No. 697,606. Patented Apr. 15, 1902.

T. R. BUTMAN.

COMBINED WATER AND FIRE TUBE STEAM GENERATOR.

(Application filed June 24, 1901.)

(No Model.) 2 Sheets—Sheet 1.

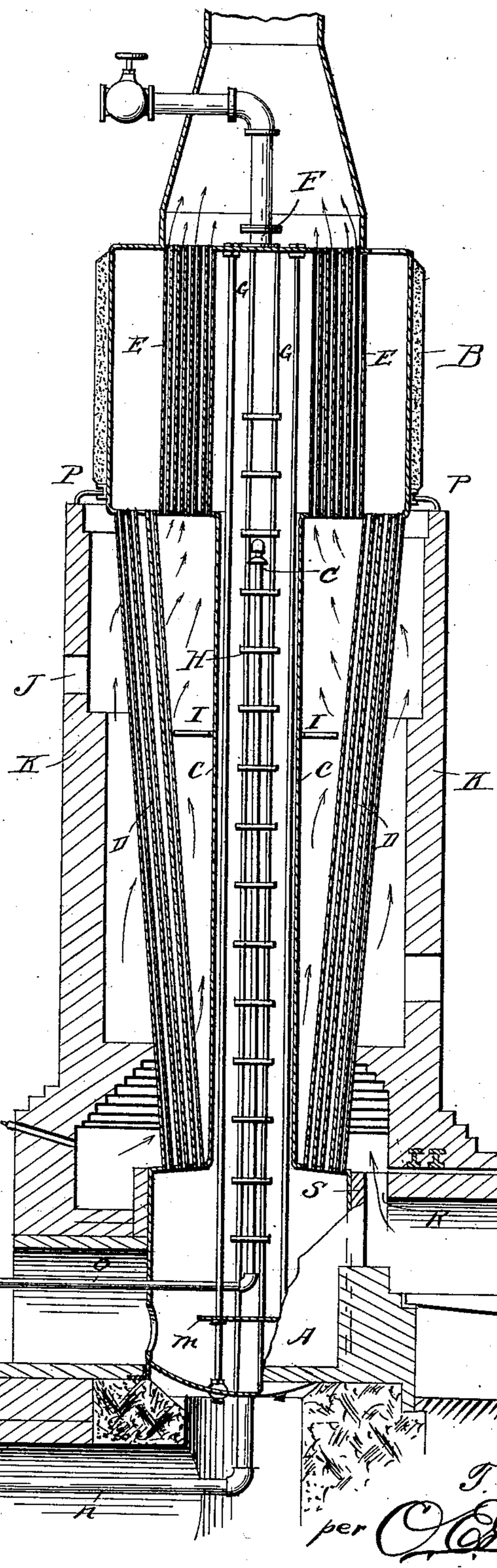

Fig. 1.

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Fig. 2.

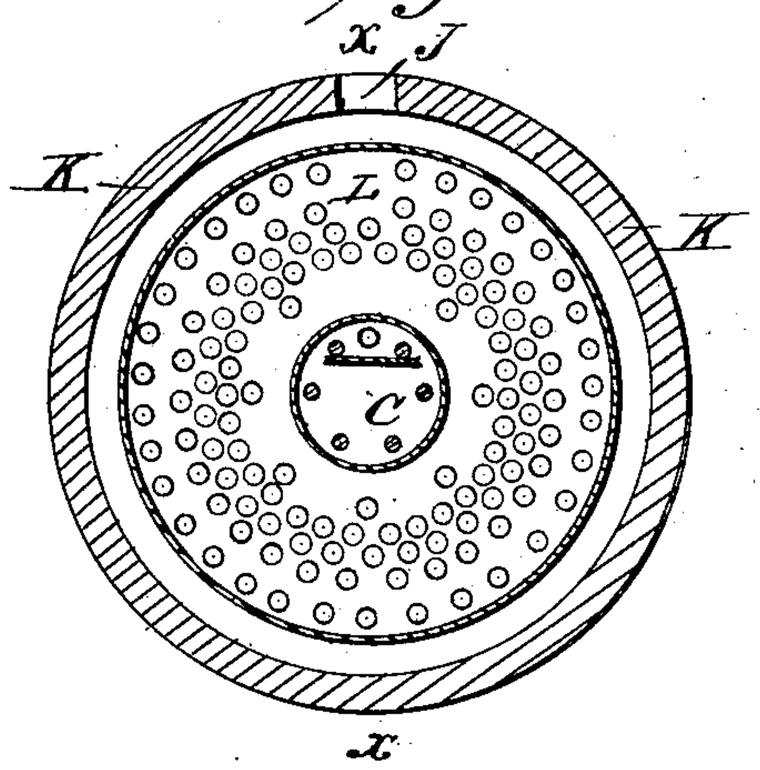
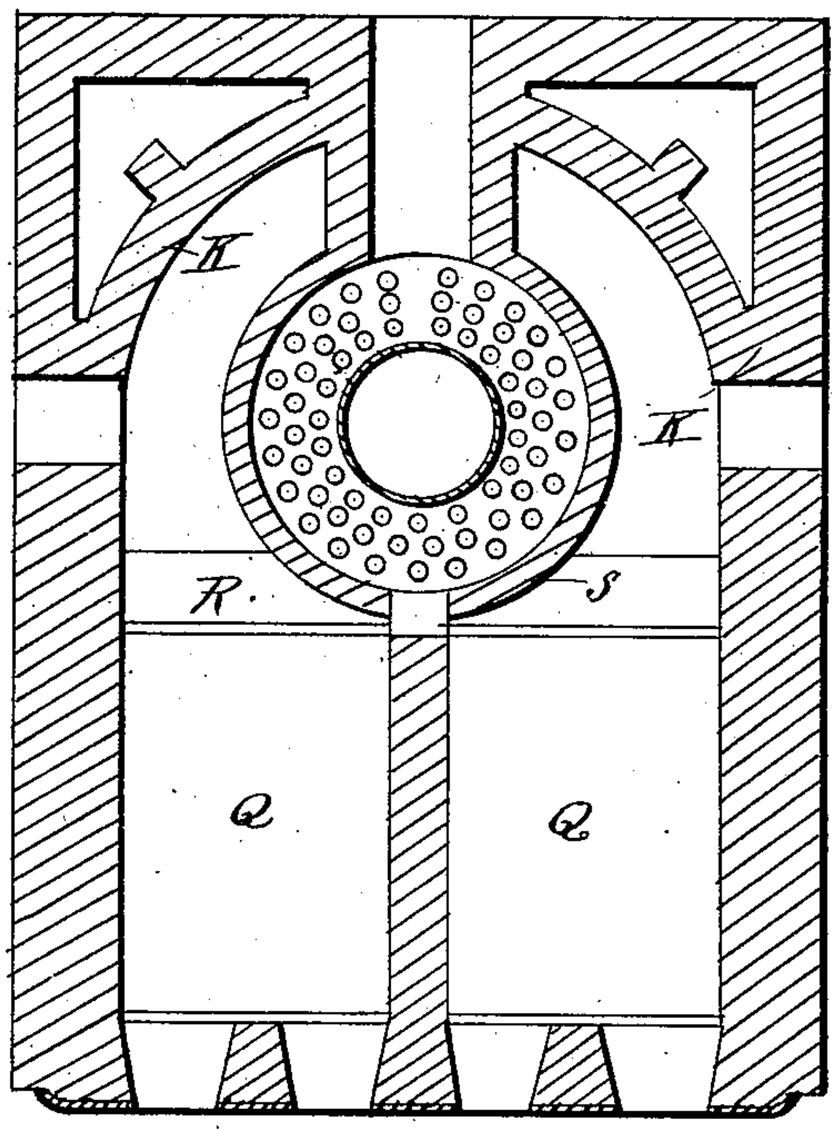


Fig. 3.



Witnesses:
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UNITED STATES PATENT OFFICE.

THOMAS REED BUTMAN, OF CHICAGO, ILLINOIS.

COMBINED WATER AND FIRE TUBE STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 697,606, dated April 15, 1902.

Application filed June 24, 1901. Serial No. 65,808. (No model.)

To all whom it may concern:

Be it known that I, THOMAS REED BUTMAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in a Combined Water and Fire Tube Steam-Generator; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of my invention is to provide an improved boiler of the vertical type combining the principles both of the water and fire tubes in a very simple and effective manner and to design and construct a boiler so that it will be readily accessible to all its vital parts, both for expanding the tubes in case of leaks or for removing defective ones and installing others in their stead, with the minimum of expense and trouble.

Another object is to provide for complete and perfect circulation of the water, which insures a free opportunity for separation of the steam therefrom and a full and complete deposit of the sediment and foreign substances in the mud-drum, from which it is blown off in the usual manner.

Another object of the invention is to arrange the feed-water pipe in such a manner that the chill is taken from the feed-water before mingling with the water in the boiler and to make the feed-water after it is heated to facilitate the circulation by its downward course after it is liberated from the feed-pipe.

Another object of the invention is to thoroughly utilize all the products of combustion and to bring them in direct contact with the water-heating surfaces and at the same time superheat the steam before its escape, and in other objects of the invention, as will be hereinafter described, and specifically pointed out in the claims.

Figure 1 is a vertical central section of my improved boiler. Fig. 2 is a horizontal section on line *x x*, Fig. 1; and Fig. 3 is a horizontal section on line *y y*, Fig. 1.

The boiler consists of two cylindrical drums. The upper, which is the largest in diameter, is the steam-drum B, while the lower is the mud-drum A. The drums are connected by a vertical water-pipe C, centrally located and of such diameter as to insure the free return of water from drum B to drum A. Surrounding said water-pipe C and extending from the top head of drum A to the bottom of head drum B is a series of water-tubes D, extending at an angle and connected near the outer periphery of the drum B, leaving an annular space in said drum between the water-pipe C and water-tubes. Inserted in this annular space is a series of fire-tubes E, which extend through and are secured in the upper head of said drum B. An opening *b* in the upper head permits the outlet of steam, to which the usual steam-pipe is connected.

The upper head of drum B and the lower head of drum A are secured together by continuous tie-rods G, to two of which are attached strips H, forming a ladder, so as to make drum B accessible from inside of drum A.

A deflecting-flange or baffle-plate I is secured to and surrounds water-pipe C for deflecting the products of combustion and heated gases to the exterior of the water-tubes and also performs the function of a platform upon which the operator stands to examine, remove, or replace the fire-tubes in the lower head of drum B. Access is had to the said platform through door J, (see Figs. 1 and 2,) through the inclosing walls K of the boiler, and the space L, formed by the spreading of the upper ends of the water-tubes E. (See Fig. 2.)

In the lower part of drum A, adjustably secured to the tie-rods G, is a baffle-plate M to deflect the downward current of water which descends through the water-pipe, and thereby forms a quiet place below the same for the sediment in the water to settle in the lower part of said drum A, from where it can be readily blown off through the blow-off pipe N.

The feed-water is conducted through feed-water pipe O, which enters through the side of drum A, extending up centrally through water-pipe C nearly to the steam-drum B, and is provided with a return-bend or gooseneck to direct the current of the water downward in the same direction as the water is flowing, and thereby induce a more rapid circulation of the same.

At the upper end of the inclosing boiler-

casing walls K and resting on the top thereof are removable plates P, which cover openings through which access is had for passing the tubes which are to be removed or replaced.

The drums are provided with the usual manhole-plates for access thereto.

Q is the furnace or furnaces which are on one or both sides of drum A, said drum being surrounded by a protecting-wall S, between the upper surface of which and the inclined inclosing wall of the furnace-flue is formed an annular opening R, through which the products of combustion are distributed between the lower portion of the water-tubes above the tube-joints in the upper surface of drum A, thereby protecting said drum and joints from the impinging force of the direct heat.

It will be readily seen that a free circulation of the water is created by my construction of boilers and that by passing the fire-tubes through the steam-drum, where there is only a medium quantity of water and where the steam is superheated by coming in contact with the upper part of the said fire-tubes.

I do not desire to limit myself to the exact construction shown or described, as many modifications may be made in the design and details thereof without departing from the spirit and scope of my invention.

What I claim, therefore, and desire to secure by Letters Patent, is--

1. In a steam-boiler the combination of an upper and lower drum with a central water-pipe connecting the same, water-tubes surrounding the water-pipe and connecting the drums, and a series of fire-tubes passing through said upper drum.

2. In a steam-boiler the combination of an upper and lower drum with a central water-pipe connecting the same, continuous tie-rods extending through said central water-pipe and securing the upper and lower heads to each other, water-tubes surrounding the water-pipe and connecting the drums, and a series of fire-tubes passing through said upper drum from head to head.

3. In a steam-boiler the combination of an upper and lower drum with a central water-pipe connecting same, continuous tie-rods securing the two outer heads of the drums together, and straps secured to two or more of the tie-rods, forming a ladder for climbing into the upper drum.

4. In a steam-boiler the combination of an upper and lower drum with a central water-pipe connecting the same, and provided with a deflecting-plate I on its outside which also serves as a platform, a series of water-tubes surrounding said water-pipe and plate, said water-tubes being so arranged as to leave a space by which access may be had to the platform, and a door in the casing of the boiler for the purpose substantially as described.

5. In a steam-boiler the combination of an upper and lower drum, with a central water-pipe connecting the same, a series of water-tubes surrounding the water-pipe and connecting the drums, continuous tie-rods securing the two outer heads of the drums, and a baffle-plate in the lower drum secured to said tie-rods.

6. In a steam-boiler the combination of an upper and lower drum, with a central water-pipe connecting the same, a series of water-tubes connecting said drums outside of said pipe and a feed-water pipe which enters the lower drum, and passes up into the water-pipe, said feed-pipe being provided with a return bend or gooseneck directing the feed-water downwardly to assist in causing a rapid circulation of the water in the boiler as set forth.

7. In a steam-boiler the combination of an upper and lower drum with a central water-pipe connecting the same, tie-rods securing the two outer heads of said drums, water-tubes surrounding the central water-pipe and connecting the drums, and fire-tubes passing through the upper drum for the purpose set forth.

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

THOMAS REED BUTMAN.

Witnesses:
ISAAC V. HOLMES,
CARL CARLSEN.