

(No Model.)

L. W. & N. LOMBARD.  
STEAM BOILER.

No. 402,091.

Patented Apr. 23, 1889.

Fig. 1.

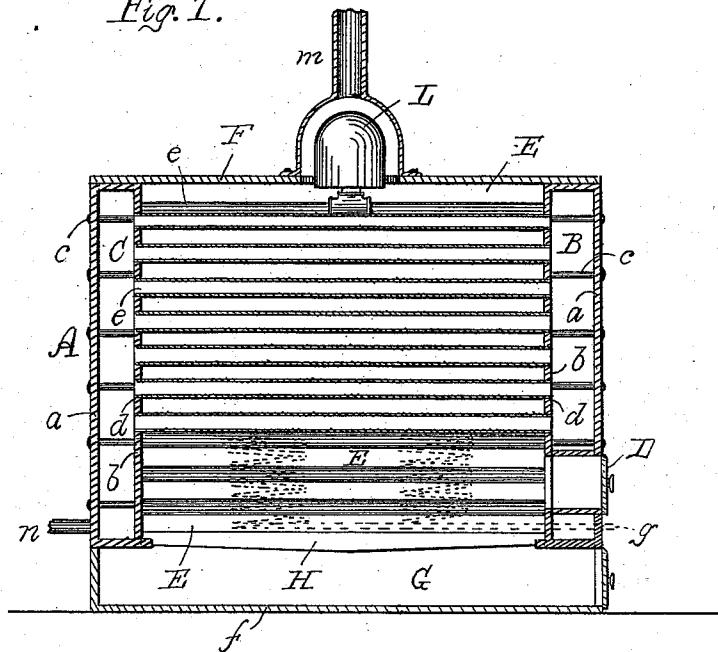
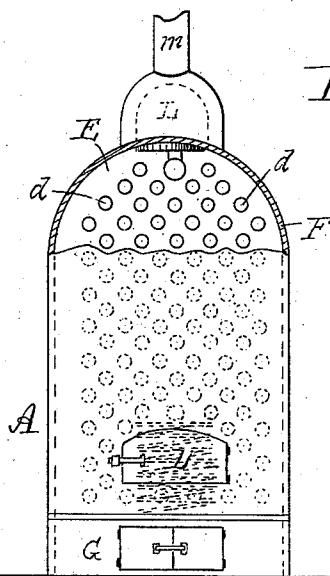


Fig. 2.



Witnesses.

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# UNITED STATES PATENT OFFICE.

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ASSIGNORS OF ONE-HALF TO ORLANDO E. LEWIS, OF SAME PLACE.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 402,091, dated April 23, 1889.

Application filed November 6, 1888. Serial No. 290,095. (No model.)

*To all whom it may concern:*

Be it known that we, LEVI W. LOMBARD and NATHANIEL LOMBARD, citizens of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented 5 certain new and useful Improvements in Steam-Boilers; and we 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 or figures of reference marked thereon, which form a part of this specification.

15 The drawings herewith annexed represent, in Figure 1, a central longitudinal sectional elevation of a boiler embodying our improvements. Fig. 2 is a front view of the same with a portion of the outer shell removed.

20 In the drawings accompanying this specification we have represented at A a boiler as an entirety, composed of a front and rear water-chamber, (indicated, respectively, at B C.) Said chambers are composed of flat plates a b, united by bolts c c, or otherwise. The two inner plates, b b, are similarly perforated with a series of holes, d d, adapted to receive the 25 ends of a number of boiler-tubes, e e, which are secured thereto, and thus interconnect the end water-chambers with each other, affording a large heating-surface. Moreover, these boiler-tubes are arranged in a series of horizontal planes with a space between each pipe. Further, the pipes composing any one 30 row are disposed in the spaces which exist between the two rows of pipes immediately adjoining, either above or below. Thus a very strong and rapid circulation is produced. As a consequence, steam is generated very rapidly, as can be judged from the fact that a 35 boiler of our construction with a width of fourteen inches, a length of twenty-six inches, and a height of twenty-four inches will be equivalent in its steam - generating capacity 40 to that of a four-horse-power boiler of ordinary construction.

The front of the boiler is supplied with a feed-door, D, which leads to the combustion-chamber E. The latter is formed by a shell, 45 F, preferably semicircular at the top and inclosing the tubes e e. This shell extends the entire length of the boiler, its end heads be-

ing attached by bolts or riveting to the water-chambers B C. Its lower side portions rest upon and are fastened to a bottom plate, 55 f, which forms the ash - chamber G, and in which the non-combustible products of the fuel are temporarily collected, whence easily removed. Above said plate f, and between the latter and the lowermost tubes e e, are disposed the grate-bars H H.

In the event of the boiler being employed with liquid fuel as a steam-generating agent, we have shown in dotted lines the location of two coils of pipe, which are in alignment with 65 the door D and disposed lengthwise of the boiler. Said coils are adapted to connect with an oil - supply pipe, g, which leads to some suitable oil-reservoir. (Not shown.)

By the disposition of the tubes e e as shown, 70 and by connecting each tube at both ends with a water-chamber, a free circulation of water is created in said pipes, and the latter are not liable to burn out. Furthermore, by the arrangement of the tubes and the application externally, in lieu of internally, as now practiced, the draft is increased and no obstruction can occur by the filling up of the tubes.

Preferably, the uppermost boiler-tube e is 80 made somewhat larger than the others and connects with a steam-drum, L, contained within and located at the junction of the boiler and smoke-stack m, the latter rising from the top of the shell F. The water - supply pipe is 85 shown at n, and the door to the fire-pan at p.

What we desire to claim is—

A steam - boiler composed of two hollow chambers having metallic walls which form the end heads, a series of pipes connecting 90 said chambers, an exterior shell inclosing said tubes to form a combustion-chamber, a fluid-supply pipe, a steam-drum, L, above the steam-pipes e and connected directly to the middle thereof, and a smoke-stack inclosing the steam-drum, substantially as set forth.

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

LEVI W. LOMBARD.  
NATHANIEL LOMBARD.

Witnesses:

H. E. LODGE,  
F. N. WALES.