

(No Model.)

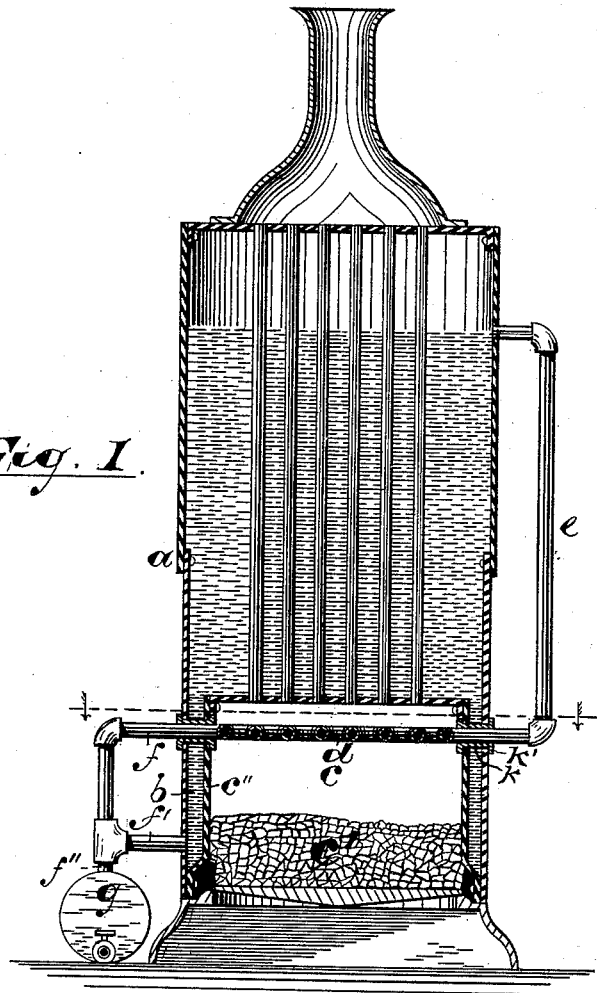
2 Sheets—Sheet 1.

J. A. ENO.  
STEAM BOILER.

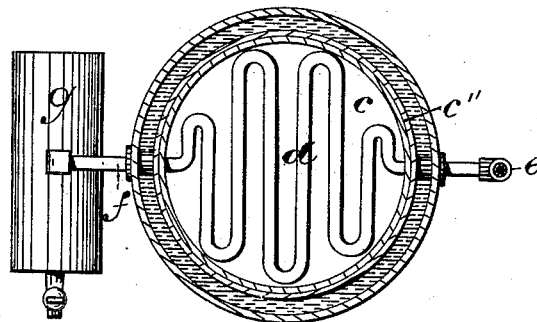
No. 385,510.

Patented July 3, 1888.

*Fig. 1.*



*Fig. 2.*



WITNESSES:

Oscar A. Michel.  
Philip G. Vogtlin.

INVENTOR:

*Joseph A. Eno,*

BY *Drake & Co.* ATT'YS.

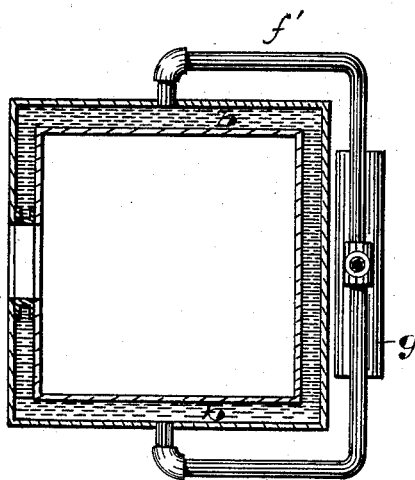
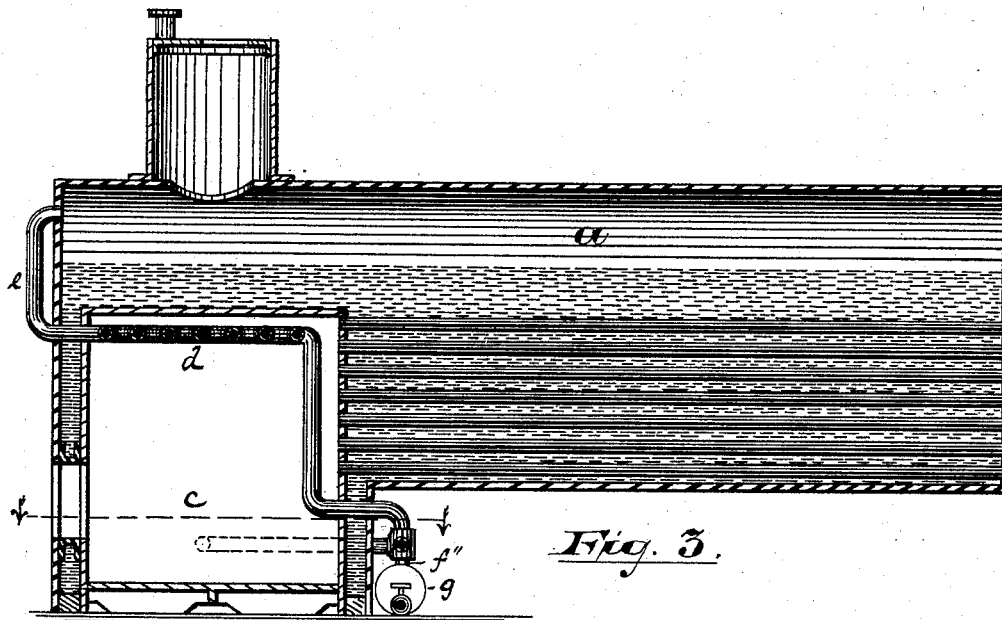
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WITNESSES:

Oscar A. Michel.  
Philip G. Voegtlin.

INVENTOR:

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# UNITED STATES PATENT OFFICE.

JOSEPH A. ENO, OF NEWARK, NEW JERSEY.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 385,510, dated July 3, 1888.

Application filed December 20, 1887. Serial No. 258,467. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH A. ENO, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Steam-Boilers and Appliances Therefor; 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

15 This invention relates to that class of vertical or locomotive boilers in which the water-chamber extends downward around the sides of the fire-box, forming a pocket the bottom of which lies on or about a level with the grate *c*, the downward extension being technically termed the "water-leg." The said water-leg has no continuous extension beneath the fire-box, such as would be formed where the fire-box consists of a large flue extending through the water-chamber, as in the Cornish type of boilers or certain marine boilers. In this class of boilers to which my improvements relate the sediment formed by the continued evaporation in generating the steam has heretofore settled in the water-leg, the water in that part being comparatively quiet.

From the above it will be seen that the object of this invention is to more effectually prevent the accumulation of sediment within the water-leg of a vertical or locomotive boiler, so that the iron at the sides of the fire-box will be preserved and the life-time or term of service of the boiler extended; to secure economy in the consumption of fuel; to gain a more lively circulation of water in the boiler, and more specifically to prevent the iron sides of the fire-box from being raised to a very high temperature and being burned out because of the sediment on the opposite side of the said iron, which sediment, settling in the contracted pocket, soon extends to the fire-line and forms a non-conducting and impervious layer, which prevents access of water to the said iron or the transmission of heat from said iron to the said water.

Referring to the accompanying drawings, in which like letters of reference indicate cor-

responding parts in each of the two sheets, Figure 1, Sheet 1, is a central vertical section of a vertical boiler, showing my improvements in operative relation thereto. Fig. 2 is a horizontal section through the boiler, taken on line *x*. Fig. 3, Sheet 2, is a vertical section of a locomotive-boiler; and Fig. 4 is a section thereof, taken on line *y*.

In said drawings, *a* indicates a boiler having a water-leg, *b*, formed between two vertical sheets of iron around the fire-box *c*, and connected with the upper part, *a'*, of the boiler-chamber, having therein the heat-flues *a''*, leading from the fire-chamber. The bottom of the water-leg, where the two said sheets of iron are joined together, lies at about the level of the grate *c*. The construction of the boiler thus described is old and provides a convenient and low-priced device, efficient in securing steam at low initial cost. To prevent the sediment from settling in the said water-leg when the said boiler is in use, I connect a mud drum or receptacle to the same, as shown in the drawings, so as to allow the sediment to gravitate from the bottom of said water-leg to said drum and quietly settle in said drum. At the upper part of the fire-box, within the chamber formed above the bed of coals, is arranged a coil or collection of pipes to present a considerable surface to the flame or heat from the coals, the said coil being marked *d* in the drawings. The heat, coming in contact with the coil, raises the same to a high temperature and turns the water lying therein partly into steam. This causes the water to rise and pass through the pipe *e* with considerable force, the coil being fed through the pipe *f*. A circulation is thus instituted.

In connection with the pipe or section *f* is arranged a mud-drum, *g*. This is arranged on the outside of the boiler and furnace at the side thereof, as shown, to keep the same cool, so that the sediment will not bake or harden, and to prevent the mud-drum from taking up room in the fire-box and interfering with the draft.

To secure a circulation at the bottom of the water-leg and to cause the sediment to pass from the said leg and be deposited in said drum, I arrange the mud-drum at the side of the boiler below the bottom of the water-leg and connect said mud-drum with the before-

mentioned coil within the fire-chamber and with the said water-leg by means of the pipes *f* and *f'*, the latter of said pipes connecting with the former at a point just above the said mud-drum. The pipe *f*, connecting the coil and drum, passes through the upper part of the water-leg, and to allow for expansion and to prevent leakage at this point an eye or sleeve, *k*, flanged, as at *K*, connects the inner and outer iron plates and provides an opening for the said pipe to pass from the interior to the exterior sides of the leg. A similar eye, *K*, is provided for the pipe *e*. The flanges are so united to the said plates of the water-leg as to make an impervious joint therewith.

By the devices thus described I secure the following circulation and deposit: The water in the coil being heated, the water passes rapidly upward through the pipe *e* to the upper part of the boiler, from whence it flows downward and enters the water-leg. At the bottom of the water-leg it passes from the body of the boiler, carrying with it such matter as has settled into the leg, and, as the settlings pass over the opening in the part *f''* of the pipe *f*, they drop into the mud-drum *g*, the water continuing its progress through the pipe *f* until it reaches the heating-coil again. The sediment being thus deposited in the mud-drum may be removed therefrom without dis-

turbing the operations of the boiler or disconnecting the parts thereof.

What I claim as new is—

1. The improved steam-generator herein described, combining therein a boiler having the water-leg *b*, forming a pocket at the sides of the fire-box, a mud-drum arranged at the side of said boiler, as shown, heating-pipes arranged within the said fire-box, pipes connecting said drum with the water-leg and with the said heating-pipes, and a pipe connecting said heating-pipes with the upper part of the boiler, substantially as set forth.

2. In combination with a vertical boiler having a water-leg, a mud-drum arranged on the outside thereof, a collection of heating or circulating pipes disposed within the fire-box at the upper part thereof, and pipes leading from the heating-pipes through the water-leg to the outside of said boiler and connecting with the mud-drum and pipes leading from said heating-pipes to the upper part of the boiler, substantially as and for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 17th day of December, 1887.

JOSEPH A. ENO.

Witnesses:

CHARLES H. PELL,  
OSCAR A. MICHEL.