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C. H. HASWELL.
Steam-Boilers.

No. 151,284. Patented May 26, 1874.

Fig. 1.

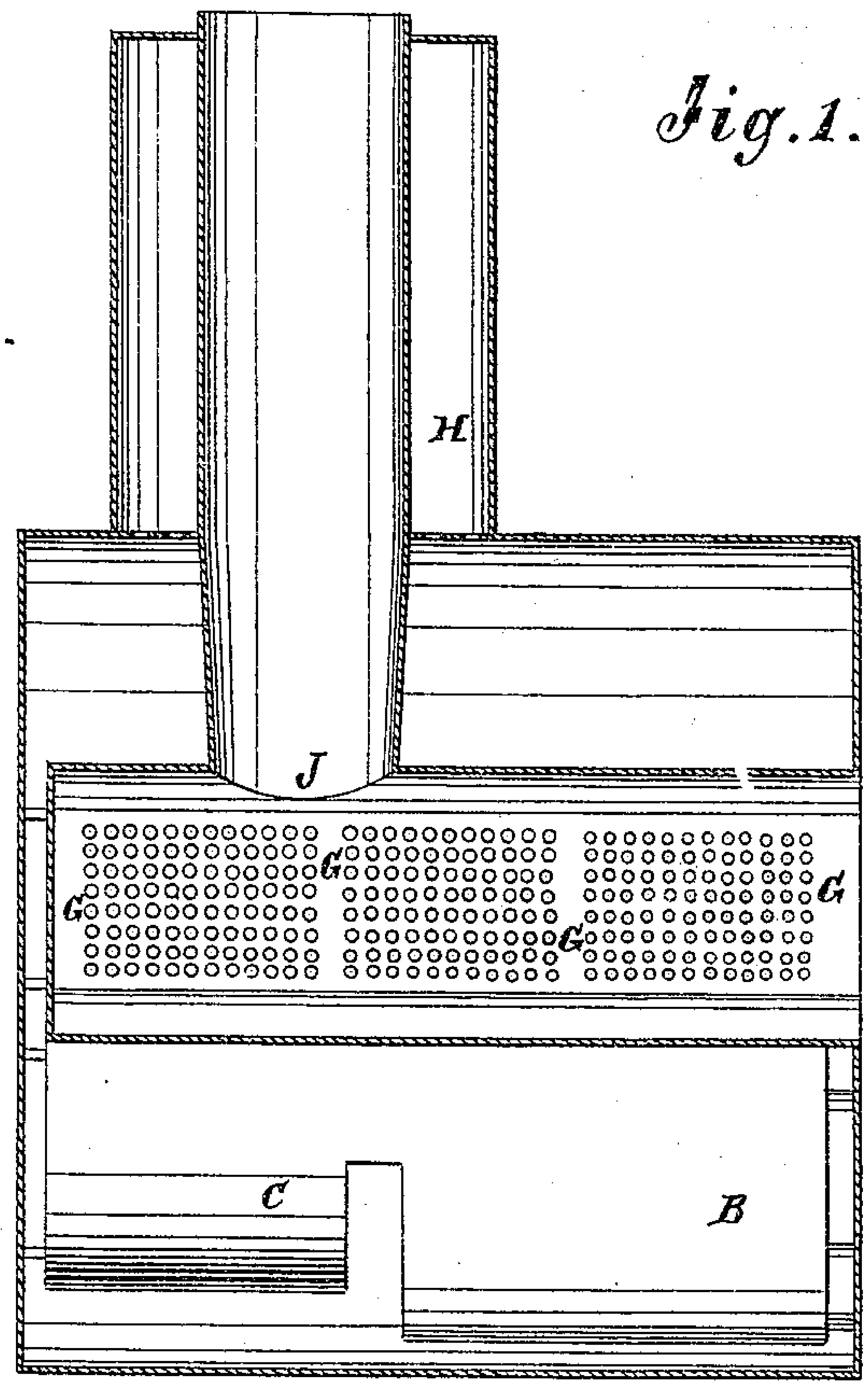
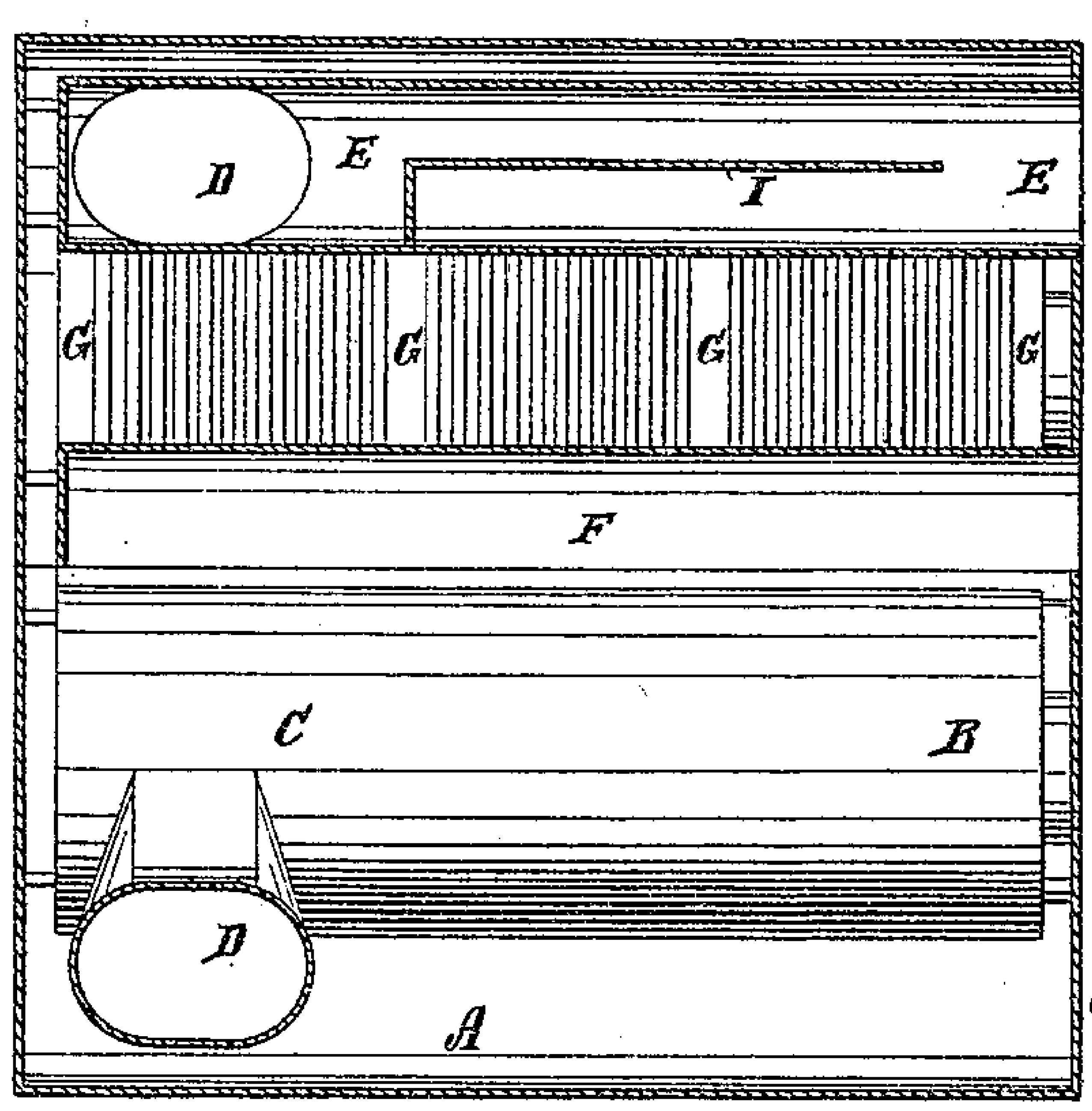


Fig. 3.



WITNESSES:

A Bennenkendorf.
C Sedgwick

INVENTOR:

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AM. PHOTO-LITHOGRAPHIC Co. N. Y. (OSBORNE'S PROCESS.)

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Fig. 2.

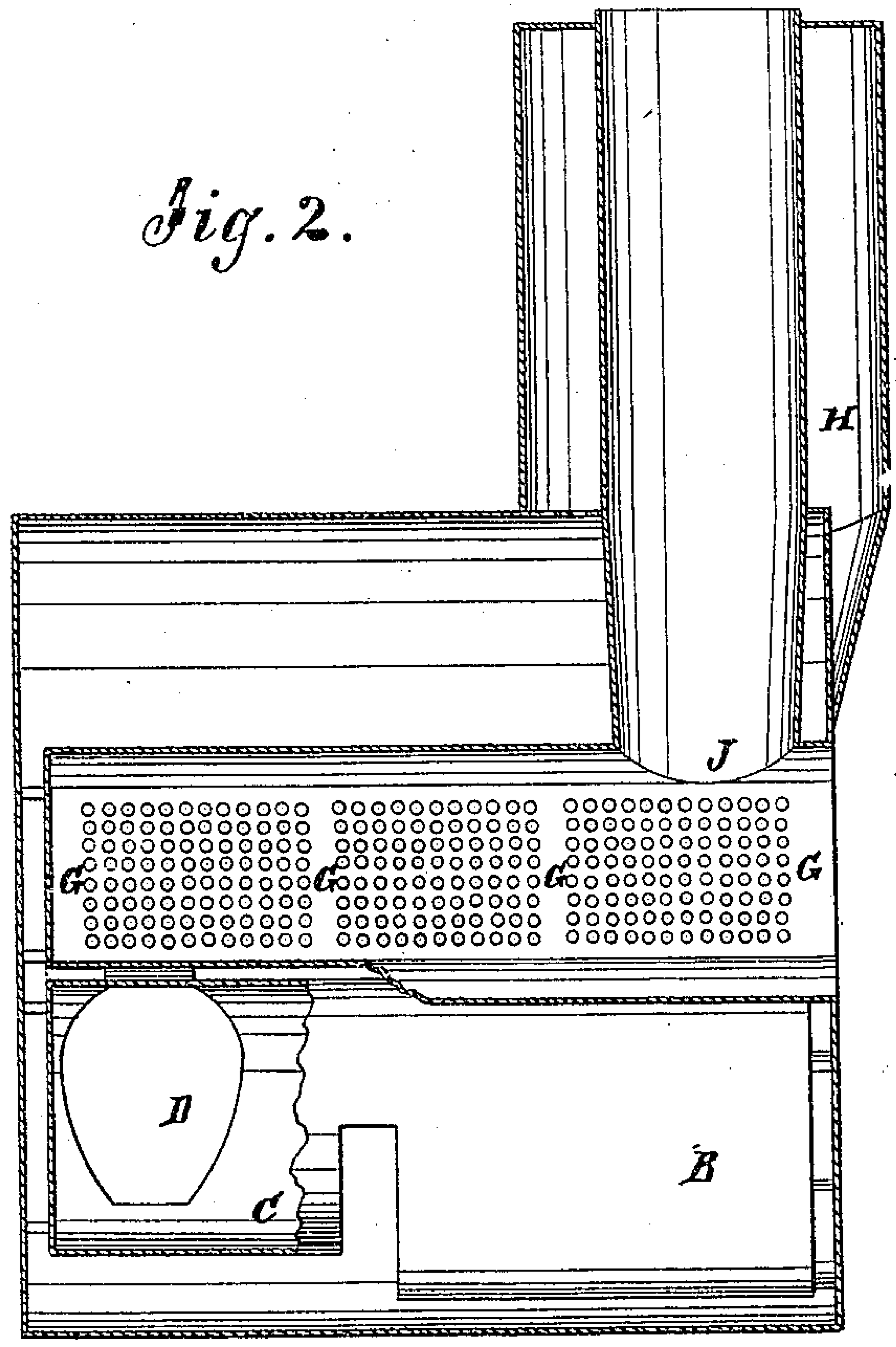

Fig. 4.

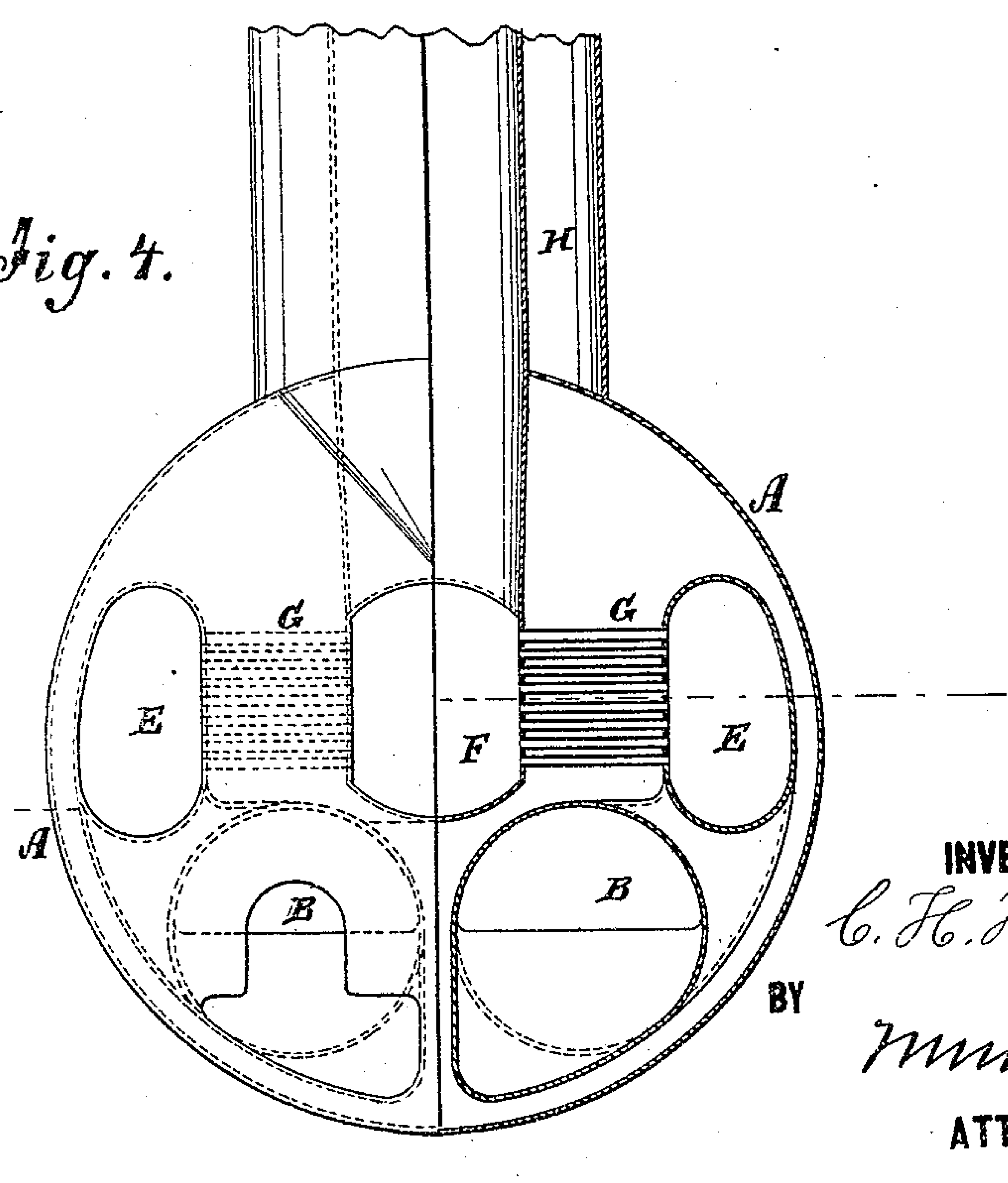

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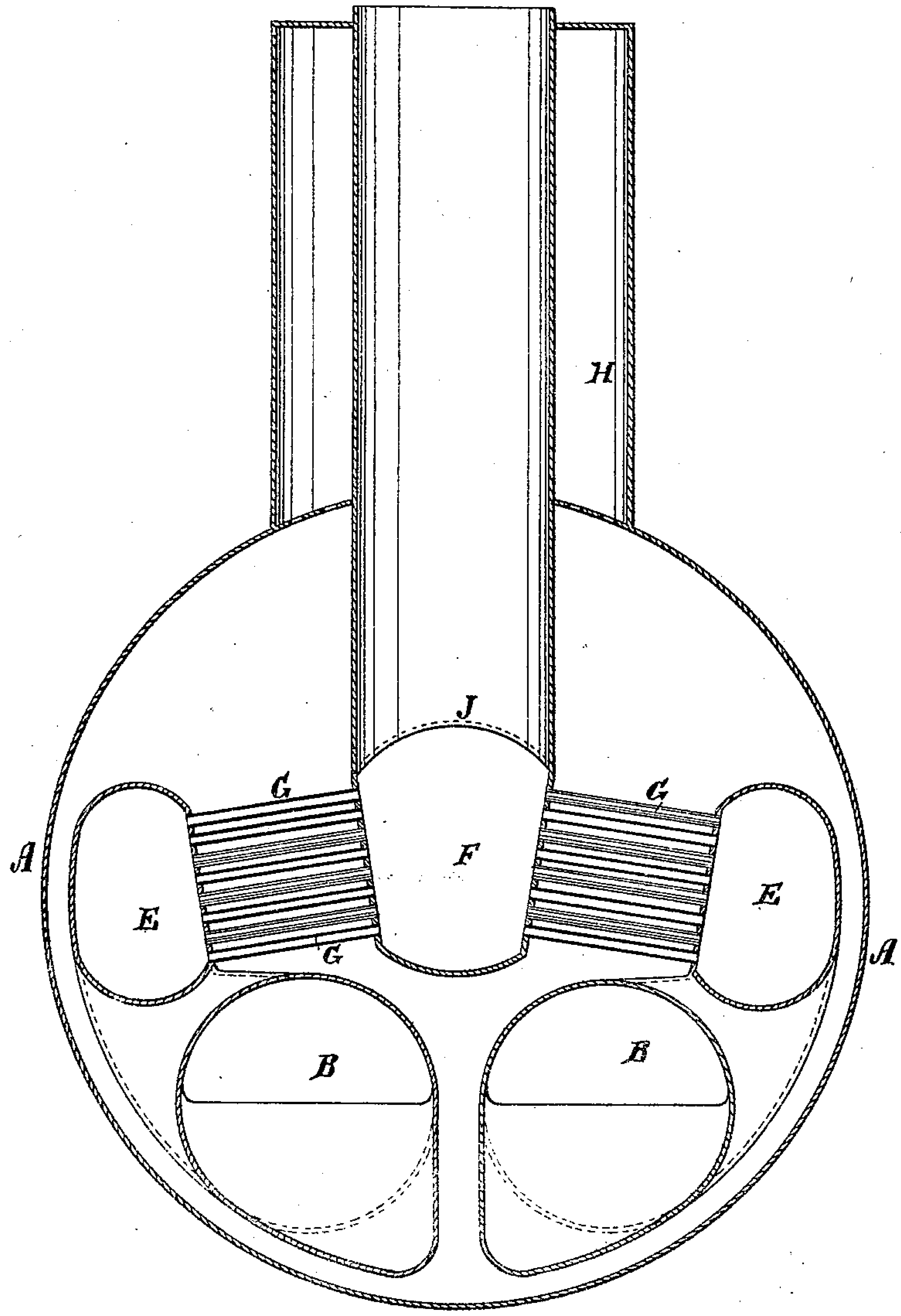
Fig. 5.



WITNESSES:

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UNITED STATES PATENT OFFICE.

CHARLES H. HASWELL, OF NEW YORK, N. Y.

IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. **151,284**, dated May 26, 1874; application filed April 4, 1874.

CASE A.

To all whom it may concern:

Be it known that I, CHARLES H. HASWELL, of New York city, in the county and State of New York, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification:

The design of this boiler, and the nature of my invention, consist of a construction of round-shell furnaces, lower flues, and arched uptake or vertical smoke-connection—also, arched horizontal smoke-connections, so far as the same may be practicable of attainment—in order to offer the greatest resistance to rupture with the least material, and with the least practicable resort to braces, combined with economy of weight, cost, and increased endurance.

In steam-boilers of ordinary design, having either overhead return-tubes or tubes directly in line with their furnace, and all set in the longitudinal plane of the boiler, it is very difficult to so proportion their diameter as to meet the several requirements of transverse area, heating-surface, and diameter proportionate to their length, and to accommodate the necessary steam-space; the cause of this difficulty arising from the circumstance that the area of the grate-bars being given, and being a positive and unalterable element for an assigned or required capacity of boiler, the diameter of the shell, the transverse area of the tubes, the height of the furnace and steam-chamber, and the proportionate length of the tubes to their diameter, are all imperative in their requirements, and cannot be restricted without impairing the operation of the boiler.

My improved boiler is represented in longitudinal sectional elevation in Figures 1 and 2, in horizontal section in Fig. 3, transverse section and end elevation in Fig. 4, and transverse section in Fig. 5.

A is the shell of the boiler; B, furnaces; C, lower flues; D, connecting-flues; E, outside, upper, or overhead return smoke-connections; F, middle overhead connection; G, tubes connecting return-connections or flues E F; J, lining to steam-chimney, and forming uptakes; and I, diaphragm in the outside flues. In Fig. 1 the steam-chimney is arranged at a point between the ends, and the diaphragm I is employed in this arrangement to cause some of the heat, which would otherwise escape directly to the smoke, to first traverse the length of the flue E. The tubes G may be horizontal, as in Fig. 4, and the middle flue may have vertical sides, while the side flues E have one vertical side, as in Fig. 4, but the more preferable arrangement will be as in Fig. 5, the tubes descending from the middle flue, whose sides converge to a point below its bottom, and connect with correspondingly-inclined sides of tubes E. The flue F will be wider than the length of tubes G, to allow of putting in the tubes from the flues. By this arrangement of fire-tubes the transverse area required by the area of grate-surface, the area of their heating-surface, and the volume of the steam-chamber above, can all be obtained without prejudice to the height of the furnace below, and without involving an impracticable length of boiler.

In an ordinary tubular boiler, when the tubes are set in its longitudinal plane, it is impracticable to remove them and substitute others without affording sufficient length for their withdrawal in the fire-room. By this arrangement of flues and fire-tubes the tubes can be removed and replaced at pleasure, and all the necessary work prosecuted within the boiler. By the design of setting the tubes at an inclination, not only is the passage of the heated air and smoke facilitated, but the tubes are rendered less liable to become choked by the aggregation of soot and ashes cemented by the moisture from leaks, added to which greater space is afforded in the central flue for the manual operation of withdrawing and replacing any tubes that may require such operation.

In the ordinary overhead single return tubular or flue boiler, the smoke-pipe must be placed at the extreme of the furnace end of the boiler, and, even in the drop-flue or tubular boiler, re-

turned on a level with the crown of the furnace. The smoke-pipe must be either at the extreme back end of the boiler or immediately behind the furnace. No deviation from these fixed points is practicable. By the introduction of a vertical diaphragm, I, in the return-flue or flues of a steam-boiler of this or like design, as here shown, the products of combustion can be so directed as to admit of the base of the smoke-pipe being located at any portion of the length of the boiler, thus enabling the constructor of a steam-vessel to locate the smoke-pipe as may suit his convenience as to its position with reference to the masts, or sails, or passage-ways of a steam-vessel.

I do not submit a round shell or furnace as a novelty, but I do submit that arched smoke-connections are novel, that they afford the required strength without braces, and that the under and inner surfaces of the connections will serve the very useful and desirable purpose of being a receptacle for ashes, instead of their choking up the lower tubes, as in all other designs of tubular boilers. I do not submit fire-tubes set transversely to the longitudinal plane of a boiler as a novelty, as they were so placed in the two instances of the steamer Kamschatka and ferry-boat Essex in this country, and by Hepworth and Miller in England, but they were confined to the furnace alone, and led directly from it to only one rectangular connection in the first cases, and to the furnace in the others, and in neither of these cases were the tubes set at an inclination; but I do submit that they have never been so placed at an inclination, or even horizontal, in connection with an overhead return side and center connections or flues, as shown, whereby any required amount of transverse area of heating-surface can be obtained by simply adding to the length of the boiler. Further, I submit that a design of boiler, where both inclined and horizontal tubes, set in the manner shown, can be removed and replaced within the boiler, is novel. I further submit that although horizontal diaphragms, and even vertical diaphragms, have been placed in a boiler, yet that they were for the purpose of duplicating or diverting the passage of the products of combustion, but that in this design it is introduced for the very different purpose of dividing the products, so as to enable the chimney to be placed where required.

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

1. The vertical smoke-connection or uptake of a steam-boiler constructed with arched sides and ends.

2. The combination of tubes G with flues E F, constructed and arranged as and for the purpose described.

3. The diaphragm I, arranged in flues E to divide the products of combustion, in the manner specified.

4. A horizontal or inclined center-flue or heat and smoke connection of a steam-boiler, with its sides converging to a center external thereto, in combination with the tubes G and side flues E, substantially as and for the purpose specified.

CHAS. H. HASWELL.

Witnesses:
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ALEX. F. ROBERTS.