

(No Model.)

2 Sheets—Sheet 1.

C. D. HOWARD.
HOT AIR AND STEAM HEATER.

No. 362,838.

Patented May 10, 1887.

Fig. 1

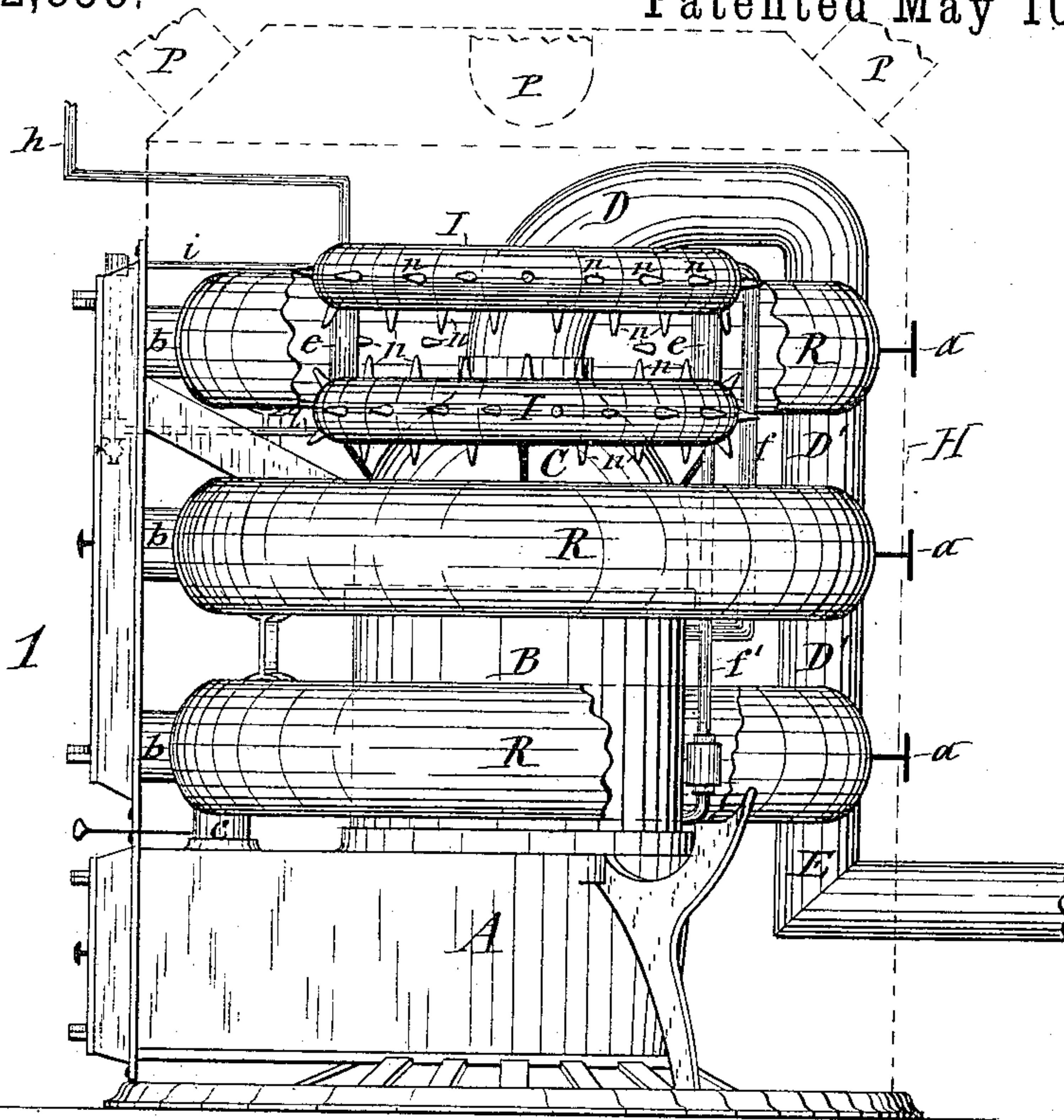
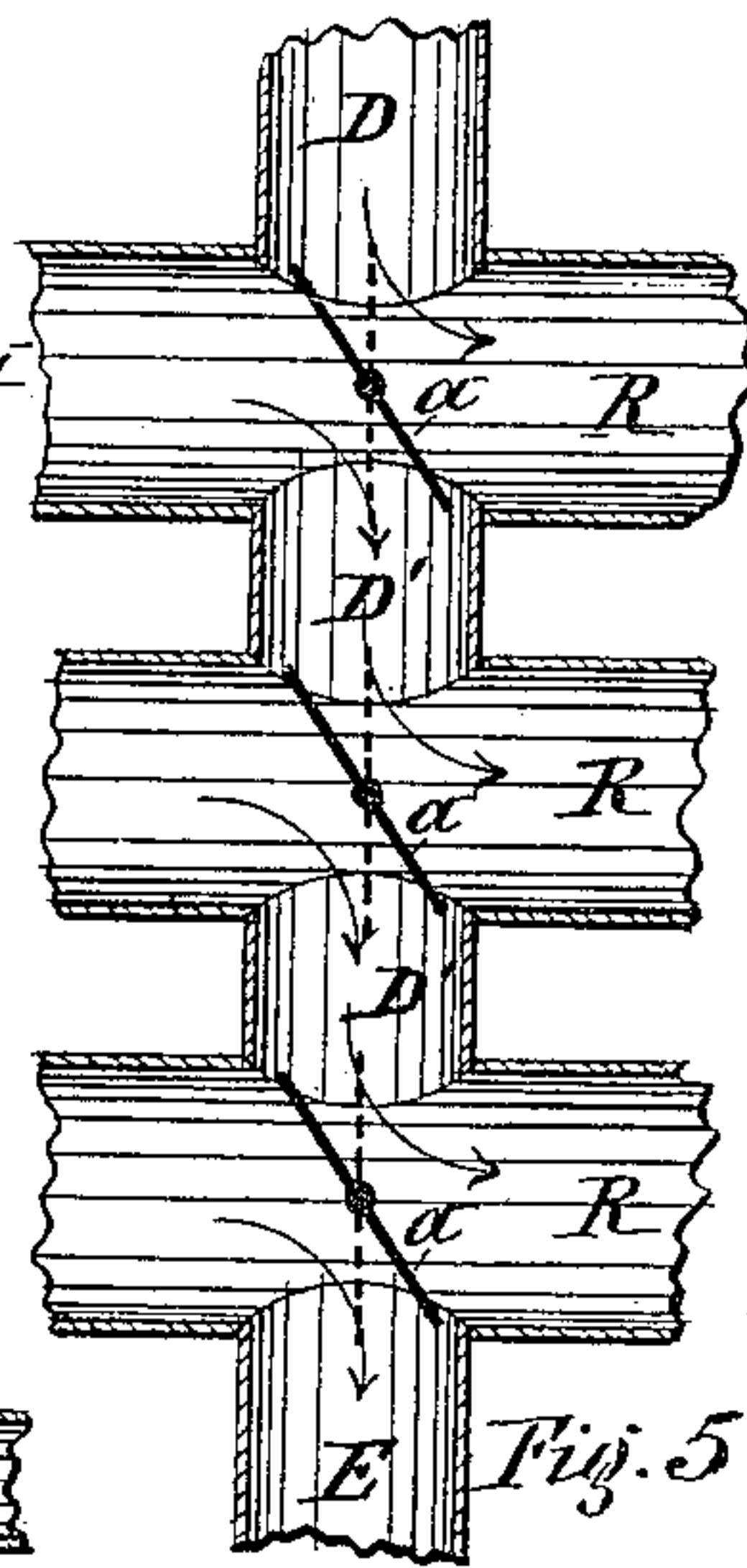
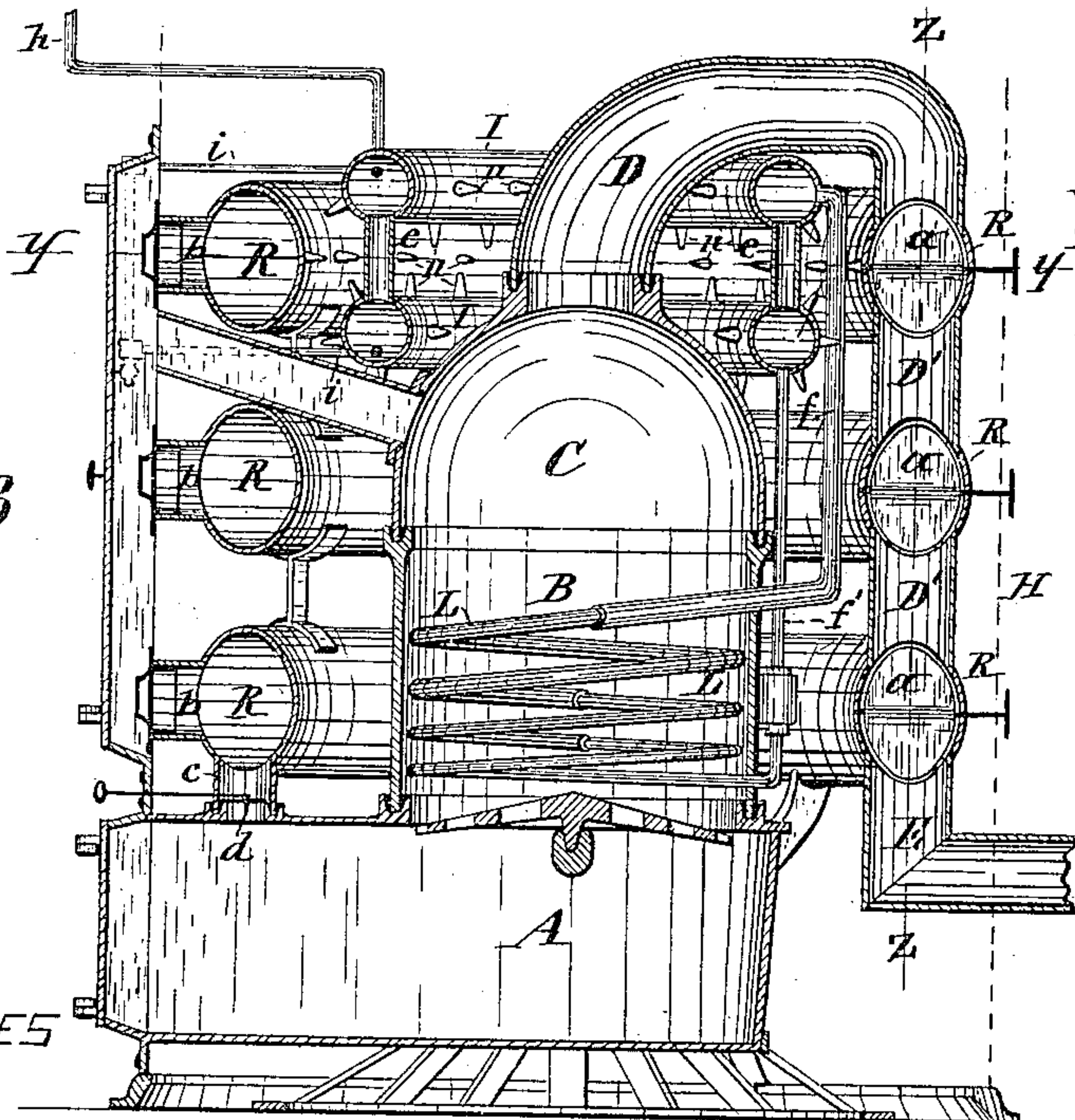


Fig. 3



WITNESSES

C. Bendixon

E. C. Cannon

INVENTOR

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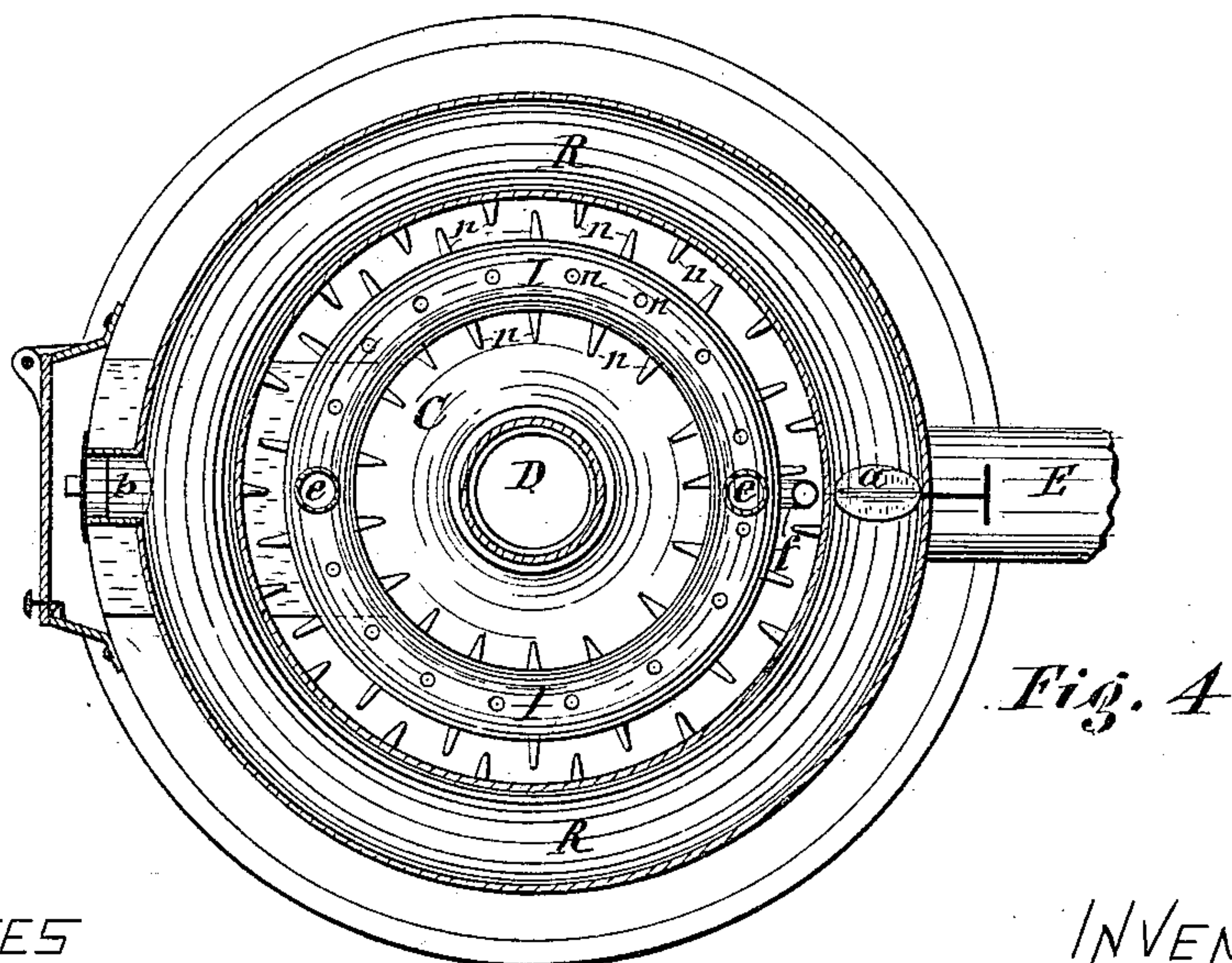
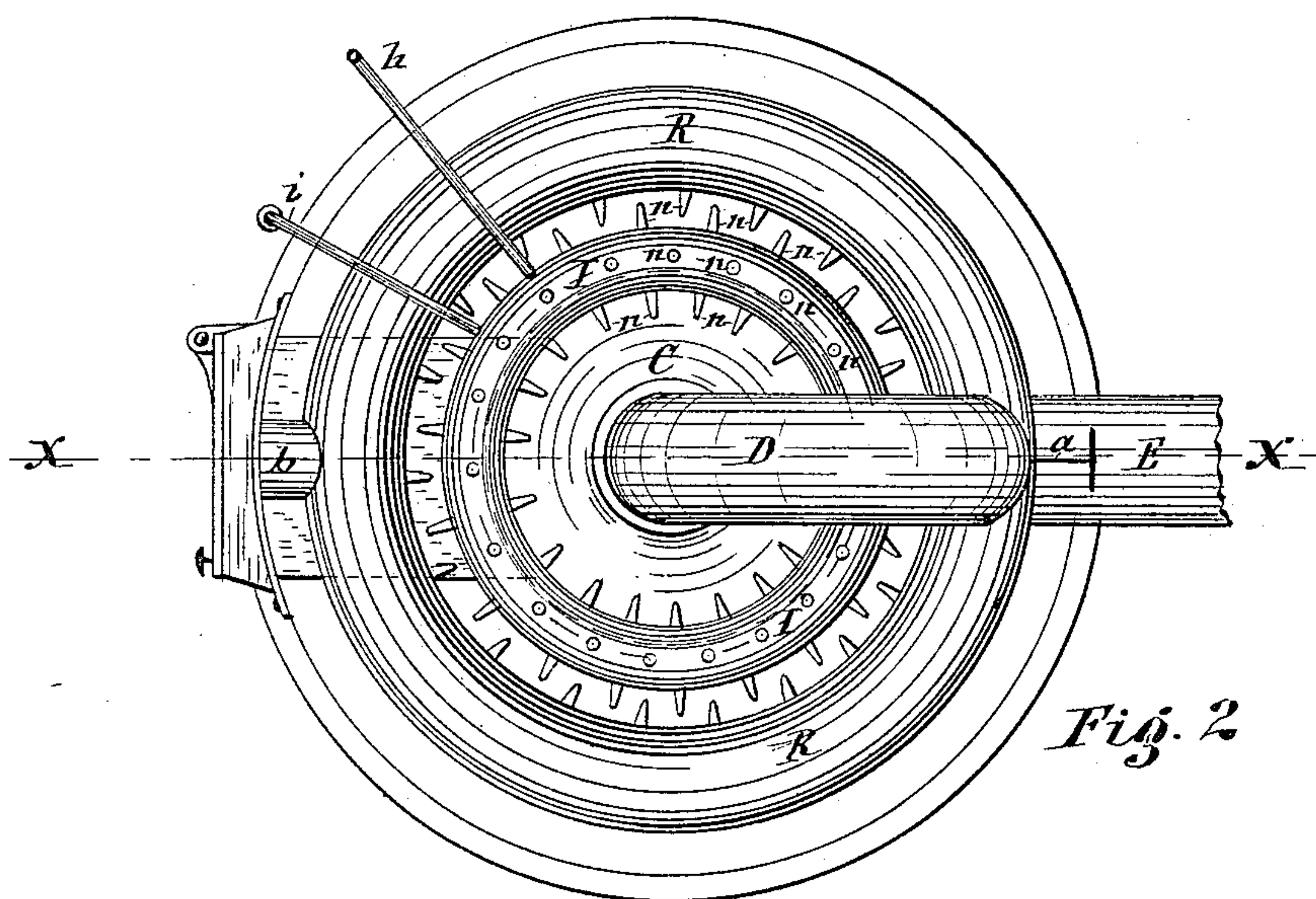
2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

CHARLES D. HOWARD, OF SYRACUSE, NEW YORK.

HOT-AIR AND STEAM HEATER.

SPECIFICATION forming part of Letters Patent No. 362,838, dated May 10, 1887.

Application filed June 3, 1886. Serial No. 204,008. (No model.)

To all whom it may concern:

Be it known that I, CHARLES D. HOWARD, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and
5 useful Improvements in a Steam-Heater and Hot-Air Furnace Combined, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

10 This invention consists in an improved organization of an apparatus designed for heating buildings either by hot air or by steam, and which is comparatively free from liability of having its flues and radiators choked by
15 dust and ashes, as hereinafter fully described, and specifically set forth in the claims.

In the annexed drawings, Figure 1 is a side elevation of my invention with the inclosing-case represented by dotted lines and portions
20 of the radiators broken away to illustrate other important features. Fig. 2 is a top plan view of the same. Fig. 3 is a vertical transverse section on line *x x*, Fig. 2. Fig. 4 is a horizontal transverse section on line *y y*, Fig. 3; and Fig. 5 is a sectional view of the connection of the smoke-flue with the radiators,
25 taken on line *z z*, Fig. 3.

Similar letters of reference indicate corresponding parts.

30 A represents the ash-pit, B the fire-pot mounted on the ash-pit, and C the combustion-chamber erected on the fire-pot.

R R R denote radiators of the form of annular pipes, arranged, successively, one below the
35 other and extending completely around the exterior of the fire-pot and combustion-chamber. These radiators communicate with each other and with the combustion-chamber by the smoke-flue D D', which is extended from the
40 center to the top of the combustion-chamber C down at the exterior of the same, and is intersected at different points of its length by the aforesaid radiators. The described smoke-flue terminates in the exit-flue E, which is ex-
45 tended from the lower radiator.

a a a are dampers pivoted across the centers of the intersections of the radiators R R R and flue D D', and adapted to stand either
50 vertically, and thus open the direct draft through the said flue, or diagonally, so as to divert the current of the products of combus-

tion from the smoke-flue successively through the radiators, as represented in Fig. 5 of the drawings, the products of combustion being thereby compelled to circulate through the
55 entire lengths of the respective radiators, and thus the escape of heat through the exit-flue is to a great extent obviated, and the heat is absorbed by the radiators, which latter heat the air as it ascends from the bottom of the
60 inclosing-case H and circulates around the radiators toward the usual hot-air pipes, P P, by which said hot air is conducted to the apartments of the building to be heated.

When first starting the fire in the fire-pot, 65 or at any time when a strong draft is required through the grate of the fire-pot, the dampers *a a a* are to be set perpendicular, as represented by dotted lines in Fig. 5 of the drawings, thereby allowing the products of com-
70 bustion to pass from the upper smoke-flue, D, down directly through the smoke-flue sections D' D' to the exit-flue E, near the base of the furnace. After the fire is under way, one or more of the aforesaid dampers may be turned
75 to compel the products of combustion to take the circuitous passage through one or more radiators R, which conduct them in one direction completely around the exterior of the
80 combustion-chamber and fire-pot, and thus greatly augment the heating-surfaces of the furnace without materially impairing the air-draft through the fire-pot.

The aforesaid radiators I provide with cleaning-flues *b b b*, extending from the radiators
85 through the side of the case H, and provided with removable covers. By removing the said covers and introducing a long-handled brush or scraper into the radiators the soot can be swept into the smoke-flue D', and allowed
90 to drop into the exit-flue E, from whence it can be removed by disconnecting the latter, or the soot can be drawn out through the aforesaid cleaning-flues.

From the ash-pit A to the lower radiator R 95 is extended a flue, *c*, in which is arranged a damper, *d*, provided with an adjusting rod or handle, which projects through the case H, so as to be convenient for manipulation. By opening the said damper the air entering through
100 the ash-pit door is allowed to enter the aforesaid radiator direct, and thus said radiator

may be cooled and the draft through the fire-pot checked when desired to cool down the furnace. Said flue can also be used to allow the soot to drop into the ash-pit during the operation of cleaning the radiator. However, in my improved hot-air furnace the accumulation of dust and ashes in the flues and radiators is effectually obviated by the downward direction of the products of combustion through the flue-sections which communicate with the radiators, and by the arrangement of said flue-sections directly in line with each other, the dampers, standing vertically when the draft is strongest, allow the dust and ashes to fall by gravity through the successive flue-sections down into the exit-flue at the base, from whence they are readily removed by disconnecting said flue.

I I represent annular water and steam pipes arranged around the exterior of the combustion-chamber, and preferably above the same, and between the upper radiator and combustion-chamber and adjacent portion of the smoke-flue D. Said pipes are connected with each other by vertical tubes *ee*. Inside of the fire-pot is arranged a steam generator consisting of a coiled pipe, L, the upper and lower ends of which are connected with the said annular pipes I I by pipes *ff'*.

In the operation of the aforesaid steam-generator and water and steam pipes, the steam rises from the coil through the pipe *f* and enters the pipe I, and the expansion of the water in the coil L drives the water upward therefrom, and it is replaced by the water descending from the lower annular pipe I through the pipe *f'* and into the bottom of the coil L, thus producing a circulation of water through the coil and obviating the danger of burning the coil by the fire surrounding it.

In order to facilitate the aforesaid circulation, I form the coil L of sections of coils joined end to end, each of said sections being formed of a pipe of a smaller diameter than the pipe of which the adjacent upper section is formed.

h denotes the pipe which conducts the steam to the radiator located in the apartment of the building to be heated.

i i are pipes extended horizontally from the pipes I I and through the side of the casing H and carrying on the extremities a water-

gage, as represented by dotted lines in Fig. 1 of the drawings.

In order to augment the heating capacity of the described apparatus, I provide the exterior of the radiators R, and also the pipes I I, with spurs *n n*, which not only serve to break up and diffuse the current of air circulating around said radiator and pipes, but also present increased heating-surface.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In combination with the fire-pot and combustion-chamber, the flue D, extending from the top of the combustion-chamber down at the exterior of the same, the flue-sections D' D', arranged vertically in line with each other and terminating in the exit-flue E at the base, the annular radiators R R, arranged, successively, one below the other and extending completely around the combustion-chamber and fire-pot, and connected with the intervening flue-sections D', and the dampers *a a a*, pivoted across the centers of the intersections of said radiators and flue-sections and adapted to stand either vertically for a direct draft or diagonally across the said intersections to direct the products of combustion through the radiators, substantially in the manner as specified.

2. In combination with the fire-pot and combustion-chamber, annular water and steam pipes arranged horizontally one above the other and concentrically around the top of the combustion-chamber, vertical pipes connecting said horizontal pipes, a coiled water-pipe inside of the fire-pot, and pipes connecting the upper and lower ends of the coiled pipe, respectively, with the aforesaid external horizontal pipes, substantially as described and shown.

In testimony whereof I have hereunto signed my name and affixed my seal, in the presence of two attesting witnesses, at Syracuse, in the county of Onondaga, in the State of New York, this 29th day of May, 1886.

CHARLES D. HOWARD. [L. S.]

Witnesses:

C. BENDIXON,
FREDERICK H. GIBBS.