

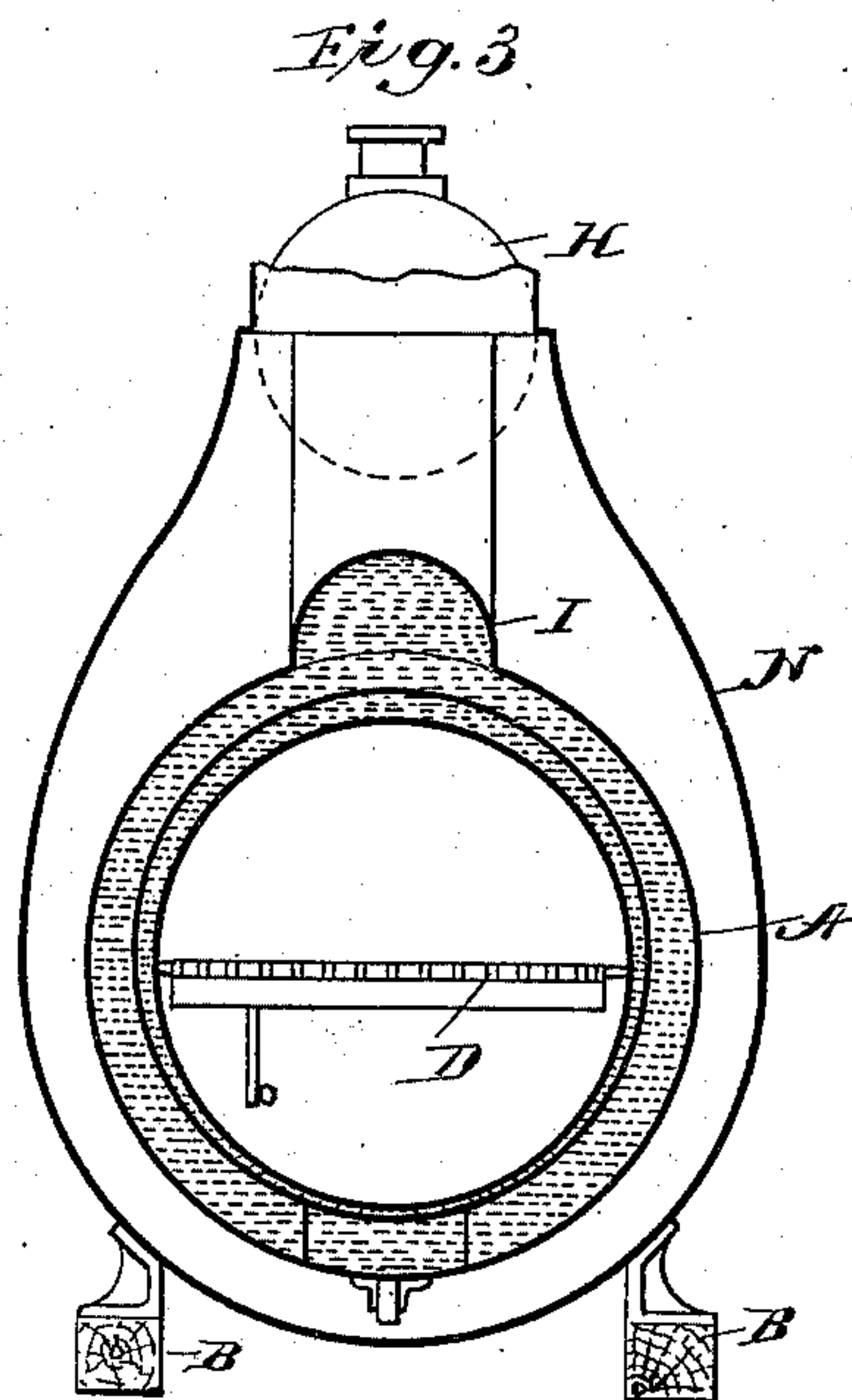
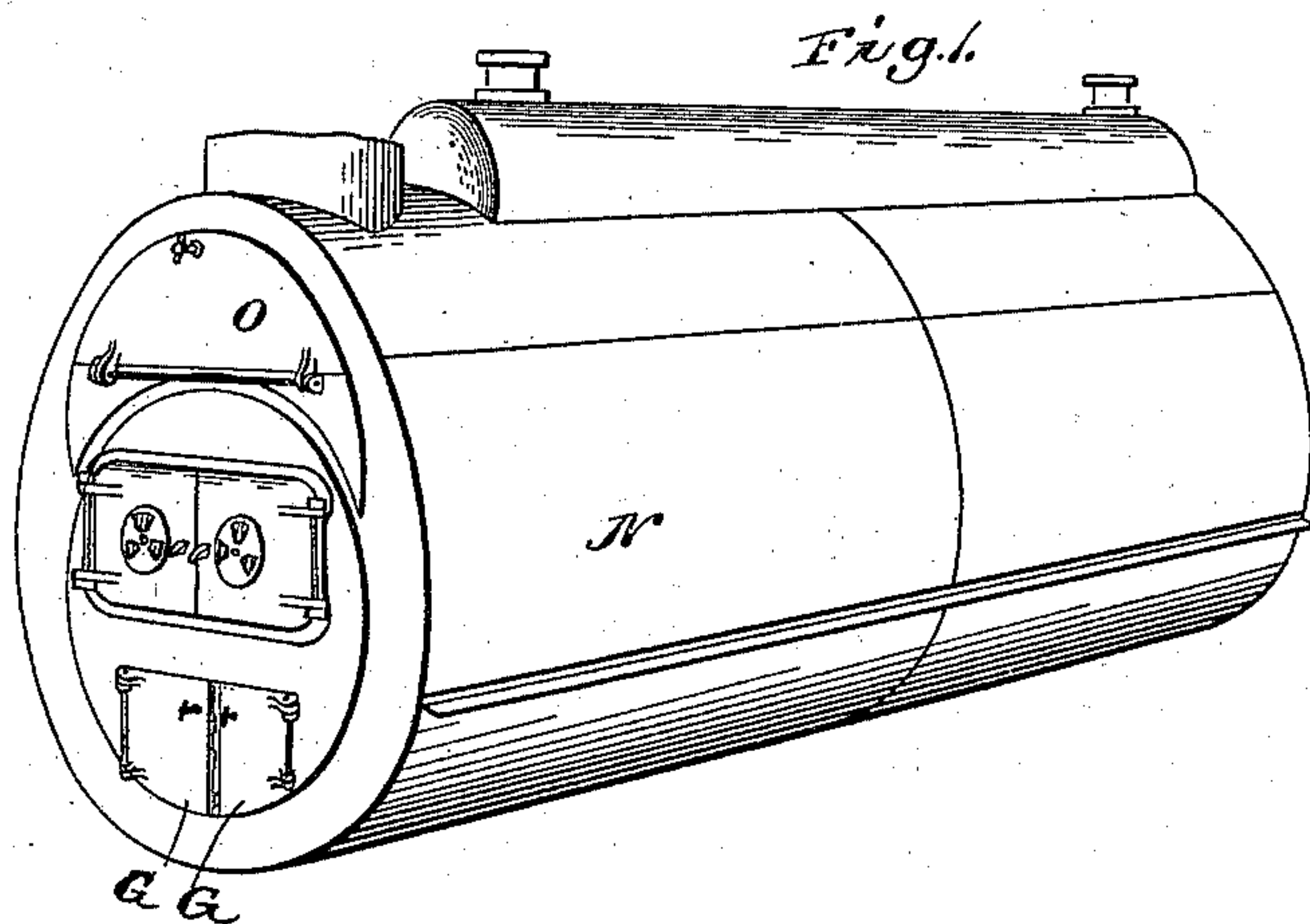
(No Model.)

2 Sheets—Sheet 1.

J. A. MUMFORD.
STEAM BOILER.

No. 558,698.

Patented Apr. 21, 1896.



witnesses:

J. M. Fowler Jr.
A. M. Kelly

Inventor:

Joseph A. Mumford,
By Church & Church
his Attorneys.

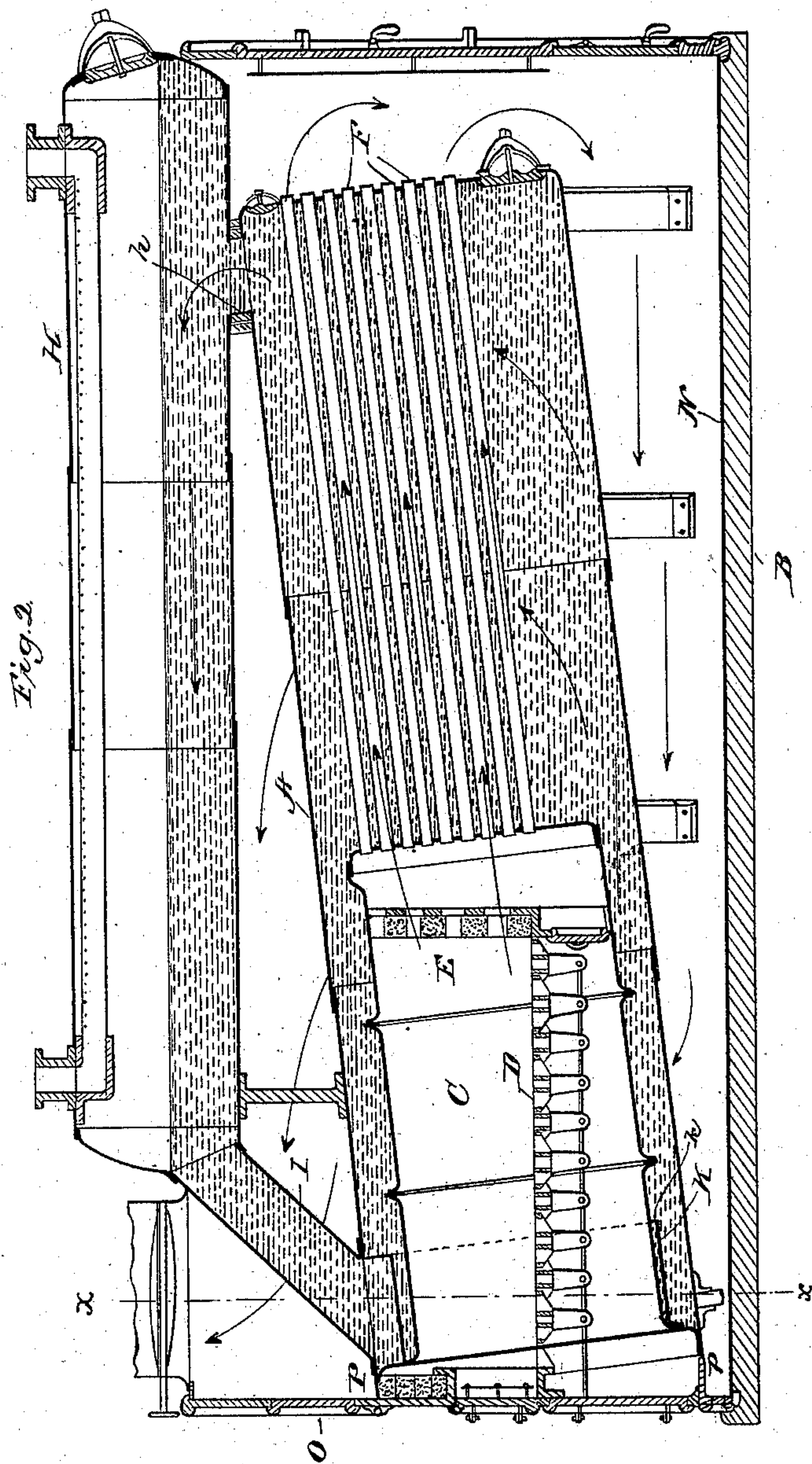
(No Model.)

2 Sheets—Sheet 2.

J. A. MUMFORD.
STEAM BOILER.

No. 558,698.

Patented Apr. 21, 1896.



Witnesses:

J. M. Fowler Jr.
A. M. Kelly

Inventor:

Joseph A. Mumford,
Church & Church,
his Attorneys.

By

UNITED STATES PATENT OFFICE.

JOSEPH A. MUMFORD, OF HANTSPORT, CANADA.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 558,698, dated April 21, 1896.

Application filed July 19, 1894. Renewed September 23, 1895. Serial No. 563,439. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH A. MUMFORD, of Hantsport, Nova Scotia, Canada, have invented certain new and useful Improvements in Steam-Boilers; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

My present invention relates to fire-tube boilers, being a further development of the invention disclosed in my prior patents, especially Patent No. 350,440, dated October 5, 1886; and in the present instance the invention consists, first, in combining with the inclined fire-tube boiler containing the fire-box, an elevated horizontal drum communicating at one end with the highest point of the boiler and at the opposite end with the lowest part of the boiler, with an inclosing case for securing a circulation of the products of combustion in the same direction as the circulation of water within the boiler and drum.

Secondly, the invention consists in certain novel details of construction and combinations and arrangements of parts, all as will be now described, and pointed out particularly in the appended claims.

Referring to the accompanying drawings, Figure 1 is a perspective view of the structure complete. Fig. 2 is a vertical section taken from end to end of the same. Fig. 3 is a detail section on the line *xx*, Fig. 2.

Like letters of reference indicate the same parts in all the figures.

The shell A of the boiler proper is supported in an inclined position on supports B of any suitable character, and within it is arranged the fire-box C, having a substantially horizontal grate D and bridge E. From the rear end of the fire-box substantially parallel fire-tubes F extend to the rear end of the boiler. Thus the fire is maintained entirely within the boiler-shell, suitable provision being made of course for the introduction of fuel and removal of cinders and ashes—such, for instance, as the fire and ash-pit doors G G'.

Above the boiler A and arranged in a horizontal position is a drum H of substantially the same length as the boiler, but preferably of much smaller diameter. A relatively

large leg-duct conduit *h* connects the extreme top of the boiler and bottom of the drum near one end, and from the other end of the drum a duct conduit or pipe I of substantially the same cross-sectional area leads down to the lower end of the boiler, the entrance to the boiler being beneath the fire-box. To pass the water around the fire-box, I preferably form by means of plates K a duct extending around the fire-box in the outer corner of the boiler-shell, as shown clearly in Figs. 2 and 3. The plates forming the duct are cut away on the rear side, as at *k*, directly beneath the fire-box, and the conduit I opens into the duct at the top. The result of this arrangement it will be seen is to carry the water coming down through the duct around the fire-box without subjecting it to the influence of the direct heat therefrom, down to the under side where it takes the place of the water constantly circulating to the upper end of the boiler and up through the drum.

The fire-box is completely surrounded by water, giving a large area of steam-producing or heating surface, and the steam generated about the same passes along up the inclined shell and into the drum, from whence it is conducted away to the point where it is to be utilized.

It is my aim in the present structure not only to utilize the heat from the products of combustion within the inclined boiler, but to also make the entire outer surface of the boiler and under surface of the drum a heating-surface, thereby securing a high degree of efficiency, and for this purpose a casing N, preferably substantially cylindrical or slightly oval in cross-section, entirely incloses the boiler and the lower portion of the drum.

The casing is of uniform height, passes around the duct I at the front end of the boiler, and has the exit or stack opening immediately in front of the drum, thereby forcing the products of combustion to pass from the fire-tubes out around the outside of the boiler-shell and under side of the drum to the forward end of the casing. The circulation of the products of combustion it will thus be seen is in the same direction as the circulation of the water.

From Fig. 1 it will be seen that the casing

is provided with a door O for inspecting boiler-shell from the front, and in the preferred construction I mount the fire and ash-pit doors in the casing and extend the cylindrical boiler-shell forward, as at P, Fig. 2, to make a tight fit.

I am aware that it is not broadly new to locate an inclined boiler in an outer casing, and I do not wish to be understood as claiming such a structure herein save in combination with the relatively long horizontal drum located above the boiler.

Having thus described my invention, what I claim as new is—

15 1. The combination with the inclined boiler having the internal fire-box and fire-tubes extending through the boiler, of the relatively long horizontal drum located above the boiler, the conduit connecting the upper end of the boiler at the top with one end of the drum, and a conduit leading from the opposite end of the drum to the lower end of the boiler; substantially as described.

25 2. The combination with the cylindrical boiler-shell mounted in an inclined position, the inclined fire-box within the boiler the fire-flues extending through the boiler and the substantially horizontal grate, of the relatively long drum arranged horizontally over the boiler, a duct connecting the upper end of the boiler at the top and the drum at one end, a duct connecting the opposite end of the drum and lower end of the boiler at the bottom, and a casing surrounding the boiler and forming a chamber for the products of combustion; substantially as described.

40 3. The combination with the inclined cylindrical boiler-shell, the fire-box mounted in the lower end of the same, the fire-tubes extending from the fire-box to the rear end of the shell and the horizontal casing surrounding the boiler, of the relatively long drum supported horizontally above the boiler, a duct connecting the upper end of the boiler

at the top and one end of the drum, and a duct leading from the opposite end of the drum and opening into the boiler beneath the fire-box; substantially as described.

4. The combination with the inclined cylindrical boiler having the fire-box in its lower end and the duct extending around the fire-box but out of contact therewith and having the opening at the bottom, of the relatively long horizontal drum above the boiler, a duct connecting one end of the drum and the upper end of the boiler at the top and a duct connecting the opposite end of the drum and the duct within the lower end of the boiler; substantially as described.

5. The combination with the horizontal substantially cylindrical casing, the fire-tube boiler supported in the casing in an inclined position and the fire-box located within the lower end of the boiler, of the relatively long drum mounted in the top of the casing and the conduits from opposite ends of the drum extending down within the casing to opposite ends of the boiler; substantially as described.

6. The combination with the horizontal substantially cylindrical casing having the exit-opening at the top of the front end, the boiler-shell supported in an inclined position in said casing, the fire box and tubes in said shell and the fire and ash-pit doors located in the front end of the casing, of the relatively long drum mounted in the top of the casing, a conduit connecting the rear end of the drum and the rear end of the boiler at the top, a conduit extending around the fire-box inside the boiler but out of contact with the fire-box and a conduit extending therefrom up to the forward end of the drum; substantially as described.

JOSEPH A. MUMFORD.

Witnesses:

W. M. CHRISTIE,
I. CURRY.