

(No Model.)

F. W. DEAN.

BOILER.

No. 385,102.

Patented June 26, 1888.

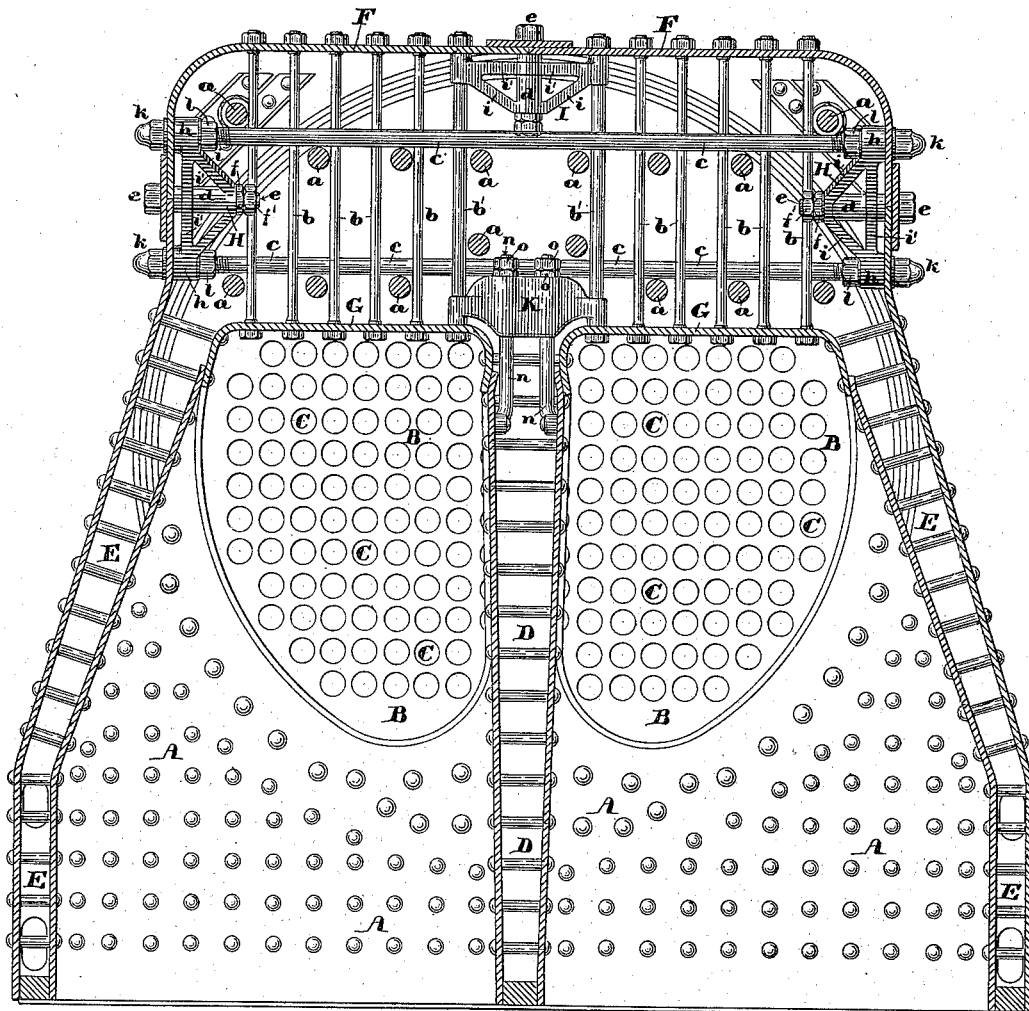


Fig. 1.

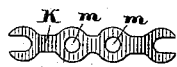


Fig. 5.

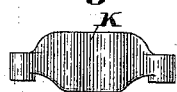


Fig. 6.

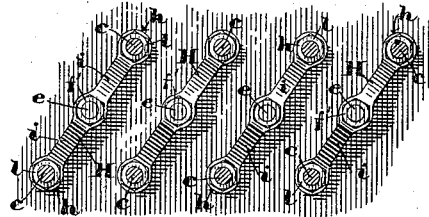


Fig. 2.



Fig. 3.

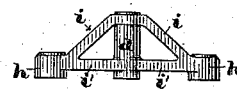


Fig. 4.

Witnesses:  
*John Jacobson*  
*Frank E. Gray*

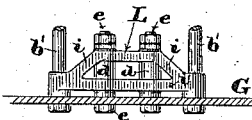


Fig. 7.

Inventor:  
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Attorney.

# UNITED STATES PATENT OFFICE.

FRANCIS W. DEAN, OF CAMBRIDGE, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO ERASMUS D. LEAVITT, JR., OF SAME PLACE.

## BOILER.

SPECIFICATION forming part of Letters Patent No. 385,102, dated June 26, 1888.

Application filed April 7, 1888. Serial No. 269,958. (No model.)

*To all whom it may concern:*

Be it known that I, FRANCIS WINTHROP DEAN, of Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Boilers, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to the construction of boilers, and particularly to that class known as the "Belpaire boilers;" and it has for its object the providing of the steam-chamber with a series of bracing which will stay and strengthen the walls thereof, while at the same time said bracing is so constructed as to leave a passage through the length of said chamber in which a man may crawl when it is desired to repair, examine, or clean any portion thereof.

It consists in certain novel features of construction, arrangement, and combination of parts, which will readily be understood by reference to the description of the drawings, and to the claims to be hereinafter given.

Of the drawings, Figure 1 represents a transverse sectional elevation of a boiler embodying my invention, looking toward the rear, the cutting plane being through the fire-box. Fig. 2 represents an elevation of a portion of one of the walls of the steam-chamber and showing my improved bracing applied thereto, the transverse tie-rods being cut in section. Fig. 3 represents a plan of one of the side bars. Fig. 4 represents a side elevation of the same. Fig. 5 represents a plan of one of the crown-bars. Fig. 6 represents a side elevation of the same, and Fig. 7 represents an elevation of a modified form of bar.

In the drawings, A is the rear wall of the fire-box; B, the tube-sheet; C C, a series of tubes extending from the combustion-chamber in the rear of the fire-box to the smoke-box in the extreme rear end of the boiler; D, the water-leg, and E E two similar water-spaces, one upon either side of the fire-box and communicating at their upper ends with the steam-chamber at the top of the boiler, all constructed in a well known manner.

It is very evident that a great strain will be brought to bear upon the walls of the

steam chamber by the pressure of the steam contained therein, and it is therefore necessary to thoroughly stay and brace the shell in order to sufficiently strengthen the same to resist every strain which may be brought to bear thereon. Heretofore this has usually been accomplished by a series of longitudinal tie-rods, *a a*, extending from the front head to the rear head of the boiler, a series of vertical stay-bolts, *b b*, connecting the upper plate or shell, F, of the steam-chamber with the crown-sheet G, and a series of transverse tie-rods, *c c*, extending from one of the vertical sides or walls of the steam-chamber to the opposite and interposed between said vertical stay-bolts. These bolts and tie-rods were necessarily placed so near together, in order to sufficiently strengthen the shell, that there was no space left between the same through which a man could crawl when it was desired to repair, examine, or clean any portion of the steam-chamber, and this was found to be very objectionable, and it is to overcome this objection which is the purpose of my invention. In order to accomplish this object, it is necessary to do away with the central transverse tie-rod heretofore used and also two or more of the stay-bolts *b b*; but the mere omission of these bolts and tie-rods, while it would provide a man-passage the entire length of the boiler, would greatly weaken the shell, so as to make it unsafe, and for this reason, therefore, I connect the ends of the transverse tie-rods *c c* together just inside of the shell by the connecting-bar H, which is provided midway of said tie-rods *c c* with the hub *d*, through which and the shell of the steam-chamber the short bolt *e* passes, upon the inner end of which is mounted the nuts *f f'*, by which the shell and the bar H may be firmly clamped together, thus strengthening the shell as much as if the bolt *e* continued across the chamber from one side to the opposite.

The hub *d* of the bar H is considerably longer than the hubs *h h*, through which the tie-rods *c c* pass, and is connected thereto by the inclined strengthening-bars *i i* in addition to the bars *j j'*.

The ends of the tie-rods *c c* are threaded, and each has mounted thereon outside of the shell

of the boiler a nut, *z*, upon either end, and another nut, *l*, for clamping the bar *H* firmly and securely against the inside of the shell of the steam-chamber, all as will be readily understood by referring to Fig. 1.

The stay-bolts *b' b'*, upon either side of the center, are made somewhat larger in diameter than the stay-bolts *b b*, and their upper ends are connected together by a bar, *I*, of the same shape as the bar *H*, while the lower ends are connected together by a similar bar, *K*, which is provided with two vertical holes, *m m*, through which project the bolts *n n*, riveted to the inner sides of the walls of the water-leg *D*, and provided upon their upper ends with the nuts *o o*, by which said bar *K* is firmly clamped to the upper surface of the crown-sheet *G*.

It is sometimes the case that the distance between the tie-rods or stay-bolts is such as to make it desirable to secure the bar to the shell by two bolts instead of one, in which case a bar, *L*, is used, such as is shown in Fig. 7, which figure illustrates the bar as used in bracing the crown-sheet *G* at a point immediately to the rear of the water-leg *D*. By this system of bracing, without diminishing in the least the strength of the shell, I am able to provide a passage between the rods *c c* and stay-bolts *b' b'* of sufficient size to admit a man and allow him to crawl through from one end of said steam-chamber to the other, as is sometimes necessary.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a boiler, the combination of two tie-rods, a bar connecting each end of one of said tie-rods with the same end of the other tie-rod, a bolt passing through said bar and the shell of the boiler, and nuts for clamping said shell and bar together.

2. In a boiler, the combination of two tie-rods the threaded ends of which project through the shell, nuts mounted upon the ends of said rods outside of said shell, a bar connecting each end of one of said tie-rods with the same end of the other, nuts mounted upon said tie-rods and bearing upon said bars to secure them to the shell of the boiler, and means for securing said connecting-bar to the shell of the boiler at a point midway between said tie-rods.

3. In a boiler, the combination of two tie-rods the ends of which are secured to opposite walls of the shell, a bar extending from either

end of one of said tie-rods to the same end of the other tie-rod and provided with a hub at right angles to said shell, a bolt passing through said shell and hub, and nuts for clamping said shell and the hub of said bar together.

4. In a boiler, the combination of two stay-bolts secured at their upper ends to the shell of the boiler and at their lower ends to the crown-sheets, a bar extending from one bolt to the other at their upper ends, means for securing said bar to said shell midway between said bolts, a similar bar extending from one bolt to the other at their lower ends, and means for securing said lower bar to the walls of the water-leg.

5. The herein-described system of bracing the shell of a steam-chamber of a boiler, consisting of a series of transverse tie-rods, a series of bars connecting said rods in pairs, means for securing said bars to the shell midway between said rods, a series of vertical stay-bolts connecting said shell to the crown-sheet, a bar extending from the upper end of one to the upper end of another of said stay-bolts, which are farther apart than the others, means for securing said bar to the shell of the boiler midway between said stay-bolts, a similar bar extending from the lower end of one to the lower end of the other of said stay-bolts, and means for securing said last-mentioned bar to the water-leg or the crown-sheet, all constructed and arranged so that a man-passage is left between the various rods and bolts for the entire length of the steam chamber.

6. A system of bracing the shell of a steam-boiler, consisting of a series of transverse tie-rods, a series of bars, each of which connect the ends of two of said tie-rods, bolts passing through said bars and the shell of the boiler, nuts mounted upon the threaded ends of said bolts for clamping said bars to said shell, and a series of vertical stay-bolts connecting said shell to the crown-sheet, all constructed and arranged so that a man-passage is left between the various rods and bolts for the entire length of the steam-chamber.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 4th day of April, A. D. 1888.

FRANCIS W. DEAN.

Witnesses:

WALTER E. LOMBARD,  
FRANK E. BRAY.