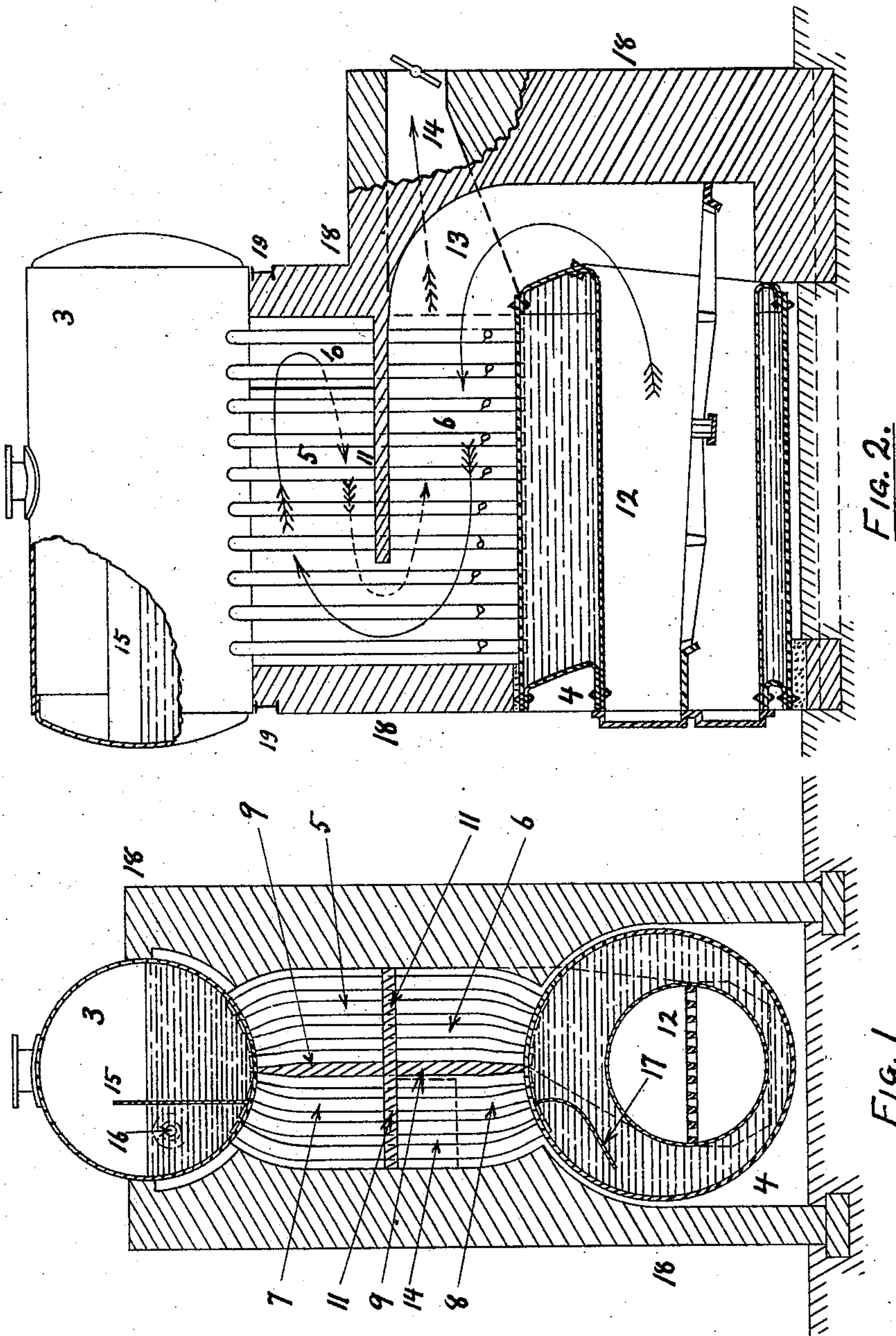


(No Model.)

R. D. KINNEY.
STEAM BOILER.

No. 575,118.

Patented Jan. 12, 1897.



WITNESSES.

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ROBERT D. KINNEY, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO
ALICE B. KINNEY, OF SAME PLACE.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 575,118, dated January 12, 1897.

Application filed April 13, 1896. Serial No. 587,365. (No model.)

To all whom it may concern:

Be it known that I, ROBERT D. KINNEY, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Steam-Boilers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical transverse section, and Fig. 2 is a longitudinal vertical section, of my improved boiler.

My invention relates to internal-fired water-tube boilers and is designed to increase their efficiency and simplify, cheapen, and improve their construction.

To that end it consists in an upper steam-and-water drum, a lower furnace-incasing water-drum, a bank of heating-tubes directly connecting these drums, and partition-walls located across and between the tubes of the bank and arranged so as to cause a transverse pass of the furnace-gases across and through said bank of tubes, the tubes being grouped by means of said partition-walls so that the gases from the furnace enter the bank of tubes by first passing among and across the group of tubes that are designed to contain the circulating water of higher temperature that is on its way to the steam-and-water drum and leave the bank, last passing among and across the group of tubes designed to contain the circulating water of lower temperature on its way to the water-drum for the purpose of an efficient abstraction of heat from the gases by the circulating water within said tubes, as also to induce a rapid circulation of said water while passing through said tubes.

In the drawings, 3 represents the upper steam-and-water drum, 4 the lower furnace-incasing water-drum, and 5, 6, 7, and 8 the bank of heating-tubes connecting the same. In the space between two adjoining rows of tubes, preferably between the two central longitudinal rows, is placed longitudinally the vertical fire-brick partition 9, which extends vertically from the lower to the upper drum the entire distance and longitudinally the entire distance between the front and rear inclosing walls of the boiler-setting. This

vertical partition is provided with an aperture 10 in its upper part along the rear inclosing wall underneath the end of drum 3 for the passage of the fire-gases through it. About the middle of the vertical distance between the drums 3 and 4 is placed on both sides of said vertical partition and transversely to the heating-tubes the horizontal fire-brick or tile partition 11, which extends to the inclosing walls of the boiler-setting on all sides (excepting the aperture-spaces at the front end of same) and to the vertical partition 9. It is provided with apertures at the front end on both sides of the vertical partition 9, as shown in Fig. 2, for the passage of the fire-gases through it.

12 is the furnace, from whence the gases pass upwardly into and through the combustion-chamber 13, thence horizontally toward the front of the boiler, among and across the part 6 of the group of tubes 5 6, thence upwardly through the aperture of the horizontal partition 11 and horizontally toward the rear of the boiler back among and across the part 5 of the group of tubes 5 6, thence through the aperture 10 of the vertical partition 9 and back horizontally again toward the front of the boiler, traversing the part 7 of the group of tubes 7 8, thence downwardly through the aperture of the horizontal partition 11 and horizontally back again toward the rear of the boiler, traversing the part 8 of the group of tubes 7 8, and thence through the outlet-flue 14, as indicated by the arrows shown in Fig. 2.

It is obvious that the partitions for directing the course of the gases among and across the heating-tubes can be modified in their arrangement from that just described, for instance, omitting the part or whole of the horizontal partition 11, without departing from the essence of my invention; but I prefer the arrangement of the same as herein shown and described.

In the steam-and-water drum I provide a vertical longitudinal partition-plate 15, which is bolted or riveted to the inside of the drum-shell by means of angle-brackets, for the purpose of separating the openings of such of the tubes as are preferred or desired to receive and convey the feed-water from the

drum 3 to drum 4, and extends upwardly to a point above the water-level. The feed-water is fed into the steam-and-water drum through the inlet-aperture 16 on the side of said partition which contains the tubes designed to receive and convey said feed-water, as before stated, and is prevented by said partition from mingling with the hotter water contained in said steam-and-water drum after its passing through the heating-tubes of the boiler. The shell of said steam-and-water drum is provided with the usual water-level and pressure-indicating devices, as also with appropriate manhole and pipe openings for steam-take-off, water-feed, and blow-off connections.

In the lower furnace-incasing water-drum I provide a vertically-inclined longitudinally-curved deflecting-plate 17, which is riveted or bolted to the inside of the shell of said drum by means of angle-brackets, and which extends downwardly to a point sufficiently low and of suitable length as will effectually deflect the downflow current of water from those tubes which convey from drum 3 to drum 4 the feed-water from impinging on the exterior of the furnace-shell and depositing thereon impurities, if any, that it might contain and that would adhere to its surface and form into a scale, and thus impair its heat-transmitting capacity.

The shell of the lower furnace-incasing water-drum is also provided with the usual mud and sediment blow-off openings and connections, as also hand-hole and manhole openings, as may be desired, for cleaning out, inspection, &c.

The furnace-box 12 is constructed in a cylindrical form or in any other desired and appropriate shape, or it may be of any of the types, whether corrugated or plain, known to the art and adapted to the construction shown in the drawings herewith.

The heating-tubes are attached to the drums 3 and 4 in any suitable manner, but I prefer their being fastened by the process known as "expanding" them to the shells of the respective drums, similar to the manner usually employed for fastening the fire and water tubes of present known boiler construction, placing them in longitudinal and transverse rows, the former being "staggered" with the latter to cause impingement thereon of the furnace-gases passing among the same.

18 is the inclosing walls of the boiler and which may be constructed of brick or metal or any other suitable material and embracing in its construction the usual clean-out doors and openings according to present practice.

19 is beams of the supporting structure of the boiler and on which the same is suspended, as shown in Fig. 2. By the employment of columns for supporting the ends of the beams 19 the support of said boiler is made independent of the inclosing walls 18.

The heat of the burning fuel is efficiently

absorbed by the water-jacket surrounding the furnace, and the heat of the hot gases passing from the furnace is efficiently extracted by their being impinged against the heating-tubes interposed in its passage from the furnace to the outlet-flue of the boiler-setting.

It is obvious that for large units the drum 4 can be modified so as to receive two or more furnaces, and that two or more steam-and-water drums employed with a separate bank of tubes for connecting the same to such modified water-drum can be employed without departing from the essence of my herein-described invention.

The advantages of my said invention are apparent, the arrangement of the parts being simple, compact, and highly effective for the purposes designed.

I claim—

1. In a water-tube boiler having a steam-and-water drum provided with a partition-wall separating the water therein contained, and directly connected to a separate water-drum by a series of heating surface tubes, a flue-furnace surrounded by a water-chamber provided with a longitudinally-curved deflector deflecting the inflowing current of water from certain of the tubes thereto connected and comprising said separate water-drum, and inclosing walls and partitions arranged to convey the furnace-gases among and across said tubes; substantially as described.

2. A steam-boiler having a steam-and-water drum provided inside with a vertical longitudinal partition-plate extending downwardly to the shell of the drum and extending upwardly above the water-level, a furnace-incasing water-drum, heating surface tubes connecting said drums, and vertical and horizontal partitions arranged to convey the furnace-gases among and across said tubes; substantially as described.

3. An internal-fired water-tube boiler having a steam-and-water drum, and, a furnace-incasing water-drum provided with a deflecting-plate for deflecting the inflowing current of water discharged by the tubes which convey the feed-water to said drum, heating surface tubes connecting said drums, and partitions arranged to convey the furnace-gases among and across said tubes; substantially as described.

4. A steam-boiler having a steam-and-water drum provided inside with a vertical longitudinal partition-plate extending downwardly to the shell of the drum and extending upwardly above the water-level, a furnace-incasing water-drum provided with a deflecting-plate for deflecting the inflowing current of water from certain of the tubes, tubes connecting said drums and vertical and horizontal partitions arranged to convey the furnace-gases among and across said tubes; substantially as shown and described.

5. In a water-tube boiler having a steam-and-water drum directly connected to a separate water-drum by a series of heating sur-

face tubes, a flue-furnace surrounded by a water-chamber provided on its inside with a deflector for deflecting the inflowing current of water from certain of said tubes and comprising said separate water-drum; substantially as described.

6. An internal-fired water-tube boiler having a steam-and-water drum, and, a furnace-incasing water-drum provided with a deflecting-plate for deflecting the inflowing current of water discharged by the tubes conveying feed-water to said drum, and heating surface tubes connecting said drums; substantially as described.

7. In a water-tube boiler, the combination, with a steam-and-water drum directly connected to a separate water-drum by a series

of heating surface tubes, of a furnace-flue suspended to the walls of said water-drum; substantially as shown and described.

8. In a water-tube boiler, the combination, with a steam-and-water drum directly connected to a separate water-drum by a series of heating surface tubes, of a furnace-flue suspended to the walls of said water-drum and provided with a fire-grate; substantially as shown and described.

In testimony whereof I have hereunto set my hand.

ROBT. D. KINNEY.

Witnesses:

ROBT. HEALEY,
JASPER W. LYNCH.