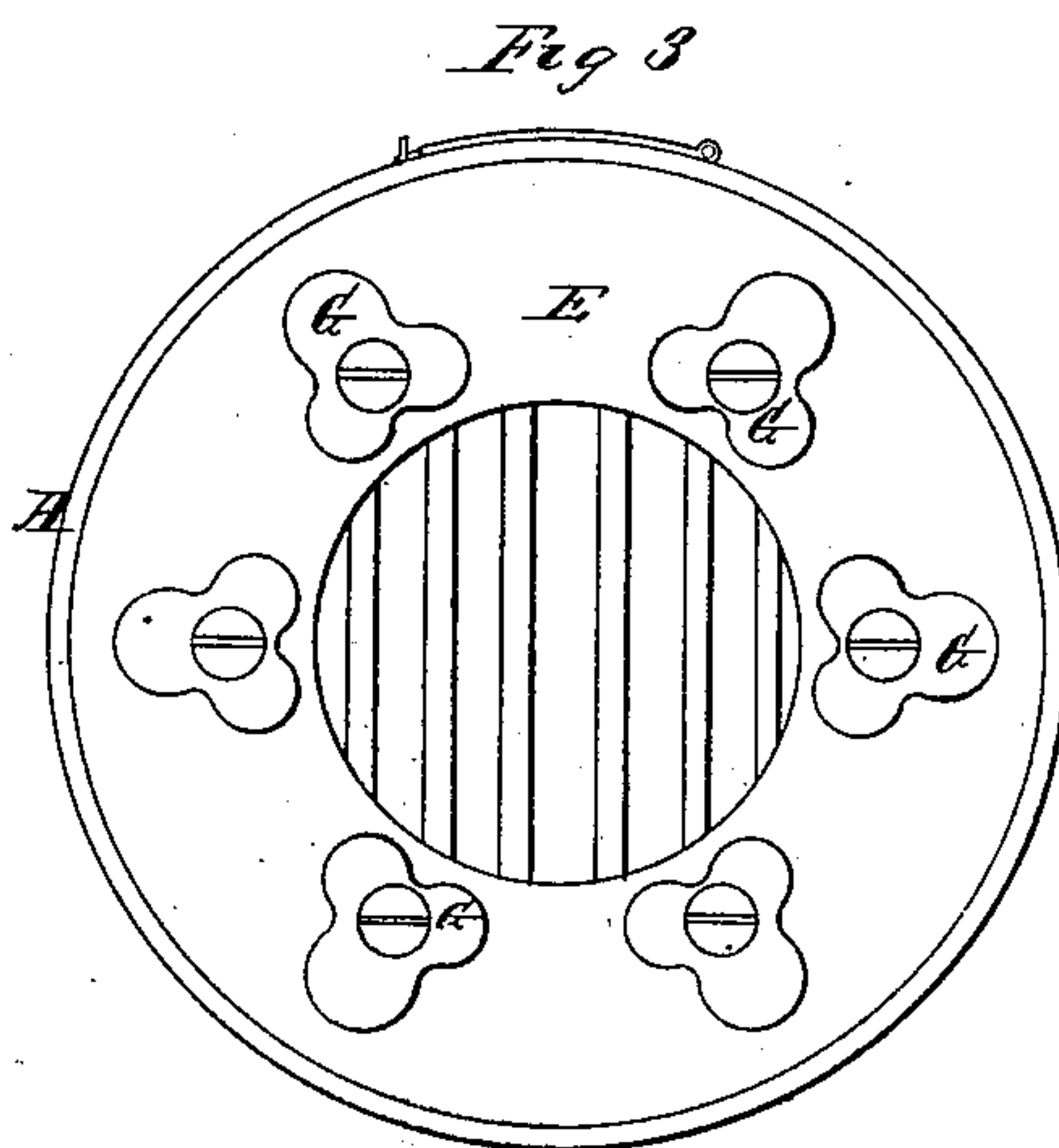
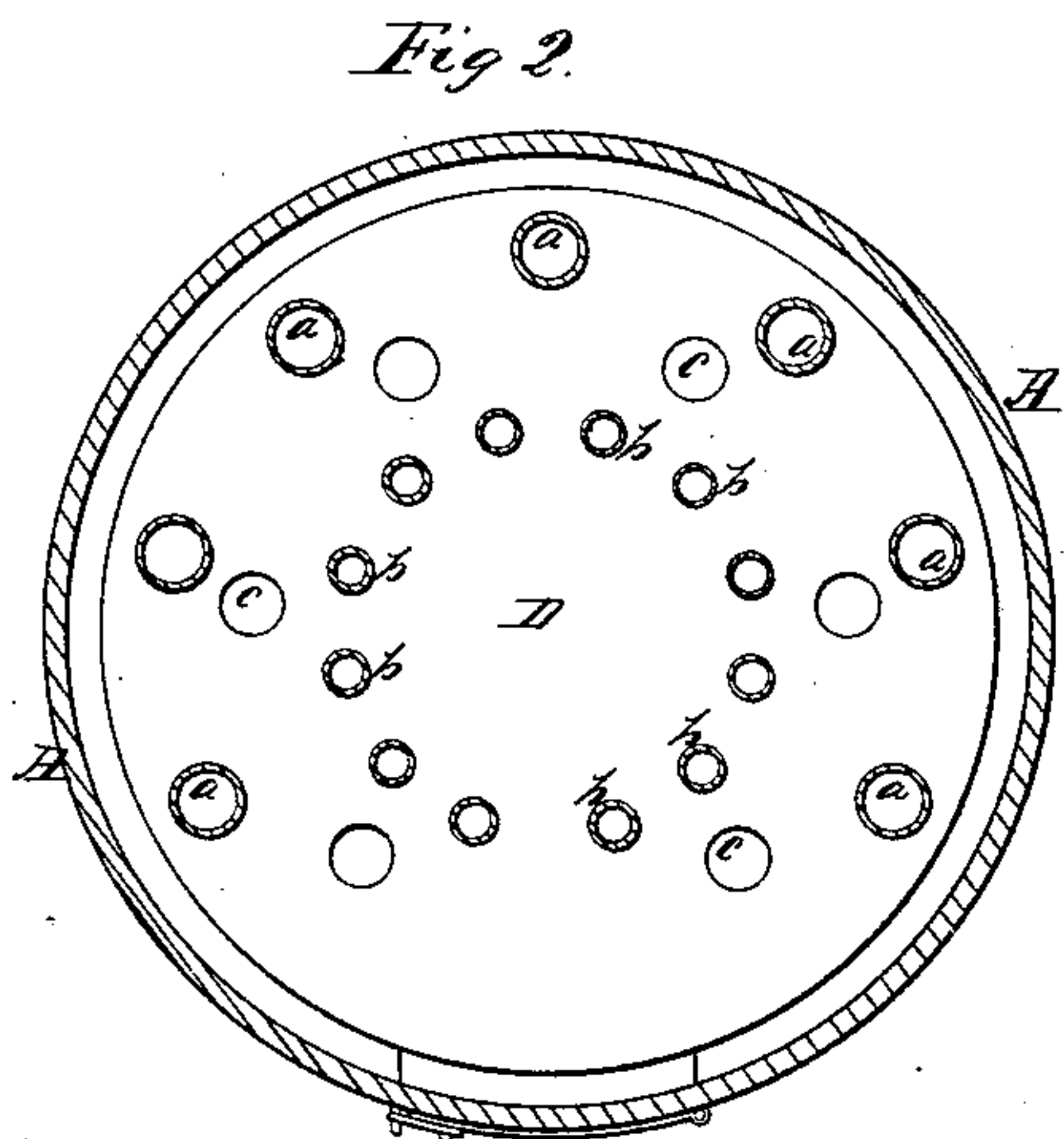
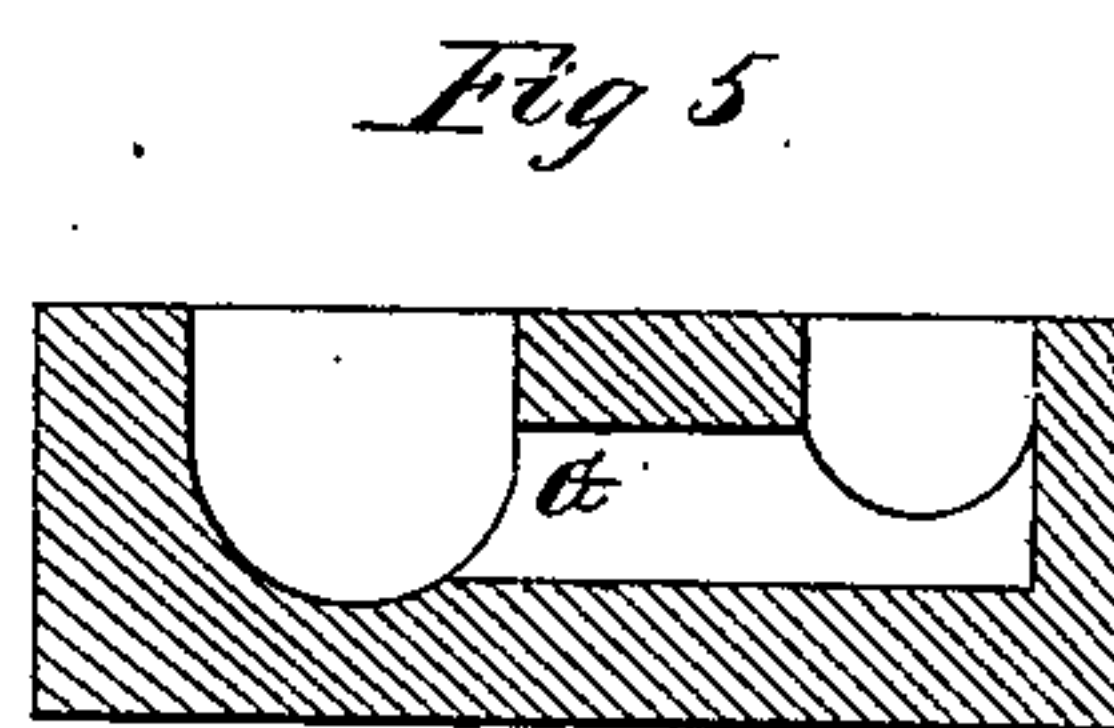
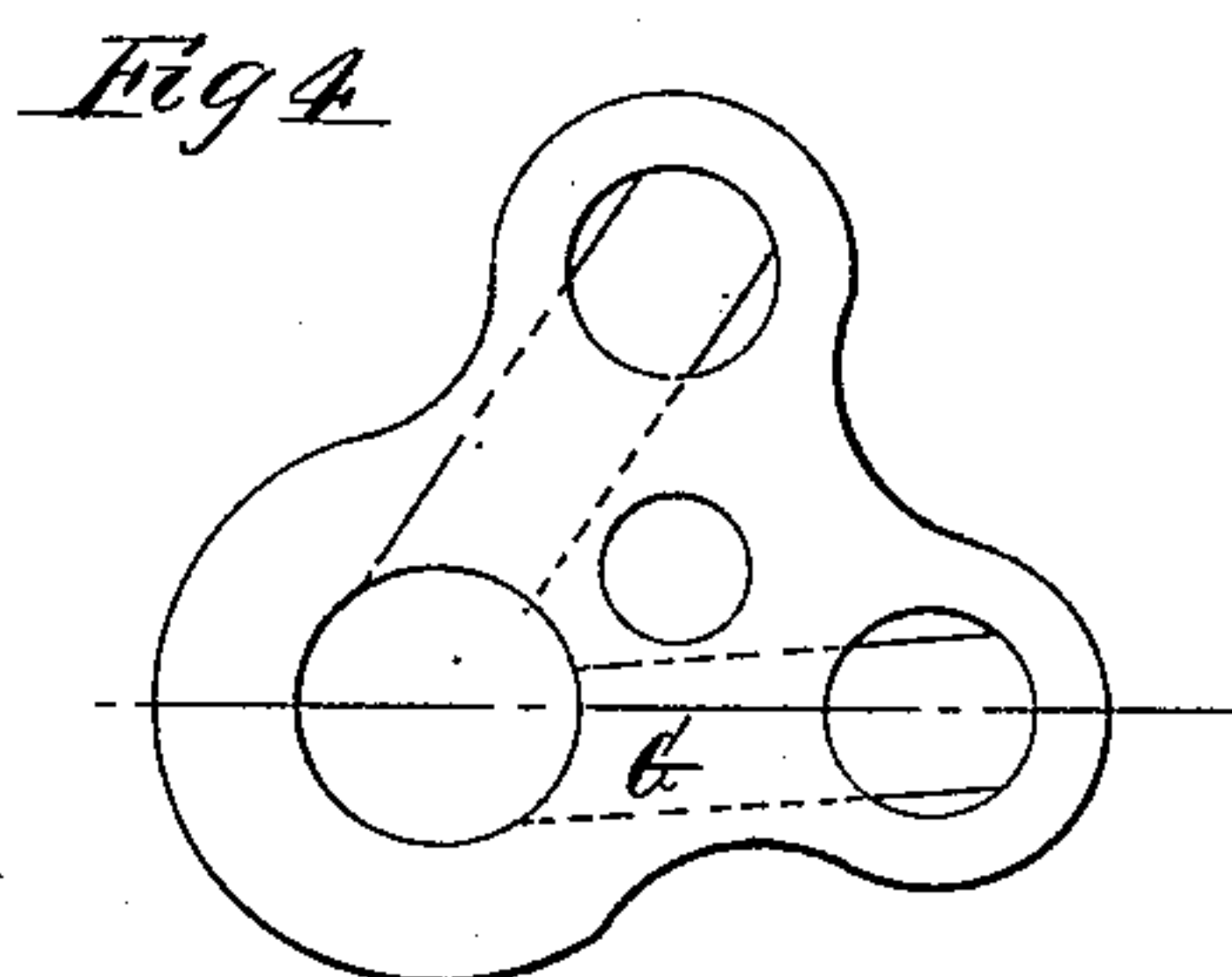
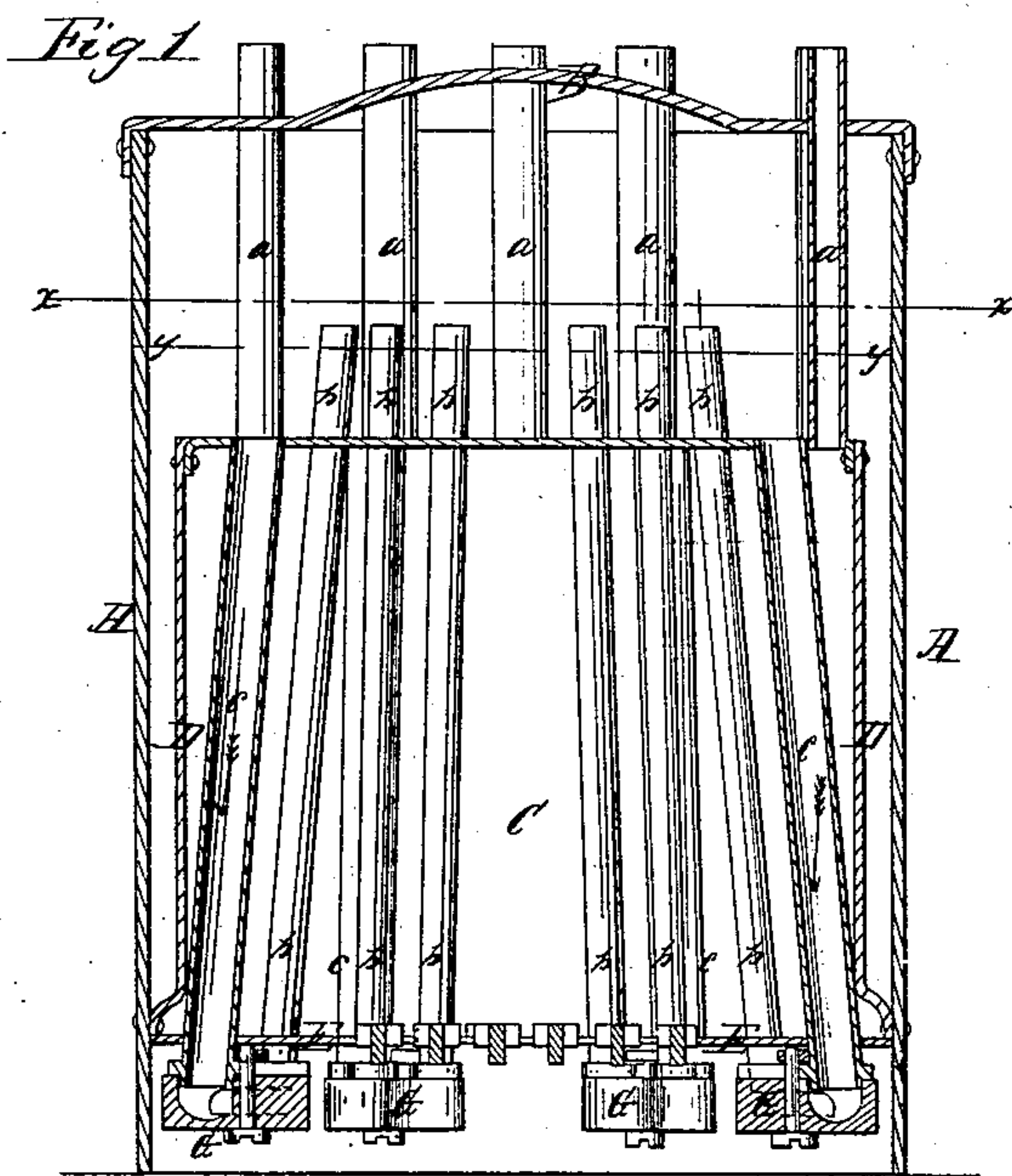


H. FEYH
STEAM GENERATOR.

No. 60,496.

Patented Dec. 18, 1866.



Witnesses,
Henry G. Lusk
Edwin Schaefer

Inventor,
Henry Feyh
By *Maun Schaefer*

United States Patent Office.

IMPROVEMENT IN STEAM GENERATORS.

HENRY FEYH, OF COLUMBUS, OHIO, ASSIGNOR TO HIMSELF AND
GEORGE T. EMERY.

Letters Patent No. 60,496, dated December 18, 1866; antedated September 13, 1866.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, HENRY FEYH, of Columbus, in the county of Franklin, and State of Ohio, have invented an Improvement in Upright Steam Boilers; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a vertical central section through a steam boiler, showing my improved arrangement of water-spaces.

Figure 2 is a horizontal section through the boiler shell, taken in the plane indicated by red line *x x*.

Figure 3 is a bottom view of the boiler.

Figures 4 and 5 are enlarged views of the coupling-boxes at the lower extremities of the pipes.

Similar letters of reference indicate corresponding parts in the several figures.

The object of this invention is to promote a forced and increased circulation of the water in steam boilers, for the purpose of obtaining a more rapid and economical evaporation, and a sure and effectual protection of the boiler-plates, tubes, and material interposed between the fire and water. Without free circulation of the water in boilers for generating steam, rapid evaporation will entirely displace the water in small apertures and tubes when exposed to a high degree of heat. It has been attempted to accomplish this object by inclining the boiler-tubes so that the difference in temperature on the more and less exposed sides would create ascending and descending currents in the same tubes; also, by the use of tubes and shells, or a tube within a tube, where the inside and less exposed tubes become feeders of water for the external or steam-generating tubes. In the first case cited, the agency is inadequate and uncertain, particularly where anthracite coal is used as the fuel, and the temperature is nearly or quite uniform throughout the fire-chamber. And in the second case cited, the steam apertures, or the spaces for generating steam, are necessarily so small that the arrangement is entirely inadmissible with feed-water holding salt or mud in solution, as the small apertures are soon filled, and the sheets and tubes burned out.

The nature of my invention consists in producing rapid circulation of water in steam generators by means of connected tubes of different diameters, which are so arranged and proportioned that the larger tubes shall serve as feeders for the smaller tubes, in which latter the water is rapidly converted into steam, and the steam conducted directly into the steam space above the water level, as will be hereinafter described.

To enable others skilled in the art to understand my invention, I will describe one form of boiler operating upon this principle.

In the accompanying drawings, I have represented a vertical boiler, having a number of tubes arranged within it, some of which are vertical and some inclined. A represents the cylindrical shell of the boiler, which is closed at its upper end by the crown sheet B, through which a number of vertical flues, *a a*, pass, for conducting off the products of combustion from the fire-chamber C. The top of this boiler should be covered by a suitable hood leading in the smoke pipe. Within the outer shell A is an inner shell, D, which leads up a suitable distance from the bottom plate E, of the fire-chamber, and has a space surrounding its sides and top, as shown in fig. 1. Within the circular fire-chamber, C, and arranged concentrically around the centre thereof, are a number of small pipes, *b b*, which may be inclined as shown in fig. 1. The lower ends of these small pipes project through the bottom plate E, and communicate with the three-way coupling-boxes G, and the upper ends of these pipes project through the top plate of the fire-chamber, through which plate they are screwed, and terminate at a point which is above the water level, indicated by red line *y y*, in fig. 1. There is also a series of larger pipes, *c c*, which are arranged vertically in the fire-chamber C, so as to communicate at their lower ends with the pipes *b b*, by means of coupling-boxes G. The upper ends of these larger pipes pass through, and are suitably secured to, the top plate of shell D, but they do not project above this plate, as will be seen by reference to fig. 1. The coupling-boxes G are adapted for receiving one of the large pipes *c*, and two of the smaller pipes *b b*, and forming communications between these three pipes so that water flowing through the feeding-pipes *c*, will pass into the lower ends of the steam-generating pipes *b b*, and rise to a level therein. The tubes, as above described and shown in the drawings, are connected to the coupling-boxes in

triples, but any number of small tubes may be thus made to communicate with a larger feeding-tube, according to the capacity of the latter. When the boiler is supplied with the proper quantity of water, and fire is made in the chamber C, within which the tubes *b* and *c* are exposed, the water which is in the tubes will become heated and begin to circulate; that which is in the smaller tubes *b* will first be converted into steam, which will cause the water to circulate through tubes *c*, and coupling-boxes G, to supply the place of the water which was converted into steam in tubes *b*. In this way a continued and forced flow of water will take place, caused by the difference in the temperature of the large and small tubes, in conjunction with the difference in evaporative powers of said tubes. It will be seen by reference to fig. 1, that the upper ends of the feeding-tubes *c* terminate below the lowest point for the water level, and, consequently, will not fail to supply water to the steam generators *b b*. These tubes *b* extend above the water level, and discharge the steam into the upper chamber of the boiler; thus the steam, on its way to the steam space, does not enter the water.

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

1. Pipes or tubes of different diameters, arranged so as to be exposed to the direct action of the fire, and connected at one end, for producing a forced circulation of water in steam boilers, substantially as described.
2. The combination of the feeding-pipes *c*, leading from the water space, and below the water level, with the end-couplings G, and with pipes leading from said couplings above the water level in the boiler, substantially as described

HENRY FEYH.

Witnesses:

WM. L. HEYL,
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