

March 29, 1932.

T. B. STILLMAN

1,851,466

BOILER

Original Filed June 11, 1929 2 Sheets-Sheet 1

FIG. 2.

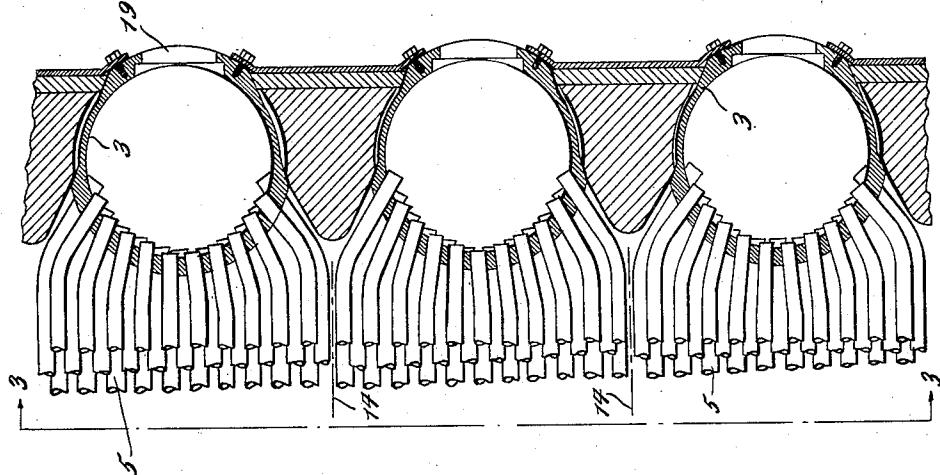
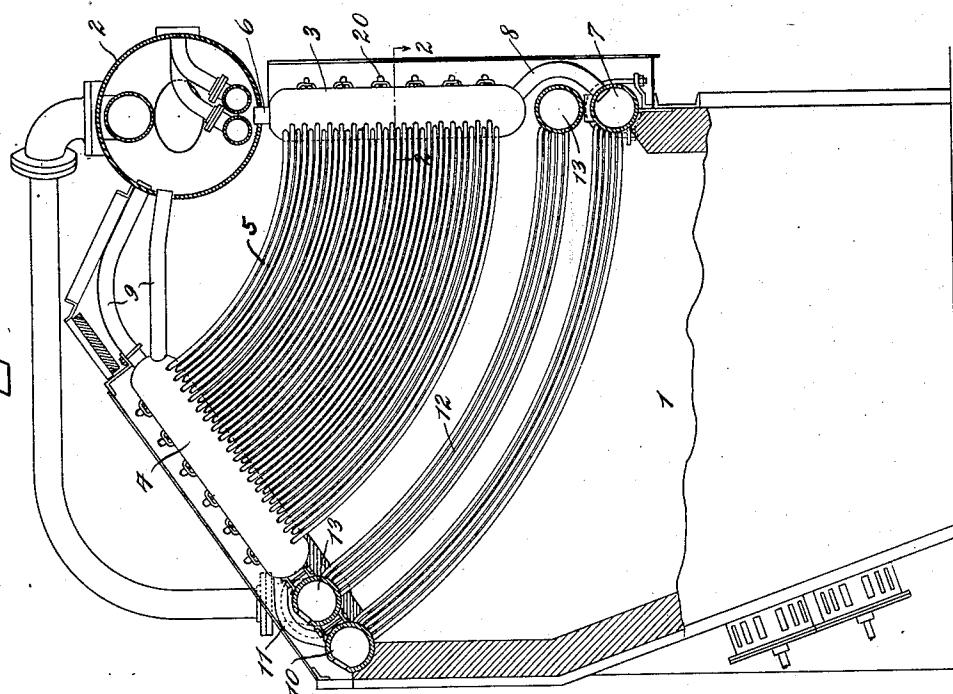


FIG. 1.



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FIG. 4.

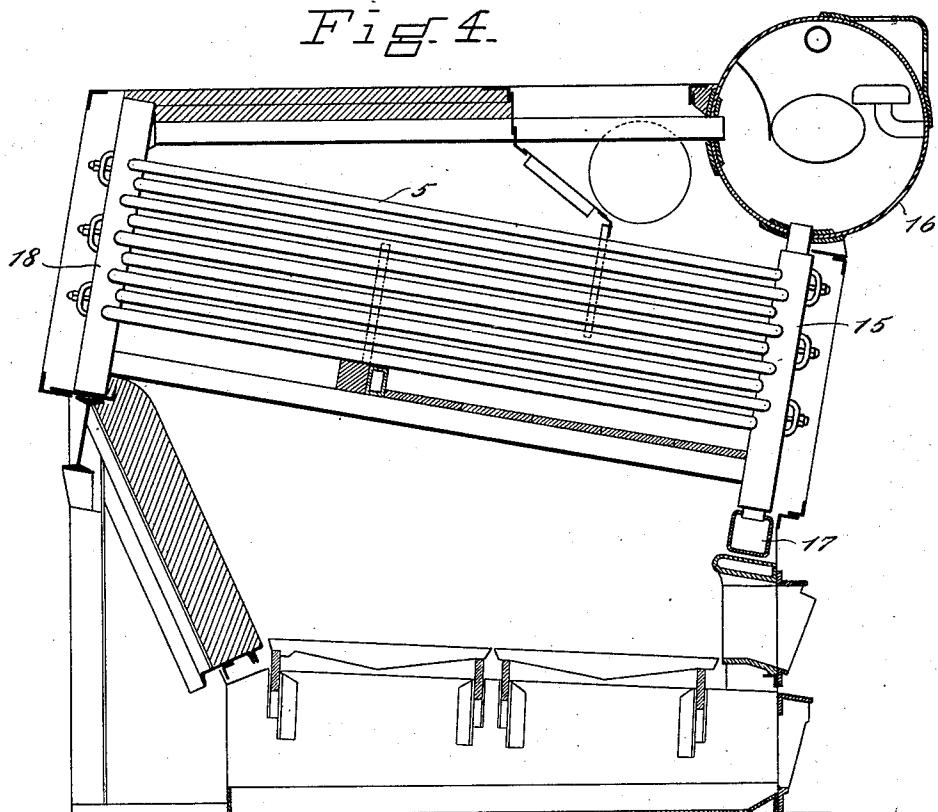
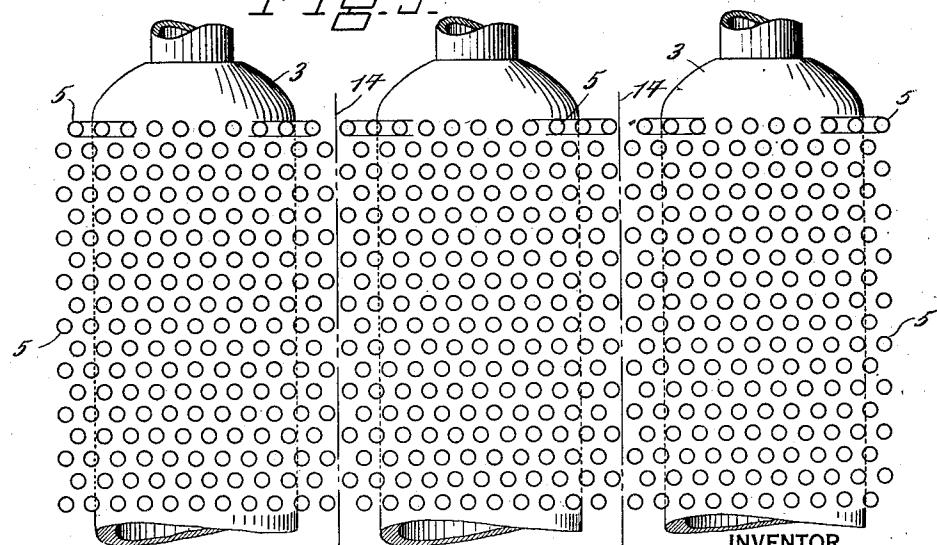


FIG. 3.



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BOILER

Application filed June 11, 1929, Serial No. 369,960. Renewed January 25, 1932.

This invention relates to a novel and improved form of boiler, the novel features of which will be best understood from the following description and the annexed drawings, in which are shown certain selected embodiments of the invention and in which:

Fig. 1 is a vertical sectional view through one form of boiler constructed according to the invention.

Fig. 2 is a fragmentary section taken on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary section taken on the line 3—3 of Fig. 2, and Fig. 4 is a view corresponding to Fig. 1 but showing a different 15 form of boiler with the invention applied thereto.

Referring first to Fig. 1, I have shown therein a boiler disposed above a furnace having a combustion chamber 1, the boiler 20 consisting of a steam and water separator in the form of a drum 2 to which are connected groups of downtake headers 3 and uptake headers 4. These headers are connected by a bank of tubes 5, these tubes being arranged 25 in nests with each nest connecting a pair of headers, one an uptake header and the other a downtake header. Each nest of tubes and the headers which it connects will be referred to hereinafter as a section. The downtake 30 headers are shown as being connected to the drum 2 by means of short nipples or pipes 6 and to a lower chamber 7 by means of nipples 8. Similarly, the uptake headers 4 are shown as being connected to the drum 2 by 35 nipples or pipes 9, and to a lower chamber 10 by means of nipples 11. In this particular form of boiler, there is shown a superheater formed of tubes 12 connected at their opposite ends to drums 13.

With the curved form of tube illustrated 40 in Fig. 1, it will be seen that the upper ends of the headers 4 are at a higher elevation than the upper ends of the headers 3. The headers, both uptake and downtake, are preferably spaced apart as shown in Fig. 2, and may be of the cylindrical type shown or may be of any any other suitable form. The tubes connected to the headers are entered in 45 holes in the walls thereof, and at least some of these tubes have their ends bent as plainly

shown in Fig. 2, whereby the greater portion of the lengths of the bent tubes may be parallel to the other tubes, and whereby the nests of tubes will form a substantially continuous bank across the boiler transversely to the length of the headers.

The tubes are arranged in horizontal rows, as plainly shown in Fig. 3, and the spacing of tubes in each row is preferably less than a tube diameter and is substantially uniform across the nest and across the bank formed by the plurality of nests. Preferably, also, the tubes in each row are staggered with respect to the tubes in adjacent rows.

With the above described construction, it will be seen that it would be difficult to remove a section consisting of two headers connected by a nest of tubes, except by swinging the entire section around the center of the concentrically curved tubes 5. If the tubes in each horizontal row are thus closely and uniformly spaced in that row entirely across the bank of tubes, and are staggered across the bank with relation to the tubes in adjacent rows, it will be seen that no horizontal or vertical movement of the section is possible, because of overlapping tubes in adjacent nests. To overcome this difficulty and to make possible the manipulation of a section either vertically or horizontally, I dispose the tubes in adjacent sections or nests on opposite sides of planes which extend between these sections or nests, such planes being indicated by the lines 14. The tubes at the edges of adjacent nests are disposed close together, and close to these planes, but nevertheless on opposite sides thereof, thereby obtaining substantially uniform close spacing of tubes across the bank and, at the same time, permitting movement of the sections either lengthwise of the headers or in the form shown in Fig. 1, horizontally. By this arrangement, a section may be manipulated, so as to withdraw it from the boiler, and this manipulation is of course dependent upon the location of obstacles outside the boiler, which it may be necessary to avoid. The arrangement described permits freedom of manipulation while, at the same time, providing a large heating area of tubes.

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Referring to Fig. 4, I have shown therein another form of boiler in which the invention finds utility. In this form, the downtake headers 15 have their ends closely adjacent to the steam and water drum 16 and the water chamber 17 respectively, to which they are connected by nipples, as shown. The uptake headers 18 are longer than the clearance between the drum 16 and chamber 17, and also have their upper ends disposed above the upper ends of the downtake headers. With this arrangement, it would be difficult to manipulate a section if the tubes in adjacent nests overlapped, to prevent vertical movement between sections, particularly if the tubes were closely spaced. But, with the tubes 5 of this embodiment arranged in the manner shown in Figs. 2 and 3, it will be seen that a section may be cut loose and then drawn horizontally out towards the right, as viewed in Fig. 4, and then it may be tilted or otherwise manipulated so that the header 18 of that particular section may be withdrawn through the space between the drum 16 and chamber 17.

In both forms shown, the headers are preferably supplied with the usual longitudinal series of handholes 19 provided with the usual covers 20, these handholes furnishing access to the tubes which are connected into the opposite walls of the headers.

I claim:

1. In a water tube boiler, a group of vertically extending headers connected at opposite ends to chambers disposed closely adjacent said ends, a second group of headers connected to the first group by tubes for substantially the entire length of the first-named headers, the headers in the second group being longer than the clearance between said chambers, the adjacent headers in each group being spaced apart and at least some of said tubes being bent at their ends to enter holes in the walls of the headers, the tubes connected to two adjacent headers in a group being disposed for substantially their entire lengths on opposite sides of a plane extending between said adjacent headers.

2. In a water tube boiler, a plurality of sections arranged side by side, each section comprising an uptake and a downtake header connected by a nest of tubes, adjacent uptake and adjacent downtake headers being spaced apart, at least some of the tubes in the nest being bent at their ends to enter holes in the walls of said headers, a steam and water separator common to a group of headers at one end of the sections, pipes connecting the end portions of both uptake and downtake headers to said separator, the tubes in each nest being substantially uniformly spaced apart transversely of the headers a distance less than a tube diameter, and the tubes in the adjacent nests forming a substantially continuous transversely extending bank of tubes,

the tubes at the edges of adjacent nests being spaced apart a distance greater than a tube diameter and being disposed on opposite sides of a plane separating said nests but closely adjacent to said plane, whereby a section may be moved longitudinally of the headers without having the tubes therein engaging the tubes in adjacent nests.

3. In a water tube boiler, a plurality of sections arranged side by side, each section comprising an uptake and a downtake header connected by a nest of tubes, adjacent uptake and adjacent downtake headers being spaced apart, at least some of the tubes in the nest being bent at their ends to enter holes in the walls of said headers, a steam and water separator common to a group of headers at one end of the sections, pipes connecting the end portions of both uptake and downtake headers to said separator, the tubes in each nest being substantially uniformly spaced apart transversely of the headers, and the tubes in the adjacent nests forming a substantially continuous transversely extending bank of tubes, the tubes at the edges of adjacent nests being spaced apart a distance greater than the distance between tubes within the nests and disposed on opposite sides of a plane separating said nests but closely adjacent to said plane, whereby a section may be moved longitudinally of the headers without having the tubes therein engaging the tubes in adjacent nests.

4. In a water tube boiler, a plurality of sections arranged side by side, each section comprising an uptake and a downtake header connected by a nest of tubes with said uptake and downtake headers disposed at an angle to each other and with said tubes in the nest disposed substantially on arcs of concentric circles, adjacent uptake and adjacent downtake headers being spaced apart, at least some of the tubes in the nest being bent at their ends to enter holes in the walls of said headers, a steam and water separator common to a group of headers at one end of a section, pipes connecting the end portions of both uptake and downtake headers to said separator, the tubes in each nest being substantially uniformly spaced apart transversely of the headers, and the tubes in the adjacent nests forming a substantially continuous transversely extending bank of tubes, the tubes at the edges of adjacent nests being spaced apart a distance greater than the distance between tubes within the nests and disposed on opposite sides of a plane separating said nests but closely adjacent to said plane, whereby a section may be moved longitudinally of the headers without having the tubes therein engaging the tubes in adjacent nests.

5. In a water tube boiler, a plurality of sections arranged side by side, each section comprising an uptake and a downtake header connected by a nest of tubes with said up-

take and downtake headers disposed at an angle to each other and with said tubes in the nest disposed substantially on arcs of concentric circles, adjacent uptake and adjacent 5 downtake headers being spaced apart, at least some of the tubes in the nest being bent at their ends to enter the holes in the walls of said headers, a steam and water separator common to a group of headers at one end of 10 a section, pipes connecting the end portions of both uptake and downtake headers to said separator, the tubes in each nest being substantially uniformly spaced apart transversely of the headers a distance less than a tube 15 diameter, and the tubes in the adjacent nests forming a substantially continuous transversely extending bank of tubes, the tubes at the edges of adjacent nests being spaced apart a distance greater than a tube diameter 20 and being disposed on opposite sides of a plane separating said nests but closely adjacent to said plane, whereby a section may be moved longitudinally of the headers without having the tubes therein engaging the tubes 25 in adjacent nests.

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