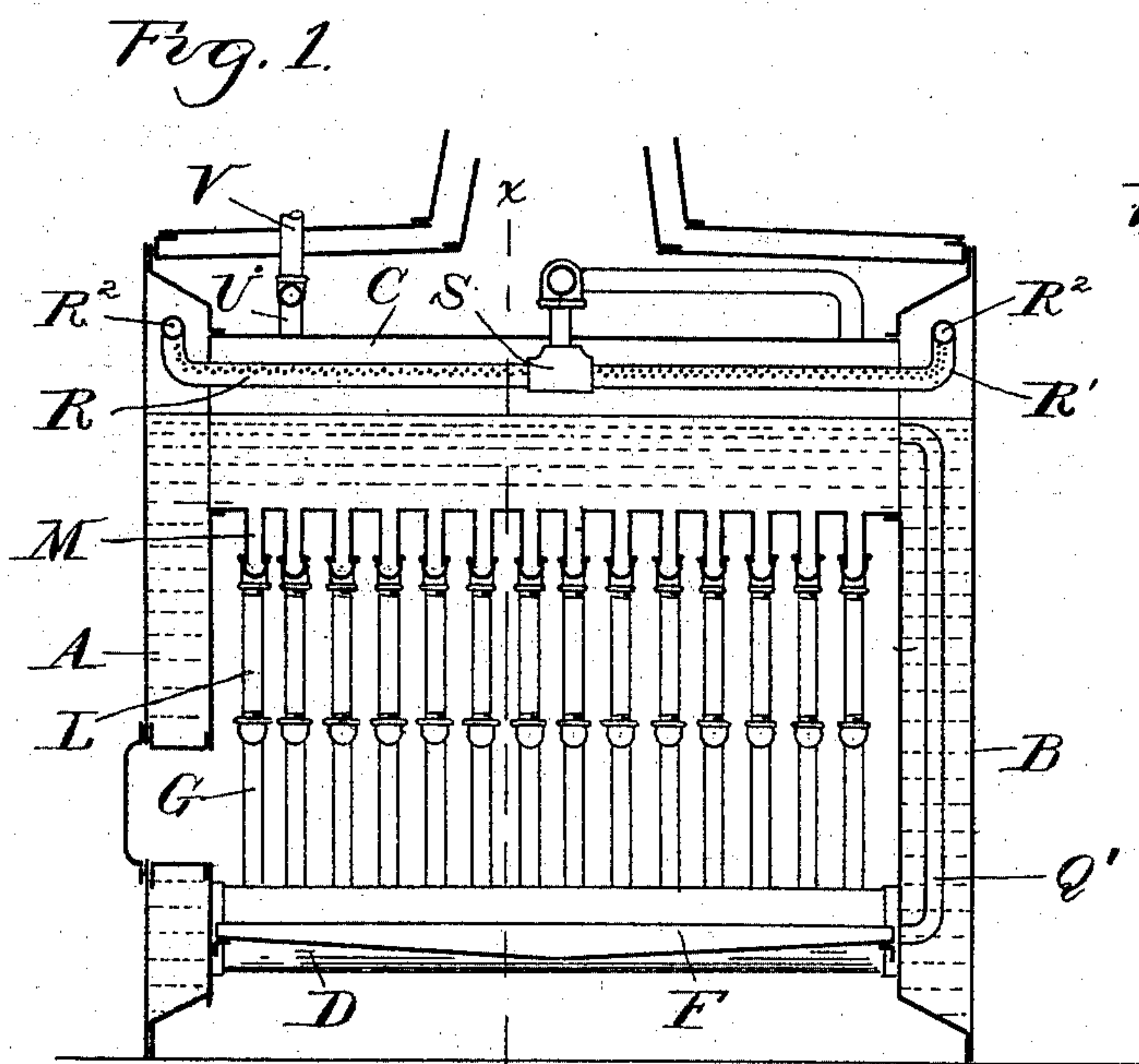
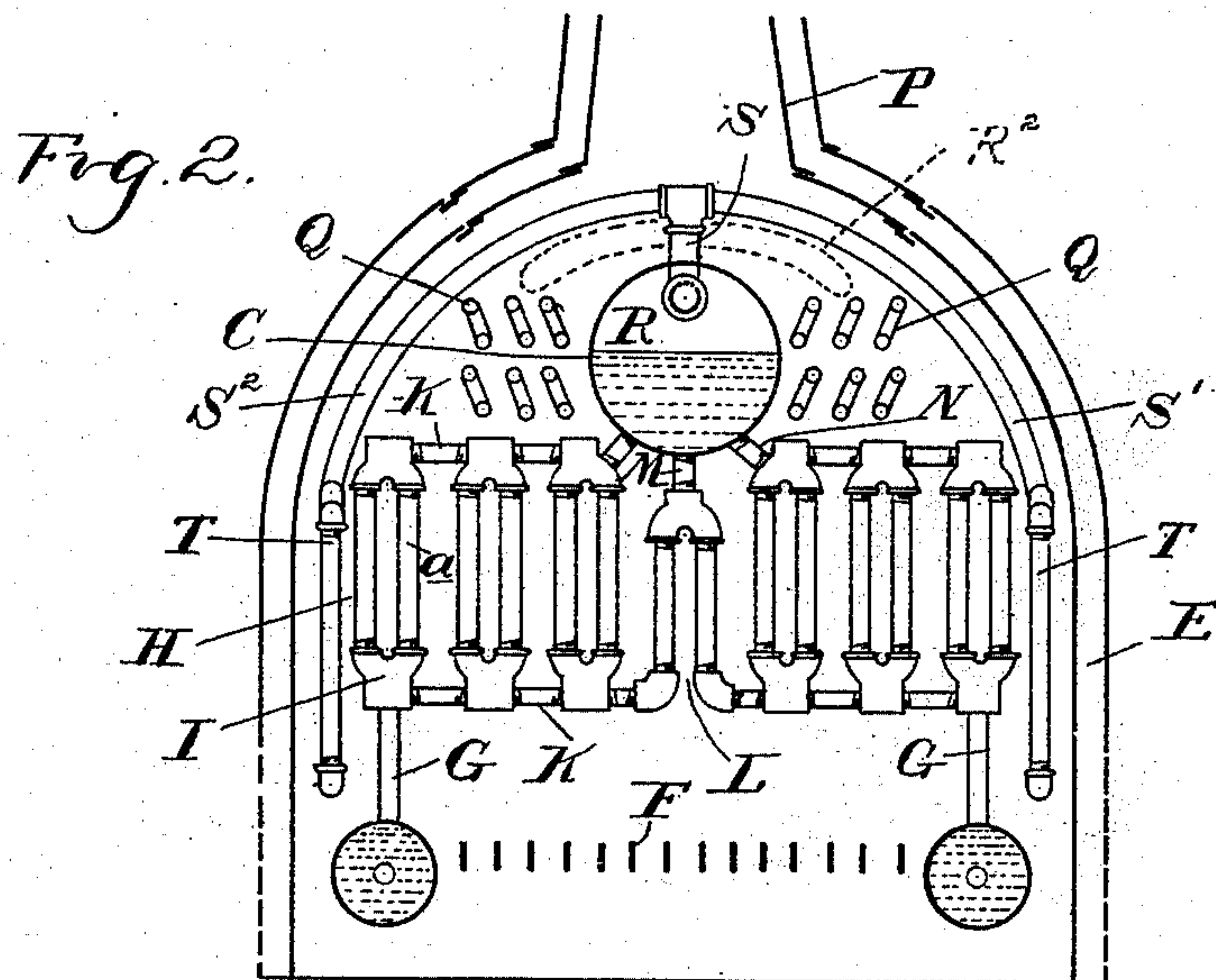


(No Model.)

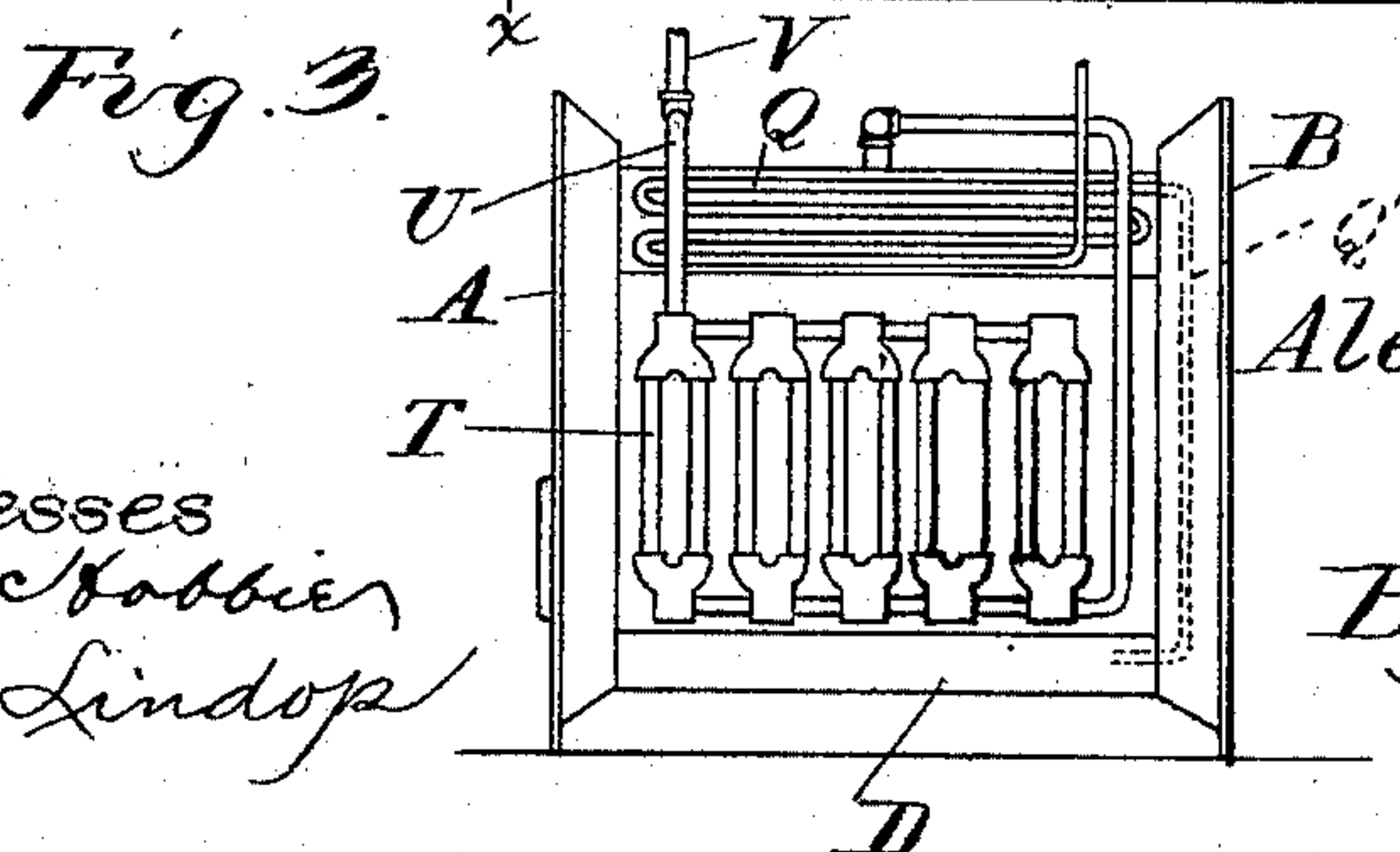
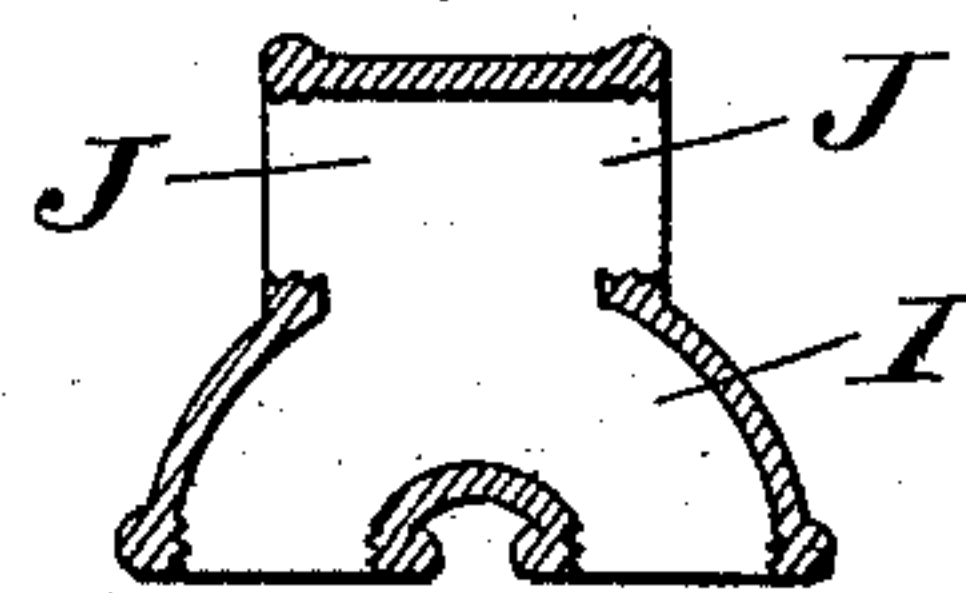
A. W. FINLAYSON & E. POPKINS.  
STEAM GENERATOR.

No. 500,803.

Patented July 4, 1893.



*Fig. 4.*



Witnesses  
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# UNITED STATES PATENT OFFICE.

ALEXANDER W. FINLAYSON AND EDWIN POPKINS, OF DETROIT, MICHIGAN

## STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 500,803, dated July 4, 1893.

Application filed January 24, 1893. Serial No. 459,555. (No model.)

*To all whom it may concern:*

Be it known that we, ALEXANDER W. FINLAYSON and EDWIN POPKINS, citizens of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Steam-Generators, of which the following is a specification, reference being had therein to the accompanying drawings.

10 The invention consists in the peculiar construction of the circulating means for the water, whereby an economical and efficient generation of steam is accomplished with a minimum expense of coal.

15 The invention further consists in the peculiar construction, arrangement and combination of the various parts, all as more fully hereinafter described.

20 In the drawings, Figure 1 is a vertical, central, longitudinal section of our improved steam generator. Fig. 2 is a cross section thereof on line *xx*. Fig. 3 is a side elevation with the casing removed. Fig. 4 is a section of one of the special fittings employed in our device.

25 A and B are two vertical water legs forming the front and back respectively of the generator. These water legs are connected together near the top centrally by the steam dome C and near the bottom at each side by the connecting tubes D, the whole forming a substantially rigid structure, adapted to be incased within a suitable casing E and adapted to support suitable circulating pipes for circulating the water which is fed into the tubes D, crossing the combustion chamber of the furnace and delivering it to the steam dome.

40 F are the grates, which extend between the tubes D and are supported thereon, or on the water legs at the ends.

45 To accomplish the circulation of water from the lower tubes to the steam dome and carry the water across the entire grate surface and yet circulate it as nearly vertical as possible, we employ the following construction: G is a series of risers tapped into the tops of the tubes D at their lower ends, and at their upper ends connected to the outer one of a series of loops H, entering at the bottom of the loop. These loops each consist of a special return bend I having lateral passages J at

each side and the usual fitting apertures for the connecting pipes *a*. These loops are connected together at top and bottom by means of the nipples K engaging into the apertures J, as plainly shown in Fig. 4. There are a sufficient number of these loops to extend from the pipe G inwardly to near the middle of the combustion chamber, there being a like series of groups on each side and the two series connect together to a common loop L in the middle of the combustion chamber and connect into the bottom of the steam dome C by means of the single nipple M. The tops of the loops are connected together as described, and the inner loops are connected to the steam dome by means of the nipples N on each side of the center.

70 There are a sufficient number of these series of loops to extend from the front water leg to the rear water leg entirely over the grate surface, or as many as may be desired, the lower ends of the loops being sufficiently above the top of the grate to allow of firing through the door O and for proper combustion. The circulation of water through each one of these series of loops is as follows: The water will rise through the riser G and be distributed laterally through the connecting nipples K at the bottoms of the loops partly rising through each of the loops H and passing through the upper connecting nipples K and through the nipple N into the steam dome, while a part will pass entirely through the horizontal passage way and into the central loop L through the nipple M into the bottom of the dome. We thus obtain a very much larger area of circulation through which water from the single riser G must pass in order to enter the steam dome, so that the circulation through each one of the loops and the horizontal nipples will be comparatively slow, while the total result in circulation will be extremely rapid, at the same time heating the water to a very high temperature before entering the steam dome, the steam dome itself being subjected on all sides to the heat of the furnace. The products of combustion pass off through the chimney P. The water is fed into the rear ends of the tubes D and we preferably arrange coils Q on each side of the steam dome above the loops H through which the feed water passes. These coils at



the rear enter the rear water leg B and pass down therethrough in a pipe Q' entering the rear end of the tubes D, as shown in Figs. 1 and 3.

5 R is a perforated dry pipe extending horizontally through the top of the steam dome and having apertures only on its upper side, being provided at each end with the upturned extensions R' and cross-heads R<sup>2</sup> in the up-  
 10 per ends of the water legs, so that steam will be taken from all parts of the steam dome through the steam discharge pipe S, which extends centrally out of the steam dome. Above the dome this pipe is branched into  
 15 the branches S' S<sup>2</sup> extending to the sides of the casing and rearwardly, thence downwardly to the lower end of the superheating coils T at each side, which are of a similar construction to the loops or coils H and ex-  
 20 tending longitudinally of the combustion chamber outside of said coils H. These coils or loops at their forward ends are provided with the outlet pipes U which extend over the steam dome and are united in a similar steam  
 25 supply V which passes out through the casing. Thus it will be seen that this arrangement not only gives us a most excellent circulation of the water to obtain the best re-  
 30 sults in economy and steam generation, but also provides ample space for steam superheating coils and feed water heater.

What we claim as our invention is—

1. In a steam generator, the combination  
 35 thereof, of water legs at opposite ends with a casing, of water legs at opposite ends thereof, a centrally arranged steam drum connecting the tops, and side tubes connect-  
 40 ing the bottoms of the legs, a grate, a series of vertically disposed circulating loops above the grate connected with the side tubes and having connections at top and bottom with  
 the drum, substantially as described.

2. In a steam generator, the combination of two end water legs, connections between the two consisting of a steam dome centrally

at the top, and by tubes at each side at the 45 bottom, connections from the side tubes to the steam dome consisting of a series of loops connected together at top and bottom, and to the dome and tubes, substantially as de-  
 scribed. 50

3. In a steam generator, the combination with end water legs, a steam drum and side tubes connecting the legs, a series of heating loops, a pipe connection between the loops  
 55 and tubes, pipe connections between the tops and bottoms of adjacent loops and pipe connections between the top and bottom of the end loops of the series and the steam drum, substantially as described.

4. In a steam generator, the combination 60 with the water legs at each end, a steam dome connecting the legs centrally at the top and the water tubes connecting the legs at each side at the bottom, the circulating pipes con-  
 65 necting the side tubes with a steam dome and superheating coils arranged outside of said circulating pipes and within the casing, and connections at opposite ends of said coils with the steam dome and the steam supply pipe  
 70 respectively, substantially as described.

5. In a steam generator, the combination with the end water legs, the steam dome connecting said legs centrally at the top, and water tubes connecting said legs at the bot-  
 75 tom, the circulating pipes connecting said tubes with the steam dome, and the feed water coils Q arranged on each side of the steam dome, and above the connecting pipes, and connected at one end to the rear ends of the  
 80 connecting tubes and at the other end to the water supply pipe, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

ALEXANDER W. FINLAYSON.  
 EDWIN POPKINS.

Witnesses:

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