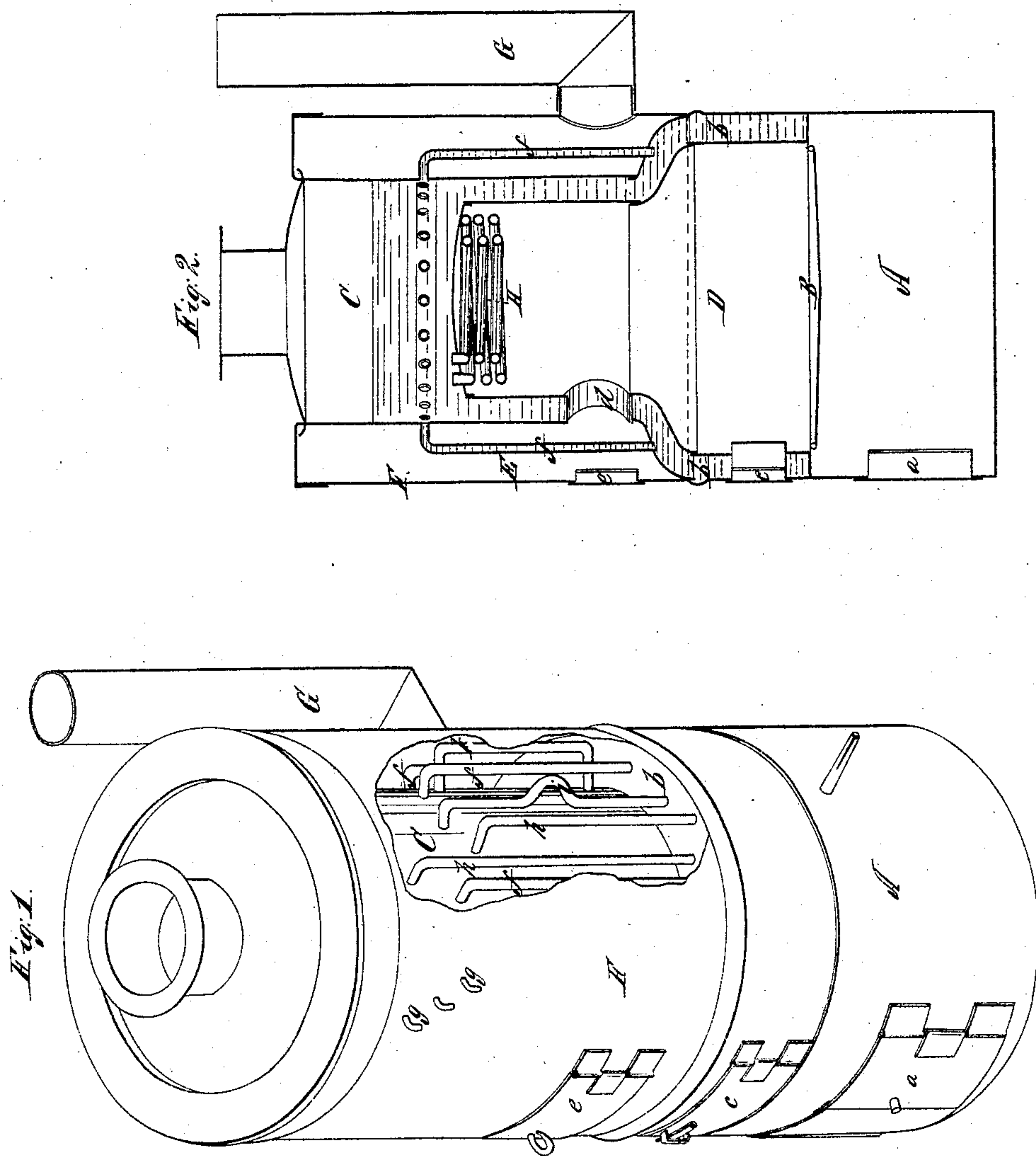


E. Whiteley,
Steam-Boiler Water-Tube.
N^o 23,733. Patented Apr. 19, 1859.



UNITED STATES PATENT OFFICE.

EDWARD WHITELEY, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. 23,733, dated April 19, 1859.

To all whom it may concern:

Be it known that I, EDWARD WHITELEY, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a view of the boiler with a portion of the outer casing broken away to show the parts within; Fig. 2, a vertical section through the same.

For the greater economy of space and fuel the fire-surface has been increased in steam-boilers by the employment of tubes through which either the water or the flame was made to pass. These tubes have heretofore been placed within the boiler and in immediate proximity to the hottest of the fire. Where great compactness is required and the fire-box is placed within the boiler, this arrangement is liable to a twofold objection: first, their position within the fire-box or immediately over it interrupts the proper combustion of the fuel, while they are exceedingly liable to be burned out on account of their nearness to the fire.

To remedy these objections is the object of my present invention, which consists in a peculiar construction of boiler in which the fire-box is within the boiler, which is surrounded with a series of vertical water-tubes leading from the upper to the lower part of the water-space and so arranged within a chamber or passage around the outside of the boiler that the products of combustion after they escape from the fire-box shall circulate around and among these tubes, as will now be more fully described.

In the drawings, A is the base, which also serves as the ash-pit. It is furnished with doors *a*, through which the draft is admitted to the fire; B, the fire grate; C, the boiler, the lower portion of which forms a water-space, *b*, around the fire. A door, *c*, gives access to the fire-space D. An opening, *d*, through the side of the boiler allows the escape of the products of combustion from the fire-space D into an annular chamber, E, formed by a casing, F, which surrounds the boiler. (A portion of this casing is broken away in Fig. 1 to show the tubes within it.) A door, *e*, in the

casing admits cold air to the chamber E when it is desired to check the too rapid generation of steam, as will be frequently the case when used for warming houses, &c. A smoke-pipe, G, is attached to the casing F on the side opposite to the opening *d*, so that the course of the products of combustion is from the fire-space D, through the opening *d*, and around on both sides of the boiler in the space E to the smoke-pipe G. Within the space is arranged around the outside of the boiler C a series of tubes, *f*, which connect with the water in the upper part of the boiler and also with the water-space *b*. (These tubes are attached to the boiler in any of the well-known methods—such as screws and lock-nuts.) The tubes thus arranged offer a large amount of heating-surface to the fire and hot air which pass through the chamber E, and also serve to establish a circulation of water in the boiler C and prevent it from foaming. Gage-cocks *g* pass through the casing F into the boiler C.

A coil of pipe, H, connecting with the water in the boiler, is placed in the top of the fire-space D; but this forms no part of my invention.

The casing F may be so arranged with suitable joints at the top and bottom that it may be lifted off from the boiler when it becomes necessary to have access to the tubes *f* for repairs, &c. The tubes may be arranged around the boiler in one continuous row, as at *f*; or a second row may be placed outside of the first one, the ends entering the boiler above or below the others, as at *h*, Fig. 1; or they may be bent, as at *i*, Fig. 1, to give more length of pipe; or, when the water-space *b* does not project beyond the body of the boiler, the tubes may be caused to enter at right angles to its vertical sides, as at *k*, Fig. 1.

The following are some of the advantages which are possessed by a boiler of the above construction: The tubes *f*, being placed out of contact with the hottest part of the fire, will last much longer than when placed within the boiler itself, while when they do require to be removed they are much more accessible. In a boiler with inside flues the boiler will be required to be made of greater height to obtain the same amount of heating-surface than in a boiler of my construction of the same diameter. This often makes the boiler of an inconvenient height in proportion to its di-

ameter. The removal of the tubes from the fire-space above the fire gives room for a larger combustion-chamber, in which the gases from the fire may be thoroughly ignited before passing off.

What I claim as my invention, and desire to secure by Letters Patent, is—

The water-tubes *f* within the space E surrounding the boiler, arranged and operating in the manner substantially as set forth.

E. WHITELEY.

Witnesses:

SAML. COOPER,
THOS. L. GLOVER.