

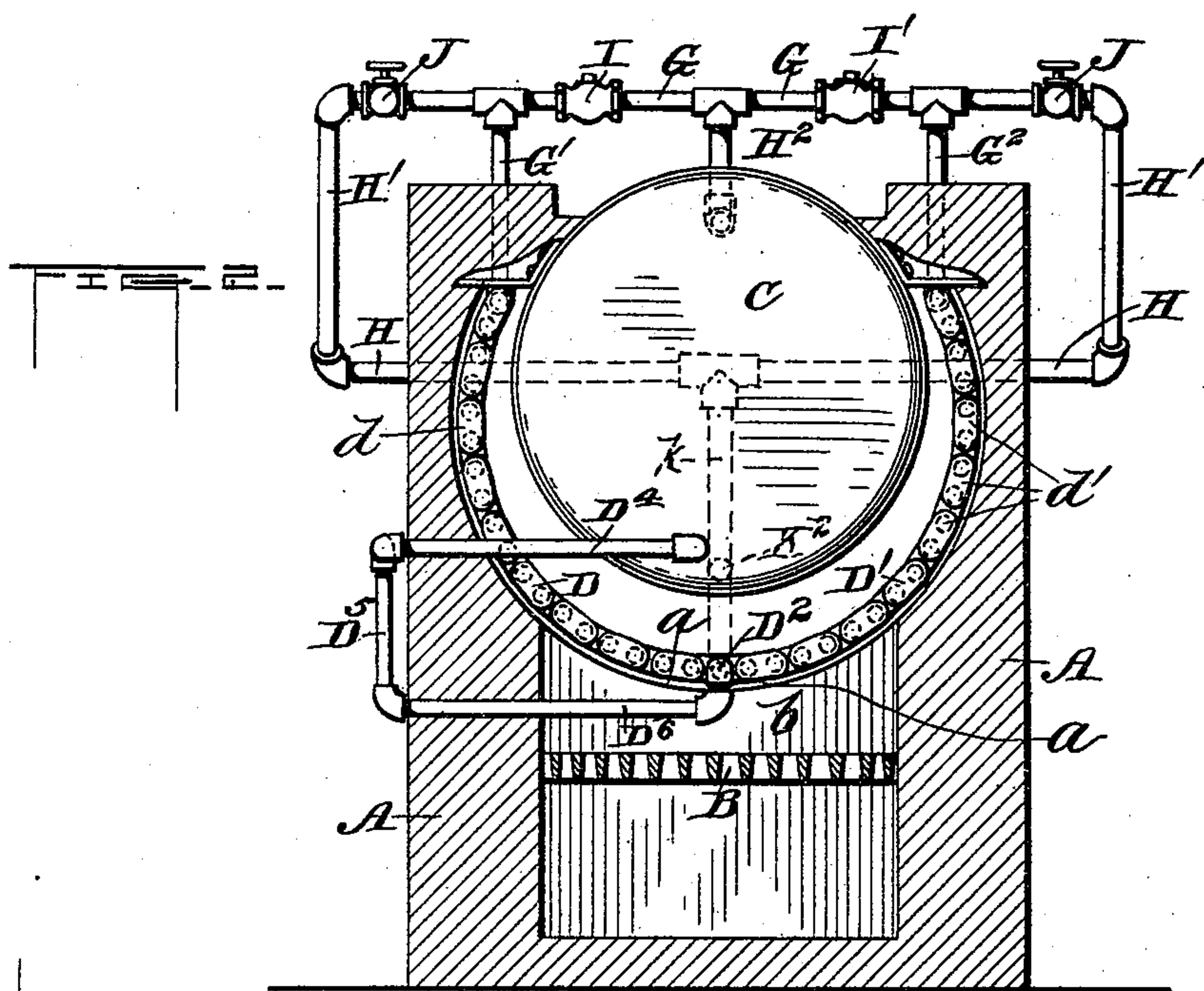
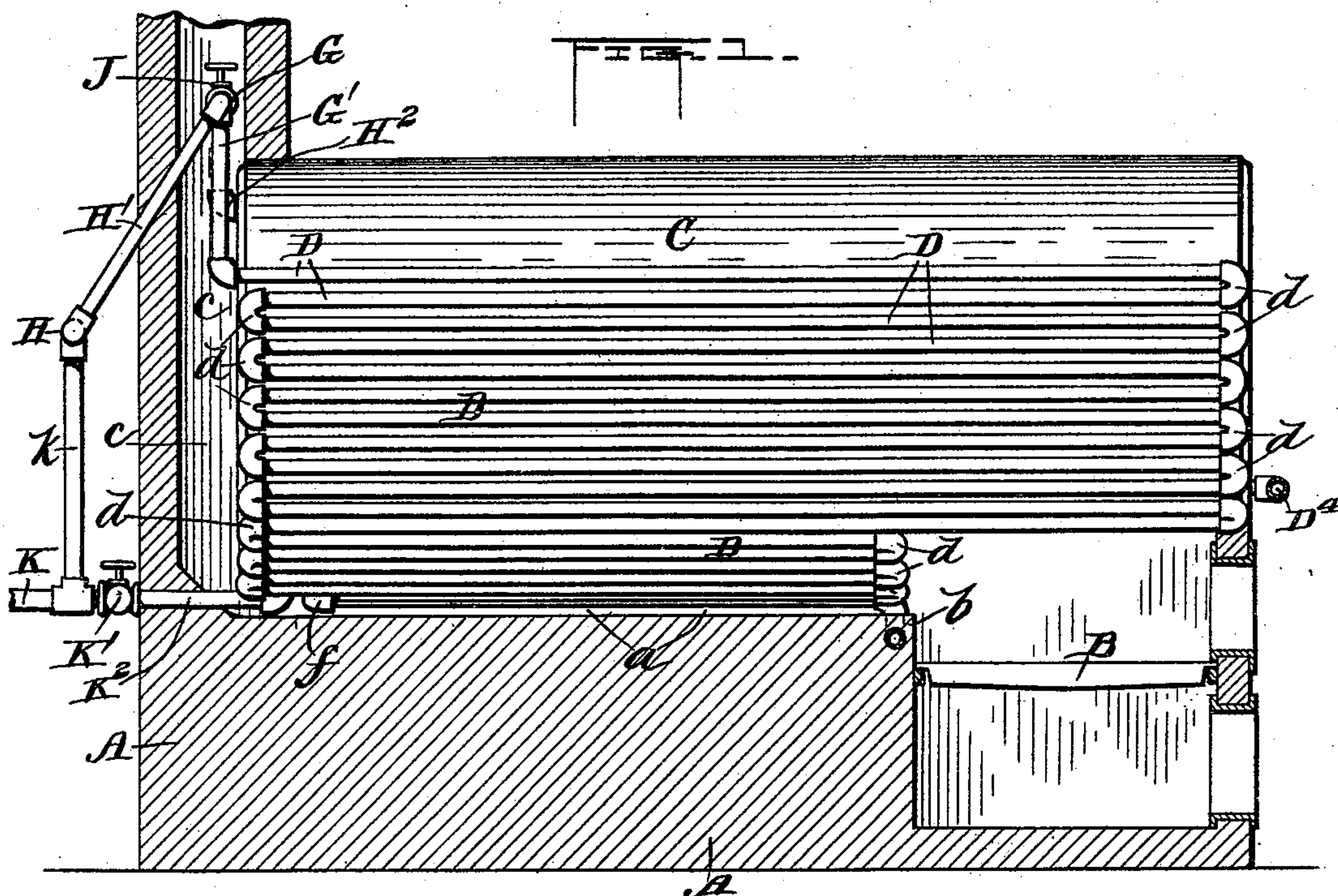
(No Model.)

2 Sheets—Sheet 1.

R. H. ALEXANDER.  
STEAM GENERATING BOILER FURNACE.

No. 491,918.

Patented Feb. 14, 1893.



Witness:  
G. C. Alexander  
C. C. Alexander

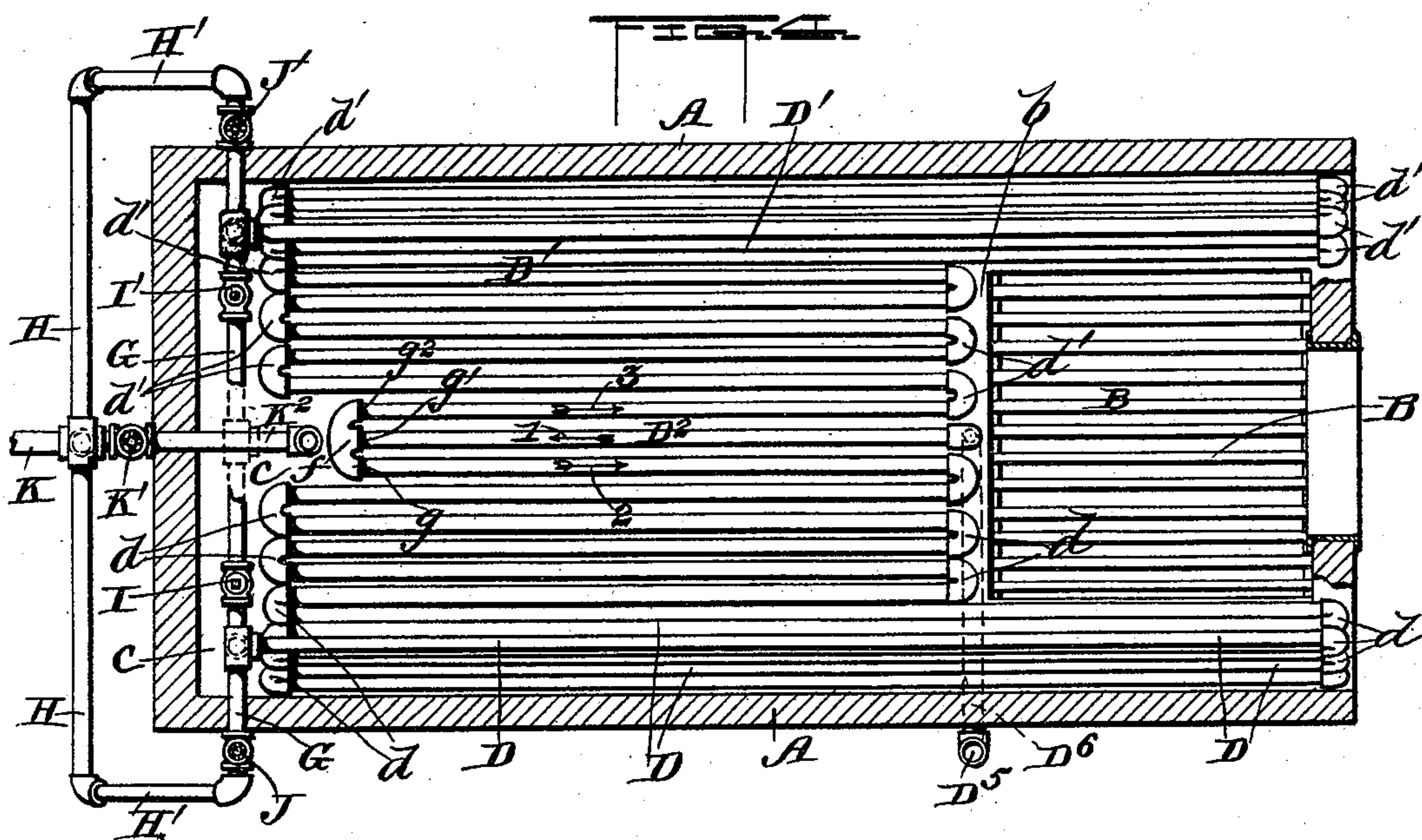
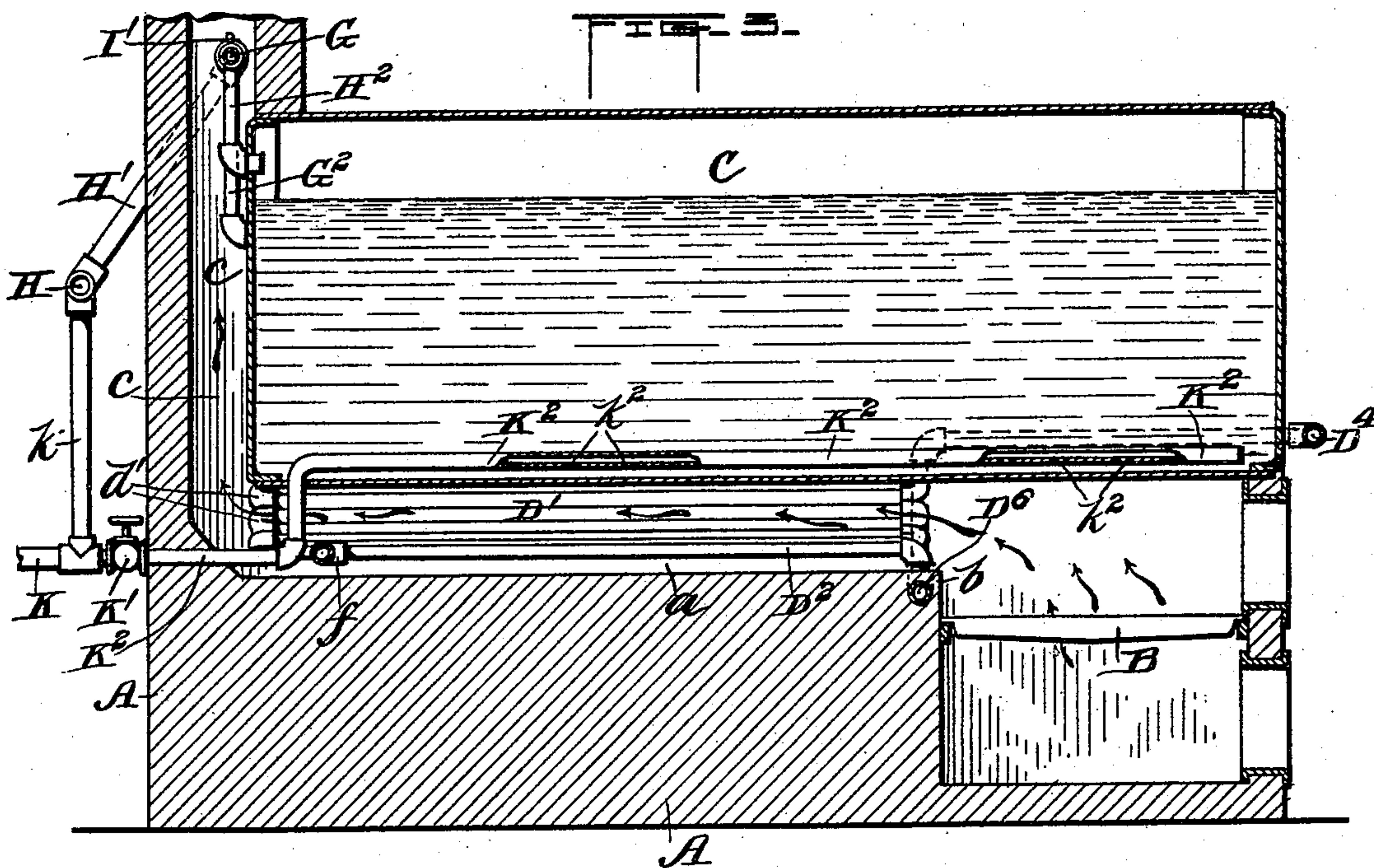
Witness:  
R. H. Alexander  
by his Attorney  
Mason, Fenwick & Lawrence



2 Sheets—Sheet 2.

No. 491,918.

Patented Feb. 14, 1893.



Witnesses:-

Reverence.  
 O. Palmer & Sons.

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Rece<sup>d</sup> H. Alexander  
by his Attorneys  
Mason, Fenwick & Lawrence



# UNITED STATES PATENT OFFICE.

REECE H. ALEXANDER, OF FORT WAYNE, INDIANA.

## STEAM-GENERATING-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 491,918, dated February 14, 1893.

Application filed November 26, 1892. Serial No. 453,287. (No model.)

*To all whom it may concern:*

Be it known that I, REECE H. ALEXANDER, a citizen of the United States, residing at Fort Wayne, in the county of Allen and State of Indiana, have invented certain new and useful Improvements in Steam-Generating-Boiler Furnaces; 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.

My invention consists in a boiler having a novel auxiliary water heating and steam generating tubes in communication with its water and steam space and arranged within the fire box on planes higher than the grate and contiguous to the boiler; said boiler being provided with check valves, blow off cocks and sediment or mud discharging means, as will be hereinafter described and claimed. By my invention a large amount of the heat is saved, a greater amount of steam generated by the heat from a given sized boiler furnace or steam generating apparatus produced, without adding very greatly to the cost of the same, or increasing the labor of attending to it.

In the accompanying drawings, Figure 1 is longitudinal section through the wall and grate of a boiler furnace, showing the boiler and my novel auxiliary water heating and steam generating appliances in side elevation. Fig. 2 is a cross section of the wall and grate of a boiler furnace, showing the boiler and auxiliary water heating and steam generating appliances in elevation. Fig. 3 is a vertical longitudinal section of the furnace and boiler, portions of the sediment removing tube being broken out, and the auxiliary water heating and steam generating appliances being shown in elevation. Fig. 4 is a horizontal section of the furnace with the boiler removed, and showing the auxiliary appliances in plan view.

A in the drawings represents the furnace wall; B the grate and C the boiler; D D' auxiliary water heating and steam generating pipes arranged in nearly a circle in a recess  $\alpha$  formed in the furnace wall above the grate B. A portion of these pipes are carried from the bridge wall  $b$  to the smoke stack flue  $c$  of

the furnace, and the remainder are on each side of the grate extended from the front to the rear end of the boiler or fire chamber and flue. The respective pipes are connected by hollow semi-circular couplings  $d d'$ , the couplings being applied so as to secure a serpentine or zig-zag circulation of the water or steam throughout the pipes. It will be observed by examining Fig. 4 of the drawings that the central pipe  $D^2$  extends into a coupling  $f$  having three inlets  $g, g' g^2$ , and that it enters the coupling by means of the intermediate inlet  $g'$  while a pipe of each of the two series of pipes D D' is entered into the inlets  $g g^2$ . With the pipe  $D^2$ , a pipe  $D^4$  leading from the water space of the boiler connects, and by this means the two series of pipes are supplied with water on each side of the central pipe  $D^2$ . The series of pipes D D' is arranged so that the heat from the grate shall in rising pass between the pipes and also against their outer surfaces, the recess  $\alpha$  formed in the furnace wall permitting this. It is very beneficial to have the water and generated steam to pass through the pipes in opposite directions, as by this means an equable distribution is secured, and all the pipes will be rapidly filled and the water subjected more perfectly to the action of the diffused heat in the fire or combustion chamber and flue under the boiler, and facilities for blowing out each series of the pipes independently are afforded. The two series of pipes D D' are connected respectively to a cross pipe G at the rear of the boiler by means of two vertical pipes  $G' G^2$  and to another cross pipe H by two inclined pipes  $H'$ , and to the steam space of the boiler by a vertical pipe  $H^2$  as represented. The pipe G is provided with two check valves I I' and two blow off cocks J J'; and this pipe is connected by a vertical pipe  $k$  with a main blow off pipe K, which is provided with a blow off cock K'. To this main blow off pipe a sediment or mud discharging pipe  $K^2$  is connected, the latter pipe being arranged about one inch above and nearly along the entire length of the boiler, and having perforations  $k^2$  in it as well as being open at its end in order to insure the rapid passage of the mud



into it and out into the main blow off pipe K when the cock K' is opened. By means of the blow off cocks J J' any sediment that may collect in the tubes D D' can be blown off, and by means of the cock K' the mud at the bottom of the boiler can be blown off, it being drawn up and through the ends and perforations of the pipe k<sup>2</sup>.

It is an advantage to have two blow off cocks J J' and two check valves I I' in the pipe G; as by that construction each section of the tubes D D' can be blown out on opposite sides of the center of the fire chamber independently, and thus more force is secured for blowing out and clearing the tubes D and D' of sediment. It will be seen that the three central pipes of the series of water heating and steam generating pipes are shortened at the point where the bend in the perforated mud blow off pipe K<sup>2</sup> is applied, but that all the other pipes are of the same length in either side of those pipes which begin at the bridge wall and extend to the end of the boiler.

From the foregoing description and the drawings, it will be seen that the boiler is tapered at its front end near its bottom, and that the water is taken from it by means of the horizontal pipe D<sup>4</sup> and conducted into the series of pipes D D' by means of a vertical pipe D<sup>5</sup> and a horizontal pipe D<sup>6</sup>. The course of the water is in the direction of the arrows 1, 2 and 3. The steam generated in tubes D and D' passes into the pipe G then into the steam space of the boiler through the check valves I I' and the blow off is through the cocks J J' and K' and pipes K<sup>2</sup> and K, as hereinbefore described. It will be observed that the portion of the water heating and steam generating tubes that lies directly above the bridge wall does not extend over the grate, and therefore the quick circulation of the heat and flame in the fire chamber proper and between the boiler, and its direct contact with the forward part of the boiler are not interfered with. This is important in order to

insure perfect combustion and heating of the water at the front of the boiler.

What I claim as my invention is:—

1. The combination with a boiler, furnace walls and grate of the two series of pipes D D' connected in zig-zag manner the pipe D<sup>2</sup> coupling f and suitable connections between said pipes D, D' and a boiler, substantially as and for the purpose described.

2. The combination with a boiler, furnace walls and grate, of the two series of pipes D D' arranged between the boiler and the grate and in relief from the furnace walls and connected in a zig-zag manner so that water circulates through them and heat passes around and between them, the pipes of the respective series of pipes having communication with each other and with the water space of a boiler by means of a pipe D<sup>2</sup>, a coupling f, pipes D<sup>4</sup>, D<sup>5</sup> and D<sup>6</sup> and with the steam space of a boiler by pipes G G' and G<sup>2</sup>, the pipe G having check valves and blow off cocks and connected with a main blow off pipe, substantially as described.

3. The combination with the boiler, furnace walls, grate, pipes D D', suitable connections between the pipes D, D' and the boiler and the blow off pipe, of the perforated mud discharging pipe and its blow off cock, substantially as described.

4. The combination of the boiler, walls of the furnace, and the grate, of the two series of pipes D D' suitable connections between the boiler and the pipes D, D', a portion of the pipes of each series being extended from the rear of the boiler and terminated at the bridge wall, while the remaining portions of the two series of pipes D D' are extended substantially from end to end of the boiler, substantially as described.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

REECE H. ALEXANDER.

Witnesses:

JAMES B. HARPER,  
ANNA E. GEBHARD.