(No Model.)

# M. J. DODDS.

## WATER TUBE STEAM BOILER.

No. 489,374. Patented Jan. 3, 1893.

Fig. 1.

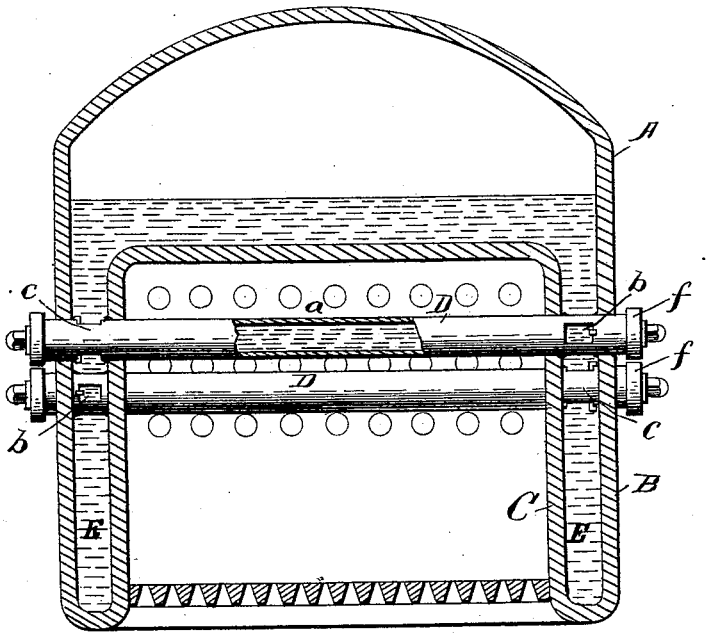



Fig. 2.

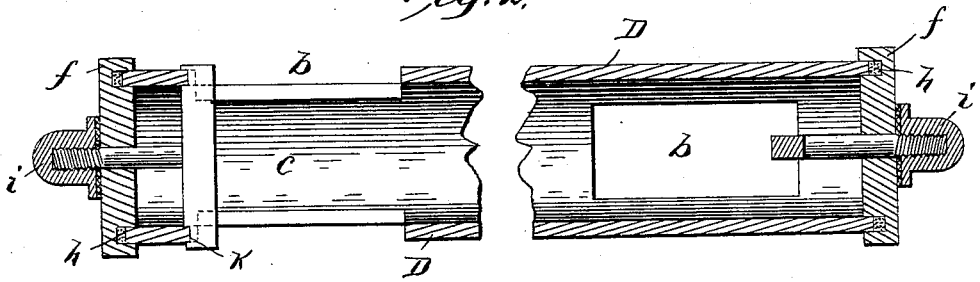



Fig. 4.

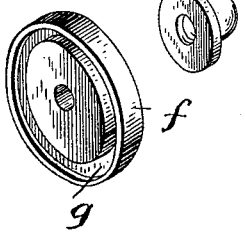
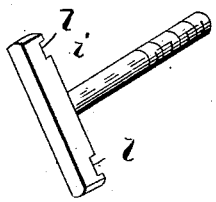



Fig. 5.




Fig. 3.

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MATTHEW J. DODDS, OF NEW BRUNSWICK, NEW JERSEY.

## WATER-TUBE STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 489,374, dated January 3, 1893.

Application filed January 5, 1892. Serial No. 417,120. (No model.)

*To all whom it may concern:*

Be it known that I, MATTHEW J. DODDS, of New Brunswick, in the county of Middlesex and State of New Jersey, have invented certain new and useful Improvements in Water-Tube Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the invention, which 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 the letters of reference marked thereon, which form part of this specification.

This invention has relation to steam generators and is generally applicable to the fire boxes having water legs and particularly to that class known as the locomotive type.

My invention consists in certain novel features of construction and in combinations of parts as more fully described hereinafter and particularly pointed out in the claims.

In the drawings;—Figure 1 is a transverse vertical section of the fire box of a steam generator of the locomotive type, showing a few of my improved tubes in position. Fig. 2 is a longitudinal vertical section. Fig. 3 shows the T bolt. Fig. 4 the end socket or tube-head showing an annular groove to receive a gasket or packing, and also the end of the tube, and Fig. 5 the socket nut which screws on the end of the bolt.

The same letters indicate like parts in the different figures.

A, is the boiler. B, and C, the outer and inner plates forming the water legs, and before further description in detail I may remark that it is well known to engineers that in this portion of the boiler the water is very sluggish and remains in almost quiescent state, the mud and sediment settling therein and frequently concreting into scale on the interior of the plate, and thus endangering the burning out of the fire box plate which is a serious matter, and which I obviate by the present invention.

D, D, are the tubes, one being broken away at *a*, showing the water therein.

*b*, *b*, are apertures formed on the tubes near their ends and located between the boiler sheets B, C, which form the water legs E of the boiler.

*c*, *c*, show the exterior of the tube which is solid and arranged opposite aperture portions *b b* of adjacent tubes. The caps *f f*, are each provided with an annular groove *g*, into which the ends of the tubes fit.

*h*, shows a packing or gasket to which the ends of the tubes abut, so that no leakage takes place.

*i*, is the socket screw nut which fits the washer *g* snugly, and with the bolt secures all the parts in position.

It will be remembered that the tubes are expanded in the wall sheet B C, by any well known expanding tool. It will also be observed that the apertures in the ends of the tubes are preferably arranged at right angles to each other and the tubes placed zig-zag in position, or the tubes may be placed at different angles, but they must be so placed that the aperture *b*, of one tube must be opposite solid portion *c*, of the next adjacent tube. At the outer end of the aperture the tube is provided with a niche or cut-out portion *k*, and the head of the T bolt with a like cut-out portion *l*, and when the bolt is in position these cut-outs *k* and *l*, fit into each other, and form a lock by means of which the bolt is prevented from turning while the nut *i*, is being screwed up. The nut *i*, having a solid end there can be no leakage through it. The tubes now being expanded in position in the plates B and C, the T bolt is inserted through the end of the tube, and into the cut-out portions *k* and *l*; the head *f* is put on the end of the tube and bolt and then the nut is put on the T bolt and screwed up which brings the several parts in position, making a snug and tight joint. These tubes may be placed in pairs, or in groups or nests of three, or more as may be desired, and they may be placed across the fire box either as high up or low down as will give the best results according to the construction of the boiler, and the relative position of the tube sheet or bridge wall.

The operation of the invention is as follows; the boiler being fired up, and steam under generation, the water is boiling. The water in the cross tubes becomes agitated by the heat transmitted from the fire, soon rushes out through the open apertures in the water leg, and which dashes against the solid portion of the tube opposite the said aperture and also against the water in the water leg,

which passes down from the crown sheet and through the nests of tubes, and in such rapid manner that the water is kept in constant circulation, the benefit of which is too well known to require description, and by this constant agitation and circulation the mud has no chance to settle until it is blown off in the usual way.

The saving and economy in fuel is due to the fact, that the transverse tubes give additional heating surface to the boiler and are auxiliary to the main tubes. The heat being transmitted to these auxiliary tubes on its way to the main tubes without losing any of its intensity, for by being partially retarded in its course it expands and becomes mingled with the heated air and gases, and therefore produces a more complete combustion than if the flames went direct to the tubes.

When the tubes are to be cleaned from the inside the cap is removed, and the T bolt taken out (better if done from opposite sides) and the usual scraping tool or brush inserted. This tool in passing the apertures in each tube respectively protrudes through and scrapes or brushes the solid portion of the tube opposite and should it be coated the tube will remove the scale or mud therefrom and leave it in a clean condition.

The water leg is stayed and braced by the tubes being expanded into the sheets, and thus, the usual stay bolts and thimbles are done away with.

The construction is durable, inexpensive, effective, simple and cheap in first cost, and easy of repair.

It is obvious that the parts may be varied in form, and position without departing from the spirit of my invention, and I do not therefore desire to be confined to the exact construction and arrangement shown and described.

Having thus fully described my invention and the best means at present known to me for carrying the same into effect, what I claim as new and desire to secure by Letters Patent is;

1. A steam generator such as described having water legs, water tubes extending across the fire box, and secured and passing through the sheets forming said water legs or fire box, said tubes being provided with apertures arranged at right angles to each other, the apertures in one tube being opposite the solid portions of adjacent tubes for the purposes substantially as described.

2. In a steam generator, water tubes extending through the boiler with their ends projecting from the exterior thereof, said tubes having opposite apertures near their ends, the caps for the ends of said tubes having the annular grooves in their inner faces provided with packing and fitting the ends of said tubes, and the T-bolts having their heads engaging the end walls of said apertures and their shanks passed through said caps and provided with nuts, substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

MATTHEW J. DODDS.

Witnesses:
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