

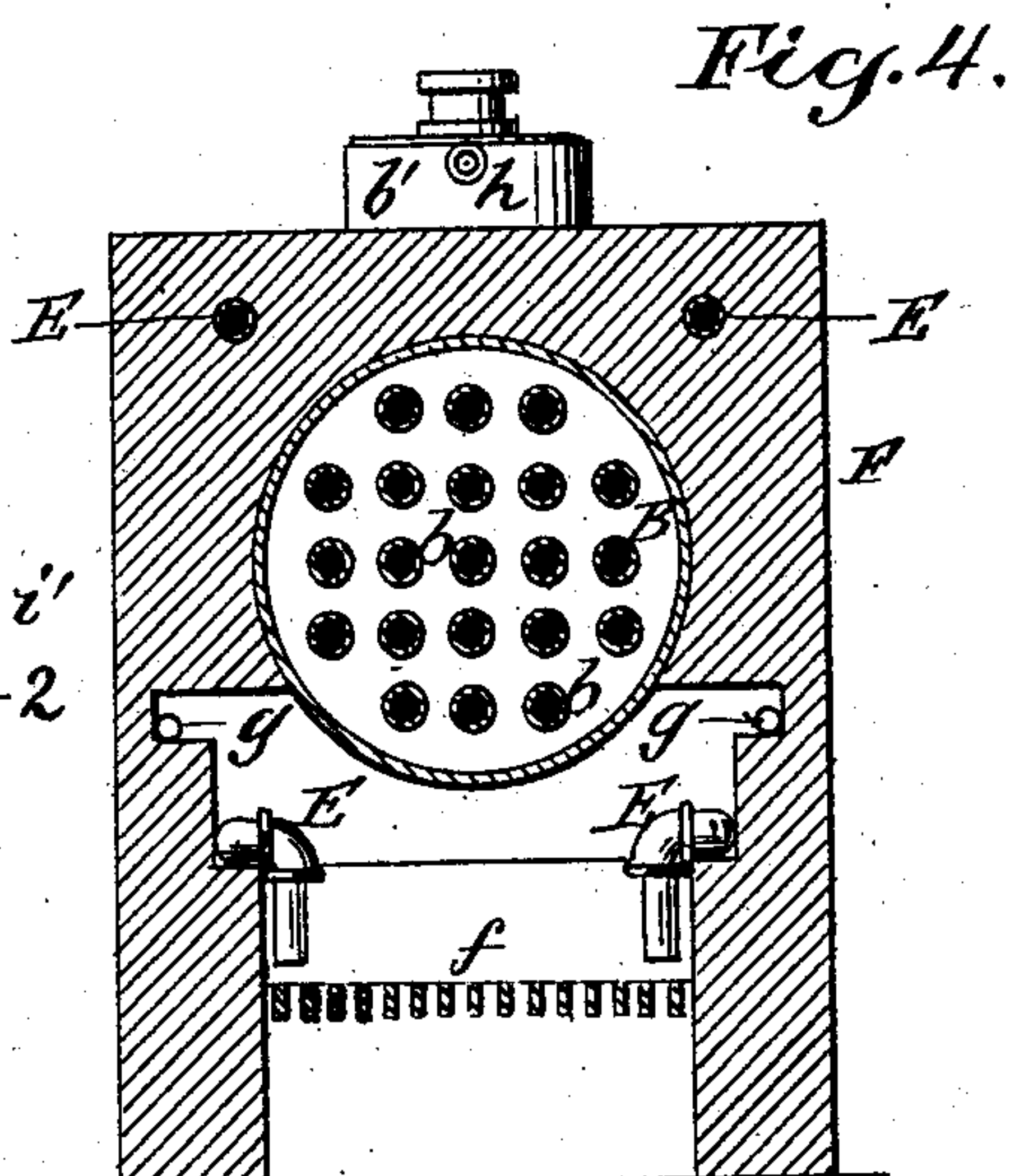
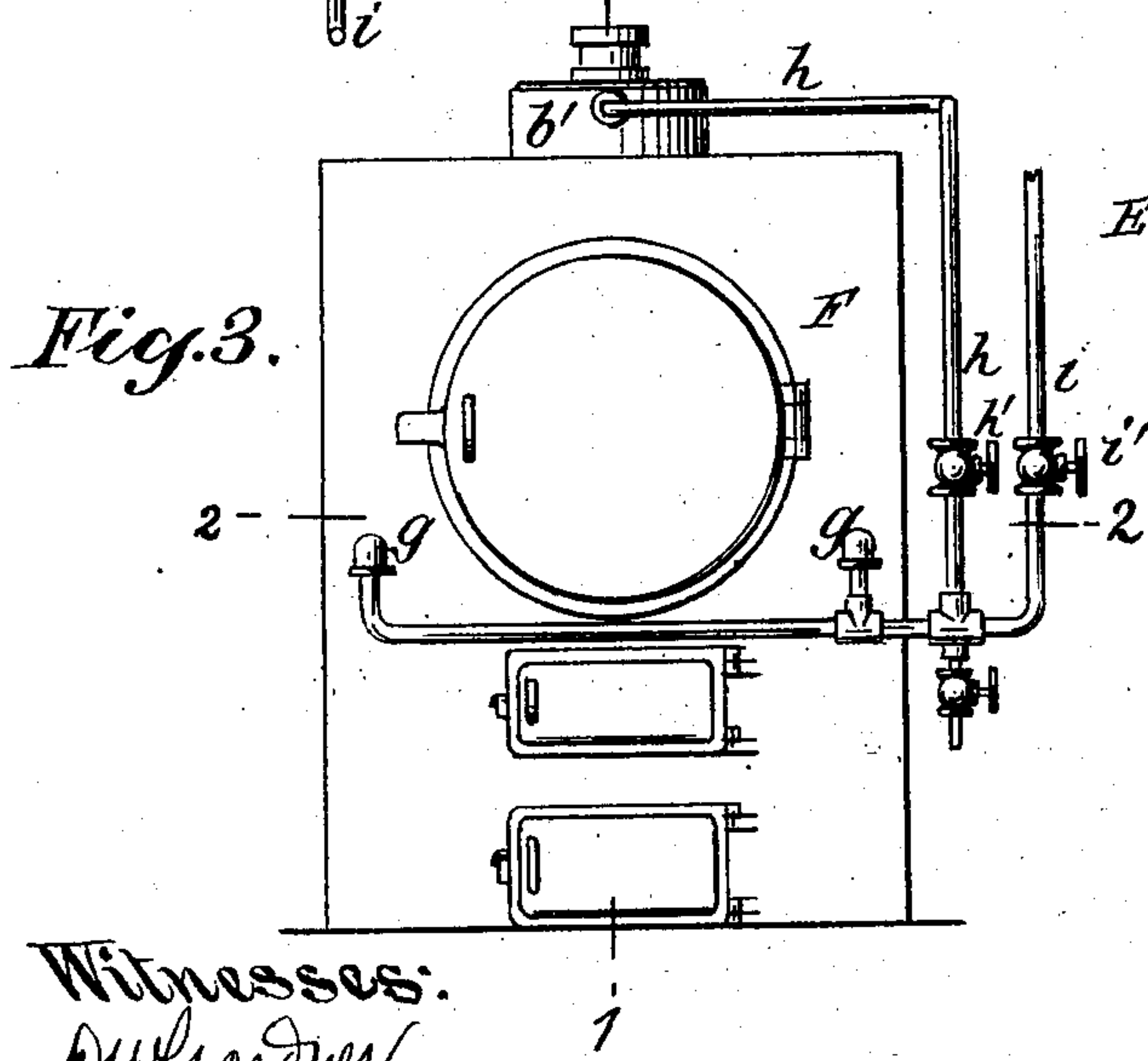
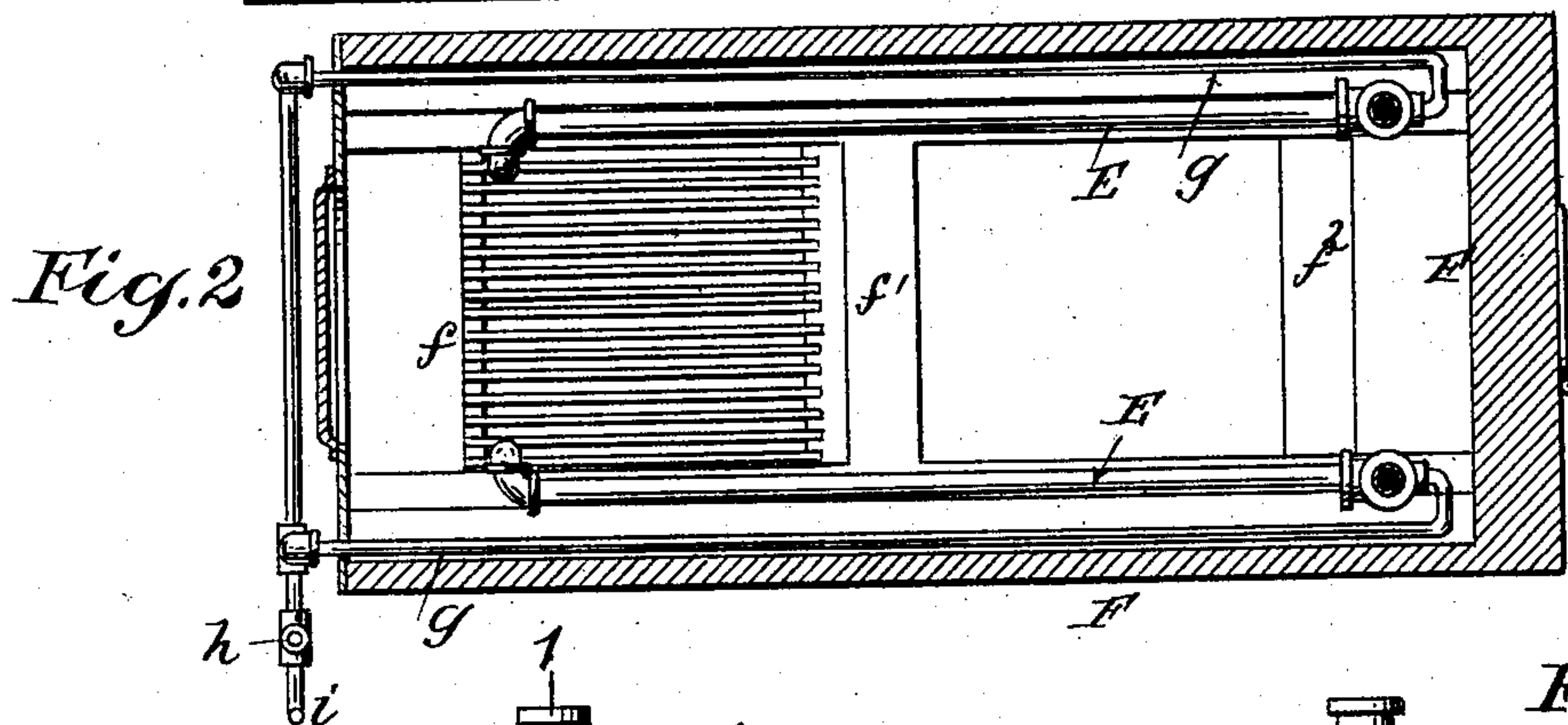
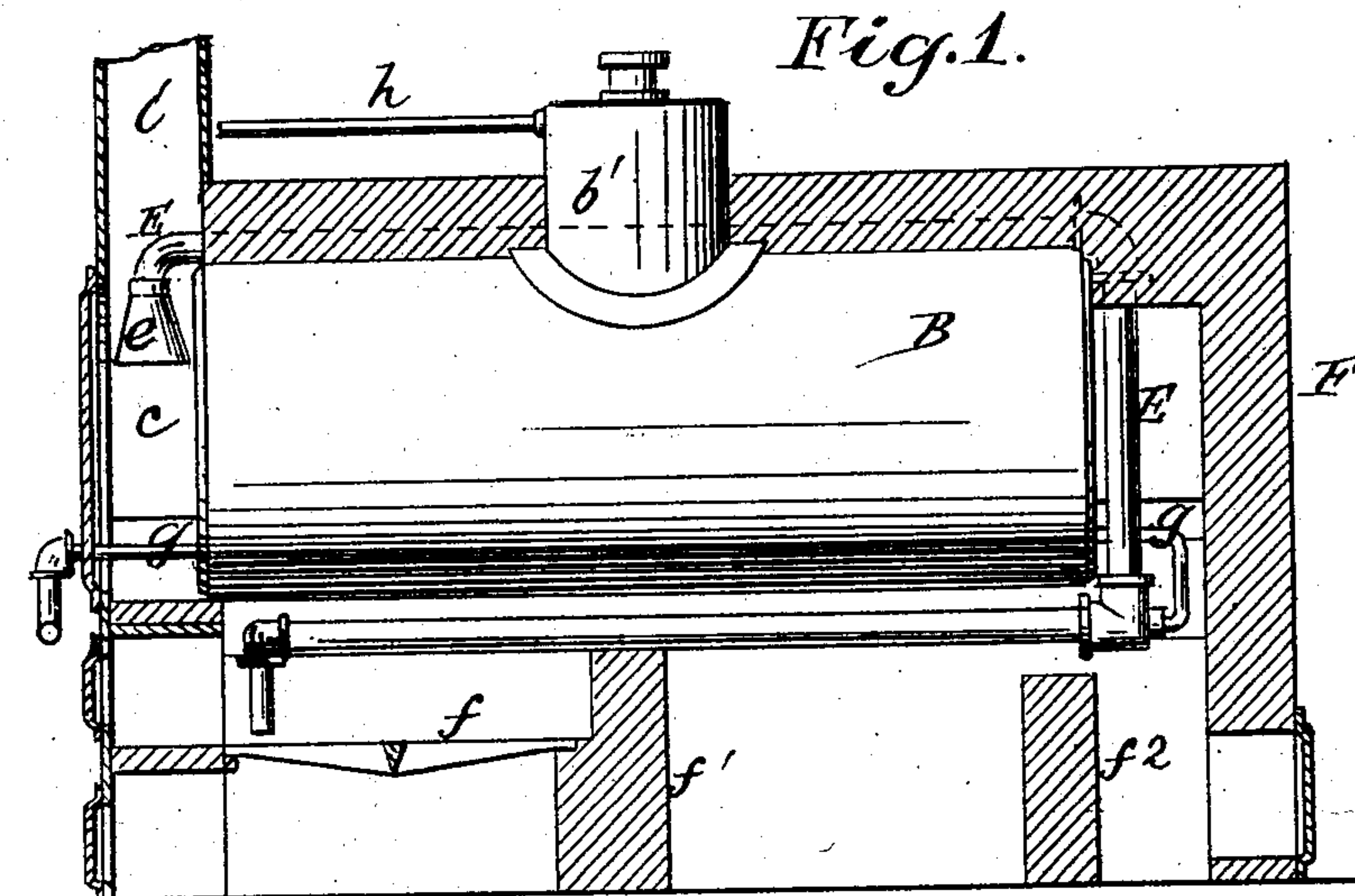
No. 747,797.

PATENTED DEC. 22, 1903.

J. W. STILLWELL.
STEAM BOILER FURNACE.
APPLICATION FILED MAR. 2, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:
A. W. Gardner.
Frank E. Roach

Inventor:
Joseph W. Stillwell
By his Attorney
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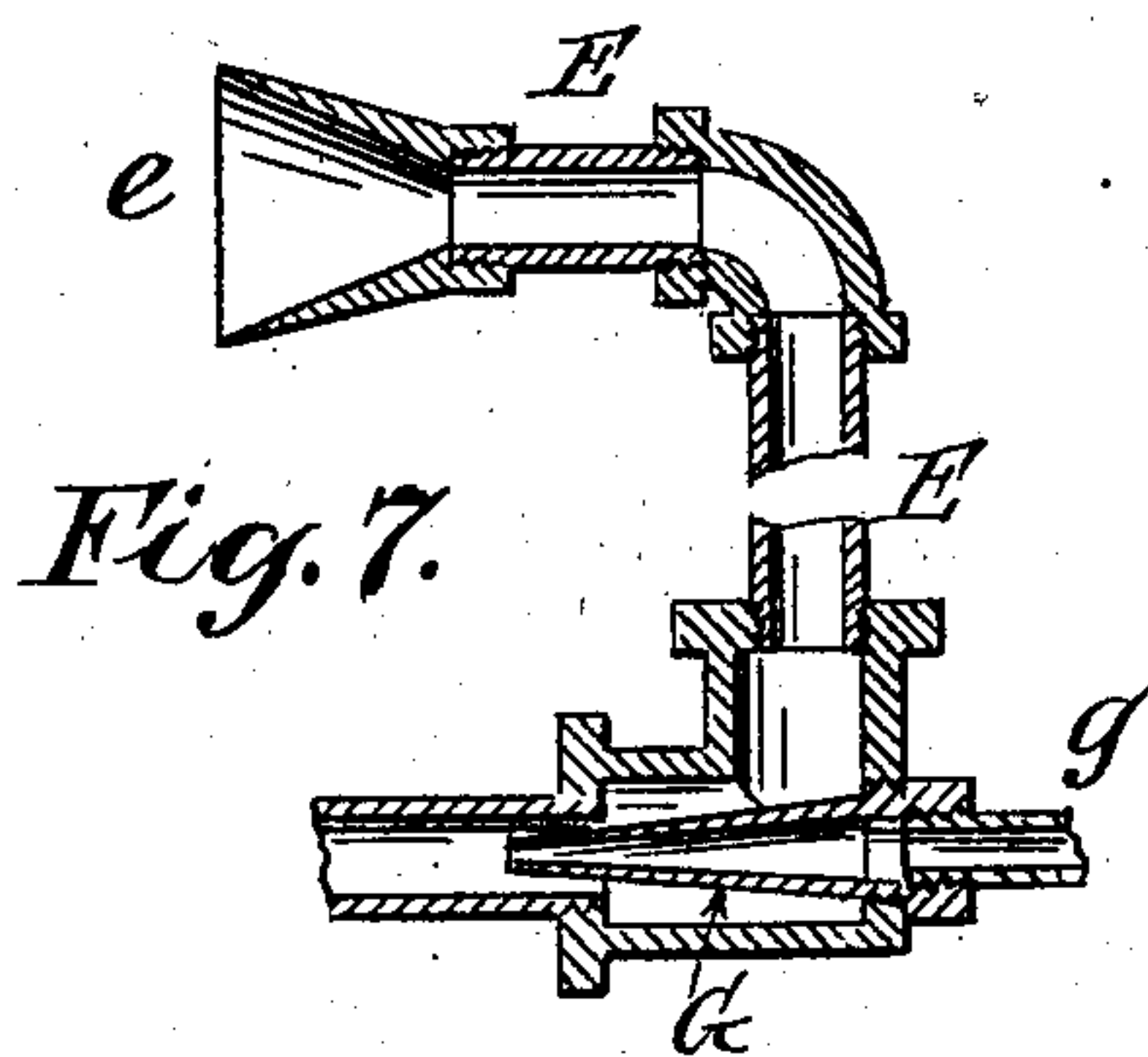
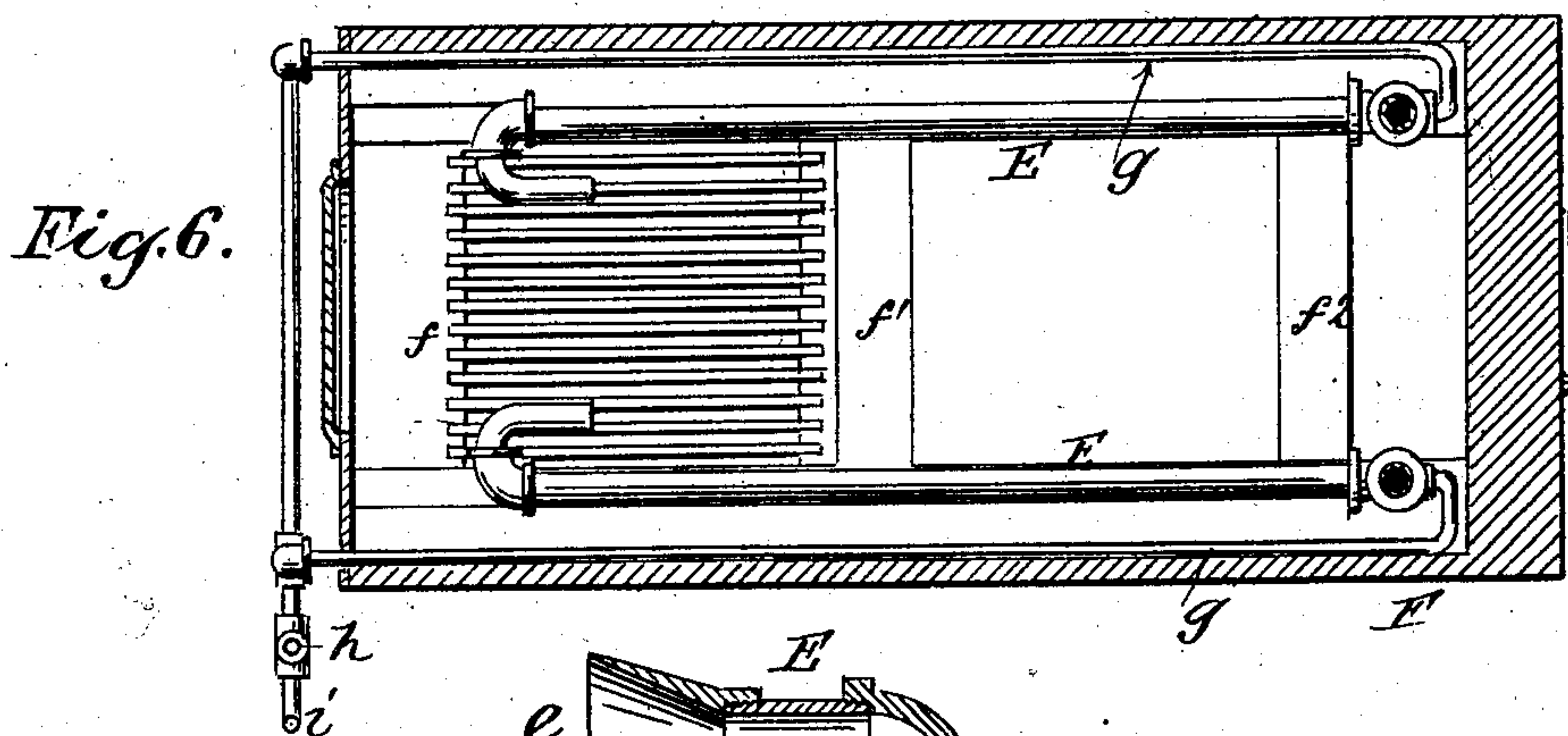
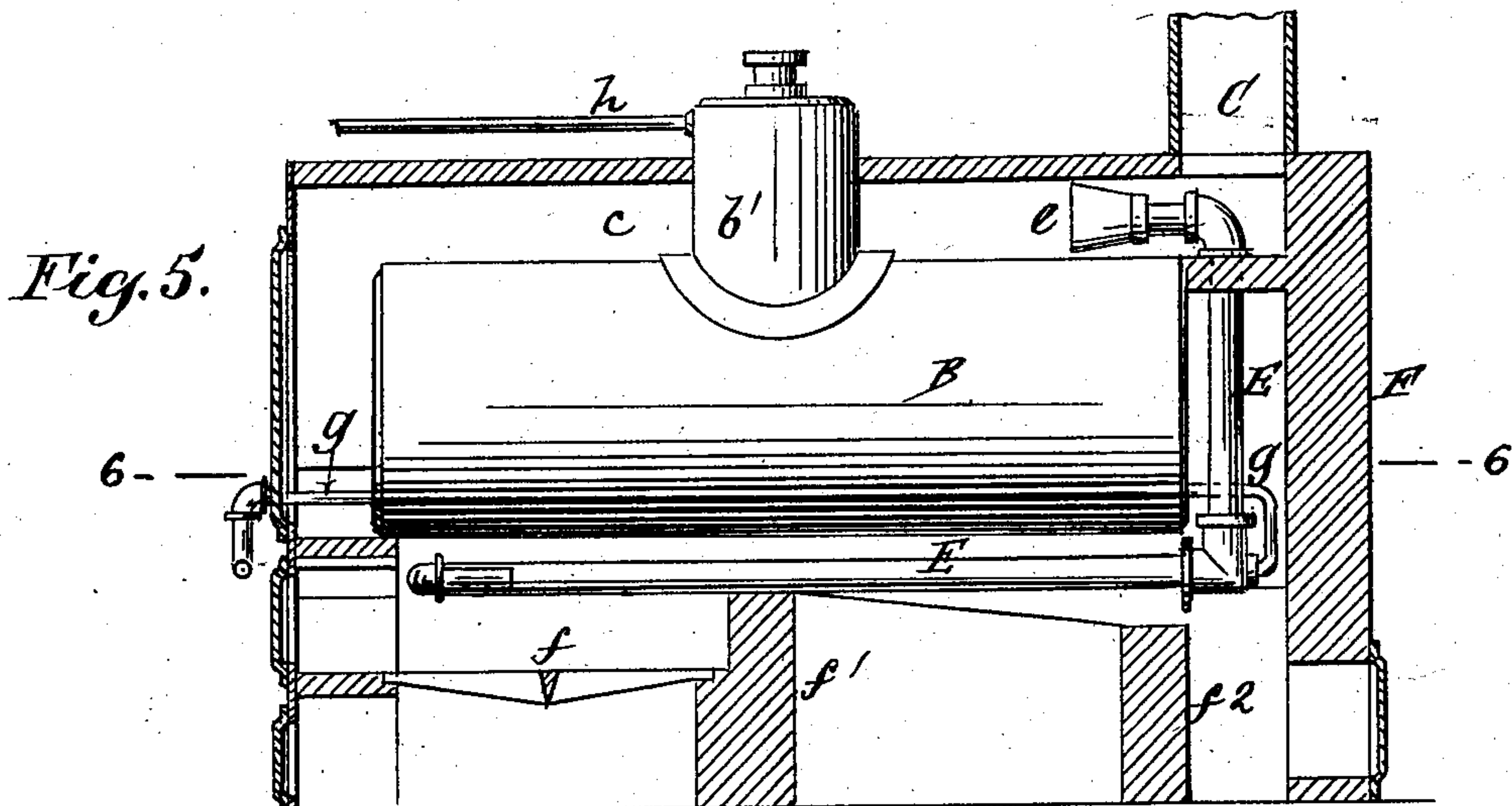
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Witnesses:
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UNITED STATES PATENT OFFICE.

JOSEPH W. STILLWELL, OF NEW YORK, N. Y.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 747,797, dated December 22, 1903.

Application filed March 2, 1903. Serial No. 145,704. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH W. STILLWELL, a citizen of the United States, residing in the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Steam-Boiler Furnaces, of which the following is a specification sufficient to enable others skilled in the art to which the invention appertains to make and use the same.

My improvements are designed to effect the total and perfect combustion of all the inflammable constituents of the fuel used in heating steam-boilers, so that only carbonic acid and other incombustible products of combustion are allowed to escape to and through the chimney.

It is well known that all flame is extinguished on entering the tubes of a boiler, so that all volatile and gaseous products emanating from the fuel excepting the portions thereof actually and immediately consumed in the fire-box escape unconsumed to the chimney, together with more or less carbon in solid form, resulting in "smoke," so called, and in a loss approximately in some cases of nearly one-half the heating capacity of the fuel.

The main object of my invention is to obviate smoke by preventing its formation, and this I accomplish by returning the unconsumed products of combustion after they pass through the boiler-flues to the fire-box by means of a forced draft or suction created by the injection of steam, preferably superheated, into a return-flue, by which the steam there introduced under pressure and the said unconsumed products of combustion are injected into or upon the incandescent body of fuel on the grate, thus insuring the ignition of all combustible matter, both solid and gaseous, and reducing the final products of combustion to carbon dioxid and other incombustible matter.

In the accompanying drawings, Figure 1 is a central vertical sectional elevation upon plane of line 1 1, Fig. 3, of a boiler and furnace in which the chimney is situated at the front of the furnace. Fig. 2 is a horizontal sectional elevation upon plane of line 2 2, Fig. 3, the boiler-shell being omitted. Fig.

3 is a front elevation. Fig. 4 is a transverse section upon plane of line 4 4, Fig. 1. Fig. 5 is a view similar to Fig. 1, showing a boiler and furnace in which the chimney is arranged at the rear thereof. Fig. 6 is a horizontal section on plane of line 6 6, Fig. 5. Fig. 7 is a sectional detail showing means for injecting steam into the flue by which the products of combustion are returned to the fire-box.

I herein show and describe means for carrying out my invention practically in connection with horizontal tubular boilers, although I do not confine myself to that class of boilers nor the identical form and construction of parts shown, since it is obvious that various modifications may be made therein without departing from the spirit and intent of my invention in this respect, which consists, essentially, in the provision of means whereby products of combustion after passing through the boiler-tubes are returned by steam under pressure to the fire-box of the furnace.

It is to be understood that the main parts hereinafter described are preferably duplicated on opposite sides of the furnace and boiler.

F F represent the furnace-walls or framework; B, a horizontal tubular boiler mounted therein.

f is the fire-box or combustion-chamber, into which the fuel is introduced in the usual way.

The products of combustion from the fire-box *f* pass over the bridges *f'* *f*² through the tubes *b* of the boiler B and into the passage *c*, which leads to the chimney C. In the passage *c* between the boiler-tubes *b* and the chimney C is interposed the open mouth *e* of a pipe or conduit E, which extends to the fire-box *f*, so that the products of combustion drawn into the open mouth *e* may be returned directly to said fire-box. This return of the products of combustion is positively assured by the injection of steam through a suitable nozzle G into the said conduit E, the steam being injected in the direction of said fire-box, so that an induced current is created within the conduit E.

The conduit E where it passes underneath the boiler B is preferably exposed directly to the heat of the products of combustion escaping from the fire-box *f* on their way to the

rear end of the boiler B, so that said conduit E becomes highly heated. In like manner the steam-pipe *g* for conducting steam to the steam-nozzle G is preferably exposed to the direct heat of the products of combustion passing from the fire-box *f*, so as to superheat the steam prior to its introduction into said return-pipe E.

Steam may be supplied to the pipe *g* either directly from the steam-dome *b'* of the boiler through the pipe *h* or from an independent source through the pipe *i*. The pipe *i* may be connected with a supply of exhaust-steam, if desired, valves *i'* and *h'* being provided, whereby one source of supply may be cut off while the other is utilized.

In operation the carbonic dioxid, hydrogen, and unconsumed carbon passing over the bridges *f' f''* and through the flues *b* of the boiler B are returned in whole or in part through the conduit E to the fire-box *f* by the induction or suction created by the injection of superheated steam through the nozzle G into the lower arm of the conduit E, the hydrogen and oxygen of the steam mingling with the products of combustion thus returned and insuring their perfect reduction to carbonic acid in said fire-box, at the same time adding to the heat generated therein by their own combustion and reduction. I thus not only attain the perfect combustion of all the combustible constituents of the fuel, but by reason of the increased draft created am enabled to use cheaper grades of fuel with satisfactory results.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination with a steam-boiler and furnace, of flues arranged adjacent the side walls of the furnace with open ends in the passages between the boiler-tubes and the chimney and their other ends terminating in

close proximity to the grate and turned at an angle to their length and steam-pipes arranged adjacent the side walls of the furnace and connected with the combustion-flues at points remote from the grate, and at points farthest from the chimney to inject the steam horizontally into said flues, substantially as described.

2. The combination with a furnace and steam-boiler of conduits for returning unconsumed products of combustion from beyond the boiler-tubes to the fire-box, said return-conduits being extended above the boiler, downwardly at the rear end and horizontally below the boiler through the path of the products of combustion escaping from the fire-box adjacent the side walls of the furnace, together with means arranged within the furnace adjacent the side walls thereof for injecting steam under pressure into said return-conduit, said steam-injecting means being arranged to discharge into the rear ends of the lower horizontal portions of said conduits, for the purpose set forth.

3. The combination with a furnace and steam-boiler, of conduits for returning unconsumed products of combustion from beyond the boiler-tubes to the fire-box, said conduits extending horizontally below the boiler adjacent the side walls of the furnace, vertically at the rear end of the boiler and horizontally above the boiler, the outlets of said conduits being above the grate, and steam-injecting pipes arranged adjacent opposite side walls of the furnace and constructed to discharge steam into said conduits at the rear ends of the lower horizontal portions thereof.

JOSEPH W. STILLWELL.

Witnesses:

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