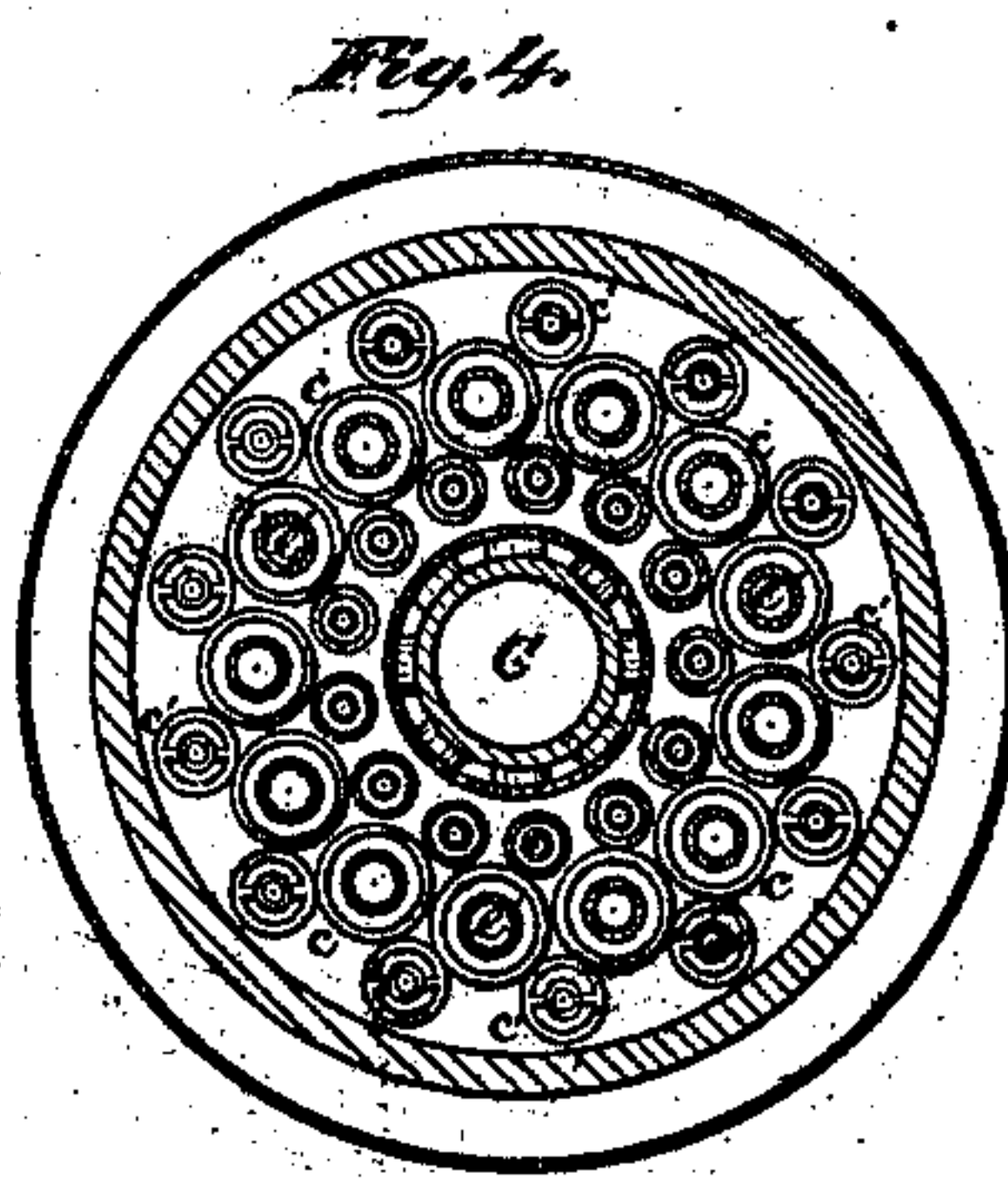
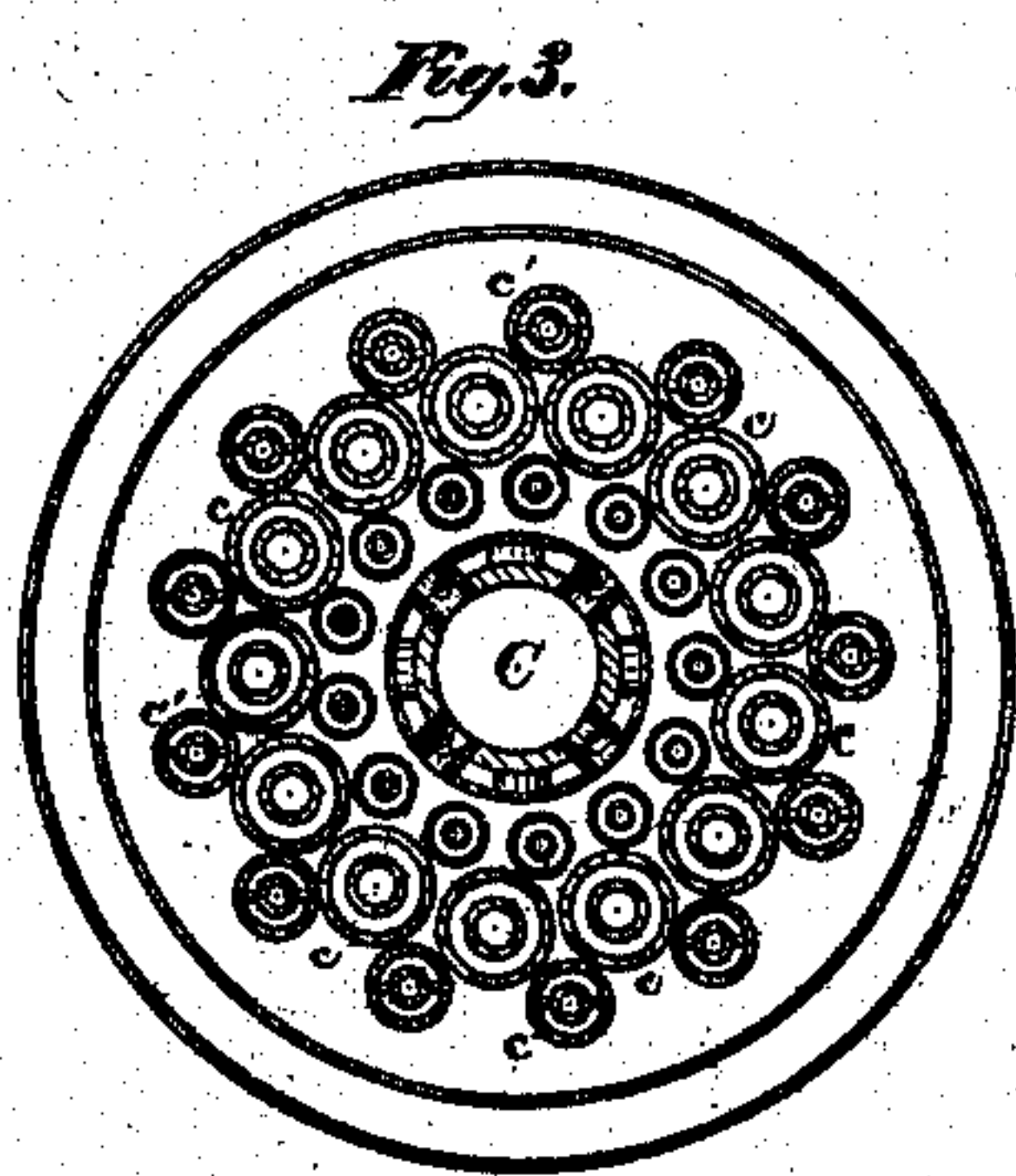
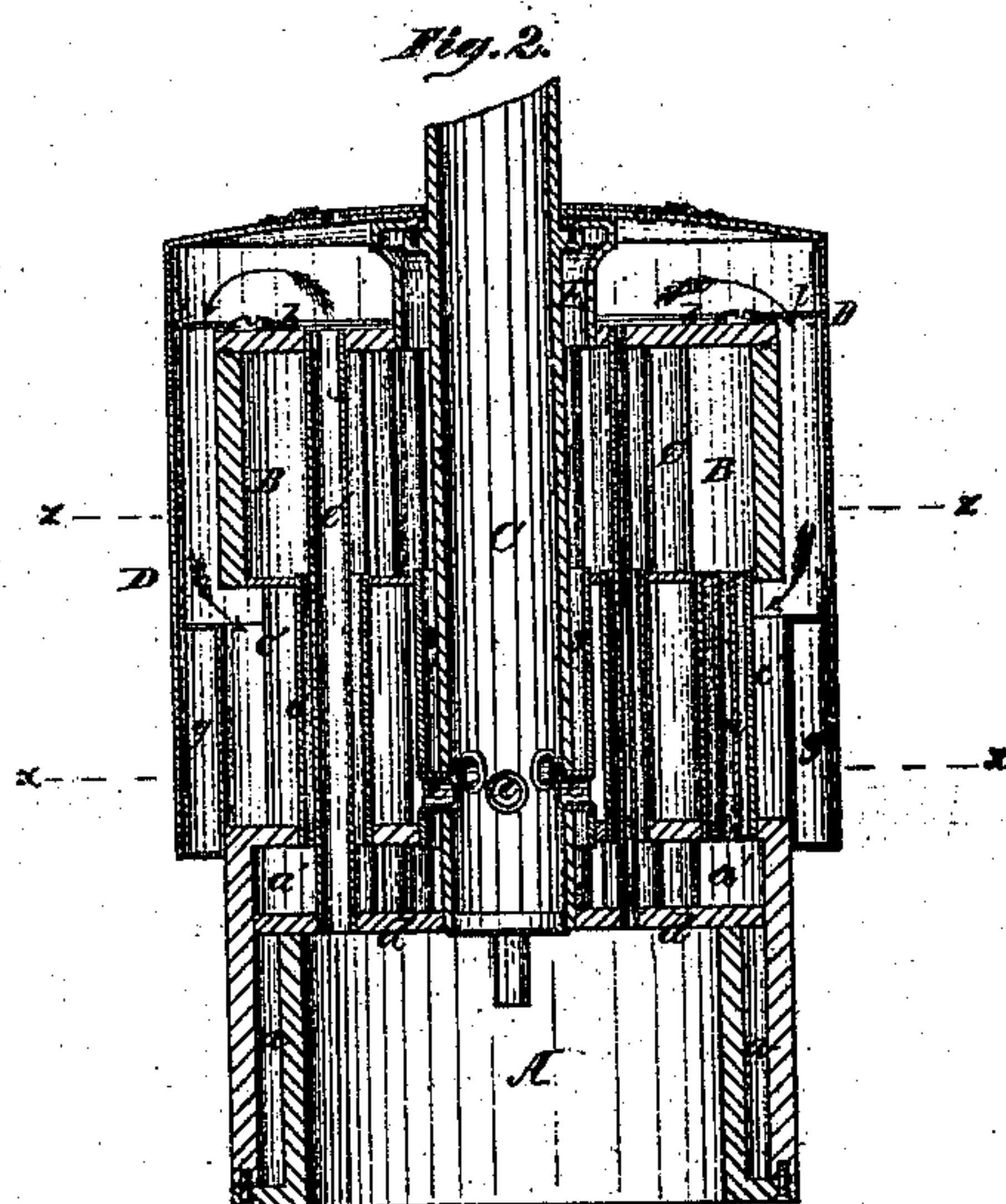
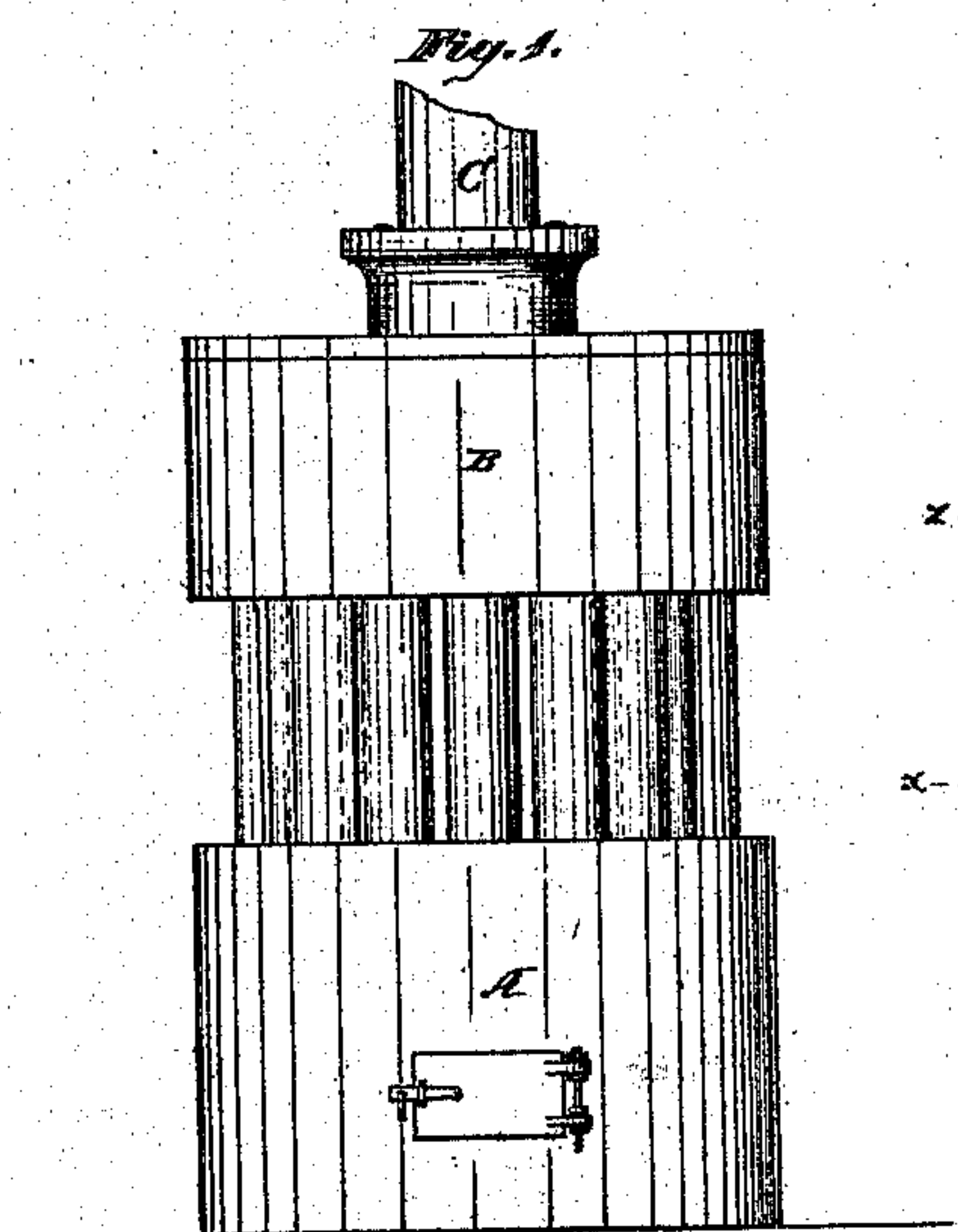


W.H. Ivens,
Water Tube Boiler.
No. 100411. Patented Mar. 1. 1870.



Witnesses.
Sydney E. Smith.
J. C. Robbins

Inventor,
Wm. H. Ivens
by Attorneys
Brown, Count & Co

United States Patent Office.

WILLIAM H. IVENS, OF TRENTON, NEW JERSEY.

Letters Patent No. 100,411, dated March 1, 1870.

STEAM-GENERATOR.

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, WILLIAM H. IVENS, of Trenton, in Mercer county, and State of New Jersey, have invented certain new and useful Improvements in "Steam-Generators;" and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing through letters of reference marked thereon, forming part of this specification, and in which—

Figure 1 represents an elevation of a boiler constructed according to my improvement.

Figure 2 is a vertical section taken through the center of the same.

Figure 3 is a horizontal section taken on the line z z on fig. 2.

Figure 4, a similar section at the line z z on fig. 2.

The same letters indicate like parts on all the figures.

The object of this invention is to produce a boiler that will generate more steam in proportion to the consumption of fuel, raise it to a given pressure in less time, and may, consequently, be constructed lighter and more portable to accomplish the same amount of work.

Referring to the drawing, it will be seen that the boiler consists of a fire-chamber, A, having an annular water space, a , around it, and between the lower and middle flue sheets at a' ; also of a water and steam-chamber, B, of somewhat similar size and shape externally.

The water spaces of these two chambers are connected by a series of tubes c , which terminate in the two middle flue sheets, and form means of circulation for the water and steam. The outer circle of these tubes c has also a smaller tube of corresponding length suspended within it, the object of which will hereinafter appear; all the tubes c , except the outer circle, have a smaller pipe passing through each, which extend to and are secured at their ends in the upper and lower sheets b d of the boiler, and these constitute flues for the passage of the products of combustion, which, after escaping at their upper end are caused to descend in the direction of the arrows, and pass between and around the tubes c , which each contain an annular column of water, through the openings e near its bottom in the smoke-stack C, which is also surrounded by an annular column of water within a cylinder of corresponding length with that of the pipes c , and similarly connected with the two middle flue sheets of the chambers A B.

The chamber B, and the waist or tubular portion of the boiler are encased by a jacket, D, at the lower portion of which is formed an annular water-chamber, g , which serves to heat the feed water before being forced into the boiler, and above the said chamber, within this jacket D, is, or may be, an extension, E, to afford additional steam space.

A perforated disk, h , or other suitable device may be applied to the jacket D, for controlling a series of holes for the admission of air, if necessary, to render combustion more perfect, the sparks being arrested by a wove wire, l , near the upper edge of the chamber B, where they are entirely consumed. This jacket renders the boiler complete for portable purposes, but when used as a stationary boiler it may be dispensed with and masonry substituted therefor.

The advantages of this construction of boilers are, that the products of combustion are retained in contact with a smaller quantity of water, and for a longer time in their passage from the fire surface to the outlet of the stack, consequently the caloric is more perfectly absorbed by the water, and an increased effect is the result from the same consumption of fuel, and the difficulty heretofore experienced in boilers having large heating surface, and containing but little water in proportion thereto, of want of circulation downwardly, is remedied in this construction.

The application of the heat through the center and around the outside of an annular column of water will cause a continual upward current, so that it becomes necessary to provide for a downward current to keep up the circulation, which I accomplish by inserting water tubes n through the outer circle of tubes c , to the outer surface only of which latter the heat is applied, so that a downward current through these inner tubes will be the result, and a perfect circulation insured thereby.

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

1. The combination and arrangement of the chambers A B and water and flue tubes c and c' , and circulating-tubes c' and n , substantially as set forth.

2. The extension of the smoke-stack C downward through the boiler to near the lower flue sheet d , and surrounded by an annular water-chamber s , having lateral openings or flues e through the latter, in combination with the annular water-tubes c , substantially as specified.

3. The arrangement and combination of the jacket D, provided with an annular water-heater, g , with the flues e , smoke-stack C, annular water-pipes c c' , and water-chambers A B, as shown and described.

4. A steam-generator, the waist portion of which is made up of a series of tubes, forming flues, surrounded by annular columns of water, as shown and described.

5. The combination of the perforated disk h , with the jacket D, and reticulated spark-arrester l , arranged for operation essentially as shown and described.

WM. H. IVENS.

Witnesses:

GEO. E. HALE,

W. MORRIS SMITH.