No. 659,836. Patented Oct. 16, 1900.

R. THOMPSON.

BOILER TUBE CLEANER.

(Application filed Aug. 6, 1900.)

(No Model.)

Fig. 1.

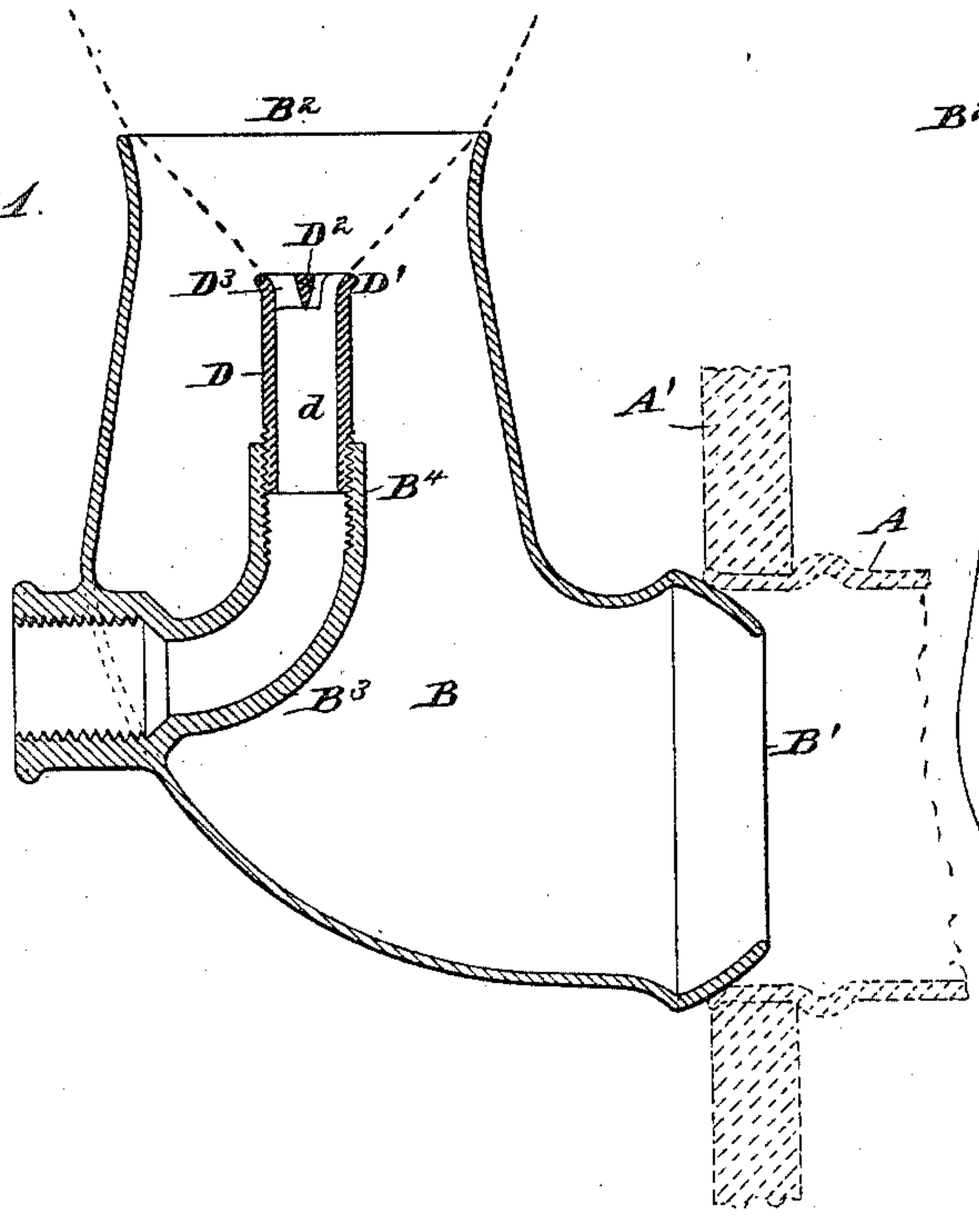


Fig. 2.

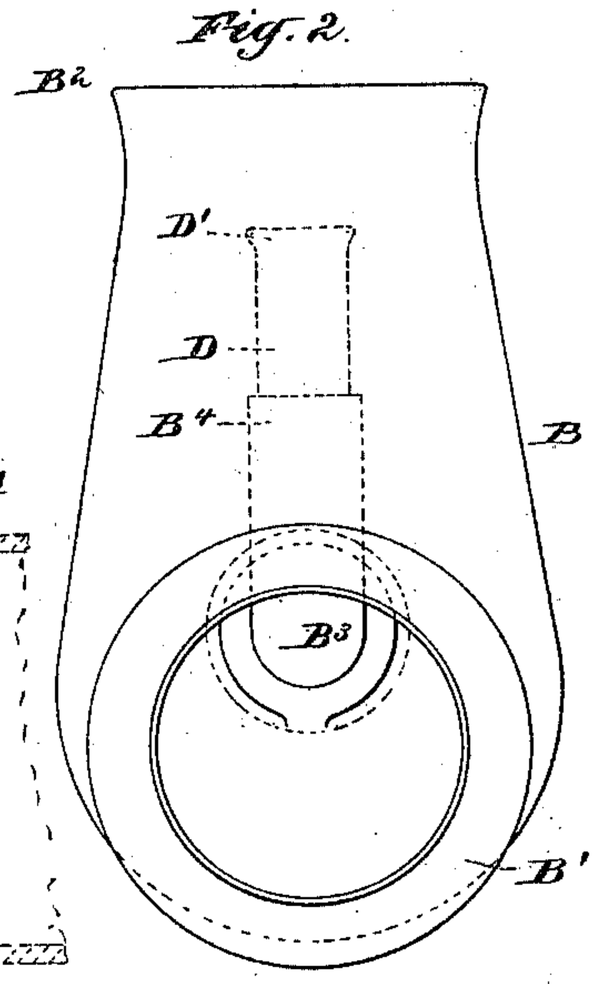


Fig. 3.

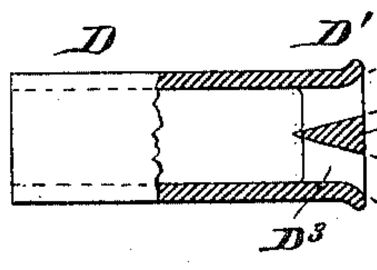


Fig. 4.

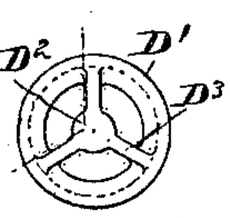


Fig. 5.

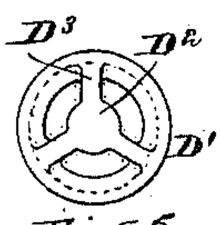


Fig. 6.

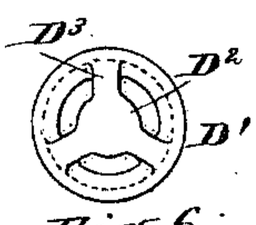


Fig. 7.

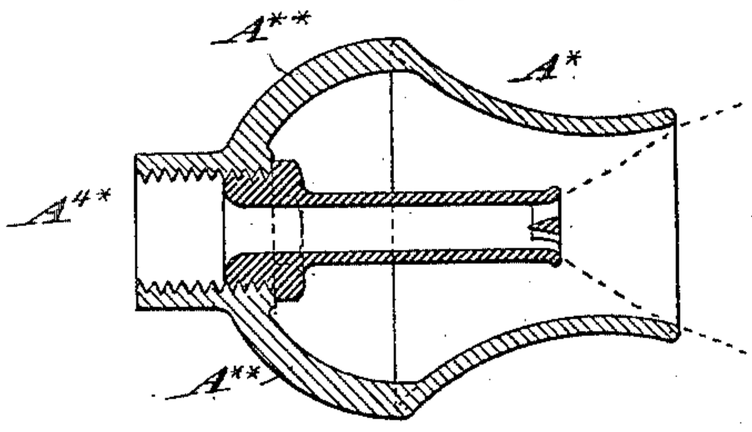
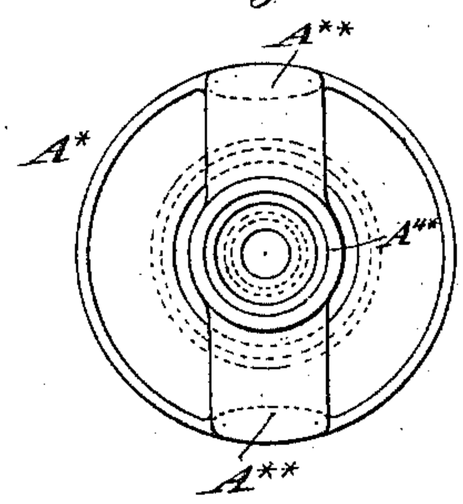


Fig. 8.



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UNITED STATES PATENT OFFICE.

RICHARD THOMPSON, OF NEW YORK, N. Y.

BOILER-TUBE CLEANER.

SPECIFICATION forming part of Letters Patent No. 659,836, dated October 16, 1900.

Application filed August 6, 1900. Serial No. 25,995. (No model.)

To all whom it may concern:

Be it known that I, RICHARD THOMPSON, a citizen of the United States, residing in the borough of Manhattan, in the city and State of New York, have invented a new and useful Improvement in Tube-Cleaners for Steam-Boilers, of which the following is a specification.

It has long been practiced to employ jets of steam from the boiler to induce strong currents of air through the tubes one by one, successively, and by that means to remove from the interiors of the tubes any soot or other solid matter, as ashes, which may be lodged therein. I have made an improvement on that class of devices. In common with many previous operators I employ a portable device connected with the boiler by a strong hose and provided with a handle, by which the attendant after obtaining access to the ends of the tubes can apply the device easily in rapid succession thereto. My improvements avoid the clogging of the apparatus which is experienced with some of the best forms previously known and also by making a simple small part both exchangeable and adjustable allow the jet of steam to be always in the highest degree efficient, while saving the device from being cut by the hard particles of the ashes and soot. In the rare cases when my device becomes clogged it is particularly easy to remove the encumbering material.

The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a central longitudinal section. Fig. 2 is an end view showing what I esteem the best form of my device in its working position. Figs. 3 and 4 represent a certain portion detached. It is on a larger scale than in the previous figures. It represents what I have termed the "tip," as it is cast before the screw-thread is cut thereon. Fig. 3 is a central longitudinal section, partly in elevation. Fig. 4 is an end view seen from the right in Fig. 3. Figs. 5 and 6 are corresponding end views showing modifications adapted for higher steam-pressures. Figs. 7 and 8 represent another modification adapted to clean the tubes by inducing motion of the air in the opposite direction to that which is produced by the form shown in Figs. 1 and 2. Fig. 7 is a central longitudinal section, and Fig. 8 is an end view seen from the left in Fig. 7.

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

Referring first to Figs. 1, 2, 3, 4, 5, and 6, A is a tube end, and A′ an adjacent portion of the boiler end or tube-sheet, in which the tube is strongly and tightly set in the ordinary manner.

I will use the single letter B to indicate the entire shell of my device, using supernumerals when necessary to designate certain portions thereof.

The device is a hollow shell B open throughout, having a slightly-tapered end B′ adapted to match on without much entering the end of the tube A. This nozzle B′ is spheroidal, which allows the device to be inclined in different directions to a moderate extent without impairing the closeness of the fit. The other end B^2 of the shell forms a delivery-nozzle, which stands about at right angles to the receiving-nozzle B′. The air, more or less laden with soot, drawn from the interior of the tube is caused to describe a smooth turn in the passage of my shell and is discharged up the chimney. The soot and ashes are thrown so high in the discharge-flue or chimney that they are carried away by the draft. I induce the strong current of air by introducing steam from the same boiler or another through a hose-pipe. (Not shown.) It enters at full pressure through the small curved pipe B^3, which latter has a straight and interiorly-screw-threaded end B^4 directed upward within the discharge-nozzle B^2. Into this screw-threaded end I insert adjustably a short corresponding screw-threaded nozzle or tip D, which is partially closed at its upper end by a central conical boss D^2, connected with the surrounding flared end D′ of the tip by radial arms D^3. All the parts D D′ D^2 D^3 are cast in a single piece or if made separately for convenience of construction are screwed together or otherwise set to serve as a single piece. The main body of the tip may be cylindrical, but the upper end is trumpet-mouthed. The latter

gives a flaring quality, which both by spreading the steam received through the main passage *d* and also by the deflecting away of the air which is drawn from the tube A insures uniformity and efficiency of the action of the metallic cone D^2 and the efficient spreading of the inverted hollow cone of steam ejected. It is important that this cone spreads just enough to fill the interior of the discharge-nozzle B^2. If it is of less diameter, it is not fully efficient. If it is of greater diameter, so that the rapidly-moving current of steam throws the solid matter drawn from the tube against the interior of the shell B and causes it to rub violently, the latter is rapidly cut away and soon becomes useless.

The cross-sectional area and the form of the passage for the steam through the lateral pipe B^3 B^4 and the tip D connected should vary. One of the important factors to determine the area is the pressure at which the steam will be usually received. If a moderate pressure—say fifty pounds per square inch—requires a passage having a cross-sectional area of a quarter of a square inch, boiler-pressure of one hundred and fifty pounds would require less than half as much sectional area. I propose not only to make my shells of different sizes for different sizes of tubes, but also to furnish with each cleaner three of the exchangeable and adjustable tips D D′ D^2 D^3, one having a large area for use with steam of moderate pressure, another a much smaller area for use with high steam, and a third intermediate.

The adjustment of either nozzle is important. I effect this by screwing down the tip more or less until the position is found which causes the steam issuing from the tip to spread just enough to fill the delivery end A^2 of the shell. A good way to determine this is to set each tip at first a little too far out, and allowing the steam to blow to waste a few seconds in order to ascertain the action observe how nearly the cone of steam, rapidly expanding, approaches to the desired condition. Then shut off the steam and screw down the tip and try again until the cone of steam just fills the delivery-nozzle. Then the adjustment is right and the cleaner may be used without further care until from working on a different boiler or other causes it is found expedient to change the tip.

The same tips and the same provisions for changing and for adjusting may be used with the other form of the invention, to be presently described. With either form a maladjustment of the tip involves either a wasteful action of the steam by leaving a part of the air coming through the shell substantially unaffected or a destructive action on the interior of the delivery-nozzle by allowing it to be cut in consequence of the cone of steam expanding too much and inducing violent friction of the steam and the soot therein.

Figs. 7 and 8 show a modification of the invention adapted to blowing the solid matter away from the operator instead of the drawing action ordinarily termed "suction" above described. In this form of the device the shell is straight. It is more convenient and efficient with this form to omit the spheroidal portion and instead of matching the device against the end of the tube to insert it a little within. The delivery-nozzle thus formed is adapted to thus enter. The other end is flared and adapted to receive the air freely from all quarters. A* is a shell. A** represents arms which connect with a steam-pipe A^{4*}. This last is screw-threaded in its interior and receives a tip, exchangeable and adjustable in the same manner as the nozzle or tip A^4 in the other form. The tip may be exchanged in the same manner as in the other form. The adjustment of the tip by screwing it farther into the nozzle A^{4*} produces the same effect in this form as in the other.

The construction of the delivery end of the tip may deserve a little further consideration. In both forms of the invention the center cone D^2 or D^{2*} spreads the steam and causes it to assume a more obtusely-conical outline after it emerges from the tip. In both uses of the tip the arms D^3 divide the hollow conical current of steam; but the arms are so thin in the circumferential direction that the divisions in the cone thus caused are inappreciable.

A marked advantage accruing from my tip, in addition to the adjustment of the cone of steam to exactly fill the shell and its exchangeability to adapt it for different pressures, lies in the facility it affords for cleaning itself. Cleaning devices are liable to become clogged. The steam sometimes brings solid material from the boiler, especially when vegetable matter, as potatoes, are put into the boiler to prevent formation of scale. Hose, especially after much use, gives off ragged messes, partly gummy and partly fibrous. Any solid or semisolid matter entering my device through the passage B^3 is liable to be arrested in the delivery end of the tip, and the ease with which the tip can be removed and cleaned is an important quality. All that is necessary is to count the screw-threads exposed or otherwise determine approximately the working position of the tip, unscrew it from its engagement in the central pipe, empty the tip by blowing or thrusting something through the tip in the reverse direction, which is very easily done, as the passages are straight, return it to place, and again finely readjust. The provisions for spreading the jet of steam as it issues from the tip are particularly advantageous in treating large tubes of four inches and upward.

Further modifications may be made without departing from the principle or sacrificing the advantages of the invention. I can vary the length of the device, taking care to correspondingly vary the length of the several tips to be used therewith.

A hexagonal portion on the tip is shown in Fig. 7 to facilitate turning by a wrench. The

tip is here shown as set inward to its fullest extent. It will usually be set a little farther out. The same hexagonal portion may be used in the tip in the other—the suction form of the device.

I claim as my invention—

1. In a tube-cleaner comprising a portable hollow shell open at each end, and adapted to be applied to the tube ends and a connection adapted to bring steam to be discharged therein to induce thereby a strong movement of the air through the tubes successively, a small spreading-nozzle receiving such steam and directing it longitudinally in the center of the shell and provisions by the central spreading-cone D^2 for spreading such steam to fill the delivery end of the shell therewith and act upon the entire current of air therein, all substantially as herein specified.

2. In a tube-cleaner comprising a portable hollow shell open at each end, and adapted to be applied to the tube ends and a connection adapted to bring steam to be discharged therein to induce thereby a strong movement of the air through the tubes successively, a small pipe receiving such steam and directing it longitudinally in the center of the shell and a separately-formed tip through which such steam is delivered, adapted to spread the steam and also capable of easy removal and emptying if clogged, and of being exchanged to give greater or less steam-delivery, all substantially as herein specified.

3. In a tube-cleaner comprising a portable hollow shell open at each end, and adapted to be applied to the tube ends and a connection adapted to bring steam to be discharged therein, to induce thereby a strong movement of the air through the tubes successively, a small pipe receiving such steam and directing it longitudinally in the center of the shell, such pipe having a straight terminal portion interiorly screw-threaded in combination with a corresponding tip adjustable axially and also exchangeable, all adapted to serve substantially as herein specified.

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

RICHARD THOMPSON.

Witnesses:
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J. B. CLAUTICE.