(No Model.)

W. F. WEST.

BOILER.

No. 533,258. Patented Jan. 29, 1895.

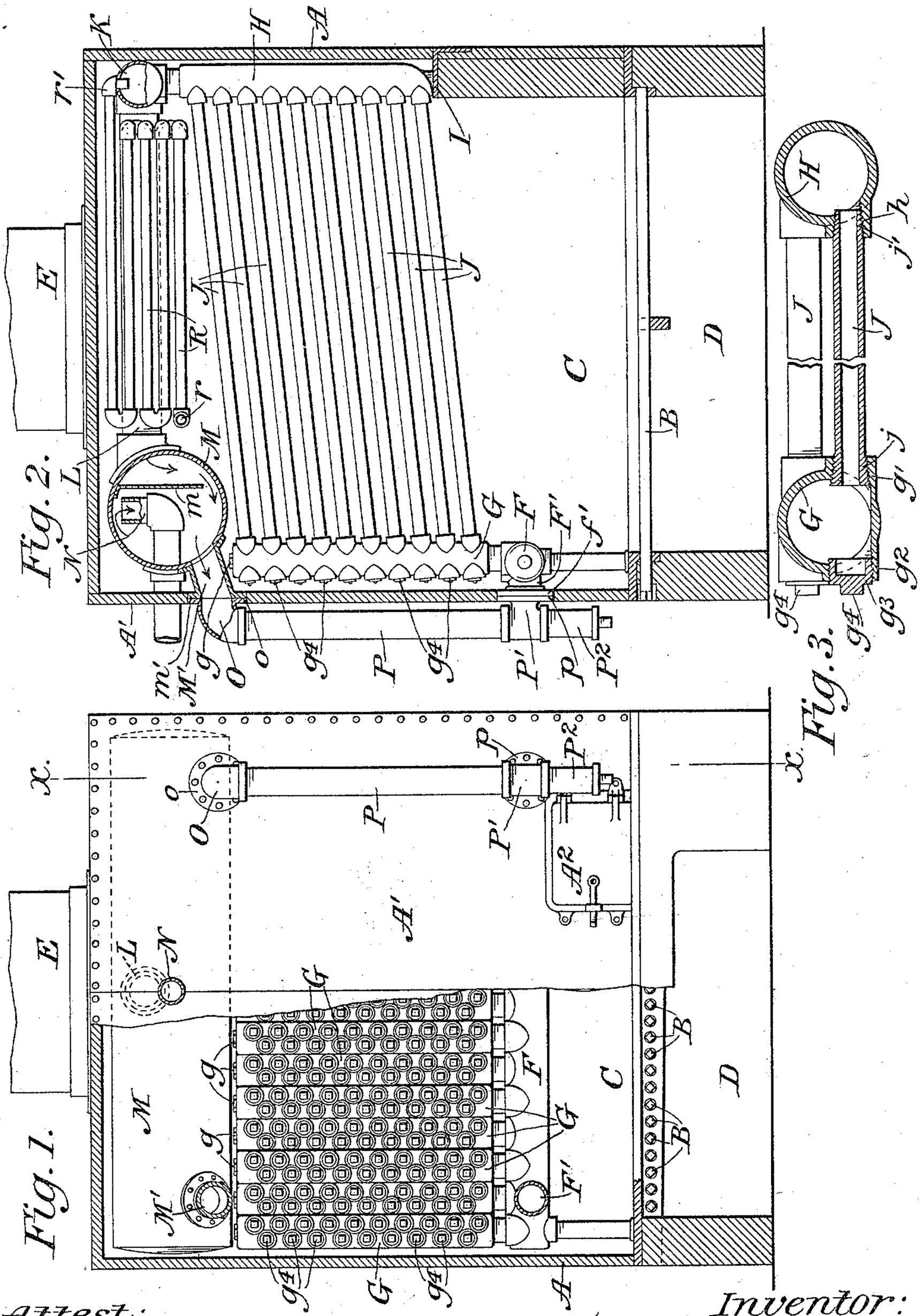

Fig. 2.

Fig. 3.

Fig. 1.

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BOILER.

SPECIFICATION forming part of Letters Patent No. 533,258, dated January 29, 1895.

Application filed October 31, 1894. Serial No. 527,512. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM FRANK WEST, of the city, county, and State of New York, have invented certain new and useful Improvements in Boilers; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

This invention relates to steam boilers of the class commonly known as water-tube boilers and particularly to boilers of this class which are adapted for marine use.

The object is generally to improve the construction of such boilers and especially to produce a boiler which shall be compact and of light weight and shall have all of its generating tubes of standard size and gage, of the same length, and so arranged that they can be removed from the front of the boiler without getting access to the sides or rear, whereby any of the tubes can be removed and replaced with the usual skill and tools to be found on a steamer at sea and even without drawing the fire. The construction devised also secures large grate and heating surface as compared with the cubic space occupied and therefore admits of building to suit a given space without affecting the efficiency of the boiler.

The various features of improvement will be set forth fully hereinafter.

In the accompanying drawings: Figure 1 is a front elevation of the improved boiler with a portion of the front of the shell and other parts removed to show the interior arrangement more clearly, the shell and the connections for one of the down-flow pipes being shown in section. Fig. 2 is a longitudinal section on the plane indicated by the line *x*—*x* of Fig. 1. Fig. 3 is a horizontal section through a pair of headers and one of the connecting water-tubes, the scale of this figure being larger than that of Figs. 1 and 2 and parts being broken out to save space.

The boiler proper is inclosed within a suitable shell or casing A which may have in its lower portion a grate B, combustion chamber C and ash-pit D and may have at the top a suitable connection E for the smoke-stack. The front A′ of the shell is provided with doors, as at A^2, and supports the gages and try-cocks in the usual manner. The front A′ is also arranged so that it may be removed readily to give access to the parts inclosed by it. In the lower front portion of the space inclosed by the shell A′ is supported a horizontal manifold F from which spring vertical manifolds or headers G, G, the same preferably being arranged in close proximity to one another along the whole length of the horizontal manifold F. The upper end of each header G may be closed by a suitable plug *g* which will permit access to the interior when necessary. At the rear of the space inclosed by the shell A are corresponding vertical manifolds or headers H, H, which are supported by a suitable shelf or bracket I, preferably in slightly higher positions than the front headers to give the proper use to the water-tubes. The headers G and H of each pair, front and rear, are connected by a series of water-tubes J, J, the tubes preferably being arranged in a double row and staggered to permit a large number of tubes to be employed. These tubes and the manner of securing them to the headers will be described more particularly hereinafter.

The several headers H, H, are closed at their lower ends and at their upper ends are connected to an upper horizontal manifold K which is connected in turn by a pipe or pipes L with the steam drum M. The latter is provided with a shield or deflector *m* and is suitably connected to the steam outlet N. The drum M is disposed transversely within the shell of the boiler and near each end has a suitable connection M′ for the down-flow pipes, the connection piece M′ having a vertical flange *m′* to which the corresponding flange *o* of the elbow O may be bolted in the plane of the front A′ of the shell. Each down-flow pipe P is also connected to the corresponding end of the horizontal front manifold F in a similar manner by means of connection pieces P′ and F′ which have flanges *p* and *f′* respectively to be bolted together in the plane of the shell. In this manner it becomes possible to remove the front A′ of the

boiler with little difficulty by first removing the down-flow pipes and disconnecting the gages and try-cocks which are not shown. At the lower end and in line therewith each down-flow pipe is provided with a settling or mud-drum P^2 to receive sediment which can then be discharged in the usual manner by means of suitable cocks not shown. The deposition of sediment is facilitated by locating the mud-drums or removable front A′ in direct line with the discharge from the steam drum, and by protecting the down-flow pipe and the mud-drum from excessive heat by the interposition of a shield, such as the shell A′, between the same and the combustion chamber.

As suggested above the water-tubes J, J, are straight and of uniform length and are so arranged that they may be withdrawn without difficulty from the front of the boiler without having access to the sides or rear of the boiler. To this end each header G is provided with a boss g' on its rear side to form the seat for the water-tube and on its front side with a boss g^2 which affords an opening of greater diameter than the greatest diameter of the water-tube at any point so that each water-tube may be passed bodily through the opening in the corresponding boss g^2 in either direction. When the tube has been inserted the aperture through the boss g^2 is closed by a screw-threaded plug g^3 which is provided with a polygonal or other suitably shaped head g^4 for engagement by a suitable tool. It will be obvious also that if the tube J is to be withdrawn or replaced while the headers G and H are in position it must be passed through the opening in the boss g'. For this purpose I prefer to enlarge the outer end of the tube, as at j, and to taper the enlarged portion, as indicated in a somewhat exaggerated manner in Fig. 3, so that the aperture through the boss g' may be greater in diameter than any other portion of the tube, the enlargement and its seat being suitably screw-threaded. It is desirable also, of course, that the end j' of the tube should be correspondingly tapered and screw-threaded to engage its seat in the box h of the header H simultaneously with the engagement of the other end with its seat. It will be obvious that by these means any tube can be removed and replaced easily from the front of the boiler whenever required and that the joints between the newly inserted tube and the headers may be made tight without difficulty.

In the rear of the steam drum M is supported the feed-water heater R which consists of tubing as usual and which may be connected to the pump through a suitable connection as at r. The extremity r' of the tubing which forms the feed-water heater is connected to the rear horizontal manifold K at the top and is directed downwardly so that the feed-water may be mingled with and have its temperature raised by the mingled steam and water which rises from the headers H, H, and is then carried along through the pipe or pipes L so that by the time the feed-water has reached the drum M its temperature will have been raised to such a degree as not to reduce the temperature of the steam within the drum M.

It will be seen from the foregoing description that the improved boiler is simple, inexpensive and strong in construction, may have its tubes removed and replaced without difficulty, facilitates the rapid circulation of the water, delivers dry steam, and possesses a very large extent of grate surface and of heating surface for the cubic space occupied.

I claim as my invention—

1. In a boiler, the combination of the steam drum having on its front side connection pieces with vertical flanges, a front horizontal manifold having on its front side connection pieces with vertical flanges, an inclosing shell having a removable front in the plane of said flanges, downflow pipes having connection pieces bolted to the flanges of the connection pieces of the steam drum and manifold, and headers, tubes and pipes between said manifold and steam drum, substantially as shown and described.

2. In a boiler, the combination of a front horizontal manifold, vertical front headers springing from said manifold, vertical rear headers, water-tubes connecting the pairs of headers, a rear horizontal manifold to which the upper ends of the rear headers are connected, a steam drum connected to said rear manifold and downflow pipes connecting the steam drum with the front manifold, substantially as shown and described.

3. In a boiler, the combination of a front horizontal manifold, vertical front headers springing from said manifold, vertical rear headers, tubes connecting said headers, a rear horizontal manifold to which the upper ends of the rear headers are connected, a steam drum connected to said rear manifold and said front manifold, and a feed-water heater connected to said rear manifold and having its extremity directed downwardly against the steam and water rising in said rear headers, substantially as shown and described.

4. In a boiler, the combination of a front horizontal manifold, vertical front headers, springing from said manifold, each front header having openings in its front and rear, the opening in the front being of larger diameter than that in the rear, vertical rear headers having openings in their front sides, water tubes passed through the front openings of the front headers and seated at their front ends in the rear openings of the front headers and at their rear ends in the front openings of the rear headers, plugs closing the front openings in the front headers, a steam drum and connections between said

drum and the front and rear headers, substantially as shown and described.

5. In a boiler, the combination of a front horizontal manifold, front headers springing from said manifold, rear headers, water-tubes connecting the headers, a rear manifold connected to the upper ends of said headers, a steam drum connected to said rear manifold, a downflow pipe connecting said drum to the front manifold, said downflow pipe being outside of the shell and extended below its connection with the front manifold to form a mud-drum, and a shield interposed between the combustion chamber and the down-flow pipe and mud-drum substantially as shown and described.

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

WILLIAM F. WEST.

Witnesses:
A. WIDDER,
A. N. JESBERA.