

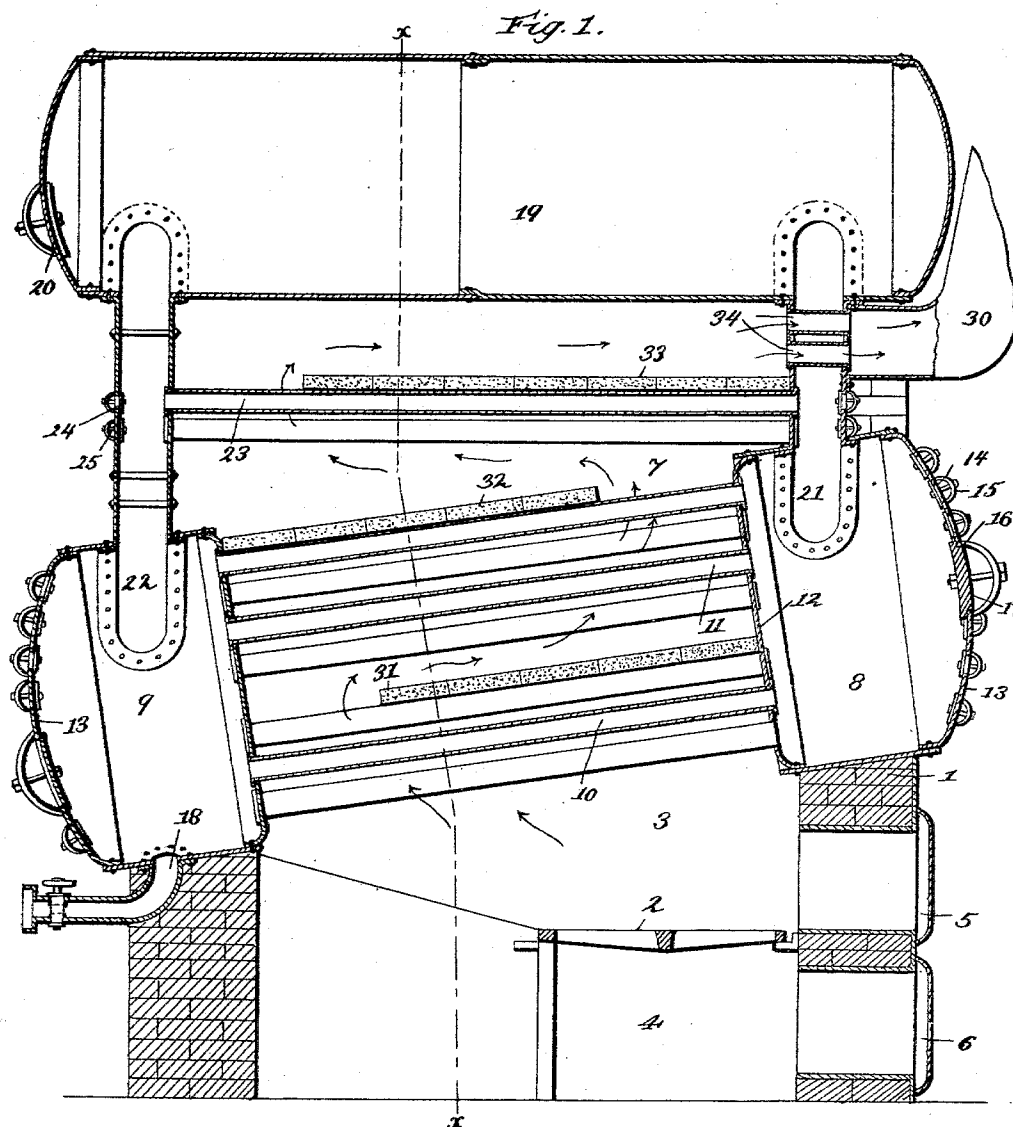
(No Model.)

2 Sheets—Sheet 1.

J. W. WARD.
WATER TUBE BOILER.

No. 566,826.

Patented Sept. 1, 1896.



witnesses:

C. H. Rader
W. A. James

Inventor

John W. Ward
By *James Sheehy*

Attorney

(No Model.)

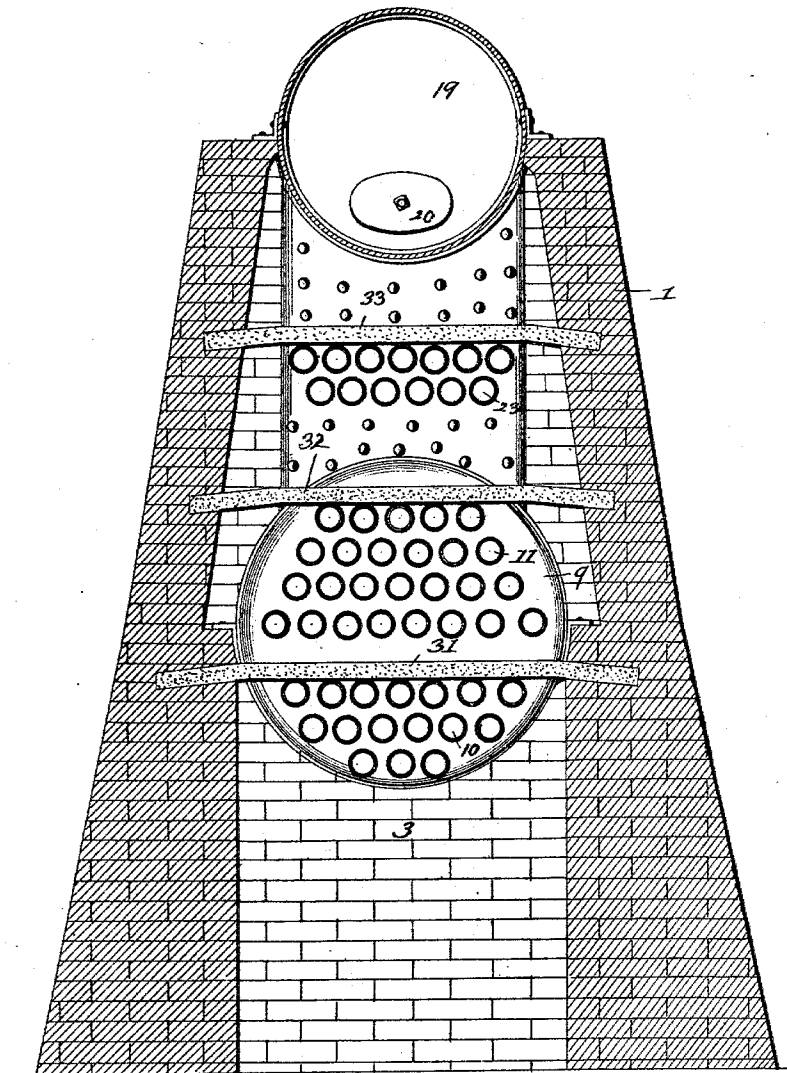
2 Sheets—Sheet 2.

J. W. WARD.
WATER TUBE BOILER.

No. 566,826.

Patented Sept. 1, 1896.

Fig. 2.



Witnesses:
C. A. Raeder
W. A. James

Inventor
John W. Ward
James J. Shuey
Attorney

UNITED STATES PATENT OFFICE.

JOHN W. WARD, OF NEW ORLEANS, LOUISIANA.

WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 566,826, dated September 1, 1896.

Application filed June 24, 1896. Serial No. 596,795. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. WARD, a citizen of the United States, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Water-Tube Boilers; and I do 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.

My invention relates to improvements in that class of steam-generators which embody water-tubes; and it has for one of its objects to provide a generator of the class mentioned embodying such a construction that ready access may be had to all of the parts for the purpose of repair or removal and replacement, and one having conduits of ample capacity to quickly carry the steam from the boiler to the steam-drum, and also having superheating-tubes in such conduits, whereby the flame, smoke, and particles of combustion are enabled to superheat the steam while the same is *en route* from the boiler to the steam-drum.

Other objects and advantages of the invention will be fully understood from the following description and claims, when taken in conjunction with the accompanying drawings, in which—

Figure 1 is a vertical longitudinal sectional view of my improved steam-generator; and Fig. 2 is a vertical transverse section of the same, taken in the plane indicated by the line *x x* of Fig. 1.

In the said drawings similar numerals designate corresponding parts in both views.

1 indicates the casing of my improved generator, which may be of the ordinary or any suitable construction and may be built of brick or other material suitable to the purposes of my invention. This casing 1 serves, in conjunction with the grate 2, which may also be of any suitable form and construction, to form the fire-box 3 and ash-pit 4, and it is provided in its front wall with doors 5 and 6, which open into the fire-box and ash-pit, respectively, as shown.

7 indicates the boiler, which is arranged in the casing and is canted or inclined downwardly toward the rear, as illustrated, for a

purpose presently described. This boiler 7 comprises the forward and rear cylinders 8 and 9 and the two series of water-tubes 10 and 11, which effect communication between the cylinders 8 and 9 and are connected to the inner plates 12 of said cylinders in any suitable manner, although I prefer to connect them in a detachable manner, so as to permit of them being readily removed and replaced when desirable or necessary. For this same purpose I provide the outer plates or heads 13 of the cylinders 8 and 9 with hand-holes 14, which are normally closed by detachably-connected plates 15, and I also arrange the hand-holes of one plate or head 13 in alinement with some of the water-tubes 10 11 and the hand-holes of the other plate or head 13 in alinement with the remaining water-tubes 10 11, whereby it will be seen that a ready removal of any one of the water-tubes may be effected when desired, which is an important advantage and a desideratum. I also provide the plates or heads 13 of the boiler-cylinders with manholes 16, which are normally closed by detachable plates 17, whereby it will be seen that ready access may be had to the interior of the cylinders 8 and 9 for the purpose of cleaning the tubes 10 and 11 without removing them, and also for the purpose of readily cleaning the said cylinders 8 and 9 I further provide the boiler 7 with the valved blow-off tube 18. This tube 18 communicates with the lower rear cylinder 9 of the boiler at or adjacent to the lowermost point thereof, and, as will be obvious, its provision renders the employment of a mud drum or drums unnecessary. All of the parts of the boiler 7, with the exception of the plates 15 and 17, which are not subjected to the action of fire, may be and preferably are formed of steel, and the boiler is thereby rendered exceedingly strong and durable.

19 indicates the steam-drum, which is also preferably formed of steel, with the exception of its manhole-plate 20, which, like the plates 15 and 17 of the boiler, may be cast-iron; and 21 22 indicate the water-legs, which connect the cylinders 8 and 9, respectively, with the drum 19, and are also preferably formed of steel. These legs 21 and 22 are of such a length as to support the drum 19 in a horizontal po-

sition, and they are preferably of such a size that their greatest width corresponds to the diameter of the cylinders 8 and 9, while their lesser width is eight inches, which is the standard width. In consequence of this, and the fact that the legs 21 22 extend in a vertical direction direct from the cylinders 8 9 to the drum 19, it will be seen that the said legs are adapted to conduct the steam in great volume and consequently quickly from the boiler to the steam-drum, which is an important advantage and a desideratum.

23 indicates water-tubes, which are preferably arranged in two horizontal series between the water-legs 21 and 22 and are preferably connected to the inner walls of plates of said legs in a detachable manner; and 24 are apertures in the outer walls of the legs, which are arranged in alinement with the tubes 23 and are normally closed by detachable plates 25, which may be of cast-iron, if desired, and are designed to be removed to permit of convenient access being had to the tubes, and also to permit of the tubes being readily removed and replaced, if desirable or necessary.

In order to cause the flame, particles of combustion, and smoke to take a tortuous course from the fire-box 3 to the uptake 30, I provide the baffle-plates or series of tiles 31, 32, and 33. The lowermost of these baffle-plates is arranged upon the lower series of water-tubes 10 and extends the full width of the boiler-casing and from the inner plate 12 of the cylinder 8 to a point adjacent to the inner plate of the cylinder 9. The intermediate baffle-plate 32 is arranged upon the tubes 11 and extends the full width of the casing and from the inner plate of the cylinder 9 to a point adjacent to the inner plate of the cylinder 8, and the upper baffle-plate 33 is arranged upon the water-tubes 23 and extends from the inner plate of the water-leg 21 to a point adjacent to the inner plate of the water-leg 22. In consequence of this it will be seen that the flames, smoke, and particles of combustion will be deflected by the baffle-plate 31 and caused to traverse the entire length of the tubes 10, and when they escape upwardly between the end of said plate and the cylinder 9 they will be deflected by the plate 32 and caused to traverse the entire length of the series of tubes 11, and when they pass upwardly between the end of plate 32 and the cylinder 8 they will be deflected by plate 33 and caused to traverse the entire length of the series of tubes 23, and passing up between the end of said plate 33 and the water-legs 24 they will be conducted between said plate 33 and the steam-drum 19 to the uptake 30, and in such passage will serve to highly heat the said drum. In order to utilize the passage of flame, smoke, and particles of combustion to the uptake 30 to superheat the steam in the leg 21, I provide the said leg with the superheating-tubes 34, through which the flame, &c., will pass *en route* to the uptake 30, as indicated by arrows in Fig. 1.

These superheating-tubes 34, which are preferably of steel, extend through the leg 21, as shown, and may be connected to the walls thereof in any suitable manner, although I prefer to connect them in a detachable manner, so as to permit of their ready removal and replacement. Owing to the tortuous course which the flame, smoke, and particles of combustion are compelled to take in transit to the uptake 30, as above described, it will be seen that almost if not quite all of the smoke, gas, and particles of combustion will be consumed before they reach the uptake, which is an important advantage. It will also be seen that said tortuous course affords a great amount of heating-surface, in consequence of which great evaporation or generation of the water into steam will take place.

In practice the water-level is in the steam-drum 19, and I have found that the best results are obtainable when the water is only sufficiently high to prevent warping of the metal of the drum.

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

1. In a steam-generator, the combination of a boiler, a steam-drum and a water-leg connecting the boiler and drum and provided at a point between the boiler and the drum with a superheating-tube for the passage of flame, smoke, &c., substantially as and for the purpose set forth.

2. A steam-generator comprising a casing having a fire-box, a boiler arranged in the casing and inclined or canted in the direction of its length and having cylinders at its opposite ends and two series of water-tubes connecting said cylinders, a steam-drum arranged above the boiler, water-legs effecting direct communication between the cylinders of the boiler and the steam-drum, water-tubes connecting the water-legs, baffle-plates arranged on the lower and upper water-tubes of the boiler and on the water-tubes between the legs, uptake communicating with the space between the upper baffle-plate and the steam-drum, and a superheating-tube extending through the water-leg adjacent to the uptake at a point between the boiler and the steam-drum, substantially as and for the purpose set forth.

3. A steam-generator comprising a casing having a fire-box, a boiler arranged in the casing and inclined or canted in the direction of its length and having cylinders at its opposite ends and two series of water-tubes connecting the inner walls of said cylinders and also having openings arranged in the outer walls of the cylinders and normally closed by detachable plates; the openings of one cylinder being arranged in alinement with some of the water-tubes and the openings in the other cylinder in alinement with the remainder of the tubes, a valved blow-off tube communicating with the cylinder at the lower end of the boiler, a steam-drum arranged above the

boiler, water-legs effecting direct communication between the cylinders of the boiler and the steam-drum, water-tubes connecting the water-legs, baffle-plates arranged on the lower and upper water-tubes of the boiler and on the water-tubes between the legs, an uptake communicating with the space between the upper baffle-plate and the steam-drum, and a superheating-tube extending through the water-leg adjacent to the uptake at a point between the boiler and the steam-drum, substantially as and for the purpose set forth.

4. A steam-generator comprising a casing having a fire-box, a boiler arranged in the casing and inclined or canted in the direction of its length and having cylinders at its opposite ends and two series of water-tubes con-

necting said cylinders, a horizontal steam-drum arranged above the boiler, water-legs effecting direct connection between the cylinders of the boiler and the steam-drum, water-tubes connecting the water-legs, baffle-plates arranged on the lower and upper water-tubes of the boiler and on the water-tubes between the legs, and an uptake communicating with the space between the upper baffle-plate and the steam-drum, substantially as specified.

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

JNO. W. WARD.

Witnesses:

PH. N. MARGETTS,
J. E. BOUDREAUX.