

944,669.

E. F. EDGAR.
STEAM BOILER.
APPLICATION FILED MAR. 6, 1908.

Patented Dec. 28, 1909.
4 SHEETS—SHEET 1.

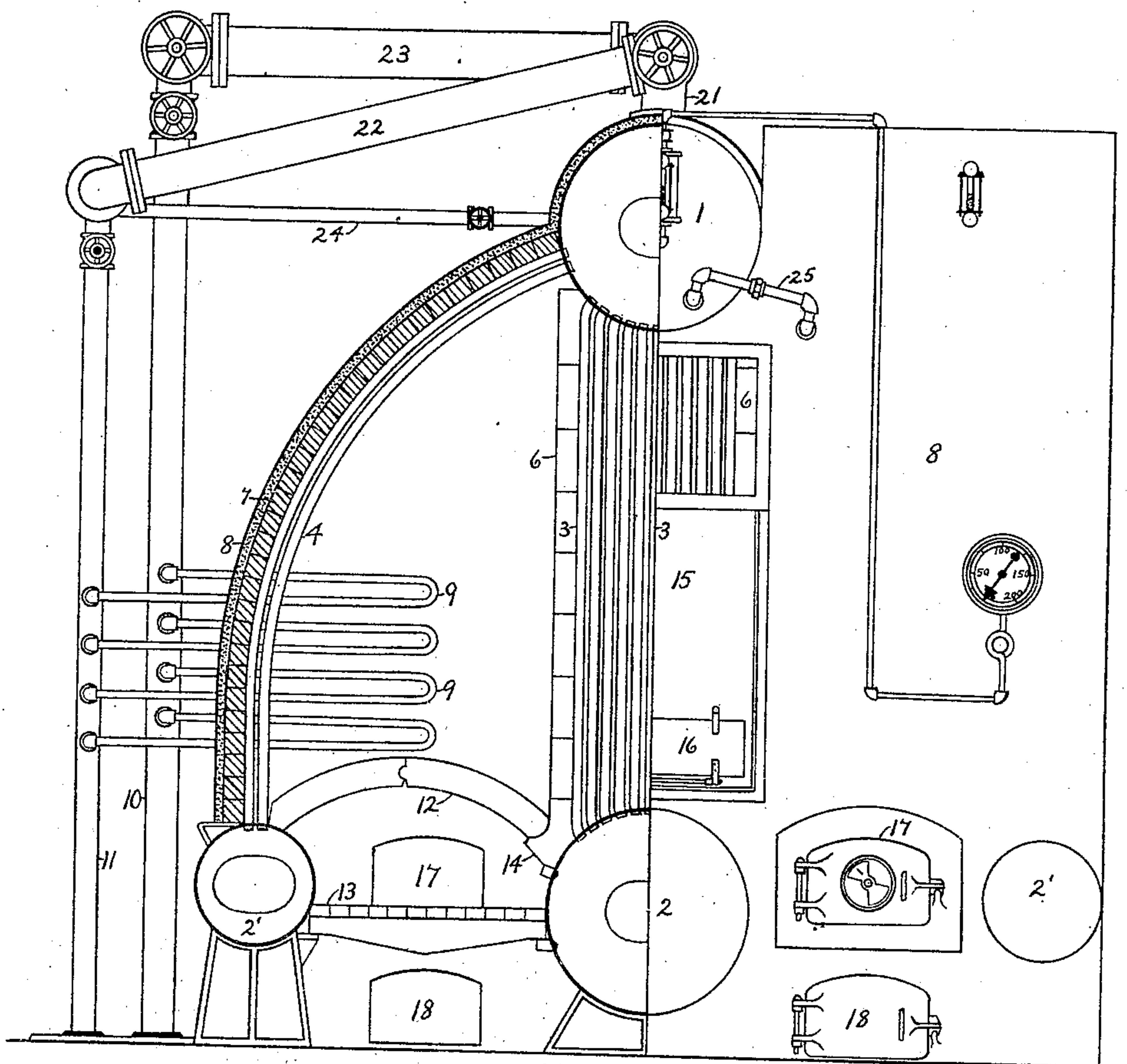


Fig. 1.

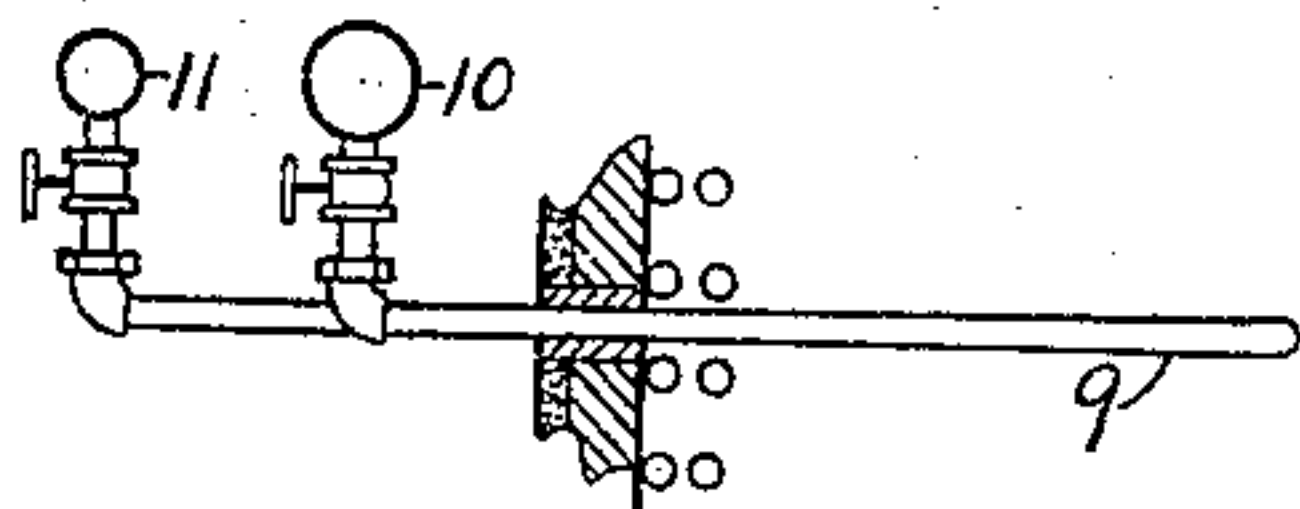


Fig. 5.

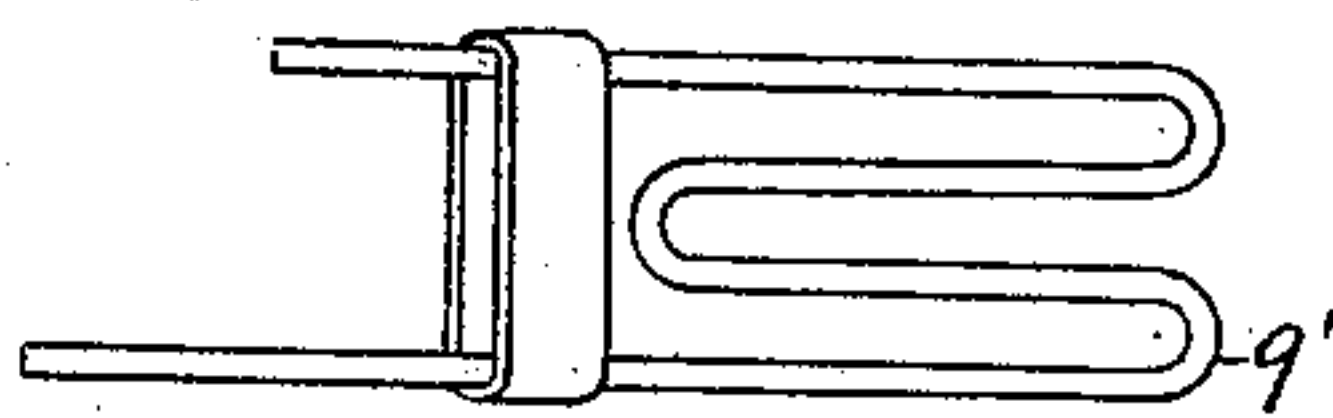


Fig. 6.

WITNESSES:
E. B. Edgar.
J. B. Edgar

INVENTOR
Ellis F. Edgar

944,669.

E. F. EDGAR.
STEAM BOILER.
APPLICATION FILED MAR. 6, 1908.

Patented Dec. 28, 1909.
4 SHEETS—SHEET 2.

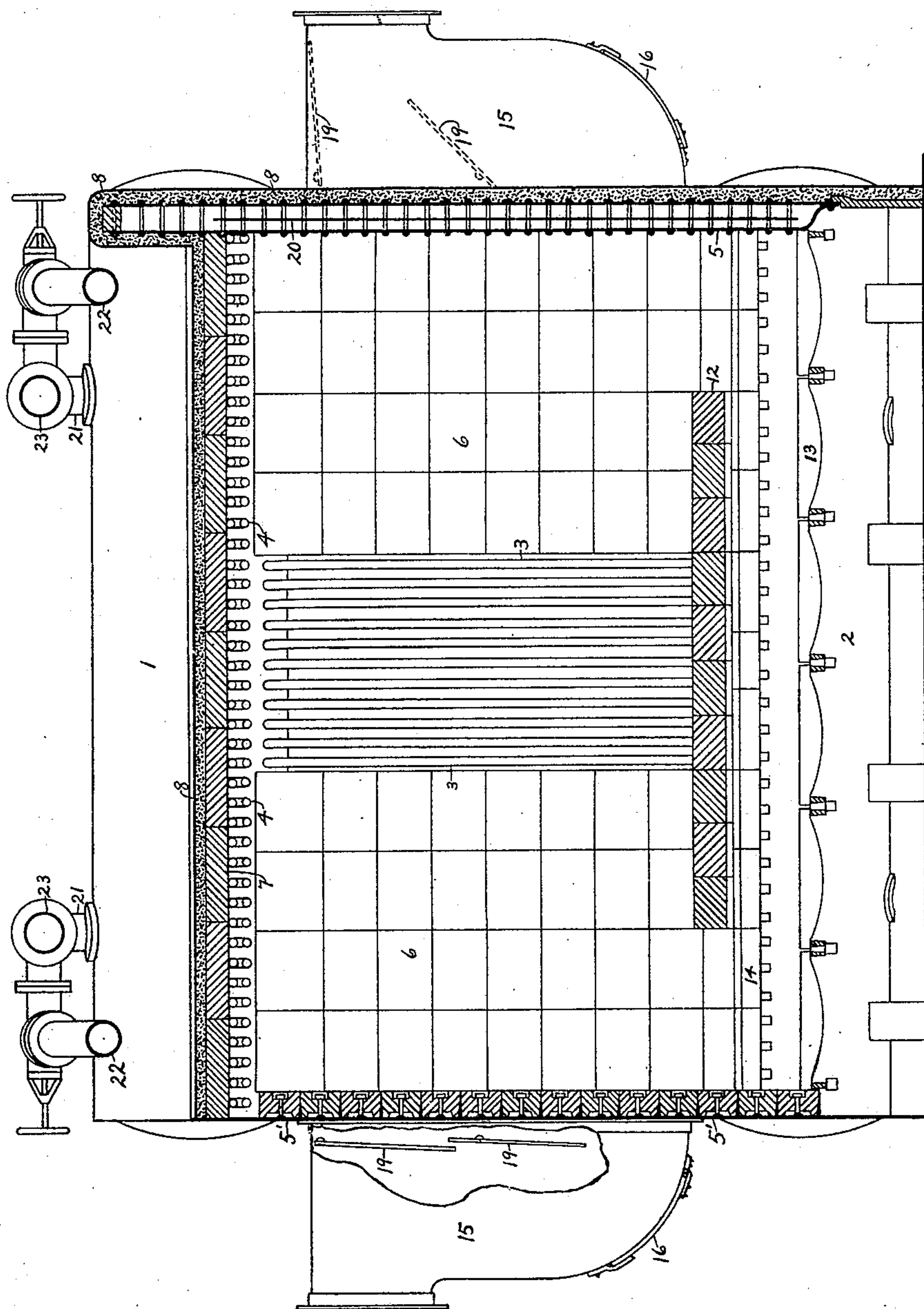


Fig. 2.

WITNESSES:
E. B. Edgar.
J. B. Edgar

INVENTOR
Ellis F. Edgar

E. F. EDGAR.

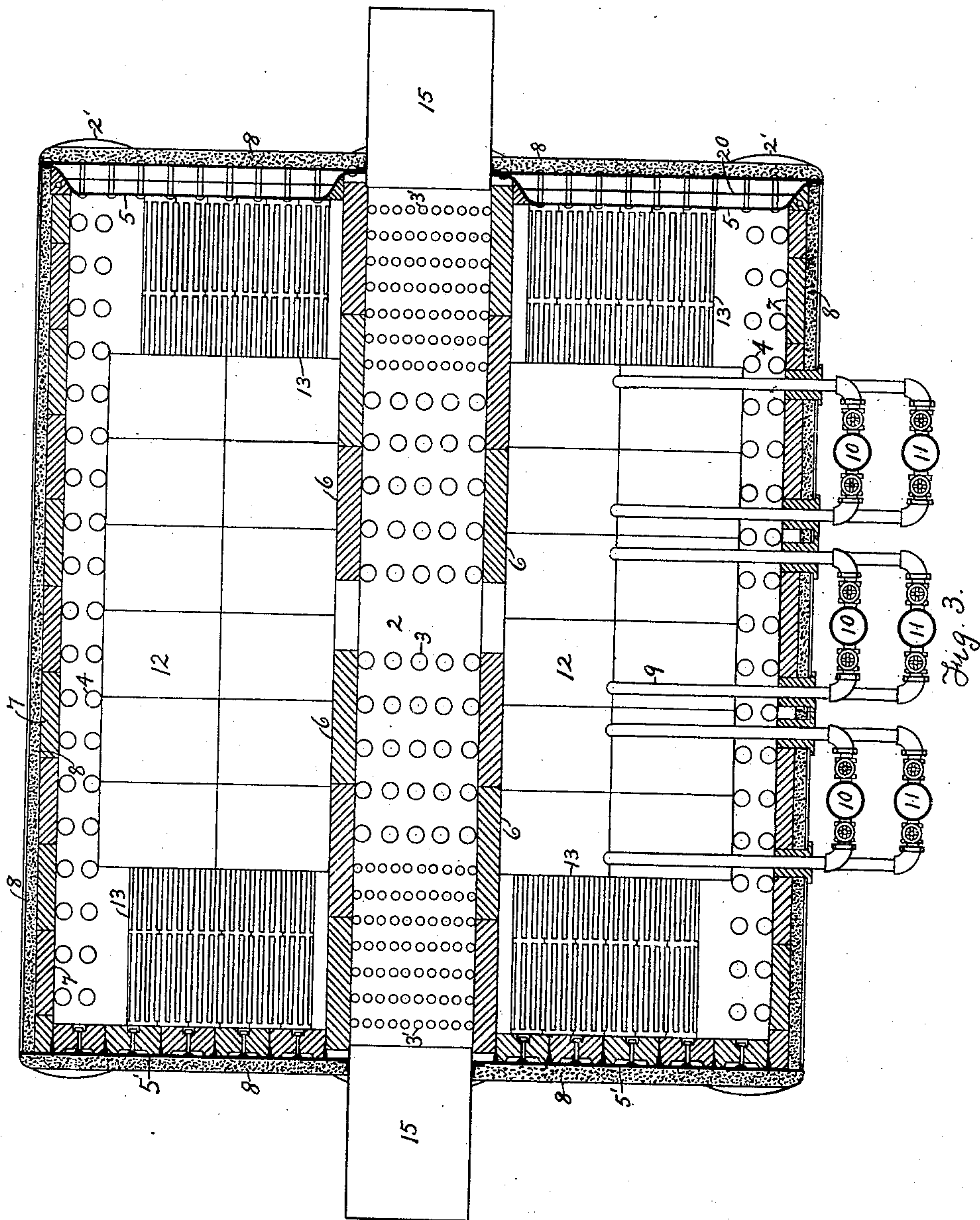
STEAM BOILER.

APPLICATION FILED MAR. 6, 1908.

944,669.

Patented Dec. 28, 1909.

4 SHEETS—SHEET 3.



WITNESSES:
E. B. Edgar.
J. B. Edgar.

INVENTOR
Ellis F. Edgar

944,669.

E. F. EDGAR.
STEAM BOILER.
APPLICATION FILED MAR. 6, 1908.

Patented Dec. 28, 1909.
4 SHEETS—SHEET 4.

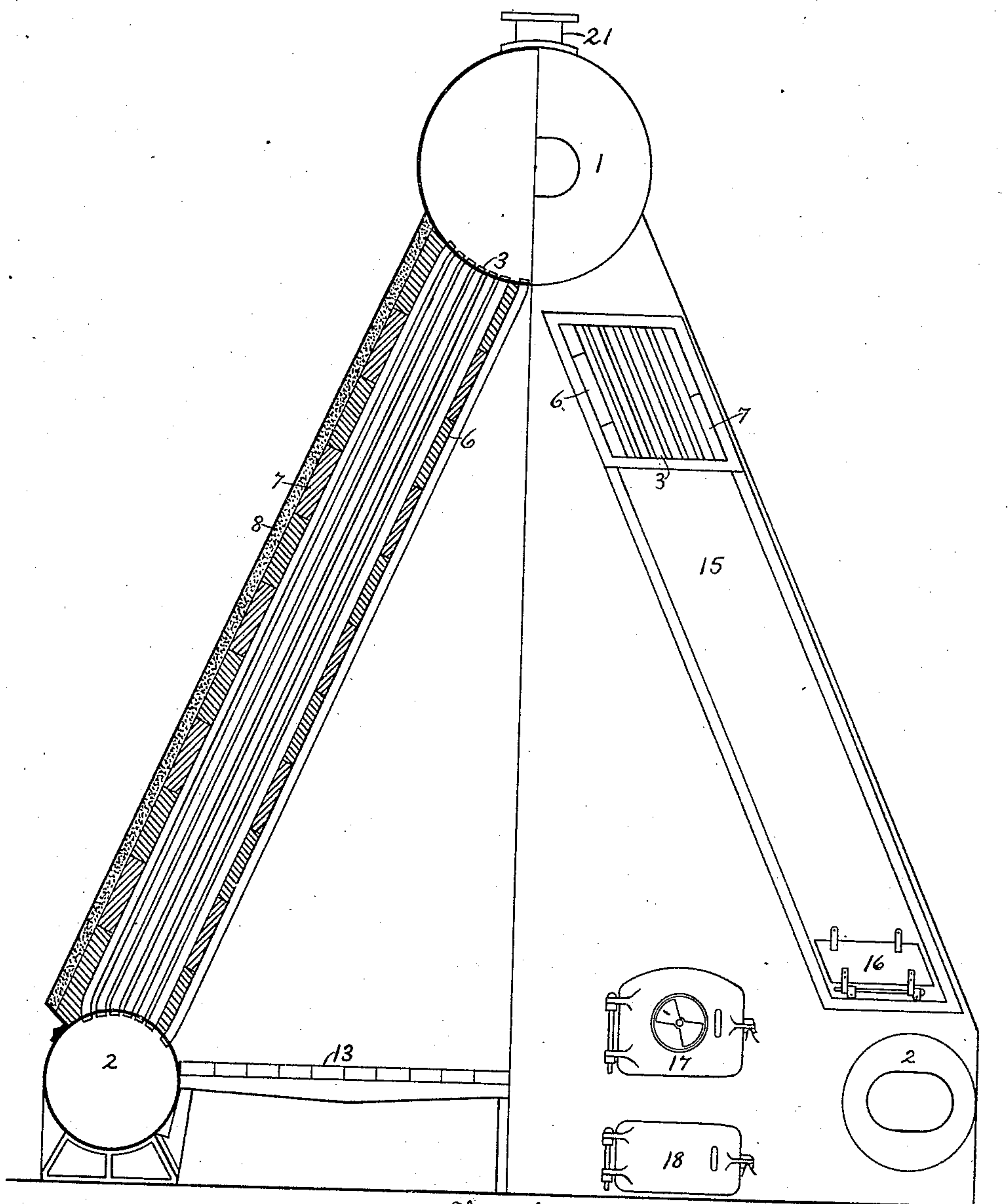


Fig. 4.

WITNESSES:
E. B. Edgar.
J. B. Edgar

INVENTOR
Ellis F. Edgar

UNITED STATES PATENT OFFICE.

ELLIS F. EDGAR, OF WOODBRIDGE, NEW JERSEY.

STEAM-BOILER.

944,669.

Specification of Letters Patent.

Patented Dec. 28, 1909.

Application filed March 6, 1908. Serial No. 419,415.

To all whom it may concern:

Be it known that I, ELLIS F. EDGAR, citizen of the United States, and resident of Woodbridge, in the county of Middlesex and State of New Jersey, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification.

Figure 1 is a front elevation part in full and part in section of a boiler embodying my invention. Fig. 2 is a side elevation section at A—B in Fig. 1. Fig. 3 is a plan view. Fig. 4 is a front elevation part in full and part in section of a modification of the general construction. Fig. 5 is a detail plan view of one of the two leg superheating loops 9, showing manner of entering through casing and connecting up to headers. Fig. 6 detail view of a four leg superheating loop 9'.

This invention relates to an oblong section composed of an upper and lower drum connected by water tubes, the water tubes being of different size in diameter, and draft exits sometimes called uptakes at one or both ends of each section, preferably at both ends, they having an opening near the top for a smoke flue connection leading to the chimney and a clean-out door in the lower portion, and a furnace on one or both sides of each section, and preferably double end fired, and preferably an arch a short distance above the grate, and preferably open at each end, and the uptakes or draft exits usually have two or more adjustable draft baffles.

Some of the principal features shown and described in this application were covered in a patent issued to me December 4th, 1906, No. 837,392, also in previous patents, September 8, 1903, No. 12,155, September 5, 1905, No. 798,997, March 13, 1906 No. 814,949, but the combination set forth in this application embodies invention as with the combination herein set forth, a boiler can be produced of far greater steaming power with corresponding economy.

Details of construction.—1 upper drum; 2 lower drum; 3 and 3' water tubes connecting upper and lower drum; 4 water tubes connecting upper drum 1 to small lower side drums 2' forming part of side casing of furnace; 5 water leg casing at end of furnace; 5' cast iron and brick casing at end of furnace; 6 baffle walls; 7 side casing bricks covering water tubes 4; 8 asbestos

covering; 9 two-leg superheating loops; 9' four-leg superheating loop; 10 discharge header from superheating loops; 11 receiving header for superheating loops; 12 brick arch a short distance above the grate; 13 the grate; 14 skewback brick; 15 uptake at end of section; 16 clean-out doors; 17 furnace doors; 18 ashpit doors; 19 draft baffles in uptakes; 20 circulating plate in water leg casing at end of furnace; 21 steam exit; 22 connection between steam exit and receiving headers for superheating loops; 23 bypass from discharge headers of superheating loops to boiler; 24 connection from upper drum to receiving headers of superheating loops for flooding same; 25 water connection from upper drum to water leg casing at ends of furnace.

Fig. 4 is a boiler consisting of two oblong sections connected to one upper drum. This modification is adapted to small boilers, especially small marine boilers, and can be worked without brick arch 12 as baffle walls 6 act as radiating surface, but better results will be obtained especially where double end firing can be used. In using brick arch 12 in this construction I would use a higher saddle under lower drums 2 so as to lower the gate. The best results are always obtained by the double end firing and the double end draft. This two section boiler shown in Fig. 4 shows one section in section view with draft exit removed, the other section shows the draft exit or uptake with its opening at the top for smoke flue connection and clean out door at the bottom. Preferably I would build this style of boiler with four draft-exits, one at each end of each section as shown in Fig. 2, which is a sectional side elevation view of one section and preferably with brick arch as shown in Fig. 2.

If the small tubes 3' next to the draft exits are one inch tubes and the space between the tubes $\frac{1}{2}$ inch it would readily be seen that the heat is divided through the water as much as it is possible to do with a boiler of any size.

The water leg casing 5 has a circulating plate through the center of it as shown, the steam being formed between the circulating plate and the plate on the furnace side rises with the water to the top of the circulating plate producing a very rapid circulation, the steam separating at the top of the circulating plate from the water to the steam

space above the circulating plate from whence it is conveyed to the steam space in upper drum 1, the water returning between the circulating plate and the outside plate.

5 I might in some cases build the outside casing of the boiler on the sides as well as the ends in this manner.

Operation.—The fire is started on grate 13, which extends almost the length of the section as shown in Fig. 2 and Fig. 3. In 10 Fig. 3 the brick arch 12, obscures the grate from view except at each end. This arch in the center should be three and a half or four feet from the grate. This will pro- 15 duce a very high temperature in the gases and when the gases come out from under this arch, the heat that is not absorbed by water leg casing 5, and water tubes 4, passes to the center of the section between water 20 tubes 3, and water tubes 3' after entering between water tubes 3 and 3'. The velocity due to the draft of the chimney is checked by baffle dampers 19, in uptakes 15, and as the heat is absorbed, the cooling gas 25 that is left drops through the wide spacing to the lower portion of this oblong section and passes out into uptake 15, under draft baffles 19. It will be seen in the sectional side elevation view Fig. 2, baffle walls 6, are 30 farther apart and expose more of water tubes 3, to the radiation of the furnace than is shown in the plan view Fig. 3, there only being shown here a draft area slightly in excess of the draft area between water 35 tubes 3.

I may use my superheating attachment for which I was granted a patent July 7th, 1903, which is especially adapted to the construction, as shown in Figs. 1, 2 and 3 40 in this application entering the furnace as shown, through the side casing between water tubes 4, and over brick arch 12, there being thimbles built in this casing for the loops to pass through and the loops only 45 extending the length of the arch and over it, and part of the height of the furnace, therefore it will be seen that they are not in the direct passage of the flame, which is advisable to prevent rapid deterioration by 50 being subject to too high a temperature, as the flames in coming out from under the arch will pass straight up to the upper part of the furnace, thence along the hot baffle walls which induces their path in this 55 course, to the center of the section through the opening between baffle wall 6, to water

tubes 3 and 3', thereby heating the superheating loops by radiation. In the side elevation section view in Fig. 2 the draft baffles 19, on the right hand uptake 15, are 60 shown raised. This is their position when blowing dust off the tubes through clean-out door 16 in the lower portion of uptake 15.

In boilers constructed to work at a very 65 high pressure where it would be an objection to use a stay-bolted surface, as shown in water leg casing 5, I would use the end casing 5' constructed of cast iron with projections cast on forming pockets and a fire 70 brick lining bolted in same as shown and the side casings would be constructed of water tubes 4, brick 7, asbestos 8 as shown.

Having described my invention, what I claim as new and desire to secure by Let- 75 ters Patent is:

1. In a water tube boiler an oblong section composed of an upper and lower drum connected by water tubes of more than one size in diameter and a suitable draft exit, 80 the tubes of smallest diameter being located next to the draft exit, adjustable draft baffles located at said draft exit, whereby the gases are checked in velocity to the extent of cooling sufficient to pass out under 85 said adjustable draft baffles all substantially as set forth.

2. The combination in a water tube boiler of two oblong sections, each oblong section having one lower drum, the lower drums 90 of both sections being connected to one upper drum by water tubes, each section having a draft exit at each end making four draft exits to the boiler, all substantially as set forth. 95

3. The combination in a water tube boiler of two oblong sections, each oblong section having one lower drum, the lower drums of both sections being connected to one upper drum by water tubes each section hav- 100 ing a draft exit at each end making four draft exits to the boiler, said boiler having a furnace located between said sections containing a non-combustible arch all substantially as set forth. 105

Signed at New York, in the county of New York and State of New York, this 4th day of March, A. D. 1908.

ELLIS F. EDGAR.

Witnesses:

E. B. EDGAR,
I. B. EDGAR.