J. WARNER.

Water Tube Boilers.

No. 166,235. Patented Aug. 3, 1875.

Fig. 1.

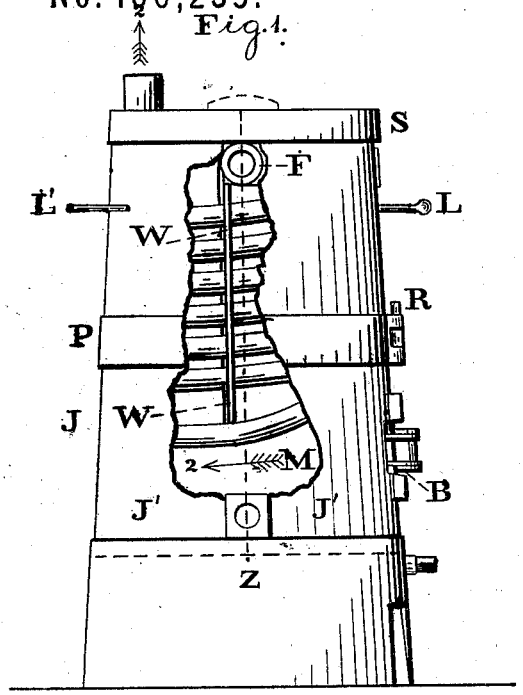


Fig. 2.

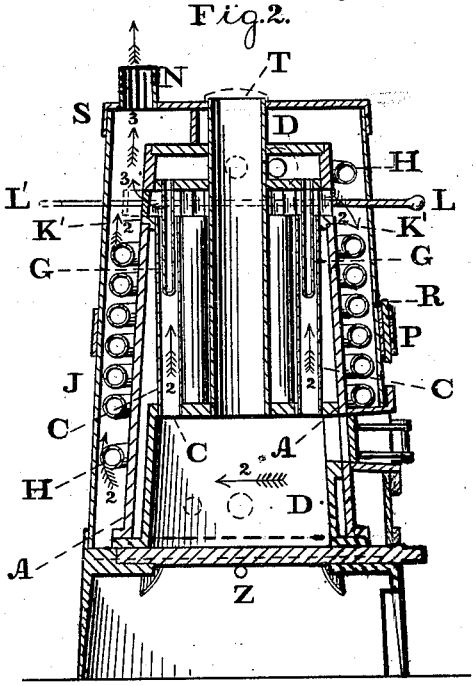


Fig. 4.

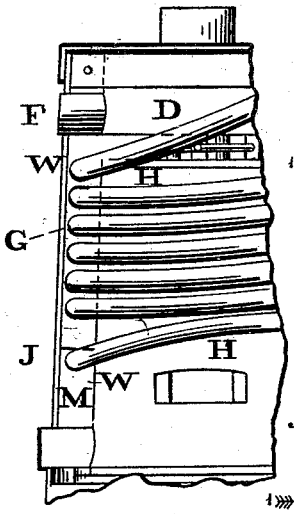


Fig. 3.

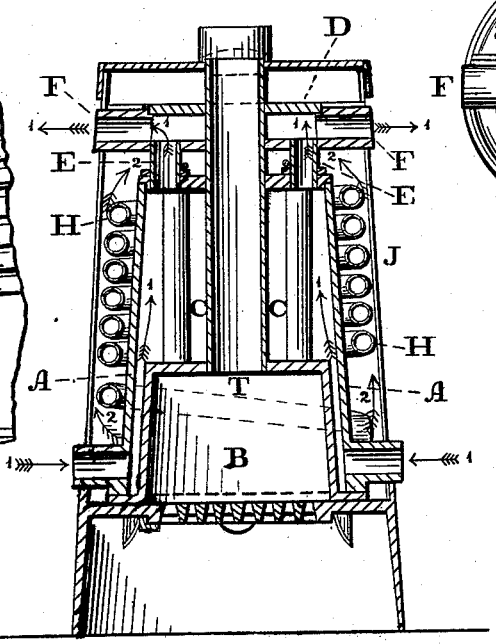
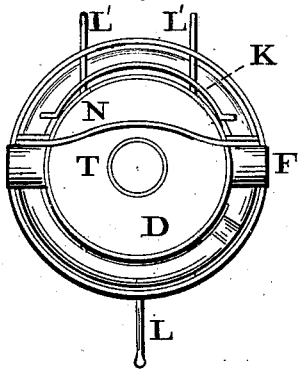


Fig. 5.



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UNITED STATES PATENT OFFICE.

JAMES WARNER, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN WATER-TUBE BOILERS.

Specification forming part of Letters Patent No. **166,235**, dated August 3, 1875; application filed March 18, 1875.

To all whom it may concern:

Be it known that I, JAMES WARNER, of the city and county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Steam-Generators; and I do hereby declare the following to be a clear and exact description of the nature thereof, sufficient to enable others skilled in the art to which my invention appertains to fully understand, make, and use the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a side elevation, partly broken away, of the device embodying my invention. Fig. 2 is a central longitudinal vertical section thereof. Fig. 3 is a central transverse vertical section thereof. Fig. 4 is a partial front view of the interior thereof. Fig. 5 is a top view of the interior thereof.

Similar letters of reference indicate corresponding parts in the several figures.

This invention consists in a steam-generator constructed of an outer casing made in removable sections, and an inner casing, between which a coil of pipe is suspended in suitable brackets, the said inner casing being provided with fire-flues, into which project water-legs, depending from a drum arranged above the the flues, with a space between the two, said space being controlled in its operation by a damper, as hereinafter fully specified.

Referring to the drawings, A represents a double-walled casing or chamber, within which, at the lower end, is the fire space or furnace B, whose upper end constitutes the tube-sheet of a series of tubes or flues, C, through which pass the products of combustion from the furnace B; the casing surrounding said tubes or flues C. Above the casing A is mounted a drum, D, which communicates with the interior of said casing by means of the pipes E, and which are provided with outlet-pipes F, by which the steam or hot water will be directed to the place of service. From the under side of the drum there depends a series of water-legs, G, whose diameters are smaller than those of the flues, and said legs project into the said flues, as will be seen on reference to Fig. 2. Surrounding the casing A is a coil of pipe, H, whose lower end communicates with the casing A, and upper end with the drum D, and surrounding the coil and drum is a jacket, J, which incloses the several parts of the generator. K represents a damper, which occupies a position at the rear of the upper portion of the generator, in the space between the top of the casing A or upper tube-sheet K′ and bottom of the drum D, and has a horizontal sliding motion from and to said space to and from the jacket J, a rod, L, being connected to the damper for operating the same, and one or more rods, I′, for guiding it. The water-legs G should be provided with plugs or other removable means at their lower ends, for the purpose of allowing access thereto for removing sediment and otherwise cleaning them.

The operation is as follows: Water is admitted in the inlet-pipes in the direction of arrow 1, and fills the space of the casing A, the coil H, drum D, and legs G. The damper K will at first be opened, and the products of combustion pass rearward to the chimney or stack, as shown by the arrows 3. When the fire is sufficiently high the damper is closed, thus cutting off the space between the rear of the top tube-sheet K′ and drum D, whereby the products of combustion are directed to the front, and in order to reach the chimney or stack they descend and pass to the rear through a passage, M, in the space between the casing A and jacket J, below the lower coil of the pipe H, and then ascend to the chimney. The coil H passes through bars W, which extend vertically, and are located at opposite sides between the casing A and jacket, so as to prevent access below from front to rear, excepting through the passage M, caused by the termination of said bars at the lowermost coil. It will be seen on reference to the arrows 2 that the products of combustion as they ascend heat the inner wall of the casing A, the water-legs G in the flues C, and the drum D, then as they ascend they heat the front exterior wall of the casing A and the front half of the coil H, and in their ascent, after leaving the passage M, they heat the rear exterior wall of the casing and the rear half of the coil H, whereby the steam or hot water will be quickly formed, the exit of which is through the pipe or pipes. In order to prevent the escape of the products of combustion

above the drum, in the space between the same and top of the jacket a wall, N, projects vertically between the drum and top of the jacket, and cuts off communication between the front and rear of said space. The jacket J is made in sections or shells J′ J′, which fit together snugly and rest on the base Z, within a groove or flange thereon. In order to hold the sections in position I employ a removable band, P, which is adapted to encircle the sections, and its ends are formed with eyes, through which is passed a pin, R, for locking the ends. As the jacket will be made somewhat conical, the forcing down of the closed band P will tighten the sections and confine them in place. The cap S of the jacket will be fitted over the top thereof, and when properly secured will hold or clamp the upper ends of the sections. When the generator is to be transported, or access is required thereunto, the cap S and band P will be removed, and the sections J′ may then be displaced. The internal parts of the generator are then also accessible. In order to feed the furnace with fuel I employ a cylinder, T, which is arranged vertically within the series of flues C or flue-space, and communicates with the furnace. The cylinder T is opened at top, but will be covered by a cap, which, when removed, affords access to the cylinder for replenishing the same, the fuel automatically entering the furnace from said cylinder. The condition of the fire may at any time be observed through the front door of the furnace provided therefor.

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

1. In a steam-generator, the combination of the suspended water-coil H, drum D, water-legs G, fire-flues C, into which said legs project, and the damper K, substantially as described.

2. The inner casing A and outer shell J, in combination with the wall N, bars W, and damper K, substantially as and for the purpose described.

3. The drum D, provided with water-legs G, located above and in combination with the fire-flues, so as to leave a space between the said drum and flues, substantially as shown and described.

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