

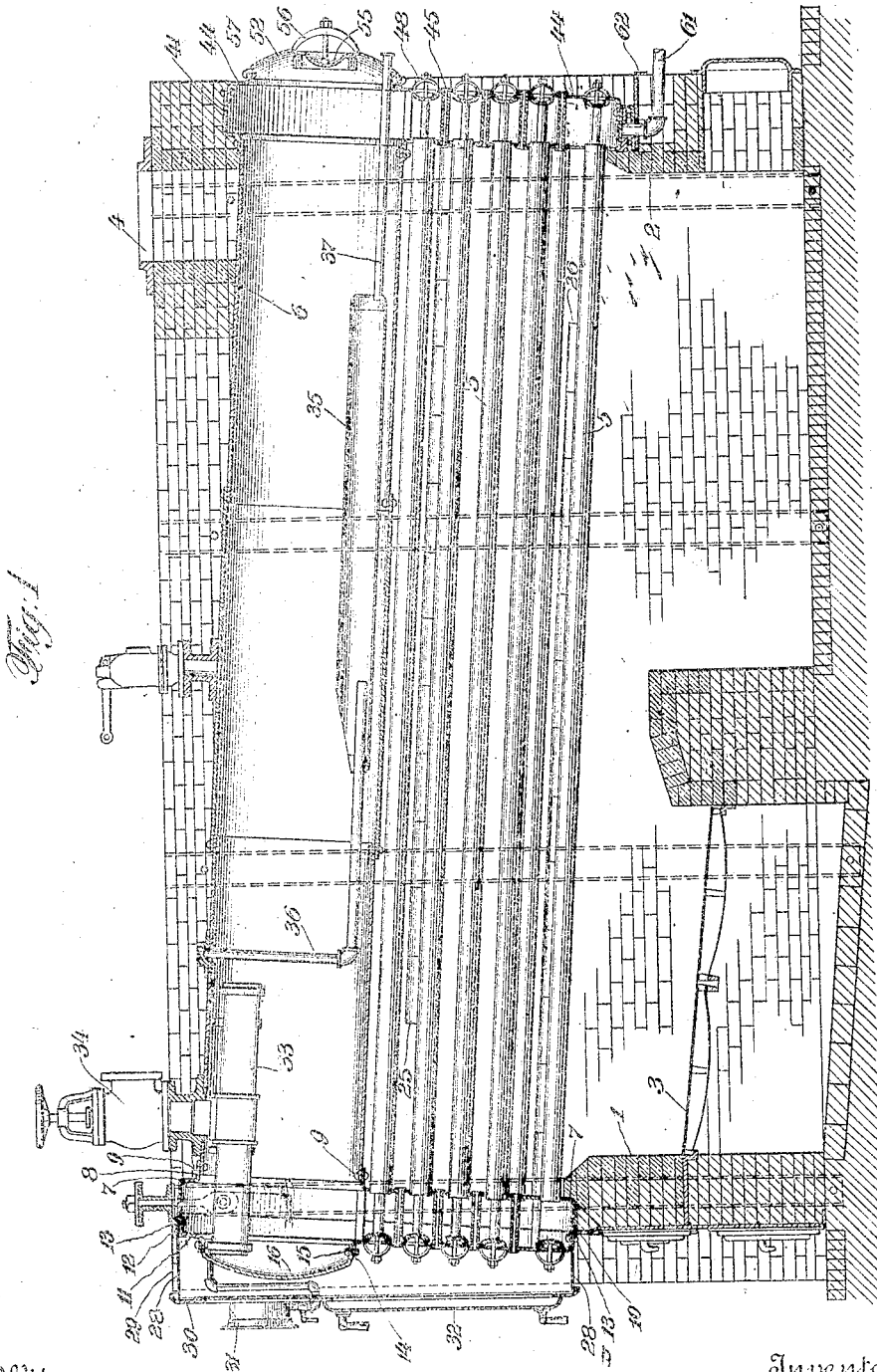
E. M. WILKINSON.
BOILER.

APPLICATION FILED NOV. 16, 1908.

Patented Dec. 6, 1910

3 SHEETS-SHEET 1.

977,915.



Witnesses:
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John O. Humphreys

Inventor
E. M. Wilkinson
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E. M. WILKINSON.

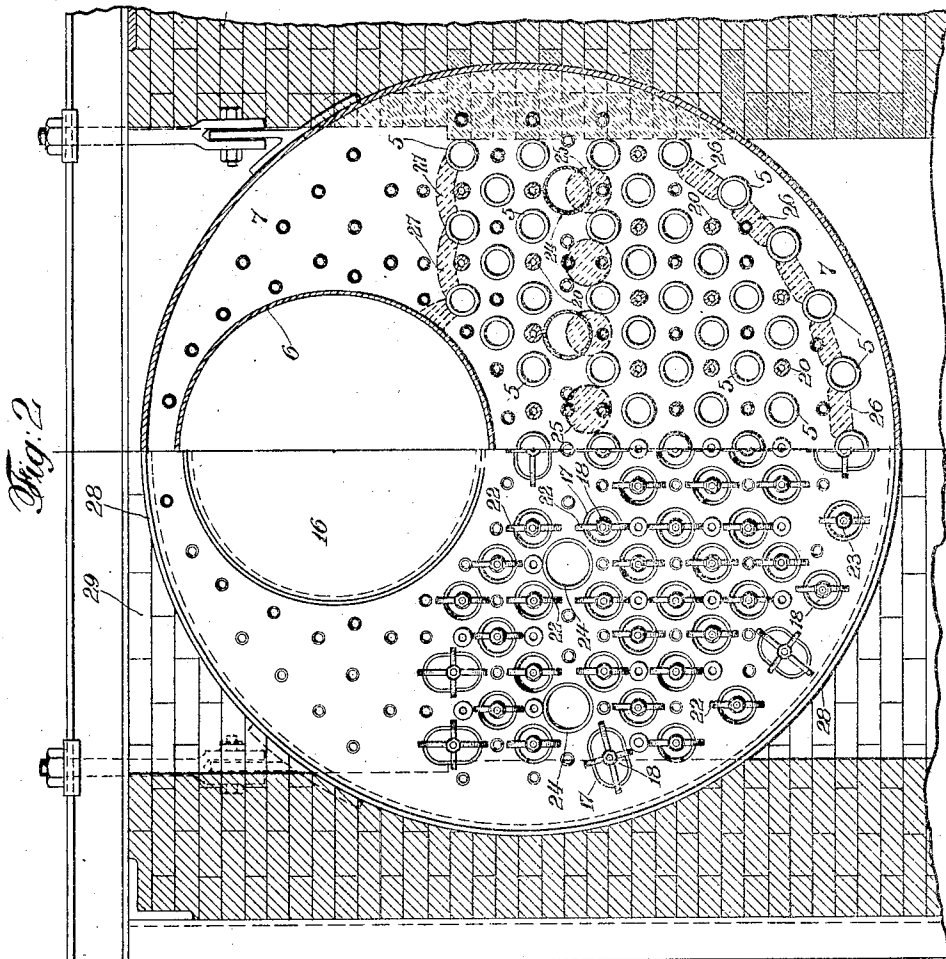
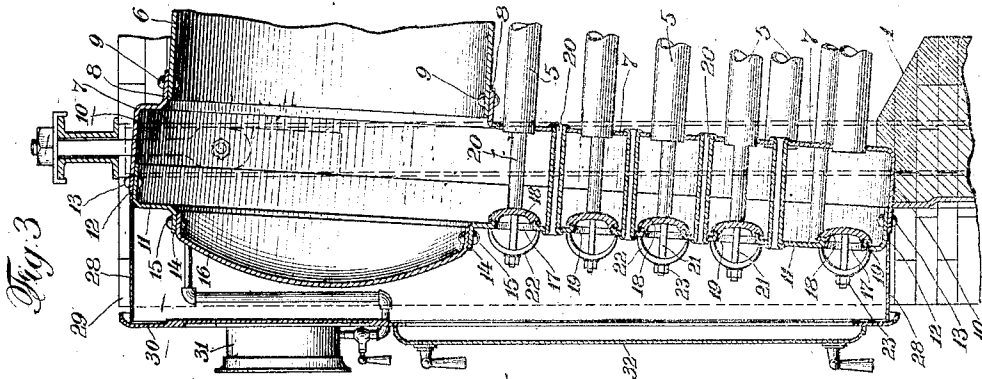
BOILER.

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3 SHEETS—SHEET 2.

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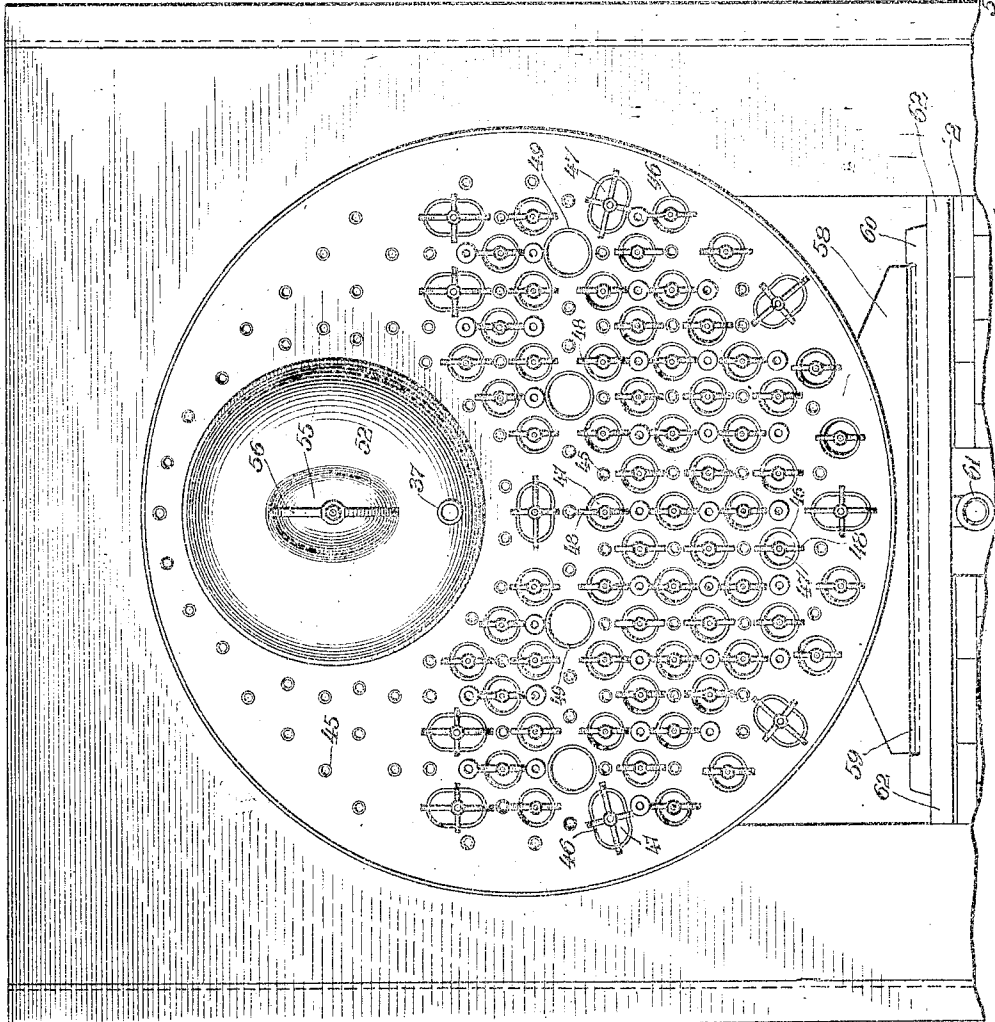
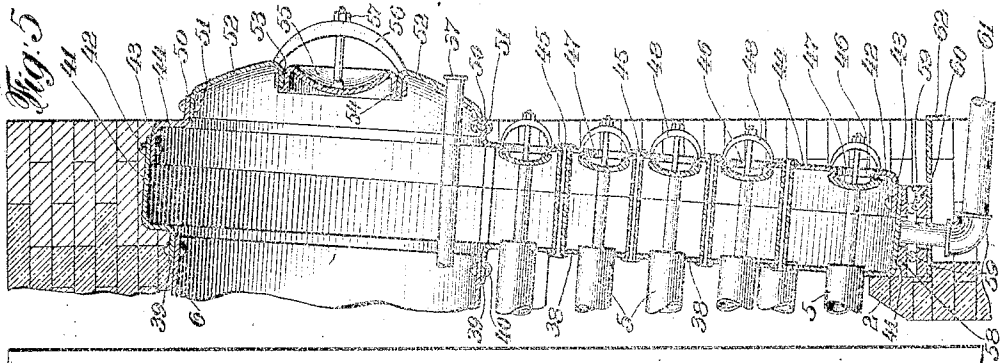
E. M. WILKINSON.
BOILER.

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Patented Dec. 6, 1910.

3 SHEETS-SHEET 3.

977,915.



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Fig. 4

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UNITED STATES PATENT OFFICE.

EPHRAIM M. WILKINSON, OF OSWEGO, NEW YORK.

BOILER.

977,915.

Specification of Letters Patent.

Patented Dec. 6, 1910.

Application filed November 16, 1908. Serial No. 462,889.

To all whom it may concern:

Be it known that I, EPHRAIM M. WILKINSON, a citizen of the United States, and a resident of Oswego, county of Oswego, and State of New York, have invented certain new and useful Improvements in Boilers, of which the following is a specification.

My invention relates to steam boilers and more especially to that class known as water tube boilers. Various objects of my invention are to provide a boiler of the class described of increased strength; one in which the more perfect combustion, circulation and impinging of the hot gases is obtained; one in which there are no rivets or seams located in the brickwork at which leaks are liable to occur and injure the brickwork; one in which the number of seams is decreased to a minimum; a boiler in which the free circulation of the water is at all times and places, insured; one in which the brickwork at the rear of the boiler is protected from water due to leakage or when the boiler is being cleaned; one in which a proper support and protection is given the brickwork over the front of the boiler; one in which the various seams are so placed that they are easily accessible for calking and repairing; and, generally, to secure a high degree of economy and efficiency in construction and operation.

Further objects and advantages will more clearly appear from the detailed description given below taken in connection with the accompanying drawings which form a part of this specification.

In the drawings, Figure 1 represents a side elevation in section of my improved boiler. Fig. 2 is a vertical double section of the front end of the boiler. In the left hand portion the boiler front is removed showing the outside front header. In the right hand portion the outside front header is removed showing the inside front header. Fig. 3 is a vertical section of the front end of the boiler. Fig. 4 is a rear end elevation and Fig. 5 is a vertical section of the same.

Referring to Fig. 1, the boiler rests upon brickwork or masonry foundations or supports 1 and 2.

3 represents the grate and 4 the stack. Above the fire box and grate 3 are arranged the tubes 5 of the boiler. The lower row of tubes are arranged in the arc of a circle as

clearly shown in Figs. 2 and 4 while the remaining tubes are staggered. Above the tubes 5 and parallel therewith is located the steam drum 6. At the front end of the boiler the tubes 5 are expanded into an inside front header 7 and the drum 6 is secured to a flange 8 on said header by means of rivets 9. The header 7 is circular and concentric with the lower row of tubes 5 and at its periphery has a deep flange 10.

11 represents an outside front header spaced from the header 7. The header 11 is also circular in shape to conform to the header 7 and has a circular flange 12 at its periphery which is secured to the flange 10 by a single row of rivets 13. Directly opposite the steam drum 6 the header 11 has a circular opening bounded by an outward flange 14 and secured to the flange 14 by rivets 15 is a bumped drum head 16, (see Figs. 2 and 3). Directly opposite each tube 5 the header 11 is provided with handholes 17 for examination, cleaning and removal of the tubes 5. The handholes are closed by plates 18 which are circular and provided with a groove at their edges for fitting over the flanges 19 bounding the handholes 17. The plates 18 are secured in place by bolts 21, crabs 22, and nuts 23. The plates or headers 7 and 11 are securely bolted together by hollow stay-bolts 20.

24 represents circular tubes forming openings through the water leg space between the headers 7 and 11. These openings are for the removal of the circular baffle brick 25. Upon the lower row of tubes 5 I locate tiles of refractory material or baffle bricks 26 which may be removed by turning them in a vertical position and dropping them down between the tubes 5. Baffle brick 27 along the top row of tubes may be removed from top of setting.

Extending forward from the flange 10 of the header 7 is a cylindrical steel extension 28 which acts as an arch for the brickwork 29 and protects the same from water and steam. Secured at the front of the extension 28 is the boiler front 30 provided with the usual gage 31 and door 32.

33 is a perforated dry pipe connected with the outlet valve 34.

35 is a feed sediment blow-off pan with feed pipe 36 entering the front end and the

sediment blow-off pipe 37 leading from the rear end thereof.

The rear end of the boiler is provided with a rear inside header 38 which is provided with an opening bounded by an inward flange 39. To the flange 39 is secured the rear end of the drum 6 by means of rivets 40. At its periphery the header 38 has a deep outwardly extending flange 41. Secured thereto by a single row of rivets 42 is the flange 43 of an outside rear header 44. The tubes 5 are expanded into the rear inside header 38 and the headers 38 and 44 are further secured together by hollow stay-bolts 45 in the same manner as the front headers. The rear outside header is also provided with handholes 46, hand-hole plates 47, crabs 48 and circular tubes 49 similar to those at the front end of the boiler. The rear outside header is also provided with an opening bounded by an outwardly extending flange 50. Secured to the flange 50 by rivets 51 is a rear bumped drum head 52 having a manhole opening 53 with an inward flange 54. The opening 53 is closed by means of a flanged plate 55, crab 56 and nut and bolt 57. The water-leg formed by rear headers 38 and 44 rests upon a saddle 58. Beneath the saddle 58 are two roller bearings 59 which rest upon the base plate 60. The roller bearings allow the rear end of the boiler to move freely back and forth to allow for expansion and contraction. A blow-off pipe 61 extends through apertures in the protective apron 62, base plate 60 and saddle 58 to the water-leg formed by the rear headers. The protective apron 62 is preferably a steel plate secured in the brickwork below the base plate 60 and preventing water from falling upon the brickwork beneath it when the boiler is being cleaned.

In operation the hot gases from the fire on the grate 3 pass upwardly impinging upon the lower row of tubes 5. The tubes being arranged in the arc of a circle the gases are deflected upwardly at the sides so that they get in all portions of the fire-box and cause a more perfect impinging of the gases upon the tubes. Because of the baffle brick 26 being arranged on the circularly arranged lower row of tubes, an incandescent inverted arch is formed over the furnace, the shape being such that there is more unobstructed space for combustion and a greater area of incandescent surface for the heating and combustion of the gases, than in prior boilers. This is largely due to the fact that the gases travel the whole length of the setting surrounded by incandescent material before striking any amount of cooling surfaces, such as the tubes. In this way, the prevention of smoke is greatly enhanced—a desideratum which is greatly sought for at the present time—and the use of smoke con-

suming devices may be avoided. The gases then pass rearwardly, up and around the rear end of the baffle brick 26, then forwardly, and up and around the baffle brick 25 and then rearwardly to the stack 4.

In prior boilers of the class described it has been customary to make the water-legs formed by the headers of a square or rectangular form. I provide headers of a circular form so that they are much stronger and can carry a much higher pressure. All the apertures and flanges in the headers may, therefore, be made circular so that the apertures may be quickly and easily cut out and the flanges quickly, easily and economically spun from the metal of the headers. This causes all the seams to be circular which further increases the strength of the boiler. Thus by the circular construction described, the result is that—in view of the high working pressures demanded of the present day boiler—there will be a larger factor of safety. This factor of safety is also increased because of the flanges and heads opposite each end of the steam drum, which gives an extra amount of metal to carry the pressure which is distributed among the circle of stay-bolts surrounding it. The circular arrangement of the lower row of tubes above the grates and the shape of the headers being made to conform to the arrangement of the tubes, unnecessary flat surfaces are done away with so that the amount of staying is minimized.

By connecting the drum 6 directly to flanges 8 and 39 on the inside headers 7 and 38 and not continuing them to the outside headers an unobstructed passage is left from the front water-leg into the drum 6 and from the drum into rear water-leg which greatly and advantageously promotes a better circulation of the water, also a large and unobstructed area for the separation of the steam from the water.

Since the headers and their outside flanges are circular only a single row of rivets is required to join the headers which greatly lessens the chances of leakage; and since this row of rivets may be made to lie mainly or wholly outside of the brickwork the brickwork does not have to be torn down in order to repair the seams, and neither does the brickwork suffer injury because of leakage at the seams. The steel or iron apron 62 reaches across the brickwork below and directly under the rear headers to protect the brickwork from water when the boiler is being cleaned out. The arch 28 also acts as a protection for the brickwork at the front end of the boiler when it is being cleaned out. The inside headers 7 and 38 being flanged inwardly or toward each other to receive the drum, the seams are much more accessible and much easier to repair.

My invention further provides for the ab-

sence of all riveted seams in contact with the fire and practically all of the joints can be calked without the removal of any brick-work; and the handhole openings 17 and 46 flanged inwardly to receive the circular recessed plates 18 and 47 further increase the rigidity and strength of the boiler.

Although I have set forth one specific embodiment of my invention in great detail, I do not desire to be limited to such details, but

Having fully and clearly described my invention, what I claim and desire to secure by Letters Patent, is:

15 1. In a boiler the combination of a suitable support, a steam drum, water tubes and substantially circular inside and outside headers for each end of said drum and tubes, each header being integrally flanged toward the adjacent header, the flanges being connected together to form a single seam between the headers and the inside headers at each end of the boiler embracing both the drum and tubes.

25 2. In a boiler, the combination of a steam drum and water tubes therefor, substantially circular inside and outside headers for said drum and tubes, the inside and outside headers having integral flanges overlapping each other connected by a single seam, and stay bolts between the outside and inside headers.

35 3. In a boiler, the combination of a steam drum and water tubes therefor, substantially circular inside and outside headers for said drum and tubes, the inside and outside headers having integral flanges overlapping each other connected by a single seam, and stay bolts between the outside and inside headers, said stay bolts being rigidly secured to the headers to firmly hold the same.

40 4. In a boiler the combination of a grate, a steam drum and water tubes, substantially circular front and rear headers therefor, each inside header embracing both the drum and tubes, one lower row of tubes being in the form of an inverted arch above said grate, and baffle brick arranged on said row to form an inverted arch for the deflection of the hot gases.

50 5. In a boiler the combination of a grate, a steam drum, water tubes below said drum, and substantially circular inside and outside front and rear headers for said drum and tubes, the lower row of said tubes being arranged substantially in the arc of a circle above said grate and substantially concentric with said headers.

60 6. In a boiler the combination of a grate, a steam drum and water tubes, the tubes of the lower layer of which are arranged substantially in the form of an inverted arch above said grate.

65 7. In a boiler the combination of a steam drum, water tubes below said drum, substan-

tially circular inside and outside front and rear headers for said drum and tubes connected by a single row of rivets, and a grate, the tubes immediately above said grate being arranged substantially in the form of an inverted arch.

8. In a boiler a grate, a plurality of water tubes, suitable headers therefor, the lower row of tubes being arranged substantially in the form of an inverted arch above said grate, and baffles arranged on said lower row of tubes.

9. In a boiler, the combination of a steam drum, a plurality of water tubes, a lower row of which is arranged substantially in the form of an inverted arch, baffles arranged on said row of tubes, and substantially circular inside and outside front and rear headers for said tubes and drum arranged to form a water-leg at each end of the boiler.

10. In a boiler the combination of a suitable support, a steam drum, water tubes and a substantially circular inside and outside header for said drum and tubes, said headers being flanged toward each other, said flanges being connected together to form a seam and said seam lying without said support.

11. In a boiler the combination of a masonry support, a steam drum, water tubes, a fire box, the tubes immediately over said fire box being arranged substantially in the form of an inverted arch, substantially circular inside and outside front and rear headers for said tubes and drum, said inside and outside headers being flanged toward each other, said flanges being connected by a single seam with rivets and said rivets lying beyond said masonry support.

12. In a boiler the combination of a steam drum, water tubes, substantially circular headers for said tubes and drum, and a grate and fire box, the lower row of tubes being arranged substantially in the arc of a circle above said grate and to conform to said headers, and the remaining tubes being staggered.

13. In a boiler the combination of a boiler front, a steam drum, water tubes, substantially circular front and rear headers for said drum and tubes and a substantially cylindrical extension piece connecting the boiler front with the front headers.

14. In a boiler, the combination of a steam drum, water tubes, inside and outside headers therefor forming a water leg extending between the tubes and drum, said outside headers being provided with handhole openings with flanges and plates for closing said handhole openings.

15. In a boiler, the combination of a steam drum, water tubes, substantially circular inside and outside headers therefor forming water legs extending from the tubes to the drum, said outside headers being provided with handhole openings with substantially

circular inward flanges and plates for abutting the said flanges to close said handhole openings.

16. In a boiler, the combination of water tubes, a steam drum, a substantially circular inside header with flat surfaces for said tubes and drum and a substantially circular outside header with flat surfaces containing flanged handholes and plates abutting said flanges and closing said handholes, said headers forming a water leg extending from the tubes to the drum and said headers being connected by a single seam and securely held together by stay bolts suitably spaced over their flat surfaces.

17. In a boiler, the combination of a steam drum and water tubes, the tubes of the lower row being arranged substantially in the arc of a circle carrying tiles of a refractory material, for the purpose as previously set forth.

18. The combination of a water leg with substantially circular inside and outside headers, with flat surfaces, openings being flanged outwardly in the upper side of the inside headers, for the reception of a drum whose ends fit in said openings, flanged openings being made in upper half of outside headers exactly opposite to said drum; said flanged openings carrying a dished head substantially as described.

19. The combination of water tubes for a

boiler and baffling means arranged on said tubes substantially in the shape of an inverted arch so that the hot gases will be deflected upwardly toward the side tubes.

20. In a boiler the combination of water tubes the lower ones of which are arranged substantially in the shape of an inverted arch and baffling brick arranged on said lower tubes to form substantially an inverted arch shaped baffling means.

21. In a boiler, the combination of water tubes and baffling brick arranged among the lower tubes to form a baffling surface with its sides inclining substantially from the center thereof upwardly so as to cause the hot gases to be deflected toward the side tubes.

22. In a boiler the combination of water tubes the lower ones of which are higher at the sides of the boiler than in the middle and baffling brick arranged among the lower tubes and extending part way along said tubes to form a baffling surface with its sides inclining upwardly.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

EPHRAIM M. WILKINSON.

Witnesses:

ANNA H. NIPPER,
JAMES S. CLARK.