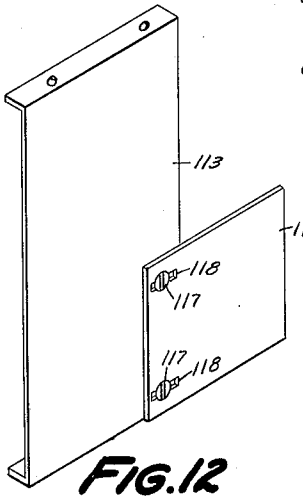


FIG. 12

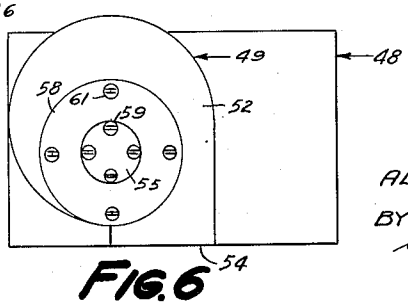


FIG. 6

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United States Patent Office 2,715,177 Patented Aug. 9, 1955

2,715,177

SPACE HEATER ATTACHMENT

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Application March 18, 1953, Serial No. 343,013

10 Claims. (Cl. 219—39)

This invention relates generally to space heating, and more particularly to a warm air circulating attachment for an insulated electric water heater.

An object of this invention is to provide an attachment including a blower that will draw relatively cold air from a room and force the air through a duct surrounding the tank of an insulated electric water heater and discharge the heated air into said room.

Another object of this invention is to adapt an electric water heater to perform the dual services of heating circulated room air as well as heating water.

It is still another object of this invention to provide a blower and a duct around a heat-storage tank, the duct including wall portions of said tank.

It is yet another object of this invention to provide a specific circulator attachment adapted to be connected to a duct-equipped heat-storage tank, and having shutter controlled ports for by-passing the duct, thereby circulating room air through the attachment only.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings in which like reference numerals designate like parts throughout the figures thereof and wherein:

Fig. 1 is an elevational view of an electric water heater, showing the circulating attachment mounted thereon.

Fig. 2 is a longitudinal sectional view of the outer casing of the heater of Fig. 1, with the tank therein, including the air duct, shown in perspective.

Fig. 3 is a longitudinal sectional view of the heater as a whole.

Fig. 4 is a perspective view of the air circulating attachment mounted on Fig. 1.

Fig. 5 is a perspective view of the blower unit of the attachment, showing the rotor and vanes therein.

Fig. 6 is an enlarged front elevational view of the attachment.

Fig. 7 is a top view of the attachment.

Fig. 8 is a bottom view of the attachment.

Fig. 9 is a rear view of the attachment, showing one of the shutters in raised position.

Fig. 10 is a right side view of the attachment.

Fig. 11 is a left side view of the attachment.

Fig. 12 is a perspective view of the central dividing wall within the attachment, showing the associated adjustable wing wall.

Fig. 13 is a perspective view of the upper rear end wall.

Fig. 14 is a view of the sheet metal housing flattened, showing dotted lines along which the sheet is bent to form the attachment housing.

Fig. 15 is a fragmentary view of the top portion of Fig. 1, showing the attachment removed, disclosing the opening in the water heater casing for receiving the circulating attachment.

Fig. 16 is a schematic cross-section through the duct

illustrating air circulation through the attachment and duct.

Referring now to the drawings, wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in Figs. 1, 2 and 3, an assembled electric water heater generally indicated at **21**, having mounted theeron an air circulating attachment generally indicated at **22**. Said water heater comprises a vertically disposed cylindrical water tank **23** having an inlet **24** and an outlet **25**. A casing **26** completely surrounds said tank in spaced relation thereto, the space being filled with heat insulating material **27**, such as Fiberglas, or the like. A base **28** is provided on which said heater is mounted. Said tank is adapted to contain a large volume of water or other suitable heat storage fluid or medium. The tank consists of a cylindrical side wall portion, and flat, top and bottom end closures.

The lower end portion of said tank has mounted therearound an annular channel member **29** having a peripheral web **31**, and inwardly projecting flanges **32** and **33** which abut against the tank **23**. More specifically, the centroid axis through the flanges of said standard channel cross-section is parallel to the axis of the tank **23**; and the concavity of the channel confronts the side wall of the tank. See Fig. 3.

A removable belted electrical heating element **34** is received in said channel member; it encircles the tank and is buckled contiguous thereto by any means. Said heating element is properly electrically insulated, and is adapted to be connected to a source of current, and controlled by a selective thermostat, not shown.

Access to said electrical heating element is had through opening **20** in heater casing **26**, and opening **30** in annular channel member opening **29**, when cover plate **40** is removed. See Fig. 1.

As shown in Fig. 3, the upper portion of the cylindrical side wall of said tank is provided with an annular channel member **35** similar to the lower annular channel member **29**. Said upper annular channel member **35** and associated wall portion of the tank define an air duct. More particularly, the peripheral web **36** and inwardly projecting flanges **37** and **38** which abut against the tank form three walls of said duct, and the associated wall portion of the tank forms the fourth wall of said duct. The centroid axis through the flanges of the standard channel cross-section is parallel to the axis of the tank.

As shown in Fig. 2, the annular channel member **35** is radially split and portions of the web thereof, on opposite sides of the split, are removed to form an opening **39** therein for the reception of the circulating attachment to be hereinafter described. The adjacent remaining flange portions are provided with companion projecting lugs **41**, **42** and **43**, **44**, respectively. These companion lugs are apertured to receive bolts **45** and **46**, respectively. As the nuts on said bolts are tightened, the annular channel member **35** becomes securely clamped to the periphery of the tank.

Fig. 15 shows an opening **47** provided in the heater casing **26** to provide access to the opening **39** in the annular channel member **35**, and otherwise to receive the circulating attachment for mounting therein.

The circulating attachment **22**, comprises a housing generally indicated at **48**, and a blower assembly generally indicated at **49**. See Figs. 4 and 5.

The blower assembly consists of a Sirocco type fan **51** mounted in a casing **52** having an axial inlet **53** and a tangential outlet **54**. See Fig. 5. The fan **51** is driven by a motor **55** having a drive shaft **56** received in fan hub **57** and fixed rotatively-rigid therewith. The motor is mounted on cover plate **58** by means of quadrature spaced bolts **59**, and the cover plate is secured to the blower casing by means of quadrature spaced screws **61**.

Spacer sleeves 62 are provided around bolts 59, and between the motor and the cover plate, to hold the motor spaced from the cover plate. An opening, not shown, under cover plate 58, in blower casing 52, provides for the insertion and removal of fan 51, when necessary. The motor 55, the cover plate 58, and the fan 51 comprise a sub-assembly. Cover plate 58 is centrally apertured, not shown, to allow the motor drive shaft 56 to pass therethrough.

The attachment housing 48, comprises, generally speaking, a truncated hollow prism, partially open at its plane of truncation, formed of a single blank of sheet steel. Figs. 4 and 14.

The front face 63, or base of the truncated housing, is substantially rectangular in configuration, outlined by dotted lines 64, 65, 66 and 67. Said front face is provided with a round aperture 70, centrally disposed in the right half portion thereof, for purposes hereinafter to be described.

The top side 68 of said housing, integral with front face 63, is trapezoidal in shape, outlined by common dotted line 64, and dotted lines 69, 71 and 72, having flange portions 73, 74 and 75, respectively, contiguous thereto. To form the housing, flange portions 73 and 75 are bent upwardly at right angles to the top side 68, along dotted lines 69 and 72, respectively. Flange portion 74 remains disposed in the plane of top side 68. Top side 68 is then bodily bent upwardly at right angles to the front face 63, along common dotted line 64. This completes the forming disposition of said top side 68.

Bottom side 76 of said housing 48, integral with front face 63 thereof, is also trapezoidal in shape, outlined by common dotted line 66, and dotted lines 77, 78 and 79, having flange portions 81, 82 and 83, respectively, contiguous thereto. Flange portions 81 and 83 are bent upwardly at right angles to said top side 76, along the dotted lines 77 and 79, respectively. Flange portion 82 remains disposed in the plane of said bottom side 76. Bottom side 76 is then bodily bent upwardly at right angles to the front face 63, along common dotted line 66. This completes the forming disposition of said bottom side 76.

Flange portion 82 is considerably longer than the corresponding flange portion 74, and is slightly tapered to facilitate insertion into opening 39. This flange portion 82 is of a length to abut against the tank periphery when the circulating attachment, as a whole, is mounted on the hot water heater casing 26. It serves to provide a wall barrier against air leakage through the split gap in the channel flange portions between lugs 43 and 44. Said flange portion 82 is of a width to be snugly received in opening 39.

The right side 84 of said housing 48, integral with the front face thereof, is rectangular in shape, outlined by common line 65, edge 85, dotted line 86, and edge 87. A rectangular flange portion 88, contiguous to dotted line 86, is provided integral with said right side 84. To form this portion of the housing, said right side 84 is bent upwardly and around to abut against the flanges 75 and 81 of the top side 68 and bottom side 76, respectively. The flange portion 88 is bent to abut the associated end edges of flanges 74 and 82, respectively. To securely hold this relationship of sides, the right side 84 is spot welded to the flanges 75 and 81. This completes the forming disposition of right side 84.

The left side 89 is similar to the right side 84. Specifically, this left side of housing 48, integral with the front face thereof, is rectangular in shape, outlined by common line 67, edge 91, dotted line 92, and edge 93. A rectangular flange portion 94, contiguous to dotted line 92, is provided integral with said left side 89. To form this portion of the housing, said left side 89 is bent upwardly and around to abut against the flanges 73 and 83 of the top sides 68 and 76, respectively. The flange portion 94 is bent to abut the associated end edges of the flanges 74 and 82, respectively. To securely hold this relationship of sides, the left side 89 is spot welded to said flanges 73 and 83. This completes the forming disposition of left side 89.

Said left and right sides are each provided with a row of three spaced squared ports 94 and 95, covered by movable shutter plates 96 and 97, mounted in paired guides 98 and 99, respectively. Finger lifting tabs 101 and 102 are spot welded to said shutter plates 96 and 97, respectively, for manually moving said shutters in said guides, to cover or uncover said ports, as desired. Figs. 9 to 11 show the shutter 97 partially raised, and shutter 96 fully closed, with respect to said ports. Lock screws 103 and 104, threadedly engaged in said left and right sides, adjacent the shutters 96 and 97, respectively, provide means for fixing the shutters in any position relative to the ports. Said screws are disposed so that the underside of their heads are engageable with their associated shutters. Figs. 9 and 10 show lock screw 104 operative locking shutter 97 in raised position.

Mounting lugs 105 and 106, spot welded on top side 68 and bottom side 76, respectively, are provided for supporting the circulating unit as a whole on the casing 26. Said lugs are provided with screws 107 and 108, threaded in said lugs, respectively. Said screws threadedly engage the casing 26 as hereinafter described.

The housing 48, thus far formed, consists of a hollow shell having a front face 63, a top side 68, a bottom side 76, a right side 84, and a left side 89. It is to be noted that one side, the rear side, is open. To adapt the housing to the opening 39 in the annular channel member 35, see Fig. 2, a rear wall 109 is provided across the upper half of said open rear side, see Figs. 13 and 9. Said rear wall is provided with integral flanges 111 along the top and sides thereof for spot welding to the corresponding sides of the housing shell.

Along the bottom edge of said rear wall there is provided, integral therewith, an air sealing flange 112 projecting normally outwardly relative to said rear wall. This air sealing flange 112 is companion and similar to flange 82. Likewise, it serves to provide a wall barrier against air leakage through the split gap in the channel 35 flange portions between lugs 43 and 44.

The chamber within the housing 48 is longitudinally divided into two equal compartments 110 and 120 by a bulkhead 113, see Figs. 12 and 9. Said bulkhead is provided with upper and lower flanges which abut against the top and bottom sides of the housing, and are secured thereto by screws 114 and 115, respectively.

A wing wall 116, snugly disposed between air sealing flanges 82 and 112, is adjustably secured to bulkhead 113 by means of bolts 117 operatively disposed in slots 118. Said wing wall 116 is coextensive with the flanges 82 and 112, and is adapted to abut against the hot water tank when the circulating attachment, as whole, is mounted on the heater casing 26. The wing wall 116 is, in effect, an extension of the bulkhead 113, and serves as a wall barrier, when disposed in annular channel member 35, driving the channel opening zone 39, equally, into a left air inlet passageway and right air outlet passageway. This completes the housing structure 48, as a whole.

The circulating attachment 22, as a whole, comprises the housing 48 and the blower assembly 49. See Figs. 1, 4, and 5. To assemble the blower to the housing, the blower inlet opening 53 is disposed in registry with the aperture 70 in the front face of the housing 48, and the blower casing spot welded to the juxtaposed housing face 63, the blower outlet 54 being disposed downwardly.

To mount the circulating attachment 22, as a whole, on the hot water heater casing 26, air sealing flanges 112 and 82 are first inserted into opening 39 in annular channel 35, and the circulating attachment pushed backwardly until the air sealing flange ends abut against the water tank. This will also dispose the end of the wing wall 116 against the water tank. Coincident therewith, the

flanges defining the rear side of the housing are snugly received in casing opening **47**, see Fig. 15, the side flanges of said defining flanges abutting against the web of the annular channel member **35**, thereby finally closing and providing a pair of adjacent passageways communicating between the housing compartments and the channel air duct member **35**. It is to be noted that the top surface of air sealing flange **112** engages with the under side of channel flange **37**; and the bottom surface of air sealing flange **82** engages with the top side of channel flange **38**; thereby effectively sealing the air gap resulting from the splitting of the channel member **35**.

When the circulating attachment is operatively disposed relative to the channel air duct member **35**, the mounting lugs **105** and **106** will be disposed against the hot water heater casing **26**. Thereupon, the screws **107** and **108** are threadedly engaged with threaded apertures **119** and **121** in casing **26**, and the attachment thereby secured and mounted on the casing **26**. See Figs. 15 and 1.

The blower motor **55** is connected to a source of current, not shown, through means of electrical leads **122** and **123**, and thermostat control means **124**. Said thermostat control means is mounted on the casing **26** by any conventional securing means not shown.

Operation.—Assume the water heater operatively installed in a room to be heated, and the water in the tank **23** thereof to be hot. When the thermostat **124** calls for heat, an electric contact is automatically made therein resulting in the energization of motor **55**. Said motor drives the Sirocco blower fan which draws air from the channel air duct **35** and discharges it through the blower outlet **54**.

Fig. 16 is a schematic cross-sectional view through the channel air duct, and shows the path of the air stream through the air duct around the tank, and through the attachment.

Cold room air is drawn into the left compartment **110** of the housing through the open air-ports **94**. (The corresponding air ports **95** are closed.) Thence it flows into the channel air duct **36** through means of the left air inlet passageway, determined by wing wall **116**, and communicating between said compartment and said duct.

As the air flows through the channel air duct **36**, the turbulence of said air causes the air to be brushed against and make contact with the hot periphery of tank **23**, resulting in the cold air becoming considerably warmed by the usual heat exchange process.

When the air travels approximately 360° in the air duct, it approaches the right air outlet passageway, determined by the wing wall **116**, and communicating between the right compartment **120** and said air duct. The air then passes through said passageway and into said right compartment **120**.

From said right compartment **120**, the air is drawn into the blower inlet **53**, through the blower fan, and is finally discharged as warm air into the same room through the downwardly directed blower outlet **54**.

When the room air, as a whole, has been sufficiently heated, the thermostat will automatically open a circuit contact therein, resulting in the de-energization of motor **55**. Consequently, air circulation through the circulating attachment will cease. When the thermostat again calls for heat, the above process will be repeated, thereby stabilizing the room temperature at any desired degree.

If desired, it is possible to circulate the room air without passing it through the warm air duct. This is accomplished by operating the Sirocco blower with air ports **94** being closed and air ports **95** being open. Under these circumstances, room air is drawn through air ports **95**, thence into right compartment **120**, thence through the blower, and finally discharged into the same room through downwardly directed blower outlet **54**.

The characteristic features of this invention are: (1) a blower, and a duct around a tank containing a heat exchange fluid, the duct including wall portions of said tank; (2) the specific construction of a circulator attachment adapted to be connected to a duct-equipped heat-storage tank; and (3) the apparatus of (2) above, and shutter controlled ports on said circulator attachment for by-passing the duct and circulating room air through the attachment only.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood, that within the scope of the appended claims, the invention may be practised otherwise than as specifically described.

What is claimed and desired to be protected by Letters Patent of the United States is:

1. A space heating device, comprising: a heat-storage tank; means including an elongated section of the side-wall of said tank defining an air duct adhering on the side wall of said tank, said duct having an inlet opening and an outlet opening; and a blower connected to one of said openings.

2. A space heating device, comprising: a heat-storage tank; means including an elongated concave member and an elongated section of the side wall of said tank defining an air duct contiguously on the side wall of said tank, said duct having an inlet opening and an outlet opening; and a blower connected to one of said openings.

3. A space heating device, comprising: a heat-storage tank; means including an enlarged open-sided hollow member and side wall portions of said tank defining an air duct abutting around the side wall of said tank, said duct having an inlet opening and outlet opening, and said duct being disposed entirely below the upper part of said tank; and a blower connected to one of said openings.

4. A space heating device, comprising: a tank containing water; means including an elongated channelized member and side wall portions of said tank defining an air duct against and around the outer surface of the side wall of said tank, said duct having an inlet opening and an outlet opening and said duct being disposed entirely below the upper part of said tank; means for heating said water; and a blower connected to one of said openings.

5. The apparatus of claim 4 and closure means across the other of said openings operable to vary the amount of opening thereof.

6. A space heating device, comprising: a heat-storage tank; means including an elongated open-sided hollow member and side wall portions of said tank defining an air duct, adhering on the periphery of the side wall of said tank, and extending substantially around said tank, said duct having an inlet opening and an outlet opening and said duct being disposed entirely below the upper part of said tank; and a blower connected to one of said ports.

7. A space heating device, comprising: a heat-storage tank; means including an elongated channelized member coacting with side wall portions of said tank to define an air duct against and substantially around the outer surface of the side walls of said tank, said duct having an inlet opening and an outlet opening at the ends of said duct, and said duct being disposed entirely below the upper part of said tank; a housing having two compartments, one of said compartments having a first port open to the atmosphere, and the other compartment having a second port communicable with the atmosphere and also an aperture communicable with the atmosphere; closure means on said second port operative to control the amount of opening of said second port; passageway means communicating with said compartments and said openings, respectively; and a blower connected to said aperture.

8. A space heating device, comprising: a tubular heat-storage tank having water therein; electrical means for heating said water; means including a belt-like channelized member and side wall portions of said tank defining an air duct against and substantially around the

outer surface of the side walls of said tank, said duct having an inlet opening and outlet opening through the ends of said duct; complementary clamping means on the ends of said belt-like member for drawing said member securely around said tank; a housing divided into two compartments, one of said compartments having a shutter controlled port communicable with the atmosphere, and the other compartment having a shutter controlled port communicable with the atmosphere and also an aperture open to the atmosphere; a pair of passageways projecting from said housing, each passageway communicating with one of said openings and one of said compartments; a blower connected to said aperture; and means for supporting said housing adjacent said openings.

9. In a space heating device, the combination of a tubular heat-storage tank with an elongated concave member adaptable to abut against the side wall portions of a tubular tank, and being adaptable to coact therewith to define an air duct substantially therearound, the ends of the concave member being open; a housing having two compartments, one of said compartments having a first port communicating with the atmosphere, and the other compartment having a second port communicable with the atmosphere and closure means operative to control the amount of opening of said second port, said other compartment also having an aperture open to the atmosphere; passageway means communicating with said openings and said compartments, respectively, said passageway means being connected to said openings and compartments; and a blower connected to said aperture.

10. In a space heating device, the combination of a tubular heat-storage tank with a belt-like channelized member adaptable to fit substantially around and against the side walls of said tubular tank, and being adaptable to coact therewith to define an air duct, said member being open at each end; complementary clamping means on the ends of said belt-like member for drawing said member securely against the side wall portions of said tubular tank; a housing divided into two compartments, one of said compartments having a shutter controlled port communicable with the atmosphere, and the other compartment having a shutter controlled port communicable with the atmosphere and also an aperture open to the atmosphere; a pair of passageways projecting from said housing, each passageway communicating with one of said compartments and connected to one open end of said channelized member, respectively; and a blower connected to said aperture.

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