No. 802,479. PATENTED OCT. 24, 1905.

L. ROWAN.

BOILER.

APPLICATION FILED DEC. 12, 1904.

3 SHEETS—SHEET 1.

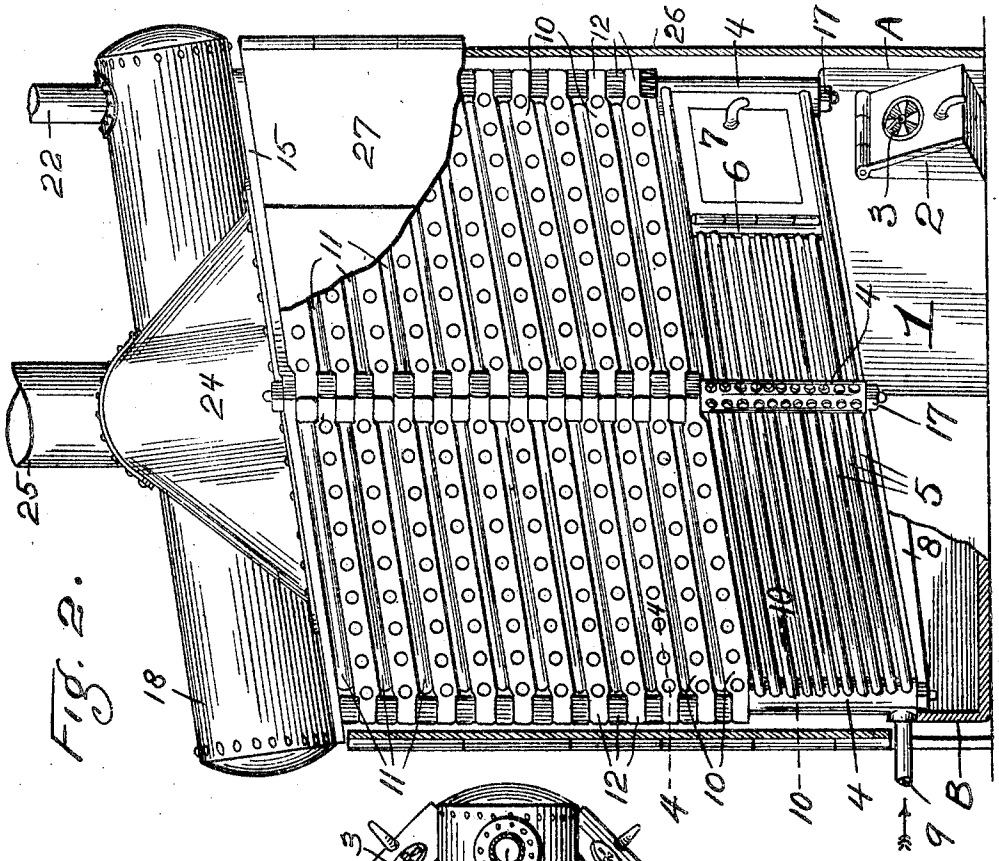

FIG. 2.

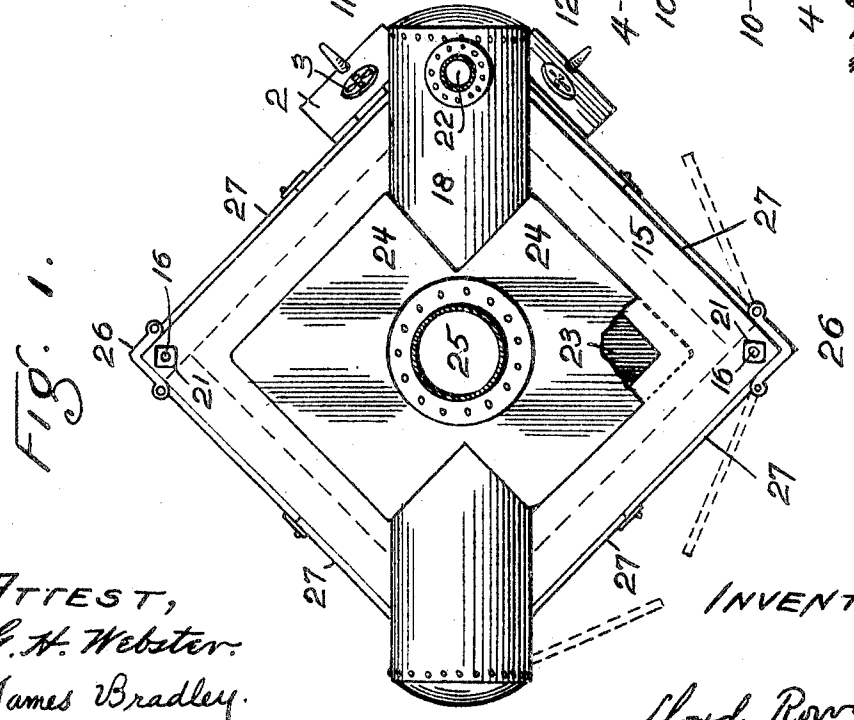

FIG. 1.

ATTEST,
G. H. Webster.
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Fig. 3.

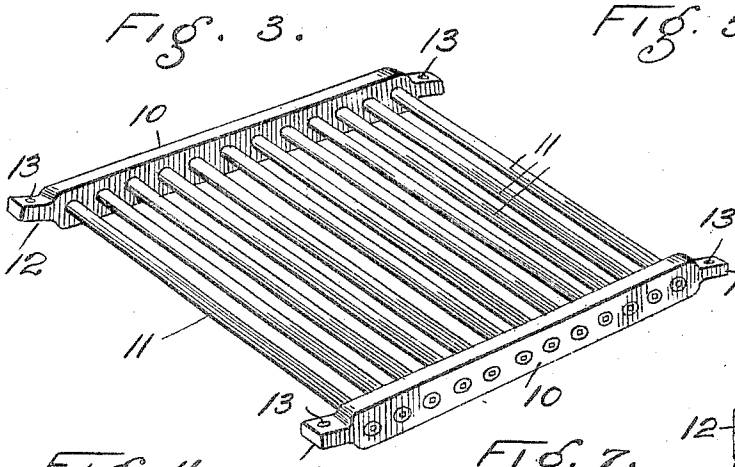


Fig. 5.

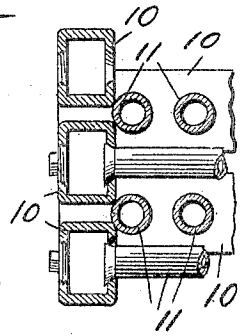


Fig. 6

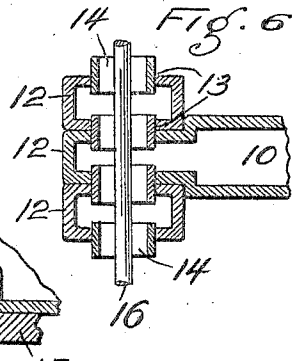


Fig. 4.

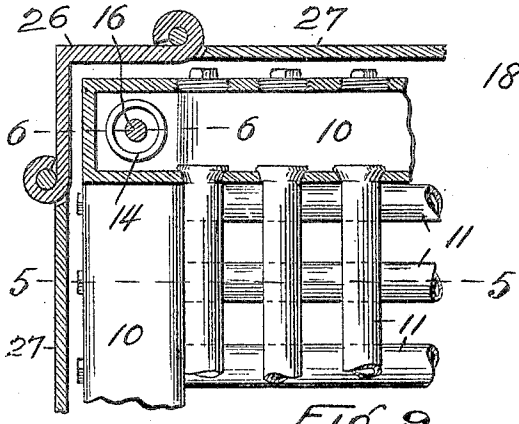


Fig. 7.

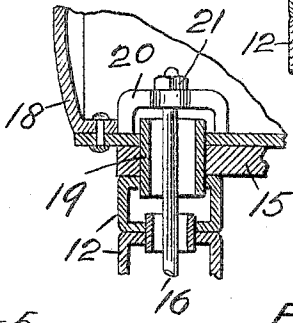


Fig. 8.

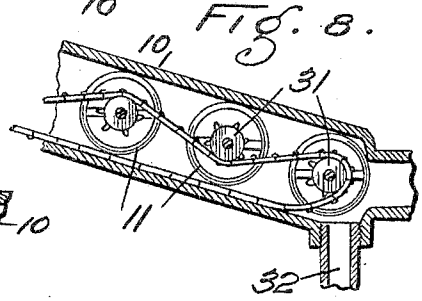


Fig. 9.

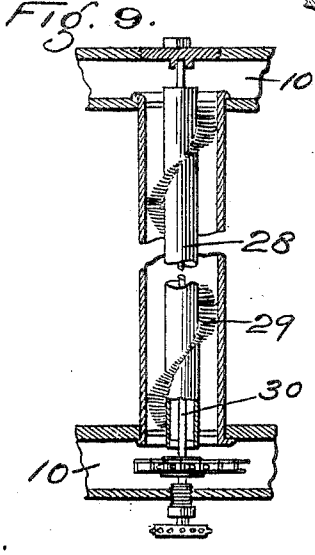
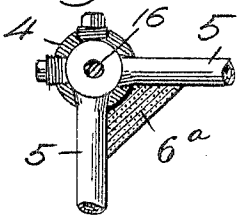


Fig. 10



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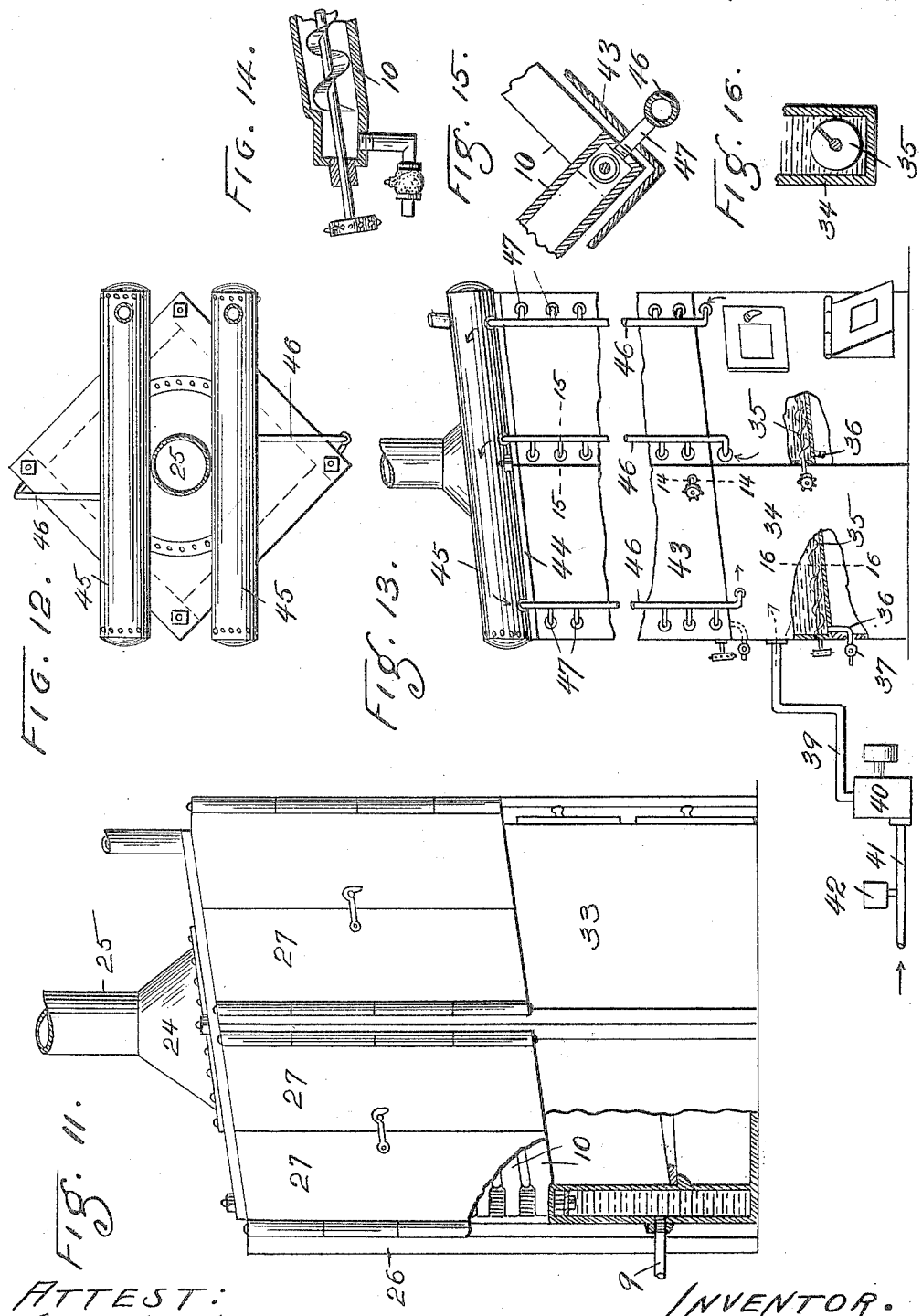
3 SHEETS—SHEET 3.



ATTEST:

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UNITED STATES PATENT OFFICE.

LLOYD ROWAN, OF SHAWNEETOWN, ILLINOIS.

BOILER.

No. 802,479. Specification of Letters Patent. Patented Oct. 24, 1905.

Application filed December 12, 1904. Serial No. 236,491.

To all whom it may concern:

Be it known that I, LLOYD ROWAN, a citizen of the United States, residing at Shawneetown, in the county of Gallatin, State of Illinois, have invented certain new and useful Improvements in Boilers, of which the following is a full, clear, and exact description.

My invention relates to that class of boilers wherein tubes are utilized to contain the water to be heated or generated into steam.

The object of my invention is to construct a simple and inexpensive boiler for heating water and generating steam that will be compact, easily assembled or taken apart, and in which short lengths of boiler-tubes are utilized.

A further object of my invention is to so arrange the parts of the boiler that the fire contacts with and passes between all of the boiler-tubes, thus doing away with all deflectors and bridge-walls and obviating the necessity of providing a forced draft.

My invention consists, primarily, in a series of hollow bars so arranged as to form the walls of the furnace and boiler-tubes connecting each pair of the hollow bars, each series of tubes being arranged at right angles to one another, all the hollow bars and tubes being so connected and inclined as to drain or discharge at a common point.

My invention further consists of certain features of novelty hereinafter shown and described, pointed out in the claims, and illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of a boiler of my improved construction. Fig. 2 is a side elevation of the boiler, the side plates or doors being broken away in order to more clearly show the invention. Fig. 3 is a perspective of one of the tube-sections which compose the body of my improved boiler. Fig. 4 is an enlarged horizontal section taken on the line 4 4 of Fig. 2. Fig. 5 is an enlarged detail section taken on the line 5 5 of Fig. 4. Fig. 6 is an enlarged detail section taken on the line 6 6, Fig. 4. Fig. 7 is an enlarged detail section and showing the connection from the boiler proper into the steam-drum. Fig. 8 is a detail section of a modification of the hollow bar and tubes wherein a sediment and scale removing device is used. Fig. 9 is a horizontal section longitudinally through one of the boiler-tubes seen in Fig. 8. Fig. 10 is an enlarged section taken on line 10 10, Fig. 2. Fig. 11 is a side elevation of my improved boiler as particularly adapted for hot-water heating purposes. Fig. 12 is a plan view of a modified form of my boiler, the same being adapted for steam generating. Fig. 13 is a side elevation of the boiler seen in Fig. 12, parts being broken away. Fig. 14 is an enlarged detail section on line 14 14 of Fig. 13. Fig. 15 is an enlarged horizontal section taken on line 15 15 of Fig. 13. Fig. 16 is an enlarged detail section taken on line 16 16, Fig. 13.

Referring by numerals and letters to the accompanying drawings, 1 indicates a rectangular ash box or pit, the front corner A being of a suitable height and the top edges of the walls sloping gradually downward to the rear corner B. Adjacent the front corner A are the ash-doors 2, provided with suitable draft-openings 3. Positioned on each corner of the ash-box 1 are the vertically-arranged tubular posts 4, and connecting each post with the other are the vertical rows of tubes 5, thus forming the four walls of the fire-box of the furnace.

The rows of tubes 5 forming the front side walls of the fire-box terminate a short distance from the front post 4 and are tapped into vertical tubular posts 6, to which are hinged fire-doors 7, that close the openings between the posts 6 and front post 4. In the corners of the fire-box against the tubular posts 6 are located triangular blocks 6^a of fire-clay or analogous material.

8 indicates grate-bars that are held in position between the ash-pit and the fire-box.

As the posts 4 are all the same height, the top of the fire-box constructed as described slopes from the front to the rear post, corresponding to the slope of the top of the ash-box. A water-inlet pipe 9 is tapped into the lower end of the rear one of the posts 4.

Referring now to Figs. 3, 4, 5, and 6, the construction of the tube-sections of which the body portion of the boiler is composed will now be described. Each tube-section comprises a pair of hollow side bars 10 and the series of connecting-tubes 11. The bars 10 are uniform in size, rectangular in cross-section, and provided with the flattened ends 12, in the top and bottom walls of which are formed the corresponding apertures 13. The ends of the tubes 11 are preferably flanged into the inner walls of the hollow bars 10. A tube-section

so constructed is positioned on top of the fire-box, and on top of this a second section is positioned, but with its tubes arranged at right angles to the first set of tubes, this arrangement being carried out with each succeeding set. The flattened ends 12 of the hollow bars lie directly on one another, with their apertures 13 coinciding, and in said apertures are positioned thimbles 14. There will necessarily be a slight space left between each pair of the adjacent bars 10; but said space is closed by the outside pair of tubes 11, as they are so positioned as to bear directly against the inner corners of the bars 10, as seen in Figs. 4 and 5. The body of the furnace, composed of the tube-sections, may be made as high as desired, all of the tubes and bars composing said sections sloping to the rear, as do the fire-box and ash-pit.

A rectangular plate 15 is positioned on the top tube-section to form a top for the furnace, and passing through the four corners of said plate are rods 16, that extend downwardly through all of the thimbles 14 in the ends of the hollow bars through the tubular posts 4 and on their lower ends are provided with nuts 17. Across the top of the plate 15 from front to rear is positioned a steam-drum 18, the under side of the rear end of which is connected to the upper tube-section by means of a thimble 19. The upper end of the rear one of the rods 16 passes through this thimble 19, through a yoke 20 on the interior of the drum 18, and there receives a nut 21, as do all of the upper ends of said rods 16. The steam-drum is provided with an outlet 22 at its front end.

Formed in the plate 15 at the sides of the drum 18 are apertures 23, covered by a hood 24, that leads to a central pipe 25, thus providing an exit for the smoke and products of combustion after they have passed upwardly through the body of the boiler.

Arranged at each corner of the boiler is a post 26, formed of a heavy angle-iron, to which are hinged plates 27, that form the inclosing sides or doors for the body of the boiler. These plates only extend down as far as the top of the ash-box, and the front pair of said plates are cut away, so as to leave the fire-doors 7 uncovered.

In the modification shown in Figs. 8 and 9, which are particularly adapted for use in boilers using water containing sediment, a rotating cylinder 28 is arranged in each tube, which cylinder is provided with a stiff-wire brush 29, that brushes the entire inner surface of the tube. The cylinders are provided with spindles 30, on the ends of which in the hollow tubes are mounted sprocket-wheels 31, around which passes a sprocket-chain 32. As this chain is driven all the cylinders are slowly rotated, and the brushes 29 scrape the inside of the tubes 11, and any sediment therein will gradually find its way downwardly into the lower end of the lower hollow bar 10 and be discharged from a suitably-located discharge-spout 32.

In the modification seen in Fig. 11 the ash-pit and fire-box are composed of a single hollow-walled box 33, into which the water-inlet pipe 9 leads, and on top of said box is positioned the tube-sections, the lower pair having communication with the water-chamber between the double walls of said box. This modified form of the boiler is not provided with the steam-drum 18, as said boiler is particularly adapted for heating water for household use.

In the modification shown in Figs. 12 and 13 the boiler is particularly adapted for rapid steam generation. In this modification the fire-box 34 is made hollow-walled, and in the bottom of each of the four sides thereof is positioned a spiral conveyer 35, that is suitably driven from the exterior of the box. From the lower ends of the chambers between the walls of this fire-box lead blow-off or discharge pipes 36, provided with valves 37. The water-inlet pipe 39 for this double-walled fire-box leads from a pump 40, and the water-pipe 41 to said pump is provided with a coagulant-introducing chamber 42, thus providing for the introduction of a coagulant into the water that is forced by the pump into the boiler. The sediment in the water in the chambers surrounding the fire-box will gradually settle to the bottom thereof, and as the spiral conveyers are slowly rotated said sediment is drawn to the lowest points in said chambers and there allowed to discharge through the blow-off pipes 36. The tube-sections are located on top of the double-walled fire-box, as described, and are inclosed by suitable side walls or doors 43, and located on top of these walls or doors is a plate 44, on which is positioned a pair of steam-drums 45. Vertical tubes 46 are arranged at each corner of the boiler so constructed, their lower ends being tapped into the upper end of the double-walled fire-box and their upper ends being tapped into the steam-drums 45. Suitable tubular connections 47 lead from these vertical pipes through the walls or doors 43 and are tapped into the ends of the hollow bars of the tube-sections, thus providing for the free circulation of water from the double-walled fire-box direct into all of the hollow bars and into the steam-drums. This construction greatly increases the circulation of water all through the boiler, and steam can therefore be quickly generated. The spiral conveyers 35 and the wire brushes 29 must necessarily be driven very slowly, and this can be accomplished by any well-known driving mechanism.

Various other modifications of my improved boiler will readily suggest themselves to persons skilled in the art of boiler-making; but in all constructions the main feature will be the hollow bars connected by the boiler-tubes,

the same being laid at right angles to one another and on top of each other, with the ends of the bars meeting, and all of said tube-sections sloping in the same direction.

A boiler of my improved construction is applicable for all purposes where it is desired to heat water or generate steam. It can be made comparatively large and of considerable height for marine use, and yet occupy a much smaller space than the ordinary horizontal boiler, or it can be made comparatively small for use in heating water for all household purposes.

As short tubes are made use of, the boiler may be easily and cheaply constructed and may be quickly taken apart should a tube-section need to be replaced or repaired.

By referring to Fig. 4 it will be noted that the alternate arrangement of the tubes provides a series of square spaces or flues, which greatly assist the normal draft of the fire through the boiler, and, if desired, the tubes may be offset or stepped, so as to form tortuous passages upward between the tubes for the draft.

My improved boiler does away with the necessity of a large amount of masonry, presents the maximum amount of heating-surface to the fire, and possesses superior advantages in point of simplicity, durability, and general efficiency.

I claim—

1. In a boiler, a series of pairs of hollow bars, the same occupying inclined positions, the ends of said hollow bars lying adjacent one another, and provided with coinciding apertures, a series of tubes for each pair of hollow bars, each series of tubes being arranged at right angles to the next adjacent series, and means whereby all of said hollow bars are held together, substantially as specified.

2. In a boiler, a rectangular ash-pit, a rectangular fire-box located on said ash-pit, a series of pairs of hollow bars arranged on top of said fire-box, their ends overlapping, and having communication with each other, and a series of tubes for each pair of hollow bars, each series of tubes being arranged at right angles to the adjacent set of tubes, substantially as specified.

3. In a boiler, a rectangular ash-pit, a rectangular fire-box located on said ash-pit, the upper end of which fire-box is inclined, a series of pairs of hollow bars positioned on the top edges of the fire-box, the meeting ends of said bars being secured together, and having communication with one another, a series of tubes connecting each pair of hollow bars, a plate located on top of the uppermost pair of hollow bars, a steam-drum located on said plate, a tubular connection from said steam-drum to one of the uppermost hollow bars, a hood extending upwardly over an aperture formed in said plate, and a pipe leading upwardly from said hood, substantially as specified.

4. In a boiler, a plurality of tube-sections, each section comprising a pair of hollow bars, tubes connecting each pair of hollow bars, the ends of said hollow bars being narrowed, and provided with apertures which coincide with the apertures in the next adjacent pair of hollow bars, substantially as specified.

LLOYD ROWAN.

Witnesses:
ALBERT M. SWIFT,
H. E. MAIN.