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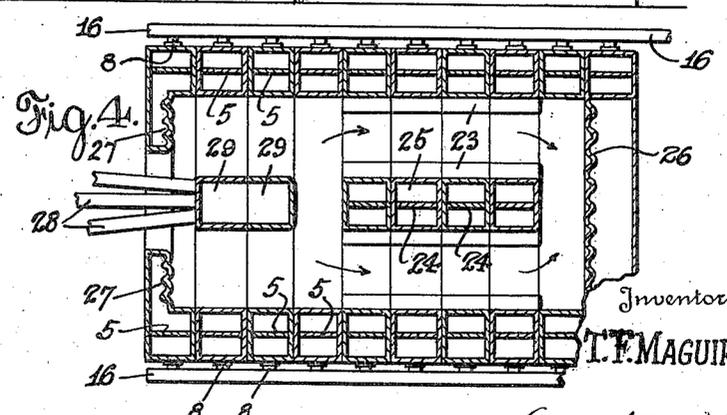
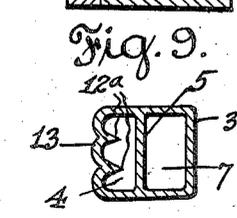
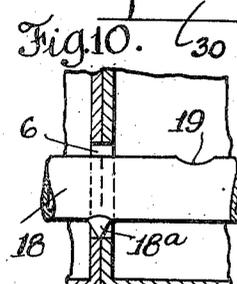
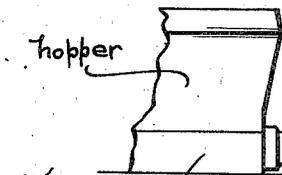
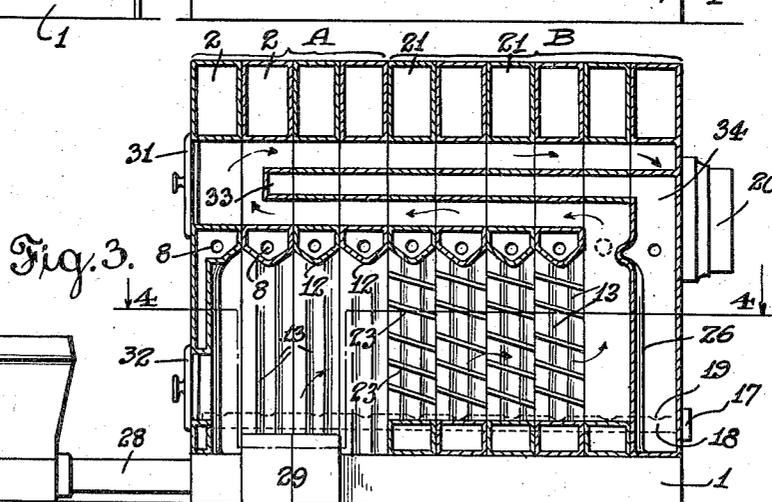
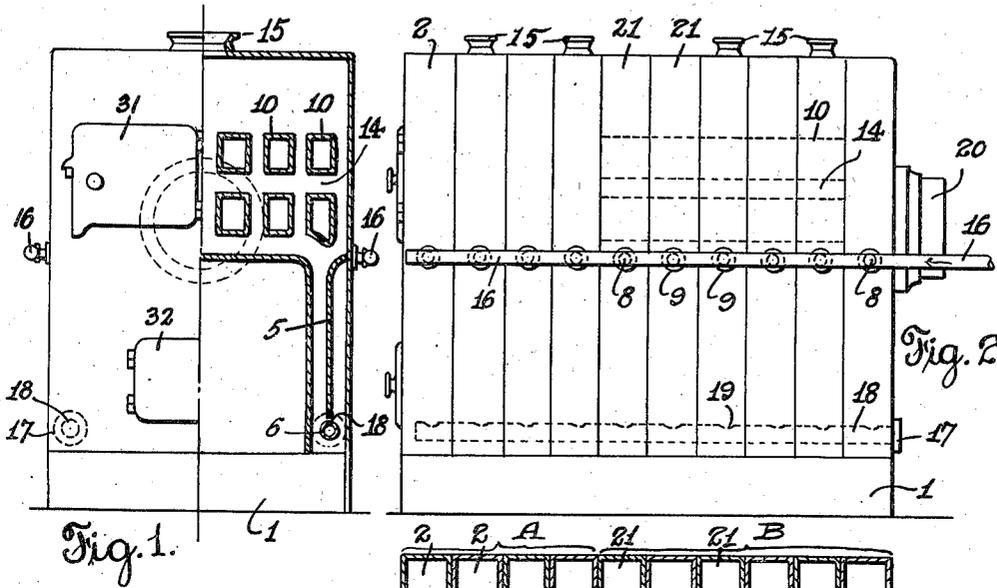
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2,125,795

CAST IRON STEAM, VAPOR, AND HOT WATER BOILER

Filed June 16, 1936

2 Sheets-Sheet 1



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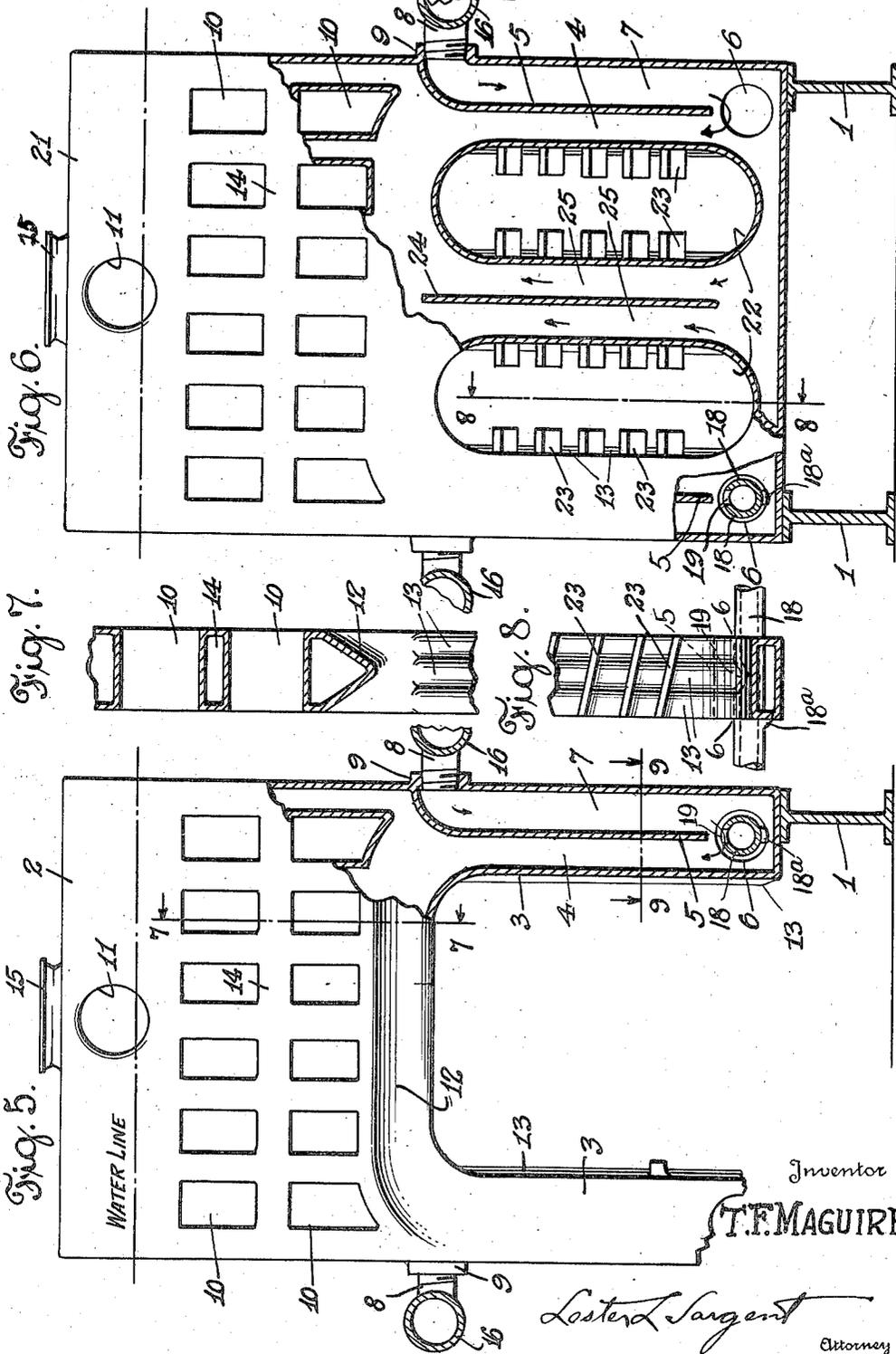
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UNITED STATES PATENT OFFICE

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CAST IRON STEAM, VAPOR, AND HOT WATER BOILER

Thomas F. Maguire, Charlotte, N. C.

Application June 16, 1936, Serial No. 85,578

4 Claims. (Cl. 122—225)

The object of my invention is to provide improvements in and original designs on sectional cast iron steam, vapor and hot water boilers to cause a more rapid circulation of the hot water and adapted both for hand fire and stoker fire installations.

It is also an object of my invention to provide furnace sections of different types for the front and rear portions of the furnace, and also to provide novel means for supplying returned waters to each of the various sections of the boiler, to provide a construction which will increase the water-holding content of the boiler, and in doing this place the increased water body or volume in positions where it is most needed and most available to absorb rapidly and efficiently the greatest percentage of the heat units and energy generated. It is also an object of my invention, besides increasing the positive and rapid circulation of all the waters in the waterways of the boiler, to also increase the boiler steam liberating area. It is also my object to provide a construction that will result in a marked improvement in the steadiness of the boiler waterline and prevent surging of water in the boiler; and to provide sections which are in a way separate boilers themselves, as far as the supply of returned water and the delivery of steam generated is concerned.

I attain these and other objects of my invention by the apparatus disclosed in the accompanying drawings, in which—

Figure 1 is a view of the boiler partly in front elevation and partly in vertical section;

Fig. 2 is a side elevation of the entire boiler;

Fig. 3 is a vertical longitudinal section through same;

Fig. 4 is a horizontal section on line 4—4 of Fig. 3, the corrugations of the inner walls of the units being omitted from this figure merely for convenience in illustrating;

Fig. 5 is a face view partly in front elevation and partly in vertical section of any one of the A sections of the boiler;

Fig. 6 is a similar view of any one of the B sections of the boiler the pipe 18 being omitted from the right hand leg to clearly show the aperture 6;

Fig. 7 is a vertical section on line 7—7 of Fig. 5;

Fig. 8 is a vertical section on line 8—8 of Fig. 6;

Fig. 9 is a horizontal section on line 9—9 of Fig. 5, and

Fig. 10 is a vertical section through one of the side water legs.

Like numerals designate like parts in each of the several views.

Referring to the accompanying drawings; I provide suitable base supports 1 extending longitudinally of the boiler and supporting a series of sections such as the A and B sections indicated in Fig. 3 of the drawings, which, as shown in Fig. 3, constitute the boiler. In the front of the furnace is provided a series of A sections designated 2, and in the rear of the furnace is provided a series of B sections designated 21. Fig. 5 shows a face view of one of the A sections 2. The member 3 designates the hollow legs of the A sections. Within each of the boiler legs 3 are vertical partitions 5 separating the legs into vertical passages 4 and 7. In the lower portions of the legs below the bottom ends of the partitions 5 are intercommunicating passages 6 between the adjacent A sections. As shown in Figs. 6 and 2, member 8 is a conduit for the inflow of water into the outer vertical passage 7 in the hollow leg 3 of the A and B sections. Member 9 is a boss in which the end of the pipe 8 is screw-threaded.

Members 10, as shown in Figs. 1 and 5, are gas chambers or passages extending horizontally through the upper portion of the furnace and are surrounded by the water passages 4.

Member 11 is an intake port into the upper portion of the respective furnace sections, the major portion of which is usually above the water line.

The fire-box arch is provided with overhead corrugations 12, and with vertical corrugations 13, as shown in Figs. 3, 5 and 7, and with vertical fins 12a projecting into the water chamber 4, as shown in Fig. 9. Members 15 are steam (or water) ports with which are connected the pipes which carry the steam or hot water to the places desired, over the building.

Each of the sections such as the A and B sections shown in Fig. 3, is provided with lateral short water-pipes 8, as shown, which in turn connect with the outside horizontal conduits or headers 16, which extend longitudinally of the boiler, as shown in Figs 2 and 4.

Member 17, (Figs. 1, 2 and 3) is a collar or port through which the pipe 18 extends horizontally of the boiler near the lower portion of the respective legs, as shown in Fig. 3. The pipes 16 are provided with a series of spaced apertures 19 opening into each of the respective sections to which the pipe extends, as indicated by the dotted lines in Figs. 2 and 3. Member 20 is a smoke-stack column.

Referring to Fig. 6, which illustrates one of the B sections, the numeral 21 indicates the body portion of a B section. The B section has spaced gas flues 22 with baffles 23 projecting into the

flues to retard and deflect the gas flow. A vertical partition 24 spaced half way between the flues 22 divides the space into separate passages for the flow of water around the respective flues. Member 26 (shown in Fig. 4) is the corrugated interior rear wall of the back or rearmost section of the series of sections. Member 27 (shown in Fig. 4) is the corrugated front wall of the first of the sections.

Members 28 are fuel feeder pipes leading from the coal feeder mechanism 30 to the fuel box 29, as shown in Figs. 3 and 4.

As shown in Figs. 4 and 6 the auxiliary external headers 16, which are connected to the tapped side opening of each section, supply all sections on both sides through the outer waterways 7, thence under partition 5 and upwards to waterways 4 with their proper and required volume of the return waters entering the boiler through these passageways.

At 18 are shown internal headers which perform similar duties as do the external headers, and by which the supply of return waters are equally and properly returned to each section through the openings 19 in the top of headers 18, as shown in dotted lines in Fig. 2 and directly on the center line of the legs of the respective sections. These headers can be made of cast iron, wrought iron, brass or copper tube. On the outside end of and as part of the header construction is placed a flanged connection 17, which flange is bolted on or otherwise fastened to the outside face of the back section, as shown in Fig. 2. The other end is made closed. Proper sized openings 19 are provided through which each section is supplied its demand of returned waters entering the boiler through this channel. The size of headers 18 and also of the top ports 19 will be in keeping with the volume of water returned to boiler, and further will be suitably proportioned so as to be placed inside of the boiler nipples 17. On the bottom of the headers will be placed suitable conventional rest lugs which will set on the nipples and which will properly support these headers so as to place no undue strain on either the flange on the back of the boiler or on the connection of this flange and the header tube.

As shown in Figs. 1, 5 and 6 vertical partition 5 which is midway between the inside and the outside walls of leg of boiler sections and which partition closes outwardly at a point about one inch above the crown sheet of fire-box, extends downward solidly to a point immediately above the boiler nipple ports 6, and it is through the opening below terminating point of partition 5 which permits passage of waters from outside waterways 7 to the inside waterways 4.

As shown in Fig 4, a vertical separating partition 24 in the center vertical waterway of the B sections as well as in the section next to back section, which is termed the "uptake section" is for the purpose of dividing the upward moving column of water into smaller streams which will result in a more positive and faster circulation of water and at the same time secure a more rapid transmission of heat units from the gases in combustion chambers to the water in waterways.

Referring to Fig. 9, the internal vertical circulating and heat transmission fins 12a are on the inside walls of the sections, which walls are exposed to the heat of the fire-box as well as of the combustion chambers. The various surfaces of the section units are preferably corrugated, as shown, and include those of the fire-box, rear

combustion chambers, front and back sections, and extend from the bottom of each section unit to a point near crown sheets. The waterways which form the ceiling of the fire-box are of drop angle face, as illustrated in Fig. 7.

The external baffle and retarding or deflecting fins 23 which are part of the vertical walls of the gas chambers forming the rear combustion chambers retard and direct to a lower level the gases of combustion which have left the fire-box, or stoker combustion chamber, the benefits of these fins 23 being that in retarding the velocity of the gases they give the boiler heating surfaces a better opportunity of absorbing the heat energy of the gases, and the redirecting feature will cause the heated gases—which naturally take as high level flow as possible—to be thrown out and down. Thereby a more even temperature of the gases is obtained in this part of the boiler. Although the drawings show only one vertical upflow column of the B sections, this space can, if the width of the sections and other conditions permit, be supplied with two, three or even four of these columns.

A feature of all these improvements over the prior art will be to increase the water-holding content of the boilers, and in doing this I place this increased water body or volume in positions where most needed and most valuable to absorb rapidly and efficiently the greatest percentage of the heat units and energy generated. Further, this increased water content is so placed in the construction as to increase the rapid and positive circulation of all of the waters in waterways of boiler, and the construction is such as to also increase the boiler steam-liberating area.

The construction of the sections, together with the individual supply of the return waters through the external headers 16 and the internal headers 18 to the waterways of the sections will result in a marked improvement in the steadiness of the boiler water line. Surging of water in the boiler is principally caused from the heaviest streaming sections picking up a too great portion of the return waters and then letting go of the excess, which process keeps the water line fluctuating and it is the back section which is the worst performer in this respect. Each section of my new boiler is in a way a separate boiler in itself as far as its supply of return water and its delivery of steam generated is concerned.

On stoker-fired boilers I use a stoker special front section, and the proper number of A sections, which number is determined by the required volume of space necessary for the amount of coal to be burned per hour. I then add to the assemblage the called-for number of B sections and after these comes the uptake section which is a B section with the upper ceiling waterways removed. Then comes the back section with its corrugated fire surfaces.

On the hand-fired boilers I use a standard front, no base, grate lugs on all sections, and one uptake section, one back section and the balance of sections will be all A sections and of the required number to make up the size or capacity of boiler called for.

As shown in Fig. 9, the internal vertical fins are built up through the corrugated surface on face of sections. I use an extra large boiler nipple for top nipple ports. Also I carry the water line up into this nipple and nipple port opening a short or predetermined distance, the purpose of doing this being to get a better flow distribution of the waters immediately below the steam chamber and

to further increase the steam-liberating area. Locating this water line as indicated, which permits each section delivering a portion of its heated water into the nipple port way, will permit of using but one supply connection for the operation of an external indirect hot water heater such as "Excelso" or "Taco". On the present boilers it is necessary to tap each individual section at a point below water line of boiler and to bring each of these openings together into a main supply header which in turn is connected with the supply opening of the external heater.

On the old type of cast iron sectional boiler it was found necessary in order to get a positive, upward, uninterrupted and rapid circulation of the heated water to restrict the volume in the lower water leg section. Now by bringing to each section through the auxiliary return header and its tapped opening an individual supply of return water I accomplish the following: First, I increase the volume of water in that portion of the boiler sections surrounding the fire-box area and around the combustion chambers, and this is where large volumes of water which when kept moving in the right direction are most valuable; second, by reason of my partition, I separate the streams of cooler return waters from the heat-absorbing inside column of waters, through this construction and accelerate the movement of the water on the heat-absorbing side of the sections and move this water in a positive and upward path and without producing any eddying, such as is common in the old type of construction where the inner wall of hot water has to flow by and against the colder strata of water on the outside wall of section. Another advantage over the old types of construction is that the heat loss by radiation through the outer walls of the thin water leg sections will now not be such a loss, as it will now be absorbed and accounted for in the increase of temperature of the outer return waters.

What I claim is:

1. In a boiler of the type described, a series of sectional vertical hollow water containing units, each unit constructed with two horizontally spaced openings to provide fire chambers with a water chamber therebetween and water chambers at the sides of the unit, return water headers in connection with each of the aforesaid units, inwardly projecting heat absorbing vertical fins projecting into the water chambers, vertically disposed chambers forming a partition midway between the walls of the spaced fire chambers to provide an upward flow of water in separate bodies of water, and vertically extending parti-

tions within the series of sectional vertical hollow water containing units dividing said series of sectional vertical hollow water containing units into vertical passages for the down flow and up flow of water, said vertical passages communicating with each other for the up flow of water adjacent the fire chamber.

2. In a boiler of the type described, a series of sectional vertical hollow water containing units, each unit constructed with two horizontally spaced openings to provide fire chambers with a water chamber therebetween and water chambers at the sides of the unit, return water headers in communication with each of the aforesaid units at a point approximately half way up the sides of said units, partitions in the legs of said units extending from a point just above the connection of the headers with the unit to a point near the bottom of the units to provide outside waterways for the downflow of the water and inside waterways for the upflow of the water adjacent the walls of the fire chambers, a second series of units having slanting spaced baffles projecting into the fire chamber to absorb heat.

3. In combination with the boiler defined in claim 2, headers at each of the longitudinal sides of the walls and disposed in the lower portions of the legs of the respective sections and having openings disposed in the central upper portions of said headers in each of the respective section units for the flow of water thereto from said headers.

4. In a boiler of the type described, a series of sectional vertical hollow water containing units, each unit constructed with two horizontally spaced openings to provide fire chambers with a water chamber therebetween and water chambers at the sides of the unit constituting water legs, a plurality of return water headers in communication with each of the aforesaid units at substantially spaced portions of said units to cause a constant circulation of water therein, some of the units having inwardly projecting heat absorbing fins extending into the water chambers, sectional units having the water legs provided with vertically disposed partitions extending from a point just above the plane in which the outside headers connect with the boilers to a plane spaced from the bottom of the units, said partitions being disposed midway between the walls of the unit to divide the water chambers into outside and inside waterways communicating with each other at one end only to increase the circulation of water.

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