

No. 827,585.

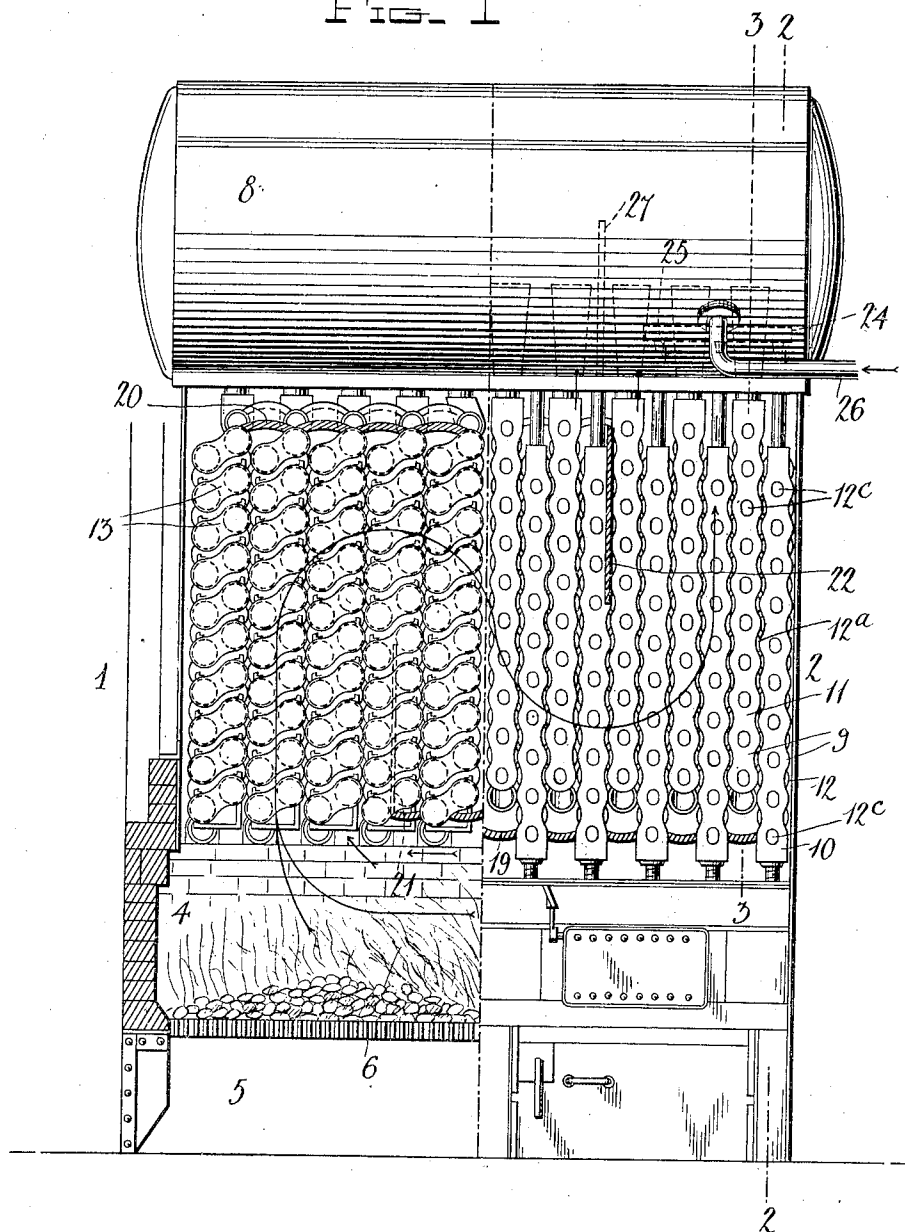
PATENTED JULY 31, 1906.

Y. WADAGAKI.
SECTIONAL WATER TUBE BOILER.

APPLICATION FILED DEC. 14, 1905.

4 SHEETS—SHEET 1.

FIG. 1



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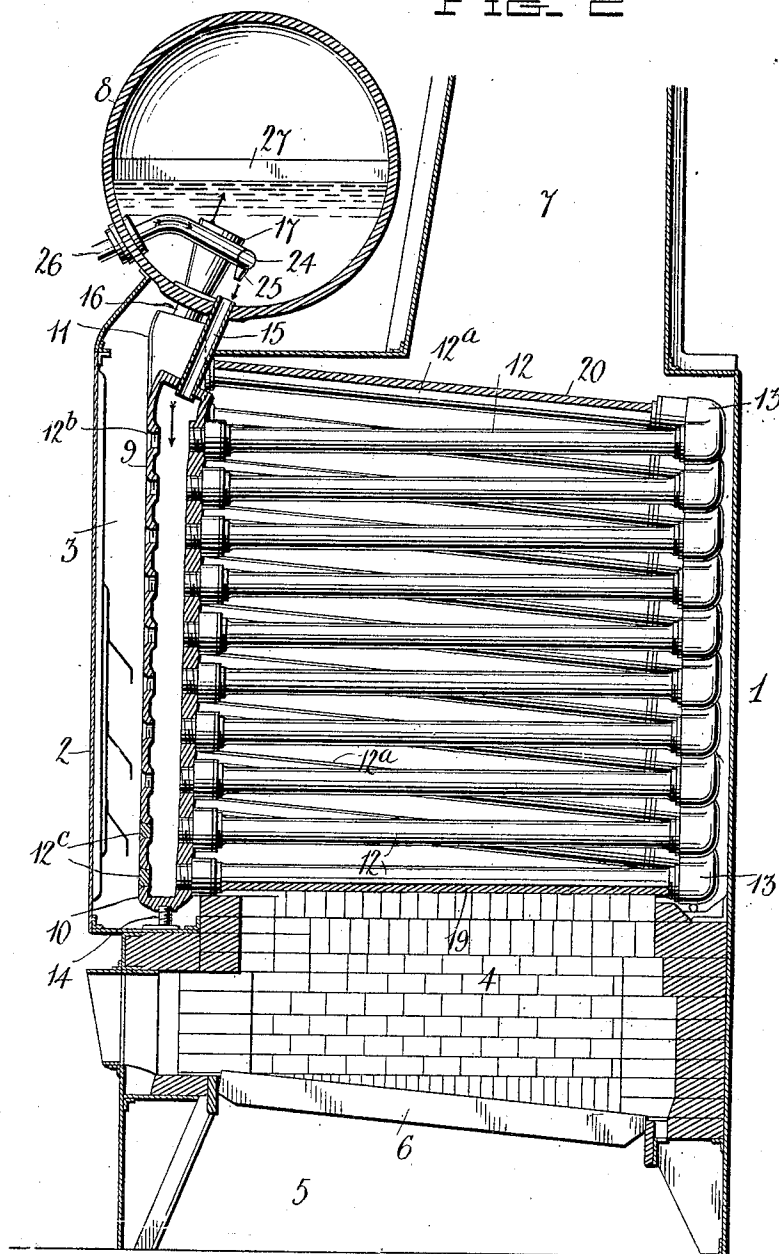
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4 SHEETS—SHEET 2.

FIG. 2



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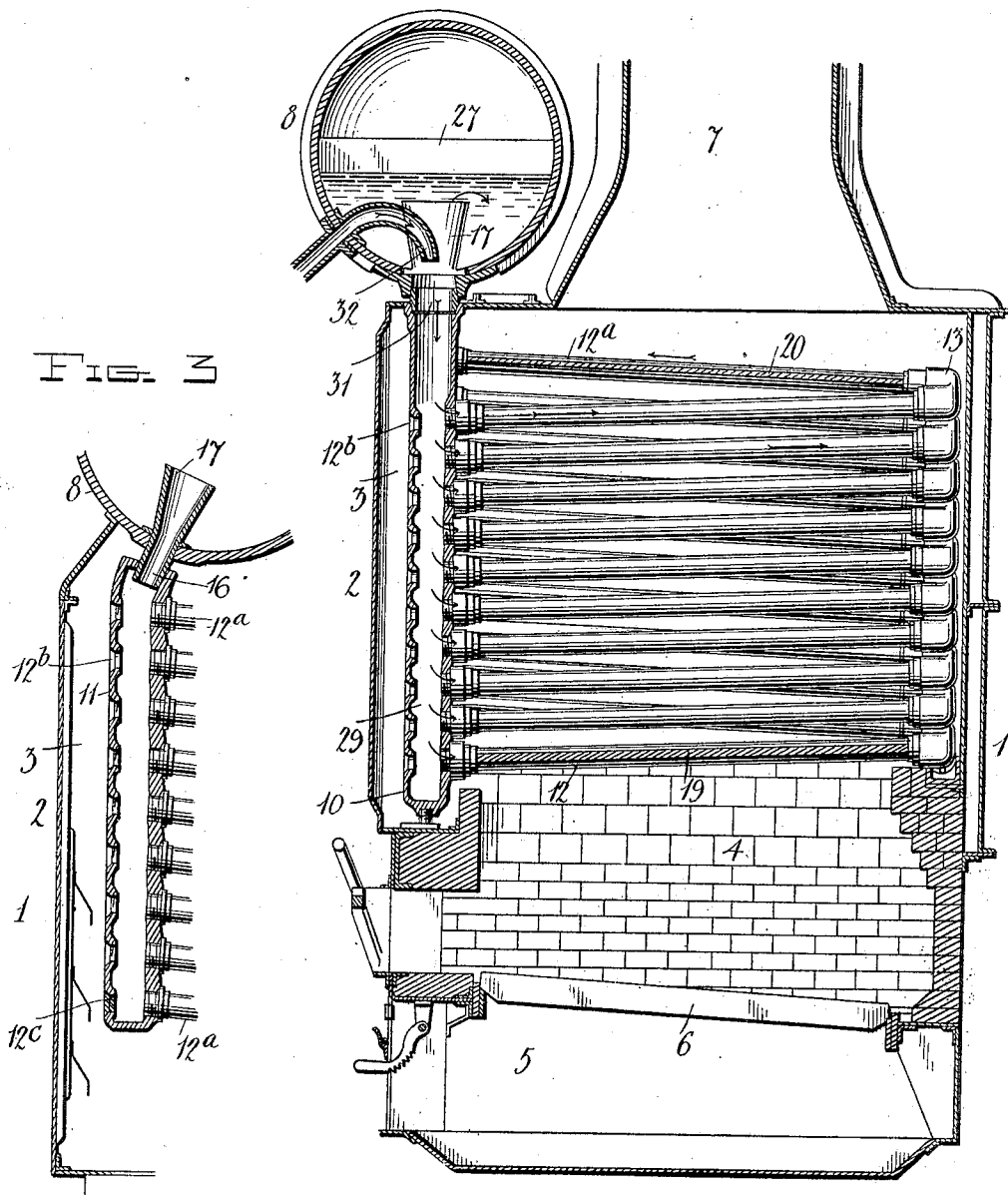
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4 SHEETS—SHEET 3.

FIG. 5

FIG. 3



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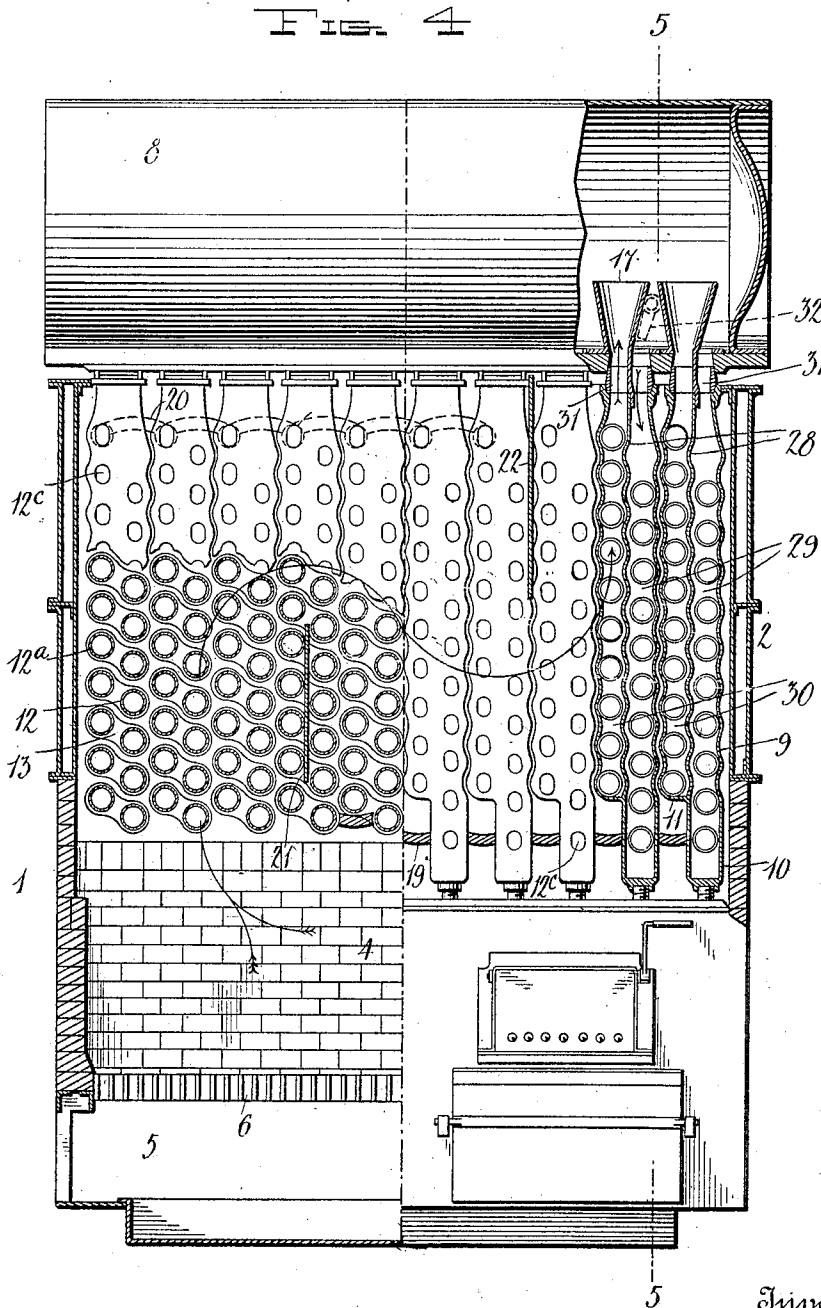
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4 SHEETS—SHEET 4.

FIG. 4



Witnesses
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UNITED STATES PATENT OFFICE.

YASUZO WADAGAKI, OF AZABU, TOKYO, JAPAN.

SECTIONAL WATER-TUBE BOILER.

No. 827,585.

Specification of Letters Patent.

Patented July 31, 1906.

Application filed December 14, 1905. Serial No. 291,774.

To all whom it may concern:

Be it known that I, YASUZO WADAGAKI, a subject of the Emperor of Japan, residing at Azabu, Tokyo, Japan, have invented certain new and useful Improvements in Sectional Water-Tube Boilers; and I do 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.

My invention relates to improvements in sectional water-tube boilers; and it consists in the novel construction, combination, and arrangement of parts hereinafter described and claimed.

One object of the invention is to provide a boiler of this character which will be of simple, compact, and durable construction and one in which the highest degree of efficiency and economy will be obtained.

Another object of the invention is to provide a boiler of this character in which one or more of its sections may be used as a feed-water heater.

A further object of the invention is to improve the construction and operation of boilers of this character, and thereby render the same more efficient and durable in use and less expensive to manufacture, clean, and repair.

The above and other objects, which will appear as the nature of the invention is better understood, are accomplished by means of the construction illustrated in the accompanying drawings, in which—

Figure 1 is a front view, partly in elevation and partly in section, of my improved sectional water-tube boiler, showing the same mounted in a furnace-casing. Fig. 2 is a vertical sectional view taken on the plane indicated by the line 2 2 in Fig. 1. Fig. 3 is a detail vertical section taken on the plane indicated by the line 3 3 in Fig. 1. Fig. 4 is a view similar to Fig. 1, showing a slightly-modified form of the invention; and Fig. 5 is a vertical sectional view taken on the plane indicated by the line 5 5 in Fig. 4.

Referring more particularly to Figs. 1, 2, and 3 of the drawings, the numeral 1 denotes my improved sectional water-tube boiler, which is here shown mounted in a furnace-casing 2 of well-known form, which comprises a fire and heat chamber 3, disposed above the fire-box 4, which is separated from

the ash-pit 5 by the grate 6. The chamber 3, in which the boiler 1 is mounted, has at the rear portion of one of its sides an outlet or stack 7, through which the smoke and products of combustion are discharged. My improved boiler 1 consists of a steam-drum 8, which is mounted in the upper forward portion of the casing, and a plurality of vertically-disposed sections or units 9. Each of these sections or units 9 consists of an outlet-header 10, a return-header 11, and inclined pipes 12 12^a, which are connected at their front ends to said headers and at their rear ends by return-elbows or junction-boxes 13. The headers 10 11 are arranged vertically in a parallel row across the front of the casing 3 and are in communication with the bottom of the steam-drum at their upper ends. The headers 10 are supported at their lower ends, as shown at 14, and have their upper ends in communication with the drum through short pipes 15, as shown in Fig. 2 of the drawings. The return-headers 11 depend from the drum 8 and are in communication therewith, as shown in Fig. 3 of the drawings, through short pipe-sections 16, which aline with flared or funnel-shaped pipes 17, arranged within said drum. The pipes 12 extend upwardly and rearwardly from the headers 10, and the pipes 12^a extend downwardly and rearwardly from the headers 11, and the rear ends of the pipes 12 12^a of each pair are connected by the return-elbow or junction-box 13, as previously stated, so that a circulation will be established through each of the units 9, as indicated by the arrows. In order to permit the tubes 12 12^a to be readily cleaned, the headers 10 11 are formed with openings 12^b, which aline with the ends of the said pipes to permit of the insertion of a cleaning instrument in said pipes. Said openings 12^b are closed by plugs 12^c or any other suitable closures. Any number of these units or sections 9 may be provided and they are preferably, but not necessarily, arranged within the casing 3, as shown, so that pipes 12 12^a extend forwardly and rearwardly in substantially horizontal planes. In order to cause the heat, smoke, and products of combustion from the fire upon the grate 6 to take a circuitous course through the sections of the boiler, and thereby increase the efficiency of the same, I provide lower and upper horizontal baffles 19 20 and lower and upper verti-

cal baffles 21 22, as clearly shown in Fig. 1 of the drawings. The baffles 19 are preferably formed by fire-bricks or tiles inserted between the said tubes, and they extend about two-thirds of the width of the furnace-casing, the lower one extending from one side and the upper one from the opposite side. The baffles 21 22 are in the form of plates arranged vertically at the inner ends of the baffles 19 20 and project in opposite directions, so as to cause the heat, smoke, and gases from the furnace to take a circuitous course, as indicated by the arrows in Fig. 1.

In order to heat the water supplied to the boiler, I may use one or more of the sections or units 8 as feed-water heaters. In doing this I preferably use the three units which are disposed adjacent to that side of the furnace-casing from which the heat and smoke escape to the stack 7 and provide an injector-head 24, which has nozzles 25 disposed in alinement with the pipes 15, as shown in Fig. 2 of the drawings. The head 24 is supplied through a suitable pipe 26, as shown. If desired, the sections or units which are used as feed-water heaters may be separated from the remaining sections or units by a vertical partition 27, which is arranged within the drum 8, as shown. When this is done, it will be seen that the soda or lime introduced with the feed-water for the purpose of protecting the boiler will be retained in that portion of the boiler until it has accomplished its object. By feeding the boiler in this manner it will be seen that the heat contained in the escape smoke and gases will be employed to heat the cold water, and the temperature of the water in the other part of the boiler will not be materially affected. The feed-water passes from the feed-heating sections to the other sections by flowing over the upper edge of the partition 27.

In Figs. 4 and 5 of the drawings the form of boiler is very similar to that of the one just described, the only difference being that the headers 10 11 instead of being made separate are formed integral, a vertically-extending partition 28 dividing the inlet and return passages 29 30 from each other, as shown. The upper ends of these double headers are in communication with the bottom of the steam-drum by means of short pipes 31, as clearly shown in Fig. 4 of the drawings. The feed-water injector shown in this form of the invention has but a single nozzle 32, so that but one of the sections or units 9 is employed as a feed-water heater.

The construction, operation, and advantages of the invention will be readily understood from the foregoing description, taken in connection with the accompanying drawings. Owing to the simplicity of the construction it will be seen that the boiler may be manufactured at a comparatively small cost and that it may be quickly repaired and

its parts replaced. Owing to the angular disposition of the pipes 12 12^a and the provision of the clean-out openings 12^b it will be seen that the air and steam will not remain in the said pipes, the boiler may be quickly drained, and the said tubes may be readily cleaned. The boiler is very compact, and the use of one or more of its sections as a feed-water heater renders it unnecessary to provide space for an extra heater and at the same time permits all of the heat from the smoke and gases to be utilized. The circulation of the water is simple and direct.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A sectional water-tube boiler comprising sections, each consisting of a header having a flow-passage and a return-passage arranged side by side, tubes connecting said passages of the headers, a steam-drum above the headers, tubes connecting the passages of the headers to the steam-drum, those tubes which connect the flow-passages to the steam-drum having their upper ends open at the bottom of the drum and those tubes which connect the return-passages to the drum extending upwardly in the latter and terminating and discharging thereinto at a point above the bottom thereof, and pipes extending into the drum and having injector-heads disposed above the upper ends of the flow-passages of the headers and discharging downwardly into said flow-passages, substantially as described.

2. A sectional water-tube boiler having sections, each consisting of a header having a flow and a return passage, arranged side by side, and water-tubes connecting said passages, one of said passages extending below the other at the bottom of the header and having its upper end lower than that of the other, and upper and lower baffles arranged in alternation and respectively disposed between the upwardly-projecting and downwardly-projecting portions of the passages of adjacent headers.

3. A sectional water-tube boiler having sections, each consisting of a header having a flow-passage and a return-passage, the upper end of the return-passage extending higher than that of the flow-passage, and the lower end of the flow-passage extending lower than that of the return-passage, to form spaces between and at the upper and lower ends of the section-headers, and baffles in said spaces.

4. A sectional water-tube boiler having a plurality of water-circulating sections arranged side by side, a furnace-casing inclos-

ing said sections, substantially horizontal
baffles arranged in alternation at the upper
and lower sides of the sections, and vertically-
disposed baffles arranged in alternation be-
5 tween certain of the sections and disposed
respectively at the upper and lower sides
thereof, substantially as described.

In testimony whereof I have hereunto set
my hand in presence of two subscribing wit-
nesses.

YASUZO WADAGAKI.

Witnesses:

GENJI KURIBARA,
K. TOYODE.