

May 4, 1937.

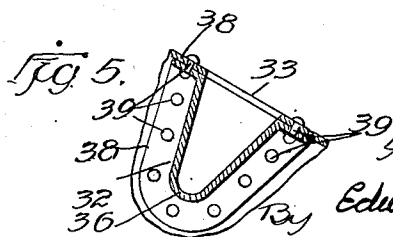
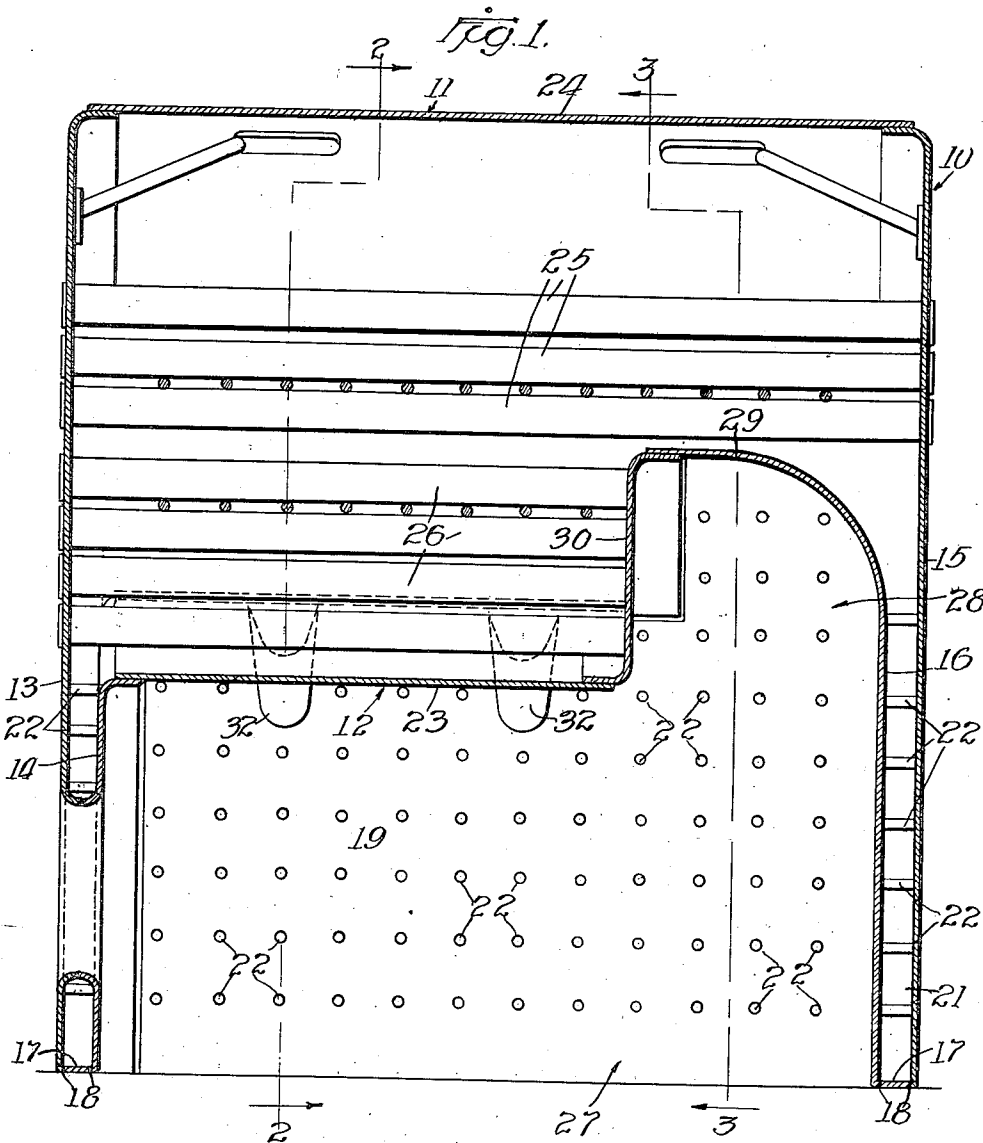
A. C. GRIST

2,079,503

BOILER

Filed May 13, 1936

2 Sheets-Sheet 1



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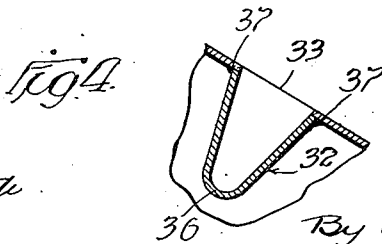
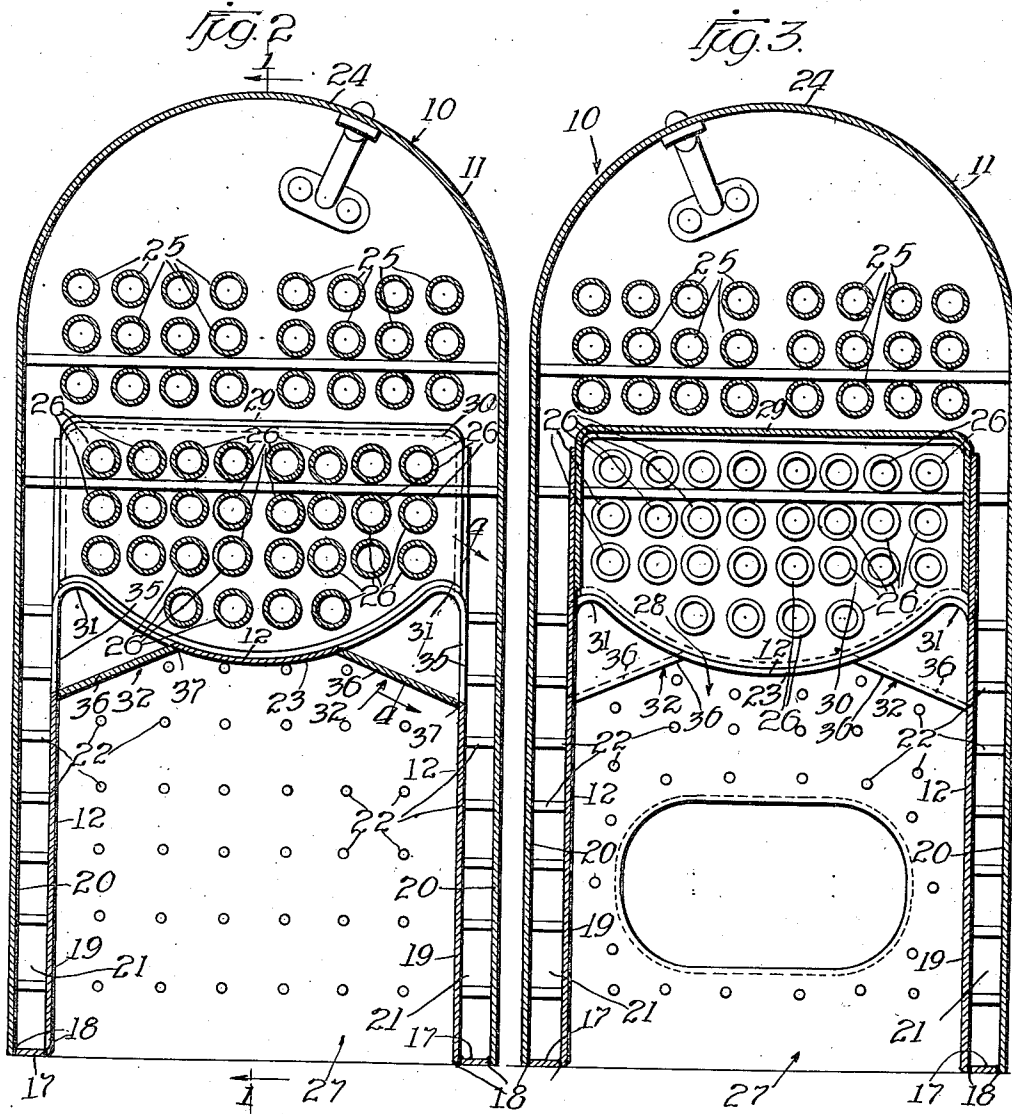
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BOILER

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2 Sheets-Sheet 2



Witness:  
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## UNITED STATES PATENT OFFICE

2,079,503

## BOILER

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Application May 13, 1936, Serial No. 79,531

6 Claims. (Cl. 122—74)

This invention relates to improvements in boilers and has special reference to improvements in heating boilers of the character disclosed in U. S. Patent No. 1,393,741, designed particularly for low pressure heating, the improvements relating specifically to means for strengthening and bracing the boiler structure against distortion and making the structure self supporting such as will make it capable of use as a high pressure boiler.

The boiler structure to which this present invention particularly relates is one which has an outer wrapper sheet, and an inner fire-box sheet forming the fire box crown sheet, and it is the especial object of the invention to provide braces for the crown sheet which will preserve it against distortion by high internal forces on pressures and at the same time due to the construction and shape of the brace, it is exposed to the products of combustion on one side and to the boiler water on the other side. Then, due to this condition and similar to the other firebox sheets, it will withstand the action of the products of combustion, holding its original shape and will not burn out.

Other features of advantage and benefit will become apparent from the following description taken in conjunction with the appended claims and the accompanying drawings, in which a preferred embodiment of the invention is portrayed. It should be understood however that such portrayal and description is typical of the invention and it is not intended that the invention shall be in any wise limited thereby.

Figure 1 is a longitudinal, vertical, central section on line 1—1 of Fig. 2;

Figs. 2 and 3 are vertical transverse sections on the lines 2—2 and 3—3 respectively, of Fig. 1;

Fig. 4 is a detailed, fragmentary section on the line 4—4 of Fig. 2; and

Fig. 5 is a section similar to Fig. 4 but showing a slight modification.

The boiler 10 as shown is of the internal fire-box type and has an outer inverted U-shaped wrapper sheet 11, an inner M-shaped fire-box sheet 12, a front end outer sheet 13, a front end inner sheet 14, an outer rear end sheet 15, and an inner rear end sheet 16. The lower edges of the several inner and outer sheets are arranged co-incident and they are spaced apart and secured together by a bottom plate or ring 17. This ring 17 fits in between the lower edges of the inner and outer sheets and is preferably welded at its inner and outer edges to the inner and outer sheets as shown at 18. Between the vertical side parts 19 of the inner fire-box sheet and

20 of the outer wrapper sheet are what are termed water legs 21, and as usual in such construction these parts are held in their spaced relation by numerous stay bolts 22.

As shown, the crown sheet part 23 of the inner fire-box sheet is spaced some distance below the top 24 of the outer wrapper sheet to form the boiler proper which contains an upper set of longitudinally extending tubes 25 and a lower set of tubes 26.

The inner fire-box sheet and the front and rear inner end sheets define a fire box space 27, and this space is extended upwardly at its rear end, as shown, to form an auxiliary combustion space 28. This auxiliary combustion space is formed by the upper part of the inner rear end sheet 16, an auxiliary crown sheet 29 formed in conjunction with the rear end portions of the inner side sheets 19 and a vertically arranged tube sheet 30 which is joined at its lower edge to the rear edge of the main crown sheet 23 and at its other edges to the forward edges of the parts of the inner fire box sheet which form the auxiliary combustion space.

The lower set of tubes 26 extend from the outer front end sheet 13 to the auxiliary tube sheet 30. The upper set of tubes 25 extend from the outer forward end sheet 13 to the outer rear end sheet 15.

It should be understood that to complete the boiler, a smoke box is provided at the forward end to connect the two sets of tubes and that at the rear end the upper set of tubes are connected by suitable means to a smoke stack for the disposal of the gaseous products of combustion.

As shown in the drawings preferably, in order to provide a maximum of water space in the boiler, the crown sheet 23 is reversely curved, in other words it is curved downwardly transversely of the boiler. This form of crown sheet rounds out the upper cylindrical part of the boiler and provides space for a number of the lower set of boiler tubes.

As thus formed a boiler of this kind is amply strong for the pressures used in what is termed "low pressure heating" but when it comes to the high pressures used in what is termed "high pressure power" it is desirable and even necessary to strengthen, brace or stiffen the curved crown sheet part 23, at the angles between said portion and the side sheet portions 19, in addition to the usual stay bolts.

It is to be noted that in forming the fire-box 12 of the form shown, the reversely curved crown sheet part 23 is joined to the side sheets or por-

tions 19 of the fire-box sheet 12 by upwardly curved connecting portions 31.

It is obvious that high internal forces or pressures would tend to force the reversely curved connecting portions inwardly or away from the outer wrapper sheet 24 producing a destructive or distorting bending lever action which must be overcome by means of braces or stiffening members.

For strengthening and bracing the curved crown sheet part 23 at its reversely curved bends 31 to prevent the inner fire box sheet 12 pulling away from the outer wrapper sheet 24, at such curved bends, I provide hollow braces or stiffening members 32 which extend from the outer portions of the crown sheet part 23 to the side sheet portions 19 below the curved connecting portions 31 and which connect the reversely curved crown sheet part 23 with the side sheet portions 19.

Preferably these hollow braces or stiffening members 32 are U-shaped the open sides 33 thereof being presented toward the interior of the boiler and the portions of the fire-box sheet within the margins of the hollow braces or stiffening members being cut away as shown at 35.

This construction provides inclined channels 36 which connect the upper parts of the side water legs to the space within the reversely curved crown sheet part 23 and obviously will present an increased amount of direct fire or heating surface to the products of combustion over the older forms.

These hollow braces or stiffening members are spaced apart longitudinally of the fire box and the number provided depends on the radius and length of the crown sheet part 23 of the sheet 12 of the fire box.

It is to be noted that these hollow braces 32 are arranged diagonally and that it would practically be impossible for mud to settle in them also that they project downwardly and inwardly into the upper portion of the fire box space in such position that they best serve as additional means for transmitting the heat of the burning gases to the water in the boiler.

The hollow braces or stiffening members 32 may be made of separate pieces preformed into the shape desired and then secured at their edges to the inner side of the fire-box sheet 12. They may be secured by welding as shown at 37 or they may be provided with suitable outwardly extending peripheral flanges as shown at 38, and

the braces secured in position by suitable rivets 39 passing through these flanges.

It is usual in applying these hollow braces to secure them by welding, in a boiler which has welded seams and to secure them by rivets in a riveted boiler.

I claim:—

1. In a boiler, a fire box having side sheets and a crown sheet, a hollow brace or stiffening member extending into the fire box and joining the crown sheet to the upper part of a side sheet, said brace being open on its upper side and in free communication throughout its entire length with the interior of the boiler.

2. The invention as defined in claim 1, the crown sheet and side sheets of the fire box being formed of a single sheet of metal.

3. The invention as defined in claim 1, the crown sheet being curved downwardly and joined at its lateral edges to the side sheets by reversely curved portions, the hollow brace or stiffening member being U-shaped and hollow and its interior being in open communication, its entire length, with the interior of the boiler, and its lower wall being inclined downwardly toward a side sheet below and adjacent to one of said reversely curved connecting portions.

4. In a boiler having an inner M-shaped sheet forming the crown sheet portion and the side sheet portions of the fire box, the crown sheet portion being downwardly curved and joined to the side sheets by reversely curved connecting portions, and a hollow brace or stiffening member spanning said connecting portion and joining the upper part of a side sheet portion to the downwardly curved crown sheet portion and arranged below and adjacent to the reversely curved connecting portion, the interior of the hollow brace or stiffening member being in open communication its entire length with the interior of the boiler.

5. In a boiler having a fire box provided with side sheets and a crown sheet, hollow braces or stiffening members arranged in the angles between the crown sheet and the side sheets, the interiors of the hollow braces or stiffening members being in open communication, their entire length with the interior of the boiler.

6. The invention as defined in claim 5, and the bottom wall of the braces or stiffening members being inclined downwardly toward the side sheets.

ALPHEUS C. GRIST.