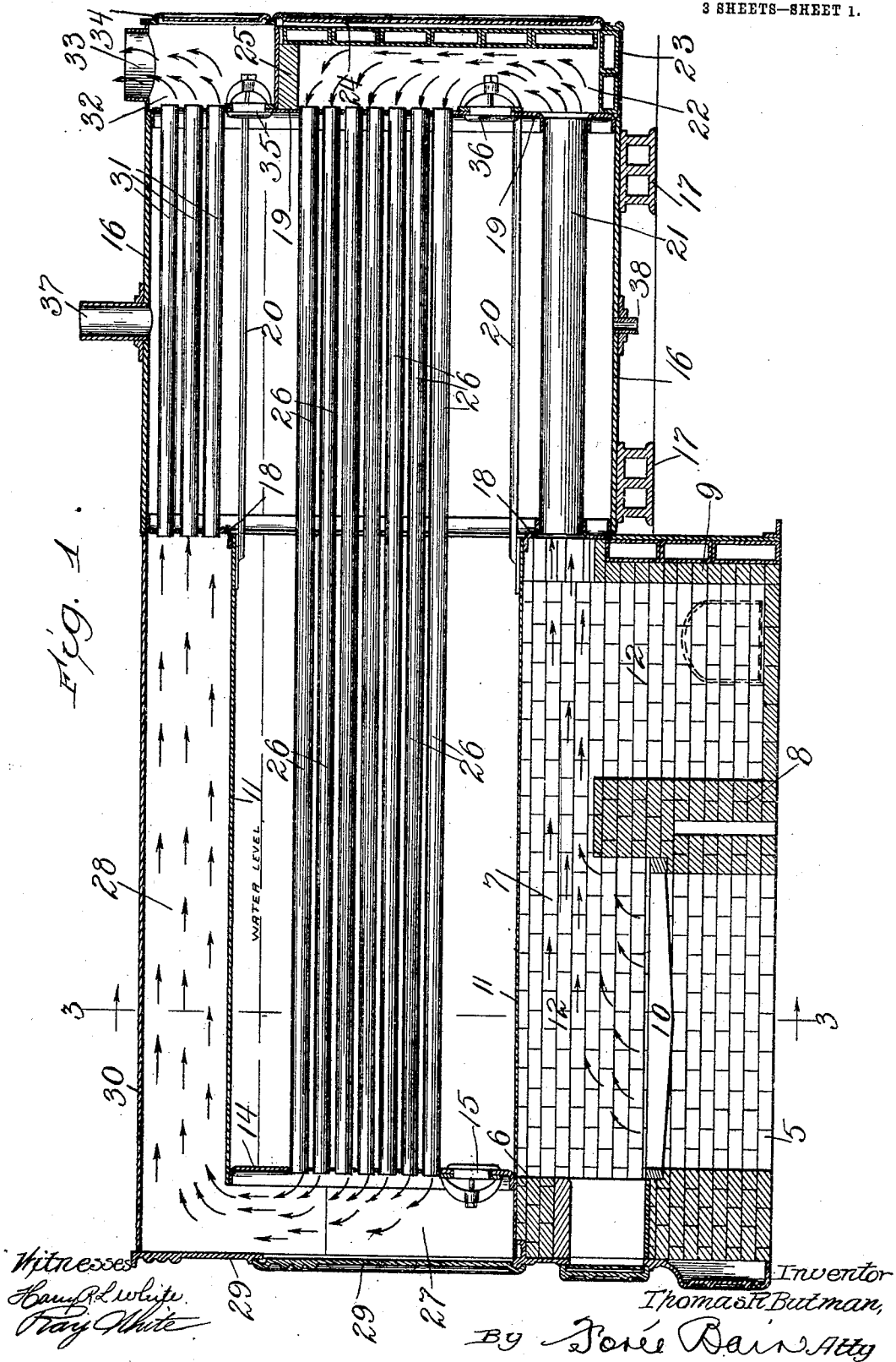


No. 809,282.

PATENTED JAN. 9, 1906.

T. R. BUTMAN.
STEAM GENERATOR.
APPLICATION FILED DEC. 31, 1904

3 SHEETS—SHEET 1.



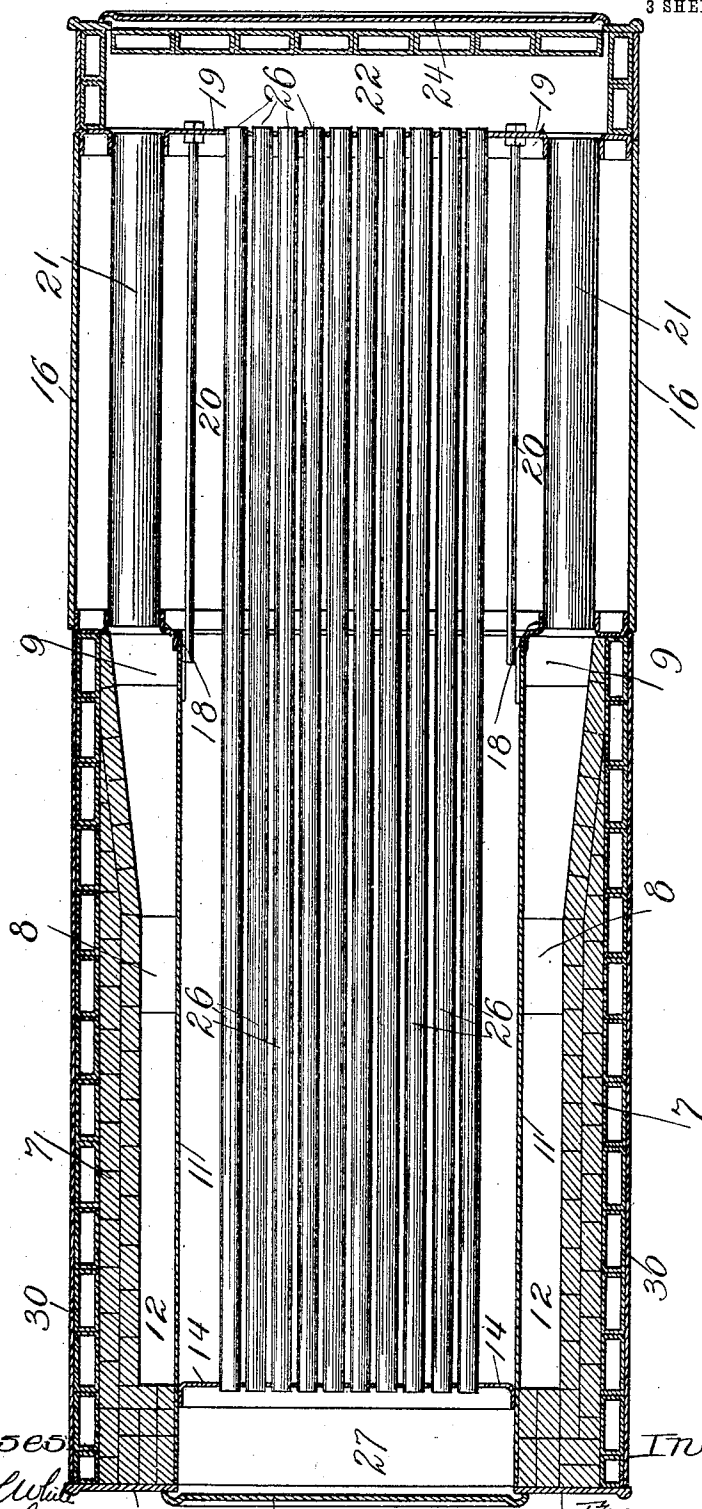
No. 809,282.

PATENTED JAN. 9, 1906.

T. R. BUTMAN.
STEAM GENERATOR.
APPLICATION FILED DEC. 31, 1904

3 SHEETS—SHEET 2.

Fig. 2



Witnesses
Harry R. White
Frank White.

Inventor:

Thomas R. Butman

By *Benie Bain* Atty.

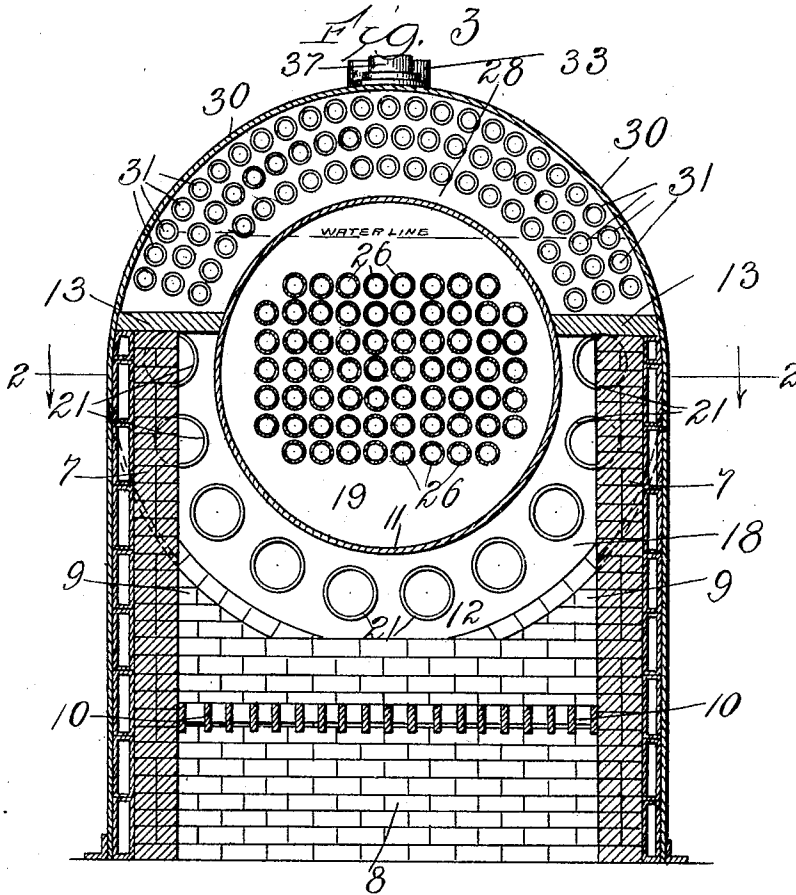
No. 809,282.

PATENTED JAN. 9, 1906.

T. R. BUTMAN.
STEAM GENERATOR.

APPLICATION FILED DEC. 31, 1904

3 SHEETS—SHEET 3.



Witnesses:

Samuel R. White
Ray White

Inventor:

Thomas R. Butman

By Joseph Bain Atty.

UNITED STATES PATENT OFFICE.

THOMAS R. BUTMAN, OF LAKE BLUFF, ILLINOIS.

STEAM-GENERATOR.

No. 809,282.

Specification of Letters Patent.

Patented Jan. 9, 1906.

Application filed December 31, 1904. Serial No. 239,142.

To all whom it may concern:

Be it known that I, THOMAS R. BUTMAN, of Lake Bluff, in the county of Lake and State of Illinois, have invented certain new and useful Improvements in Steam-Generators; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to improvements in steam-generators, and has for its primary object to provide an improved and highly-efficient boiler or steam-generator of the horizontal type.

One of the salient objects of my invention is to provide a horizontal steam-boiler of relatively large capacity wherein the surfaces exposed to the action of the applied heat may be large and the heavy shell not subjected to the direct impingement of heat from the furnace.

A further object of my invention is to provide a boiler wherein the applied heat is utilized to a very efficient degree.

Other and further objects of my present invention will become apparent to those skilled in the art from the following description.

In the drawings, wherein I have illustrated an operative embodiment of my invention,

Figure 1 is a longitudinal vertical section therethrough. Fig. 2 is a horizontal section on line 2 2 of Fig. 3, and Fig. 3 is a transverse vertical section on line 3 3 of Fig. 1.

Throughout the drawings like numerals of reference refer always to like parts.

In the drawings, 5 indicates in general the furnace, whereof 6 is the front wall, 7 7 are the side walls, 8 the bridge-wall, and 9 the rear wall, all of which may be of any usual or preferred construction. 10 indicates the grate, also of any usual or preferred construction. These parts constitute in general a heat-generator or source of heat-supply.

The boiler-shell comprises two cylinders of different diameters concentrically or somewhat eccentrically arranged, as preferred, and in open communication, preferably, throughout the full diameter of the smaller cylinder, the smaller cylinder being disposed relative to the setting to receive heat from the furnace on its exterior surface and a larger cylinder being disposed with its peripheral wall without the path of the gases of combustion.

Specifically 11 indicates the smaller cylinder or shell, preferably constructed of material as light as is compatible with the requi-

site strength for its diameter, mounted upon the setting 5 to directly receive in contact with its lower portion gases of combustion, the space 12 for the impingement of said gases, or, as I will arbitrarily term it, the "combustion-space," being limited in a vertical direction by the horizontal fire-wall 13 bridging from contact with the shell 11 to the side wall 7 of the setting.

14 indicates the front head of the smaller cylinder, preferably provided near its bottom with a manhole 15. Preferably the shell 11 extends from the front wall 6 to the rear wall 9 of the setting, said shell at its rear end being arranged in open communication, preferably throughout its entire extent, with the shell of larger diameter, the cylinder-wall 16 whereof is preferably mounted on suitable supports 17 and preferably lies wholly without the combustion-space and outside of the setting. The shell or cylinder 16 may be of any thickness deemed desirable for the requisite strength, for as no applied heat impinges directly thereon the use of heavy material in said cylinder is not attended with the disadvantages attendant upon the use of such thick material when the heat is applied directly thereto.

18 indicates the annular front head of the cylinder of larger diameter with which the cylinder of smaller diameter makes proper connection, and 19 indicates the rear head thereof. Preferably the rear head of the cylinder is braced by rods 20 20, each preferably secured at its inner end to the cylinder 11 and extending in alinement with the wall of said cylinder to the rear cylinder-head, to which they are secured in any suitable manner.

The circulation of hot gases in my boiler, effected through the provision of suitable tubes, flues, and passages, is in general such that their heat is first applied to the water-space and subsequently to the superheating space, the hot gases first impinging against the water-filled portion of the smaller cylinder and traversing suitable passages through the larger cylinder or both cylinders, and then traversing the steam-space in part through tubes disposed therein. In the specific construction shown the gases pass from the combustion-chamber primarily or first around the smaller cylinder, rearward through the larger cylinder in a portion of the zone thereof lying out of alinement with the smaller cylinder, forward through the joint length of the two cylinders, and back again over the upper por-

tion of the smaller cylinder and through the upper portion of the zone of the larger cylinder lying out of alinement with the smaller cylinder to the point of escape.

5 Specifically, 21 21 indicate a series of flues or tubes, preferably flues of relatively large diameter, arranged in an arc of preferably somewhat more than a semicircle, but taking
10 through the enlargement of the shell formed by the larger cylinder from end to end thereof. In lieu of the flues 21 it will be apparent that tubes might be employed; but I deem it desirable and advantageous to employ the large flues for the reason that the large flues
15 are secured in contact with the heads by rivets and are more efficiently held in contact with their heads under high temperatures than are tubes which are usually expanded into the heads of the boiler. At the rear end
20 the flues 21 open into an uptake 22, provided by a suitable casing structure 23, preferably having a removable panel 24 to permit access to the uptake-tube, and flue ends through said uptake, the uptake 22 being closed at its
25 top by a partition-wall 25, arranged above the main battery of tubes to be described.

The main battery of tubes 26 26 extend longitudinally of the boiler through a central area thereof from end to end of the shell afforded jointly by the cylinders, said tubes being disposed to leave thereabove and therebelow throughout the entire length of the shell a segmental free space, through which a man may crawl to clean the boiler or to make
35 repairs. At the front end the tubes open into an uptake 27, communicating with the passage 28, extending back to the annular head of the enlarged portion of the boiler, said uptake 29 and passage 28 being inclosed by suitable casing-walls 29 and 30, the former comprising a removable panel 29', arranged to give access
40 to the uptake 27 and to the main tubes.

Superheater flues or tubes 31 31, preferably arranged in an arc-shaped battery of several
45 rows or layers, connect the passage 28 with the uptake 32, alining with the uptake 22 above the partition-wall 25. From said uptake 32 opens the outlet-flue 33, leading to any suitable chimney or stack. A removable
50 panel 34 is preferably provided above the partition 25 to permit access to the tube ends and manhole-openings through uptake 33, and manholes 35 and 36 are preferably provided in the head 19, respectively, located just above
55 the partition-wall 25 and just below the battery of tubes 26, so as to communicate with the segmental spaces above and below the main battery of tubes. Any suitable heat-protecting covering may be provided for the crab of manhole 36. When desired, manhole
60 36 may be dispensed with and access had to the segmental space through manhole 15 only; but I prefer to employ both manholes where possible.

65 A steam-pipe communicating with the

steam-dome is illustrated at 37, and the fragment of a blow-off and feed pipe are shown at 38, both connected with the enlarged end of the boiler.

In operation the heat and products of combustion take the path indicated by the darts, first impinging on the lower side of the smaller portion of the boiler-shell, then passing through the flues or tubes 21, through the uptake 22 from and through the main battery of
75 tubes 26, and thence through the uptake 27, passage 28; superheater-tubes 31, and uptake 32 to the outlet-flue 33.

It will be apparent that as the portion of the boiler against which the hot gases impinge is of relatively small diameter it may be constructed of metal thin enough to be not deleteriously affected by the uneven expansion of the interior and exterior surfaces thereof, while the enlarged portion of the boiler, which gives it its large capacity and the peripheral wall of which is necessarily thick, does not have heat directly applied thereto. Therefore the thickness of the wall of the larger cylinder is not disadvantageous.
80 85 90

The water in the boiler is maintained at about the level indicated, so that the top of the small cylinder and upper arc of the enlarged zone, through which tubes 31 pass, provide a steam-dome of large capacity wherein the steam is superheated by the gases passing over the smaller cylinder and through tubes 31. Further, it will be apparent that through the provision of the removable panels and the manhole-access may readily be had to all
95 100 parts of the structure for cleaning and repairing.

While I have described in some detail a specific embodiment of my invention which I deem to be new and advantageous in the details of construction, I do not desire to be understood as limiting myself in respect to the broader features of my invention to the specific construction shown and described.
105

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—
110

1. In a steam-generator, a horizontal boiler-shell comprising a portion of smaller diameter, and a portion of larger diameter extending above the top of the portion of smaller diameter to provide a water-space in its lower portion alining with that of the portion of smaller diameter, and a steam-space in its upper segment, and passages for conducting gases through the water-space and subsequently through the steam-space in the larger portion of the shell.
115 120

2. In a steam-generator, a boiler-shell comprising a portion of smaller diameter and a portion of larger diameter, extending above the top of the portion of smaller diameter to provide a water-space in its lower portion alining with that of the portion of smaller diameter, and a steam-space in its upper segment,
125 130

tubes or flues taking through the joint length of said portions from end to end of the shell, superheating tubes or flues taking through the steam-space in the larger portion of the shell, and means for directing gases successively through the first said tubes or flues and the second said tubes or flues.

3. In a steam-generator, a boiler-shell comprising a portion of smaller diameter, and a portion of larger diameter, extending above and below the portion of smaller diameter, gas-passages through the lower segment of the portion of larger diameter, a main battery of tubes extending through the shell from end to end, passages through the upper segment of the portion of the shell of larger diameter, and means for directing the heating medium successively through the passages and tubes in the order named.

4. In a steam-generator a source of heat-supply, a boiler-shell having a portion of smaller diameter and a portion of larger diameter, the portion of smaller diameter being directly exposed to the heat, water-heating passages through the lower segment of the enlarged portion of the shell, water-heating tubes extending throughout the entire length of the shell, and superheating-tubes extending through the upper segment of the enlarged portion of the shell, and means for directing the heat successively through said passages and tubes in the order named.

5. In a steam-generator, a boiler-shell comprising a portion of smaller diameter and a portion of larger diameter, water-heating tubes or flues extending through the lower arc of the enlarged zone of the shell, superheating-tubes extending through the upper arc of the enlarged zone of the shell, a heat-generator arranged to primarily heat the portion of the shell of smaller diameter, and means for directing the heated gases through the water-heating tubes and superheating-tubes.

6. In a steam-boiler, a shell comprising a cylinder of smaller diameter and a cylinder of larger diameter arranged end to end in open communication, heads for the opposite ends of the cylinders, and braces for the head of the larger cylinder at one end secured to said head,

and at their other ends secured to the smaller cylinder.

7. In a steam-generator, a shell comprising a portion of smaller diameter and a portion of larger diameter, passages through the lower segment of the portion of larger diameter, tubes through the upper segment of said portion, a source of supply of a heating medium, and means for directing the heating medium successively through the passages and tubes in the lower and upper segments of said larger portion of the shell.

8. In a steam-generator, a shell comprising a portion of smaller diameter and a portion of larger diameter, flues through the lower segment of the larger portion of the shell, tubes through the upper segment of the larger portion of the shell, a source of supply of a heating medium, and means for directing the heating medium sequentially through said flues and tubes.

9. In a steam-generator, a shell having a front portion of relatively small diameter and a rear portion of relatively large diameter, a passage in rear of said shell, and a partition-wall in said passage dividing it into two uptakes, an uptake at the front end, a passage over the smaller part of the shell communicating with the front uptake, a furnace arranged to directly heat the lower surface of the smaller portion of the shell, tubes or flues taking through the lower segment of the enlarged portion of the shell arranged to receive heat from the furnace and opening into the lower rear uptake, fire-tubes taking through the shell from end to end and opening into the lower rear uptake and the front uptake, tubes taking through the upper segment of the enlarged portion of the shell opening into the passage over the front of the shell, and into the upper rear uptake, and an outlet-flue communicating with the upper rear uptake.

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

THOMAS R. BUTMAN.

In presence of—

FORÉE BAIN,

MARY F. ALLEN.