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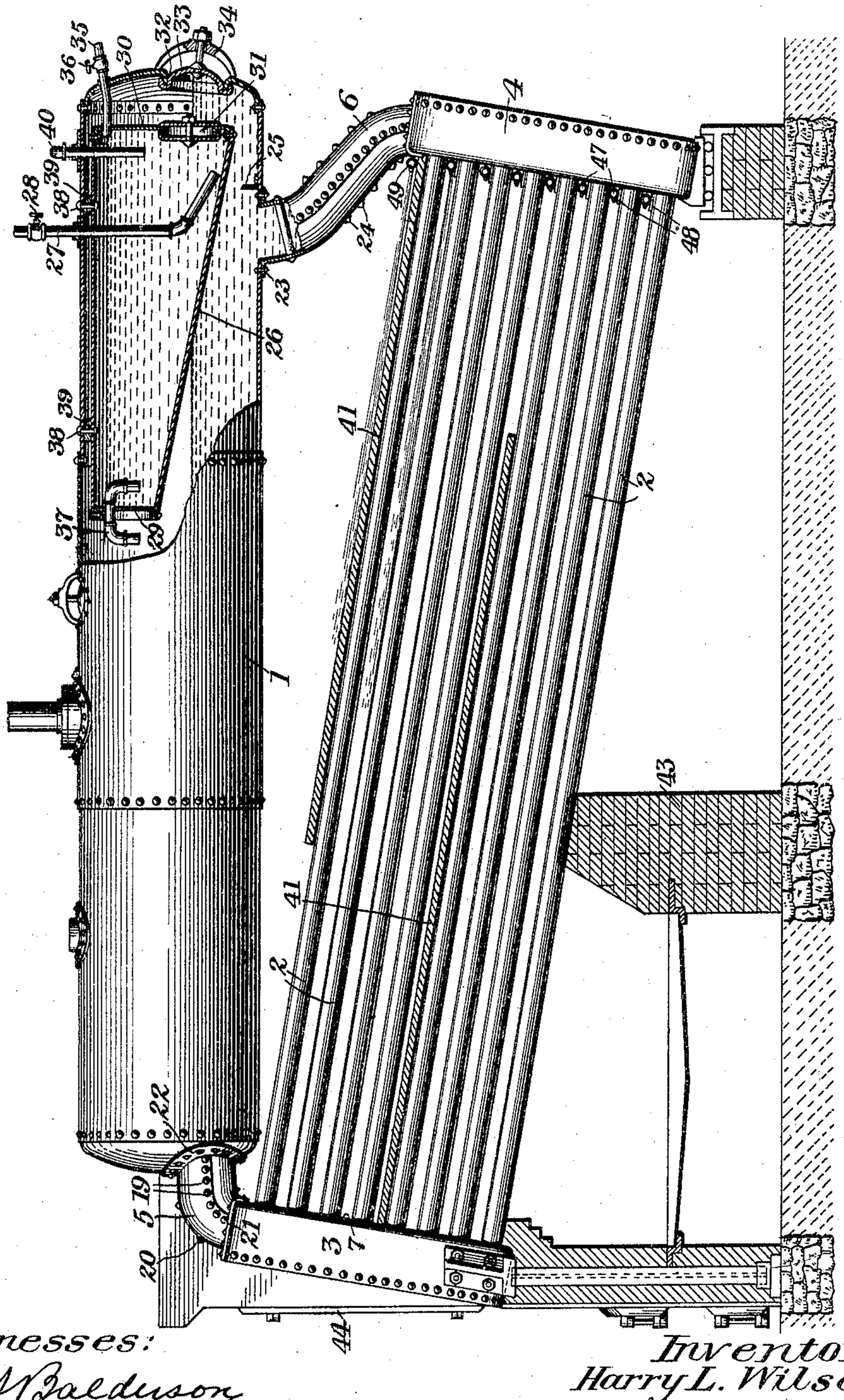
H. L. WILSON.

WATER TUBE BOILER.

APPLICATION FILED JUNE 26, 1902.

NO MODEL.



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UNITED STATES PATENT OFFICE.

HARRY L. WILSON, OF ERIE, PENNSYLVANIA.

WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 775,435, dated November 22, 1904.

Application filed June 26, 1902. Serial No. 113,292. (No model.)

To all whom it may concern:

Be it known that I, HARRY L. WILSON, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented a certain new and useful Water-Tube Boiler, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to steam-generating boilers of the type known in the art as "water-tube boilers," the object in view being to provide for a free flow, a rapid and uninterrupted circulation of water through the tubes, headers, and drum, and, incidentally, the ready passage of the water to and from the headers and drum, the connections between the headers and drum being of such construction as to give an easy turn to the water as it flows into and from the drum; to provide increased strength in the headers and tubular connections leading therefrom to the drum, at the same time preventing all movement or vibration; to provide for ready access to the drum and settling-tank; to remove a large part of the solids held in suspension in the feed-water before the water is admitted to the boiler proper, and to provide means for blowing off the scum or sediment from the feed-water before it passes into the boiler proper and without affecting the water-level in the boiler.

With the above and other objects in view, the nature of which will appear more fully as the description proceeds, the invention consists in the novel construction, combination, and arrangement hereinafter fully described, illustrated, and claimed.

The accompanying drawing represents a side elevation, partly in section, of a water-tube boiler constructed in accordance with the present invention.

Like reference-numerals designate corresponding parts in the drawing.

Referring to the drawing, the boiler is seen to comprise a steam-drum 1 of cylindrical shape arranged horizontally, being supported by suitable masonry in any usual or preferred manner. Beneath the drum 1 are arranged water-tubes 2, which are inclined so as to slope from their forward ends downward to their rear ends, the tubes all being connected at their forward ends to the front header 3 and at their rear ends to the rear header 4. The front header 3 is connected with the drum 1 by means of a tubular elbow or front connecting-neck 5, while the rear header 4 is connected with the drum by means of the tubular neck or connection 6. Thus provision is made for a free flow and rapid circulation of water through the drum, headers, tubes, and connecting-necks.

The headers 3 and 4 are the counterpart of each other, being exactly the same in size and shape throughout, so that the parts thereof may be pressed in the same dies. The front header 3 is connected with the drum 1 by means of a tubular elbow or front connecting-neck 5, which may be either round or oval in cross-section and which is composed of two plates bent into semicircular or semi-oval shape and having their side edges overlapped and riveted together, as shown at 19, the plates being braced relatively to each other by means of stay rivets or bolts 20, similar to those (16) just above described. At one end the elbow 5 is provided with an angular flange 21, which is riveted to the top of the header 3, while said elbow is provided at its opposite end with a flange 22, which is riveted to the adjacent end of the steam-drum. In this way the water rising in the header 3 flows with an easy turn directly into the head of the steam-drum. The tubular neck or downflow connection 6, which is at the opposite end of the boiler, is connected directly to the top of the rear header 4 in the same manner as the neck 5 is connected with the header 3 and extending upward in ogee form is provided at its upper end with a flange 23, which is riveted to the bottom of the drum 1 at a point remote from the rear end of the drum, as shown in Fig. 1. The tubular neck or downflow connection 6 is constructed in the same manner as the elbow 5 and also braced by means of stay rivets or bolts 24. Immediately in rear of the entrance of the neck 6 into the drum 1 there is placed a dam 25, which may consist of an angle-iron extending transversely across the lower portion of the

boiler, the dam serving to arrest the flowing water and cause it to pass downward through the connection 6 into the rear header 4.

Within the steam-drum 1 is mounted a settling-tank 26, which is preferably of conico-cylindrical form and so arranged as to bring its upper side in a substantially horizontal plane and parallel with the upper side of the drum, while its lower side is inclined so that any sediment or solids held in suspension in the feed-water will gravitate to one end, or, in other words, the lowest point in the sediment-tank, at which point is arranged the extremity of a blow-off pipe 27, controlled by a stop-cock 28, enabling the entire contents of the sediment tank or chamber to be blown off without affecting the water-level in the steam-drum. The settling-tank is closed at its opposite ends by the heads 29 and 30, which are of different sizes, the outermost head 30 being provided with a hand-hole 31 and a suitable cover and retaining means therefor. The steam-drum itself is provided with a hand-hole 32 in line with the hand-hole 31 and provided with a suitable cover 33 and fastening bail or crab 34, so that when the boiler is emptied access may be readily had to the settling tank or chamber. Another surface blow-off pipe, 35, enters the end of the settling-tank, passing also through the adjacent head of the drum, and is provided with a stop-cock 36. In this way any scum or floating substance may be blown off from the surface of the feed-water contained in the tank 26. At the smaller end of the tank and passing through the head 30 is an inverted-**U**-shaped feed-water-discharge pipe 37, having one leg extending downward within the tank to a point several inches below the surface of the feed-water, while the other leg extends downward an equal distance on the outside of the tank, so as to discharge the feed-water directly into the steam-drum. In this way scum or floating substances are prevented from being discharged into the steam-drum. The settling tank or chamber is suspended within the steam-drum immediately adjacent to the top thereof, preferably by means of hanger bolts or rivets 38, encircled by washers or spacing-sleeves 39, thus leaving a space entirely surrounding the settling-tank.

40 designates a feed-water-supply pipe which enters the top of the settling-tank and also passes through the upper portion of the steam-drum. The settling-tank is thus suspended in the drum in such a manner that the feed-water in the tank, being at a lower and more variable temperature than the water in contact with the heating-surface and under the steam temperature in the drum proper, does not come in contact with any of the highly-heated parts of the drum-shell to cause local contraction and expansion and consequent injury to the drum. In this way mud-scales and sediment are to a great extent eliminated from the feed-water and retained in the sediment-tank, thus preventing corrosion of the drum. It will be observed that the water is taken neither from the surface nor from the bottom of the sediment-tank and is therefore free from solids when discharged into the steam-drum.

A line of baffle-brick 41 extends along the top of the series of water-tubes 2 from the rear header well forward, as shown in Fig. 1. Another line of baffle-brick, 42, extends from the front header rearward a considerable distance and beneath the upper tier 41 and also midway between the top and bottom of a series of water-tubes. The bridge-wall 43 extends at its top slightly above the bottom of the lower series of water-tubes, so as to give as much curvature and deflection as possible to the flow of gases and products of combustion before they pass around the rear end of the intermediate baffle-brick 42.

The front and rear headers 3 and 4 are supported upon masonry or other suitable framework, and at each side of the headers 3 and 4 there are arranged vertically-elongated sight-doors 44, one of which is shown in Fig. 2. These doors extend practically the full height of the headers, so that an attendant by opening one of the doors may thoroughly examine the water-tubes and, in fact, all the fire-surface of the boiler and may free the same from soot or dust by a suitable hand implement. A series of parallel pipes 47 extend horizontally inward through the boiler-casing and along the upper sides of a series of shelves 48, resting on the water-tubes, as shown in the drawing. Each pipe 47 is provided with a series of discharge-nozzles 49, located over the water-tubes and upper row of baffle-brick, as shown at one end in the drawing, thus enabling a large number of jets of steam to be forced along the water-tubes, &c., for the purpose of displacing soot and dust which may adhere thereto. As the pipes 47 are exposed to the direct action of the products of combustion, it is preferred to cover the same with asbestos. When deemed necessary, the blowpipes may be arranged at both ends of the boiler, so as to direct the jets of steam in opposite directions, and all of said pipes may connect with a common supply-pipe.

The boiler hereinabove described may be constructed practically throughout of wrought material, thus increasing the efficiency of all parts of the boiler. From eighty-five to ninety per cent. of the labor of construction may be performed by machinery. A free and rapid flow and circulation of water through the drum, water-tubes, headers, and connecting-necks is provided for, and the feed-water discharged into the steam-drum is practically free from the usual solids, which have an injurious effect on the drum and other parts of the boiler. The connecting-necks by reason of their shape and arrangement avoid any

quick and sudden turns, which would greatly hinder circulation. The various parts of the boiler are also rendered easily accessible for examination and cleaning. The scum and sediment may be blown off from the settling-tank at any time and without disturbing the water-level in the drum proper. The settling-tank itself is not exposed to the direct action of the products of combustion, being surrounded by the steam-space of the boiler and also partially submerged in the water in the drum. The water is first heated in the settling-tank and is therefore carried off into the steam-drum in a highly-heated condition.

Having thus described the invention, what I claim as new is—

1. In a water-tube boiler, the combination of a steam-drum, a conico-cylindrical settling-tank suspended within the drum and in contact with the water in the drum when at the normal level but out of contact with the highly-heated portions of the drum, and supply, discharge and blow-off pipes communicating with said settling-tank.

2. In a water-tube boiler, the combination of a steam-drum, and a settling-tank substantially cylindrical in cross-section with an inclined bottom, said tank being suspended in the drum so as to be partially submerged in the water contained in the drum but out of contact with the highly-heated portions thereof, substantially as and for the purpose specified.

3. In a water-tube boiler, the combination of a steam-drum, a settling-tank suspended therein and having an inclined bottom, a feed-water-supply pipe communicating with the tank, an inclined U-shaped discharge-pipe having one leg arranged in the tank and the other leg arranged outside of the tank to discharge into the main drum, and a blow-off pipe having its discharge end arranged within the tank and adjacent to the lowest portion of the bottom, substantially as described.

4. In a water-tube boiler, the combination of a steam-drum, a settling-tank supported within the drum and comprising a bottom sloping from one end of said tank to the other, a feed-water-supply pipe communicating with the settling-tank, and a discharge-pipe having a pendent receiving end arranged above the bottom of the settling-tank and below the normal level of the water therein.

5. In a water-tube boiler, the combination of a steam-drum, a settling-tank suspended therein and having an inclined bottom, a feed-water-supply pipe communicating with the tank, and an inverted-U-shaped discharge-pipe having one leg arranged in the tank and the other leg arranged outside of the tank to discharge into the main drum, substantially as described.

6. In a water-tube boiler, the combination of a steam-drum, a settling-tank supported within the drum and comprising a bottom which slopes from one end of the tank to the other, feed-water supply and discharge pipes connected with said tank, and a blow-off pipe having its discharge end arranged within and adjacent to the lowest portion of the bottom.

7. In a water-tube boiler, the combination of a steam-drum, a settling-tank supported within the drum and comprising a bottom which slopes from one end of the tank to the other, a feed-water-supply pipe communicating with one end of the tank, and a feed-water-discharge pipe arranged at the shallow end of the settling-tank with its receiving end extending downward and terminating above the sloping bottom and beneath the normal water-level.

In testimony whereof I affix my signature in presence of two witnesses.

HARRY L. WILSON.

Witnesses:
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