Jan. 30, 1968 J. M. BOVE 3,366,092

HEATING BOILER

Filed May 6, 1966 3 Sheets-Sheet 1

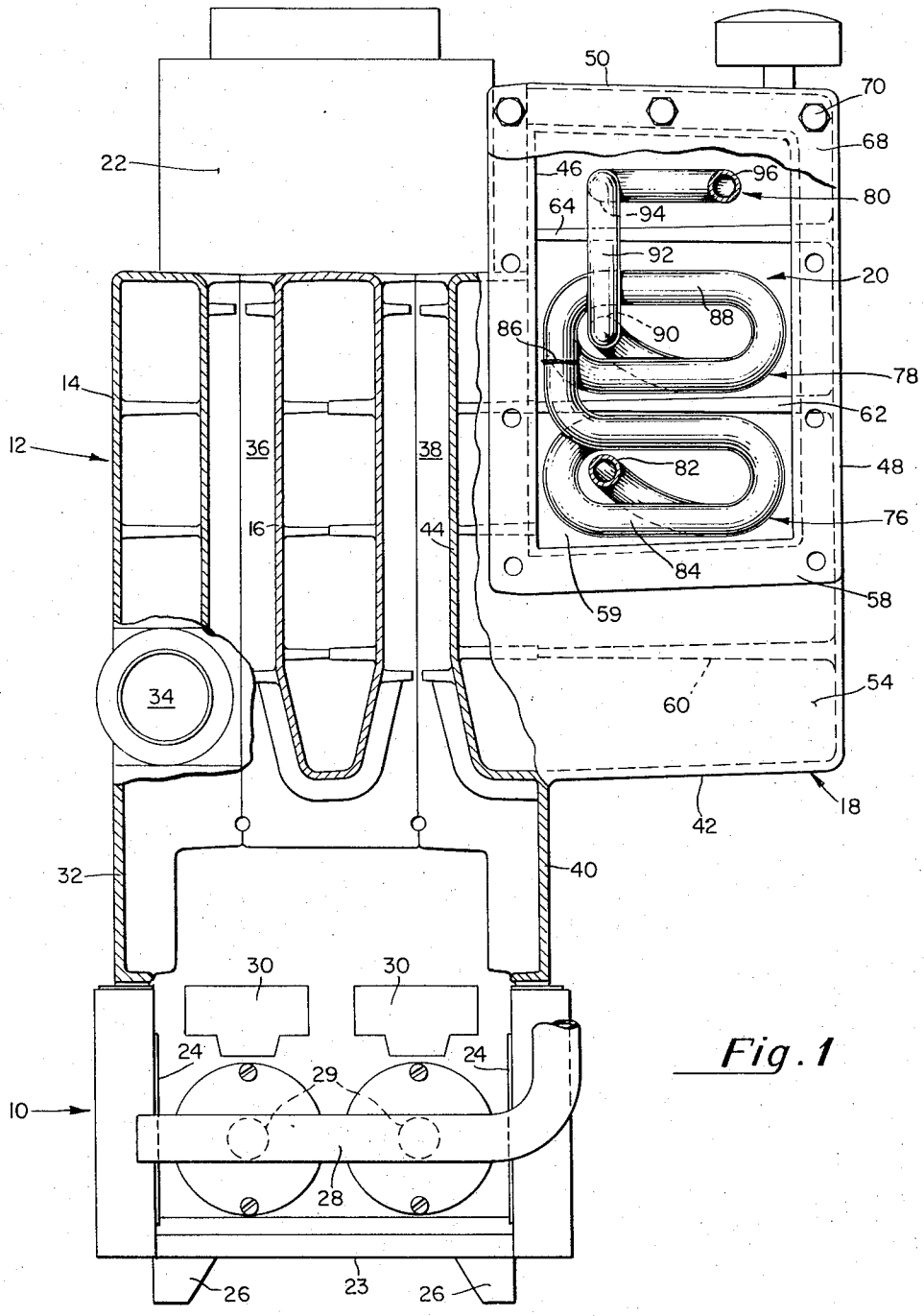


Fig. 1

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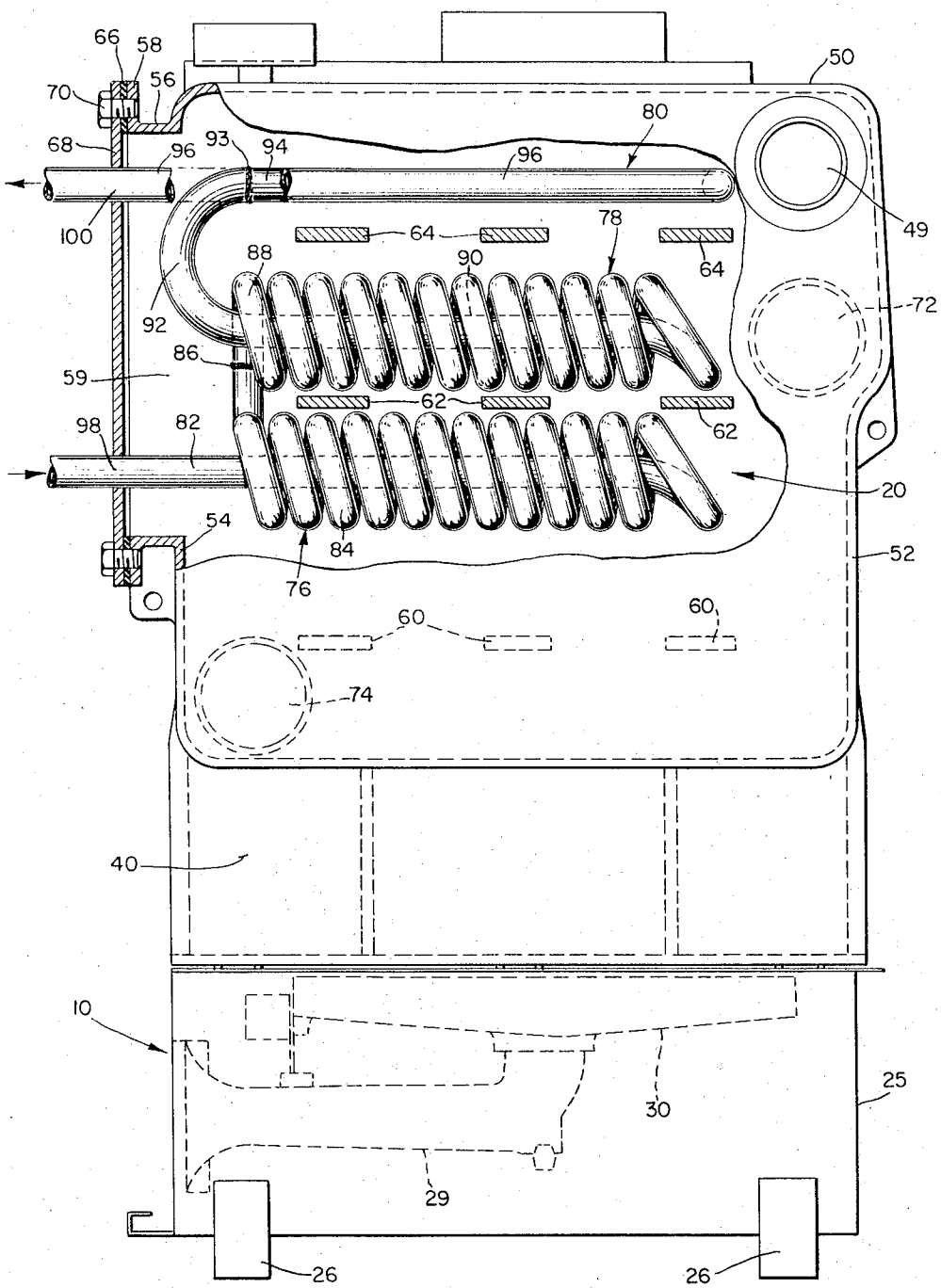


Fig. 2

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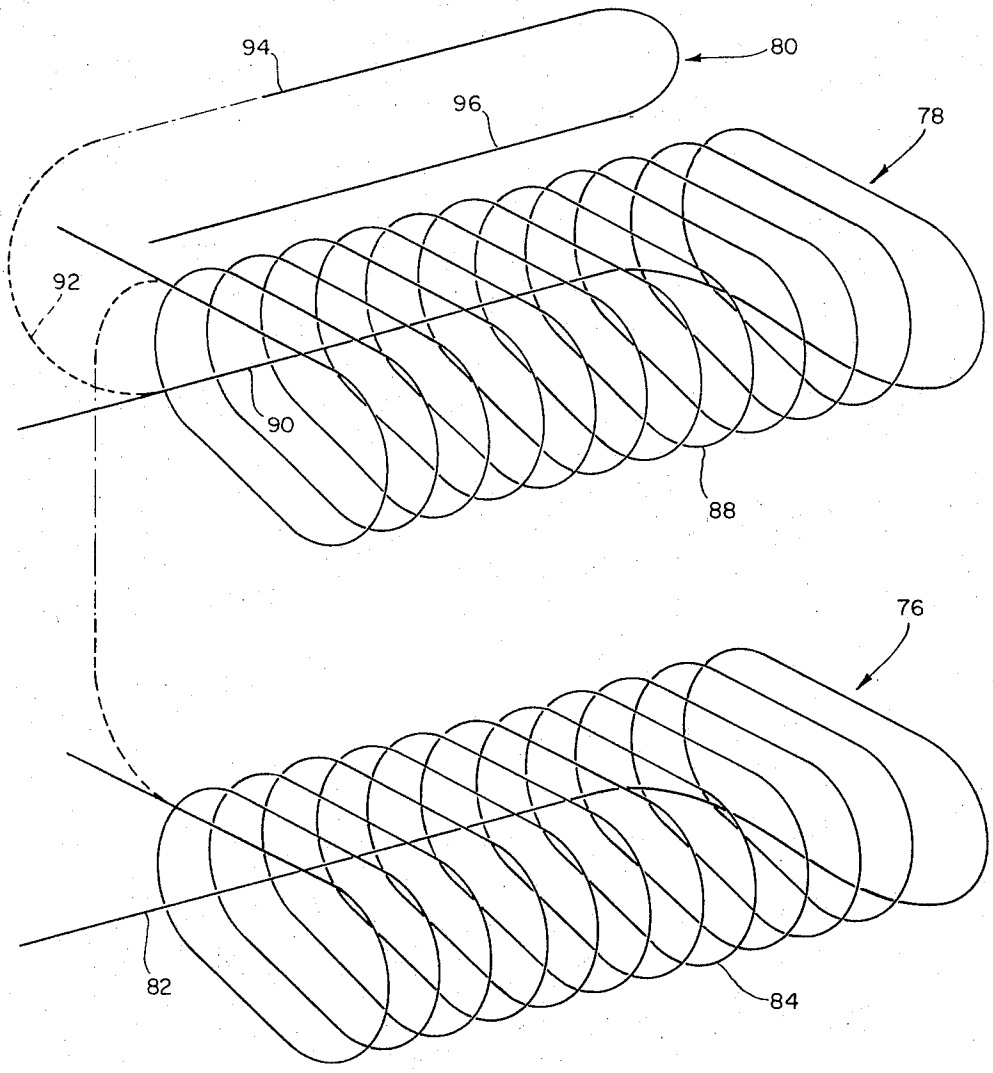


Fig. 3

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HEATING BOILER

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5 Claims. (Cl. 122—33)

ABSTRACT OF THE DISCLOSURE

A cast iron sectional heating boiler is provided with a tankless water heater wholly accommodated by an end section of the boiler which is of such size and weight that the boiler may be supported upon a base for a boiler of comparable size, but of the type using a tank.

This invention relates to heating boilers, and particularly to tankless or indirectly heated water heaters used with such boilers to supply domestic hot water.

It has been proposed to install a tankless water heater in an end section of a cast iron sectional heating boiler with the coil disposed below the water line. Such installations have been employed extensively in the larger sizes of heating boilers, but have never been employed to a normal extent in the smaller or "compact" sizes because certain difficulties inherent in such installations have a tendency to become aggravated in the compact sizes to the point where they cannot be tolerated. As indicated, such installations have been available in the compact sizes, but cast iron sectional heating boilers of the type employing tanks, being less troublesome, have proved to be more practical, and consequently more popular. In recent years though, with the development of heating boilers having vastly improved heat transfer characteristics, cast iron sectional heating boilers with tankless heaters installed in an end section thereof have become very practical in the compact sizes, in consequence of which the tendency is for increased use of such heating boilers. But not all difficulties have been avoided.

When a tankless water heater is installed wholly within one section of the boiler, that section is, of necessity, a relatively large end section customarily with very thick, heavy walls. The weight of the section and its contents tends to overturn the boiler, making it necessary to stabilize the boiler by providing a relatively large base—materially larger than is necessary for a boiler of comparable size, but of the type using a tank.

Accordingly, an important object of the invention is to provide a cast iron sectional heating boiler with a tankless water heater wholly accommodated by an end section of the boiler which is of such size and weight that the boiler may be supported upon a base for a boiler of comparable size, but of the type using a tank.

Another object is to mount the end section of the boiler accommodating the tankless water heater directly upon the base supporting the boiler.

Another object is to provide the end section of the boiler accommodating the tankless water heater with relatively thin walls tied together by a series of stays whereby to materially reduce the weight of the end section and thereby the tendency for the boiler to overturn.

Another object is to provide the boiler with such a tankless water heater accommodating end section and a tankless heater with interconnected parallel coil sections that straddle the stays.

Another object is to provide a tankless water heater that is simple in design and easy and economical to produce.

Other objects of the invention will become apparent when the following description is read with reference to the accompanying drawings, in which:

FIGURE 1 is a front elevation of a compact gas fired boiler unit for hot water heating constructed in accordance with the invention, part being shown in section;

FIGURE 2 is a side elevation of the boiler unit shown in FIGURE 1, part being shown in section; and

FIGURE 3 is a diagrammatic exploded perspective view of the tankless water heater, indicating how the coils may be conveniently fabricated.

The following description is directed to the specific embodiment of the invention shown in the drawings. It is not directed to the scope of the invention, which may be practiced in a variety of forms.

The unit constructed in accordance with the invention comprises a burner base **10** supporting a boiler, generally indicated **12**. As indicated in FIGURE 1, the boiler **12** is provided with a section **14** at the right thereof, an intermediate section **16** and a section **18** at the left thereof. Within the end section **18** is a tankless or indirectly heated water heater **20**, and surmounting the boiler **12** is a flue collector **22**.

The burner base **10** comprises a sheet metal body including a bottom wall **23**, opposite side walls **24** and a rear wall **25**. The top and front of the base **10** are open. The base is supported upon four legs **26**. Extending across the open front of the base is a gas manifold **28**, and extending from the manifold into the base through the open front thereof are a pair of mixer tubes **29** and a pair of gas burners **30**. Reference may be had to my copending application, Ser. No. 488,158, filed Sept. 17, 1965, for further details of the burner base.

The end section **14** of the boiler **12** is provided with a skirt **32** seated directly upon the underlying side wall **24** of the base **10**. The lower front corner of the end section **14** is provided with a connection **34** for return of water from the system to the boiler **12**. Separated from the section **14** by a flueway **36** is an intermediate section **16**, and separated from the section **16** by a flueway **38** is the end section **18**, which is provided with a skirt **40** seated directly upon the underlying wall **24** of the base **10**.

The end section **18** is also provided with a horizontally extending bottom wall **42**, an upright inner side wall **44** with an offset area **46** at the top thereof, an upright outer side wall **48** with a flow connection **49** in the upper rear corner thereof, a horizontally extending top wall **50**, an upright rear wall **52** and an upright front wall **54**. The front wall is provided with a forwardly extending neck **56** terminating in a flange **58** defining an opening **59**. The inner side wall **44** and the outer side wall **48** are interconnected by several lower stays **60**, several intermediate stays **62** and several upper stays **64**. Overlying the flange **58** is a gasket **66**, and overlying the gasket is a mounting plate **68** secured to the flange **58** by bolts **70**. Nipples **72** press fitted into suitable openings therefor in the upper rear corners thereof, and nipples **74** press fitted into suitable openings therefor in the lower front corners thereof, interconnect the boiler sections **14**, **16**, **18** in the usual manner.

The tankless or indirectly heated water heater **20**, conveniently made of approximately twenty-eight feet of copper tubing in the order of five-eighths of an inch in diameter, comprises lower, intermediate and upper coil sections respectively designated **76**, **78** and **80**. A first section of the tubing, designated **82**, extends through the mounting plate **68** rearwardly into the end section **18** of the boiler. A second section of the tubing extends from the section **82** back toward the plate **68** forwardly in a series of loops **84** to form the lower or first coil section **76**, which embraces the section of tubing **82**. The terminal portion of the coil section **76** is turned upwardly and brazed, as at **86**, to one end of a third section of the tubing which ex-

tends away from the plate 68 rearwardly in a series of loops 88 to form the intermediate or second coil section 78. A fourth section of the tubing, designated 90, extends from the coil section 78 back toward the plate 68 forwardly through the loops 88 of the coil section 78, whereupon it turns upwardly, as at 92, and is brazed, as at 93, to one end of a fifth section of the tubing, which forms the upper coil section 80. The fifth section of the tubing and the section 90 thereof are reversely bent to form a first loop 94 disposed in a vertical plane and a second loop 96 disposed in a horizontal plane, with one arm of the loop extending through the plate 68. The connection of the lower and upper coils 76 and 80 to the mounting plate 68, respectively designated 98 and 100, are fluid and pressure tight.

Water returns from the system to the boiler 12 through connection 34, passes from section 14 to section 16 and from section 16 to section 18 through nipple connections 72 and 74, and returns to the system through flow connection 49. Gases from the burners 30 rise through flueways 36 and 38 and are collected in the flue collector 22, from whence they are expelled through a flue. Thus cold water entering the boiler through the connection 34, passing through the boiler and flowing therefrom through the connection 49, is heated. Cold water enters the tankless water heater at connection 98, circulates through coil sections 76, 78 and 80 and leaves through connection 100.

The tankless water heater 20 is permanently mounted upon the plate 68 and is inserted into the end section 18 through the opening 59. The lower coil section 76 is disposed below the several intermediate stays 62, while the intermediate coil section 78 is disposed between the several intermediate stays 62 and the several upper stays 64, and the upper coil section 80 is disposed above the several upper stays 64. It will be noted that the walls of section 18 may be made comparatively thin because of the presence of stays 60, 62 and 64, which tie the walls together.

If the sectional heating boiler were of the type employing a tank, the end section 18 would be similar to the end section 14, and the boiler would measure in the order of nine and one-half inches wide by eleven and one-half inches high and fifteen and one-half inches from front to back. The boiler would not overhang one side of the base 10. However, section 18, enlarged for housing the tankless water heater 20, overhangs the base 10 by approximately seven inches, and rises to approximately four inches above the sections 14 and 16. Nevertheless, the boiler of the present invention is stable on the base 10 because of the comparatively light weight of the section 18 and its contents. It should be noted, too, that the section 18 is supported directly upon the underlying wall 24 of the base 10.

Referring particularly to FIGURE 3, it will be noted that the tankless water heater may be conveniently fabricated in three sections. The coil sections 76 and 78 initially may be identical in every respect (as they come from the bending machine), as illustrated in full lines. Then the extremities of the coil sections may be cut to suitable length and bent, as shown in dotted lines.

What is claimed is:

1. The combination comprising

(A) a cast iron end section for a sectional heating boiler including

(1) opposite side walls and front and rear end walls interconnecting said side walls, one of said end walls having an opening therein, and

(2) a plurality of horizontally extending vertically spaced members each tying together opposed areas of said side walls, and

(B) an indirectly heated water heater including

(1) a plate closing said opening, and

(2) a water conducting coil carried by said plate and consisting of a continuous length of tubing having

(a) a first section extending through said plate rearwardly into the cast iron end section of said heating boiler,

(b) a second section extending from said first section forwardly toward said plate and turned about said first section to form a first multi-loop coil section,

(c) a third section extending from said second section rearwardly away from said plate,

(d) a fourth section extending from said third section forwardly toward said plate, said third section being turned about said fourth section to form a second multi-loop coil section, and

(e) a fifth section extending from said fourth section and terminating in a part extending forwardly through said plate, said first and second multi-loop coil sections and said tie members being disposed in vertically spaced alternate relation.

2. The combination according to claim 1 wherein the tie members are arranged in vertically spaced groups, and the tie members of each group thereof are disposed in laterally spaced planar relation to provide for the free circulation of water thereabout.

3. The combination according to claim 1 wherein the loops of each multi-loop coil section are identical with the loops of the other multi-loop coil section in shape, size, number and direction of looping.

4. In an indirectly heated water heater, the combination comprising

(A) means providing a chamber having an opening in a wall thereof,

(B) a plate closing said opening, and

(C) a water conducting coil carried by said plate and consisting of a continuous length of tubing having

(a) a first section extending through said plate into said chamber,

(b) a second section extending from said first section back toward said plate and turned about said first section to form a first multi-loop coil section,

(c) a third section extending from said second section away from said plate,

(d) a fourth section extending from said third section toward said plate, said third section being turned about said fourth section to form a second multi-loop coil section, and

(e) a fifth section extending from said fourth section and terminating in a part extending through said plate to the outside of said chamber, said first and second multi-loop sections being disposed in laterally spaced relation.

5. The combination according to claim 4 wherein the fourth and fifth sections of the continuous length of tubing are reversely bent whereby to provide a pair of loops, the individual loops of said first and second coil sections are generally ellipsoidal in shape, said first and second coil sections and one loop of said pair thereof are disposed in mutually overlying spaced relation with the longer sides of the loops of said coil sections extending generally parallel to the plane of said one loop of the pair thereof, and the other loop of the pair thereof and the first section of said continuous length of tubing are disposed proximate corresponding ends of the loops of said coil sections.

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