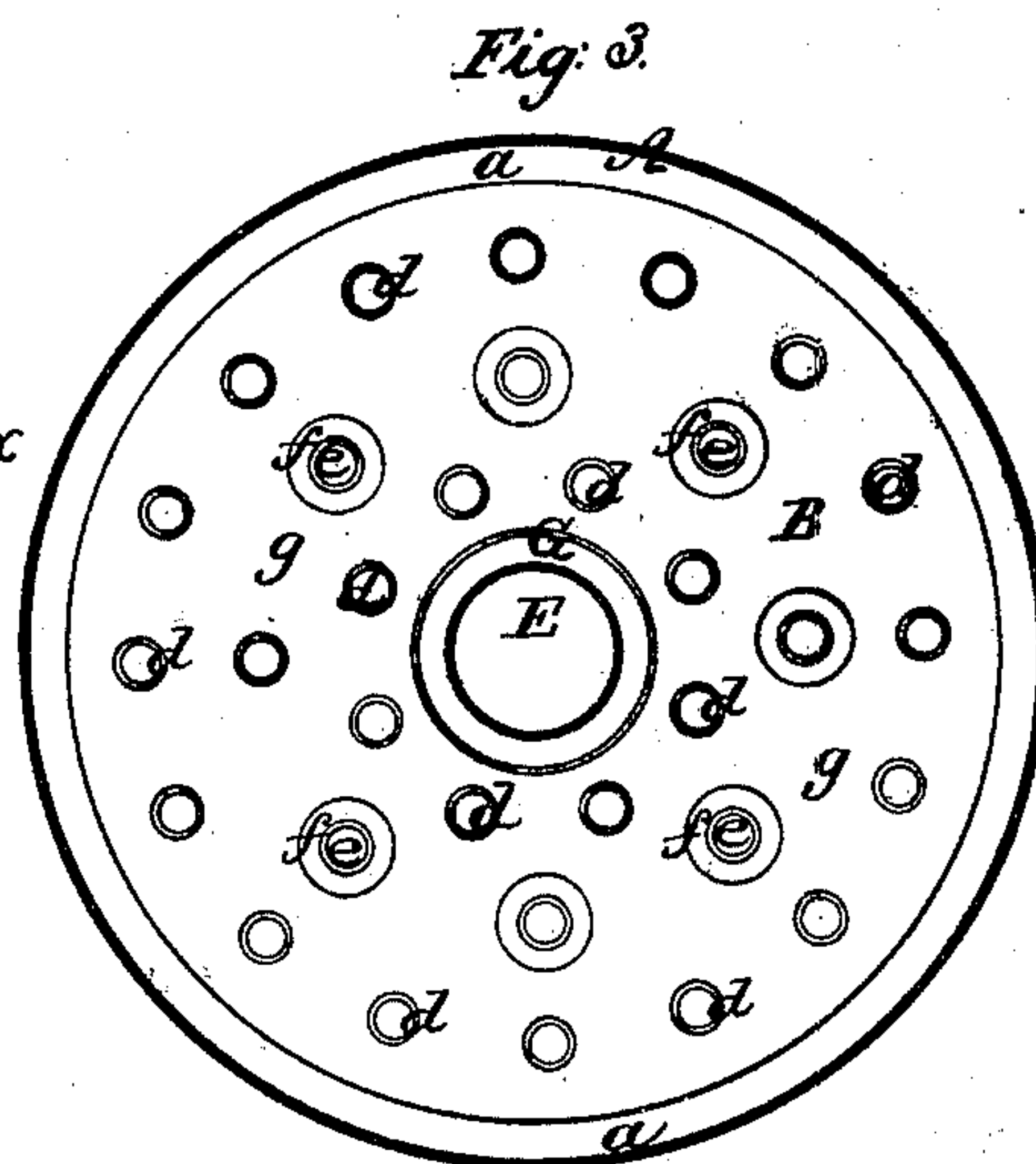
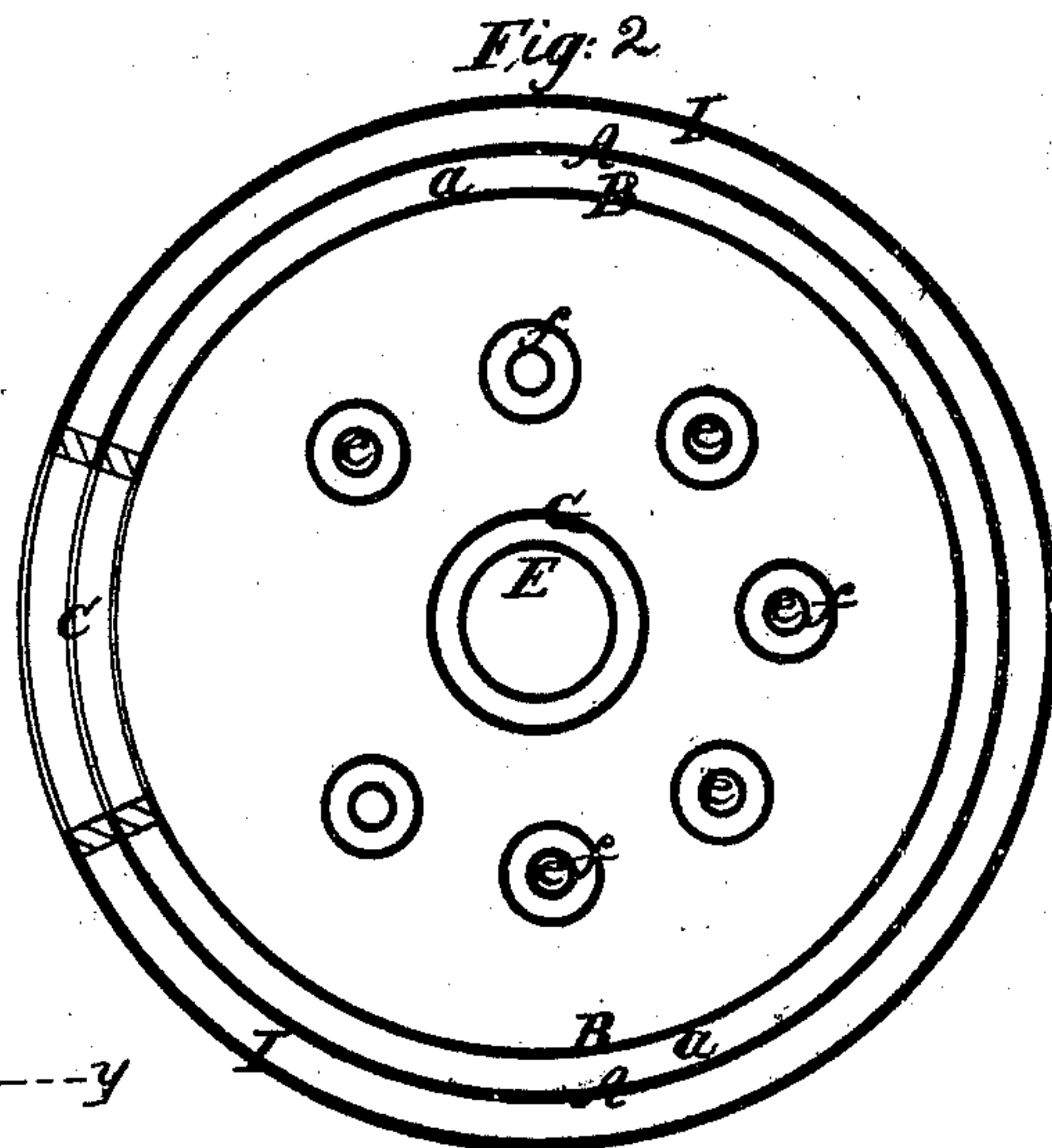
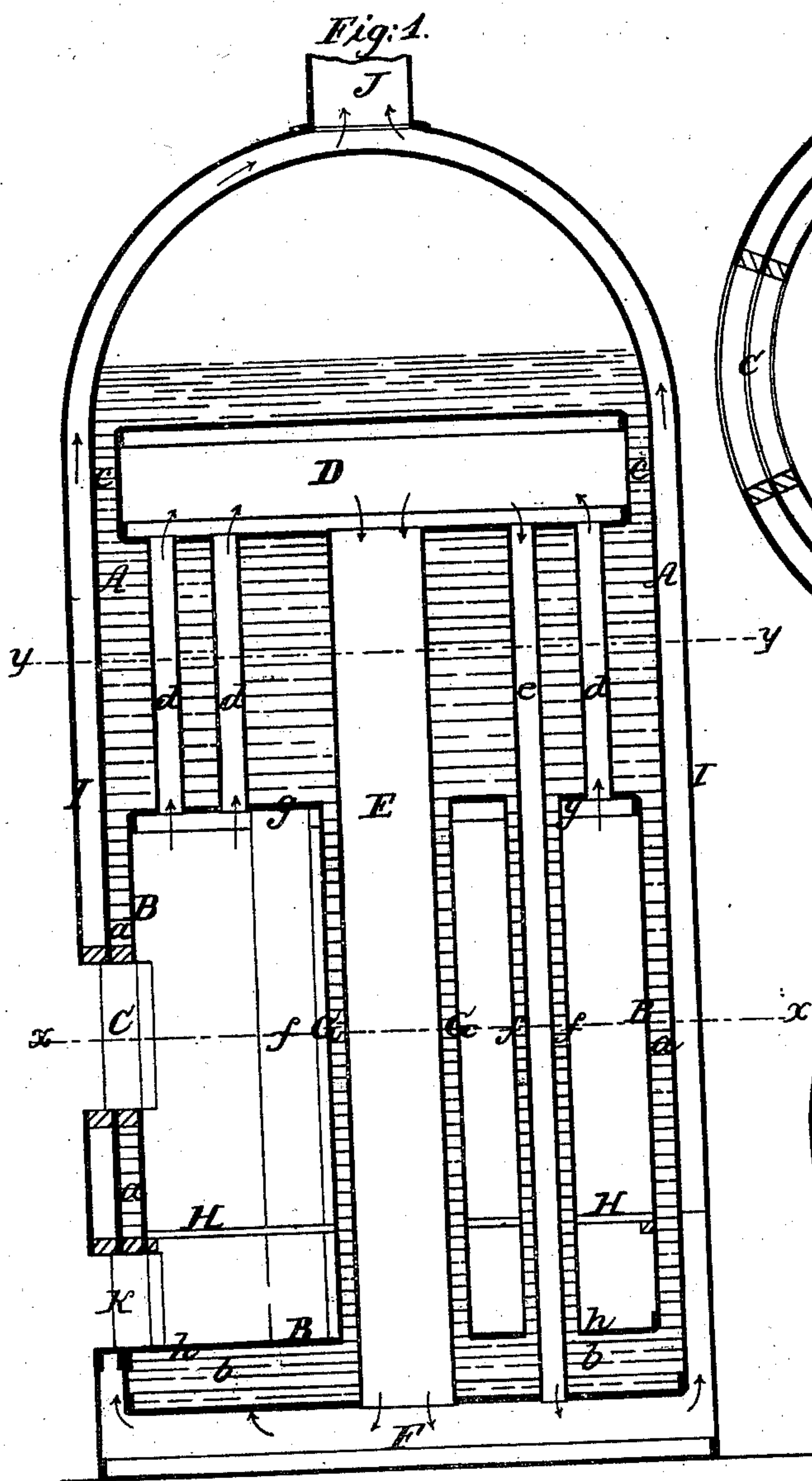


*C. M. Miles.*  
*Steam Boiler.*

*N<sup>o</sup> 42443.*

*Patented Apr. 19. 1864*



*Witnesses;*  
*J. H. Coombs*  
*Henry M. Orma*

*Inventor;*  
*C. M. Miles*  
*per Munn & Co.*  
*attorneys*



# UNITED STATES PATENT OFFICE.

CHARLES M. MILES, OF VINELAND, NEW JERSEY, ASSIGNOR TO HIMSELF  
AND CHARLES F. JONES, OF SAME PLACE.

## IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. 42,443, dated April 19, 1864.

*To all whom it may concern:*

Be it known that I, CHARLES M. MILES, of Vineland, in the county of Cumberland and State of New Jersey, have invented a new and useful Improvement in Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a central vertical section of a steam boiler constructed according to my invention. Fig. 2 is a horizontal section in the plane indicated by the line *x x* in Fig. 1. Fig. 3 is a horizontal section of the same in the plane indicated by the line *y y* in Fig. 1.

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

This invention consists in a novel arrangement and combination of fire and smoke or gas boxes, water, fire, and gas or smoke tubes and water-spaces in a vertical boiler, whereby I obtain a very large and effective heating-surface and extract from the gaseous products of combustion the greatest possible amount of heat before permitting them to escape to the chimney, and so greatly economize fuel.

To enable those skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A is the outer shell of the boiler, consisting of an upright cylinder with a hemispherical or dome-shaped top.

B is the fire-box, of upright cylindrical form, arranged concentrically within the shell A, with an annular water-space, *a*, all round it, except at the fire-door C, and a water-space, *b*, below it. This fire-box reaches about half-way to the top of the shell.

D is a shallow cylindrical smoke and gas chamber, arranged some distance above the fire-box concentric with the outer shell, and having a water-space, *c*, all round it. This chamber is connected with the fire-box by means of tubes *d d*.

E is a larger central vertical tube, descending from the chamber D down through the bottom of the shell A, for conveying a large portion of the hot gaseous products of combustion from the said chamber down through the center of the body of water in the boiler

to a chamber, F, under the bottom of the shell A.

G is a central vertical water-tube, larger than the tube E, surrounding and concentric with the latter tube, passing through the fire-box and secured in the top and bottom plates, *g h*, thereof, and forming a communication between the lower water-space, *b*, and the main water-space above the fire-box.

*e e* are a series of smaller vertical tubes, arranged around the central tube, E, at equal distances apart, and forming, like E, communications between the smoke and gas chamber D and the bottom chamber, F.

*f f* are vertical water-tubes, larger than the tubes *e e* and corresponding in number therewith, each surrounding one of the tubes *e e*, passing down through the fire-box and secured in the top and bottom plates, *g h*, thereof, and forming communication between the lower water-space, *b*, and the main water-space above the fire-box. The fire-grate H is arranged at a suitable distance from the bottom of the fire-box, and below it, directly under the fire door C, there is a door, K, for draft and the removal of ashes from the bottom plate, *h*. It will be observed that the tubes *f f* and G pass right through the grate and are surrounded by the fire.

I is a casing surrounding the shell of the boiler from top to bottom, for conveying escaping gaseous products of combustion from the bottom chamber, F, to the chimney J, which is on the top of the boiler. The gaseous products, escaping through this casing and surrounding the boiler, heat the shell A, and so till their passage to the chimney their heat is utilized, while it has been so far reduced as to prevent them from burning the upper part of the boiler, which contains the steam. If preferred, this casing may be omitted and the chamber F may communicate with the chimney through a flue on one side of the boiler. The boiler is kept filled with water to a suitable height above the chamber D, and the upper part of the shell A above the water is the steam-space. Fire having been lighted in the grate, the portions of the sides of the fire-box and of the tubes *f f* and G, which are immediately above the grate, are heated by the direct contact of the incandescent fuel,



while the flame and heated gaseous products of combustion, circulating over the other parts of the sides of the box, around the upper parts of the said tubes, and under the top plate, *g*, of the fire-box, heat all those parts and generate steam from the water in contact with them. From the fire box the flame and gases pass upward through the tubes *d d* to the smoke and gas chamber D, the whole of whose exteriors constitute heating-surface. From thence the heated gaseous products pass through the tubes *e e* and E to the chamber F, and thence to the chimney. The bottom plate, *h*, of the fire-box also presents a heating-surface, receiving heat by radiation from the fire between the grate-bars and from the hot cinders which fall through. Thus it will be seen that a very extensive heating-surface is

presented by the fire-box chamber D and all of the tubes.

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

1. The combination of the fire-box B, the chamber D, the short ascending flues or tubes *d d*, the long descending flues or tubes E *e e*, and surrounding water-tubes G and *f f*, and lower chamber F, substantially as herein specified.

2. In combination with the parts above specified, the casing I, applied substantially as described.

CHARLES M. MILES.

Witnesses:

JAMES H. NIXON,  
E. P. MOREHOUSE.