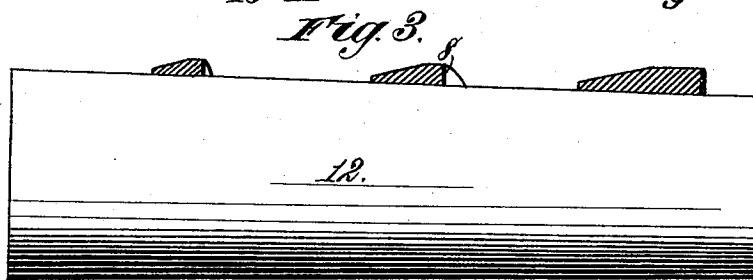
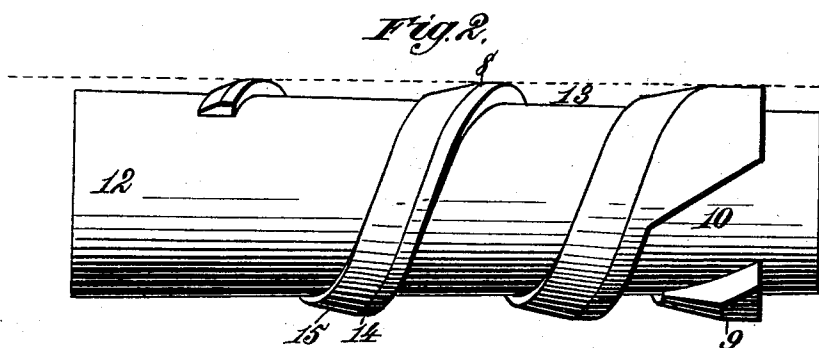
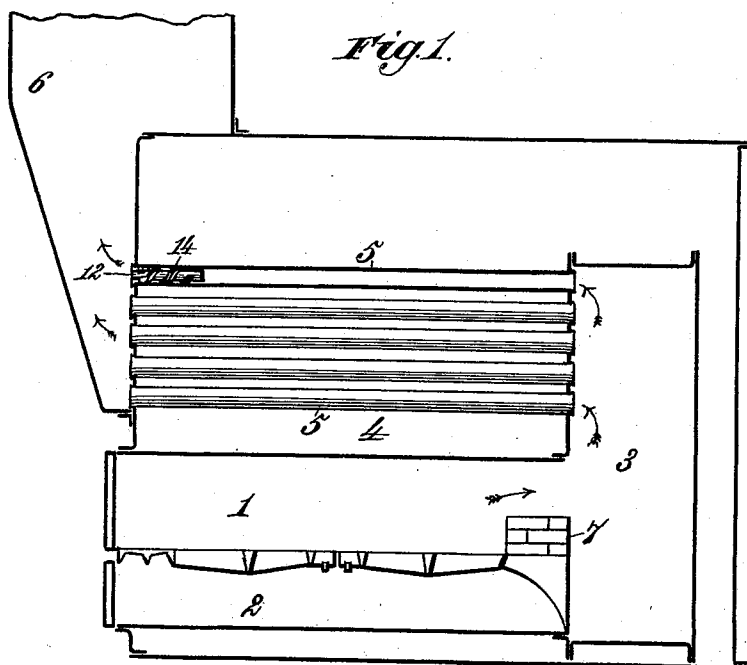


(No Model.)

E. KEMBLE.  
CHECK FOR FIRE TUBES.

No. 538,589.

Patented Apr. 30, 1895.



Witnesses:  
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*G. W. Rea.*

Inventor:  
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By *James L. Norris,*  
*Atty.*

# UNITED STATES PATENT OFFICE.

EDMUND KEMBLE, OF NEW YORK, N. Y.

## CHECK FOR FIRE-TUBES.

SPECIFICATION forming part of Letters Patent No. 538,589, dated April 30, 1895.

Application filed October 20, 1894. Serial No. 526,511. (No model.)

*To all whom it may concern:*

Be it known that I, EDMUND KEMBLE, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Checks for Fire-Tubes of Boilers, of which the following is a specification.

This invention relates to marine and stationary steam boiler furnaces having fire tubes through which the products of combustion flow to the chimney or smoke-stack.

The chief object of the invention is to provide new and improved screw or worm checks for the interiors of the fire tubes, whereby the heat and flame are retarded in their passage through the tubes, and the latter are constantly filled with the products of combustion, for the purpose of reducing the consumption of fuel and materially increasing the heating capacity of the furnace. To accomplish this object the invention consists in the combination with the fire-tube of a boiler furnace, of a screw or worm-check arranged in the said tube, and a core located inside the screw or worm-check to provide in connection therewith a spiral passage for the products of combustion.

The invention also consists in the combination with the fire-tube of a boiler furnace, of a screw or worm-check arranged in the tube and having a part parallel and a part inclined out of parallelism with the internal surface of the tube to provide air spaces between the tube and portions of the screw or worm-check, and a core located inside the screw or worm-check to provide in connection therewith a spiral passage for the products of combustion.

The invention also consists in certain other features of construction and combination or arrangement of parts hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a vertical sectional view of a steam-boiler furnace having fire-tubes, one of which is broken away to illustrate the improved screw or worm check arranged therein. Fig. 2 is a detail side elevation of the screw or worm check and the core located within the same, and Fig. 3 is a sectional side elevation of the same.

In order to enable those skilled in the art

to make and use my invention, I will now describe the same in detail, with reference to a type of steam-boiler furnace comprising a fire-chamber 1, an ash-pit 2, a rear connecting chamber 3, a water space 4, a series of fire tubes 5, and a chimney or smoke-stack 6. The rear end of the fire-chamber is provided with a bridge wall 7, and the ends of the fire-tubes communicate respectively with the connecting chamber 3 and the chimney or smoke-stack.

The fire-tubes are each provided interiorly with one of the improved screw or worm-checks illustrated in detail, Figs. 2 and 3, and these checks are inserted into the fire-tubes at the front ends thereof. The checks each consist of a screw or worm 8, having at its rear end a ring 9, broken away to form a passage-way, as at 10, and within the screw or worm is arranged a solid cylindrical core 12 which completely fills the interior of the screw or worm and creates between the latter and the fire-tube a spiral passage-way 13, through which the heat and flame flow to the cut-away part 10 of the ring 9 at the front end of the fire-tube. The screw or worm is formed of a metallic plate or bar coiled into shape, and having a spiral portion, as at 14, parallel with the internal surface of the fire-tube, and a portion 15 inclined out of parallelism with the internal surface of the fire-tube, for the purpose of forming a spiral air space between the inclined surface 15 and the internal surface of the fire-tube. This construction avoids occupying too much of the heat surface of the tube and produces an eddy of the heat before it passes entirely out of the fire-tube. The bar or plate of which the screw or worm is formed gradually decreases in thickness from the ring portion 9 to the opposite extremity of the screw or worm, so that the interior of the screw or worm is tapering or gradually increases in diameter from the ring 9 toward the front end of the fire-tube.

The core 12 is tapering, and when inserted into the screw or worm it serves to force the surface 14 of the latter against the internal surface of the fire-tube to make a tight joint and compel the heat and flame to traverse the spiral passage-way 13. It will be observed that the core not only serves to fill the interior of the screw or worm, but also serves to seat

the latter in the fire-tube and retain it in proper position.

In the operation of the boiler furnace, the heat and flame pass from the furnace to the connecting chamber 3 to the rear ends of the fire-tubes, and thence flow through the latter. In their passage through the fire-tubes, the heat and flame are retarded by the screw or worm-checks, and the heat and flame are forced to follow the spiral passage-way, so that the tubes are kept filled constantly with the heat and flame in contradistinction to being only partially filled.

The improved checks effect a reduction in the consumption of fuel and increase the heating capacity of the furnace.

The portions 14 of the screw or worm which are parallel with the internal surface of the fire-tube may be one-fourth of an inch in width more or less, or just sufficient to keep the screw or worm in its proper position. The remainder of the exterior part of the screw or worm is inclined out of parallelism with the internal surface of the fire-tube to provide the air-space between the screw or worm and the tube. This is an important feature of the invention, by which useful results are attained.

While I have illustrated in the drawings a particular construction of boiler furnace, I desire it to be clearly understood that my invention is useful in connection with the fire-tubes of any construction of furnace, and therefore I do not limit myself to the type of furnaces selected for illustrating the invention.

Having thus described my invention, what I claim is—

1. The combination with the fire-tube of a boiler-furnace, of a screw or worm check arranged in the fire-tube, and a solid, or practically solid core located inside the screw or worm-check to provide in connection therewith a spiral passage for the products of combustion between said core and the inner surface of the fire-tube, substantially as described.

2. The combination with the fire-tube of a boiler furnace, of a screw or worm-check arranged in the fire-tube and having a portion parallel and a part inclined out of parallelism with the internal surface of the said fire-tube, and a core located inside the screw or worm-check to provide in connection therewith a spiral passage for the products of combustion, substantially as described.

3. The combination with the fire-tube of a boiler-furnace, of a screw or worm-check arranged in the fire-tube and having its interior gradually increasing in diameter from one end to the opposite end, and a tapering core located inside the screw or worm-check, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand and affixed my seal in presence of two subscribing witnesses.

EDMUND KEMBLE. [L. s.]

Witnesses:

H. E. KEMBLE,  
G. W. REA.