(No Model.) 3 Sheets—Sheet 1.

A. W. SHEARER.

WATER TUBE STEAM BOILER.

No. 522,238. Patented July 3, 1894.

Fig. 2.

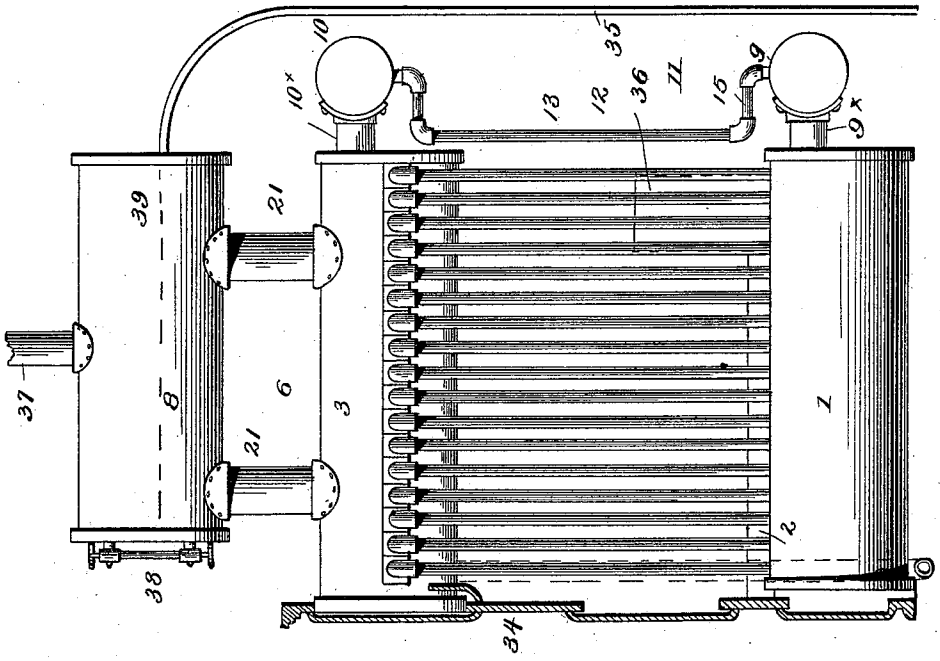
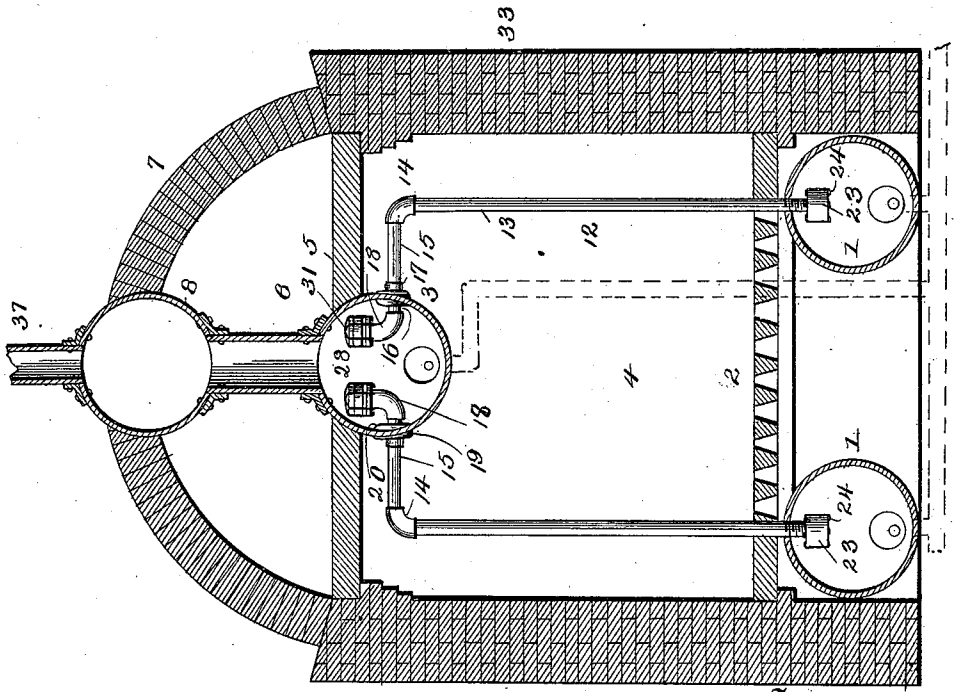


Fig. 1.



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by John Wedderburn
Attorney

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A. W. SHEARER.

WATER TUBE STEAM BOILER.

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Fig. 5.

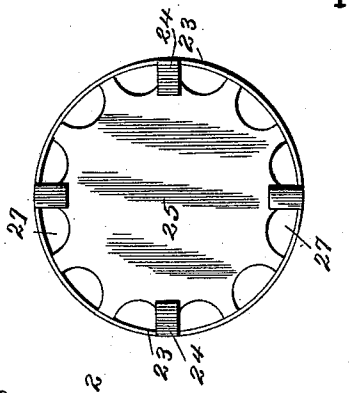


Fig. 4.

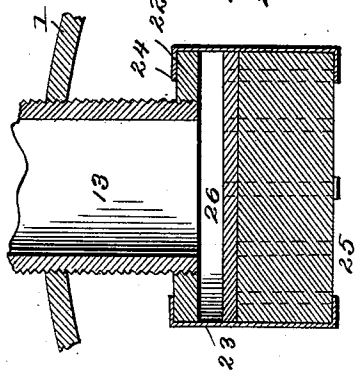


Fig. 6.

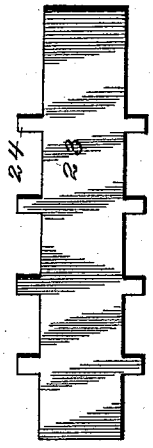
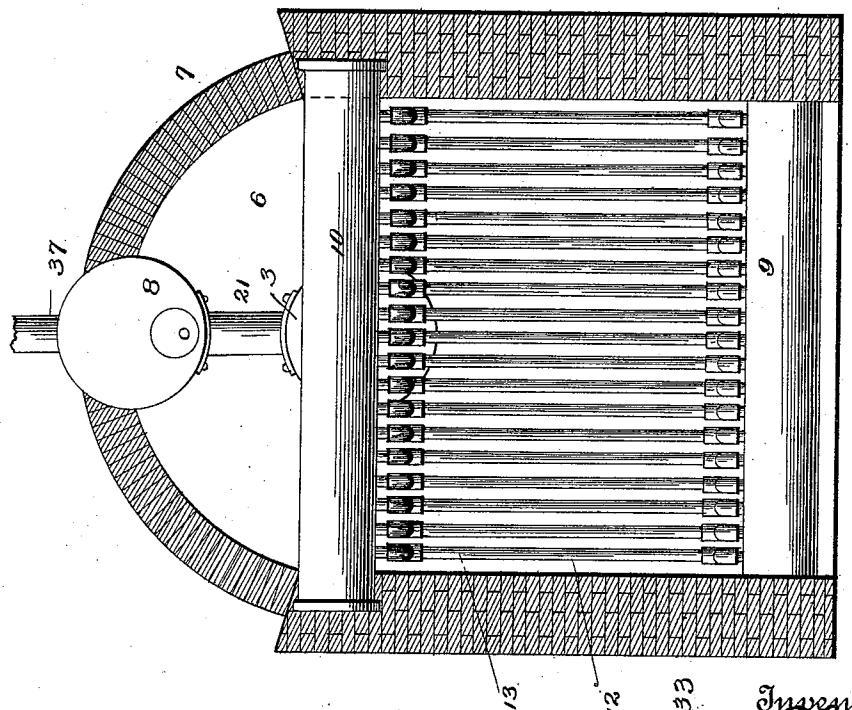


Fig. 3.



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(No Model.) 3 Sheets—Sheet 3.

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WATER TUBE STEAM BOILER.

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Fig. 8.

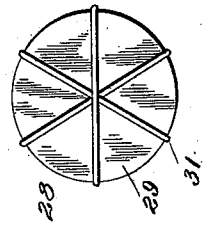


Fig. 9.

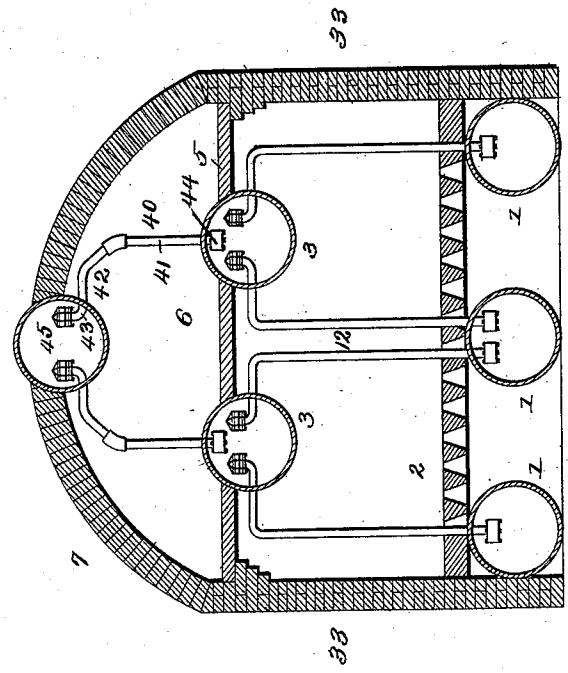
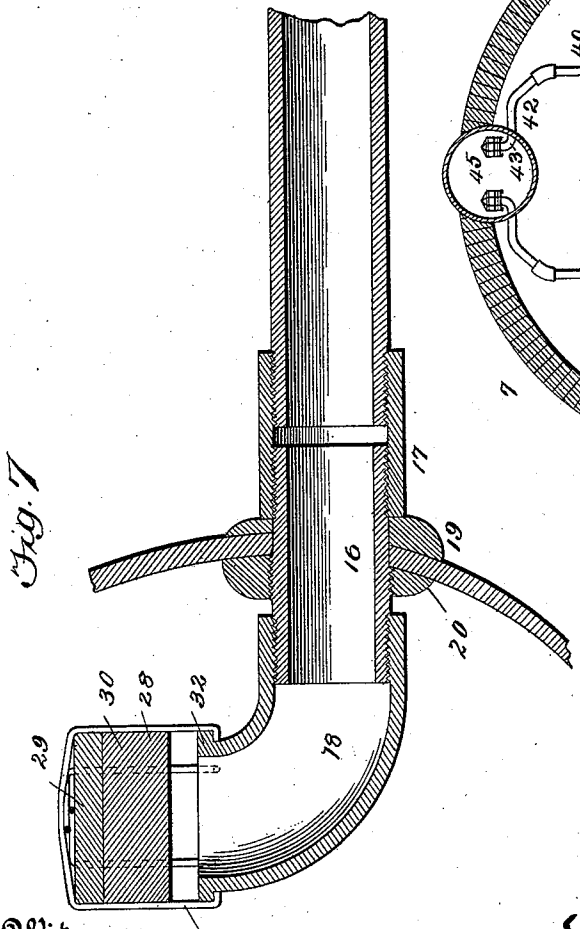


Fig. 7.



Witnesses

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UNITED STATES PATENT OFFICE.

ALBERT W. SHEARER, OF OMAHA, NEBRASKA, ASSIGNOR OF ONE-HALF TO WILLIAM S. FELKER, OF SAME PLACE.

WATER-TUBE STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 522,238, dated July 3, 1894.

Application filed July 12, 1893. Renewed June 4, 1894. Serial No. 513,482. (No model.)

To all whom it may concern:

Be it known that I, ALBERT W. SHEARER, a citizen of the United States, residing at Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Water-Tube Steam-Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in water-tube steam boilers, and the object of my invention is to produce a boiler which shall be simple in construction, ready of access, economical as regards the consumption of fuel, durable, and capable of resisting a high pressure of steam with safety, and shall at the same time be suitable either for milling and factory purposes or for steam and hot water apparatuses. I attain these results by the novel construction, combination and arrangement of parts hereinafter fully specified and pointed out in the claims.

In the accompanying drawings, Figure 1 is a cross-section of my improved boiler. Fig. 2 is a side elevation of the same with the casing removed. Fig. 3 is a rear elevation thereof with the casing removed. Fig. 4 is a vertical sectional view of a check valve at the lower end of one of the water-tubes. Fig. 5 is a bottom plan view of this valve. Fig. 6 is a detail of the valve casing. Fig. 7 is a vertical sectional view of an upper check-valve. Fig. 8 is a top plan view of the same, and Fig. 9 is a cross-section of a modification of my improved steam boiler.

1, 1, represent drums of wrought iron, or other material suitable for the purpose, placed longitudinally beneath the grate-bars 2, and 3 is a similar drum placed in the top of the firebox 4 between the fire-clay tiling 5 which forms a partition between the fire-box and the upper combustion chamber 6. In the roof 7 of this combustion chamber, which is arched in form and constructed of brick or any other material suitable for the purpose, is a longitudinal drum 8 in which the steam collects and from which it is supplied.

9 and 10 are lower and upper transverse drums in the rear combustion chamber 11 of the boiler, connected to the drums 1 and 3 respectively by pipes $9^{\times}$ and $10^{\times}$. Connection is made between the drums 1 and 3, and between the drums 9 and 10 by the water-tubes 12, which are composed of vertical sections 13, elbows 14, horizontal sections 15, nozzles 16, (Fig. 7) pipe couplings 17, and elbows 18 opening vertically in the drums.

19 and 20 are inner and outer washers at the entrance to the drums. Connection is made between the drums 3 and 8 by the pipes 21.

I will now explain the construction of the check-valves which I use at the terminations of the water-tubes in the upper and lower drums, and referring to Fig. 4 which shows the lower check valve, it will be seen that upon the screw-threaded end of the tube-section 13 is screwed a valve-seat 22, to the upper surface of which is attached the valve casing 23. This valve casing is shown in the flat in Fig. 6, and has, on each side, spurs 24. When the valve casing is placed in its position around the valve seat, and the ends soldered, the spurs 24 are turned over and hold the casing to the valve seat. The valve 25 having been inserted in the casing the spurs on the other side of the casing are turned up, and support the valve in the casing. The valve 25 is provided with a top 26 of lead or other suitable metal, and has lateral recesses or corrugations 27 which facilitate the flow of the water from the drums 1 past the valve into the water-tubes.

The upper valves 28 are cylindrical in shape and are preferably made of a cylinder of cork 29 superposed upon a cylinder of wood 30. 31 is the wire cage of the same which is secured to the flanged valve-seat 32 upon the elbow 18.

In its normal position the valve 25 rests upon the bottom of its casing, and the valve 28 floats to the top of its casing, but in case of bursting of one of the water-tubes, the pressure of the water in the upper and lower drums immediately drives the valves against their seats, and retains them there so that no further escape of water can take place. By this arrangement, therefore, the danger of explosion is reduced to a minimum.

33 are the side walls of the steam boiler

which may be made of brick or any suitable material.

34 represents the cast iron front of the boiler, 35 the rear casing of the same, and 36 the bridge wall of the fire-box.

37 represents the blow-off pipe and fill-up pipe, 38 the water-glass or gage-cock, and 39 the water-line in the drum 8. In the modification of my invention shown in Fig. 9, I employ three lower drums 1, and two upper drums 3, and I am thereby enabled to have two additional series of water-tubes 12. In this arrangement I may also employ instead of the pipes 21, upper series of water-tubes 40, each having a vertical section 41, an oblique section 42 making an angle of about forty-five degrees with the vertical, and elbows 43. These water-tubes have, at their connections with the drums 3, valves 44 similar to the valves 25, and, at their connections with the drums 8, valves 45 similar to the valves 28. By this arrangement I greatly increase the heating capacity of the boiler with only a slight increase of the width of the boiler front and casing.

Whichever form of my boiler may be used, the fuel is placed between the water-tubes 12 as far back as the bridge wall, and the draft carries the flame around and between the water-tubes in the rear end of the boiler, over the drum 10 and under the drum 8 to the smoke conductor to the chimney, forming a return draft system and utilizing the benefit of the heat to a great extent. Moreover this construction of water-tubes and drums gives a very rapid evaporating boiler, either for steam or hot water apparatuses, on account of the large extent of heating surface which is efficiently distributed for the absorption of heat. It will also be observed that, in my construction of boiler, the disadvantage to the evaporation of water which arises from the accumulation of soot upon the heating surface is greatly obviated by the fact that there is no place for the soot to collect upon such heating surface. At the same time the space in the rear of the boiler between the back wall of the fire box and the rear casing of the boiler forms a combustion chamber to consume the smoke and allow the soot to settle, thereby obviating, to a great extent, the inconvenience of smoke and soot discharged from the chimney. Furthermore the evil effect of expansion and contraction of the water-tubes is minimized by the manner in which they are attached to the drums, which gives them necessary freedom of longitudinal play, and there will be no evil effect from the uneven expansion of the water-tubes should any take place, as each tube has an expansion play independent of the others. I further secure a decided advantage over previous forms of water-tube boilers by the simplicity of the construction of the boiler and the readiness with which each and every part thereof can be inspected. Leakages and other damages can be repaired without disturbing the casing, and every one of the water-tubes can be removed and a new one put in its place without disturbing any of the other pipes. Furthermore, it will be observed that the boiler will have the convenience of either a steam boiler or a hot water boiler and can be changed from a hot water boiler to a steam boiler for heating purposes, without any change whatever in the setting of the boiler. The return and steam pipes can be connected with the upper and lower drums to suit the convenience of the builder.

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

1. In a steam boiler, the combination of a fire-box, longitudinal drums in the upper part of the fire-box, longitudinal drums below the upper drums, water-tubes connecting the upper and lower drums, casings secured at the ends of said water tubes, and check valves in said casings of such specific gravity as to remain normally open when immersed in water, substantially as described.

2. In a steam boiler, the combination of a fire-box, a return combustion chamber above the fire-box, longitudinal drums in the upper parts of the return combustion chamber and the fire-box, longitudinal drums beneath the upper drums, water-tubes connecting the drums, casings secured at the ends of said water tubes, and check valves in said casings of such specific gravity as to remain normally open when immersed in water, substantially as described.

3. In a steam boiler, the combination of a fire-box, a rear combustion chamber, longitudinal drums in the upper part of the fire-box, transverse drums in the upper part of the rear combustion chamber communicating with the longitudinal drums, drums beneath and parallel with the upper drums, water-tubes connecting the same, casings secured at the ends of said water tubes, and check valves in said casings of such specific gravity as to remain normally open when immersed in water, substantially as described.

4. In a steam boiler, the combination of a drum, water-tubes opening vertically in the drum, open casings secured at the ends of the water-tubes, and check valves in the casings of such specific gravity as to remain normally open when immersed in water, substantially as described.

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

ALBERT W. SHEARER.

Witnesses:
W. M. COWELL,
C. T. LARSEN.