Nov. 1, 1927. 1,647,223

C. S. HART

BOILER TUBE STOPPER

Filed Aug. 2, 1926

Fig. 1.

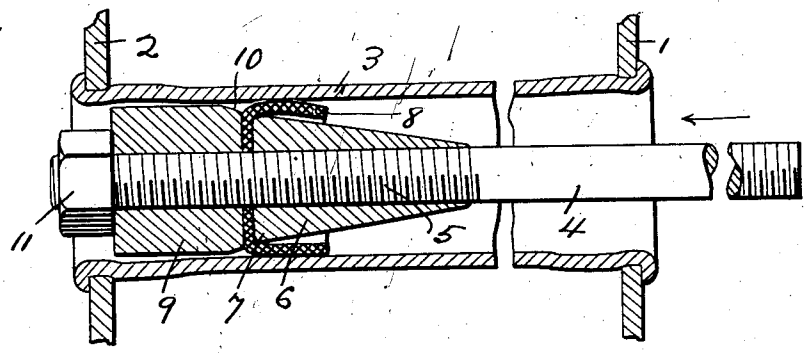


Fig. 2.

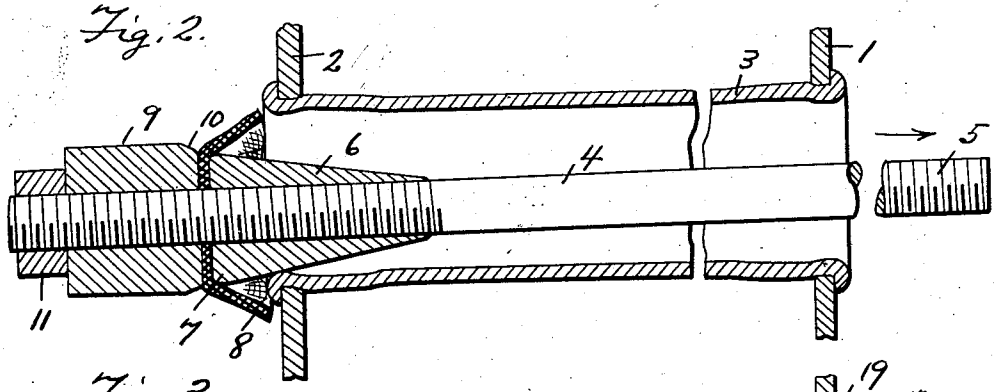
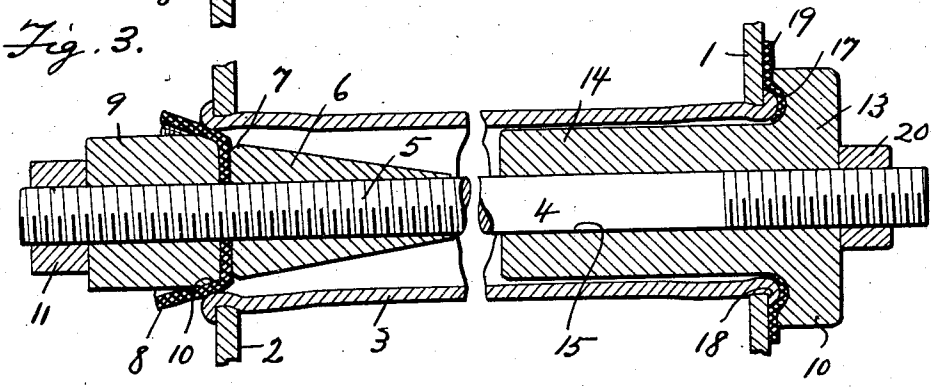


Fig. 3.



Inventor

Charles S. Hart

By Clarence A. O'Brien

Attorney

Patented Nov. 1, 1927. 1,647,223

UNITED STATES PATENT OFFICE.

CHARLES S. HART, OF WARWICK, RHODE ISLAND.

BOILER-TUBE STOPPER.

Application filed August 2, 1926. Serial No. 126,549.

This invention relates to tube stoppers and particularly those used for stopping slips or broken boiler tubes and particularly to a tube stopper which may be inserted in the tube from the forward end thereof and which is provided with means for stopping both ends of the tube.

An object of this invention is to provide a tube stopper of simple construction which is provided with suitable means including a flexible washer adapted to be inserted through a boiler tube in which the means will be positively operable in co-operation with the rear end of the boiler tube to provide for the outward flexing of the washer so that it may be seated in cooperation with said means against the end of the boiler tube to seal the rear end thereof while suitable means may be applied to a rod carrying the first mentioned element for sealing the front end of the boiler tube from which the device is inserted.

It is an important feature of this invention as distinguished over stoppers now known in the art, to provide a stopper having one stopper element adapted for insertion through the boiler tube from the front to the rear end thereof and provided with a flexible packing washer in cooperation with the guide and feeding elements so that the guide will permit flexing of the washer for the insertion of the device through a boiler tube and will also provide means whereby the flexing of all portions of the packing washer are obtained after insertion past the rear end of the boiler tubes, in order that the washer will seat circumferentially around the seating member which aids in securing the packing washer on the device in such a way that it may be secured in position from the forward end of the tube if desired, or other suitable means provided for anchoring the device in the tube.

The invention comprehends numerous other objects and advantages residing in the specific construction and arrangement of the parts to obtain simplicity of structure, assemblage and positiveness in operation to provide a highly operative device which are all the more particularly pointed out in the following description in detail, and in the claims directed to a preferred form of construction, it being understood, however, that various changes may be made in the size, shape and relation of the parts for carrying out the invention, which are clearly within the scope of the same as hereinafter set forth.

In the drawings forming part of this application:

Figure 1 is a longitudinal sectional view through a boiler tube showing one end portion of the stopper structure forming the subject matter of this invention in the course of application through a tube, the arrow indicating the direction of movement of the device through the tube.

Fig. 2 shows the position of the parts in Fig. 1, after the rear end stopper element has been inserted past the rear end of the tube and at the beginning of the operation to flex the packing washer outwardly for a seating cooperation with the tube.

Fig. 3 shows the stopper and assembled operative relation showing the complete stopper structure applied to the tube with the packing washers in cooperative position with the other elements for effectively sealing the opposite ends of the tubes.

The front tube sheet of a boiler construction is indicated at 1 and the rear tube sheet at 2 which is formed with suitable alined openings in which is mounted the opposite ends of the boiler tube 3, in any usual and preferred manner well known in the art.

This structure refers particularly to a fire tube type of boiler wherein the tubes 3 extend from the fire box to the smoke box of the boiler, as well known, frequently becomes slit between the ends thereof interfering with the efficient operation of the boiler.

This invention is designed to provide an efficient stopper for the opposite ends of the tubes of a fire tube boiler for instance, of such a type that the stopper may be inserted from the forward end of the tube in a well known manner, without throwing the fire in the boiler and which is positive in operation and will effectively stop the opposite ends of the tube from leakage therethrough due to the slit in the intermediate portion.

This stopper includes a rod member 4 which is provided with opposite threaded ends 5, the rod being usually several inches longer than the tube 3. A conical guide member 6 is threadedly and adjustably mounted on the rod 4 at one end portion thereof with the enlarged diameter 7 at one end of the member disposed toward the end portion of the rod and against which is positioned the flexible packing washer 8 of sub-

stantially annular form which is provided with a central opening adapted to receive the rod 4.

A seating member 9 is threadedly mounted on the end portion of the rod 4 adjacent to the guide member 6 and is provided with the cylindrical periphery thereof slightly beveled on its forward edge adjacent the conical member as indicated at 10. A nut 11 is threaded on the rod 4 for suitably locking the seating member 9, the packing washer 8, and a conical guide member 6 in rigid assembled relation with the rod.

A front stopper structure includes the block member 13 which is formed with a cylindrical portion 14 adapted to slidably fit within the boiler tube 3 and provided with an opening 15 for slidably receiving the rod 4. The head portion 16 of the flat member 13 is formed with a curved annular recess 17 adapted to fit the contour of the bead 18 formed by the end of the tube 3 so that the packing washer 19 may be evenly compressed for sealing the joint around said tube, and against the tube seat 1 to prevent leakage between the tube and the sheet.

A suitable nut 20 is threaded on the forward end of the rod 4 and adapted to be operated to draw the sheeting member 9 toward the forward end of the tube to provide seating cooperating thereof with the packing 8 and the rear end of the tube as well as seating cooperation of the block member 13 with the front tube sheet, in a manner as shown in Fig. 3.

This tube stopper will have the parts constructed of predetermined dimensions according to the size of the tube with which it is to be used which proportions are generally illustrated in the accompanying drawings. For instance, the seating member 9 will have the cylindrical outer surface thereof of a diameter slightly less than the interior diameter of the tube 3 while the guide member 6 will have the largest diameter thereof smaller than the diameter of the seating member 9 and of such size that it will conveniently accommodate the thickness of the packing washer 8 so that it may be folded over the large end of the guide member in order that it may be readily pushed through a boiler tube as shown in Fig. 1.

The block member 13 will be proportioned so that the portion 14 will slidably fit in the front end of the boiler tube, while the head 16 will be substantially larger than the tube as illustrated. This block member will form a guide during the insertion and application of the stopper to a tube in a manner which will now be described.

In using this invention, the stopper may be applied to a leaky or split boiler tube without drawing the fire in the boiler and may be readily applied in a quick and efficient manner. The assembled device as shown in Fig. 3 is employed in positioning the parts in the boiler tube with the nut 20 substantially loosened in order to permit the projection of the rod and the stopper at the rear end of the tube past the tube sheet 2. With the parts assembled in this way, one end of the rod 4 carrying the seating member 9 in the guide member 6 is inserted in the forward end of the tube and pushed through the tube in the direction of the arrow in Fig. 1, with the flexible packing 8 folded over the guide member 6 as illustrated in Fig. 1.

The seating member 9 will operate to clean the dirt from the tube in view of its size approximating the interior diameter of the tube and push it outwardly through the rear end of said tube. The parts are moved so that the seating member 9 will be moved beyond the rear end of the tube as shown in Fig. 2 with the packing member 8 while the guide member 6 will engage the rear end portion of the tube as shown in Fig. 2. By drawing the rod 4 forwardly in the direction of the arrows at the right hand ends of Fig. 2, it will be seen that as the guide member rides upwardly toward the centered position positive engagement of the packing washer 8 with the rear end of the boiler tube will take place, and cause the outward flexing of the packing. By pushing the rod 4 rearwardly again and slightly rotating the same, and then pulling it forwardly, another portion of the packing washer will be caused to engage the rear end of the tube and flex outwardly, and as this operation is repeated, a number of times, the entire free annular edge of the washer will be flexed outwardly so that upon again pulling the rod 4 forwardly a seating cooperation will take place between the seating member 9 and the rear end of the tube with the packing member 8 interposed therebetween as shown in Fig. 3.

With the parts in this position, it will be readily seen that the rear end of the tube will be effectively sealed and that by screwing up on the nut 20 toward the block member 13, an effective sealing of both ends of the tube will take place. In inserting the stopper into the tube as above described, the end carrying the seating member 9 is inserted a short distance into the tube, following which the block member is preferably moved along the rod and inserted in the forward end of the tube in the position as shown in Fig. 3 to act as a guide for the rod 4. In addition, as the stopper for the rear end of the tube passes the split portion thereof, this block member 13 will prevent steam or hot water from being ejected forwardly from the forward end of the tube onto the hands or the body of the operator inserting the stopper, so that it will serve as a protector in the application of the stopper to the tube.

The difference in size of the conical guide 6 and the seating member 9 not only provides for the cleaning of the tube by the sheeting member but the small sides of the guide provides for the accommodation of the washer 8 to permit the folding thereof for passing through the tube, while the seating member is of such a size that when the washer is positioned over the end as shown in Fig. 3, it cannot be withdrawn through the tube but will have a seating cooperation with the rear end of the tube as shown. The beveled edge portion 10 of the seating member permits a more effective seating thereof in the end of the tube in order that the packing may be wedged between the tube and the seat and beveled portion 10 for sealing the rear end of the tube in a liquid-tight manner.

The guide member 6 therefore not only cooperates to center and guide the rod and seating member in its forward movement in the tube, but provides a means for insuring the positive flexing of the packing member 8 so that it will be forced outwardly to fit around the seating member 9 as shown in Fig. 3. In this way, it is impossible to insert the stopper without obtaining an efficient seating of all portions of the flexible packing around the seating member 9.

It should therefore be clearly understood that a highly practical tube stopper has been provided which may be inserted in a tube for stopping the opposite ends thereof without drawing the fire and in which the stopper for both ends is inserted from the forward end of the tube and through the rod connections 4 drawn toward each other into seating cooperation with the tube.

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

A boiler tube stopper comprising a rod, a conical guide member adjustable on one end of the rod, an annular flexible packing mounted on the rod to abut the large end portion of said conical guide member, a seating member having a larger diameter than the large end of said guide member and mounted on said rod for securing said packing in engagement with the guide member, said members and packing being adapted for insertion into a boiler tube with the packing folded over the guide member, said guide member cooperating with the end of the boiler tube to turn the packing outwardly and backwardly towards the seating member, said seating member adjacent said packing being tapered towards said packing and the remaining portion being cylindrical in formation, said packing cooperating with said seating member to engage in the end of said tube to seal said end of the tube, and means for anchoring the rod.

In testimony whereof I affix my signature.

CHARLES S. HART.