Oct. 8, 1946. R. C. CROSS ET AL 2,408,969

STOKER BOILER UNIT

Filed Aug. 7, 1944 4 Sheets-Sheet 1

Fig. 1.

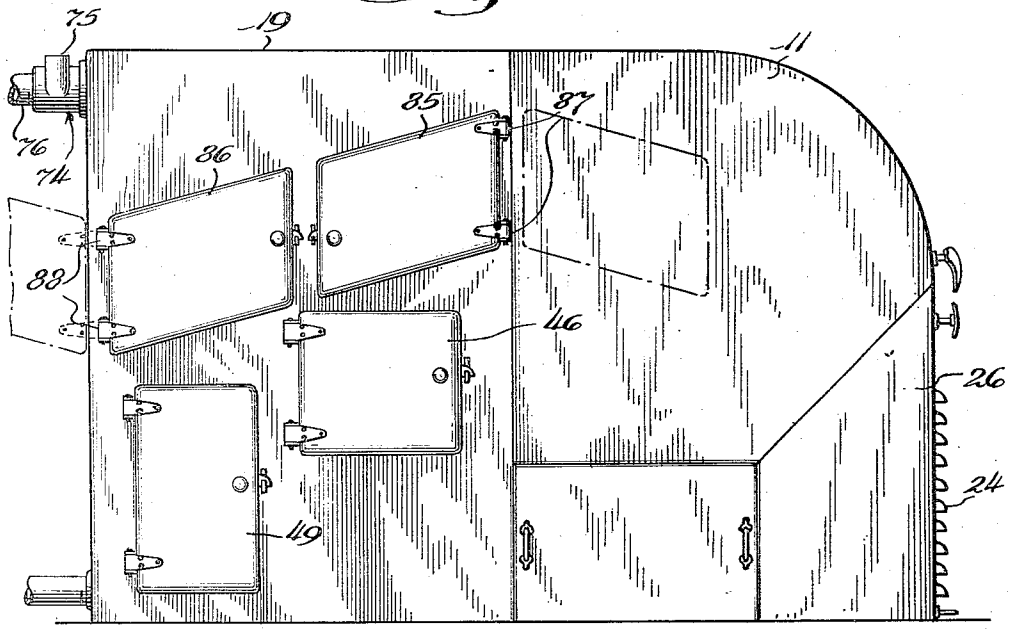


Fig. 2.

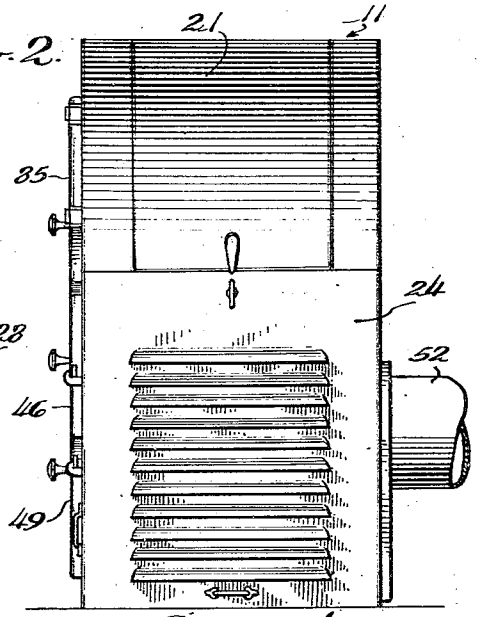
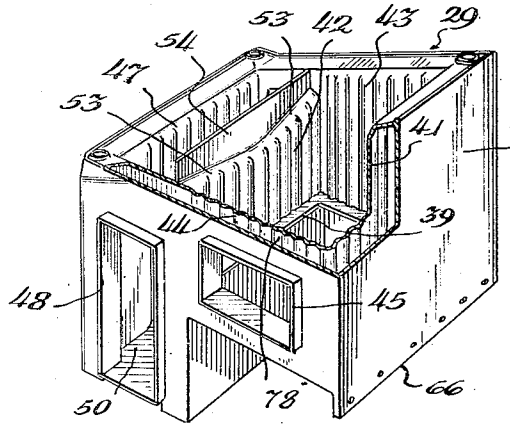


Fig. 4.



Inventors.
Robert C. Cross
George W. Smandon
By Lois Sheldon
Attorneys

Oct. 8, 1946. R. C. CROSS ET AL. 2,408,969

STOKER BOILER UNIT

Filed Aug. 7, 1944 4 Sheets-Sheet 2

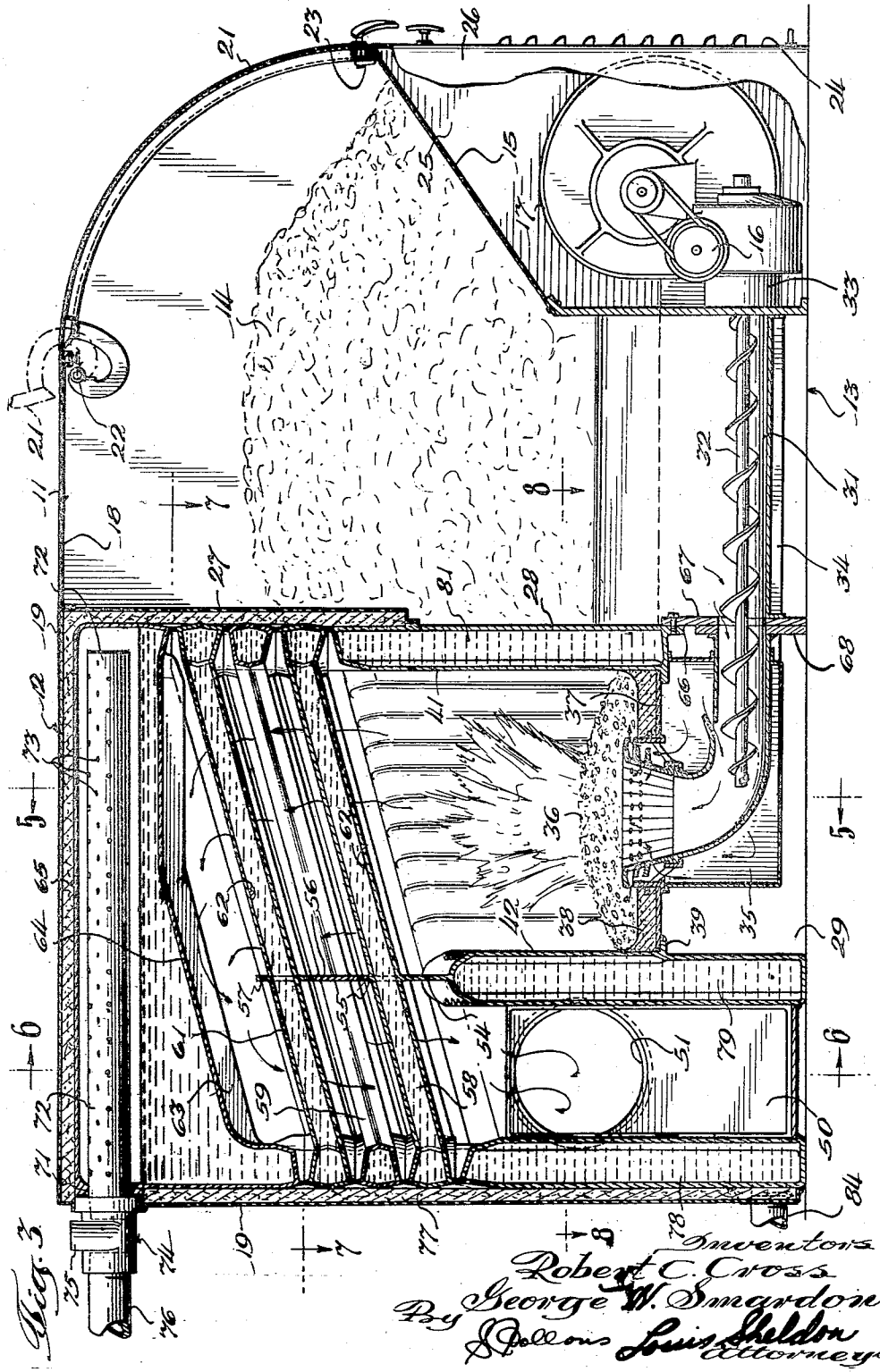


Fig. 3

Inventors
Robert C. Cross
George W. Smardon
By Dallons Louis Sheldon
Attorneys

Oct. 8, 1946. R. C. CROSS ET AL 2,408,969

STOKER BOILER UNIT

Filed Aug. 7, 1944 4 Sheets-Sheet 3

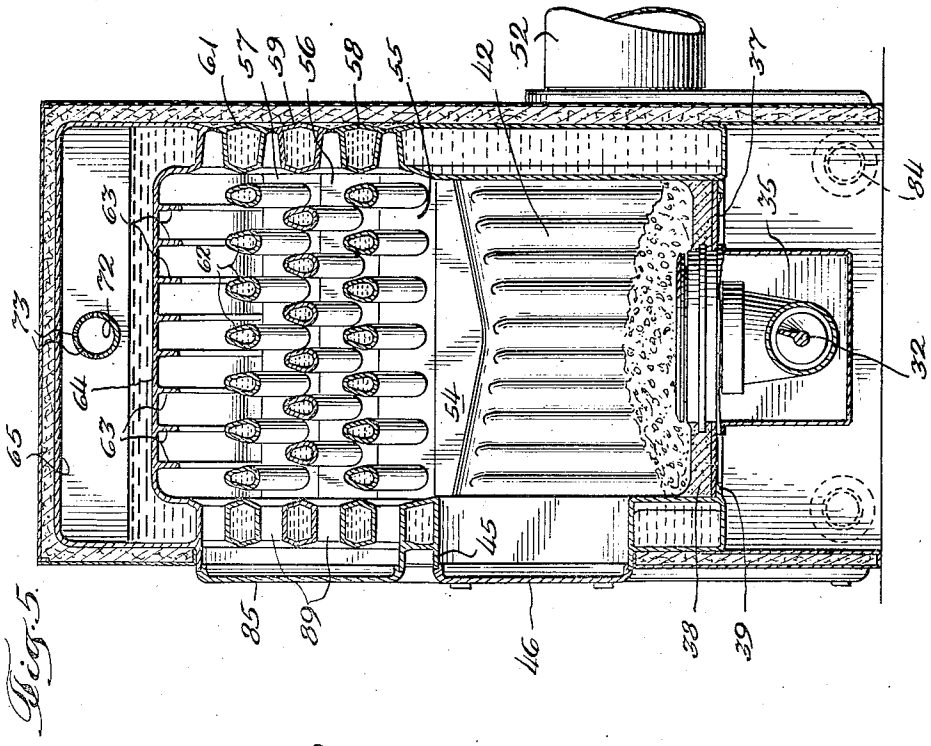


Fig. 5.

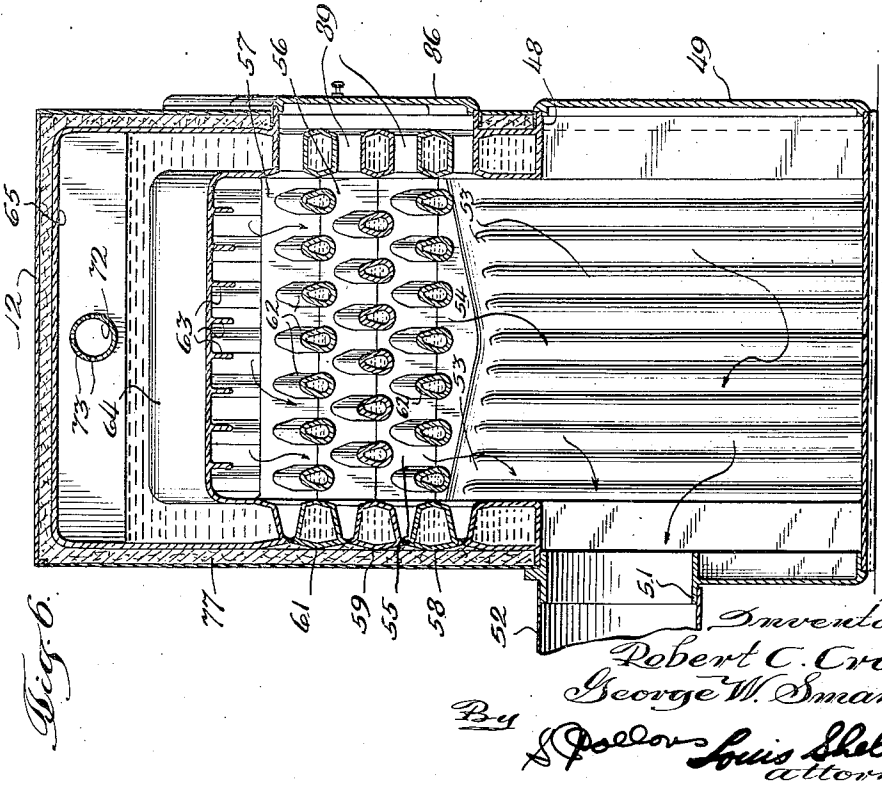


Fig. 6.

Inventors.
Robert C. Cross
George W. Smardon
By Louis Sheldon
Attorneys

Oct. 8, 1946. R. C. CROSS ET AL 2,408,969

STOKER BOILER UNIT

Filed Aug. 7, 1944 4 Sheets-Sheet 4

Fig. 7.

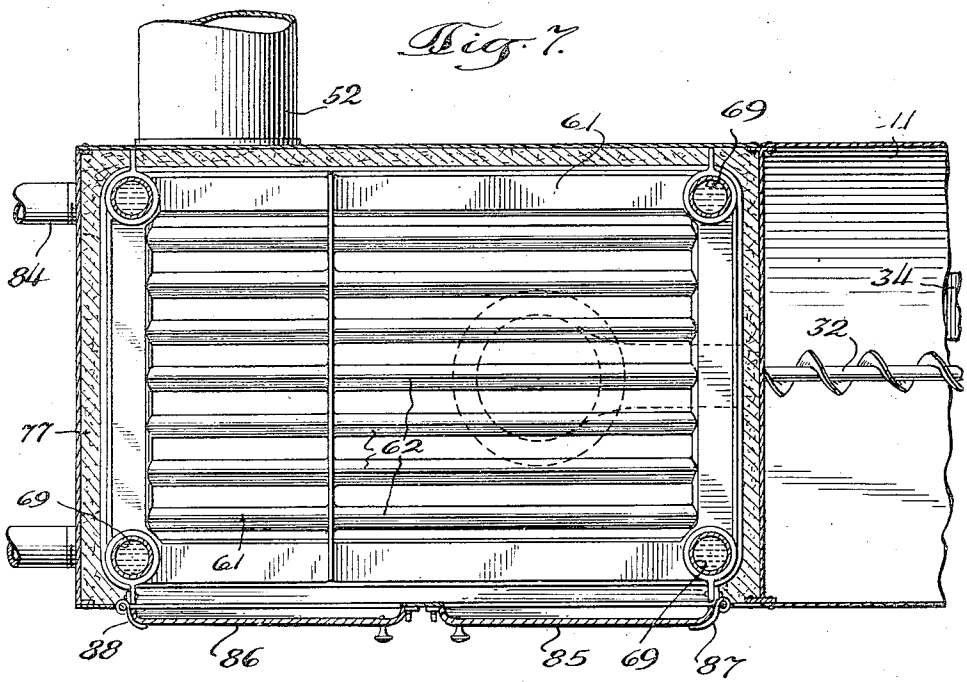
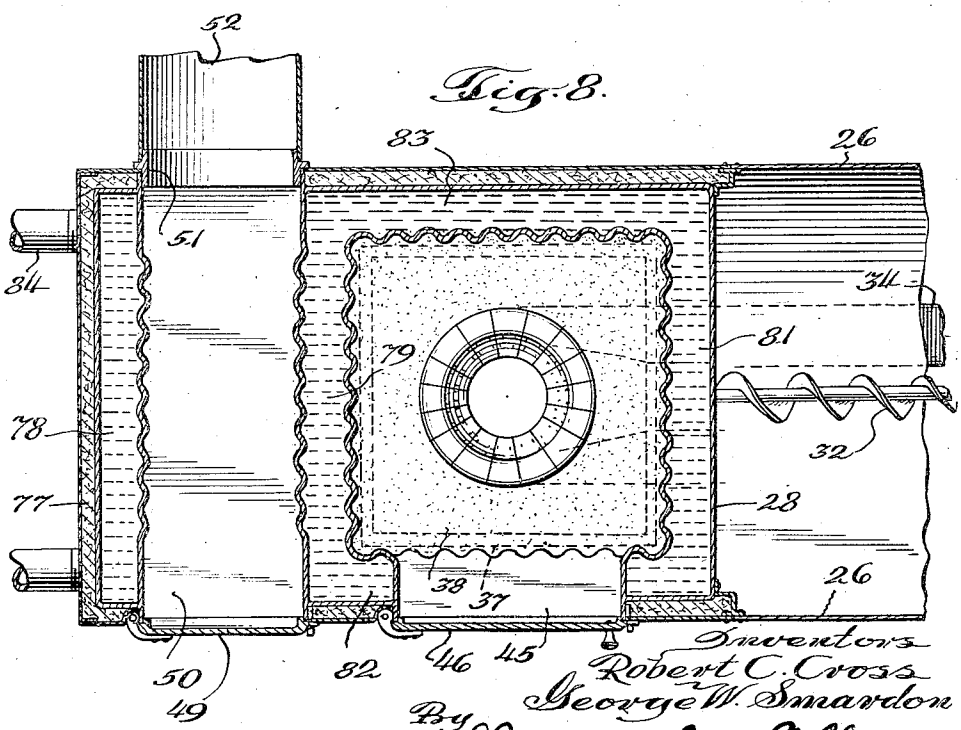


Fig. 8.



Inventors
Robert C. Cross
George W. Smardon
By Louis Sheldon
Attorneys

Patented Oct. 8, 1946

2,408,969

UNITED STATES PATENT OFFICE

2,408,969

STOKER BOILER UNIT

Robert C. Cross, Riverside, and George W. Smardon, Lombard, Ill., assignors to Sears, Roebuck and Co., Chicago, Ill., a corporation of New York

Application August 7, 1944, Serial No. 548,434

4 Claims. (Cl. 122—4)

1

The present invention relates to improvements in combined central heating plant apparatus with automatic fuel feeding mechanism contiguous therewith, and is particularly concerned with boiler construction adapted for integral association with a coal storage bin and screw feed solid fuel supply mechanism.

The principal object of the present invention is to obtain an aesthetic and mechanically efficient unit design in a hopper fed coal stoker together with a multiple section water tube boiler construction affording a combustion chamber of proper proportions, abundance of heating surface suitably disposed, a diving flue and fly ash trap with suitable accessibility, and other features hereinafter disclosed.

A further object of this invention is to obtain an aesthetic stoker boiler combination design which utilizes a minimum over-all space under conditions of maximum operating efficiency, traveling the fire stream through a course which fully utilizes the liberated heat within a volume and space complementing a fuel supply and stoker apparatus.

Customarily central heating boiler units are provided with frontal flue and combustion chamber access doors and when combined with conventional automatic coal feeding apparatus necessitate a substantial spacing therefrom in order to afford access to said doors. Such arrangement requires occupation of a comparatively large floor area with the intervening space offering no utility and frequently obstructing the passageway in the chamber where the heating plant is located. Also such mechanical combinations are usually comprised of separate differently shaped outlines totally lacking in aesthetic appeal. In addition to being unsightly, these construction characteristics entail considerable bothersomeness for cleaning, since it is recognized that coal burning apparatus is always subjected to excessive soot and fly ash accumulation both externally as well as internally of the unit.

It is accordingly a principal feature of the present design to so combine a stoker and boiler component pair as to render the exposed soot and dust collecting surfaces at a minimum while nevertheless obtaining all of the utilitarian advantages which are functionally desirable in order to make the maintenance and servicing attention most convenient for the attendant. For a better understanding of how these and other objects of the present invention are obtained, reference will now be had to the accompanying drawings and to the following detailed

2

specification, in which like reference characters represent corresponding parts throughout, and in which:

Fig. 1 is a side elevation of a combined stoker-boiler unit having embodied therein the principal features concerned in the present invention;

Fig. 2 is a front elevational view of the same apparatus;

Fig. 3 is a side sectional view of the apparatus showing the hopper, screw feed and boiler construction in transverse section;

Fig. 4 is a detailed perspective view of the boiler base casting which supports the fire bed and outlines the fire box chamber;

Fig. 5 is a vertical sectional view through the boiler unit taken approximately on line 5—5 of Fig. 3;

Fig. 6 is a transverse sectional view taken approximately on line 6—6 of Fig. 3;

Fig. 7 is a plan sectional view through the boiler unit taken approximately on line 7—7 of Fig. 3; and

Fig. 8 is a plan sectional view through the boiler unit taken approximately on line 8—8 of Fig. 3.

Reference will now be had more particularly to the accompanying drawings where specific attention is directed to the coal hopper generally designated 11, Figs. 1, 2 and 3. This element is a specially shaped enclosure defined by two sidewardly sloping upper walls (not visible in Fig. 3 because of the portrayal of the solid fuel content 14), and the inclined back bottom wall 15 which overlies the motor and blower assembly mechanisms 16 and 17 that may be of conventional design. The top and outer definition of this magazine chamber is completed by a flat top wall 18 coextensive with the jacketed boiler enclosure material 19, Fig. 3, and by a curved mortise fitting hopper door 21 which is pivoted by means of the under slung hinge bars 22 and latched by the control of a handle operated latch bolt 23. The lower extremity of the door 21 alines peripherally with the removable louvered cover 24 that conceals the stoker machinery housing space 25. The sides of the hopper chamber are flat surface plates continuing the plane of the side panels 26 which define the space 25 as well as the side surfaces of the boiler unit 19, as best indicated in Fig. 2. One wall of the hopper enclosure is formed by the forward wall of the boiler unit which includes an insulated and jacketed portion 27 that extends part way down from the top surface 19 and the adjacent lining wall 28 of the fire box base casting 29, see also Fig. 4.

A supply of coal 14 is delivered into the hopper

chamber 11 when the door 21 is swung to its open position (see dotted outline, Fig. 3) and is permitted to gravitate between sideward inclined wall sections to a lower channelway 31 wherein is disposed horizontally a stoker feed screw 32 powered through a gear box 33 and also driven as is a blower unit 17 by the motor 16. Alongside and paralleling the feed screw 32 is an air supply duct 34, Fig. 8, through which air under pressure is conveyed from right to left, Fig. 3, to be distributed in an enclosure chamber or wind box 35 to the tuyères and thus fed to the fuel bed 36. The construction of the wind box 35 and the proportions of the stoker apparatus are designed to accord with the dimensions of the instant assembly, but the details and features thereof need not be essentially different from the conventional practice.

The stoker burner apparatus extends through a hearth supporting plate 37, the surface of which is covered with a layer of refractory material 38, both resting on a ledge 39 formed around the four wall surfaces 41, 42, 43 and 44, which are vertically fluted or corrugated, as best indicated in Fig. 4. The fire box portion of the base casting is water jacketed on all sides, as shown by the broken away disclosure of Fig. 4. The side wall of the fire box, foremost in Fig. 4, is provided with an opening defined by a rim 45 against which there is adapted to fit a cast iron cleanout and servicing door 46, Figs. 1 and 5. Through this portal access may be had to the fire box chamber for purposes of periodic cleanout of clinker formations and repair. The side walls of the base casting 29 extend beyond the fire box and form defining walls of a fly ash trap chamber 50 which is similarly outlined by the water jacketed wall sections 47, the opposite side of wall 42 and the extensions of walls 43 and 44.

This chamber is accessible from one side through a rectangular rim defined opening, as at 48, which is normally closed by a cast iron door 49. The opposite side is also provided with an opening which is circular, however, and includes a smokepipe collar 51 over which is fitted the exhaust chimney pipe 52, Figs. 5 and 6. The central wall 42 is preferably sloped in both directions upwardly from the center, as best indicated in Fig. 4, at 53 so that no air accumulation might be pocketed within the water space throughout its length. A thin baffle wall, which extends vertically above the jacketed wall 42 and which begins with a lowermost wall section 54 intergrally formed with and above wall 42, continues with integral wall formations 55, 56 and 57 of the boiler sections 58, 59 and 61, requiring the products of combustion to pass over such barrier and thence be directed downwardly into the trap 50.

This downward course induced upon the exhaust gases and obtained through the design arrangement afforded by the aforediscussed baffle wall in combination with the trap chamber 59 permits the solid matter with which the exhaust gases are laden to precipitate and accumulate in the trap chamber whence they may be removed periodically through the cleanout door 49. The heat carried by the exhaust gases meanders through the labyrinth of tubes 62 of the several boiler sections 58, 59 and 61, as best indicated in Figs. 5 and 6, the latter being in staggered or offset relation to one another, thereby fully communicating with the surfaces thereof and effecting a more complete heat transfer to the water internally of said tubes. In this manner of course direction the combustion gases are forced

through the tubes once in their upward travel on the one side of the baffle wall and again in their downward travel on the other side of the baffle wall. Also these gases are brought into contiguous relationship with a plurality of heat exchange fins 63 which are integral with the bottom wall 64 of the boiler dome casting 65. It will thus be understood that by means of the compact and efficient design of the heat exchange features of the boiler a maximum and thorough transfer of the heat is effected within a small overall space as represented by the dome, sectional and lower casting members of the boiler assembly. Accordingly, the space occupied by the under-extending stoker apparatus does not diminish from the heating efficiency of the boiler unit nor does this construction require the displacement or protrusion of boiler appurtenances beyond the customary limits of conventional overall dimensions.

When viewed in plan section, all of the component elements of the boiler are rectangular and they are built up one upon another with the lower boiler casting 29 resting on its wall sections 42 and 47, as best indicated in Figs. 3 and 4, its forward wall 28 being provided with a flange 65 to which is bolted a face plate 67, Fig. 3. Plate 67 is provided with an opening through which the feed screw 32 extends and to which is secured the retort casting face flange 68. The upper perimeter of the base casting 29 presents a surface inclined from the horizontal, as best indicated in Fig. 3, and upon this surface are stacked a plurality of boiler sections 58, 59, etc., seen in plan view in Fig. 7, all held together by means of push nipples 69, at the corners of the several sections. The dome casting 65 is provided with an opening as at 71 through which is received a dry pipe 72 provided with upper surface perforations 73 after the conventional boiler design practice for use when the unit is employed in a steam heating system, to insure against water particle intake. The dry pipe 72 is preferably secured by threading within a special pipe fitting 74 provided with vertical horn formations 75 for receiving immersion type appliances or control devices and with a header 76. The boiler section tubes are preferably of inverted tear-drop cross-section just as and for the same object as used in the boiler construction featured in co-pending application Serial No. 529,986, filed April 7, 1944.

In order to insure against conduction heat losses, the entire boiler assembly is lined on its outer surfaces with a layer of heat insulating material 77, such as rock wool, spun glass, etc., and thereover covered by a metal lining 19. Water is heated in the jacket spacings 78, 79, 81, 82 and 83, surrounding the fire box chamber 36 as well as those surrounding the ash trap chamber 50. In addition to these sources of heating, the water which is contained in the tube sections 62 is heated by the circulating combustion gas stream which rises above the combustion chamber and thence descends into the ash trap chamber.

The flow of water within the boiler assembly is predominantly from left to right, Fig. 3, due to the inclined arrangement of the boiler sections 58, 59, etc., so that the hottest water currents which obtain during any prevailing condition are presented near the forward end of the boiler or at the intake end of the dry pipe 72. Return water is drawn into the jacket chamber 78, through the return pipe 84. Pursuant to conventional practice, two return pipe openings may be provided in the casting wall of the base cast-

ing at opposite corners and in the same manner two header connections for receiving fittings 74 may be provided in the dome casting, with the installation of feeding connections optional to accommodate particular conditions or requirements. This design is adaptable for use with either hot water or steam heating systems and for the latter usage conventional water level maintenance apparatus may be applied outside the header casting in accordance with customary practice.

Referring now again to Fig. 1, it will be observed that the jacketing wall is, in addition to the openings for doors 46 and 49, provided with a pair of parallogrammatic cleanout doors 85 and 86, the former pivoted on pintle hinges 87 and the latter at 88. When the doors 85 and 86 are swung open into their dotted line positions, access is afforded to the spaces 89 which intervene the boiler sections and through which tube cleaning brushes may be inserted for removing ash and soot deposits from the upper surfaces of the section tubes 62, Figs. 5 and 6.

While the present invention has been explained and described with reference to a particular embodiment, it will be understood, nevertheless, that numerous variations and modifications may be incorporated without departing from the essential spirit and scope thereof. Accordingly, it is not intended to be limited by any of the detailed illustrations in the accompanying drawings, nor by the particular language employed in the foregoing specification, except as such limitations are indicated in the hereunto appending claims.

The invention claimed is:

1. A boiler-stoker combination unit comprising a substantially rectangular boiler assembly made up of a bottom casting affording an inclined top surface, a plurality of inclined section castings superimposed one upon another upon said bottom casting, a dome casting having an inclined bottom surface of substantially supplementary angle to said bottom casting inclined surface, said bottom casting and said boiler section castings have intermediate their length component wall section elements for contiguous alinement to form a flue barrier, a water jacketed wall portion in said bottom casting constituting a continuation of said barrier and dividing said bottom casting into a fire chamber and a fly ash trap chamber, a stoker retort extending under a portion of said bottom casting for communicating with said fire chamber whereby gaseous products of the combustion supplied with fuel through said retort may be drawn by an exhaust flue draft over said barrier wall, thence downwardly into said fly trap chamber traversing during its course said boiler section castings during both upward and downward passage before being exhausted through said trap chamber.

2. A boiler-stoker combination unit comprising a rectangular boiler assembly of a base casting presenting a top surface inclined to direct the thermal flow of contained heating fluid, a plurality of section castings superimposed one upon another upon said inclined top surface of said base casting, a dome casting having a bottom surface of substantially supplementary angle to said base casting inclined surface, a draft barrier intermediate said section castings, a fire chamber enclosure portion to said bottom casting disposed at one side of said barrier and an ash trap chamber on the other side of said barrier wall, a stoker retort extending under a portion of said bottom casting for supplying fuel to said combustion chamber, and flue draft means whereby combustion products may be drawn over said barrier wall, thence downwardly into said fly trap chamber traversing during its course said boiler section castings during both upward and downward passage.

3. A combined heating unit for firing a rectangular boiler assembly comprising in vertical alinement, a lower base casting having an undercut clearance for the admission therethrough of a stoker retort element, a plurality of inclined water tube boiler castings and an uppermost enclosing dome casting, all of said sections being waterjacketed and intercommunicating to form a continuous sealed chamber for connection to a heating system, a partition part of which is formed in said base casting and other parts of which are formed in said inclined water tube boiler castings for dividing the internal chamber of said assembly into a combustion chamber and an exhaust chamber, exhaust flue draft means connecting with the lower extremity of said exhaust chamber whereby products of combustion are drawn from said combustion chamber over said partition thence downwardly through said exhaust chamber for expulsion, and a coal supply and magazine auxiliary mechanism having conforming lines horizontally with said boiler assembly and including a hopper, a fuel propulsion worm and power means for operating said worm under periodic supervision for directing fuel from said hopper into the region beneath said combustion chamber.

4. In a base casting for stoker operated hot water or steam boilers, a unitary casting comprising an inclined plane upper extremity defined by four vertical wall portions each water jacketed and provided with intercommunication orifices, an intermediate dividing wall section connecting with the side walls of said casting also water jacketed and intercommunicating with said water jacketing of said side wall sections, portions of said side walls and the forward wall of said base casting being undercut so as to provide a nethermost clearance whereby is afforded accessibility for the retort mechanism of a fuel feeding stoker, and a fire bed supporting plate having a central opening for admitting a retort mechanism and supported by ledge formations extending inwardly perimetrically from said side walls, front wall and said intermediate wall section.

ROBERT C. CROSS.
GEORGE W. SMARDON.