

(No Model.)

2 Sheets—Sheet 1.

F. R. McMILLAN.
CROSS WATER TUBE STEAM BOILER.

No. 475,947.

Patented May 31, 1892.

Fig. 1.

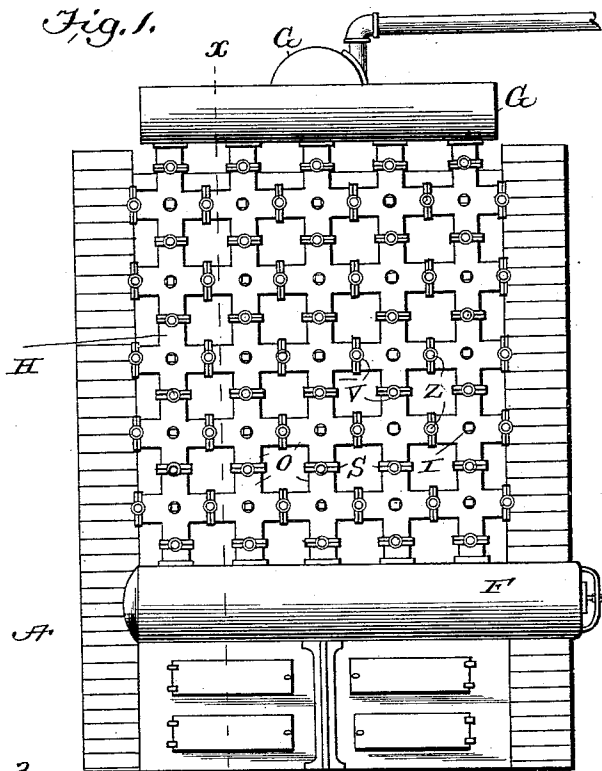


Fig. 3.

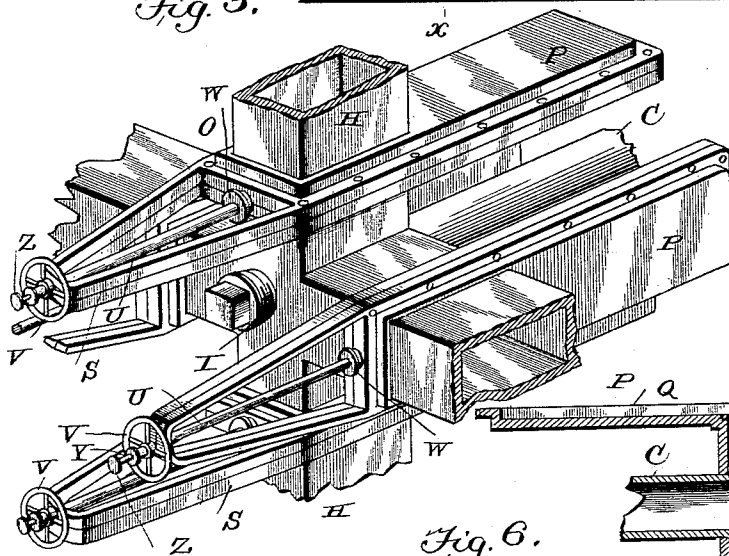


Fig. 7.

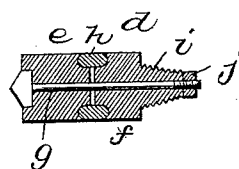
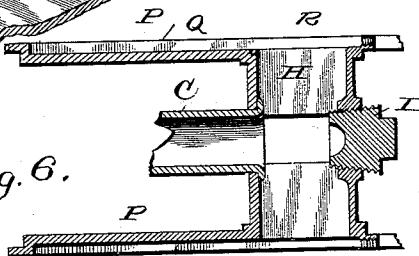


Fig. 6.



Witnesses

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John Shaw

Inventor

By Frederick R. McMillan
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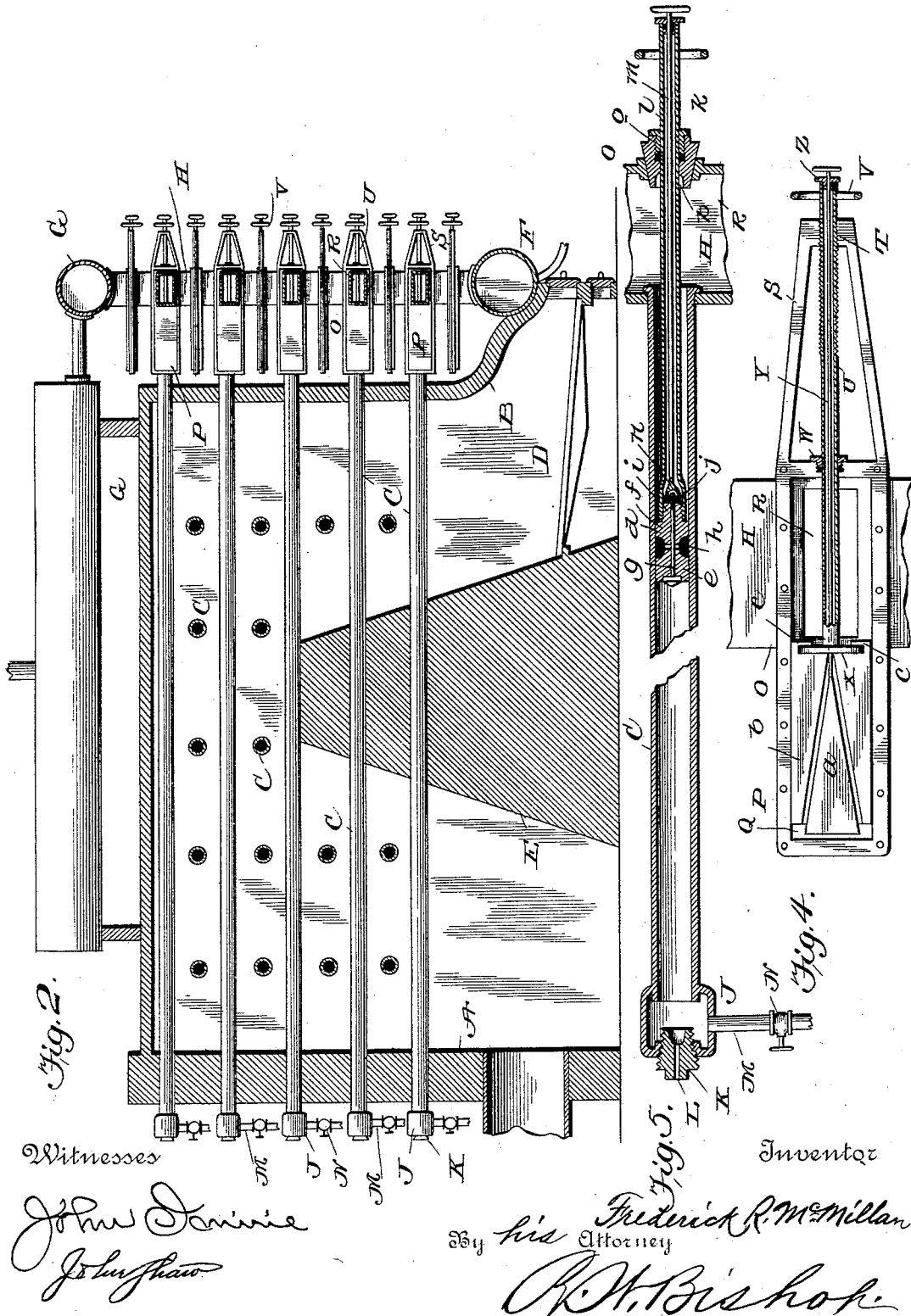
(No Model.)

2 Sheets—Sheet 2.

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CROSS WATER TUBE STEAM BOILER.

No. 475,947.

Patented May 31, 1892.



UNITED STATES PATENT OFFICE.

FREDERICK R. McMILLAN, OF JACKSONVILLE, ILLINOIS.

CROSS WATER-TUBE STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 475,947, dated May 31, 1892.

Application filed March 31, 1890. Serial No. 346,124. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK R. McMILLAN, a citizen of the United States, residing at Jacksonville, in the county of Morgan and State of Illinois, have invented new and useful Improvements in Water-Tube Steam-Boilers, of which the following is a specification.

The object of my invention is to so improve the construction of water-tube steam-boilers that a broken or worn-out tube may be removed and a new one substituted without stopping the circulation of the water or extinguishing the fire. This object I accomplish by the use of the construction illustrated in the accompanying drawings; and the invention consists in certain novel features of the same, as will be hereinafter first fully described, and then pointed out in the claims.

In the drawings, Figure 1 is a front elevation of a boiler constructed in accordance with my invention. Fig. 2 is a vertical longitudinal section of the same on the line xx of Fig. 1. Fig. 3 is a perspective view of a portion of the tube-drum. Fig. 4 is a detail view of a cut-off valve and its seat. Fig. 5 is a detail sectional view of a tube, showing the vent at the rear end of the same, the stopper in the front end of the same, and the tool for removing said stopper. Fig. 6 is a detail sectional view of the front end of the tube, and Fig. 7 is an enlarged detail view of the stopper.

In constructing a steam-boiler in accordance with my invention I employ a supporting-wall A of the usual formation, and also a front B, which may be of iron or any other suitable material, and arrange the tubes C across the boiler between the said wall and front. I also employ the usual grate-bars D and bridge-wall E, as shown. The mud-drum F is arranged at the lower end of the front, and the steam-drums G are arranged at the top of the boiler, communication between the two drums and the tubes being provided by a tube-drum H, arranged in front of the boiler-front B. The ends of the tubes are extended beyond the wall A and the front B, and their front ends are expanded into the tube-drum, as shown most clearly in Figs. 5 and 6. The tube-drum is provided opposite the front ends of the tube with openings in which are seated plugs I, the purpose of which will be hereinafter set forth. On the rear end of each tube

I secure an elbow or T J, which is provided with a plug K, having a small vent L, and from which a pipe M, provided with a valve N, leads downward.

The tube-drum H consists of a series of sections O, which may be bolted together or which may be intimately joined by casting, as preferred, and correspond in number to the tubes. The sections are provided with the rearward extensions P, which are provided with the grooves Q, forming valve-seats for the valves presently described, and in advance of the said extensions of the main body the sections is provided with openings R to permit the proper circulation of the water. Extending forward from the sections are the converging brackets or supporting arms S, which meet in an interiorly-threaded nut T, as shown. Within this nut I mount the exteriorly-threaded hollow stem U, which is provided with a hand wheel or handle V at its outer end and passes into the sections through a stuffing-box W in the front end of the section and is provided at its rear end with an annular flange or collar X, as shown. Within this hollow stem I provide a rod Y, having a nut Z on its front end, which is adapted to be turned up against the handle V to secure the said rod in its proper position. The rear end of the rod Y projects slightly beyond the stem U and is secured rigidly to a wedge-shaped plate a , which fits between and is adapted to act on the wedge-shaped plates b , which are provided at their front ends with lugs c , adapted to engage over the collar or flange X, as shown. These plates b rest in the valve-seats Q, so that they can slide easily forward to close the opening H.

In Figs. 5 and 7 I illustrate the manner of preventing the flow of water from the tube to the tube-drum while the new tube is being secured in place. A stopper d is fitted in the tube near the front end of the same, so as to prevent the water escaping therefrom, and this stopper is of a peculiar construction. The said stopper consists of two plates or cylindrical blocks $e f$, which are connected by a stem g and have their adjacent ends beveled, so as to form a seat for an elastic ring or cushion h , as shown. The front end of the block f is provided with a threaded boss i and the end of the stem g projects through and

beyond the said boss, a nut *j* being mounted on the end of the stem and adapted to be turned up against the boss, so as to force the blocks together, and thereby expand the ring against the tube. When it is desired to remove the stopper, I bring into play the removing-tool *k*, which consists of an outer hollow stem *l*, which is provided at its inner end with internal screw-threads adapted to engage the boss *i*, and a solid rod *m*, mounted within the said stem and provided at its inner end with a socket *n*, adapted to engage the nut. This removing-tool is mounted in a stuffing-box *o*, which takes the place of the plug I when the tool is in use. The said stuffing-box is provided in its inner side with a recess *p*, adapted to receive the stopper after it has been withdrawn from the tube. Ordinarily the openings in the front side of the tube-drum are closed by the plugs I, and the valves N are closed. The several tubes and the tube-drum being then filled with water and a fire kindled in the furnace, steam will be generated in the usual manner and will pass into the steam-drum. Should an accident happen to one of the tubes or it should become burned out or otherwise rendered inoperative, the valves in the extensions of the tube drum are drawn forward and expanded so as to cut off the flow of water from the front end of the said tube, and the valve N in the pipe M is opened, so as to draw off the water in the said tube. The plug in front of said tube is then removed and the front end of the tube cut away from the tube-drum. The tube is then removed from the boiler and a new one put in place. Before the new tube is inserted, however, a stopper is fitted therein near the front end thereof, and the tube is filled with water, so as to prevent its being unduly heated or burned out while being inserted in position and secured. The front end of the new tube is then expanded against the tube-drum, so as to be secured in position, after which the rod Y is pushed slightly rearward, so as to loosen the sliding valve, and the stem U is then turned so as to push the said valve into the rearward extension P, thus letting the water flow into the front end of the tube. At the same time additional water-pressure is applied through the rear end of the tube, so as to prevent the stopper from being blown out. Before the sliding valves have been opened the removing tube is inserted into the tube and its stuffing-box *o* is secured in the opening in the front of the tube-drum, as will be readily understood. The hollow stem of the removing tube is rotated so that its threads cause it to be securely fastened to the boss at the front end of the stopper and the socket at the inner or rear end of the rod *m* is caused to engage the nut *j*. The said rod is then rotated so that the socket will loosen the nut, when the two blocks will be separated slightly by the pressure of the elastic ring, and the ring thus released from the tube. The stem is then drawn forward so that

the stopper will be removed through the front end of the tube and brought into the recess in the plug *o*, where it is allowed to remain until the boiler is shut down or the tube cleaned.

From the foregoing description, taken in connection with the accompanying drawings, it will be seen that I have provided an extremely simple construction for steam-boilers by which any one tube may be easily removed without in any way affecting the circulation of water to the other tubes or extinguishing the fire. It will be observed that in order to shut off any one tube it is necessary only to draw forward and close four sliding cut-off valves, when the circulation through the particular tube will be stopped without affecting the circulation through any of the other tubes. The sliding valves are very simple in their construction and operation, the entire valve being drawn bodily forward and the central member then given a slight pull to spread the valve and form a steam-tight closure. The plug at the rear end of the tube not only provides a vent for the escape of the steam generated in the said tube while being fitted in place, but also aids the cleaning of the tube, as by removing the said plug the steam will be allowed to escape through the rear end of the tube and all sediment and impurities thus blown out.

My construction of boiler effects a great economy of time, and its advantages are thought to be obvious.

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

1. A steam-boiler provided with a tube-drum on its front side, independent tubes having their front ends secured in the said tube-drum and their rear ends provided with vent-plugs and waste-pipes, and valves in the drum to control the flow of water to the tubes.

2. A steam-boiler having a tube-drum on its front side, independent tubes having their front ends secured in the said tube-drum, and sliding cut-off valves mounted in the tube-drum and adapted to cut off the water in the drum from the front end of any one tube.

3. In a steam-boiler, the combination of a tube-drum, a tube having its front end secured in said drum, a plug in the front side of the drum opposite the end of the tube, and sliding cut-off valves mounted in the drum around the front end of the tube.

4. The combination of the tube-drum provided with rearward extensions, a tube having its front end secured in said drum between said extensions, sliding valves resting normally in the rearward extensions of the drum, and means for drawing said valves forward to cut off the water from the tube.

5. The combination of a tube-drum, a tube having its end secured thereto, sliding valves mounted in the drum and surrounding the end of the tube, supporting-arms projecting forward from the drum, and operating-rods

mounted in said arms and acting on the sliding valves.

6. The combination of a tube-drum, a tube secured therein, a sliding valve consisting of
5 three wedge-shaped plates mounted in the drum, a stem projecting from the drum and adapted to draw the valve forward, and a rod mounted in said stem and adapted to pull on the middle plate to expand the valve.

10 7. In a boiler of the character described,

the stopper-removing tool provided with a stuffing-box *o*, adapted to be fitted in the tube-drum and consisting of a stem *l*, adapted to engage the stopper, and a rod *n*, adapted to release the stopper from the tube.

FREDERICK R. McMILLAN.

Witnesses:

CHARLES L. ROUTT,

CATHARINE M. McMILLAN.

Correction in Letters Patent No. 475,947.

It is hereby certified that in Letters Patent No. 475,947, granted May 31, 1892, upon the application of Frederick R. McMillan, of Jacksonville, Illinois, for an improvement in "Cross Water-Tube Steam-Boilers," an error appears in the printed specification requiring correction, as follows: In line 65, page 1, the word "of" after the word "extensions" should be stricken out and inserted after the word "body" in same line and same page; and that the Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 7th day of June, A. D. 1892.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

W. E. SIMONDS,
Commissioner of Patents.