

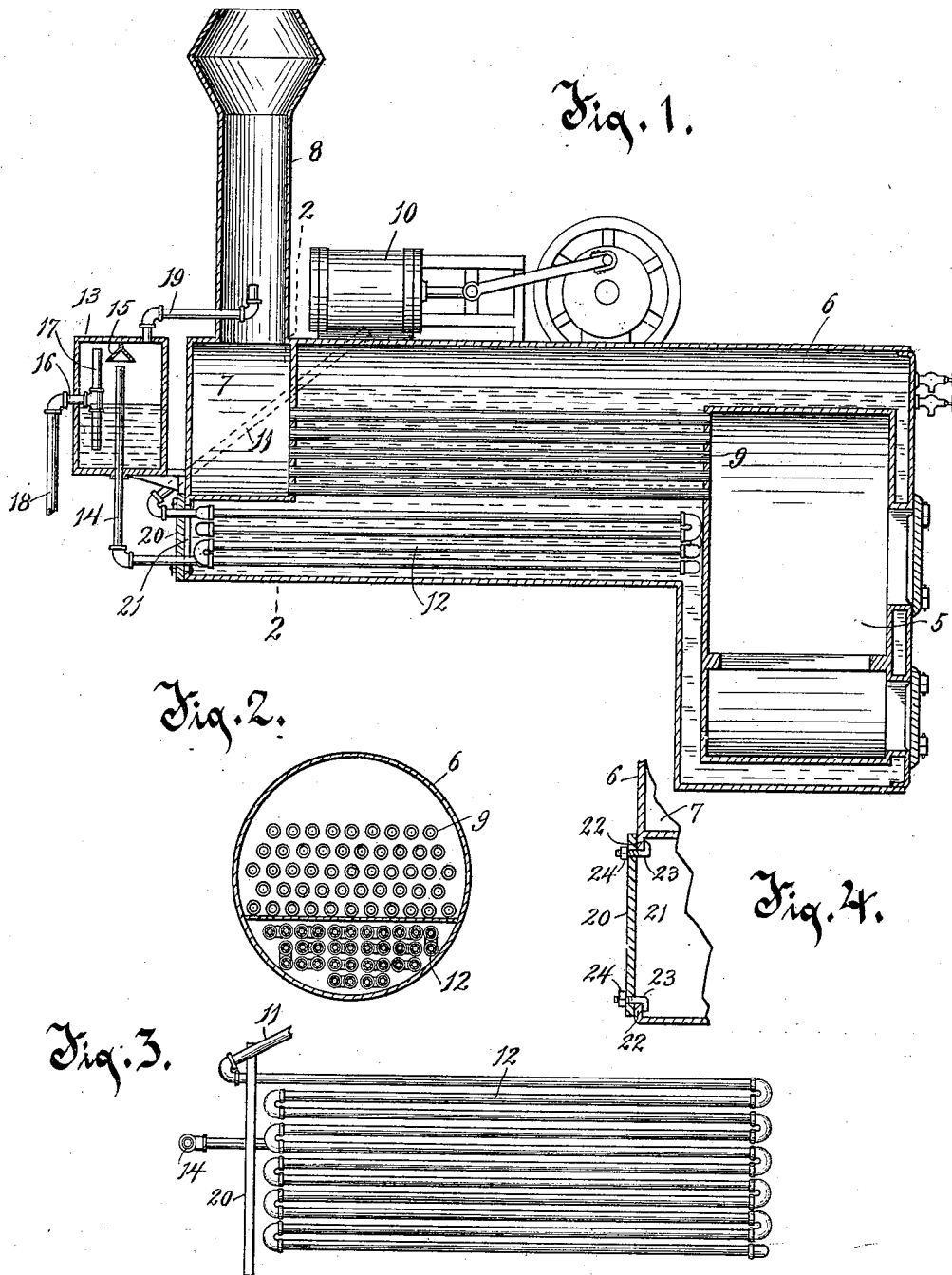
No. 627,763.

Patented June 27, 1899.

J. M. SAILER.
BOILER.

(Application filed Dec. 20, 1897.)

(No Model.)



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UNITED STATES PATENT OFFICE.

JOHN M. SAILER, OF JANESVILLE, WISCONSIN.

BOILER.

SPECIFICATION forming part of Letters Patent No. 627,763, dated June 27, 1899.

Application filed December 20, 1897. Serial No. 662,544. (No model.)

To all whom it may concern:

Be it known that I, JOHN M. SAILER, of Janesville, in the county of Rock and State of Wisconsin, have invented a new and useful Improvement in Boilers, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

My invention has relation to improvements in boilers.

It is the object of the invention to provide an improved construction for utilizing the exhaust-steam from the engine for the purpose of assisting in heating the water within the boiler, and thereby generating more steam, and at the same time through the action of the hot feed-water within the boiler causing the exhaust-steam to be thereby condensed, and to further provide improved means for conducting the water of condensation resulting therefrom back into the boiler to augment the amount of feed-water therein, whereby a saving both in fuel and in water is effected.

With the above and other incidental objects in view the invention consists of the devices and parts or their equivalents, as hereinafter more fully set forth.

In the accompanying drawings, Figure 1 shows in longitudinal section an ordinary form of agricultural boiler with my improvements applied thereto. Fig. 2 is a section on the line 2 2 of Fig. 1. Fig. 3 is a detail view of the coils for the exhaust-steam, and Fig. 4 is an enlarged sectional detail showing means for fastening the end piece to the boiler.

Referring to the drawings, the numeral 5 indicates the fire-box, 6 the boiler proper, and 7 a chamber at the forward end of the boiler, from which chamber the smoke-stack 8 extends.

The numeral 9 indicates the flues, which extend longitudinally through the boiler and connect the fire-box with the forward chamber 7.

The numeral 10 indicates an ordinary form of engine-cylinder into which steam is admitted from the boiler in the usual and well-known manner.

The parts just explained relate to the ordinary form of agricultural boiler, and hence require no further description.

My improvements will now be specifically referred to. The exhaust-steam from the engine-cylinder is shown as being capable of being conducted therefrom by means of a pipe 11. This pipe at its lower end is connected to a coupling, and to the other end of this coupling is connected the initial tube of a series of exhaust-steam tubes 12. These exhaust-steam tubes are preferably located at or near the bottom of the boiler beneath the fire-flues 9, where the feed-water is introduced, and are preferably arranged in the manner most clearly shown in Figs. 2 and 3, wherein they are illustrated as arranged in a series of horizontal planes one above the other, the terminal tube in each horizontal series being connected to the tube immediately below, and so on throughout the series.

While I herein show a series of exhaust-steam coils in the boiler for receiving the exhaust-steam from the engine-cylinder, yet I do not wish to be understood as limiting myself thereto, as any suitable form of closed passage for the exhaust-steam to prevent said exhaust-steam from entering directly into the boiler will answer the purpose.

In front of the boiler is a water-reservoir 13, and one of the tubes of the lowest series of exhaust-steam tubes extends outwardly through the front of the boiler and is coupled to an upright pipe 14, which extends upwardly into the water-reservoir for a desired distance. Depending from the top of the water-reservoir and located just above the discharging end of the tube 14 is a deflector 15, preferably of conical form. The water in the reservoir normally stands at about the level illustrated in the drawings. Extending through one side wall of the reservoir is a nipple 16, which is coupled to an upright tube 17, said upright tube extending downwardly into the water for a desired distance below the surface of the water and the upper portion of said tube extending a desired distance above the surface of the water, so as to provide an air-vent. Coupled to the outer end of the nipple 17 is a pipe 18, which is connected to any suitable force-pump or other suitable device for forcing the water in the pipe 18 back to the bottom of the boiler.

The numeral 19 indicates the usual pipe

leading from the water-reservoir into the smoke-stack for the purpose of conducting surplus steam to the exterior.

In the operation of my invention the exhaust-steam is forced from the engine-cylinder on the reverse reciprocation of the piston within said cylinder through the exhaust-pipe 11 into the exhaust-steam tubes 12. It circulates through the coils of these tubes, and the heat radiating therefrom assists to a great extent in heating the feed-water in the bottom of the boiler, which water, of course, has the lowest temperature, with the result that the heating of said feed-water is not entirely dependent upon the products of combustion passing through the fire-flues 9. By this augmented heating of the water it will also be obvious that more steam is thereby generated. It will of course be obvious that a certain proportion of the exhaust-steam passing through the coils will become condensed, and the water of condensation, together with the steam which has not been condensed, will pass upwardly into the tube 14 and be discharged into the reservoir 13. The steam issuing out of the tube 14 will strike the deflector 15 and be forced downwardly to the water, and thereby also condensed. Any surplus steam, however, is free to pass out of the pipe 19. The water in the reservoir is forced upwardly into the tube 17, thence through the nipple 16 into the pipe 18, and is forced through said pipe back into the bottom of the steam-boiler to augment the feed-water contained within said boiler. Under ordinary circumstances all the water introduced into a boiler to replenish the supply of feed-water is generally in a cool condition, and consequently reduces the temperature of the water within the boiler. By my construction, however, this water of condensation from the exhaust-steam is still in a hot condition, and it therefore follows that when it enters the bottom of the boiler instead of reducing the temperature of the feed-water in the bottom of the boiler, which water in the bottom of the boiler is of course cooler than the volume of water above, it has an opposite effect—that is to say, it adds to the temperature of the water within the boiler. By this process it is obvious that a saving is effected in both fuel and water. From the fact that the upright tube extends downwardly for quite a distance below the surface of the water within the reservoir 13 the water forced up into said tube and back to the boiler in the manner just explained is clear of all grease or other floating sediment which generally accumulates on the top surface of the water.

In further explanation of the operation of my invention I would state that with the water which is saved by condensing part of the exhaust-steam I mix or introduce a certain amount of cold water in order to maintain the proper supply in the boiler. The pipe 18, as previously explained, is connected to any suit-

able force-pump or other suitable device for forcing the water of condensation into the bottom of the boiler. The cold-water supply may also be introduced by the same or by a separate forcing means, as desired, and said water thereby forced into the bottom of the boiler. The effect of the cold water is of course to lower considerably the temperature of the water in the bottom of the boiler. As heat rises, it is evident that if heat is applied only by means of flues, such as 9, passing through the center of the boiler the water will be heated only as it passes up through or around the flues 9, and the result is that steam will be in the upper part of the boiler and cold water in the bottom of said boiler, provided, of course, that steam is continuously used from the top and cold water pumped into the bottom of the boiler. Now in my improved construction the water pumped in to supply the boiler cannot come into contact with any surface that is heated by fuel until said water has passed through the space occupied by the coils 12, which are used for the exhaust-steam, and as the exhaust-steam has a temperature considerably above the boiling-point, and as the other and cooler water fed in must be below the boiling-point, it is obvious that the exhaust-steam in the coils will heat the other and cooler water introduced, as described, into the bottom of the boiler, and that also the other results hereinbefore referred to will be accomplished.

I do not wish to be understood as restricting myself to the details of construction herein shown and described. It is obvious that the invention is equally applicable to boilers for almost any form of engine—such as the boilers of locomotive, marine, stationary engines, &c.—or, in fact, for any purpose where a steam-boiler is used to obtain power. It therefore follows that the particular arrangement of exhaust-coils herein shown and described is not necessary nor any of the other particular features shown. The exhaust-coils, for instance, in an upright boiler might consist of a coil of pipe passing around just inside of the shell or around the fire-box. The generic feature of my invention, it will be understood, is the conducting of the exhaust-steam from the cylinder into the exhaust-coils for closed passage within the bottom of the boiler where the feed-water is introduced. This sets forth the invention in its broadest significance, and where the water of condensation of the exhaust-steam is desired to be conducted back to augment the amount of feed-water in the boiler the invention further comprehends a connection between the exhaust-steam coils or passage in the bottom of the boiler and the space in the bottom of said boiler in which the feed-water is contained.

In Fig. 4 I show improved means for retaining the removable front portion or door of the boiler in a closed position and for permitting the door to be readily removed when desired.

This door is indicated by the numeral 20 and is adapted to fit the opening 21 in said front portion of the boiler. The edge of this opening is formed with inwardly-extending flanges 22. Bolts 23 pass through the door and are provided with angularly-bent inner ends, which engage back of the flanges. The outer ends of the bolts are threaded to receive nuts 24. By turning these nuts in the proper direction it is obvious that the door may be drawn up water-tight against the bordering edges of the opening, and when it is desired to remove the door for obtaining access to the interior for cleaning or other purposes the nuts can be loosened and the bolts turned so as to disengage their bent ends from the flanges, when of course the door is free to be removed.

What I claim as my invention is—

1. The combination, of a boiler, an exhaust-steam passage at or near the bottom of the boiler where the feed-water is introduced, said exhaust-steam passage having a branch leading therefrom for discharging the exhaust-steam, a cylinder and a piston therein, said cylinder having communication with the boiler, and a connection between the exhaust-port of the cylinder and the exhaust-steam passage in the boiler, whereby the exhaust-steam from the cylinder is conveyed to the exhaust-steam passage in the boiler, for the purpose of assisting in heating the feed-water within the boiler.

2. The combination, of a boiler, an exhaust-steam passage at or near the bottom of the boiler where the feed-water is introduced, a cylinder and a piston in the cylinder, said cylinder having communication with the boiler, a connection between the exhaust-port of the cylinder and the exhaust-passag in the boiler, whereby the exhaust-steam from the cylinder is conveyed to said exhaust-steam passage for the purpose of assisting in heating the feed-water in the boiler, and a connection leading from the exhaust-steam passage to the boiler, and adapted for conveying the water of condensation back to the feed-water chamber of the boiler.

3. The combination, of a boiler, an exhaust-steam passage at or near the bottom of the boiler where the feed-water is introduced, a cylinder and a piston in the cylinder, said cylinder having communication with the boiler,

a connection between the exhaust-port of the cylinder and the exhaust-steam passage in the boiler, whereby the exhaust-steam from the cylinder is conveyed to said exhaust-steam passage in the boiler, for the purpose of assisting in heating the feed-water in the boiler, a connection extending from the exhaust-steam passage, a reservoir to which the connection leads, said connection adapted to convey the exhaust-steam to the reservoir, and a connection extending from the reservoir and leading to the feed-water chamber of the boiler, said connection adapted to convey the water of condensation of the exhaust to the feed-water chamber of the boiler.

4. The combination, of a cylinder and a piston therein, a boiler in communication with the cylinder, an exhaust-steam passage at or near the bottom of the boiler where the feed-water is introduced, means for conducting the exhaust-steam from the cylinder into the exhaust-steam passage in the boiler, a pipe for conducting said exhaust-steam and water of condensation therefrom out of the exhaust-steam passage, a reservoir into which said pipe extends, a deflector within the reservoir and above the upper end of the pipe, and a pipe leading from the reservoir to the feed-water chamber of the boiler.

5. The combination, of a cylinder and a piston therein, a boiler in communication with the cylinder, an exhaust-steam passage at or near the bottom of the boiler where the feed-water is introduced, means for conducting the exhaust-steam from the cylinder into the exhaust-steam passage in the boiler, a reservoir, a pipe for conducting the exhaust-steam and water of condensation from the exhaust-steam passage in the boiler to the reservoir, a deflector within the reservoir and above the upper end of the pipe which extends into said reservoir, a tube within the reservoir and having one end extending above the level of the water in said reservoir, and a pipe leading from the tube to the feed-water chamber of the boiler.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN M. SAILER.

Witnesses:

A. J. EASTMAN,
G. E. FOOTE.

It is hereby certified that in Letters Patent No. 627,763, granted June 27, 1899, upon the application of John M. Sailer, of Janesville, Wisconsin, for an improvement in "Boilers," an error appears in the printed specification requiring correction, as follows: Page 2, line 119, the word "for" should read *or*; and that the said 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 18th day of July, A. D., 1899.

[SEAL.]

WEBSTER DAVIS,
Assistant Secretary of the Interior.

Countersigned:

C. H. DUELL,
Commissioner of Patents.