

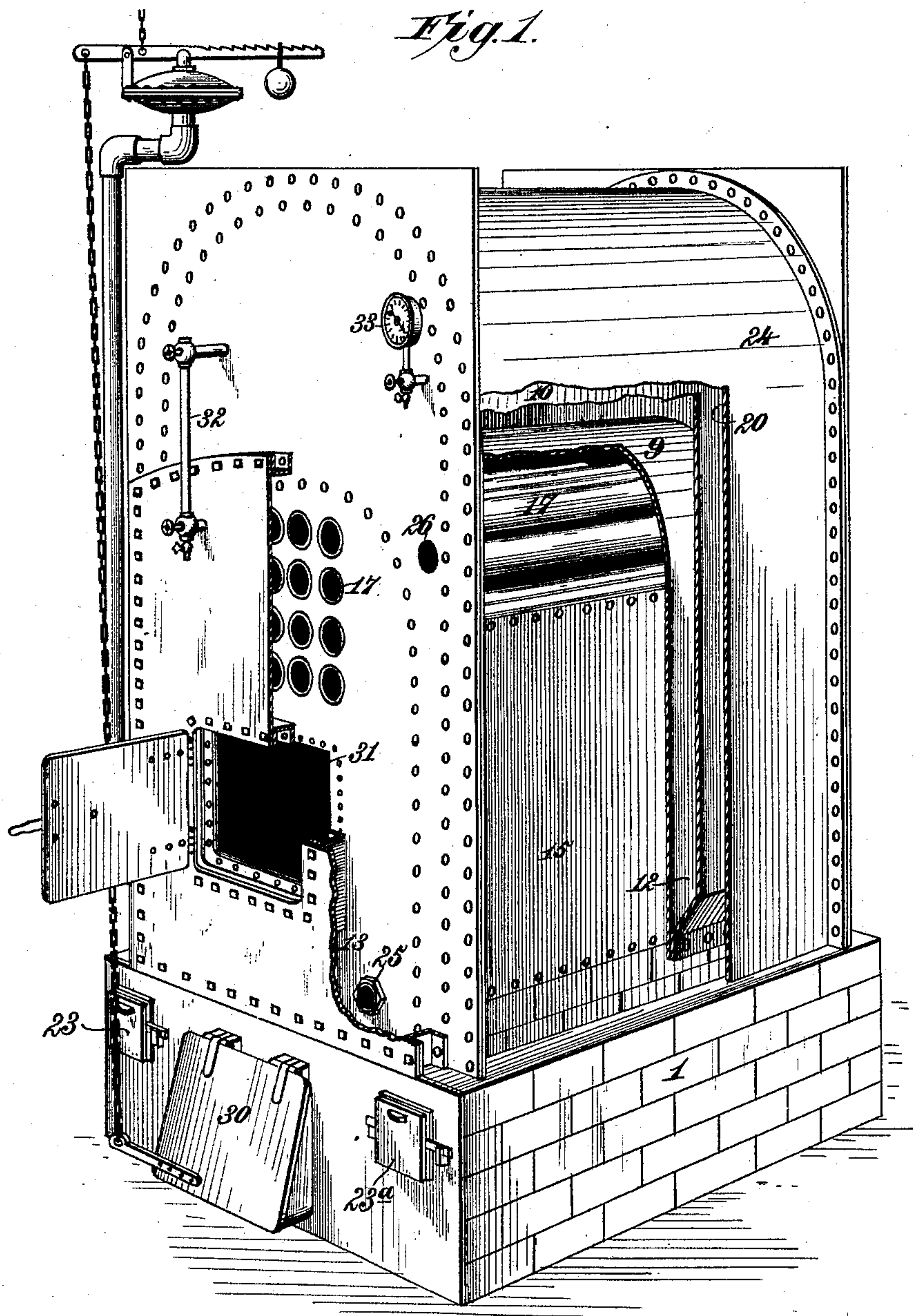
(No Model.)

3 Sheets—Sheet 1.

C. H. FARWELL.  
STEAM GENERATOR.

No. 422,754.

Patented Mar. 4, 1890.



Witnesses,  
*Robert G. Pratt,*  
*JA Rutherford.*

Inventor,  
*Chas. H. Farwell.*  
By *James L. Norris,*  
*Atty.*

(No Model.)

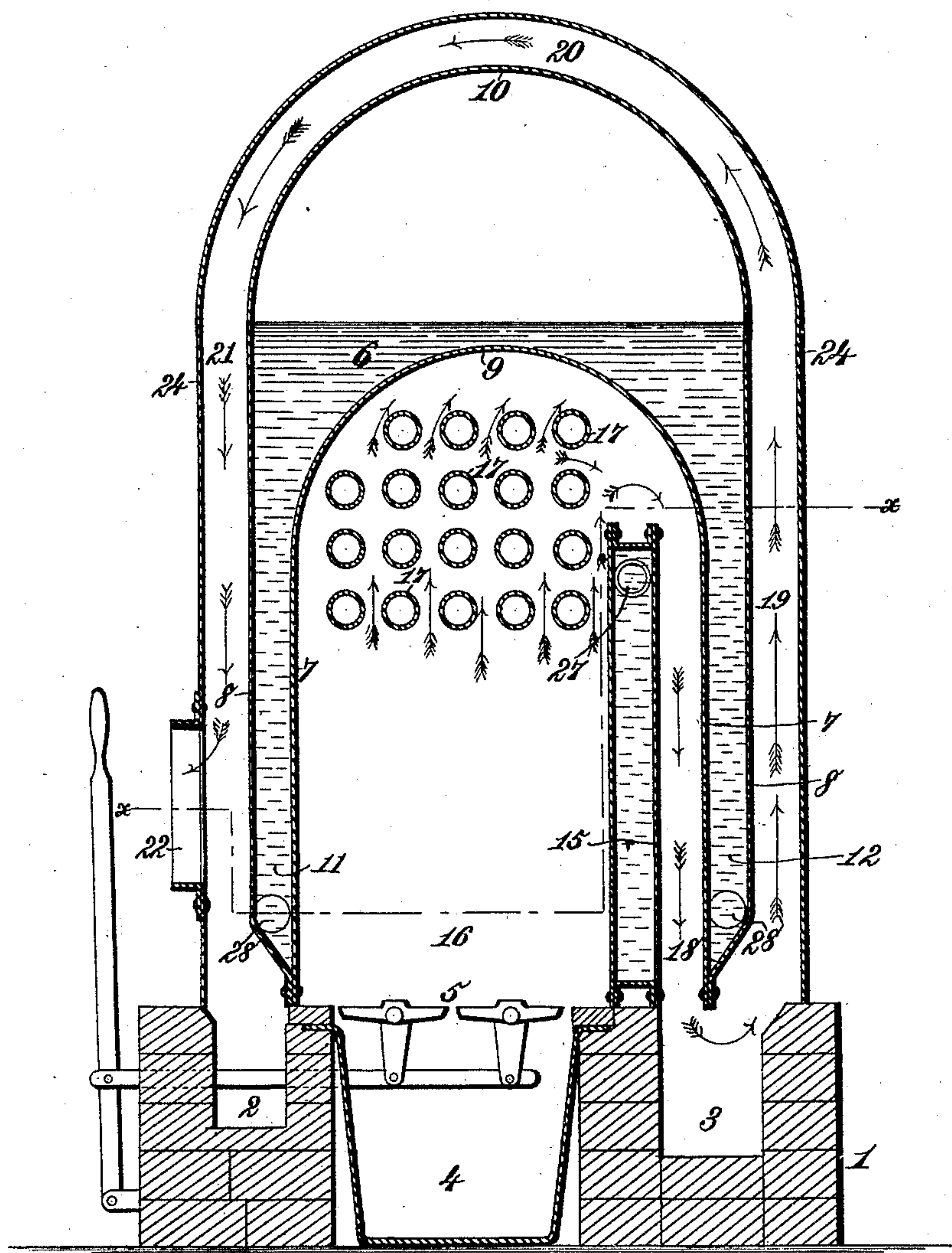
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C. H. FARWELL.  
STEAM GENERATOR.

No. 422,754.

Patented Mar. 4, 1890.

*Fig. 2.*



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(No Model.)

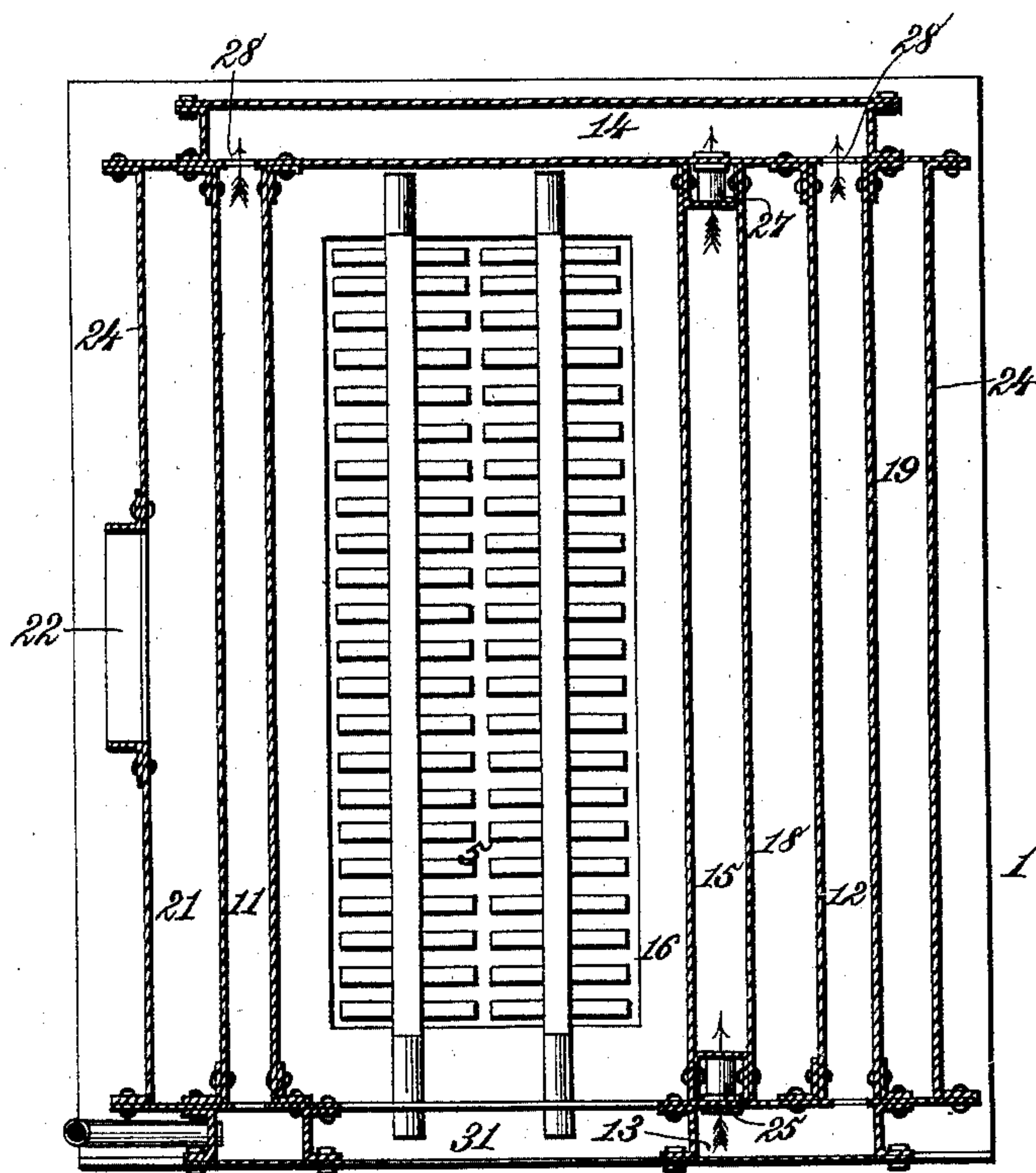
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*Fig. 3.*



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# UNITED STATES PATENT OFFICE.

CHARLES H. FARWELL, OF ATCHISON, KANSAS.

## STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 422,754, dated March 4, 1890.

Application filed July 22, 1889. Serial No. 318,255. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES H. FARWELL, a citizen of the United States, residing at Atchison, in the county of Atchison and State of Kansas, have invented new and useful Improvements in Steam-Generators, of which the following is a specification.

This invention has for its objects to provide an improved steam-generator, whereby the boiler is efficiently and perfectly heated by an economical consumption of fuel; to provide novel means for utilizing the heat in the escaping products of combustion; to provide a novel construction for the perfect circulation of the water; to provide a novel arrangement of water-back and diving smoke-flue, whereby the escaping smoke and other products of combustion are utilized to heat the side of the water-back, which is opposite or remote from the fire-box, and also the water-leg of the boiler, and to provide novel means whereby the smoke in its passage to the chimney is caused to traverse the entire top and side walls of the boiler. These objects I accomplish by the features of construction and combination of devices hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a perspective view broken away in front and at one side to more clearly exhibit the construction; Fig. 2, a vertical sectional view, and Fig. 3 a sectional view on the line *x x*, Fig. 2.

In order to enable those skilled in the art to make and use my invention, I will now describe the same in detail, referring to the drawings, where—

The numeral 1 indicates a brick-work or other base having in one side wall a longitudinal soot pit or flue 2, in the opposite side wall a similar longitudinal soot pit or flue 3, and between said walls an ash-pit 4, over which is a fire-grate 5, of any construction suitable for the conditions required, said grate being here shown as composed of two sections capable of being rocked or rotated by a hand-lever and connecting-rod as usual.

The water-chamber 6 of the boiler comprises inner and outer vertical shells 7 and 8, arched

at the top, as shown at 9 and 10, and so constructed as to form two depending vertical water-legs 11 and 12, located, respectively, at opposite sides and extending from the front water-head 13 to the rear water-head 14, the space between such water-legs containing a water-back 15, which rises vertically from the base 1 at one side of the grate and extends longitudinally from the front to the rear water-head. The fire chamber or box 16 is co-extensive in length with the space between the water-heads, and the upper end of the water-back terminates at a short distance beneath the arched part 9 of the inner shell 7.

The inside sheets of the water-heads are connected by a series of horizontal water-tubes 17, the external surfaces of which throughout their length are exposed to the direct action of the smoke and other products of combustion from the fire. The water-back 15 is located parallel to and at a short distance from the water-leg 12, to provide an intervening diving-flue 18, which receives the smoke at its top, conducts it down toward the longitudinal flue 3 in the base 1 to the ascending flue 19. This ascending flue connects at its top with a flue 20, arched over the boiler and communicating with a descending side flue 21, that connects at its lower portion with an escape-opening 22, which in practice is connected with any suitable chimney.

The soot-pit 2 underlies the smoke-flue 21 and serves to receive and retain soot and other matter, which can be removed as occasion demands by means of the opening and closing door 23, the flue 3 being also adapted to be cleansed through a similar door 23<sup>a</sup>. The flues 19, 20, and 21 are formed by an external shell or jacks 24, resting on the base 1, surrounding the boiler and separated a sufficient distance therefrom, such external shell or jacket extending from the front to the rear water-head and causing the smoke and other products of combustion to traverse the entire area of the side and top walls of the boiler. The inner sheet of the front water-head is provided at its bottom with a tube or orifice 25, that places the lower portion of the



said water-head in communication with the lower portion of the water-back, while the upper portion of the inner sheet of the front water-head is furnished with an overflow-orifice 26, that places the upper part of the front water-head in communication with the interior of the boiler. The rear end of the water-back at or near its top communicates by an overflow-tube 27 with the upper portion of the rear water-head. The rear ends of the water-legs communicate at their base with the rear water-head by the orifices 28, and the two water-heads are placed in communication by the series of horizontal water-tubes 17, connected to the inner sheets of the said heads. The front of the base is provided with a draft-regulating door 30, and the front water-head has a fire-door 31, these doors being of any desired construction.

The feed-water is introduced by any suitable pipe-connection with a water-supply, and, as shown, the water in the front water-head enters the lower part of the water-back by the supply-tube 25, and thence overflows by tube 27 into the rear water-head. The water entering the boiler through the overflow-opening 26, passes to the water-legs 11 and 12 through the orifices 28 to the rear water-head, and thence by the water-tubes 17 back to the front water-head and through the orifice 26 into the boiler, as before, thus causing a circulation of water through the lower part of the water-legs, the rear water-head, the water-tubes, and the front water-head, and also a circulation through the water-back and both water-heads.

I do not confine myself to a single water-back between the water-legs, nor to the exact arrangement shown of the smoke-escape opening 22. A water-gage 32 and a steam-gage 33 of suitable construction are provided, as usual.

Having thus described my invention, what I claim is—

1. The combination of a boiler having a pendent water-leg at each side, a fire-chamber between such legs, the front and rear water-heads in communication, respectively, with the front of the boiler and the rear lower portion of the water-legs by a top overflow-opening and base-orifices, a vertical diving-flue beside one of the water-legs, the water-tubes connecting the water-heads, and a shell or jacket surrounding the boiler and constituting a continuous flue in communication with the fire-chamber through the medium of the vertical diving-flue for causing the smoke and heat to traverse the entire outer surface of the water-legs and the top of the boiler, substantially as described.

2. The combination of a fire-chamber, a boiler having a pendent water-leg at each side of the fire-chamber, the front and rear water-heads, the connecting water-tubes, a vertical water-back rising at one side of the fire-chamber and communicating, respect-

ively, at its front and rear with the water-heads, a diving smoke-flue between the water-back and one of the water-legs, and an ascending smoke-flue beside said water-leg connected with the lower portion of the diving-flue and with an escape-opening, substantially as described.

3. The combination of a fire-chamber, a boiler comprising inner and outer shells arched at the top and extended downward into water-legs at the opposite sides of the fire-chamber, the front and rear water-heads communicating, respectively, with the upper front part of the boiler and the lower rear ends of the water-legs, a series of water-tubes connecting the water-heads, a water-back rising at one side of the fire-chamber between the water-legs, a diving smoke-flue located between a water-leg and the water-back and in communication at the top of the latter with the fire-chamber, and an ascending smoke-flue located beside the outer surface of such water-leg and communicating with the lower part of the diving-flue and an escape-opening, substantially as described.

4. The combination of a base, a fire-chamber, a boiler comprising inner and outer shells arched at the top and extending downward at the opposite sides of the fire-chamber to form two pendent water-legs, front and rear water-heads in communication, respectively, with the upper part of the boiler and the lower part of the water-legs by the top overflow-opening 26 and the base-orifices 28, water-tubes connecting the water-heads and exposed to the direct action of the fire, and a shell resting on the base, surrounding the boiler and its legs and constituting a continuous external smoke-flue having communication with the fire-chamber and causing the smoke and heat to traverse the entire surface of the outer shell of the boiler, substantially as described.

5. The combination, with a fire-chamber and a boiler having a depending side water-leg, of the water-heads, the connecting water-tubes, the water-back rising at one side of the fire-chamber adjacent to the water-leg, a diving smoke-flue located between the water-leg and water-back and communicating over the top of the latter with the fire-chamber, and an ascending smoke-flue rising outside the water-leg and connected with the lower part of the diving-flue, substantially as described.

6. The combination of the brick-work base having a central ash-pit and each side wall provided with a longitudinal side soot-pit and clean-out door, with the boiler having side water-legs and the external shell surrounding the boiler and its legs and forming the ascending, the arched, and the descending smoke-flues about the outside of the boiler, substantially as described.

7. The combination, with the boiler having water-legs and the front and rear water-heads



connected, respectively, with the boiler by the  
top overflow-opening 26 and the base-orifices  
28, of the water-back connected at the lower  
part of its forward end with the front water-  
5 head and at the upper parts of its rear end  
with the rear water-head, and a diving smoke-  
flue between the water-back and one of the  
water-legs, substantially as described.

In testimony whereof I have affixed my sig-  
nature in presence of two witnesses.

CHARLES H. FARWELL.

Witnesses:

HENRY ELLISTON,  
S. B. MCQUEEN.