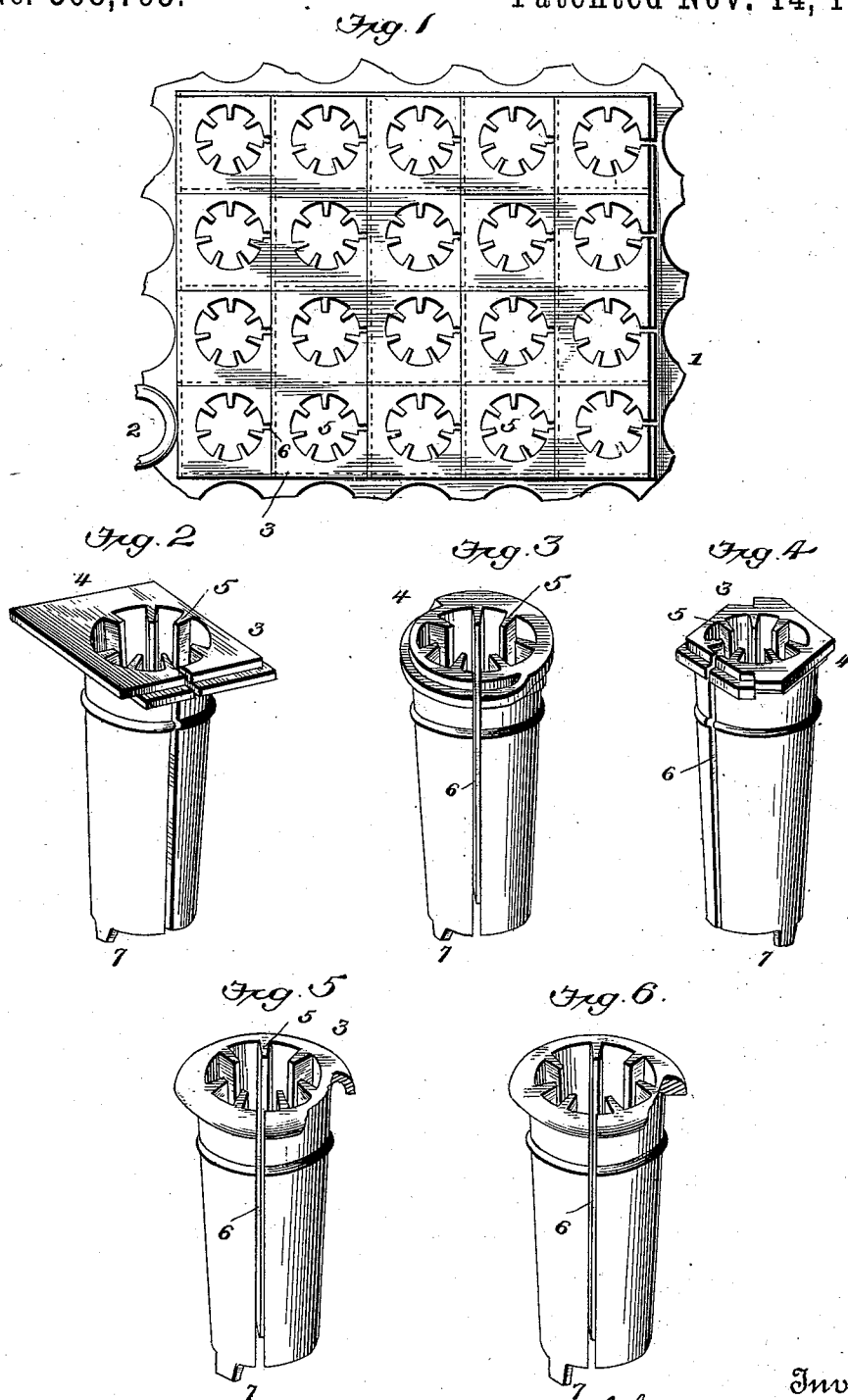


(No Model.)

C. W. WHITNEY.
BOILER TUBE PROTECTOR.

No. 508,793.

Patented Nov. 14, 1893.



Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES W. WHITNEY, OF NEW YORK, N. Y.

BOILER-TUBE PROTECTOR.

SPECIFICATION forming part of Letters Patent No. 508,793, dated November 14, 1893.

Application filed April 29, 1893. Serial No. 472,316. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. WHITNEY, a citizen of the United States of America, residing at New York city, in the county and State of New York, have invented certain new and useful Improvements in Boiler-Tube Protectors, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This improvement relates to a novel form of boiler tube protector, designed to not only protect the ends of the tube but to prevent the entrance into the same of particles too large to pass through it, which if allowed to enter, not infrequently form an impediment or dam around which the soot and other infusible matters collect and ultimately block the tube and nullify its action as a steam generator.

20 To these ends the invention consists in the peculiar construction and arrangement of parts hereinafter more particularly described and then definitely claimed.

In the accompanying drawings—Figure 1 is an elevation of a portion of a tube sheet of a boiler with one form of my improved protector attached over a portion of the tubes. Fig. 2 is a perspective view of the same protector on a larger scale detached. Fig. 3 is a similar view of a protector having a round interlocking head. Fig. 4 is a similar view of a protector having a hexagonal interlocking head. Fig. 5 is a similar view of a protector having a "mushroom" top partly broken away. Fig. 6 is a similar view of a solid round top also partly broken away.

Referring now to the details of the drawings by figures—1 represents part of a tube sheet of a boiler and 2 the tubes set therein.

40 Fig. 2 shows one of my protectors with a square head 3 and preferably provided with flanges 4 to interlock over and under the heads of the adjoining protectors.

The protector shown in Fig. 3 has a round head, the two halves of which are on different planes so as to interlock with the adjoining heads. When made with round heads as in Fig. 3, there are little triangular places left between them which leave the tube sheet slightly exposed. This, however, may be remedied by the construction shown in Fig. 4 where the head is shown in the hexagonal

form and with this style the tube sheet may be entirely covered.

In the form shown in Fig. 5, the head is hollowed out underneath as shown at the part represented broken away, making what is known as a "mushroom" top.

In Fig. 6 the top is half round in cross section and solid underneath as indicated in the broken away portion. The bodies of these protectors are round and preferably slightly tapering. Inside of the bodies I have shown a series of ribs 5 running lengthwise through the interior and extending outward flush with the front, and each body is slit down one side, as shown at 6, and is provided with a bead of about one-fourth of an inch in width at about three-fourths of an inch below the head, but I may have two or three rings if found preferable. With these ribs 5 it will be seen that all large pieces of cinder, coke, clinker or other objectionable materials are prevented from entering the tube, the ends of the ribs acting as a sieve or strainer through which only such particles can enter as will readily pass through the tube with the ordinary draft employed and between the ribs where ribbed tubes are employed. In order that these protectors may work to the best advantage where ribbed tubes are employed, I provide the inner end of the protector with one or more slightly tapering tongues 7, which will enter between the ribs of the tube, thus preventing the protectors from turning in the tubes. As these tongues are set on a line between two of the protector ribs, said ribs will register with the ribs of the tube and thus there is no chance for anything to accumulate at the beginning of said ribs if my protectors are employed. Of course where ribbed tubes are used, these ribs in the protectors should never be less than the number of ribs in the tubes, but the number of ribs may be varied to suit the various conditions under which the protectors are used. They may also be varied in shape to suit the makers or users, and it may be found better in practice to increase the number of ribs in the protector so as to reduce still more the size of the particles that can enter the tube. The height of the ribs may also be varied, or they may extend completely across the face of the protector as may be found best in practice.

The annoyance of clogging or filling up by the reception of particles within the tube too large to pass readily through it, although by no means confined to ribbed tubes, is more pronounced in their case, because the ribs being removed for several inches from the ends of the tubes for the purpose of expanding them in the boiler, present of themselves at the point where they are cut off, an obstruction against which a piece of cinder or other matter too large to pass between the ribs is sure to lodge and form a nucleus or dam against which other matter collects and finally blocks the tube. But besides protecting the tube, my invention also protects the tube-sheet from the excessive heat of the furnace, which is so great in locomotive and other boilers in which forced draft is used, that the water coming into direct contact with the tube-sheet is immediately converted into steam, which practically deprives the ends of the tubes from the moisture and protection which the water in its liquid and natural state affords, and which in my judgment, is one of the principal causes of leaky tubes in boilers, viz: the excessive expansion and contraction of the metal due to this continual overheating and subsequent cooling off.

It will be noticed that the collars or flanges of some of the patterns of my tube-end protectors interlock or fit into one another by lapping, so that in case one should become loose from any cause it would be held in place by the others adjoining it; but they may be cast with a solid or mushroom flange if preferred, and of any thickness that may be found best in practice. Those forms of my protectors having square or hexagonal heads may be made to cover the entire surface of the tube-sheet, and also interlock. It will be seen that my protector with the narrow collar or flange with either tapering or straight body, as may be preferred, and having an opening or slit entirely through it lengthwise may be forced into any tube of the size it is intended for, and will of itself spring open so as to remain practically tight in the boiler without being turned up or being ground to fit each particular tube. Moreover, after the protector has been driven into the tube, this bead passing beyond that portion of the tube which is expanded in the tube-head, will catch on the shoulder formed by the expander back of the tube-sheet, and will thus assist materially in holding the protector in place.

I may find it advisable in practice to have a second or third bead cast on the outside of my protector, so that if it should be found necessary to turn up or grind down any portion of the outer surface to make a tighter fit

than can be obtained by simply springing it in the end of the tube, this labor may be confined to these beads and not necessarily, as would be the case without them, cover the entire outer surface of the body.

With my invention, the article may be used almost as it comes from the foundry, without any turning up or labor upon it to speak of, other than that required to drive it in place. From this it will be seen that my invention is not only a protection to the end of the tube, which is always the most vulnerable part of it and the soonest to wear or burn out, but a protection to the tube-sheet itself, because as before stated, the collars lapping and interlocking each other, may be made to cover the entire face of the tube-sheet and protect it from the direct action of the flame or gases upon it, thereby not only lengthening the life of the tube, but of the tube-sheet also; lessening the liability of the tubes to leak; increasing the generation of steam; and thus consequently lessening the cost of the motive power.

What I claim as new is—

1. A tube protector adapted to be used with ribbed tubes, consisting of a cylindrical body having a series of solid ribs arranged longitudinally in the interior thereof, said ribs matching with the ribs of the tube in which said protector is designed to be inserted, substantially as described.

2. Tube protectors having bodies constructed to enter boiler tubes and having interlocking heads, whereby both tubes and tube sheets are protected, substantially as described.

3. A tube protector having a round body, and a head provided with flanges arranged at different planes, whereby one head may overlap the flange of the next adjacent head, substantially as and for the purpose set forth.

4. A tube protector adapted to be used with ribbed tubes, consisting of a cylindrical body having an enlarged portion near its outer end, and a series of narrow, solid internal ribs arranged longitudinally in the interior thereof and matching with the ribs of the tube in which said protector is to be used, and a projecting tongue set in line with the space between the ribs of the protector to enter between the ribs of the tube, substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses, this 24th day of April, 1893.

CHARLES W. WHITNEY.

Witnesses:

JAMES J. QUINLAN,
H. B. VAN VLECK.