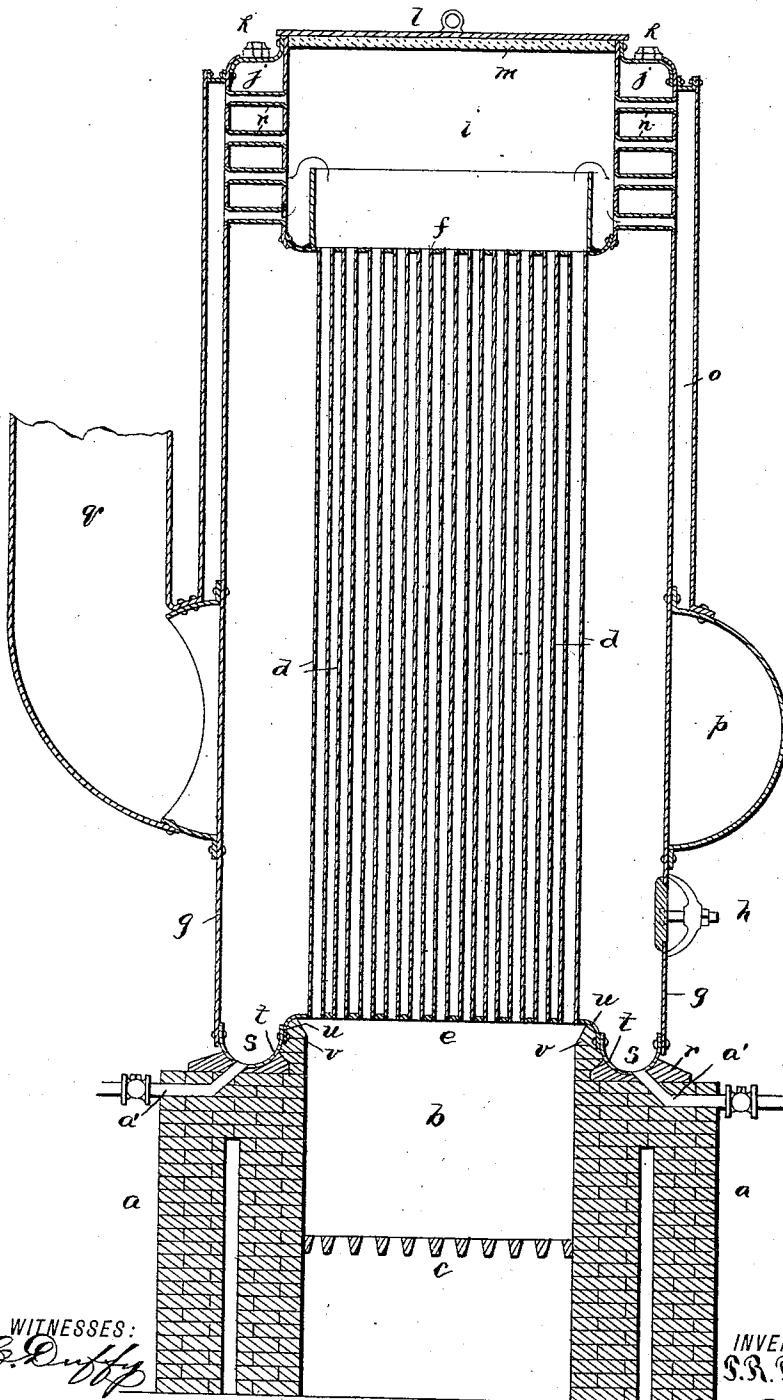


(No Model.)

T. R. BUTMAN.
STEAM BOILER.

No. 469,124.

Patented Feb. 16, 1892.



WITNESSES:

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THOMAS REED BUTMAN, OF CHICAGO, ILLINOIS.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 469,124, dated February 16, 1892.

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To all whom it may concern:

Be it known that I, THOMAS REED BUTMAN, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention relates to certain improvements in steam boilers or generators.

15 The object of the invention is to provide an improved boiler of the vertical type of an exceedingly simple and durable construction and accessible for cleansing and repairs which will maintain an improved circulation and produce a maximum quantity of steam with a minimum consumption of fuel. These objects are accomplished by and this invention consists in certain novel features of construction and in combinations of parts, more fully described hereinafter, and particularly pointed out in the claims.

The accompanying drawing illustrates my invention in vertical section.

Reference-letter *a* indicates the walls of the furnace, composed of masonry or other suitable heat-resisting material forming vertical combustion-chamber-inclosing grate *c*, and vertical fire-tubes *d* extend directly up from the upper end of the combustion-chamber *b*.

35 *e* indicates the lower tube-sheet, and *f* indicates the upper tube-sheet.

g indicates the outer boiler-sheet or shell of the boiler, preferably of such diameter as to leave space sufficient between the outer circle of fire-tubes and the boiler's sheet so that a man can move around within the boiler for cleansing or testing purposes.

45 *h* indicates a man-hole in the boiler-sheet through which access can be had to the interior of the boiler. The upper ends of the fire-tubes are received in the bottom of the smoke or heating drum *i*, which is of such diameter as to leave the steam-chimney *j* around said heating-drum and within the boiler-shell.

50 This annular steam space or chimney is closed at the top, as shown, preferably by sheets se-

cured to the upper edges of the boiler-shell and the shell of said drum, and suitable openings are provided into the upper end of the steam-space. A removable cover *l* closes the upper end of this drum and on its end surface is preferably lined with suitable non-conducting material *m*, such as asbestos or the like. By means of this construction the cover can be lifted off and all the tubes opening into the heating-drum can be thoroughly cleaned. Horizontal cross-tubes *n*, preferably of extra thickness, extend from said drum through the steam-space *j* and the shell of the boiler into the upper portion of the narrow heating-space *o*, formed around the shell of the boiler by the outer casing, which at its lower end is secured so that the space *o* opens into the encircling-flue *p* near the lower portion of the boiler, which flue is provided with a suitable uptake *q*. By means of this construction all the heat possible is utilized. If more desirable, the cross-tubes *n* can open into the encircling flue, so that they will be carried directly off without passing down around the exterior of the shell. The cross-tubes are preferably wedged or extended at their outer ends, thereby performing the office of stay-bolts for the boiler shell and drum. The water-line is preferably established high enough to keep the upper ends of the fire-tubes submerged, and yet ample steam-room is preserved. The heated products of combustion in the smoke or heating drum pass through the cross-tubes and superheat the steam. An annular deflecting-plate is arranged within the smoke-box so as to prevent the heat products from passing directly into the cross-tubes and by which it is better distributed and utilized. The boiler is supported upon the walls of the furnace by means of the base-plate *r*, strongly constructed and in the shape of a ring resting on the upper edge of the furnace-wall and having its upper surface concaved or formed into a socket. The outer portion of the bottom of the boiler beyond the outer circle of fire-tubes is depressed to form an annular sediment or settling chamber *s*, which depressed portion or sediment-chamber rests on the outer face of said base-plate in the socket formed therein to receive such chamber. This chamber is formed by

the base-ring *t*, which is preferably U-shaped in cross-section, as shown, with its outer edge riveted or otherwise firmly secured to the lower edge of the boiler-sheet and having its inner 5 annular upper edge riveted or otherwise firmly secured to the outer edge of the lower tube-sheet, which extends beyond the outer circle of the tubes and is bent down at *u*, so as to lap over said upper edge of the base-ring. An 10 annular sediment-chamber is thus formed in a plane below the lower ends of the fire-tubes and outside of and around the outer circle of the fire-tubes. The masonry is extended upwardly at *v* within the base-ring and depending 15 flange of the tube-sheet, so as to thoroughly and completely protect the same from the intense heat and direct action of the heated gases of combustion, thereby allowing the sedimentary deposit to accumulate without 20 endangering the burning of the sheet. The sediment can be readily drawn off through the blow-off pipes *a'*, extending from the bottom of the sediment-chamber and provided with suitable valves. This peculiar construction 25 of sediment-chamber has great strength to resist high internal pressure, and is such that stay-bolts are not required, which would materially impede the cleansing of the boiler.

The walls of the furnace which support the 30 boiler are constructed of suitable refractory material and maintain the high temperature of the gases as they evolve from the coal, thereby permitting a more perfect combustion than is possible in the ordinary fire-box inclosure. Of course it is only in large boilers 35 that the space between the fire-tubes and shell is sufficient to permit the entrance of a man and allow him to move completely around the tubes.

40 It is evident that various slight changes might be resorted to in the form, construction, and arrangement of the parts described without departing from the spirit and scope of my invention. Hence I do not wish to 45 limit myself to the construction herein set forth.

What I claim is—

1. In a vertical steam-boiler, the combination of the outer shell, the fire-tubes, the 50 smoke or heating drum within the upper end of the shell, forming a steam-space around it, the fire-tubes opening into the bottom of said drum, the horizontal tubes from the side of the drum through the steam-space, and the re-

movable cover for the upper open end of said 55 drum.

2. In a boiler of the vertical type, the combination of the fire-tubes, the outer shell, the smoke-drum located in the upper end of the 60 shell, forming the annular steam-space around it, and into the bottom of which the fire-tubes open, said annular steam-space being closed at the top, the cross-flues extending from said drum through said steam-space and the boiler-shell, and the removable lid for said drum 65 having the lining of non-conductible material.

3. In combination, the outer shell, the fire-tubes extending directly up from the furnace, the smoke-drum within the upper end of the 70 shell, forming an annular steam-space within said shell, and into the bottom of which the fire-tubes open, a cover for said drum, an annular passage around the exterior of said shell, an encircling flue provided with a take-up 75 into which said passage opens and located around the exterior of the shell near the base thereof, and the cross-tubes passing from said drum through the steam-space in said passage, as set forth. 80

4. A vertical boiler having the annular depending sediment-chamber outside of its outer circle of fire-tubes, in combination with the walls of the furnace extended up around the 85 inside of said sediment-chamber.

5. A vertical boiler provided with the annular depressed sediment-chamber U-shaped in cross-section, substantially as described, the base-plate having socket to receive said 90 chamber, and the furnace-walls on which said base-plate rests and which protect said sediment-chamber.

6. A vertical boiler having a sediment-chamber formed by the base-ring substantially U-shaped in cross-section and having its outer 95 edge secured to the outer edge of the boiler-sheet, the inner tube-sheet having its outer edge depressed and secured to the inner edge of said ring, and supporting means for the boiler, substantially as set forth. 100

In testimony that I claim the foregoing as our own I affix my signature in presence of two witnesses.

THOMAS REED BUTMAN.

Witnesses:

EDWARD C. QUIMBY,
H. P. G. NORSTRAND.