W. S. FERGUSON.

FEED WATER HEATER.

APPLICATION FILED MAY 3, 1909.

971,599.

Patented Oct. 4, 1910.

3 SHEETS—SHEET 1.

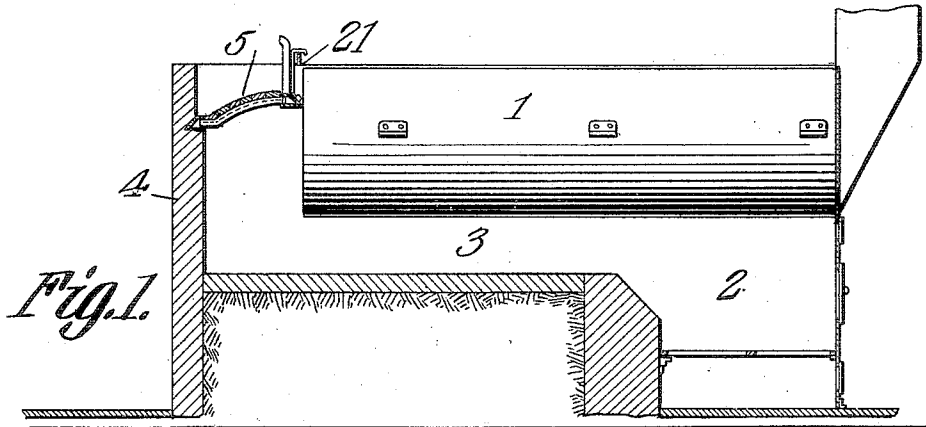

Fig. 1.

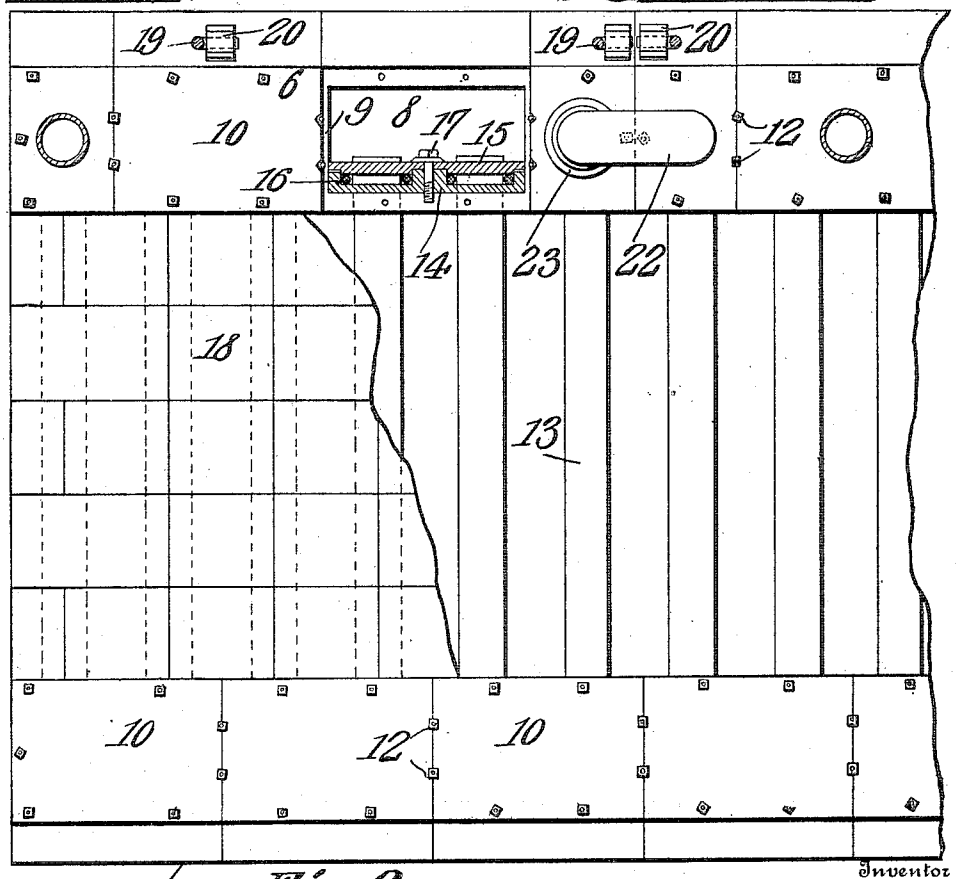

Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 3.

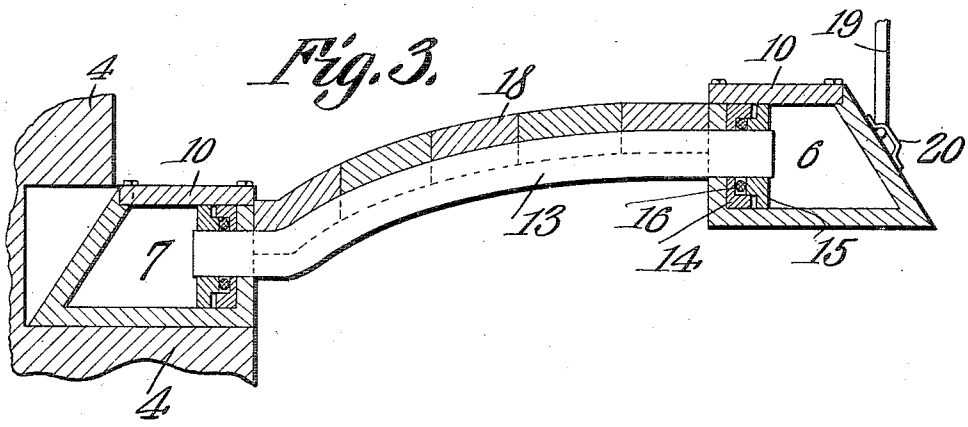


Fig. 4.

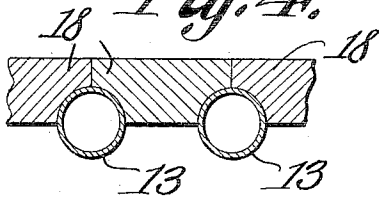


Fig. 5.

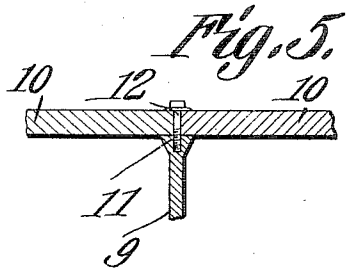


Fig. 6.

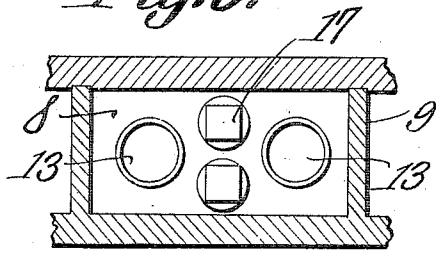
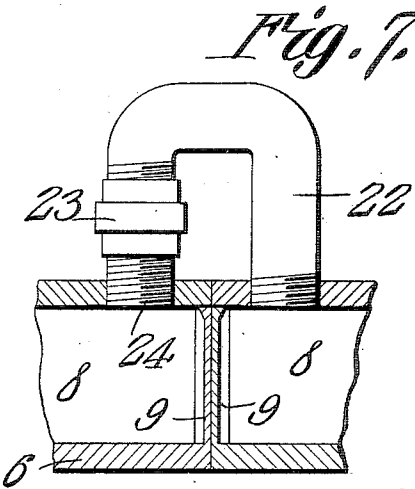


Fig. 7.



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3 SHEETS—SHEET 3.

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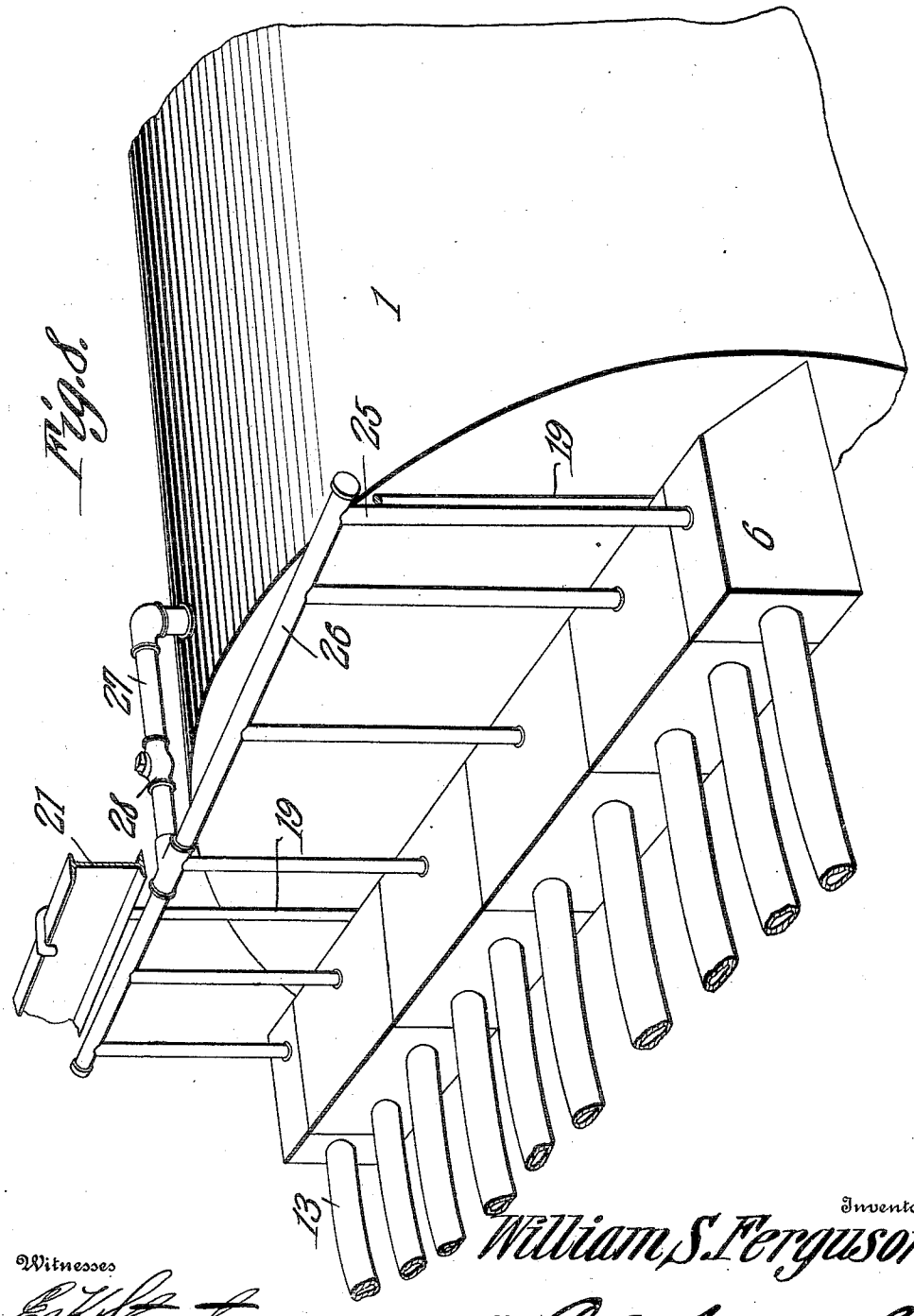

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UNITED STATES PATENT OFFICE.

WILLIAM S. FERGUSON OF LEESVILLE, LOUISIANA.

FEED-WATER HEATER.

971,599. Specification of Letters Patent. Patented Oct. 4, 1910.

Application filed May 3, 1909. Serial No. 493,610.

To all whom it may concern:

Be it known that I, WILLIAM S. FERGUSON, a citizen of the United States, residing at Leesville, in the parish of Vernon and State of Louisiana, have invented a new and useful Feed-Water Heater, of which the following is a specification.

This invention has reference to improvements in feed water heaters and superheaters and is designed to produce a structure of this character in the form of an arch bar.

By the present invention the circulating pipes for the water to be preheated or the steam to be superheated are utilized to support the arch brick so that not only is the furnace heat at this point utilized for the purposes named but the same structure is employed for directing the flames into the fire tubes of the boiler.

The invention will be best understood from a consideration of the following detail description taken in connection with the accompanying drawings forming a part of this specification in which drawings,

Figure 1 is a longitudinal section partly in elevation of a boiler and its setting with the improved arch-bar and feed water heater and superheater in place. Fig. 2 is a plan view of a portion of the arch bar embodying the present invention, with parts shown in section and parts broken away. Fig. 3 is a vertical section in the direction of the length of the circulating pipe. Fig. 4 is a cross section through adjacent circulating pipes showing the arrangement of the arch bricks. Fig. 5 is a detail section showing the manner of connecting the cover plates of the header chambers. Fig. 6 is a plan view of one of the header chambers with the cover removed showing the manner of applying a packing gland to the circulating pipes. Fig. 7 is a detail section of a means for connecting two header sections for circulation between them. Fig. 8 is a perspective view of means for relieving the arch bar from steam generated should the feed water pump be stopped.

Referring first to Fig. 1 there is shown a boiler 1 with the grate chamber 2 and fire chamber or flue 3 leading to the back of the boiler and also the back wall 4 of the boiler setting. These various features are only shown in a more or less schematic manner in the drawings since they form no part of the present invention and may be considered as illustrative only of any suitable type of boiler and setting therefor. The arch is shown generally at 5 in Fig. 1 but will be described more in detail with reference to the other figures of the drawings.

In Figs. 2 and 3 there are shown two headers 6 and 7 which may be as wide as the boiler setting or may be made of two or more sections of less lengths. Each header is divided into a longitudinal series of chambers 8 by means of end walls or webs 9 and each chamber is completed by a cover plate 10 so that access to the chambers may be had at any time by the removal of the cover plates 10. The meeting ends of two cover plates are brought into abutment over a web 9 as indicated in Fig. 5 and the web may at this point be expanded to form supporting shoulders 11. At these meeting edges each plate is formed with half cylindrical grooves so that the grooves of two plates will form a cylindrical passage for bolts or screws 12 tapped into the corresponding edge of the web 9 and therefore one screw serves to hold both plates to a web 9 at each point where a screw or bolt 12 is used. Each chamber 8, except the end chambers of one header, is entered by two pipes 13, each pipe extending from one header to the other. The chambers 8 of the two headers are arranged in staggered relation so that a pipe 13 coming from one chamber in one header will enter the next chamber in order in the other header. In this manner there is formed a continuous circulatory system from one end of the arch to the other, or from one section of the arch to the other end of the same section where the arch is made of more than one section. Each pipe 13 is curved appropriately to conform to the ordinary shape of the arch, but the ends of the pipes are straight for a distance where they enter the headers 6 and 7, the straight portion of one end of each pipe 13 being somewhat longer than the straight portion of the other end of the same pipe so that the pipes may be moved longitudinally into the chambers within the headers, the movement of the pipe in one direction being greater than that in the other in order that the pipe may be readily inserted into or removed from the headers at any point without disturbing the pipes already installed. This avoids the necessity of dismantling the arch when it becomes necessary to replace a pipe which has become worn out or damaged.

Because of the removability of the pipes

they are rendered water and steam-tight at the points of entrance into the chambers 8. This is accomplished by providing the matching side walls of the two headers with a pocketed plate 14 in each chamber 8, and this plate is made double, that is it is provided with two spaced pockets in those chambers in which two pipes enter, the pipes extending through suitable passages in the bottoms of the pockets in the plates 14. These pockets are designed to receive glands 15 preferably double glands in the chambers 8 into which two pipes enter, the glands matching the double pockets in the plates 14. These glands serve each to confine suitable packing 16 in the pockets in the plates 14 about the ends of the pipes 13 where they pass through said pockets and through the glands 15 to ultimately open into the chamber 8. Bolts or screws 17 extending through the gland 15 and pocketed member 14 between the pockets and entering the appropriate wall of the chamber 8 serve to hold the packing devices in position in the respective chambers 8. Supported by the pipes 13 are arch bricks 18 each formed along one edge with a groove of about 90° extent so that two bricks 18 in abutment will half inclose the pipe 13, or approximately so inclose the pipe.

The header 7 may be appropriately supported on the end wall 4 while the header 6 may be appropriately supported by the boiler 1 or hangers 19 engaging eyes 20 on the header 6 and in turn supported by a suitable beam 21 extending across the boiler setting may be employed for supporting the header 6 in operative relation to the boiler. The end chamber of one of the headers 6 or 7 is of only half the area of one of the intermediate chambers and of course the end chamber at the opposite end of the same header is likewise of small capacity. Leading from this end chamber is a pipe 13 communicating with the end chamber of the other header and this last named chamber communicates by another pipe 13 with the first of the larger chambers of the first named header and so the pipes extend from one chamber to the other in continuous series throughout the length of the headers or throughout the length of sections of the headers where the latter are made sectional.

When it is desired to use a sectional header but at the same time make the same practically continuous the abutting ends of the two sections of the header are formed with small chambers and these are connected by a return elbow 22 communicating with one of the smaller chambers and this return elbow is connected by a union 23 with a nipple 24 entering the other small chamber in the abutting end of the other header section. Where it is not desirable that these two header sections should communicate then the small end chambers constitute the inlet and outlet chambers for the circulation of feed water or of steam to be superheated, or where two sections are used to constitute a single header then one of the sections may be used for the heating of feed water and the other section may be used for the superheating of steam.

It will thus be seen that the invention is susceptible of a variety of uses as may be desired by the constructor.

Since the arch has one header lower than the other the end chambers of the top header may be the ones which are of small or half size and the chambers of the lower header may be all full size. Of course where the arch is made sectional a portion may be used as a feed water heater or as a superheater for steam and the other part or parts may be utilized as a plain arch.

Should the pump supplying the feed water to the arch bar cease working from any cause the water contained in the arch bar would be converted into steam and unless provision be made for the disposition of such steam there is danger of destructive action of the steam on the arch bar. For this reason each chamber 8 is provided with a riser pipe 25. All the pipes 25 are connected to a common header pipe 26 and this header 26 is connected by a pipe 27 to the boiler 1. In the pipe 27 is a check valve 28 opening toward the boiler but closing toward the header 26.

Should the pump cease to act then water in the headers 6 and 7 and the arch bar pipes 13 would be converted into steam and such steam will find escape through the pipes 25 and header pipe 26 into the boiler 1 through the check valve 28, but the latter prevents passage of boiler steam to the arch bar.

What is claimed is:—

1. In a boiler furnace, an arch bar composed of parallel curved pipes terminating in straight portions and extending in a direction longitudinal to the boiler, supporting headers into which said straight portions of the pipes enter, one header being adjacent to the boiler and the other remote therefrom, and a brick covering on and supported by said pipe between the headers.

2. In a boiler furnace, an arch bar composed of straight headers, one located at the end of the boiler and the other spaced therefrom, pipes connecting said headers and curved to conform to the curvature of the arch and terminating in straight portions entering the respective headers and a brick lining on and supported by the pipes between the headers, said brick lining being supported solely by the pipes between the headers.

3. In a boiler furnace, an arch bar composed of parallel pipes extending in a direction longitudinal to the boiler, and support-

ing headers into which the ends of the pipes enter and provided with slip bearings for the ends of the pipes, one header being adjacent to the boiler and the other remote therefrom.

4. In a boiler furnace, an arch bar composed of parallel curved pipes terminating in straight portions and extending in a direction longitudinal to the boiler, and supporting headers into which the straight portions of the pipes enter, one header being adjacent to the boiler and the other header being remote therefrom and mounted in the back wall of the furnace.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

WILLIAM S. FERGUSON.

Witnesses:
IKE WILLIAMS,
L. GOSSELLE CRAFT.