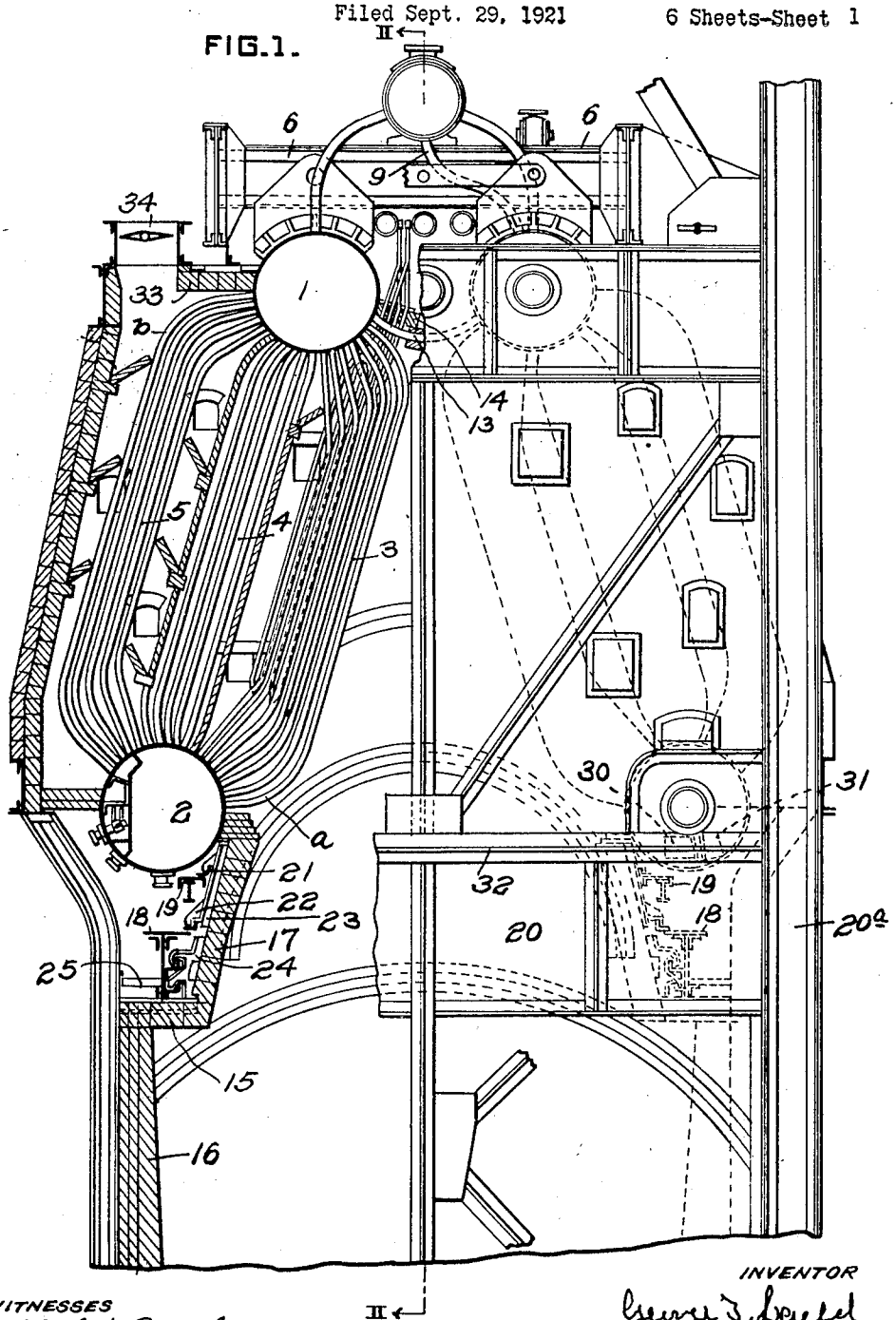
April 17, 1928. 1,666,659

G. T. LADD

BOILER

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FIG. 1.



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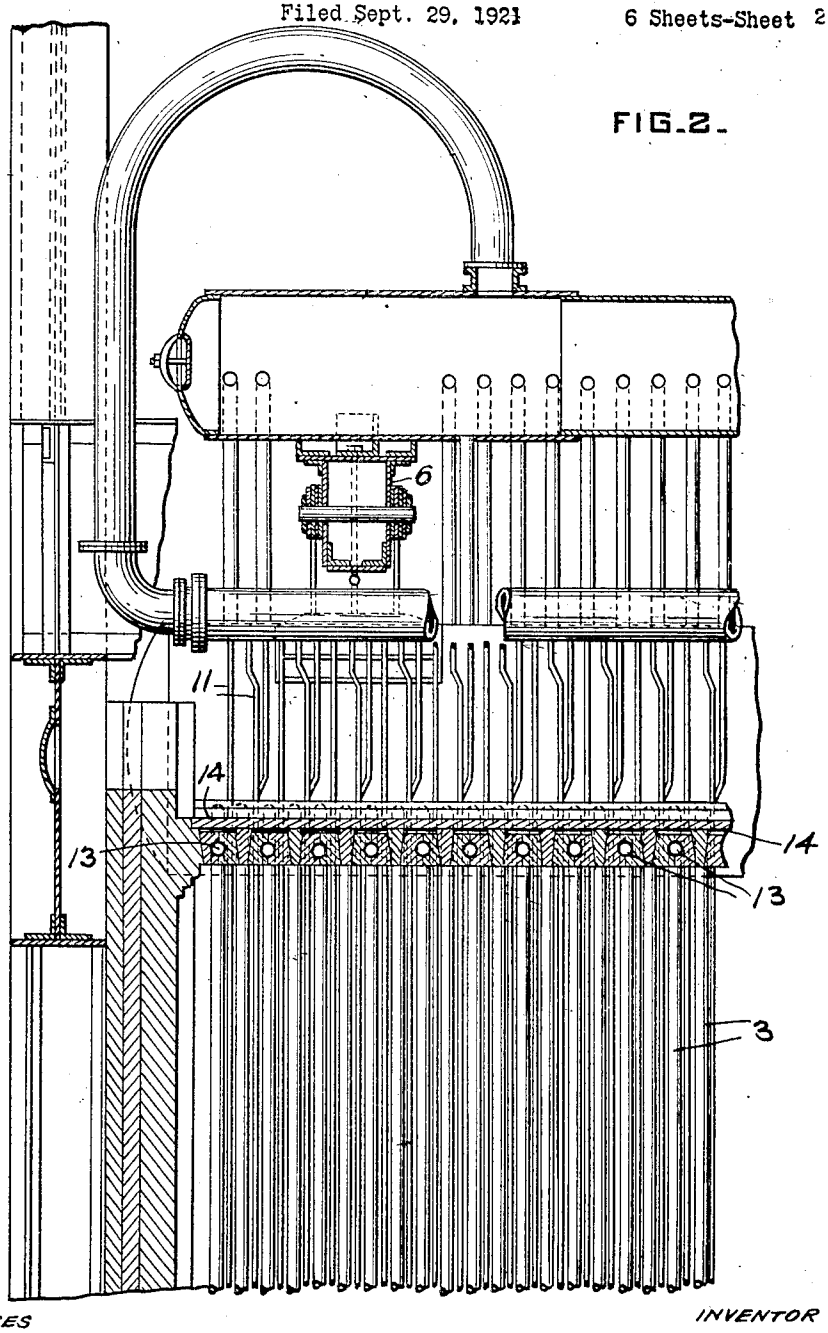
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FIG. 2.



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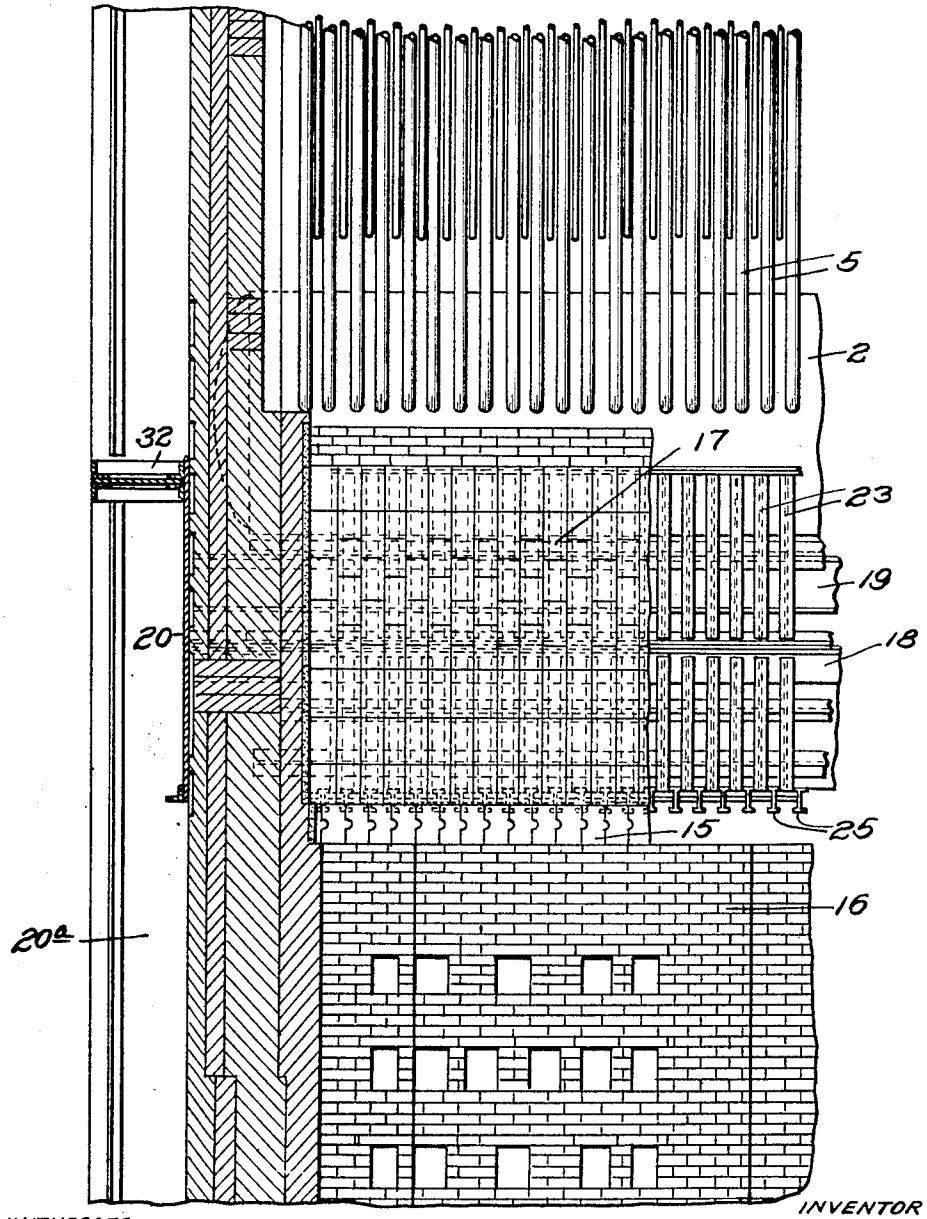
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FIG. 2.a



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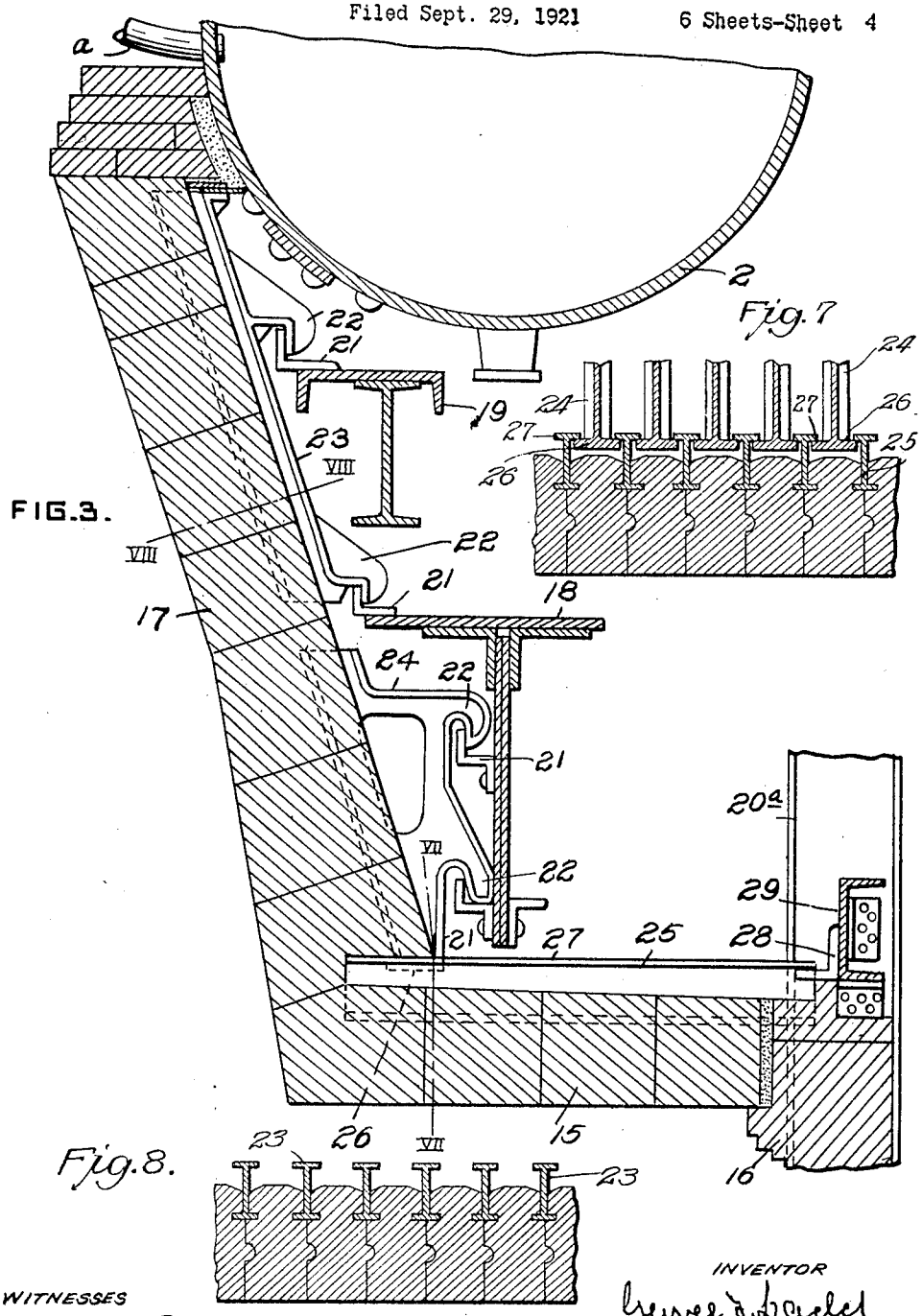


FIG. 3.

Fig. 7

Fig. 8.

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FIG. 4.

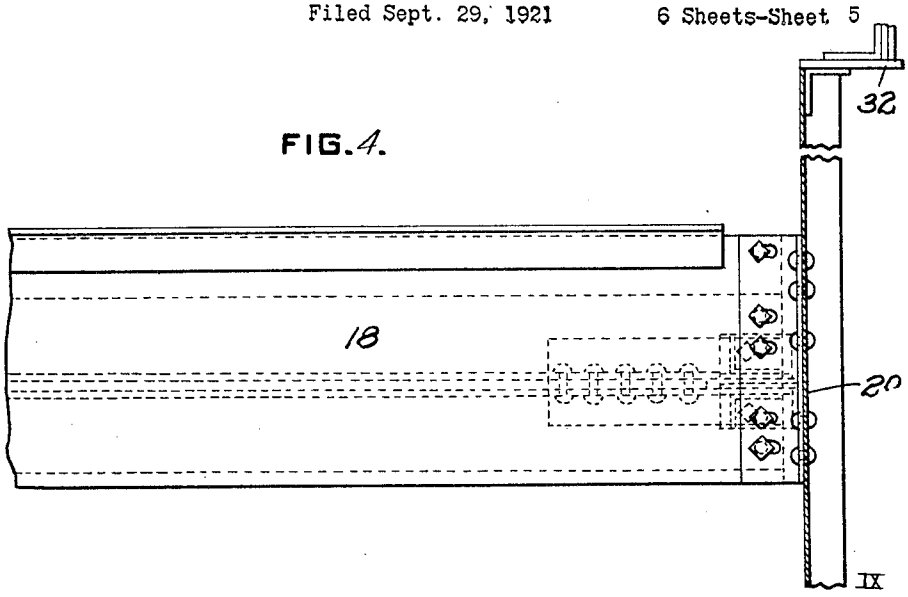


FIG. 5.

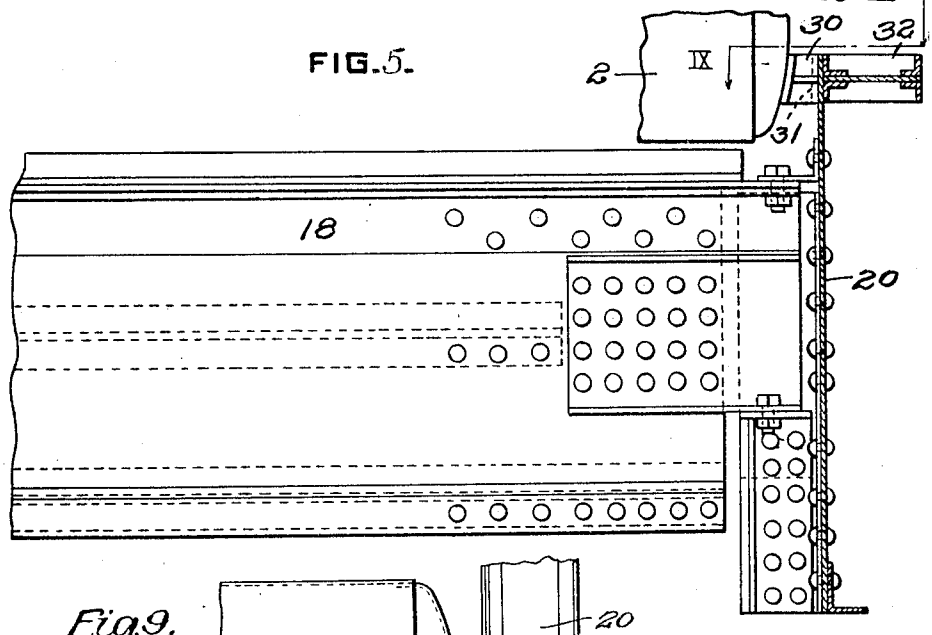
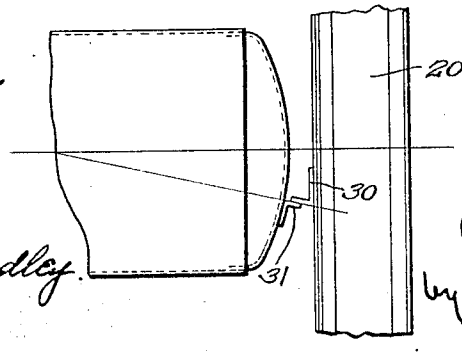


Fig. 9.



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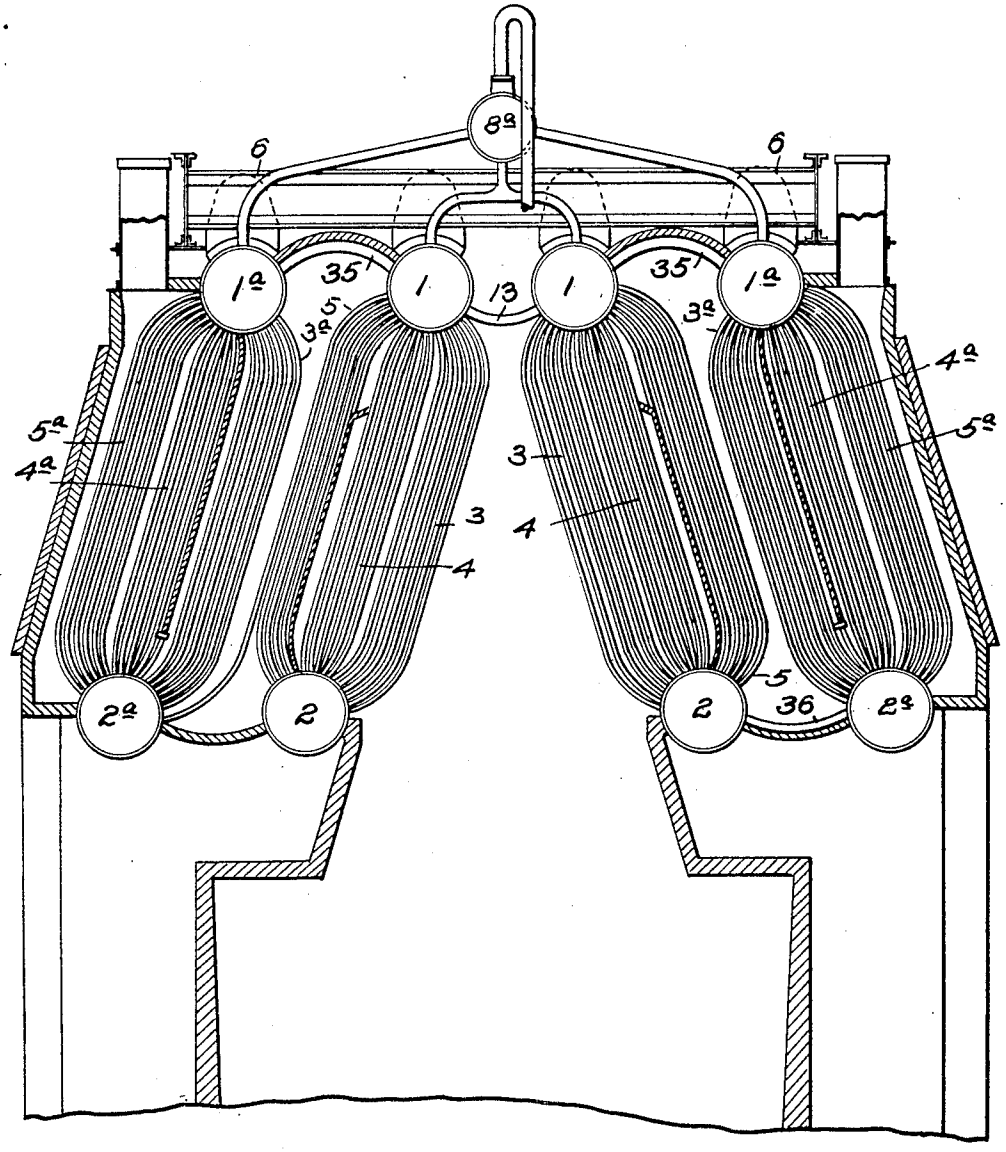
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BOILER

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FIG. 6.



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Patented Apr. 17, 1928. · 1,666,659

UNITED STATES PATENT OFFICE.

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BOILER.

Application filed September 29, 1921. Serial No. 504,086.

This invention relates to boilers, and one object of the invention is to improve the construction of a boiler of the straddle type, which is suspended from a framework, by providing novel means to maintain the lower drums of the boiler spread apart in proper spaced relation.

Another object of my invention is to provide supporting means for the arch and bridge wall construction, that may be carried by the supporting framework of the boiler.

In the accompanying drawings forming a part of this specification, Fig. 1 is a view partly in section and partly in elevation of a boiler installation embodying the improvements described herein; Figs. 2 and 2ª show respectively the upper and lower portions of a sectional elevation, the plane of section being indicated by the line II—II, Fig. 1; Fig. 3 is a sectional detail view on an enlarged scale showing the top of a portion of the fire box, the bridge wall and the means employed for supporting said members; Figs. 4 and 5 are a side elevation and plan respectively, of portions of the steel frame and the beam supporting the bridge wall and fire box arch; Fig. 6 is a sectional elevation showing modifications in the generating units; Figs. 7, 8 and 9 are sectional detail views, the planes of section being indicated by the lines VII—VII, VIII—VIII in Fig. 3 and the lines IX—IX in Fig. 5.

In the practice of the invention two heating or generating units are employed, each of said units consisting of upper drums 1, lower drums 2, and banks 3, 4, 5, of connecting tubes. These units are so installed as to form between them a combustion chamber from which the hot gases flow in opposite directions and traverse the heating surfaces of the respective units. It is preferred that the units should be inclined towards each other thereby forming an A-shaped combustion chamber. The units are suspended from beams which are supported by a metal frame enclosing but not connected to the brick walls of the setting, as described and claimed in Letters Patent No. 1,159,051, granted November 2, 1915. In suspending the units the upper drums 1 are so connected to the supporting beam 6 which as before stated is carried by the steel frame that the units may move freely under changes of temperature. The suspending elements may be constructed and arranged if the boiler has a relatively small normal rating per unit, as shown and described in Letters Patent No. 1,238,530, dated August 28, 1917, or if the boiler consists of larger units it is preferred that the upper drums have a pivotal connection to the supporting beams as shown herein in Figs. 1 and 2.

In order to ensure uniform level of water in the units, the upper drums 1 are connected by a plurality of pipes 13, the points of connection of said pipes with the drums being by preference closely adjacent to the outer tubes *a* of the inner banks 3. These connecting pipes 13 serve to support refractory blocks 14 which close the space between the drums 1 and form what may be termed the combustion chamber as shown in Figs. 1 and 2.

At suitable distances between the lower drums 2, flat arches 15 project inwardly from the side walls 16 of the fire box, and bridge walls 17 extend up from the inner edges of these arches to a horizontal plane intersecting the lower drums closely adjacent to the points of connection of the outer tubes *a* of the banks 3, with the drums. Provision is made for so connecting the tiles or blocks forming the arches 15 and bridge walls 17 to the metal frame enclosing the brick work, as to permit of the easy and quick removal or renewal of such blocks or tiles as shown in Figs. 2ª, 3, 4 and 5. Beams 18 and 19 have their ends suitably secured to horizontal girders 20 having their ends secured to vertical members 20ª, said girders and vertical members forming parts of the enclosing metal frame. The beams 18 and 19 extending horizontally from one side of the frame to the other below the lower drum as shown in Figs. 1 and 3. On each of these beams are secured angle bars 21 for engagement by hooks 22 on frames 23 and 24 having the edges opposite those provided with the hooks T-shaped in cross section for engagement with correspondingly shaped grooves in the faces of the blocks and tiles forming the bridge walls as shown in Figs. 3 and 8. It will be observed that the beams 18 and 19 are so located and the tile supporting frames so constructed that when the frames are hung on the beams, the upper frame 23 will be at such a distance from the lower drum that the tiles may be easily placed on and

removed from the frames. The tiles forming the flat arch are supported by I-beams 25, said tiles having T-shaped grooves in their upper ends for the reception of the lower flange of the beams 25. The inner ends of the beams 25 are supported by the frames 24 which are provided at their lower outer corners with ledges 26 adapted to project under the upper flange 27 of the beams 25 as shown in Figs. 3 and 7. The outer ends of these beams are notched for the reception of one of the sides of angles 28 riveted to horizontal beams 29 which have their ends secured to the columns 20^a forming portions of the enclosing metal frame.

By reference to Figs. 1, 2^a and 5, it will be seen that the upper member of the girder 20 is formed by an I-beam 32 thereby increasing the strength of the girder as against compressive strains, such strengthening being necessary as such portion of the girder is employed in holding the lower drums spread apart the desired distance.

In order to hold the lower drums spaced the desired distance apart, knee pieces 30 are secured to the upper portions of the girders 20, which serve as abutments for the angle pieces 31 secued to the ends of the drums as shown in Figs. 5 and 9. The units being pivotally suspended from the beams 6 and the center of gravity of the units being outside of the pivotal points, when their lower drums are properly spaced, the portions of the girders intermediate the knees or abutments 30 will be subjected to severe compressive strains, when large units are employed and charged with water. Hence it is desirable to reinforce the portions of the girders directly subjected to such strains as hereinbefore stated.

The top of the heating chamber is formed in part by the tiles 14 intermediate the upper drums and carried by tubes 13 as hereinbefore described, and over the rear passes and outside of the drums by tiles 33 which are supported by bars arranged intermediate the outlets 34 to the stack and the respective drums 1. It will be observed that these tiles abut against the drums along a line closely adjacent to the points where the outer tubes 5 of the bank 5 enter the upper drums.

As is well known, the heat absorbing efficiency of the elements of a boiler is dependent upon the relation of its surface to the volume of water therein and varies inversely with its diameter, and hence in boilers of the type shown herein the heat absorption or gas cooling efficiency of the drums is practically nil as compared with the efficiency of the tubes. It has therefore been one of the objects in designing the installation shown and described herein to reduce nonefficient heat absorbing surfaces such as the drums and the walls of the setting and to confine the flow of hot gases to areas occupied by the tubes.

As shown in Fig. 6 the generating units each may consist of a pair of upper drums 1, 1^a, and a pair of lower drums 2, 2^a, and banks of connecting tubes 3, 4, and 5, and 3^a, 4^a, and 5^a. The additional members of the units consisting of drums 1^a, 2^a, and connecting banks of tubes 3^a, 4^a, 5^a, are pivotally supported from beams 6 carried by the metal frame in the same manner as shown in Figs. 1 and 2. When using the additional members the drums 1 and 2 are connected respectively to the drums 1^a and 2^a by tubes 35 at points above the water level in said drums and the drums 1^a and 2^a are connected by tubes 7^a with the steam drums 8^a.

In order to maintain a uniform water level in the members of each pair, the lower drums may be connected by tubes 36 as shown at the right in Fig. 6, or one row of the tubes in the bank 5 of the inner member of the pair may be connected to the lower drum 2^a as shown at the left in Fig. 6.

I claim herein as my invention:

1. A boiler installation having in combination a metal frame, a setting enclosed by the frame, two generating units, each consisting of upper and lower drums and connecting tubes, pivotally suspended from the frame, and means carried by the frame for holding the lower drums in such positions that the axes of the lower drums will be outside of vertical planes coincident with the axes of the upper drums.

2. A boiler installation having in combination a metal frame, a setting enclosed by the frame, two heating units each consisting of upper and lower drums and connecting tubes, so arranged within the setting as to form between them a combustion chamber, arches extending into the combustion chamber, bridge walls arranged above the arches, beams having their ends connected to the metal frame, and means carried by the beams for supporting the tiles or blocks forming the arches and bridge walls.

3. A boiler installation comprising in combination a generating unit including upper and lower drums and connecting tubes, a framework, means for suspending said generating unit from said framework, a refractory enclosure for said unit, a refractory lined combustion chamber below said unit, a bridge wall between said combustion chamber and said unit cooperating with the refractory lining of the combustion chamber to provide a throat through which the products of combustion pass to the generating unit, and means for supporting said bridge wall from said framework.

In testimony whereof, I have hereunto set my hand.

GEORGE T. LADD.