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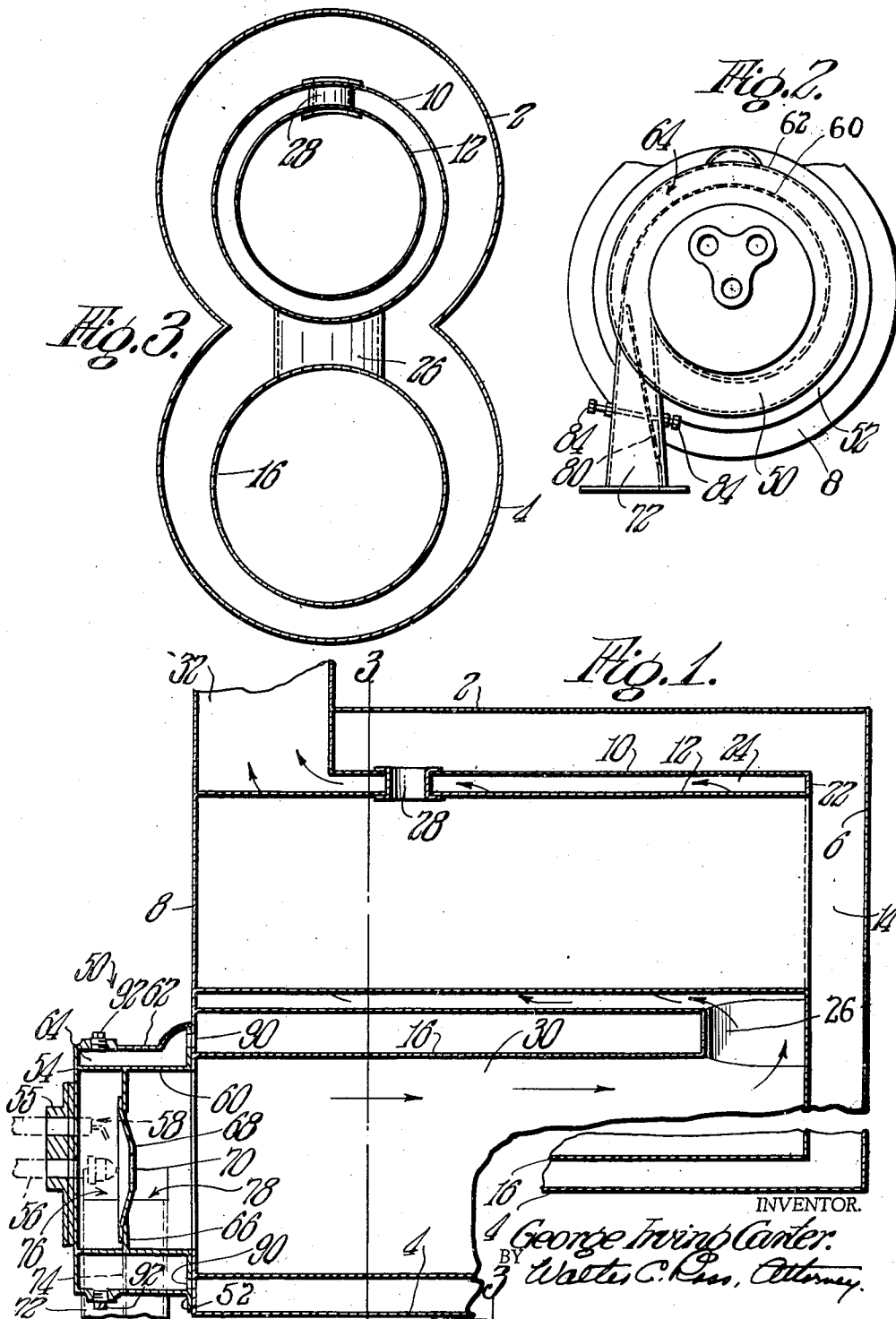
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BOILER

Filed April 23, 1943

2 Sheets-Sheet 1



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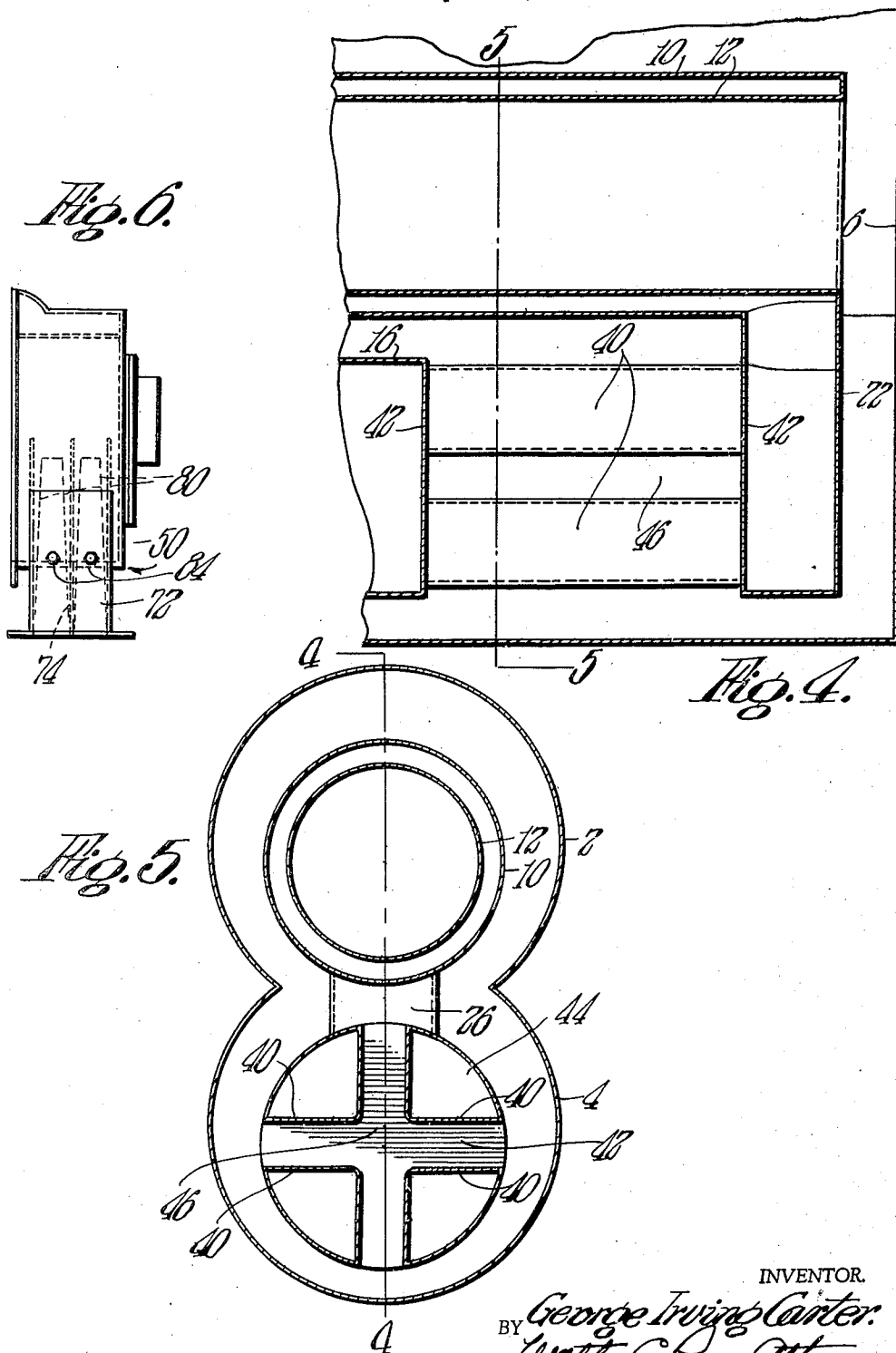
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2 Sheets-Sheet 2



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2,370,145

BOILER

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4 Claims. (Cl. 122—136)

This invention relates to heating apparatus and is directed more particularly to improvements in boilers.

The principal objects of the invention are directed to the provision of a boiler construction which, by reason of its simplicity and novel arrangement, is not only economical to produce but is characterized by its economy and efficiency in operation.

Various novel features of construction and the advantages thereof will be observed from the following description of the present preferred form of the invention shown in the accompanying drawings wherein:

Fig. 1 is a longitudinal sectional view through a boiler embodying the novel features of the invention;

Fig. 2 is a front end elevational view of the lower part of the boiler shown in Fig. 1;

Fig. 3 is a transverse sectional view on the line 3—3 of Fig. 1;

Fig. 4 is a partial view on the line 4—4 of Fig. 5 similar to Fig. 1 showing a modification of the invention;

Fig. 5 is a sectional view on the line 5—5 of Fig. 4; and

Fig. 6 is a side elevational view of the head construction for the combustion chamber of the boiler.

Referring now to the drawings more in detail, the invention will be fully described and it will be understood that various changes and modifications may be made all within the scope of the invention.

Upper and lower tubular sections 2 and 4 of metal have their adjacent longitudinal sides cut away with their side walls joined together as by welding or the like so as to provide the side walls of a casing which is more or less in the form of a figure eight.

The opposite ends of the casing are closed by end plates 6 and 8 which are suitably secured to the casing side walls as by welding so as to provide a closed vessel.

Relatively concentric cylinders 10 and 12 disposed within the upper tubular member 2 are secured at their forward ends to the front end wall 8 as by welding and they terminate at a distance from the rear end wall 6 so as to provide a space 14. A cylinder or tubular member 16 is disposed within the lower member 4 and has its forward end secured to the front wall 8 while its rear end as with members 10 and 12 is spaced from wall 6, as shown.

An inner rear wall or walls 22 is secured to

the rear ends of the cylinders 10, 12 and 16 as by welding so as to close off the annular space 24 between cylinders 10 and 12 as well as the cylinder 16 at the rear ends thereof leaving cylinder 12 open and in communication with space 14. A hollow connection 26 is connected to and extends between cylinders 10 and 16 so as to bring a combustion chamber 30 within member 16 into direct communication with the annular space 24. A hollow connection or connections such as 28 extends between and through cylinders 10 and 12 and through the annular space 24 and a flue connection 32 is provided leading from the space 24 for connection to a stack.

It will be noted that a passageway extends from the combustion chamber 30 through connection 26, around and along the cylinder 12 to the stack connection 32 whereby heat is conducted back and forth of the boiler and around the cylinder 12. In this way the walls of the members 10, 12 and 16 are heated.

The cylinders 10 and 16 being spaced from the casing sections 2 and 4 and from rear end wall 6 and the cylinder 12 being open at its end there is provided a water space adjacent to the walls of members 10, 12 and 16.

The arrangement is such as to provide alternate adjacent water and heating spaces so that with the cylinders made from sheet metal which is relatively thin, the heat transfer is most efficient. The water level may be as desired but will be for the most practical purposes at or somewhat above the upper side of cylinder 10.

As a special feature of the invention, the boiler may be made from preformed tubular members and sheet metal formed as may be desired with the parts secured together by welding or the like. In any event, the construction is such as to make for economy in manufacture, compactness so as to occupy but small space while the novel construction makes for utmost economy and efficiency in operation.

Heating means is preferably disposed at the left end of the tubular member 16 and while it may take any form desired, a liquid fuel burner apparatus is preferred. Such is associated with a head construction at said forward end of the member 16 which will be presently described.

With an oil burner located as described the products of combustion travel from the combustion chamber 30 through connection 26, around and along annular space 24 between cylinders 10 and 12 to the stack connection 32. The cylinders 16 and 10 being surrounded by water with the

cylinder 12 open at its end the heat transfer is most efficient.

In some cases it may be desired to locate means in the chamber 30 to provide additional heat absorbing facilities and at the same time prevent swirling of the flame from the burner.

To that end angular shaped longitudinally extending members 40 are arranged within the member 16, as shown in Figs. 4 and 5. The longitudinal edges of the members 40 are secured to the member 16 which is cutaway between adjacent edges of the member 40 and cross shaped end plates 42 are secured by welding to the opposite ends of members 40 and to member 16.

The construction is such as to divide the chamber 30 into separate longitudinally extending passageways 44 for the products of combustion and a cross-shaped water compartment 46 which is in communication with the water space around member 16, as shown. In this way, additional walls are provided for heat transfer while there are plural passageways for the products of combustion.

A head 50 for liquid fuel burner apparatus is associated with the front wall 8 which may be rigidly secured thereto or it may be bolted in place by some convenient method with a suitable packing when necessary disposed between a flange 52 thereof and said front wall 8. An outer end wall 54 of the head may carry a support 55 secured thereto for an oil delivery nozzle and spark plugs indicated by dot-dash lines 56 and 58.

An inner wall 60 is spaced from and arranged more or less spirally relative to the outer wall 62 of the head so as to provide a circumferential space 64 which may be a water space, see Figs. 1 and 2. A transverse partition wall 66 is provided and it has secured thereto a more or less dished plate 68 provided with a central aperture 70 for the passage of atomized fuel and air into the combustion chamber.

A hollow air inlet member 72 which may be connected to any suitable source of air such as a blower, pump or the like is provided that extends through the outer peripheral side wall 62 and into communication with the space within the wall 60. The space 64 around wall 60 may be utilized as a water space and the inlet member 72 extends therethrough into the space within the said wall 60.

This member 72 has a partition 74 corresponding to wall 66 so as to provide separate adjacent air delivery passageways 76 and 78 leading into the space within wall 60 at opposite sides of the partition wall 66.

Vanes such as 80 within the said passageways 76 and 78 have their lower ends secured to a wall of the member 72 and adjusting bolts 84 in engagement with the walls of the member 72 have their inner ends in abutment with the vanes. As the bolts 84 are moved in and out, their ends act on the vanes to move them relative to the passageways so that the areas of the said passageways may be varied.

The vanes by being adjustable are adapted to control the air delivered to the spaces at opposite sides of the partition 66. In this way it is possible to provide the same or a relatively greater or less volume or velocity of air at opposite sides of the partition which according to the delivery of fuel and the type of fuel, its pressure, etc., will accomplish the desired combustion effect all to the end that the apparatus may be operated with the utmost efficiency and economy commensurate with the type and grade of fuel being used.

The water space between parts 60 and 62 may be connected to and in communication with the water space of the boiler through openings 90. Or the openings 90 may be plugged and other plugs 92 removed so that the water space between parts 60 and 62 may be connected to a hot water supply system through the openings closed by plugs 92.

From the foregoing it will be observed that the novel construction is such as to be efficiently and economically produced while at the same time it occupies but small space and its components are so related as to result in economical and efficient operation. The novel head arrangement makes it possible to deliver air in the desired volume and velocity at opposite sides of the transverse partition to obtain the desired combustion effect while at the same time the head may be utilized for supplementing the heating of the boiler water or for numerous other purposes.

The invention may be embodied in other specific forms without departing from the essential characteristics thereof. Hence, the present embodiments are therefore to be considered in all respects merely as being illustrative and not as being restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all modifications and variations as fall within the meaning and purview and range of equivalency of the appended claims are therefore intended to be embraced therein.

What it is desired to claim and secure by Letters Patent of the United States is:

1. Apparatus of the class described comprising in combination, upper and lower tubular casing members having adjacent side walls joined together longitudinally thereof and providing a passageway therebetween, and front and rear end walls secured to the front and rear ends of said tubular members providing thereby a closed casing, a lower inner tubular member within and spaced from the lower casing member and having a front end secured to said front wall and a rear end spaced from the rear wall, spaced substantially concentric upper inner tubular members within and spaced from the upper tubular casing member and having front ends secured to the front wall and rear ends spaced from said rear wall, an inner rear wall closing the rear end of the lower inner member and the space between the upper inner members, a hollow connection between the lower inner and the upper outermost concentric members, and a hollow stack connection from the outermost of the upper inner members to and through said casing, all adapted and arranged whereby there is provided a combustion chamber in the lower inner tubular member in communication with said stack connection through said first-named connection and the space between the upper inner members and also connecting water spaces between said casing and the lower inner and upper outermost members.

2. Apparatus of the class described comprising in combination, upper and lower tubular casing members having adjacent side walls joined together longitudinally thereof and providing a passageway therebetween, and front and rear end wall secured to the front and rear ends of said tubular members providing thereby a closed casing, a lower inner tubular member within and spaced from the lower casing member and having a front end secured to said front wall and a rear end spaced from the rear wall, spaced substan-

tially concentric upper inner tubular members within and spaced from the upper tubular casing member and having front ends secured to the front wall and rear ends spaced from said rear wall, an inner rear wall closing the rear end of the lower inner member and the space between the upper inner members, a hollow connection between the lower inner and the upper outermost concentric members, and a hollow stack connection from the outermost of the upper inner members to and through said casing, all adapted and arranged whereby there is provided a combustion chamber in the lower inner tubular member in communication with said stack connection through said first-named connection and the space between the upper inner members and also connecting water spaces between said casing and the lower inner and upper outermost members, said first-named connection and the hollow stack connection being disposed at opposite ends of said inner members.

3. Apparatus of the class described comprising in combination, upper and lower tubular casing members having adjacent side walls joined together longitudinally thereof and providing a passageway therebetween, and front and rear end walls secured to the front and rear ends of said tubular members providing thereby a closed casing, a lower inner tubular member within and spaced from the lower casing member and having a front end secured to said front wall and a rear end spaced from the rear wall, spaced substantially concentric upper inner tubular members within and spaced from the upper tubular casing member and having front ends secured to the front wall and rear ends spaced from said rear wall, an inner rear wall closing the rear end of the lower inner member and the space between the upper inner members, a hollow connection between the lower inner and the upper outermost concentric members, a hollow stack connection from the outermost of the upper inner members to and through said casing, all adapted and arranged whereby there is provided a combustion chamber in the lower inner tubular mem-

ber in communication with said stack connection through said first-named connection and the space between the upper inner members and also connecting water spaces between said casing and the lower inner and upper outermost members, said first-named connection and the hollow stack connection being disposed at opposite ends of said inner members, and a connection from the innermost of the upper inner members through the outermost member to the space between said outermost member and casing.

4. Apparatus of the class described comprising in combination, upper and lower tubular casing members having adjacent side walls joined together longitudinally thereof and providing a passageway therebetween, and front and rear end walls secured to the front and rear ends of said tubular members providing thereby a closed casing, a lower inner tubular member within and spaced from the lower casing member and having a front end secured to said front wall and a rear end spaced from the rear wall, spaced substantially concentric upper inner tubular members within and spaced from the upper tubular casing member and having front ends secured to the front wall and rear ends spaced from said rear wall, an inner rear wall closing the rear end of the lower inner member and the space between the upper inner members, a hollow connection between the lower inner and the upper outermost concentric members, and a hollow stack connection from the outermost of the upper inner members to and through said casing, all adapted and arranged whereby there is provided a combustion chamber in the lower inner tubular member in communication with said stack connection through said first-named connection and the space between the upper inner members and also connecting water spaces between said casing and the lower inner and upper outermost members, and means in the lower inner tubular member providing therewith separate adjacent passageways in the combustion chamber and a separate water space.

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