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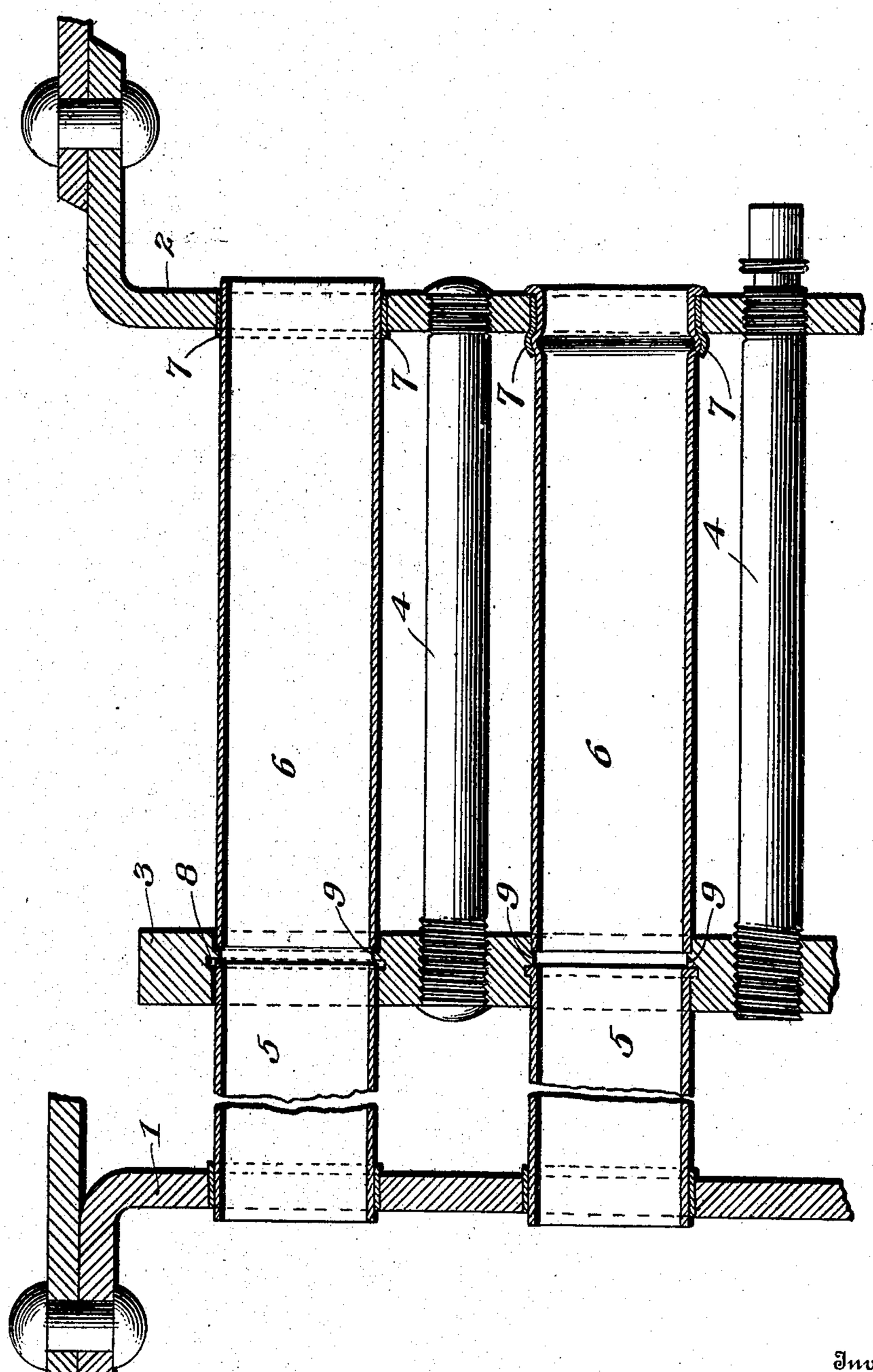
J. A. DOARNBERGER.

STEAM BOILER.

APPLICATION FILED APR. 19, 1907.



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STEAM-BOILER.

No. 885,229. Specification of Letters Patent. Patented April 21, 1908.

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To all whom it may concern:

Be it known that I, JOHN A. DOARNBERGER, a citizen of the United States, residing at Roanoke, in the county of Roanoke and State of Virginia, have invented certain new and useful Improvements in Steam-Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to certain new and useful inprovements in steam boilers and more especially such as are now almost universally used upon locomotive engines.

It is well understood by those familiar with the construction and uses of locomotive boilers that the repairs due to leaky joints between the tubes and the flue sheets constitute much the largest per cent. of the cost of maintaining locomotives in condition for efficient work. Such leaky joints have been principally due to three prominent causes, viz: the variation in expansion and contraction, the vibration of the tubes and the effect of the direct attack of the heat in the fire box upon the ends of the tubes in the flue sheets.

Many efforts have been made in the direction of improving the character of joints between the flues and flue sheets to render them tight and to avoid as much as possible the destruction of the ends of the tubes in the back flue sheet, and success to a certain extent has attended these efforts, but it is a recognized fact the heat from the fire box will of necessity and in time of greater or less duration, attack the ends of the tubes to such an extent as to render it necessary to remove such tubes and repair the same by cutting off the affected portion and welding a section of new tubing to the remaining portion then restoring them to their position. In making such repairs it becomes necessary to remove the front of the engine, the exhaust pipes, netting, spark arrester &c. before the defective tubes can be removed and in order that when repaired they may again be properly secured in place in the flue sheets. The time, labor and expense involved in such work, especially in locomotives of modern construction in which the tubes are of twenty or more feet in length is well understood by those familiar with the subject.

My invention has for its object to lessen the time and amount of labor necessary in making such repairs, and to render absolutely unnecessary the uniform practice of welding new sections to the tubes after the removal of the defective parts or ends, and my invention is rendered practicable and successful by taking advantage of features of construction involved in Letters Patent No. 823,399, granted to me on June 12, 1906, and to which special reference is made. In the construction covered by said Letters Patent, the joint between the ends of the tubes and the flue sheet is protected from the effects of undue vibration of the tubes through the medium of a reinforcing, auxiliary flue sheet tied and stayed to the main sheet by suitable bolts.

According to my present invention advantage is taken of the presence of this reinforcing and auxiliary flue sheet, and its presence constitutes one of the essential elements of my present invention, which consists in primarily forming the tubes in two sections and securing one end of each section in one of the main flue sheets, and the opposite end in the reinforcing auxiliary flue sheet, as will be hereinafter more fully set forth.

My invention further consists in the special manner hereinafter described of securing the adjacent ends of the tube sections in the reinforcing, auxiliary flue sheet.

In order that those skilled in the art to which my invention appertains may fully appreciate the advantages of the same I will proceed to describe the construction of my improved boiler referring by numerals to the accompanying drawing which represents a vertical section of a part of a boiler embodying the features of my invention and in which

1, is the front flue sheet; 2, the back flue sheet, and 3, the reinforcing auxiliary flue sheet shown and described in the Letters Patent hereinbefore referred to, and which is tied and stayed to the main flue sheet 2, by bolts 4, as therein shown, or by threading the bolts in the main, and reinforcing, auxiliary sheets as herein shown, or in any other suitable manner.

5—6, is one of my two-part tubes located within the flue sheets and in position to be permanently secured therein, and 6—7, represents such a two-part tube after it has been rolled in the reinforcing, auxiliary tube sheet and also in the back sheet.

7, represents the ordinary copper ferrules employed in making the usual joints between the tubes and the front and back sheets.

While I do not wish to be confined to any exact dimensions, I have found it desirable to make the reinforcing, auxiliary sheet 3, of one inch gage, or about double the gage of the front and back sheets. The reinforcing, auxiliary sheet is bored for the reception of the adjacent ends of the two parts of the tube, and an annular groove or recess 8, preferably rectangular in cross section, is formed and within which the extreme end of the long part of the tube extending from the front sheet is rolled as clearly shown. An annular shoulder 9, is also preferably formed to constitute an abutment for the adjacent ends of the two sections of the two part tube, but if deemed desirable this shoulder 9, may be omitted and the front end of the rear or short section of the tube may abut the rear end of the long section. When the opposite ends of the front or long section of the tube is rolled in the front sheet in any well known manner, and in the reinforcing, auxiliary sheet as shown, such section is obviously secured against independent longitudinal movement, and when the opposite ends of the short rear sections of the tube are rolled in the back, and reinforcing auxiliary sheets which are held in fixed relation with one another by the tie or stay bolts 4, the two parts of the tubes constitute practically one continuous unobstructed tube. As set forth and illustrated in the Letters Patent hereinbefore referred to the reinforcing, auxiliary sheet 3, may be tied to either or both the back and front sheets.

From the construction shown and described it will be seen that when the rear ends of the short sections of the two-part tubes become damaged they may in the usual manner be released from the back sheet and withdrawn from the reinforcing auxiliary sheet and new short sections substituted and secured in position without in any manner affecting the condition of the front or long sections of the tubes, and rendering their removal or handling in any manner or for any purpose unnecessary.

In locomotive boilers of modern construction and in which the tubes are twenty or more feet in length, when the rear ends of such tubes become damaged it becomes necessary as heretofore stated to remove the entire tube, then cut off the damaged portion and restore the tube to normal condition by welding to it a section of new tubing, testing the welded joint, removing the scale and rolling the two ends of the tube in the front and back sheets, while according to my invention and with my two-part tube, additional short sections may be kept in stock and expeditiously substituted for similar damaged sections.

I do not wish to be confined to any particular location of the reinforcing, auxiliary sheet and consequent lengths of the two sections of my two-part tube, but it is of course desirable that the reinforcing, auxiliary sheet be located as near as practical to the back sheet in order that the rear sections of the tubes may be comparatively short.

I have found from the practice of my invention as covered in the Letters Patent referred to, and in boilers of modern construction with tubes twenty feet in length it is desirable and practicable to locate the reinforcing auxiliary sheet about eight inches from the back sheet, thus rendering it necessary to use correspondingly short rear sections of the two-part tube. As indicated however herein, I do not wish to be confined in any manner to any exact dimensions of parts, or to any particular manner of securing the two ends of the two-part tubes in the main and reinforcing, auxiliary sheets, as the broad and generic feature of my invention resides in the employment of tubes made in two parts, in connection with a reinforcing auxiliary sheet located intermediate the front and back main sheets and preferably tied or bolted in fixed relation with one or both of said sheets.

Having described the construction and advantages of my improved boiler what I claim as new and desire to secure by Letters Patent is—

1. In a steam boiler provided with a reinforcing auxiliary flue sheet located intermediate the front and back main sheets and secured in fixed relation therewith; two part tubes each having one end fixed in a main flue sheet and the opposite ends fixed in the reinforcing auxiliary sheet, substantially as hereinbefore set forth.

2. In a steam boiler having a reinforcing auxiliary flue sheet intermediate the front and back main sheets and secured in fixed relation to the back main flue sheet; tubes formed of two sections secured at their outer ends within the main front and back sheets respectively, and their opposite adjacent ends secured within the reinforcing auxiliary sheet formed with an annular recess, and an adjacent annular shoulder constituting an intermediate abutment for the adjacent ends of the tube sections, substantially as hereinbefore set forth.

3. In a steam boiler provided with a reinforcing, auxiliary flue sheet intermediate

the front and back main flue sheets; two-part tubes each having one end secured in a main flue sheet and its opposite end secured in the reinforcing auxiliary flue sheet and constituting a continuous flue, substantially as hereinbefore set forth.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN A. DOARNBERGER.

Witnesses:
W. H. LEWIS,
JOHN A. PILCHER.