

H. W. RICE.
Steam-Boilers.

No. 146,614.

Patented Jan. 20, 1874.

Fig. 1.

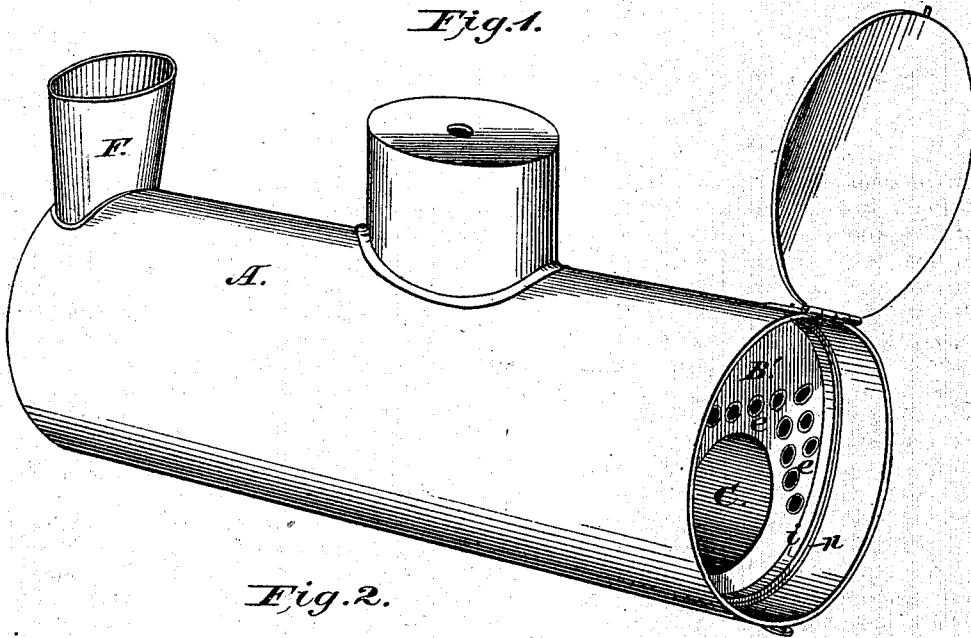


Fig. 2.

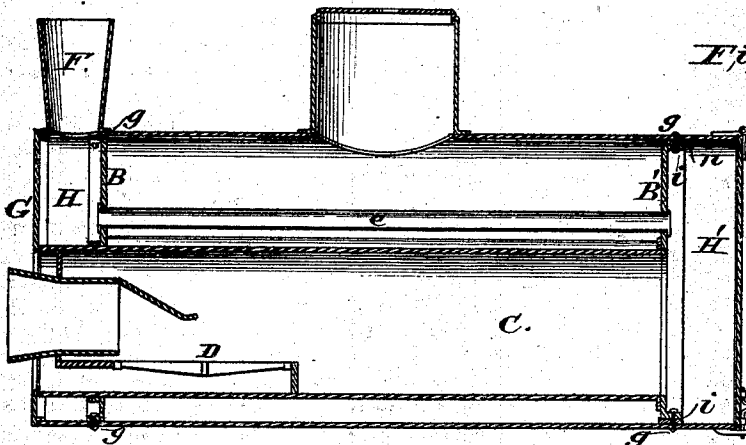


Fig. 3.

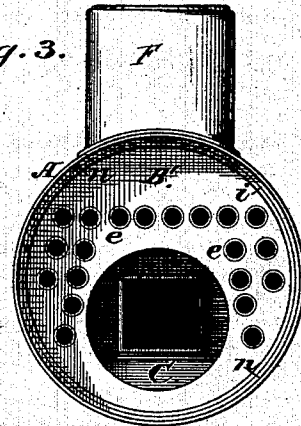


Fig. 4.

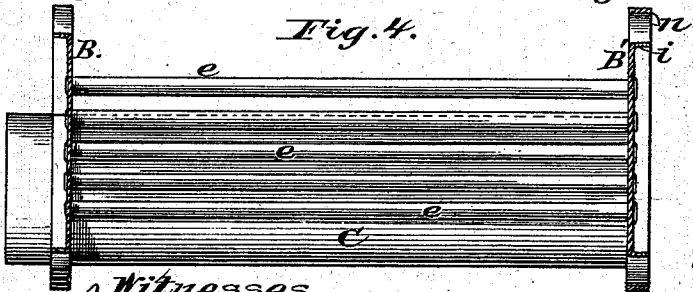
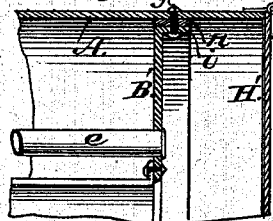


Fig. 5.



Witnesses.

John L. Boone.
C. M. Richardson,

Inventor.

Harvey Wood Rice.
By Dewey & Co.
Attys.

UNITED STATES PATENT OFFICE.

HARVEY W. RICE, OF HAYWOOD, CALIFORNIA.

IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. **146,614**, dated January 20, 1874; application filed November 3, 1873.

To all whom it may concern:

Be it known that I, HARVEY WOOD RICE, of Haywood, Alameda county, State of California, have invented new and useful Improvements in Steam-Boilers; and I do hereby declare the following description and accompanying drawing are sufficient to enable any person skilled in the art or science to which it most nearly appertains to make and use my said invention without further invention or experiment.

My invention relates to certain improvements in the construction of steam-boilers, whereby I am enabled to utilize straw and other light substances for fuel, so that a complete combustion of the smoke is attained, and the danger from fire in harvest-fields, where these boilers are more especially useful, is entirely obviated; and to a novel method of securing the tubes and tube-sheets within the shell of the boiler, so that they can be at any time easily removed for the purpose of cleaning or repairing, and at a much less expense than is ordinarily entailed for such work.

Referring to the accompanying drawings for a more complete explanation of my invention, Figure 1 is a perspective view, exposing the tube-sheet at one end of the boiler. Fig. 2 is a longitudinal section. Fig. 3 is an end view with rear head removed. Fig. 4 shows the tube and tube-sheet removed. Fig. 5 is an enlarged view, showing the rear tube, sheet-flange, and ring.

A is the shell of my boiler, which is more especially intended to be used for that class of engines employed in thrashing and other field work where there is straw or other light material enough for fuel, but which has never been satisfactorily burned without an artificial draft or blast, and which has always been dangerous by reason of the sparks thrown out on account of incomplete combustion. In order to remedy these faults, and perfectly consume all the smoke and sparks, I perforate my tube-sheets B B, so as to admit one large tube, C, near the bottom, which receives the fuel upon a grate, D, and acts at the same time as a tube and fire-box. Any suitable feeder may be employed to supply straw to the grate; but I have found the de-

vice patented by D. Morey, June 20, 1873, to be very suitable. Above and around the sides of the large tubes C I place small or locomotive-boiler tubes *e e*, as shown, and these serve to return the heat and the products of combustion to the chimney F, which is located at the front end of the boiler, and communicates with the chamber H, formed between the flue-sheet and the head or door G. A similar chamber, H', is formed at the back end of the boiler, into which the products of combustion pass from the large flue C before entering the return-flues *e*.

By this construction the light fuel is thoroughly ignited in its passage through the large tube, which has plenty of air admitted for the purpose. The heat and flame will be concentrated in returning through the small flues, and the combustion will be so complete that no sparks and but very little smoke will escape from the chimney, and this latter will not even need a bonnet.

The tube-sheets B B are made with a flange, *i*, which is turned outward, and these flanges are pierced, so as to admit screw-bolts or rivets *g*, as may be preferred. These bolts secure the tube-sheets in their places perfectly steam and water tight.

Whenever, by reason of long use, there is a collection of scale or sediment, or if the tubes or the interior of the boiler need repairing, the screw-bolts can be removed; or, if rivets are used, they can be cut off, when the two tube-sheets with the tubes can be removed from the shell in a body, and repairs or cleaning can be easily effected with much less time and trouble than when the boilers are made in the ordinary manner. The flange on the rear tube-sheet is turned so much smaller than the interior of the shell that an iron ring, *n*, can be introduced between it and the shell, the bolt passing through it. When it is necessary to remove the tubes and sheets, this ring can be taken out after removing the nuts and rivets, and this leaves the rear tube-sheet small enough to pass any rivets or obstructions freely when taking it out.

By this construction I am enabled to make a boiler and furnace in which straw can be used as a fuel with perfect safety, and in which repairs can be easily effected.

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

In a horizontal steam-boiler, the large tube C, formed with a grate, D, to serve as a fire-place, in combination with small return-flues *e e*, when the tubes and tube-sheets are secured by flanges *i* and bolts *g*, so as to be re-

movable from the shell in a body, substantially as and for the purpose set forth.

In witness whereof I hereunto set my hand and seal.

HARVEY WOOD RICE. [L. S.]

Witnesses:

C. M. RICHARDSON,
JOHN L. BOONE.