

(No Model.)

2 Sheets—Sheet 1.

E. J. WOOD.
STEAM BOILER FURNACE.

No. 574,051.

Patented Dec. 29, 1896.

Fig. 1.

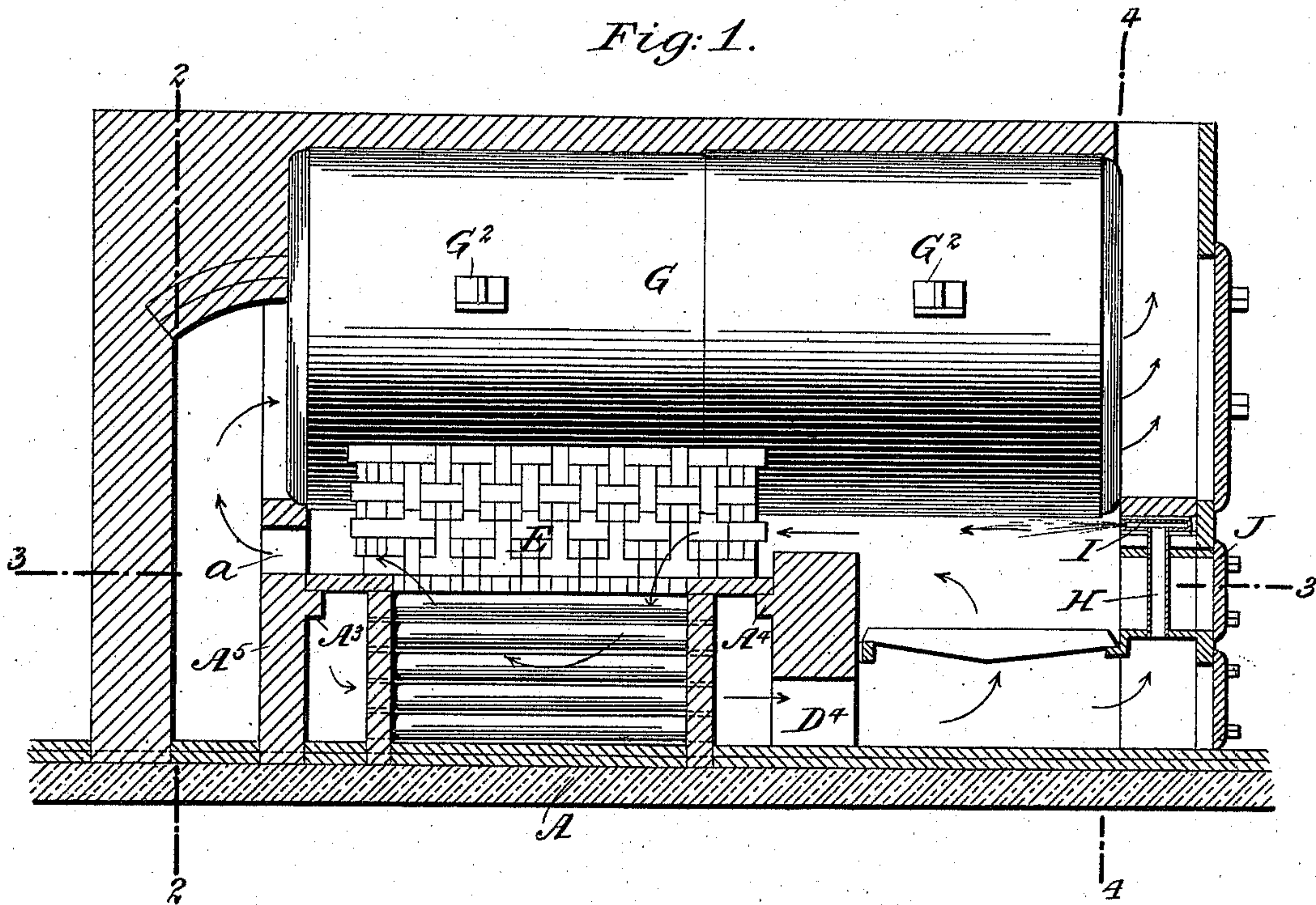


Fig. 2.

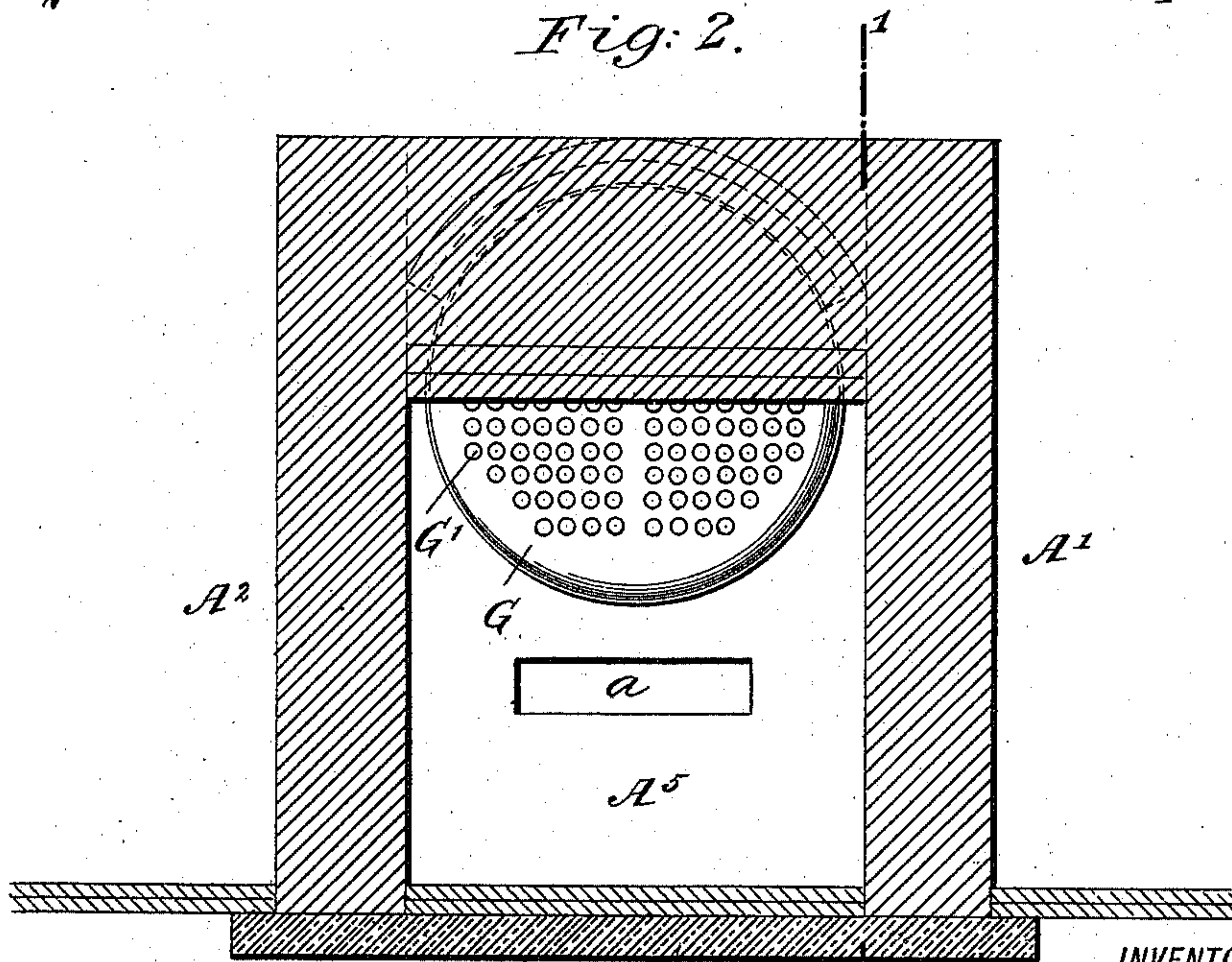
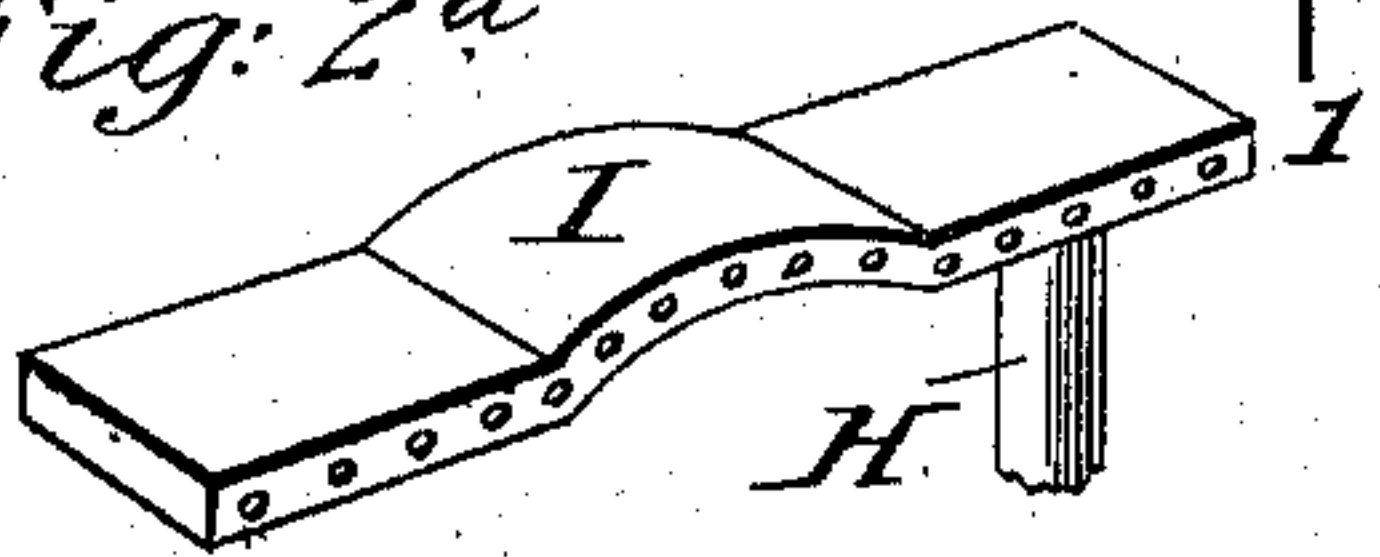


Fig. 2a



WITNESSES:
John A. Rennie
William A. Rennie

INVENTOR
Edgar J. Wood
BY
Thomas Drew Jackson
ATTORNEY

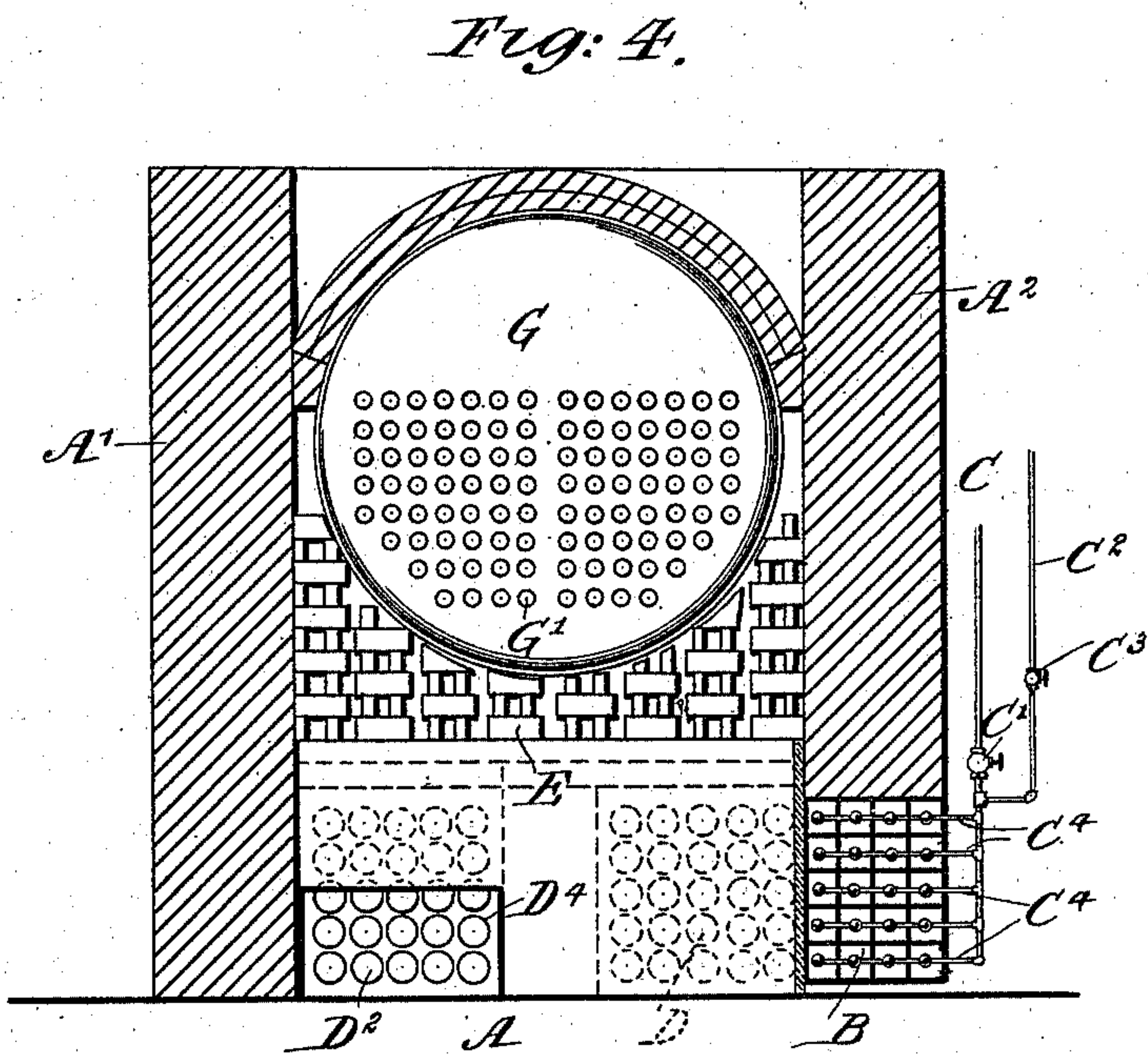
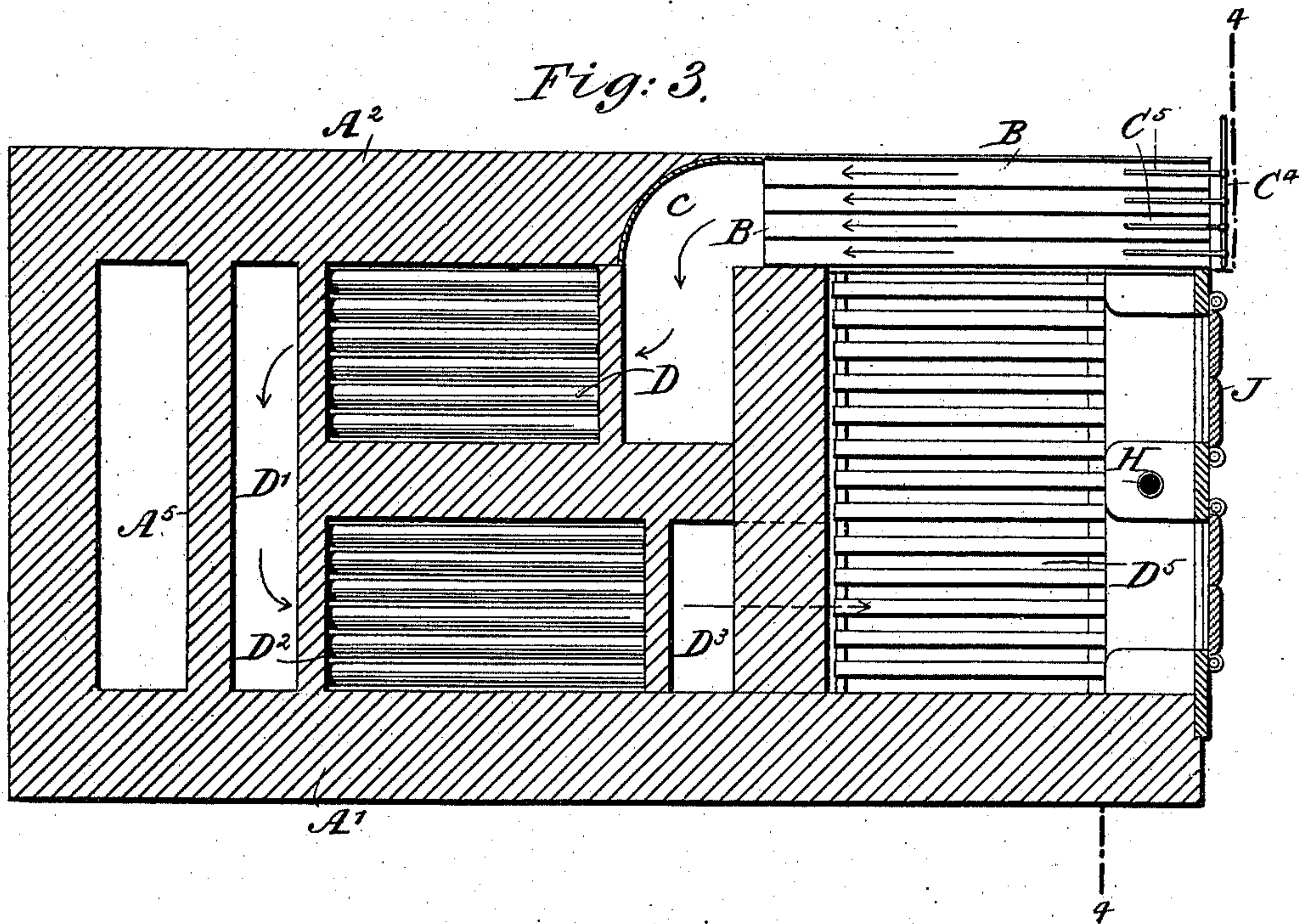
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WITNESSES:
John A. Rennie
William M. Rennie

INVENTOR
Edgar J. Wood
BY
Thomas D. Stetson
ATTORNEY

UNITED STATES PATENT OFFICE.

EDGAR J. WOOD, OF BROOKLYN, NEW YORK, ASSIGNOR TO MARGARET A. WOOD, OF SAME PLACE.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 574,051, dated December 29, 1896.

Application filed June 6, 1896. Serial No. 594,500. (No model.)

To all whom it may concern:

Be it known that I, EDGAR J. WOOD, a citizen of the United States, residing in Brooklyn, Kings county, in the State of New York, have invented a certain new and useful Improvement in Steam-Boiler Settings and in Devices to be Used Therewith, of which the following is a specification.

I will show and describe the invention as applied to a cylindrical boiler with a great number of small tubes traversing longitudinally the entire lower portion. This common form of boiler is particularly well adapted for my invention, but there may be modifications within considerable limits. I especially propose to use in some instances two large flues in place of the great number of small tubes. I provide for blowing in the air to be used in the combustion of the coal by a number of streams of steam at moderate pressure. The ordinary exhaust-steam from high-pressure engines, when the exhaust is restrained a little by being compelled to traverse heating-pipes, feed-heating devices, grease-separators, &c., or, in the absence of such, restrained a little by being driven through a contracted passage, will have sufficient pressure to effect my blowing under the conditions which I provide.

I place the blowing apparatus in the base of a wall at the side of a boiler. The air thus inducted is led through two series of air-heating tubes, where the air is exposed to an active circulation of the hot gases resulting from the combustion. After the air has traversed one portion of the set, or one set from the front rearward, and has turned and traversed the other portion or set from the rear forward it is sufficiently heated to materially influence the economy of the steam generating. The air thus heated and blown is delivered into the ash-pit, and the main portion rises through the bed of fuel on the grate in the ordinary manner. Another portion of the air rises through a passage in the boiler-front and is delivered into a thin casing which extends across over the fire-door, and is delivered therefrom into the upper portion of the furnace from the front either in a continuous sheet or preferably in a series of small streams. The gases thus fed with air and dry steam at

a high temperature are conducted rearward under the boiler in the ordinary manner, except that the passage between the bottom of the boiler and the masonry or other fixed continuous parts below is deeper than usual, and the portion thereof which is not occupied by the two series of heating-tubes described is filled up nearly to the boiler-shell with material in convenient form, which is adapted to endure the heat and is manufactured and applied in small sections cross-piled. Fire-brick fulfils the conditions. The gases after moving through this mass of open-work material turn at the rear and move forward through the tubes in the boiler and then are allowed to rise through the stack.

The accompanying drawings form a part of this specification and represent what I consider the best means of carrying out the invention with a single cylindrical tubular boiler.

Figure 1 is a vertical section on the line 1 1 in Fig. 2. Fig. 2 is a rear view of the boiler with a section of some of the adjacent parts on the line 2 2 in Fig. 1. Fig. 3 is a plan view of the lower portion of the boiler-setting. It may be described as a horizontal section on the line 3 3 in Fig. 1. Fig. 4 is a vertical section on the line 4 4 in Figs. 1 and 3.

Similar letters of reference indicate corresponding parts in all the figures where they appear.

A is the ground, and A' A² the side walls of the boiler-setting.

B is a series of square pipes, preferably made in three or other convenient number of lengths, matched together so as to give continuous apertures through their lengths.

C is a steam-pipe bringing steam from the exhaust-pipe of the engine or from other convenient source. It may come from the boiler at full pressure, with a valve C' for shutting off the exhaust-steam and with a branch pipe C² and a valve C³ for bringing the live steam when it is considered expedient to use such.

C⁴ C⁴ are parallel branches from the pipe C, and C⁵ are horizontal branches from these. The branches or short pipes C⁵ lead into the several square tubes B and are slightly contracted at their nozzles to jet the steam with

force in the direction of the length of the several pipes.

A passage *c*, curved as shown in Fig. 3, leads the mixture of air and steam thus inducted inward nearly to the center line of the boiler, from whence it is delivered rearward through a series of cylindrical pipes *D* into a back chamber *D'*. In this chamber the "gases," if such we may term the mixture of steam and partially-heated air, turn and move forward through the other set of cylindrical pipes *D*² into a chamber *D*³, in which they descend and pass into the ash-pit *D*⁵ through a sufficient passage *D*⁴. All these parts yet described and a portion of the open-work material to be presently described lie below the level of the boiler, and all the movements of the air thus far described are in the lower portion of the apparatus.

E is the open-work material, which, when similar parts have been used in other apparatus, have been often designated as "checker-work." The front portion should be fire-bricks. The rear portion may be the same, or they may be common bricks, or they may be masses of pig-iron or other convenient material which will have the property of readily absorbing and readily giving off heat. I prefer that the form of these parts be rectangular like bricks, and it is important that they may be placed together by cross-piling, so as to leave liberal spaces between. This checker-work lies on the pipes *D* and *D*² and on the intermediate wall of solid masonry which separates them. It is also supported in part by ledges *A*³ *A*⁴, the first on the front of a rear wall *A*⁵, which lies under the rear end of the boiler, and the latter on the rear face of the bridge, which latter stands in the usual position and may be in all respects the same as an ordinary bridge, except for the passage under one side through which the hot air is admitted into the ash-pit.

G is the boiler, and *G'* the series of tubes therein. *G*² *G*³ are the ordinary lugs by which it is supported on the side walls *A'* *A*².

H is an upright pipe of iron or other suitable material leading upward in the boiler-front and connected at its upper end with a transverse casting *I*, which extends half across the front of the furnace, but, is of so little height that it can be readily accommodated in the space over the fire-door *J*. The rear of the casting *I* is adapted to eject the steam and air in a thin sheet or in a nearly equivalent series of small jets into the upper portion of the furnace.

My apparatus requires no attention further than to occasionally regulate the valve *C'* or the valve *C*³, and thus to control the force with which the steam is delivered through the nozzles *C*⁵. It may be found expedient while the draft is moderate to always close the cock or valve and entirely suppress the blasts of steam during the short periods while the fire-doors are open to supply or stir the fire.

The checker-work performs a function

somewhat different from that in which it is usually employed. Instead of absorbing heat continuously for a period and then giving it off again, as in various branches of manufacture, it maintains a uniform temperature during the whole period while the boiler is operated, with the exception of the very slight and rapidly-recurring changes which occur as the imperfectly-mixed air and the gaseous products of combustion move rearward from the furnace. My checker-work performs the difficult role of keeping itself heated by the excess of temperature in the flame, which prevails continuously throughout nearly the whole mass of the gases, and of imparting heat to raise the temperature to the burning-point in any streaks or portions of such gases which may be moving away at too low a temperature. The movement of the mixed gases through the irregular passages of the checker-work compels the mixing of the gases, and the gentle resistance offered by the checker-work to the movement of the gases insures that a portion shall be compelled to descend and traverse rearward through the spaces around the tubes *D* and *D*². None of the gases can escape without passing through the first part of the checker-work even if they descend to traverse through the more liberal spaces under the middle portion of such work, and they cannot reach the back connection and rise to enter the boiler-tube without again passing through the rear portion of the checker-work.

It will be understood that the chamber at the rear, (marked *D'*), in which the mixed air and steam travel transversely across, and the passage at the front of the tubes *D*², in which those gases gather and descend to go into the ash-pit, should be covered so as to be practically gas-tight.

I prefer that the checker-work shall be of uniform construction throughout, but it is important that it is not allowed to extend quite up into contact with the boiler. The relatively cool surfaces of the boiler absorb the heat of the gases rapidly, and in order to keep a luminous condition of the gases along those surfaces there should be a space of from half an inch to an inch and a half left clear between the checker-work and the correspondingly-curved surface of the boiler. The arched form of the covering of the back connection and the corresponding but transversely-arched form of the covering of the main body of the boiler need not be particularly described. These parts, with the grates and the bearers for the latter and other adjuncts of the boiler, may be of any ordinary or suitable construction.

The wall *A*⁵ is provided with a liberal aperture *a*, but with this exception it is a tight wall. It not only aids by its front ledge *A*⁴ to support the rear part of the checker-work, as described above, but also aids to support the rear end of the boiler and closes the flue or passage at the rear of the boiler, so as to compel the gases traveling along the high

part of the passage at each side under the boiler to descend a little to escape, thus insuring that the hottest gases shall be retained.

I claim as my invention—

5 1. The combination of a steam-boiler, a furnace, a liberal passage rearward from the latter under the boiler and a partial filling of checker-work in such passage, and air-pipes in a space below such checker-work which
10 space is in free communication with the checker-work adapted to allow a portion of the gaseous products of combustion to descend and circulate between such tubes, substantially as herein specified.

15 2. The combination of a steam-boiler, a closed furnace, two sets of air-heating pipes arranged to conduct the air first backward and then forward under the boiler before its introduction into the furnace, and the steam-
20 nozzles C⁵ and connecting steam-pipes C⁴ adapted to blow steam mingled with air through such pipes, all substantially as herein specified.

25 3. The combination of a steam-boiler, a furnace and furnace-wall, a series of steam-blowing nozzles C⁵ with connections for supplying steam and a series of pipes B in the base of such wall arranged to perform the double function of a support for the wall and
30 to constitute small passages for the blowing,

all arranged to serve substantially as herein specified.

4. The combination of a steam-boiler, a closed furnace, provisions for blowing, and two sets of heating-pipes arranged to conduct 35 the air first backward and then forward under the boiler before its introduction into the furnace, and the hollow casing I having little depth and being widely extended laterally, arranged in the boiler-front with provisions 40 for blowing therefrom into the gases near the top of the furnace, and the pipe H, arranged for supplying hot air at the required pressure to such casing, substantially as herein specified.

45 5. The combination of a steam-boiler having a closed furnace with checker-work arranged as shown, and with air-heating pipes below and with the tubes B and the steam-pipes C within the branches of the latter for 50 blowing and with the rear wall A⁵ with its aperture *a*, all adapted for joint service as herein specified.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses. 55

EDGAR J. WOOD.

Witnesses:

J. B. CLANTICE,
M. F. BOYLE.