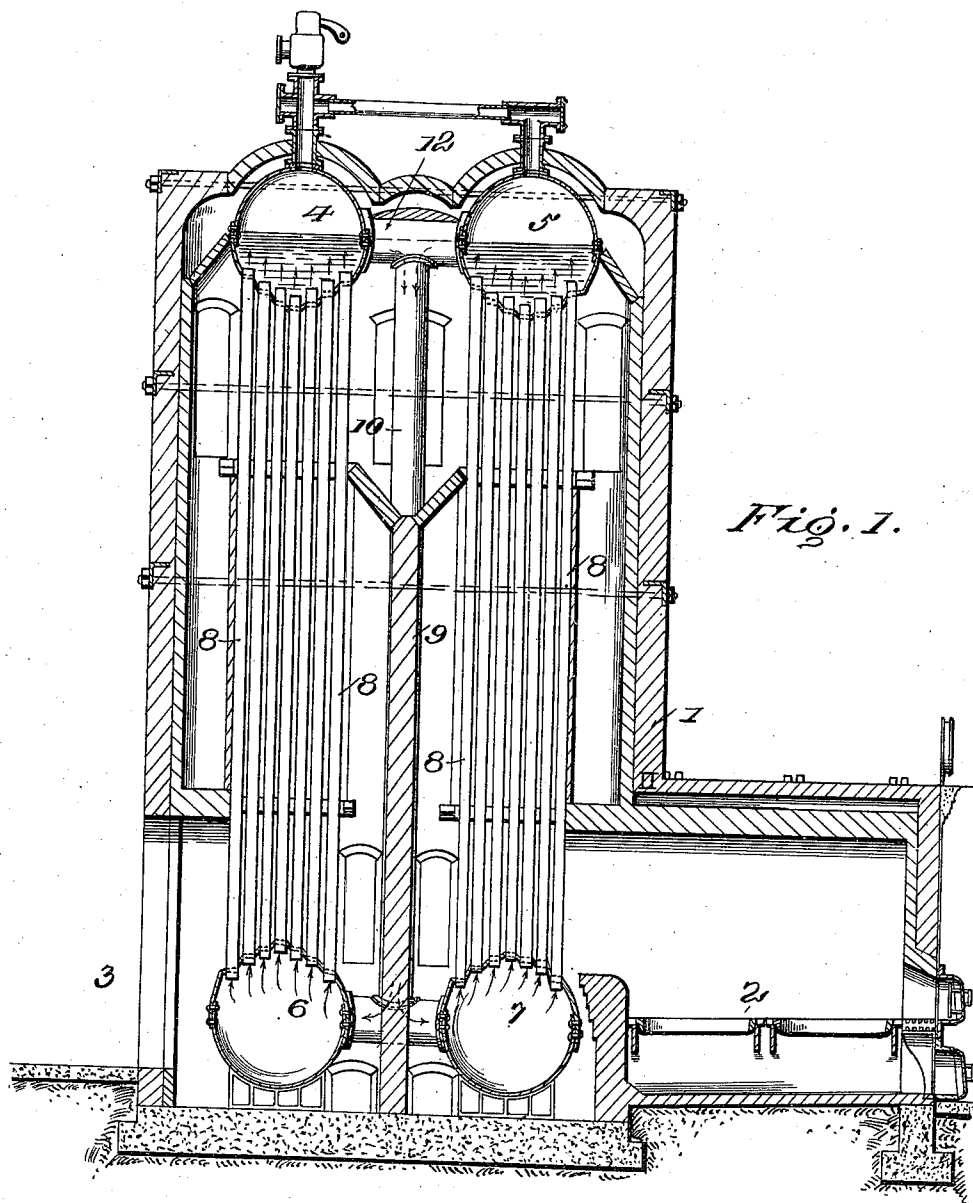


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STEAM BOILER.
APPLICATION FILED JULY 7, 1910.

Patented Dec. 6, 1910.
2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 2.

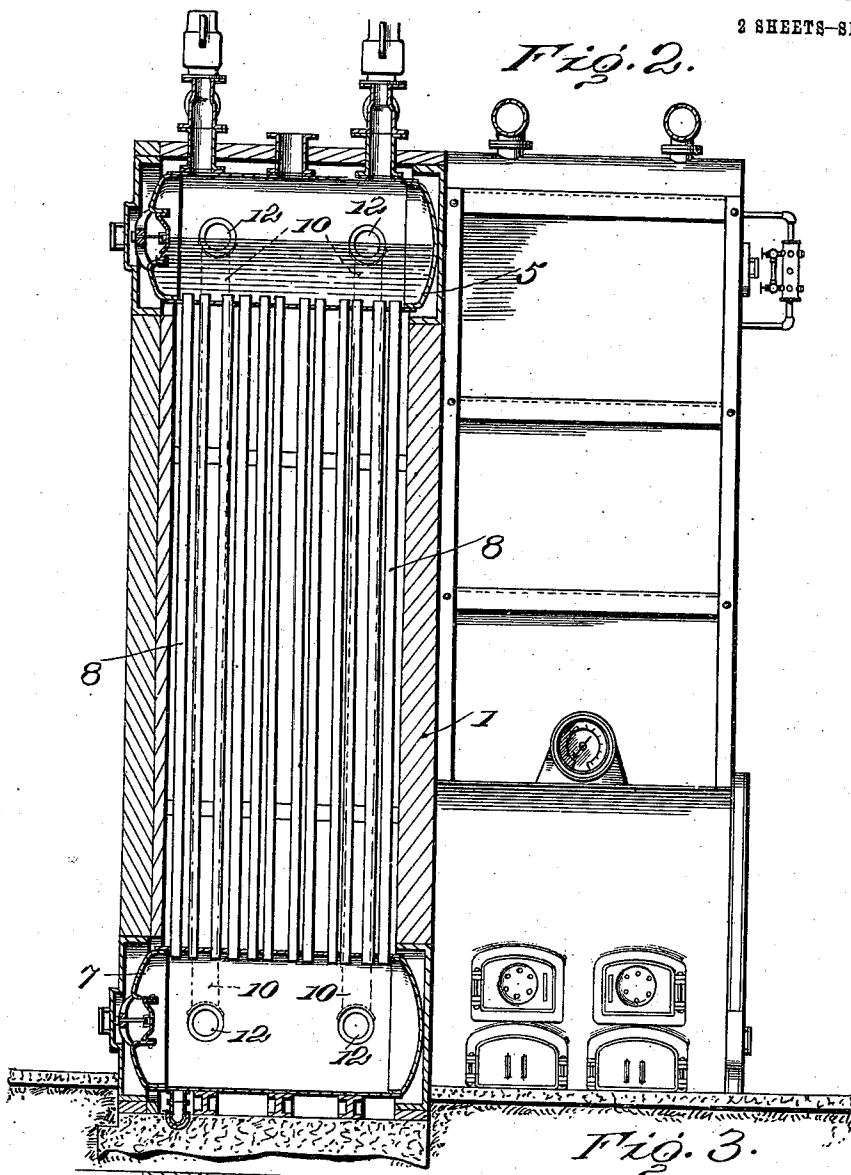
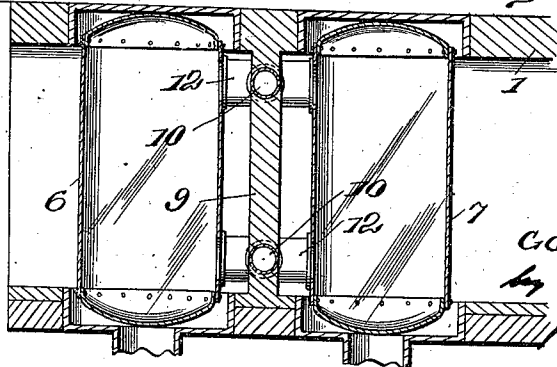


Fig. 3.



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UNITED STATES PATENT OFFICE.

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STEAM-BOILER.

978,009.

Specification of Letters Patent.

Patented Dec. 6, 1910.

Application filed July 7, 1910. Serial No. 570,814.

To all whom it may concern:

Be it known that I, GODFREY ENGEL, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Steam-Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The primary object of this invention is to provide improved means for maintaining, under all conditions, circulation between the upper and lower drums of a boiler independently of the steam generating tubes, and which will insure the equalization of both the water level and the steam pressure within the upper drums.

A further object is to locate the circulation passages wholly within the furnace setting.

A further object is to provide against trouble arising from double circulation which might be caused by the formation of steam in the circulation passages. And a further object is to so form the circulation passages as to enable access to be readily had thereto for both construction and repair work.

The invention will be hereinafter fully set forth and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a sectional elevation showing my present improvements. Fig. 2 is a view at right angles to Fig. 1, partly in section. Fig. 3 is a section on line 3—3, Fig. 1.

Referring to the drawings, 1 designates a furnace setting which may be of any preferred construction, and equipped with fire-boxes 2 and chimney outlet 3. Within this setting, at the top thereof, are two drums 4 and 5 which are shown as connected, respectively, to two lower drums 6 and 7 by means of two series of steam generating tubes 8. These drums are preferably provided with seats for the tubes formed after the manner contemplated by Letters Patent No. 948,271 issued to me February 1, 1910. Located between the two series of generating tubes is a vertical partition 9 which extends from the bottom of the furnace setting to a point near the upper drums, such partition, as customary, serving to cause the heat products to travel first upward and then

downward before escaping to the chimney outlet 3.

It is the purpose of my present invention to so connect the upper and lower drums, within the furnace setting, as to equalize both the water level and the steam pressure within the upper drums. To this end I form commodious circulation passages between all the drums, and while the number of passages is not material, yet I prefer to use two of them. These passages are shown as composed of large I pipes 10 located wholly within the furnace setting within the space between the two series of generating tubes. The upper and lower lateral branches 12 of each pipe open, respectively, directly into the upper and lower drums at about their median lines, the upper branches forming communication with both the steam and water spaces of the upper drums. These branches of the circulating pipes are usually of such diameter that a workman may crawl through them in construction or repair work, and they provide freedom of communication between all the drums and equalization of level and pressure within the upper drums. The diameter of the vertical portions of these pipes is usually sufficiently large to provide the full capacity for carrying downward all the necessary water regardless of how severely the boiler may be forced, and also to take care of any double circulation that might be caused by steam formation within such pipes. The circulation pipes are shown as extending vertically within partition 9, which, although it does not wholly inclose the pipes, lessens the chance of steam being formed therein.

Although I have shown and described the preferred manner of carrying out my invention, it will be understood that changes may be made without departing from the scope or spirit of the invention.

The advantages of my improvement will be readily appreciated by those skilled in the art. It will be seen that the large circulating pipes are located wholly within the furnace setting, and being within the space between the two series of generating tubes are wholly out of the way. These pipes freely maintain a perfect circulation between all the drums, and this circulation is not liable to be interfered with by the generation of steam in such pipes, the water being always free to flow therethrough.

I claim as my invention:

1. In a water tube boiler having upper and lower drums arranged in pairs, and two series of generating tubes connecting
5 the upper drums with the lower drums, a water circulating pipe of relatively large diameter connecting all the drums and opening into the steam and water spaces of the upper drums, said pipes extending vertically
10 within the space between the two series of generating tubes.

2. In a water tube boiler having upper and lower drums arranged in pairs, and separate series of generating tubes connecting
15 the upper drums to the lower drums, a water circulating pipe extending vertically within the space between the series of generating tubes, such pipe having at its upper and lower ends opposite lateral branches opening
20 directly into oppositely disposed drums at the median lines thereof.

3. In a water tube boiler having upper and lower drums arranged in pairs, and generating tubes connecting the upper
25 drums to the lower drums, a water circulating pipe extending vertically within the

space between the tubes, and having an upper horizontal portion connecting the steam spaces and water spaces of the oppositely
disposed upper drums, and having a lower
30 horizontal portion communicating with the oppositely disposed lower drums.

4. In combination with a furnace setting, upper and lower drums located therein and arranged in pairs, and two series of gener-
35 ating tubes connecting the upper drums to opposite lower drums, a partition extending vertically between the two series of tubes from the lower part of the furnace setting to a point near the upper drums, and water
40 circulating pipes extending vertically within said partition and having lateral branches opening directly into adjacent drums, the upper branches opening into the steam and
45 water spaces of the upper drums.

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses.

GODFREY ENGEL.

Witnesses:

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