L. Fagin,

Steam-Boiler Water-Tube.

No. 63,376. Patented Apr. 2, 1867.

Fig. 1.

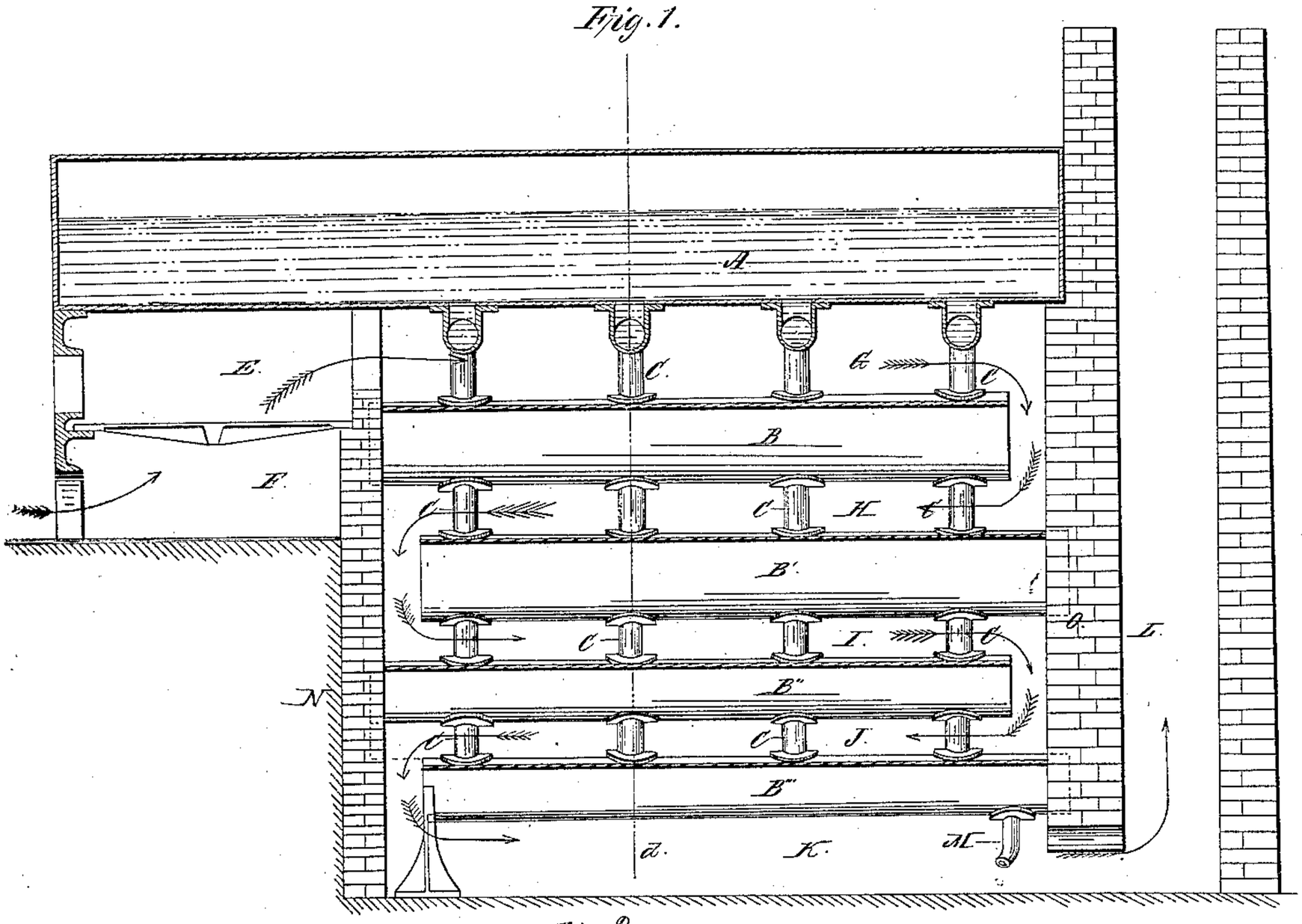
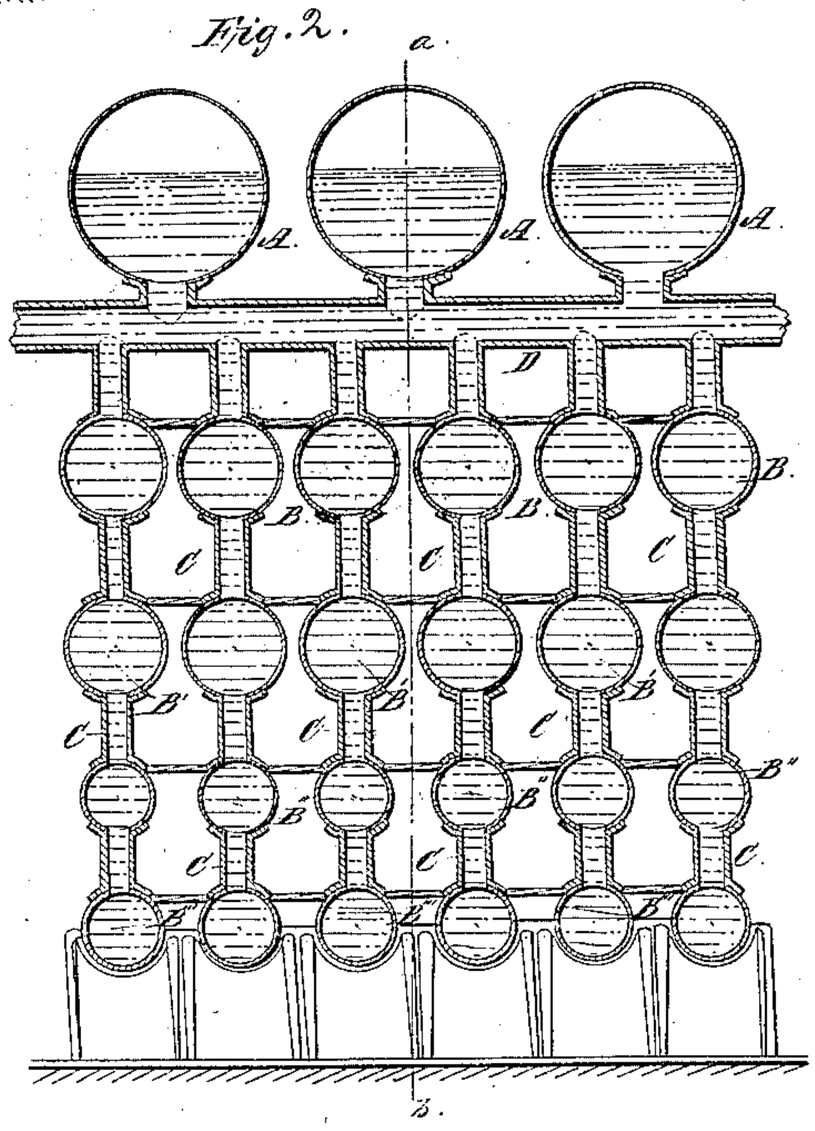


Fig. 2.



Witnesses:
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LEWIS FAGIN, OF CINCINNATI, OHIO.

Letters Patent No. 63,375, *dated April* 2, 1867.

IMPROVEMENT IN STEAM GENERATORS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, LEWIS FAGIN, of Cincinnati, in the county of Hamilton, and State of Ohio, have made a new and useful Improvement in Steam Generators; and I do hereby declare the following to be a full, clear, and exact description of the nature, construction, and operation of the same, sufficient to enable one skilled in the art to which my invention appertains to construct and use the same, reference being had to the accompanying drawings, which are made part of this specification, and in which—

Figure 1 is a vertical section on the line *a.b*, fig. 2.

Figure 2 is a vertical transverse section on the line *c d*, fig. 1.

The same letters refer to like parts in the different figures.

This invention consists of a series of horizontal cylinders or tubular boilers, one under the other, connected by tubular necks, as shown in the drawings, and with the furnace and flue spaces so arranged as to make separate and independent flues between each tier of boilers or tubes, and with transverse connecting tubes, so that the heated air shall pass from the fire-bed under the upper tier, descending at the after end, and passing back and forward under and between each successive tier of boilers or tubes until the heat is so far exhausted or absorbed as to render any further application of it useless.

In this arrangement of boilers the upper tier should not be kept more than half full of water, whereas the lower tiers are of necessity entirely full, the water being supplied at the lowest point. It is obvious that in whatever shape or position boilers are made or placed, if set on a level with each other, and connected with tubes or pipes, the pressure and temperature within the whole is, as near as may be, the same, the head of water being the only difference against the lower tiers. This arises from the fact that the circulation of water in boilers set on a level with each other is so complete that a uniform temperature as well as pressure is maintained. It does not, however, follow that because the temperature and pressure are alike, in boilers set on a level with each other in the ordinary way, that it will be the same in boilers set one under the other, but, on the contrary, that while the pressure in the under boilers is the same, or slightly greater, (owing to the pressure of the column of water in them,) the temperature within them will be in proportion to the heat applied on the outer surface, and no greater; and as the heat is constantly diminishing from the grate bars to the stack, the temperature within the lower boiler is lower, and lower from one tier of boilers or tubes to another, adapting them to take up or absorb heat from the passing body of air in the flues, which has an ever-diminishing temperature, until, as nearly as possible, all the heat that is of value is taken up. When expanded by increase of temperature the heated water or globules of steam rise and pass from boiler to boiler, increasing in temperature according to the heat applied, until they reach the surface, and the steam there generated or escaping from the water adds to the common mass of steam in the upper boilers, where the most intense heat is applied. It is certain that no boiler, however arranged, can take up heat of a lower temperature than what is necessary to maintain the required pressure and consequent temperature within; hence the necessity of arranging boilers on a plan so that the constantly diminishing temperature of heated air can be taken up or absorbed as it passes from under one boiler to another.

In the drawings, A A are cylindrical boilers, connected underneath by necks to the cross-pipes D. B B′ B″ B‴ are cylindrical boilers, also horizontally placed, and in a descending series, alternately supported by the front and by the rear walls of the furnace, so as to make a zigzag course, G H I J K, for the heated volatile products of combustion which pass towards the chimney L. The series of boilers are connected by vertical tubular necks, *c c c*, &c., which may be as numerous as required. I have shown four in the length of the boilers, and the heated water in each may rise vertically through the boilers and successive necks into the cross-pipe D, and eventually into the upper boilers. The feed water is received by the pipe M, which is at the coldest part of the boiler and of the furnace. The tendency of the water is gradually upward until it reaches the boilers A, from whence it is used. E is the furnace, and F the ash-pit, N the front wall under the fire-bridge, and O the back wall.

I do not claim the diving and reverberating flues in connection with the furnace under the upper portion of the boiler, nor do I claim broady the arrangement of boilers in tiers one above another; but what I claim, is—

The arrangement of either cylinder or tubular boilers one under the other, with the flue spaces between them arranged so that heated air shall pass under and between each successive tier, alternately from the upper to the lower, the tubes or boilers being connected by vertical necks and transverse tubes, D, as described, and for the purpose set forth.

LEWIS FAGIN.

Witnesses:

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