

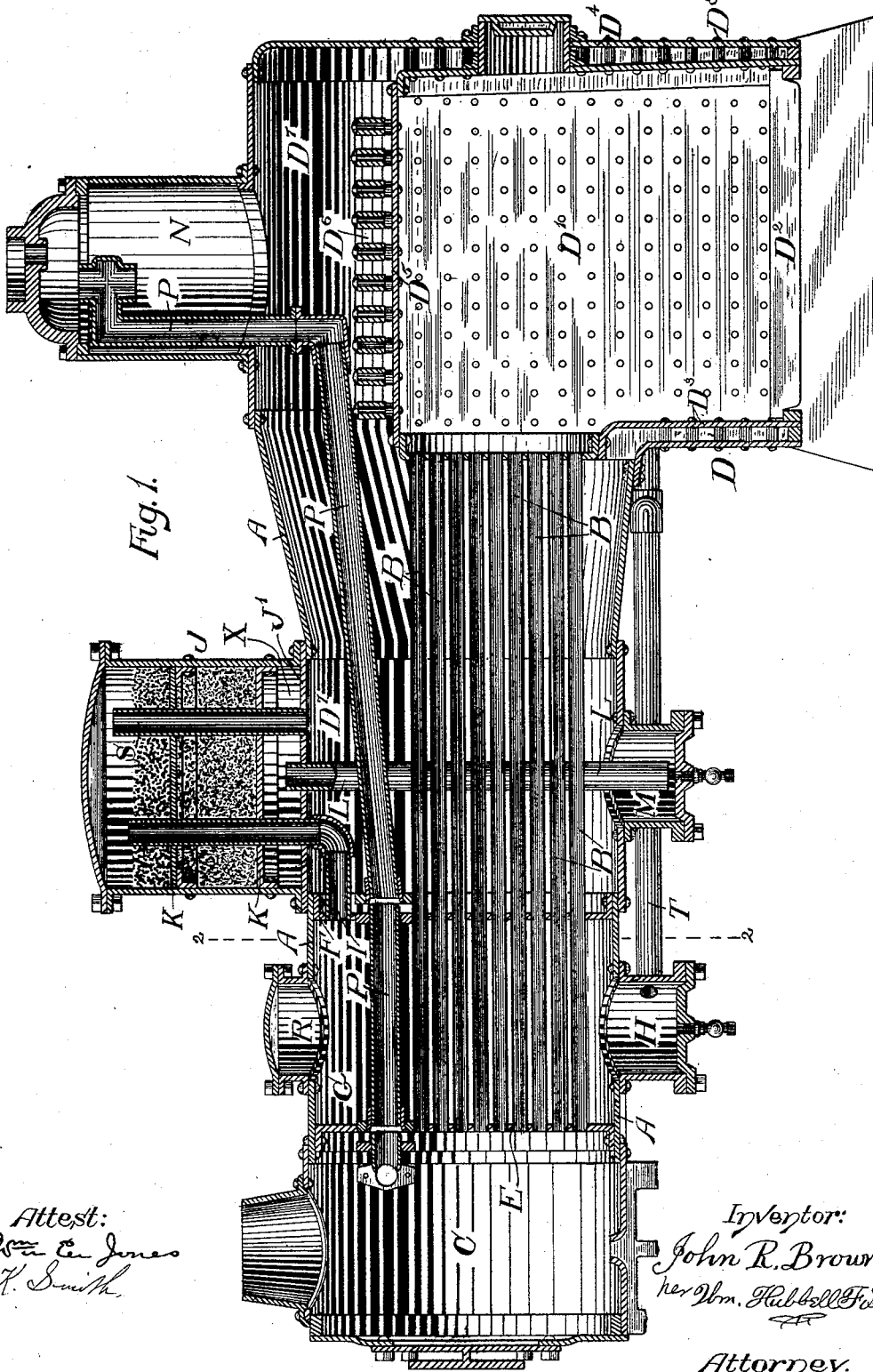
(No Model.)

3 Sheets—Sheet 1.

J. R. BROWNELL.  
BOILER.

No. 489,453.

Patented Jan. 10, 1893.



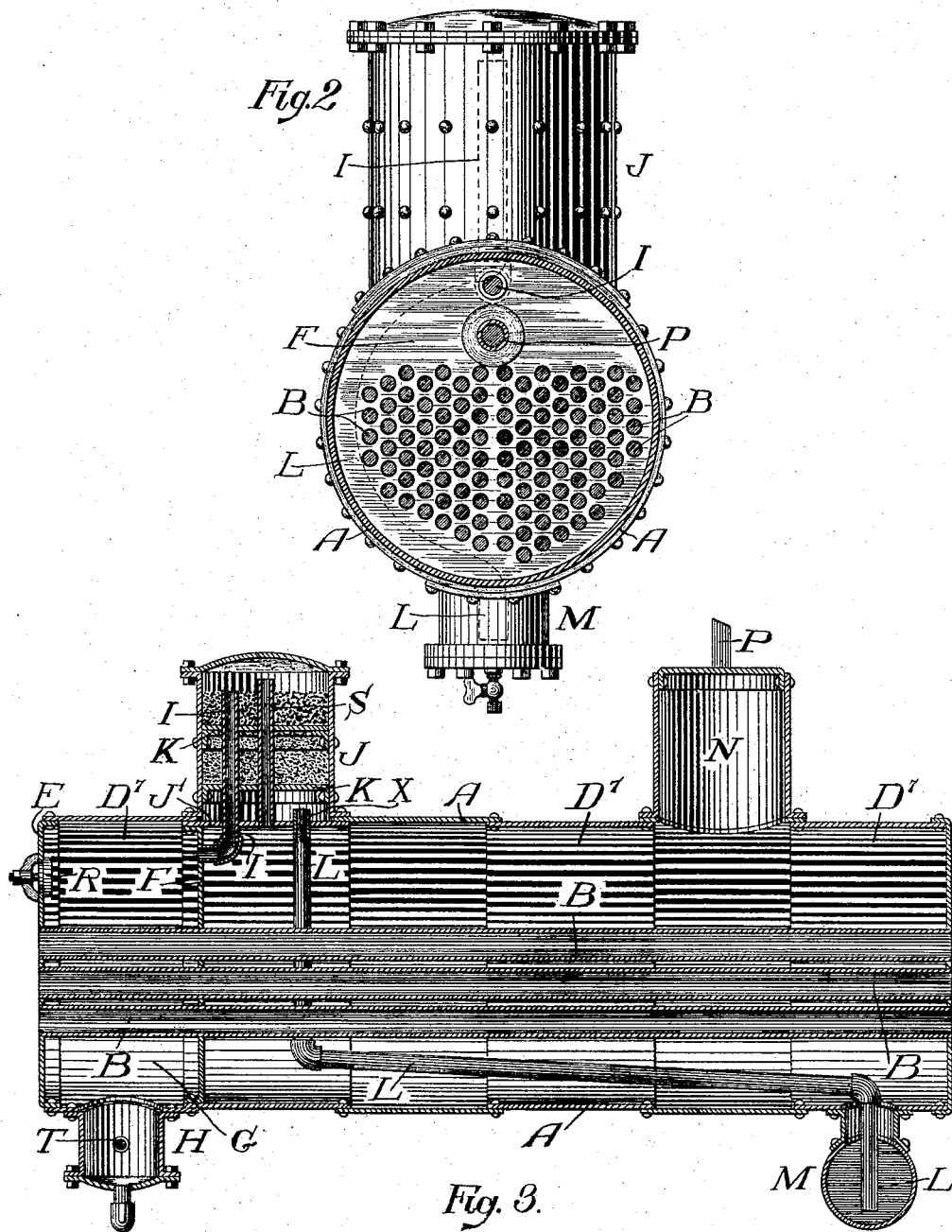
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Wm E Jones  
K. Smith.

Inventor:  
John R. Brownell  
per Wm. Hubbell Fisher  
Attorney.

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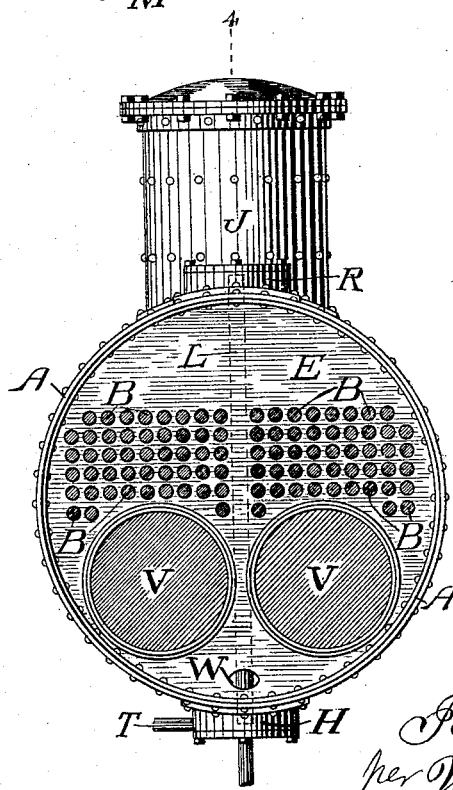
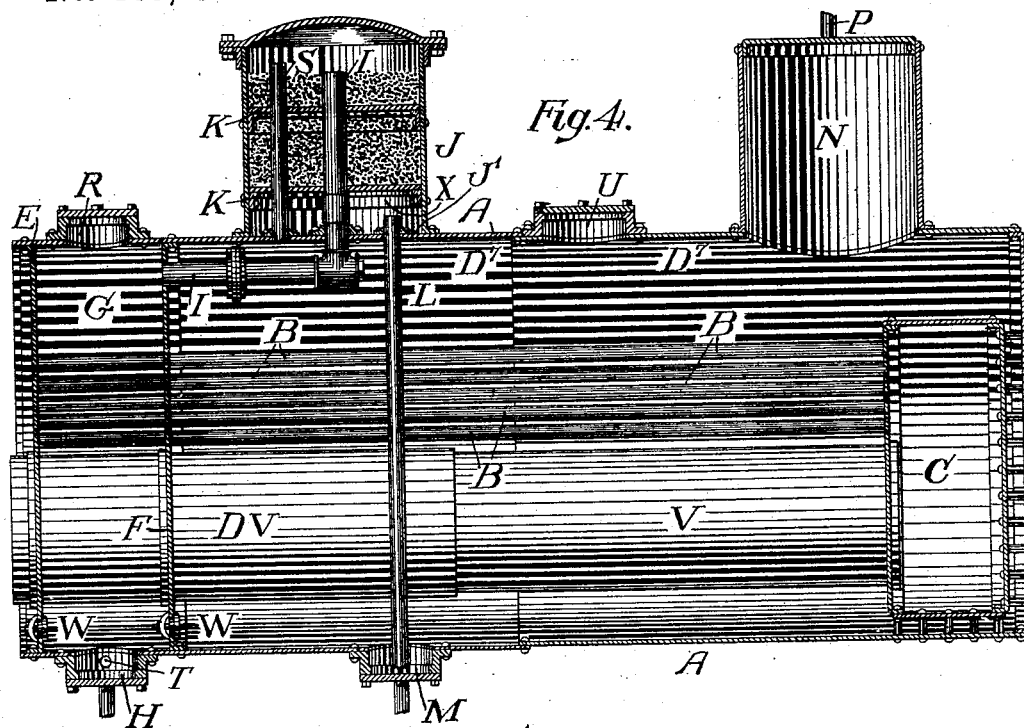
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3 Sheets—Sheet 3.

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# UNITED STATES PATENT OFFICE.

JOHN R. BROWNELL, OF DAYTON, OHIO.

## BOILER.

**SPECIFICATION** forming part of Letters Patent No. 489,453, dated January 10, 1893.

Application filed February 10, 1892. Serial No. 421,043. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN R. BROWNELL, a citizen of the United States of America, and a resident of the city of Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Boilers, of which the following is a specification.

My invention relates to improvements applied to boilers and entering into their construction, whereby the water for the boiler is filtered and delivered to the steam generating compartment of the boiler at a high degree of temperature.

My invention is applied to various descriptions of steam boilers. Among the principal of these may be mentioned stationary boilers, tubular boilers, portable boilers, special boilers for drilling oil wells, and marine boilers.

The several features of my invention and the various advantages resulting from their use, conjointly or otherwise, will be apparent from the following description and claims.

In the accompanying drawings, Figure 1, Sheet 1, represents a longitudinal vertical section of a locomotive boiler with which my invention has been combined. Fig. 2, Sheet 2, is a vertical transverse section of the boiler and improvements shown in Fig. 1. The section is taken at the dotted line 2, 2, in Fig. 1, and that side of the said section is shown which faces toward the left hand of Fig. 1. In this section, the inlet pipe T for supplying water to the boiler is omitted. Fig. 3, Sheet 2, represents a vertical longitudinal section of a stationary boiler, constructed in accordance with my invention. Fig. 4, Sheet 3, represents a vertical, central longitudinal section of a marine boiler embodying my invention. This section is taken in the plane of the dotted line 4, 4, of Fig. 5. Fig. 5 is a front view of the marine boiler shown in Fig. 4.

The application of my invention to the boilers set forth in the aforementioned drawings appears to be sufficient to illustrate the principles of my invention and the mode in which it operates.

I will now proceed to describe my invention in connection with Figs. 1 and 2.

A indicates the barrel or main portion of

the boiler, containing the fire tubes or flues B, B, &c. The usual smoke box C is present at the forward end of the boiler, and at the rear is the usual rectangular compartment D, in which are the fire box D' and the usual fire grate D<sup>2</sup>.

D<sup>3</sup> indicates the inner shell of the fire box, and D<sup>4</sup> the outer shell thereof. These shells may be braced in position in any desired manner. In the present illustrative instance, they are connected by the usual stay bolts D<sup>5</sup>. The rear ends of the fire tubes connect with the interior face of the fire box at its upper front portion, and the fire tubes at their front ends connect with the smoke box C, so that the products of combustion are free to pass from the fire box to the smoke box. The sheet D<sup>6</sup> of the fire box is of the usual form, and above this is the usual water space D<sup>6</sup>, which space continues into the barrel A of the boiler.

E represents the front flue sheet or diaphragm, through which the ends of the fire tubes pass and in which they are secured. At the rear of this diaphragm E is a second diaphragm or partition F, through which the fire tubes pass, and all communication between the chamber or compartment G formed between the diaphragm E and the diaphragm F and that portion of the boiler which lies behind the said diaphragm is prevented. It is, however, understood that the fire tubes pass through said chamber and through these flues pass the flame and hot products of combustion. At the bottom of the said compartment G is a mud drum H.

The water to be fed to the boiler is to be first conducted to chamber G, and to this end the inlet or water supply conduit T is connected to the space within the said mud drum H. At the upper end of this compartment G is an outlet conduit I. This tube or conduit I passes through the upper part of a portion of the space D<sup>7</sup> of the main portion of the boiler and thence into a filtering chamber J, located at the upper side of the boiler. The conduit I passes upward into the upper portion of this filtering chamber J. Across this chamber J, and below the delivery mouth of the conduit I, extend filtering shelves K, K, and the liquid which is delivered by the conduit I into the filtering chamber J passes

down through these filtering shelves and thence into a delivery tube L. This conduit or tube L is carried down through the main portion of the boiler into the mud drum M at the lower side of the boiler. The water thus enters this mud drum and then is free to pass up into the main portion of the boiler, and take the place of the water which has been consumed in the generation of steam. The chamber J has a bottom or floor J' which prevents communication between this chamber and the boiler proper, except by way of the conduits I and L, and of a conduit S, as hereinafter described. Each of the filtering shelves preferably consists of a sheet of metal, provided with small bottom perforations. These shelves are located one above the other, and each carries a desired amount of filtering material, preferably of excelsior, fine sand, or broken quartz, gravel and the like, so that upon each of the shelves there is present a layer of filtering material. A conduit S extends from the steam space D' up through the diaphragm or bottom J', and by or through the filtering shelves K, into the upper portion of the interior space of the chamber J.

N indicates the customary steam dome, in which is present, as usual, the inlet opening of the steam delivery pipe P, which latter receives the steam generated in the boiler and carries it to the point where it is to be utilized. This pipe P may pass out of the dome or boiler at any desired point, but in the present instance, it passes down from the dome into the boiler and thence forward through the boiler and chamber G into the smoke box C, and thence to the point of special delivery.

That portion of the surface of the steam delivery conduit which is present in the chamber or compartment G, is composed of or packed with a non-conducting substance, thereby preventing the steam within the conduit from becoming chilled or condensed on its way to the place or places where it is to be utilized.

The mode in which my invention operates is as follows,—To fill the boiler, in the first instance, water is let into the mud drum H, by means of the inlet pipe T. This water fills the drum, and compartment G, and passes up into and through conduit I to the filtering chamber J. This water while in the drum H, and while in chamber G, deposits on the floor of chamber G and more particularly in this drum, a certain portion of the sediment it contains. The water fills the filtering chamber, and as it trickles or passes down through the filtering shelves K, K, it leaves thereon a still larger proportion of its sediment. Thence the water passes down through the pipe or conduit L to the mud drum M, and thence flowing upward fills the boiler to the desired height, at which time the supply of water is cut off. The water in passing through the mud drum M deposits the small amount of sediment, if any, remaining in it, and enters the boiler in a state substantially pure. A

fire being duly started in the boiler and steam being generated and utilized, as it is made, all of the various functions of my invention come into operation, as follows:—As soon as water is needed in the boiler, a fresh supply is admitted through the pipe T into the drum H. The water passes up through the compartment G, and on its way passing between and in contact with the fire flues B and the rear hot diaphragm F, becomes hot. At the same time a goodly portion of the sediment it contains is deposited in the mud drum and on the lower surface of this compartment. Thence it passes through the conduit I, and as the latter is located in the steam space D' and is highly heated, the water passing through, becomes still more highly heated. The water now enters the filtering chamber J, and comes in contact with the steam which, coming from the boiler through conduit S, has entered into the chamber J. The water is thereby raised to a high degree of temperature, and passing down through the filter, is divested of all or nearly all of the residue of the sediment it contained. Thence it passes through the hot conduit L heated by the steam and water of the boiler respectively in contact with the exterior surface of the conduit L, and thence enters the mud drum M, and leaving any possible residue enters the boiler proper in a substantially clear condition, and at a degree of temperature substantially the same as that of the water already in the boiler. The top of the filtering chamber is constructed so that it can be unfastened and removed, and the shelves K, K, and their filtering material may be removed, and replaced, and new filtering material may be introduced as desired. Over the compartment G there is preferably located a man hole drum or opening R, whereby access can be obtained to the said compartment for the purpose of cleaning or flushing out the same.

Among the great disadvantages attending the use of steam boilers, a principal one is the detriment accruing to them from the deposit within them of sediment from the water used to generate steam. This sediment rests upon the surfaces of the metal through which the heat from the fire is communicated to the water, and constitutes a non-conducting substance interposed between the metal and the water. The heat of the fire is thereby to a great extent neutralized and much fuel wasted, and the capacity of the boiler for generating steam very much impaired. The boiler is speedily impaired and burned out, and has soon to be repaired. This is a great expense arising from the cost of repairs, and the time the boiler is out of use. My invention obviates this great disadvantage, and collecting the sediment from the water, delivers the same to the boiler in a condition at once clear and at a degree of temperature equal or substantially equal to that of the water in the boiler.

The boiler can at any time be blown off at

the mud drums H and M, and the sediment therein be immediately removed.

My invention enables the life of the boiler to be greatly prolonged.

5 In the case of locomotive boilers, the disadvantages arising from the deposit of sediment are greatly increased by reason of the narrowness of the water space between the inner shell or box D<sup>3</sup> and the outer shell or  
10 box D<sup>4</sup>, and of the additional fact that in this narrow space many cross securing bolts are present. This space affords a secure foothold for that sediment which may be deposited there by the water within. It has thus  
15 far been found impossible to dislodge this sediment by flushing or blowing out. Hence this part of the boiler has to be frequently repaired at a great loss of money and time. My invention obviates this deposit of sedi-  
20 ment, and hence obviates this loss of time and money.

In Fig. 3 is seen an ordinary stationary boiler, and my invention combined therewith in a preferred manner. This boiler has the  
25 customary flues B, extending through from end to end, the number and size of which vary according to the uses for which the boiler is designed. In the present illustrative instance, the chamber G is located at  
30 that end of the boiler farthest from the fire. The construction of the parts which go to constitute my invention are not essentially different from that shown in Figs. 1 and 2. It may, however, be noted that the pipe L for deliver-  
35 ing the purified water to the boiler, is extended along inside the boiler and near the bottom to within a short distance of the right hand end of the boiler, and there enters the mud drum M. The increased length of the pipe L through  
40 the boiler serves to increase the temperature of the water flowing through pipe L, and at the same time to give further opportunity for the settling and deposit of any few particles of sediment which the water passing through  
45 said pipe L, may perchance, contain. Such lengthening of the pipe L in a straight line and extending it to near the right hand end of the boiler is permitted in this stationary boiler, because of the absence of the fire box  
50 D' present in the locomotive boiler heretofore described. In passing, it will be noted by way of explanation of this figure, that the man hole drum R shown in Fig. 1, is absent and an equivalent device, viz: a man hole opening  
55 R is present in the left hand end of the boiler. Upon Sheet 3 are shown the figures of a marine boiler. In this illustrative instance, the chamber G is shown as located at that end of the boiler where is the fire or fuel chamber.  
60 The left hand portion of the chamber V constitutes the fire chamber, and the latter is duly provided therein with a grate. This grate being of any desired form and not of my invention, is omitted. The products of  
65 combustion pass from the fire chamber through the remainder of the chamber or passage V into the smoke box or chamber C, and

thence pass into the tubes B and passing through them from right to left, pass out into the chimney or smoke stack. When the fire  
70 chamber or box is thus located, and so that the chamber G surrounds all or a part of this fire chamber, the feed water entering chamber G as aforementioned, is somewhat more rapidly heated than when the fire box is located  
75 elsewhere in the boiler. It will be observed that in all of these instances my invention is essentially the same in its construction, application and operation.

While the various features of my invention  
80 are preferably employed together, one or more of the said features may be used without the remainder, and in so far as applicable, one or more of said features may be employed in  
85 boilers other than those herein specifically mentioned.

What I claim as new, and of my invention and desire to secure by Letters Patent, is:—

1. In a steam boiler, the combination of the compartment G receiving heat from the adja-  
90 cent portions of the boiler, and the filtering compartment J, conduit I for conveying liquid from compartment G to compartment J, and conduit for conveying the filtered water from  
95 compartment J on its way to the boiler, substantially as and for the purposes specified.

2. The compartment G occupying a portion of the barrel or main portion of the boiler, and the compartment J having filtering material, and located at the top portion of the boiler  
100 and connected with compartment G by conduit I, whereby the water from the latter compartment is delivered to the compartment J, the latter compartment being connected with  
105 the boiler by an opening or conduit for enabling the water in the compartment J to be delivered into the boiler, substantially as and for the purposes specified.

3. The compartment G occupying a portion of the barrel or main portion of the boiler, and the compartment J having filtering material, and located at the top portion of the boiler and connected with compartment G by  
110 conduit I, whereby the water from the latter compartment is delivered to the compartment J, the latter compartment being connected with the boiler by an opening or conduit for enabling the water in the compartment J to be delivered into the boiler, and steam conduit S, whereby steam is conveyed from the  
120 boiler to compartment J for the purpose of raising the temperature of the water in the filtering compartment, previous to entering the boiler, substantially as and for the purposes specified.  
125

4. In a boiler, the filtering compartment J, having shelf or shelves as K, holding filtering material, and having the inlet water pipe I, extending up through the filtering material and ending in the compartment J, at or above  
130 said filtering material, and a chamber X, located in the lower portion of said compartment and located upon and in contact with the boiler and conduit pipe L, whose inlet

orifice is above the bottom of the chamber, and which pipe extends down directly through the bottom of said chamber X, and into the boiler, substantially as and for the purposes specified.

5 In a boiler, the filtering compartment J, having shelf or shelves K, holding filtering material, and having the inlet water pipe I, extending up through the filtering material and ending in the compartment J, at or above said filtering material, and a chamber X, located in the lower portion of said compartment and located upon and in contact with the boiler and conduit pipe L, whose inlet  
10 orifice is above the bottom of the chamber, and which pipe extends down directly through the bottom of said chamber X, and into the boiler, and the inlet pipe for supplying water to the said filtering compartment, passing  
15 through the boiler and up through the chamber X and through the filtering material to the upper portion of compartment J, substantially as and for the purposes specified.

6. In a boiler, the filtering compartment J  
25 having shelf or shelves as K, holding filtering material, and having the inlet water pipe I, extending up through the filtering material and ending in the compartment J, at or above said filtering material, and a chamber X in  
30 said compartment J, and conduit L, connected to the chamber X and to the boiler, and chamber G located in the boiler, the pipe I receiving its water from said chamber G, substantially as and for the purposes specified.

35 7. In a boiler, the filtering compartment J, having shelf or shelves K, holding filtering material, and having the inlet water pipe I extending up through the filtering material and ending in the compartment J, at or above  
40 said filtering material, and a chamber X, located in the lower portion of said compartment and located upon and in contact with the boiler and conduit pipe L, whose inlet orifice is above the bottom of the chamber, and  
45 which pipe extends down directly through the bottom of said chamber X, and into the boiler, and extending down through the boiler to the lower portion thereof, substantially as and for the purposes specified.

50 8. In a boiler, the filtering compartment J having shelf or shelves as K, holding filtering material, and having the inlet water pipe I, extending up through the filtering material and ending in the compartment J, at or above  
55 said filtering material, and a chamber X in said compartment J, and conduit L, connected to the chamber X and to the boiler, and extending down to the lower portion or bottom of the boiler, and chamber G located in the  
60 boiler, the pipe I receiving its water from the said chamber, substantially as and for the purposes specified.

9. The compartment G, located in the boiler, and the filtering compartment J, having filtering means substantially as described, and connected to the upper portion of the compartment G by means of the conduit I, having its

outlet in the upper portion of compartment J, and outlet pipe L, connecting the lower portion of the said compartment J with the lower  
70 portion of the boiler, substantially as and for the purposes specified.

10. The compartment G extending from the bottom to the top of the boiler and receiving water at or near the bottom of the said boiler, and delivering it near the top thereof, and  
75 conduit I and filtering chamber J, to which the conduit I delivers the water from compartment G, and conduit L taking the water from the compartment J, and delivering it in the boiler near the bottom of the latter, substantially as and for the purposes specified.

11. The compartment G extending from the bottom to the top of the boiler, and receiving water at or near the bottom of the said boiler, and delivering it near the top thereof, and  
85 conduit I, located within the boiler, and filtering chamber J, to which the conduit I delivers the water from compartment G, and conduit L taking the water from the compartment J and delivering it in the boiler near the bottom of the latter, substantially as and for the purposes specified.

12. The compartment G occupying a transverse section of the boiler, and receiving water at or near the bottom of the said boiler, and delivering it near the top thereof, and  
95 conduit I and filtering chamber J, to which the conduit I delivers the water from compartment G, and conduit L taking the water from the compartment J and delivering it in the boiler, substantially as and for the purposes specified.

13. The compartment G, occupying a transverse section of the boiler, and receiving water at or near the bottom of the said boiler, and delivering it near the top thereof, and  
105 conduit I and filtering chamber J, to which the conduit I delivers the water from compartment G, and conduit L taking the water from the compartment J, and delivering it in the boiler near the bottom of the latter, substantially as and for the purposes specified.

14. The compartment G occupying a transverse section of the boiler, and having the mud drum H, provided with pipe T through which water enters said compartment, and filtering chamber J located at the upper portion of the boiler, and the conduit I connecting the compartment G to the compartment  
120 J, and the pipe L delivering the filtered water from the filtering chamber to the boiler, substantially as and for the purposes specified.

15. The compartment G occupying a transverse section of the boiler, and having the mud drum H, provided with pipe T through which water enters said compartment, and filtering chamber J located at the upper portion of the boiler, and the conduit I, located within the boiler, connecting the compartment  
125 G to the compartment J, and the pipe L delivering the filtered water from the filtering chamber to the boiler, substantially as and for the purposes specified.

16. The compartment G occupying a transverse section of the boiler, and having the mud drum H, provided with pipe T through which water enters said compartment, and filtering chamber J located at the upper portion of the boiler, and the conduit I connecting the compartment G to the compartment J, and the pipe L, extending to or near the bottom of the boiler and delivering the filtered water from the filtering chamber to the boiler, substantially as and for the purposes specified.

17. The compartment G occupying a transverse section of the boiler, and having the mud drum H, provided with pipe T through which water enters said compartment, and filtering chamber J, located at the upper portion of the boiler, and the conduit I connecting the compartment G to the compartment J, and the pipe L, and mud drum M, the pipe L extending to said mud drum and there delivering the water from the filtering chamber, substantially as and for the purposes specified.

18. The combination of the compartment G occupying a transverse section of the boiler next to the smoke box, and having inlet T, located in the vicinity of the bottom of the said boiler, and filtering chamber located to the rear of said compartment and at the top portion of the boiler, and provided with filtering material, conduit L located in the upper portion of the boiler and connecting the upper part of said compartment with the upper part of the said filtering chamber and the steam pipe S connecting the steam space of the boiler with the upper portion of the filtering chamber, and chamber X below the filtering material and above the floor of compartment J, and delivery conduit L located in the boiler, and extending from said chamber X to the lower portion of the boiler, the fire flues passing through the latter and through compartment G, substantially as and for the purposes specified.

19. The combination of the compartment G occupying a transverse section of the boiler

next to the smoke box, and having inlet T, located in the mud drum in the bottom of the said boiler, and filtering chamber located to the rear of said compartment and at the top portion of the boiler, and provided with filtering material, conduit L located in the upper portion of the boiler and connecting the upper part of said compartment with the upper part of the said filtering chamber, and the steam pipe S connecting the steam space of the boiler with the upper portion of the filtering chamber X below the filtering material and above the floor of compartment J, and delivery conduit L, located in the boiler and extending from said chamber X into the mud drum M, at the bottom of the boiler, the fire flues passing through the latter and through compartment G, substantially as and for the purposes specified.

20. The combination of the compartment G occupying a transverse section of the boiler next to the smoke box, and having inlet T, located in the mud drum in the bottom of the said boiler, and filtering chamber located to the rear of said compartment and at the top portion of the boiler, and provided with filtering material, conduit L located in the upper portion of the boiler and connecting the upper part of said compartment with the upper part of the said filtering chamber, and the steam pipe S connecting the steam space of the boiler with the upper portion of the filtering chamber X below the filtering material and above the floor of compartment J, and delivery conduit L, located in the boiler and extending from said chamber X into the mud drum M, at the bottom of the boiler, the fire flues passing through the latter and through compartment G, and man hole R, for reaching compartment G, substantially as and for the purposes specified.

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Attest:

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