

T. S. La FRANCE.  
Steam-Boilers.

No. 214,402.

Patented April 15, 1879.

Fig. 2.

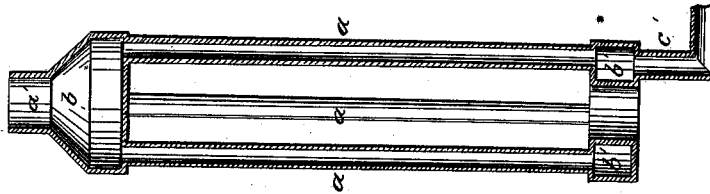


Fig. 3.

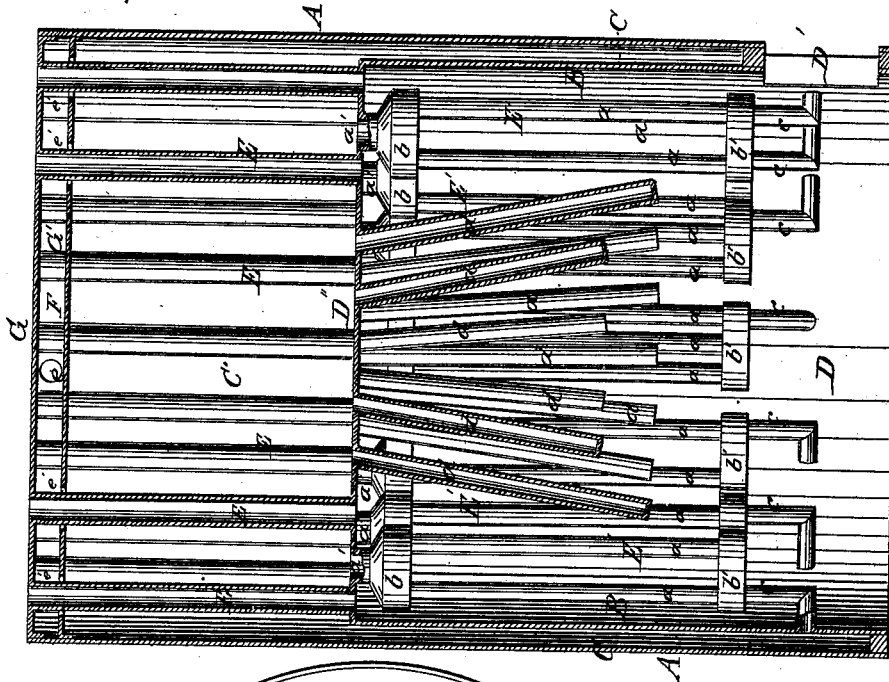
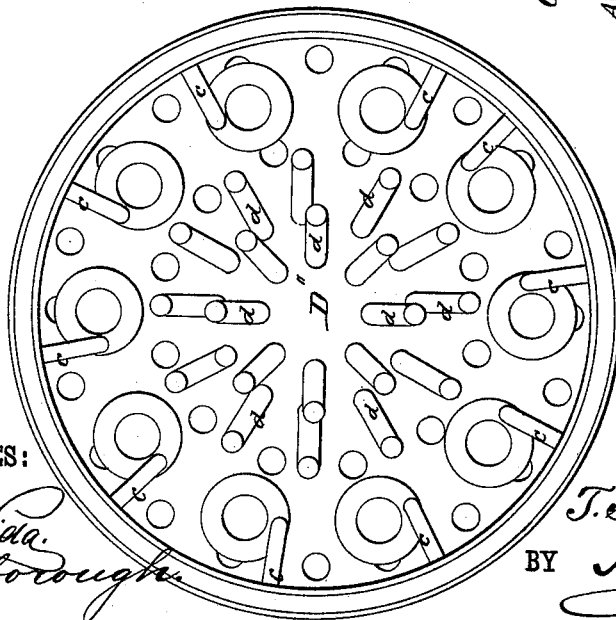


Fig. 1.



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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. **214,402**, dated April 15, 1879; application filed October 5, 1878.

*To all whom it may concern:*

Be it known that I, TRUCKSON S. LA FRANCE, of Elmira, in the county of Chemung and State of New York, have invented a new and Improved Steam-Boiler, of which the following is a specification.

The objects of this invention are, to obtain a more complete exposure of the water to the heat; to superheat the steam by forcing it through narrow openings in contact with the smoke-flues, and thus expose all of it to the extreme heat of the upper parts thereof; and, finally, to prevent, in a measure, the destruction of the upper part of the smoke-flues by cooling them with the moisture in the steam.

It consists, first, in arranging nests or clusters of flues together in the fire-chamber, joined at their upper ends into a single pipe passed through the crown-sheet, whereby a great number of flues and a great extent of water-surface can be exposed to the heat without taking up too much of the crown-sheet and limiting the space for the smoke-flues.

It consists, secondly, in providing a steam-chamber and device for superheating the steam, formed by placing a diaphragm in the upper part of the boiler just below the head, the smoke-flues passing through holes therein a little larger than the flues in diameter, through which all the steam passes, so that every part is exposed to the intense heat of the upper part of the flues, superheating it, and the moisture taken from the steam tends to cool this part of the flues, and thus extend their usefulness.

The invention consists, lastly, of details of construction and arrangement, hereinafter specifically referred to and described.

In the accompanying drawings, forming part of this specification, Figure 1 is a bottom view of the boiler of a steam fire-engine provided with my improvements. Fig. 2 is a vertical section of the boiler; and Fig. 3 is a detail, in section, of the nest of flues.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A represents the outer shell or casing of the boiler; B, the walls of the fire and combustion chamber; C, the water-space surrounding the fire-chamber; C', the water and steam chamber; and D, the up-

per part of the fire and combustion chamber. D' is the door of the fire-chamber. D'' is the crown-sheet separating the fire-chamber from the water-chamber; and E are the smoke-flues, through which the volatile products of combustion are conveyed from the fire-chamber to the dome and thence to the smoke-stack. Neither of these last-mentioned parts are shown in the drawings, as my invention does not include any change in them of form or arrangement.

The nest or cluster of water-circulating flues or tubes are designated by the letter E'. Each nest is composed of a number of vertically-placed tubes, *a a a*, having their upper ends inserted in the bottom plate of a dome, *b*, and their lower ends in an annular chamber, *b'*. The domes are each fitted with a short tube, *a'*, which is coupled with the crown-sheet by a steam and water tight joint.

The annular chambers *b'* are each connected with the lower part of the water-chamber C by a pipe, *c*, of sufficient capacity to furnish all the tubes comprised in the nest or cluster with a full supply of water. When these nests are placed in position, the water passes through them freely from the lower chamber, C, to the upper chamber, C', and thus a continuous circulation is kept up through them. The cold water pumped into the boiler, entering the pipes *c*, flows into the tubes composing the nests as the hot water is emitted from them.

It will be readily perceived that this arrangement furnishes a greater extent of heating-surface in water-tubing than can be obtained by the use of single flues, as in a large boiler each nest or cluster E' will be composed of ten or twelve tubes, and thus the extent of heating-surface will be largely increased without any disadvantage to the other parts of the boiler, as, no matter how many tubes are used, but one hole will have to be made in the crown-sheet, and thus there will be no decrease of space appropriated for smoke-flues. The number of these can be largely increased without inconvenience, and thus a more powerful draft obtained.

The ability to get up steam in a short time and the rapid generation of steam in the boiler are greatly increased by the arrangement above described.

The nests *E'* may be used exclusively to supply the boiler with water-circulating tubes; or they may be used in connection with the drop-flues *d*, constructed in the usual manner and supplied with the well-known circulators, (not shown in the drawings,) as their use and arrangement are well known.

In the upper part of the chamber *C'* is placed a diaphragm, *F*, between which and the boiler-head *G* is a space, *G'*, forming a steam-superheating chamber, from which leads the steam-pipe *e*. The smoke-flues *E* pass through holes in this diaphragm that have a diameter slightly in excess of that of the flues, thus leaving spaces *e'* surrounding the flues, whose united capacity should not be less than that of the steam-pipe *e*. This plate is designed to serve as a dry pipe for superheating the steam. All the steam generated in the boiler has to pass through the spaces *e'* and in contact with the flues at these points, and as the upper parts of the flues become intensely heated the steam is exposed thereto and superheated, and the moisture drawn from the steam tends to lower the temperature of flues, and thus conduce to their preservation—a desirable object to obtain, as they are subjected to rapid deterioration when they are unprotected by the water in the boiler.

The operation of the different parts of my invention is sufficiently set forth in the above description, and the skilled workman will have no difficulty in understanding the construction and arrangement of parts or their utility.

Having thus described my invention, I claim

as new and desire to secure by Letters Patent—

1. As an improvement in boilers for steam fire-engines, the nests or clusters of water-circulating-flues *E'*, composed of the flues *a a a*, their ends inserted in a dome, *b*, at the top, and an annular chamber, *b'*, at the bottom, the former coupled to the crown-sheet *D''*, and the latter communicating through pipes *c* with water-chamber *C'*, whereby a circulation of water can be maintained through said tubes from water-chamber *C* to chamber *C'*, and exposed to the heat in the fire and combustion chamber *D*, substantially as hereinbefore described.

2. As an improvement in boilers for steam fire-engines, the nests or clusters of water-circulating flues *E'*, constructed and arranged as described, in combination with chambers *C C'*, drop-flues *d*, crown-sheet *D''*, and fire-chamber *D*, substantially as described.

3. As an improvement in boilers for steam fire-engines, the diaphragm *F*, furnished with holes forming spaces *e'* around the smoke-flues *E*, for the passage of steam, in combination with chamber *C'*, flues *E*, and steam-chamber *G'*, substantially as described.

4. In a steam fire-engine, a number of pendant or drop flues, connected with the crown-sheet by a single tube, as shown and described, whereby more smoke-flues are secured without diminishing the fire-surface.

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Witnesses:

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