(No Model.)

H. PATTERSON, J. MacCORMACK & H. L. VAN ZILE.

STEAM BOILER.

No. 421,509. Patented Feb. 18, 1890.

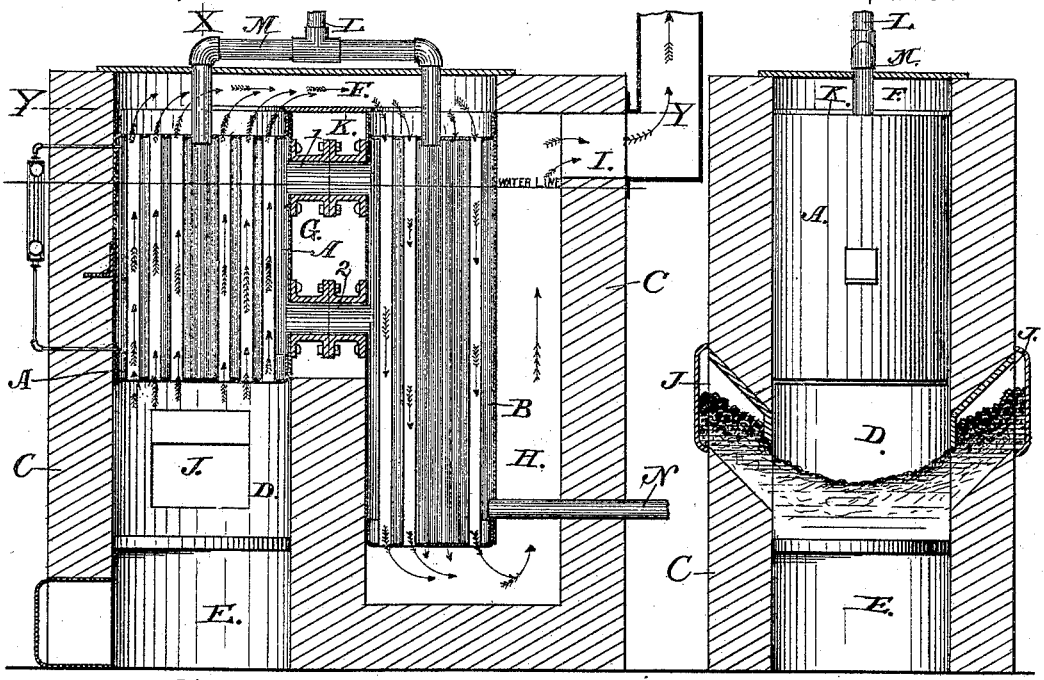

FIG. 1. FIG. 2.

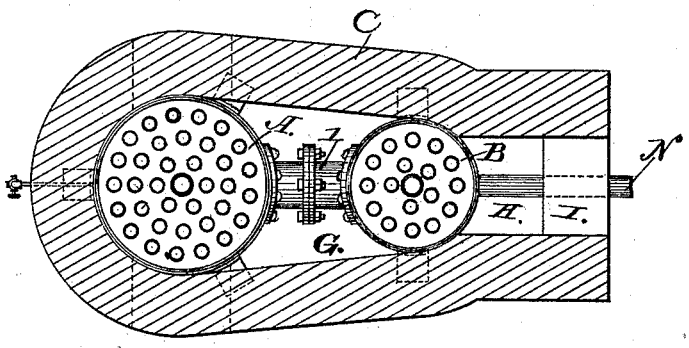

FIG. 3.

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HUGH PATTERSON, JOHN MACCORMACK, AND HARRY L. VAN ZILE, OF ALBANY, NEW YORK; SAID MACCORMACK AND VAN ZILE ASSIGNORS OF PART OF THEIR INTEREST TO SAID PATTERSON.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 421,509, dated February 18, 1890.

Application filed November 6, 1889. Serial No. 329,411. (No model.)

To all whom it may concern:

Be it known that we, HUGH PATTERSON, JOHN MACCORMACK, and HARRY L. VAN ZILE, all of the city and county of Albany, in the State of New York, have invented new and useful Improvements in Steam-Boilers, of which the following is a specification.

Our invention relates to improvements in multitubular steam-boilers of the class in which the products of combustion pass vertically through the tubes; and the object of our invention is to provide a boiler that will more perfectly utilize the heat generated by the combustion of fuel in its furnace. This object we attain by the means illustrated in the accompanying drawings, which are herein referred to and form part of this specification, and in which—

Figure 1 is a vertical longitudinal section of our boiler and its setting. Fig. 2 is a vertical transverse section of Fig. 1 at the line X X, with the primary boiler shown in elevation; and Fig. 3 is a horizontal section of Fig. 1 at the line Y Y.

Our invention consists in combining two multitubular vertical boilers that are connected together in such manner that a free circulation of both the steam and water will be obtained between the two, one of said boilers (which is hereinafter referred to as the "primary" boiler) being located directly over the fire-chamber, so that the heated products of combustion will pass upwardly through the tubes of said primary boiler, and the other boiler (which we preferably make of smaller diameter, but of greater height) being located between said primary boiler and the outlet for the escape of the spent products of combustion, the secondary boiler being so arranged in relation to the primary boiler that the heated products of combustion emerging from the tubes of the primary boiler will pass downwardly through the tubes of the secondary boiler and from thence toward the escape-outlet, the said primary and secondary boilers being connected together in such manner as to be separable from each other.

As represented in the drawings, A designates the primary boiler, and B the secondary or adjunctive boiler, and the two are connected together by an upper connecting-pipe 1, which is located either partially or entirely above the water-line of the boiler, and a lower connecting-pipe 2, which is located entirely below said water-line, each of said connecting-pipes being made in two pieces, so as to be separable about midway of their length, and the corresponding ends of the pieces being permanently secured to the boiler to which said pieces are allotted, each piece of said connecting-pipes being provided with a flange that is fitted to join with and be secured to a corresponding flange of the conjoining piece of pipe, and thereby said primary and secondary boilers are rendered readily separable from each other when occasion requires. By means of said connecting-pipes ample provision is made for a free circulation of both water and steam from one of said boilers into the other, so that the heat and pressure will be perfectly equalized in both of them.

C is the boiler-setting, which is commonly made of brick-work, and which includes a fire-chamber D, which is formed directly under the lower end of the primary boiler A, so that the heated gases and other volatile products of combustion will pass upwardly through the tubes of said boiler. Said setting also includes an ash-pit E, formed directly under said fire-chamber, a pass-over flue F, formed over the upper end of both of said boilers, as a communication from the tubes of the primary boiler to the tubes of the secondary boiler, a heated-air chamber G, formed between the cylindrical bodies of the primary and secondary boilers, a flue H, which leads from the lower end of the secondary boiler to the outlet for the escape of the spent products of combustion, and an escape-outlet I, which leads from the flue H to the pipe or flue for carrying off said spent products. Said setting is provided with one or more feeding-doors J, which are preferably arranged on an inclined plane, so as to operate as magazines or feeders for automatically feeding the fuel to the fire in the fire-chamber D; but, when preferred, said feeding-doors may be arranged horizontally in the usual manner.

Preferably the fire-chamber D and ash-pit E are made in a cylindrical form, so as to conform to the form and diameter of the primary boiler A. The heated-air chamber G has no communication with the fire-chamber D, nor with the flue F, the upper end of said air-chamber being closed by a plate K, and it forms a dead-air space wherein a body of heated air will be retained in contact with the bodies of the primary and secondary boilers.

L is a steam-pipe for conveying steam to any point where it may be required. It is connected to a branch pipe M, which leads from the steam-space in the upper end of the primary and secondary boilers.

N is a feed-pipe, which is connected to the lower end of the secondary boiler for the purpose of conveying the feed-water thereinto, and said feed-pipe may be connected to a feed-pump, a return-pipe of a steam-heating system, or to any other appliance for supplying feed-water to steam-boilers.

By making the primary and secondary boilers separable from each other in the manner herein described we reduce them to a form which renders them readily transportable, and when made in the form described the two boilers are capable of being separately used as an ordinary upright tubular boiler, each one independently of the other, by simply separating the joint in the middle of the connecting-pipes and closing the outer end of the sections of said connecting-pipes. Said boilers can then be separately placed in the ordinary setting with a suitable fire-chamber under each.

We do not confine ourselves to locating the escape-outlet I at or near the upper end of the secondary boiler, as shown in Fig. 1, as said outlet may be located near the lower end of said boiler, and in some instances the latter location may be more convenient for forming a connection with a chimney or flue, and for that reason might be preferable. Nor do we limit ourselves to providing a heated-air chamber for our boiler-setting; but we prefer to retain all the features of construction of our invention as hereinbefore described.

The course of the gases and other heated products of combustion of the fuel in the fire-chamber D, as indicated by arrows in Fig. 1, will be as follows: They first pass upwardly through the tubes of the primary boiler A, then rearwardly through the pass-over flue F, then downwardly through the tubes of the secondary boiler B, and then upwardly through the flue H to the escape-outlet I, from which they are conveyed into the atmosphere through any suitable flue or chimney.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. A steam-boiler which is composed of a primary and a secondary boiler placed side by side and separably connected together by upper and lower connecting-pipes—one above and the other below the water-level line of said boiler—both of said connecting-pipes being flanged together at or near the middle of their lengths, and each of said boilers being provided with a series of tubes through which the heated gaseous products of combustion will pass, substantially as herein specified.

2. In a steam-boiler, the combination of a fire-chamber, a primary boiler provided with tubes and fixed directly over said fire-chamber, a secondary boiler provided with tubes and connected by steam and water pipes to said primary boiler, and a dead-air chamber for containing heated air located between said primary boiler and secondary boiler, as and for the purpose herein specified.

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