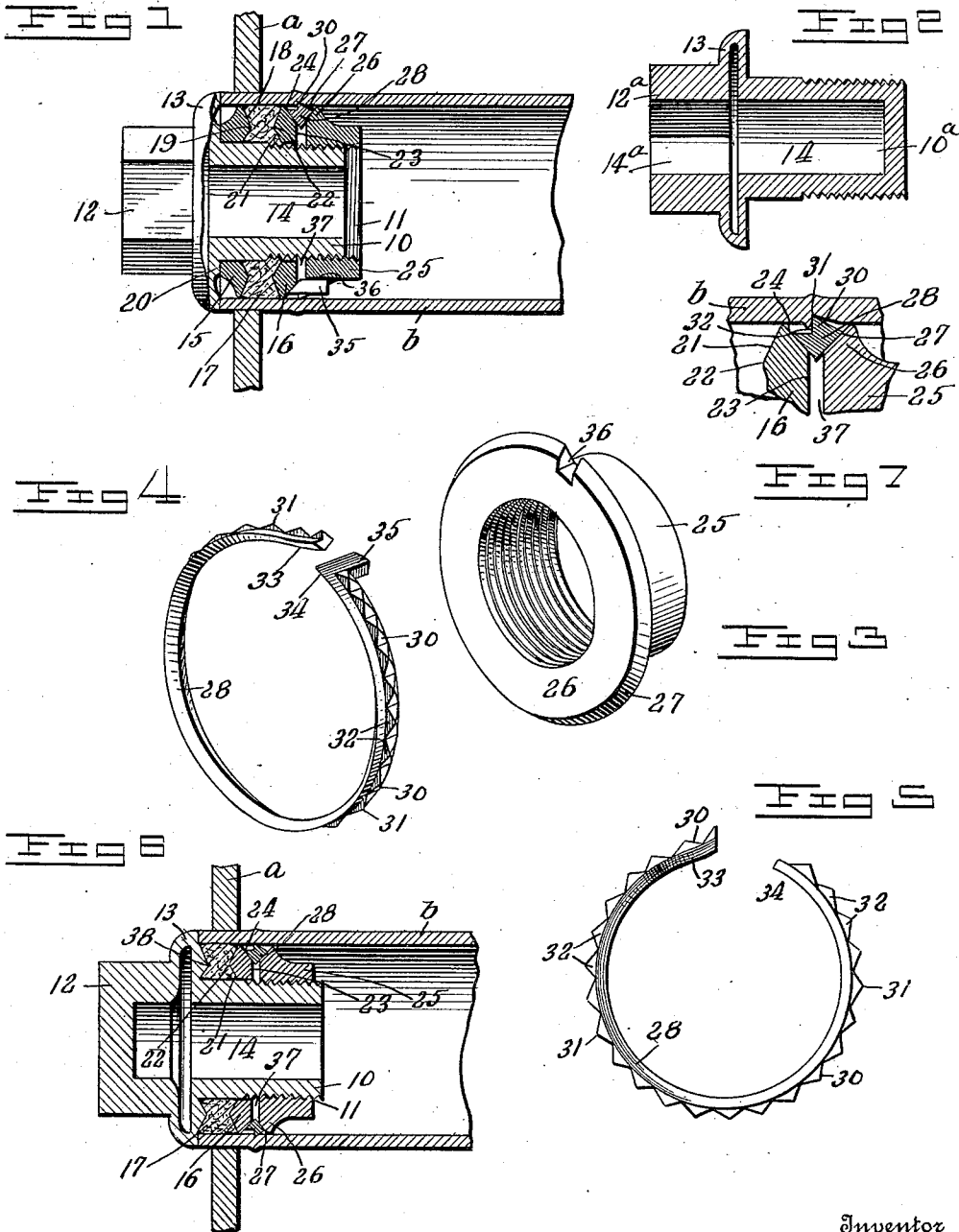


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LEAK STOPPER FOR BOILER TUBES.
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LEAK-STOPPER FOR BOILER-TUBES.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CORNELIUS S. CLARK, a citizen of the United States, residing at Norfolk, in the county of Norfolk and State of Virginia, have invented new and useful Improvements in Leak-Stoppers for Boiler-Tubes, of which the following is a specification.

My invention relates to leak stoppers for boiler tubes, and is an improvement in a device of the same class forming the subject of my United States Letters Patent No. 955,500, dated April 19, 1910.

In the aforesaid patent, the defective tube is closed by a leak stopper, placed within the tube with a head at each end fitting steam tight, the two heads being open from end to end and connected by a pipe to permit circulation therethrough. One of said heads, the outer one preferably, has a turning member which, through the medium of the pipe, tightens the packing of both heads. This same head has also a projecting finger on one of the packing compressing rings that engages a projecting tube end and prevents said ring from rotating. The other head has a compressing ring held against rotation by a frictional member attached thereto bearing against the inner surface of the tube. The respective coöperating compressing members have facial projections which engage the packing rings and are held from turning by this means.

The principal objects of the present invention are to simplify the construction and reduce the cost of leak stoppers; to dispense with the connecting pipe between the heads, by closing a defective boiler tube with like leak-stoppers exteriorly inserted in each end of said tube, said stoppers each having both an expansible steam packing, and an expansible anchoring or attaching means which engage the inner wall of the tube so securely that the stopper cannot leak around the packing nor be blown out of the tube; and finally to keep the leak stoppers relatively cool by forming a chamber therein open at one or the other end so as to fill with water, whether the defective tube be a fire tube or a water tube.

With these and other objects in view the invention consists of the construction, combination and arrangement of parts herein-

after described in detail and set forth in the appended claims and illustrated in the accompanying drawings, in which:

Figure 1 is a vertical longitudinal section through the fire tube of a boiler with my improved leak stopper in place therein and shown partly in section. Fig. 2 is a sectional view of the hollow or chambered body, such as is used with the leak stopper in water tube boilers. Fig. 3 is a perspective view of a flanged and threaded collar forming a part of the leak stopper. Fig. 4 is a perspective view of the divided anchor ring which holds the stopper within the tube. Fig. 5 is a view of one side of the same. Fig. 6 is a view similar to Fig. 1 showing a modification. Fig. 7 is an enlarged sectional view illustrating a feature of the invention.

In the drawing, *a* designates a portion of a boiler with one end of a tube *b* secured therein in any usual manner. The tube *b* may be a fire tube or water tube, as the invention is applicable to either type.

The leak stopper comprises a body 10 of cylindrical form, screw threaded at one end as at 11 and provided at its opposite end with a polygonal head 12, at the base of which is an outstanding flange 13, the inner face of which is preferably smooth and, when in place, bears against the end of the tube *b*. The body 10 is preferably made with a chamber 14 therein which extends into the head 12 and laterally into the flange 13. I preferably close the outer or head end of the chamber when the stopper is used to close a fire tube, as in Figs. 1 and 6, and the inner or threaded end (see Fig. 2) when employed in a water tube. The object of the chamber 14 and the closed ends will be described hereinafter.

Loosely fitted on the body 10, which is of less diameter than the flue and extends therein when the stopper is in use, are two compression rings 15 and 16 between which is placed a packing ring 17, preferably of asbestos, that expands when the compression rings are drawn together and bears water and steam tight against the inner surface of the tube. The compression ring 15 has its inner face 18 beveled from its outer and inner circular edges toward the center of said face to form a circular rib or apex 19 thereon that is forced into the packing which

holds said ring 15 from rotating when the body 10 is turned. The outer face 20 of said compression ring 15 is finished smoothly and bears against the inner face of the flange 13. The other or inner compression ring 16 has its outer face 21 formed with a rib 22 similar to the inner face and rib of the ring 15 and for the same purpose. Its opposite face has a flat portion 23 and a beveled portion 24 inclined toward the opposite face, as in Figs. 1, 6 and 7.

A pressure collar 25, screw threaded on the body 10 is made with a flange 26 on its inner end adjacent the compression ring 16 and preferably of the same diameter, the edge being beveled at 27 in a direction opposite the bevel on said ring 16, the two beveled surfaces 24 and 27 forming between them a V-shaped groove in which is placed a transversely divided ring 28 hereinafter called an anchor ring because it anchors or holds the leak stopper within the tube.

The anchor ring 28, made of a hard resilient metal such as steel, is of angular shape interiorly to fit snugly within the V shaped groove hereinabove described, and has on its outer surface a plurality of flat semi-pyramidal projections 30, each having a sharp point 31 and three inclined sides. The remaining side 32 is straight and perpendicular to the axis of the ring. When the anchor ring is placed in the V-groove, the straight sides 32 of the projections face outwardly and one of their inclined sides directed inwardly relatively to the tube 7. The anchor ring is divided, as stated, and the ends slightly separated, one end 33 being bent outward slightly (see Fig. 5) while the other end 32 has a laterally projecting lug 35 that enters a notch 36 in the periphery of the collar flange 26 to prevent the collar rotating when the body 10 is turned.

To use the leak stopper, the two compression rings 15 and 16 with the packing ring 17 between them are slipped on the body 10 up to the flange 13. The anchor ring 28 is next placed against the compression ring 16 and finally the collar 25 is screwed on the body until the beveled side of its flange 26 bears against the anchor ring. In this position of the parts, the collar 25 does not abut against the compression ring 16, a space 37 being left between them so that the collar may be drawn toward the ring as the body is rotated. When the several parts of the stopper have been assembled and it is desired to close a defective tube, the stopper is inserted into one end of said tube until the flange 13 strikes the end of the tube, as shown in the drawing. The diameter of the anchor ring 28 is such that some force is necessary to enter the leak stopper, but as the beveled sides of the projections 30 face the direction in which the stopper moves, the latter may easily be driven home.

A wrench or other tool is now applied to the polygonal head 12 and the body 10 rotated, drawing the collar 25 toward the compression ring 16. The collar cannot rotate, it being held by the lug 35 on the anchor ring, nor can said anchor ring turn owing to the sharp points 31 of the projections 30 engaging the interior of the tube. To guard against slipping of the anchor ring owing to a possible slight enlargement of the tube due to heat, or, because of insufficient expansion of said ring before placing the stopper in the tube, the end 33 of the anchor ring has been turned outwardly to insure the engagement of the pointed lug or lugs 30 thereon with the tube 7. Continued rotation of the body 10 first draws the collar 25 toward the compression ring 16 which narrows the V-groove therebetween, and consequently expands the anchor ring, thus driving the points 31 of the peripheral projections into the tube. Besides moving radially, the projections 30 have a movement toward the outer end of the tube due to the anchor ring riding along the beveled portion 24 of the compression ring 16. The flat sides 32 of the projections facing the direction of linear movement, the points 31 cut into the metal of the tube and each turns up a bur in front of it, as clearly shown in Fig. 7. The pressure exerted by the outward movement of the collar also forces the compression ring 16 against the packing ring and expands the same tightly against the inside of the tube.

The anchor ring 28 being expanded and moved outwardly by the collar 25, the pointed projections 30 on the ring penetrate the tube more and more as the ring travels outwardly, thus forming grooves of gradually increasing depth in the tube and enlarging the upturned burs which serve as abutments for the projections and prevent the leak stopper being blown out by the pressure within the boiler tube.

In a fire tube boiler, the outer end of the chamber 14 in the body 10 is closed, as in Fig. 6, and its inner end open to permit water which enters the defective tube flowing into said chamber and keeping the stopper relatively cool and prevent the same burning out. With a water tube boiler, the outer end of the chamber is open and the inner end closed, see Fig. 2, so that water may flow therein from the water leg.

If desired, the inner compression ring 15 may be omitted and the inner face of the body flange 13 be formed with a projecting rib 38 similar to the rib 19 on the compression ring 15 and for the same purpose, the packing forms no appreciable impediment to the rotation of the body.

While it is preferred to construct the anchor ring with a plurality of peripheral projections as shown, other equivalent means

may be substituted therefor without departing from the spirit of the invention.

The leak stopper 10^a for use in water tubes, has the open end of the chamber 14, where it passes through the head 12^a, made polygonal in form as at 14^a, to receive the polygonal end of a rod by means of which the plug is turned. This is rendered necessary as the open end of the water tube is within the water leg or pocket of the boiler, and a stopper therein could be reached with difficulty, if at all, with a wrench.

Having thus described the invention what I claim as new is:—

1. In a leak stopper for boiler tubes, a rotatable body member, a pair of compression rings and a packing ring therebetween on said member, non-rotatable means on said body member adapted to be drawn longitudinally thereof, and an anchor ring having peripheral projections adapted to be expanded and drawn longitudinally by said means to force said projections into the body of a tube.

2. In a leak stopper for boiler tubes, a rotatable body member, a pair of compression rings and a packing ring therebetween slidable on said member, means on said body member adapted to be drawn longitudinally thereof to laterally compress said packing and cause it to expand peripherally, and a divided anchor ring having pointed peripheral projections placed between said means and one of said compression rings to be expanded by and move longitudinally with said means for forcing said projections into the body of a boiler tube grooving the same and forming a bur in front of each projection.

3. In a leak stopper for boiler tubes, a body member, expansible packing means thereon for closing a boiler tube, an anchor ring having peripheral projections, and means movable longitudinally of the body member for expanding said packing and also expanding the anchor ring and moving it longitudinally to force said projections into the body of the boiler tube and cut gradually deepening grooves therein to prevent blowing out of the leak stopper.

4. In a leak stopper for boiler tubes, a rotatable body member, expansible packing means thereon for closing a boiler tube, a divided anchor ring having a series of peripheral projections around the same beveled on one side and approximately perpendicular to the axis of the ring on the other side, and a non-rotatable collar screw threaded on said body and movable longitudinally thereof when the body is rotated for expanding said packing and also for simultaneously expanding the anchor ring to force said projections into the body of the tube and moving it longitudinally thereof to cut by the perpendicular edges of the projections

grooves of gradually increasing depth and turning up a bur in advance of each projection.

5. In a leak stopper, a hollow rotatable body closed at one end, expansible packing means fitting loosely thereon, a divided anchor ring having a series of pointed peripheral projections and a laterally projecting lug, and a collar threaded on said body and movable longitudinally thereof held against rotation by the lug engaging a notch in the collar, said collar adapted to expand said anchor ring and simultaneously move it longitudinally to force said pointed projections into the body of a boiler tube and turn up burs therefrom.

6. In a leak stopper for boiler tubes, a rotatable body member, having a flange adapted to bear against the end of a boiler tube, a polygonal head for rotating the same, said body having a chamber therein extending into said flange and head and open at one end, an expansible packing member slidable on said body, a collar screw threaded on said body adapted to expand said packing, a divided anchor ring between said packing means and the body on the periphery of which ring are a plurality of pointed projections adapted to be forced into the body of a boiler tube by said collar to hold the ring against rotation, and means between said collar and ring to prevent rotation of the collar.

7. In a leak stopper for boiler tubes, a rotatable body having means for limiting its admission to a boiler tube, compression rings and a packing therebetween slidably mounted on said body, a collar screw threaded on said body movable longitudinally thereof, and a divided anchor ring having exterior peripheral projections and its inner side inclined in opposite directions to contact with beveled surfaces on said collar and the adjacent compression ring to expand said collar and move it longitudinally of the body when the latter is rotated, for forcing said projections into the body of a water tube and cut gradually deepening grooves therein.

8. In a leak stopper for boiler tubes, a rotatable body having means for limiting its admission to a boiler tube, compression rings and a packing therebetween slidably mounted on said body, a collar screw threaded on said body and movable longitudinally thereof when the body is rotated, said collar having a projecting circular flange beveled at its outer edge, and a divided anchor ring having a lateral projection on one end engaging a notch in said collar flange to prevent rotation of the collar, pointed projections on the outer surface of said anchor ring and a double inclined surface to contact with the beveled surface of the collar flange and with a like surface on the adja-

cent compression ring, said pointed projections adapted to be forced into the body of a boiler tube by the collar for holding the anchor ring from rotating.

5 9. A leak stopper for boiler tubes comprising a rotatable body, an expansible packing, a non-rotatable collar threaded on said body, and an anchor ring having peripheral projections for engaging the body of a
10 boiler tube to prevent the ring from turning, said collar adapted to expand said anchor ring to force the projections into the tube, and a lug on said anchor ring engaging the collar to prevent rotation of the latter.

15 10. A leak stopper for boiler tubes having an expansible packing insertible in a flue end, a divided ring having pointed peripheral projections adapted to be forced into the body of a tube to anchor the tube stopper, and means for expanding said ring and
20 the packing when the body is rotated.

11. A leak stopper for boiler tubes comprising a rotatable body having an outstanding flange to bear against the end of
25 a boiler flue, an expansible packing slidable on said body, a compression ring also loose on the body provided with a rib on one side to press against said packing, the opposite side of said rib having a beveled surface at
30 its periphery, a non-rotatable collar screw threaded on said body and having a flanged end, the side of which facing the compression ring being beveled in the opposite direction, and a divided anchor ring, the inner
35 side of which is beveled in opposite directions adapted to fit snugly between the two beveled surfaces and be expanded thereby when the body is rotated, said anchor ring having a plurality of projections on its
40 exterior surface inclined on their sides next the collar, and substantially perpendicular to the outer edge of the collar on their sides next the compression ring which are forced into the body of the flue when expanded to
45 prevent the pipe stopper being blown out by internal pressure.

12. An anchor ring for boiler tube leak stoppers comprising a divided spring ring, the inner surface of the ring comprising
50 portions inclined in opposite directions to

form an intermediate projecting edge, one end of said ring being turned outwardly, and a laterally projecting lug on the other end.

13. An anchor ring for boiler tube leak stoppers comprising a divided spring ring having a plurality of exterior projections beveled on one side and approximately perpendicular to the axis of the ring on the other side, the inner surface of the ring comprising portions inclined in opposite direction to form an intermediate projecting edge, one end of said ring being turned outwardly, and a laterally projecting lug on the other end.

14. An anchor ring for boiler tube leak stoppers comprising a divided spring ring having a biting projection on its outer surface, one side of which is inclined and the opposite side substantially perpendicular to the axis of the ring, the inner surface of the ring comprising portions inclined in opposite directions to form an intermediate projecting edge.

15. In a leak stopper for boiler tubes, a rotatable body member, a pair of compression rings and a packing ring therebetween on said member, non-rotatable means on said body member adapted to be drawn longitudinally thereof, and an anchor ring having a peripheral biting projection said ring adapted to be expanded and drawn longitudinally by said means to force said projection into the body of the tube.

16. In a leak stopper for boiler tubes, a cylindrical body threaded at one end and having a polygonal head at its other end, an outstanding flange on said body at the base of said head, a chamber being formed in said body closed at one end and open at the other, said chamber extending into the polygonal head and communicating with a narrow chamber within the flange.

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

CORNELIUS S. CLARK.

Witnesses:

A. CHRISTE,
C. C. BEAL.