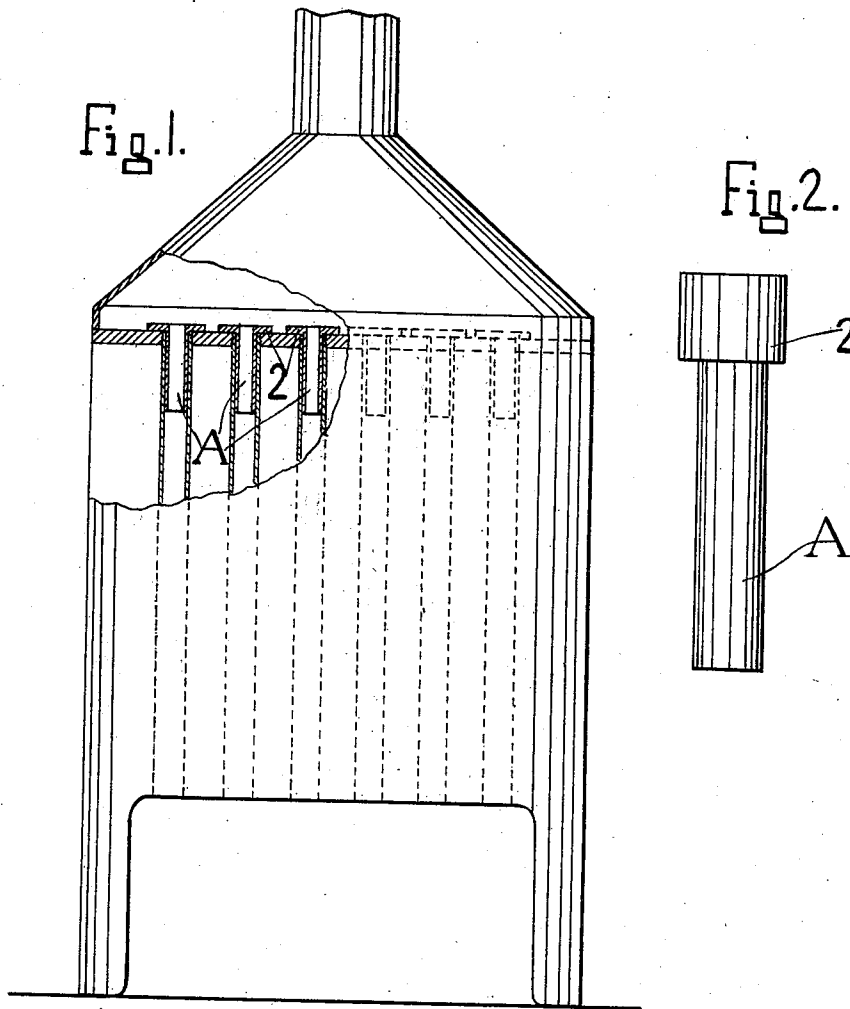


No. 732,508.

PATENTED JUNE 30, 1903.

C. H. BOONE.  
TUBE SHEET PROTECTOR.  
APPLICATION FILED FEB. 2, 1903.

NO MODEL.



WITNESSES:

*John Oller*  
*J. H. Brown*

INVENTOR.

*Charles H. Boone*  
BY  
*Geo. H. Strong*  
ATTORNEY.

# UNITED STATES PATENT OFFICE.

CHARLES H. BOONE, OF SAN LEANDRO, CALIFORNIA.

## TUBE-SHEET PROTECTOR.

SPECIFICATION forming part of Letters Patent No. 732,508, dated June 30, 1903.

Application filed February 2, 1903. Serial No. 141,499. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES H. BOONE, a citizen of the United States, residing at San Leandro, county of Alameda, State of California, have invented an Improvement in Boiler-Tube and Tube-Sheet Protectors; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to a device for protecting the junction of boiler-tubes with the tube-sheets, and especially at the end most distant from the fire-box.

It consists of a tube of asbestos which may have an enlarged flange or shoulder at the end to abut against the outer face of the tube-sheet and retain the supplemental tube in place.

Referring to the accompanying drawings, Figure 1 is a front elevation and partial section of a boiler with my invention attached. Fig. 2 is a front view of one of the tubes.

In the use of boilers, and especially that class in which the heat-tubes extend vertically from the fire-box upward to the upper tube-sheet, the heat of the products of combustion passing through the tubes is so intense at the discharge end that the tubes are expanded more rapidly than the tube-sheet in the first instance, and the variable expansion and contraction of the two soon causes leaks at this point, which are very detrimental to the surface of the boiler.

It is the object of my invention to reduce the intense heat upon this tube-joint, and thus lessen the possibility of leakage occurring.

My invention consists of tubes A, made of asbestos or like indestructible material of low conductivity. These tubes are made of such size as to slip into the upper or outer ends of the metal tubes through which the

products of combustion pass from the fire-box to the chimney. In order to protect the outer end of the tube and its junction with the tube-sheet and also prevent the displacement of the supplemental tubes, I have shown a sleeve or collar 2, made of the same material and surrounding the upper end of the tube A. These collars are of sufficient thickness to rest upon the upper end of the tube and its joint with the tube-sheet, and they also extend slightly above the level of the tube-sheet, so that the products of combustion are delivered above the tube-sheet and entirely out of contact with the joint formed between the sheet and the tubes. By this construction the tube is protected from the sudden intense heat passing through it and is thus prevented from a more rapid expansion than takes place in the tube-sheet, the heat being thus gradually applied to the tube and the sheet and the expansion and contraction of the two made more nearly equal. I have found by practice that this construction greatly increases the life of the tube-sheet connections and prevents leakage at this point.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

The combination with the metal tubes and tube-sheet of a steam-boiler, of an asbestos tube fitting each of the metal tubes and extending through the tube-sheet said asbestos tube provided with a wide collar to rest upon the end of the tube and tube-sheet.

In witness whereof I have hereunto set my hand.

CHAS. H. BOONE.

Witnesses:

J. E. QUINN,  
JOHN W. BULEN.