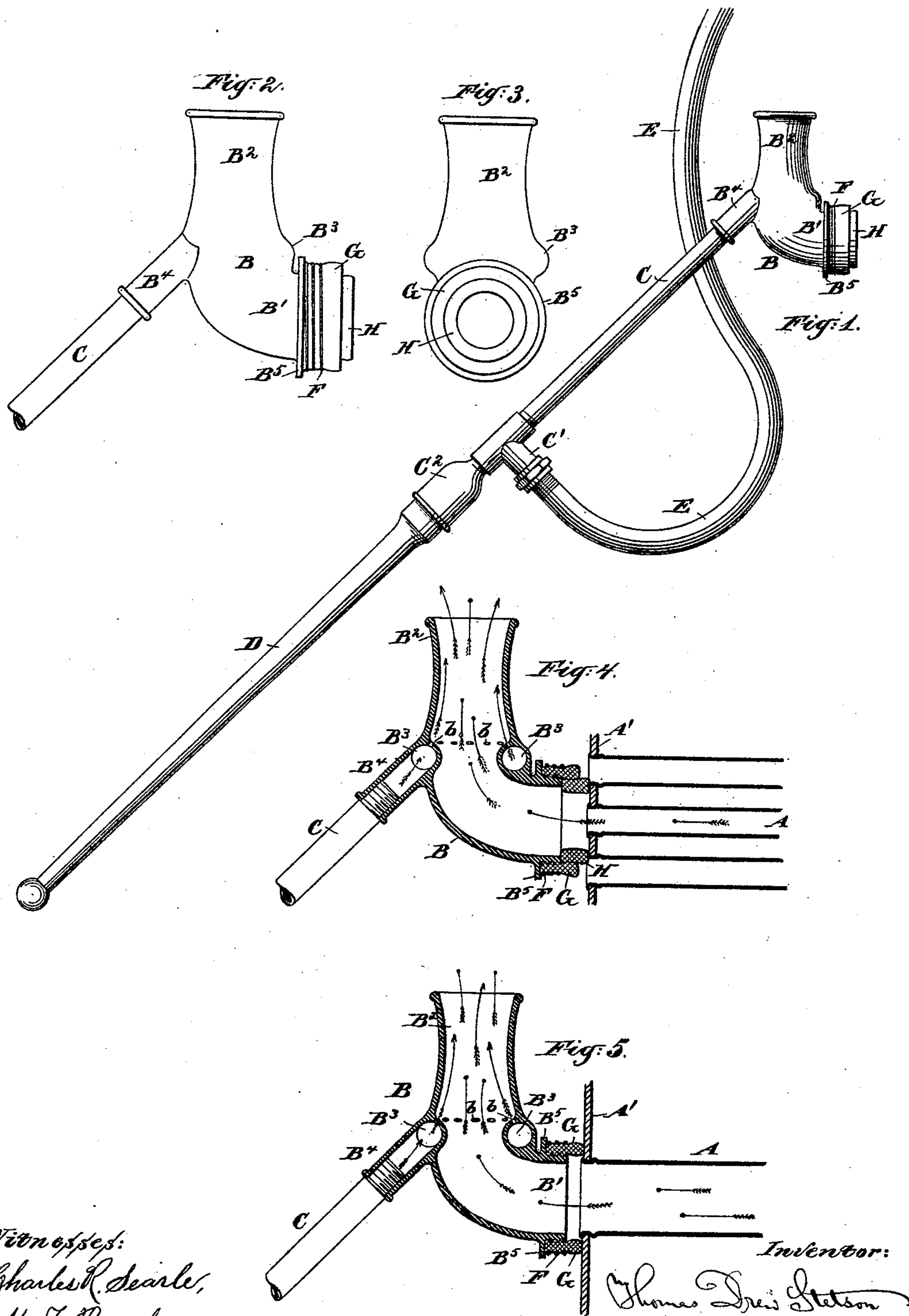


(No Model.)

**T. D. STETSON.**  
**BOILER TUBE CLEANER.**

No. 465,437.

Patented Dec. 15, 1891.



Witnesses:  
Charles R. Searle,  
M. F. Boyle

Inventor:  
 Lewis Stetson



# UNITED STATES PATENT OFFICE.

THOMAS DREW STETSON, OF NEW YORK, N. Y., ASSIGNOR TO RICHARD THOMPSON, OF SAME PLACE, AND JOHN S. BUSHNELL, OF BROOKLYN, NEW YORK.

## BOILER-TUBE CLEANER.

SPECIFICATION forming part of Letters Patent No. 465,437, dated December 15, 1891.

Application filed September 7, 1891. Serial No. 405,049. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS DREW STETSON, of the city and county of New York, in the State of New York, have invented a certain new and useful Improvement in Boiler-Tube Cleaners, of which the following is a specification.

My tube-cleaner may be applied to either end of a set of tubes; but is more especially intended for the end farthest from the furnace. It removes the loose ashes and soot accumulated in the tubes by inducing a partial vacuum by jets of steam and applies to the plane surface of the tube-sheet around the tube, thus avoiding any obstruction of the tube and making its whole area available for the passage of the cleaning-current of air or gas. The light material is dislodged by dry air or dry gas, thus avoiding the liability of caking the soot experienced with tube-cleaners, in which the jets are projected in the opposite direction, so as to mingle steam with the soot and dampen it in pushing it through the long tubes. N. W. Wheeler's patent of 1865 showed a tube-cleaner of this class similarly applying outside of the tube end and having the steam act in this direction; but his cleaner employed only a single central jet, and the pipe through which it was introduced was necessarily extended into the passage and formed an obstruction. P. H. Grimm in 1888 patented a tube-cleaning device in which there was an annular chamber or hollow belt supplied with steam at high pressure extending around the device, with a multitude of small jets delivered therefrom obliquely inward; but they were inclined in the direction to push instead of pull the loose material in the tube. More recently R. Thompson has introduced a cleaner in which a similar belt is employed, with jets inclined in the opposite direction, but without any special provisions for making the joint tight. Still later F. R. Baldwin has patented a cleaner having these qualities, with the addition of a packing to make a tight joint around a tapering nozzle thrust into the tube end. This obstructs the tube, giving always less than its full area for effective action or suction, and it cannot match a large range of sizes of tubes. My improved cleaner, by applying to

the tube-sheet around the exterior of the tube, like Wheeler's, avoids this difficulty, and it moves the material in the same direction as Wheeler's by inducing less pressure of air or suction at the end where the device is applied. It is important with this mode of operating to make a very tight connection between the cleaning device and the several tubes to which it is applied. I attain this by providing a suitable cylindrical nozzle on the metallic part with a flange or offset to make a firm abutment and fitting thereon a ring or short tube of soft vulcanized rubber and causing the latter to project beyond the metallic part. The soft rim thus projecting can yield elastically and may make a close joint when applied even to a quite irregular surface. The face of a tube-sheet or metallic plate in which the tubes are set is usually plane; but there are roughnesses and irregularities which allow the introduction of air when only the smooth metallic nozzle is pressed against it, and as tubes are ordinarily set the tube ends project so as to present considerable deviation from the plane condition. The soft rim of my device may be considerably larger than the tubes, and is liable to rest on such ridges, especially when carelessly placed. Its soft and elastic character allows it to adapt itself to such irregular surfaces.

My cleaner of a given size will apply to a wide range of sizes of tubes. The fact that my soft rim is of large diameter, giving great area to the circle inclosed, is of advantage, both by presenting a broad bearing-surface, contributing to aid the operator in applying the device fairly against the tube-sheet, and also by presenting a greater area within its interior, within which area the partial vacuum is felt, and thus inducing a greater pressure of the device against the boiler, and consequently a tighter joint between them.

When my cleaner of a given size is employed to clean tubes which are very small and set closely together, there is a liability that the soft rim shall cover or partially cover the adjacent tubes, which, by allowing air or gases to be drawn through them, as well as through the central tube which is being cleaned, would embarrass or defeat the result. I provide for such contingencies by employing a removable



soft ring, which can be applied within the permanently-attached soft rim and will extend inward sufficiently to prevent such result. The removable ring should extend forward or project a little beyond the permanent soft rim.

I provide a handle which is detachable and allows the device to be packed in small compass for storage or transportation.

The accompanying drawings form a part of this specification and represent what I consider the best means of carrying out the invention.

Figure 1 is a side elevation. The remaining figures show portions on a larger scale. Fig. 2 is a side elevation. Fig. 3 is an end view. Fig. 4 is a vertical section showing the device applied to a small tube. Fig. 5 is a similar view showing the device applied in position to clean a tube of larger diameter.

Similar letters of reference indicate corresponding parts in all the figures where they appear.

A is a tube, and A' the tube-sheet or the plane portion of the boiler, in which the tube is set.

B is the body of my device, certain portions being designated when necessary by super-numerals.

B' is the receiving-nozzle, or the portion which is presented toward the tube-sheet A', and would apply fairly against it, except for my soft ring, to be presently described.

B<sup>2</sup> is my delivery-nozzle.

B<sup>3</sup> is a belt or ring kept filled with steam at the boiler-pressure, which is supplied through the nozzle B<sup>4</sup> and the connecting-tube C, bringing steam supplied through a nozzle C' and connected hose E from the dome or other high portion of the boiler. (Not shown.) A series of perforations b are drilled or otherwise produced in the interior of the steam-belt B<sup>3</sup>, inclined in the direction shown, so that the finely-divided currents of high-pressure steam issuing from these perforations are projected in the direction to pull the air through the tube A, forming a partial vacuum in the interior of the device, which can only be supplied by a current of dry air or of gaseous products of combustion drawn through the tube entering at the opposite end and emerging through this cleaner.

The delivery-nozzle B<sup>2</sup> is preferably set at about a right angle with the receiving-nozzle A', so that by holding the device properly the mingled current of air, soot, and steam may be ejected into the uptake and carried away. When the device is applied with the boiler in use, the steam is dry in consequence of the high temperature of the gaseous products of combustion with which it is mingled. In the cases when the device is applied to a cold boiler or to one after the fire has been drawn or banked the conditions will develop little disposition to caking of the soot, because it is driven immediately out through the short nozzle B<sup>2</sup>.

G is a ring of soft vulcanized rubber. It may be a short length of rubber hose made of good material and free from fiber. Such hose will endure a high temperature, and in case it is burned or becomes from any cause worn, cracked, or otherwise impaired it can be removed and a new ring substituted with little expense or labor. There is little strain on this ring, and it will be held sufficiently by being fitted close and abutting against a flange B<sup>5</sup>, formed around the nozzle B' at a sufficient distance from the end to give a fair bearing. A wire F may be wound tightly around to confine this ring G, if desired. It is important that its front edge or rim shall extend sufficiently beyond the metal of the nozzle B' to match to all ordinary irregularities of the tube-sheet and make a tight joint all around between this soft rim and the tube-sheet to prevent any air being drawn in between those surfaces when the device is in use.

H is a removable ring of soft vulcanized rubber adapted to apply within the soft rim G and abutting against the edge of the metallic nozzle B' and extends a little beyond the face of the rim G. This ring should extend inward radially a little beyond the inner face of the nozzle B'. It is useful only in cases when the device is used to clean small tubes, which are set close together. When large tubes are cleaned, this ring H is removed and the soft rim G is pressed directly against the boiler, as above described. When small tubes are to be cleaned and the rim G would be liable to include portions of the adjacent tubes, the ring H is inserted and forms itself a soft bearing-surface so much within the soft rim G that it bears against the smooth surface of the tube-sheet and makes the required tight joint.

The handle D, which may be of wood, is inserted into the socket C<sup>2</sup> in the end of the tube C and forms a convenient means by which the device may be easily managed by the attendant, so as to be successively and rapidly applied to cover the ends of and clean the several tubes one after another.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention.

Parts of the invention may be used without the whole. The tube C may be shorter or may be dispensed with, the flexible hose E being connected directly to the nozzle B<sup>4</sup>, if preferred.

I claim as my invention—

1. The metallic body B, having a receiving-nozzle B', adapted to match approximately to the face of the tube-sheet adjacent to the tube, and provisions, as the perforated steam-belt B<sup>3</sup> b, nozzle B<sup>4</sup>, and supply-pipe C, for discharging steam at high pressure in the direction to induce a partial vacuum in the tube, in combination with the soft ring G, extending beyond the metallic part and adapted to make a tight joint when the device is applied



to the tube-sheet, all substantially as herein specified.

2. The metallic body B, having a receiving-nozzle B', adapted to match approximately to the face of the tube-sheet adjacent to the tube, and provisions, as the perforated steam-belt B<sup>3</sup> b, nozzle B<sup>4</sup>, and supply-pipe C, discharging steam at high pressure in the direction to induce a partial vacuum in the tube, in combination with the soft ring G, extending beyond the metallic part and adapted to make a tight joint when the device is applied to the tube-sheet, and with the additional removable soft ring H, matching in the interior of the ring G, all adapted to serve as herein specified.

3. The tube-cleaner described, composed of the metallic body B, receiving-nozzle B',

adapted to apply against the face of the tube-sheet, soft packing-ring G, extending around the end thereof, delivery-nozzle B<sup>2</sup>, arranged at an angle thereto, and provisions for inducing a current of air or gas through the same by the force of steam allowed to escape in the proper direction at a high velocity, in combination with each other and with the detachable handle D, arranged for joint operation, as set forth.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

THOMAS DREW STETSON.

Witnesses:

WM. BAGGER,

M. F. BOYLE.