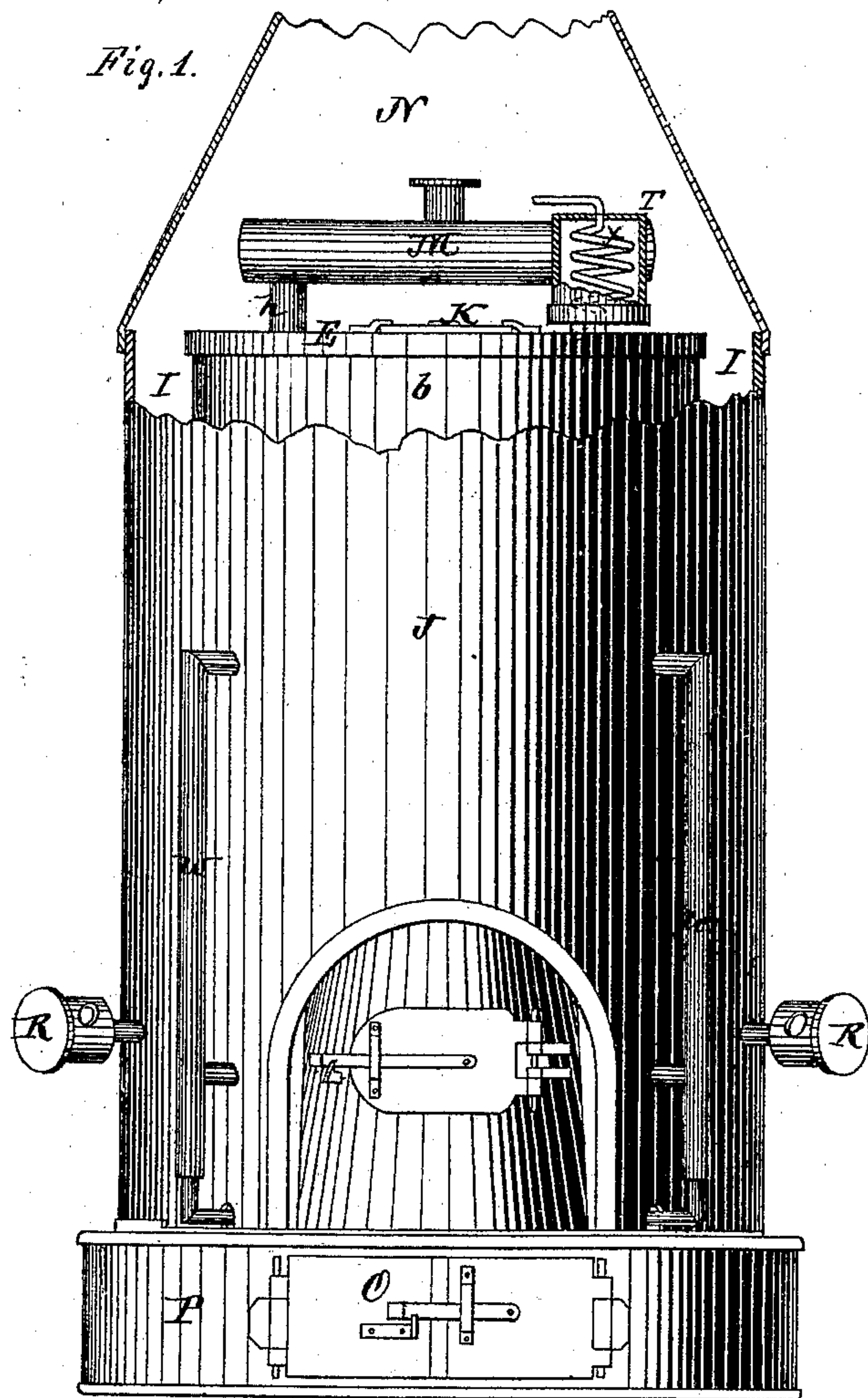
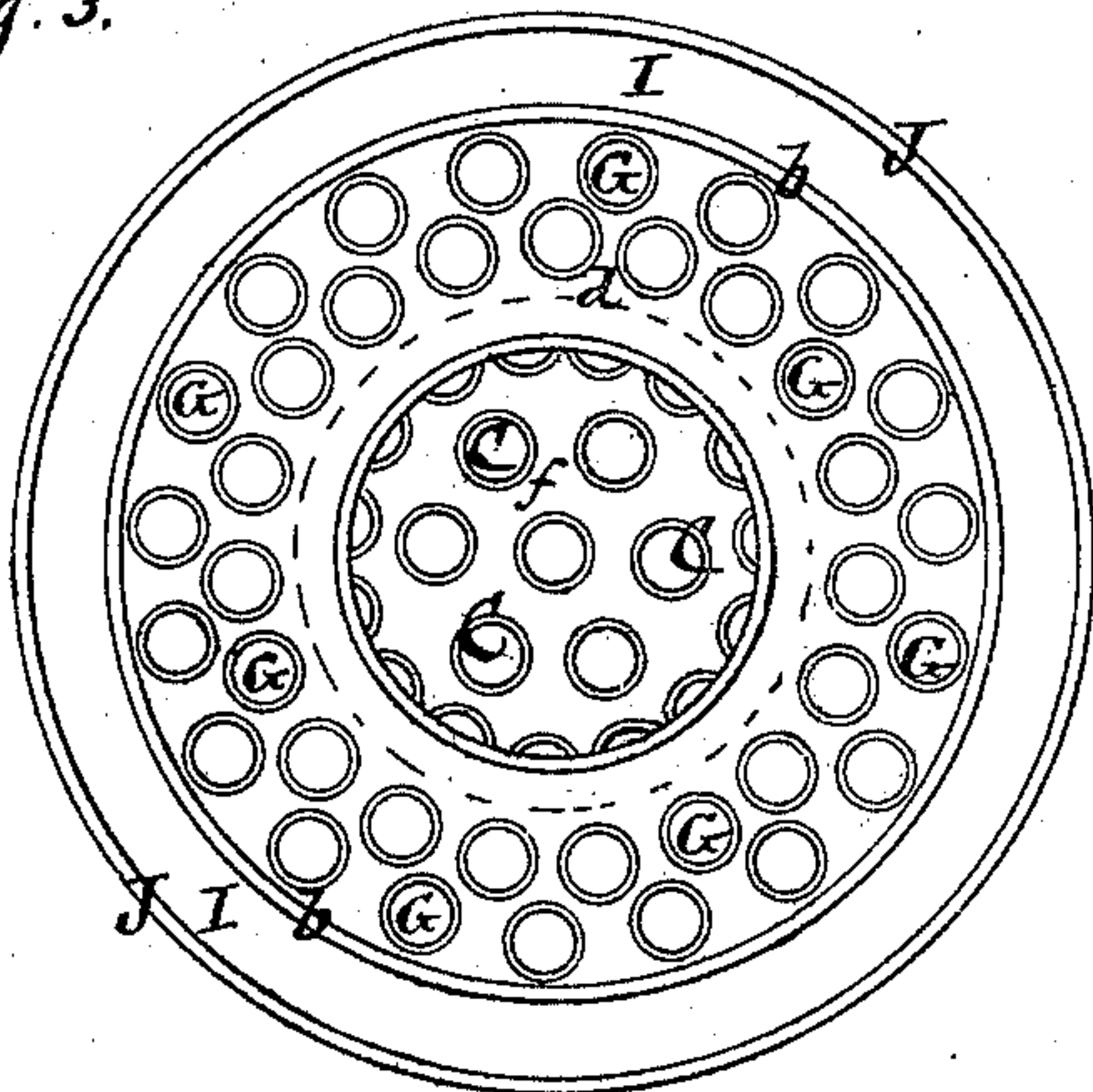


ISAAC BARTON.  
Improvement in Steam Boilers.  
No. 125,520.

Patented April 9, 1872.



*Fig. 3.*



Witnesses:

Henry N. Miller  
C. L. Everett.

Inventor

Isaac Barton  
per  
Alexander Mason

Attorneys.

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Fig. 2.

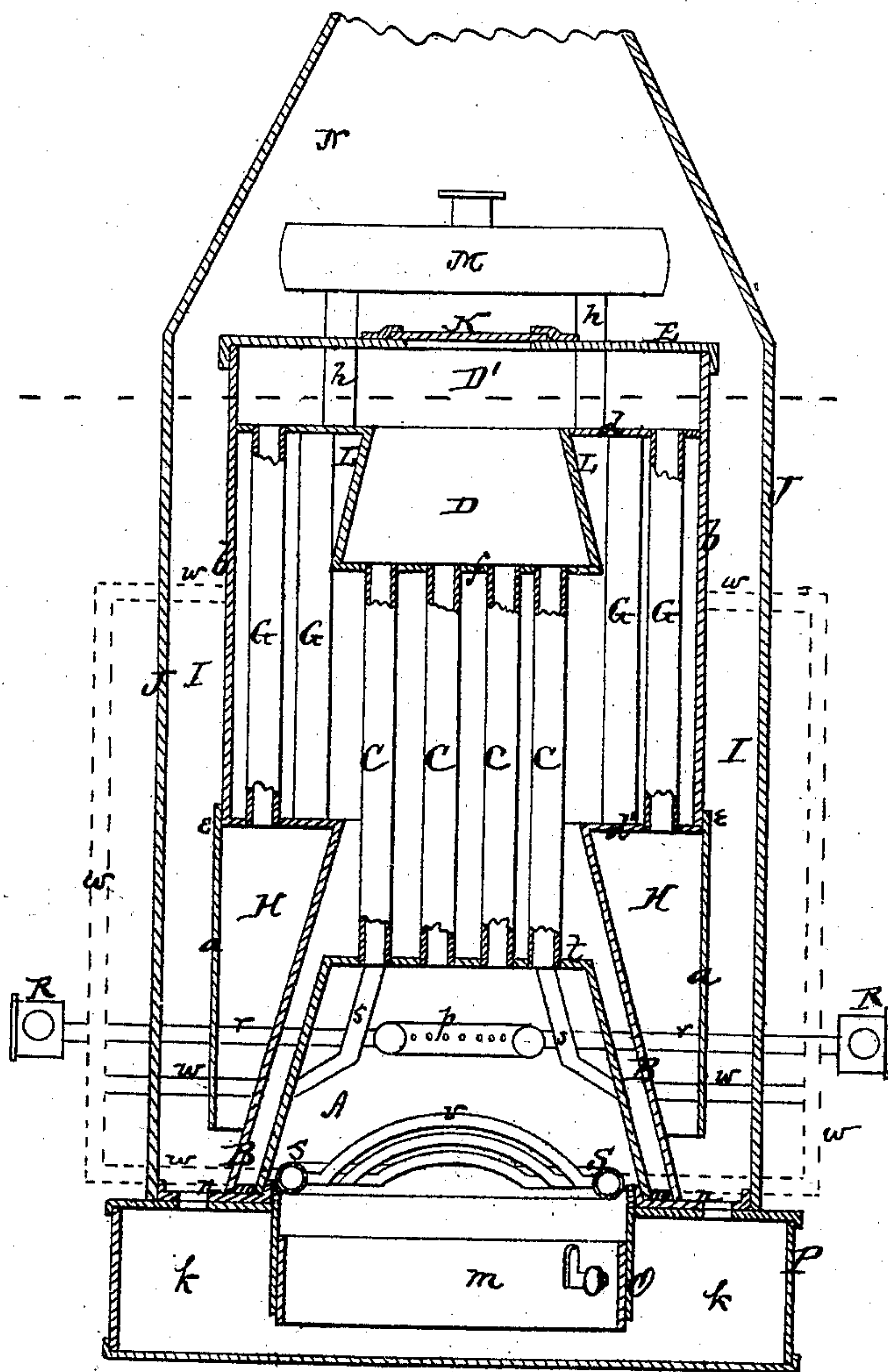
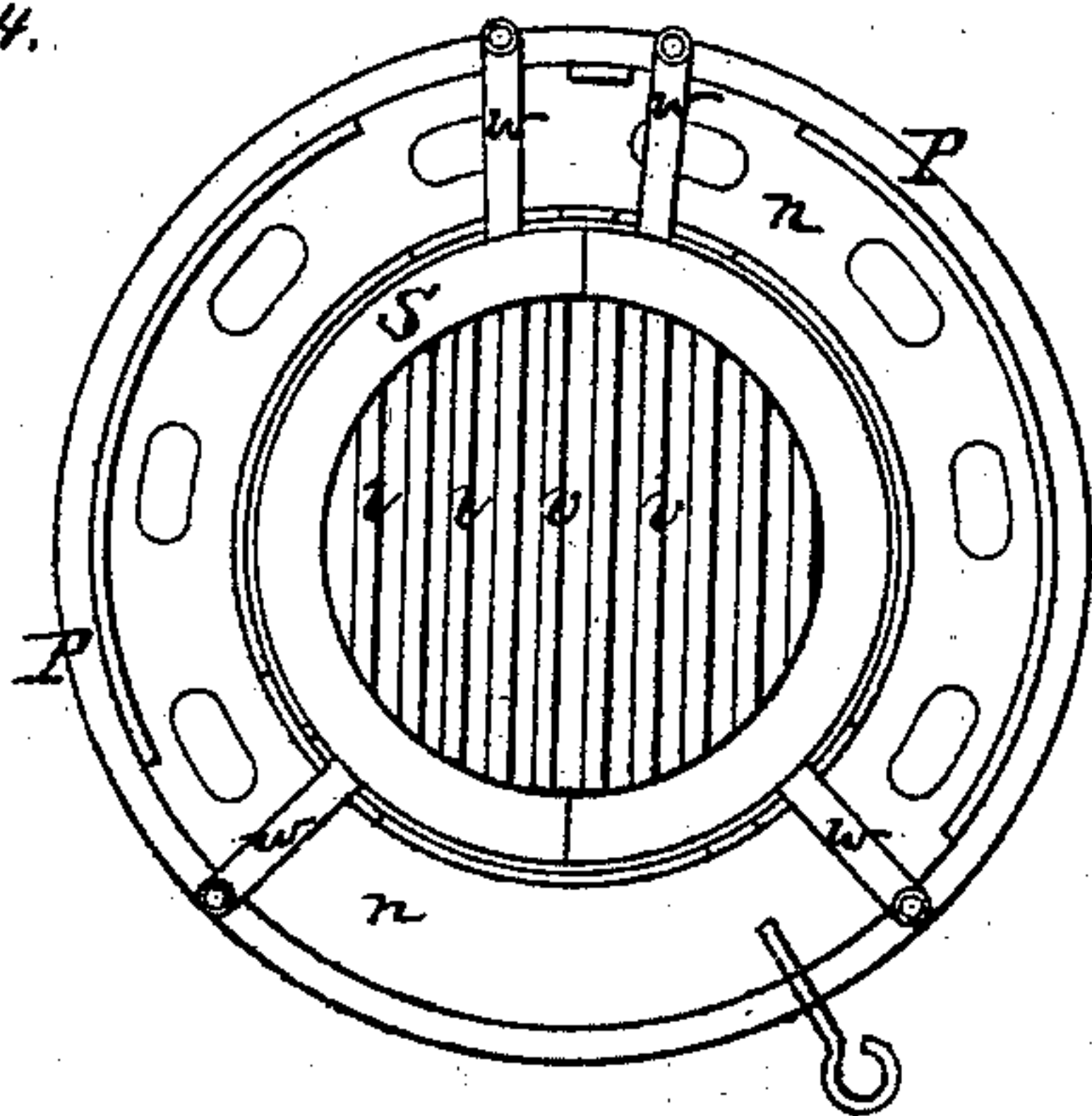


Fig. 4.



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Fig. 5.

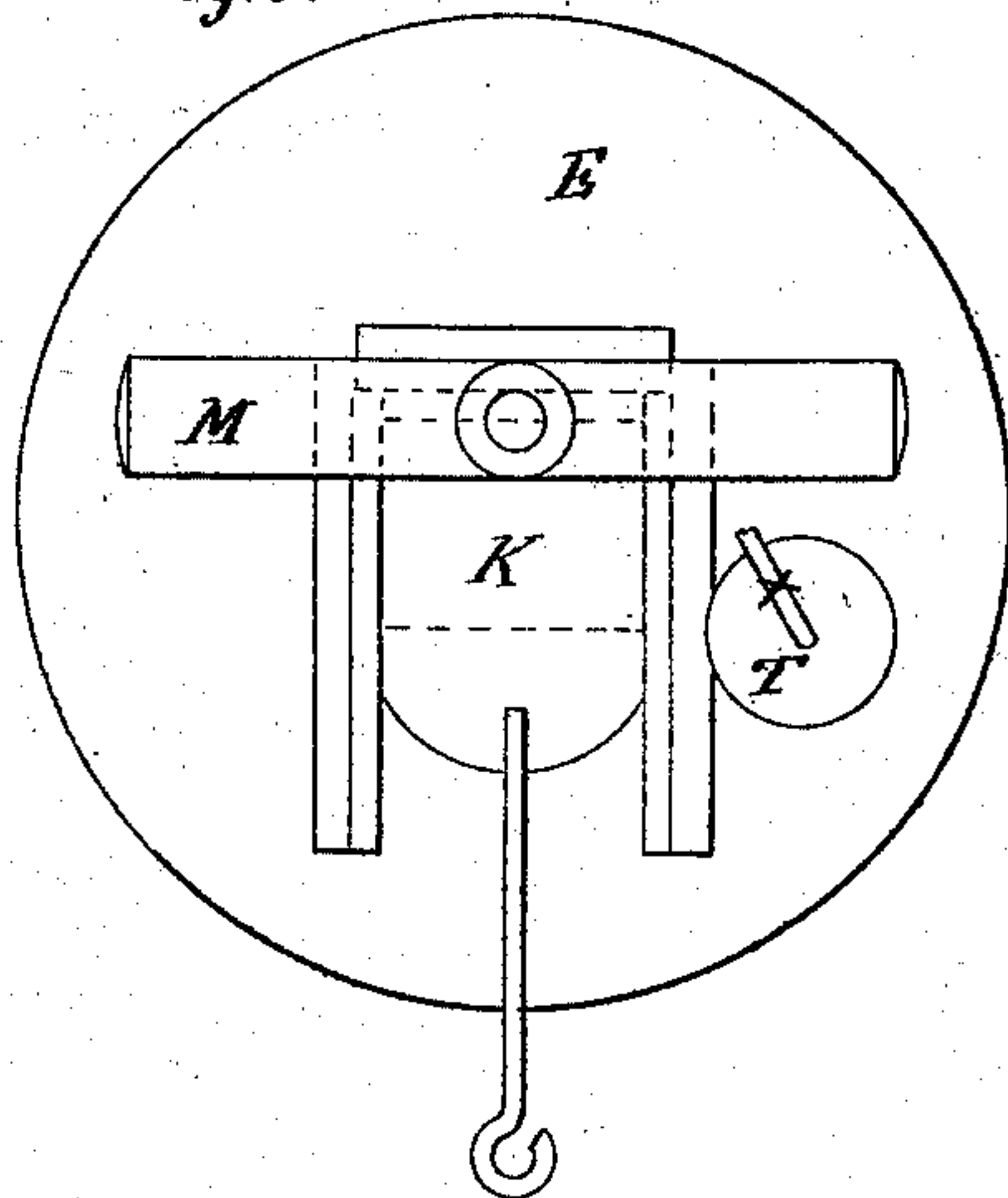
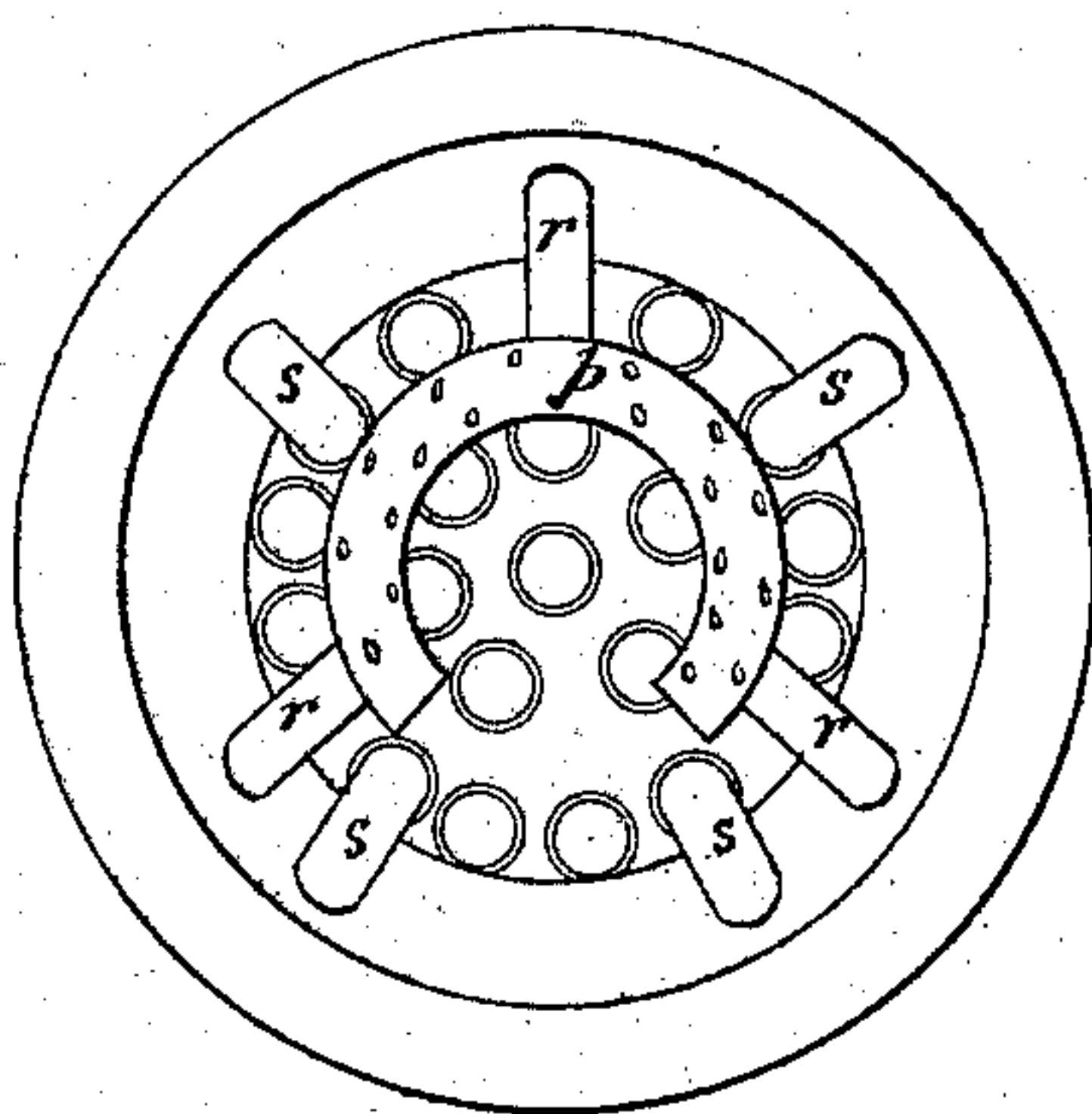


Fig. 6.



Witnesses:

Henry A. Miller  
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Isaac Barton  
per  
Alexander Mason  
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# UNITED STATES PATENT OFFICE.

ISAAC BARTON, OF WILLIAMSPORT, PENNSYLVANIA.

## IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. 125,520, dated April 9, 1872.

*To all whom it may concern:*

Be it known that I, ISAAC BARTON, of Williamsport, in the county of Lycoming and in the State of Pennsylvania, have invented certain new and useful Improvements in Steam-Boilers; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing and to the letters of reference marked thereon making a part of this specification.

My invention relates to that class of boilers known as upright tubular boilers; and it consists in the construction and arrangement of the various parts composing the same, as will be hereinafter more fully set forth.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to describe its construction and operation, referring to the annexed drawing, in which—

Figure 1 is a front elevation of my boiler, the upper part of the outer casing, with the smoke-box, being in section. Fig. 2 is a vertical section through the entire boiler. Fig. 3 is a horizontal section above the top flue-sheet. Fig. 4 is a plan view of the base of the boiler with the grate. Fig. 5 is a plan view of the upper sheet or head of the boiler, and Fig. 6 is an inverted view of the lower end of the fire-box.

A represents the fire-box, and B the outside shell of the same. C C are the flues through which the heat, gases, &c., pass from the fire-box to the chamber D D', where, being stopped in their passage to the stack by the sheet or head E, they pass down through the tubes G G to the chamber H formed by extending a sheet iron casing, *a*, from the shell *b* of the boiler down to near the base of the boiler. At this point the heat, &c., turn and pass up through the chamber I formed around the entire exterior of the boiler by a surrounding casing, J, either of brick-work or sheet iron. At the point *e* the heat again comes in contact with the outer shell *b* of the boiler, thus forming a complete hot-air casing, the entire boiler being brought in contact with the heat. Provision is made in the top sheet or head E, by means of a damper, K, for passing the products of combustion direct to the stack without returning through the tubes G and space I. The space between the top flue sheet *d*,

and the top of the flues C C, forms a steam space or chamber, L, which may be made any desired height, making a very efficient dome, and also contributing largely to superheat the steam, it not being necessary to carry the water more than on a line with the first flue sheet *f*. From the steam-chamber L two or more pipes, *h h*, lead upward through the sheets *d* and E, to a steam-drum, M, located above the head E within the smoke-box N. A part of the gases, smoke, &c., may be passed into the ash-pit O, and thence through the fire by means of a hollow chamber, *k*, formed in the base P of the boiler around the ash-pit, a communication being established between said chamber and the ash-pit by means of the movable circular slide *m*, as shown in Fig. 2. The passage of the smoke, heat, &c., through the ash-pit and fire-box is controlled by a register, *n*, placed on the base B, by closing the usual regulating damper in the smoke-stack, said register opening communications between the lower ends of the chambers H I and the chamber, *k*. By thus closing the stack it can be so regulated, that with a proper mixture of air, or in connection with a blower or artificial draught in the ash-pit, slack or refuse coal, bituminous or other gaseous fuel can be burned to advantage. In connection herewith I have introduced a circular pipe or flue, *p*, in the inner fire-box A over the fire, which pipe is perforated with numerous small holes to allow small jets of cold air to mingle and mix with the gases given off from coal. This perforated pipe is connected by pipes *r r* with air chambers R R on the outside of the boiler, each of said chambers consisting of a box or a flaring conical mouth, attached to each connecting-pipe, and provided with a register for controlling the flow of air. By this means the gases liberated from the coal will be ignited and consumed, thereby preventing smoke. Several bent tubes, *s s*, connect the first flue-sheet *t* in the fire-box with the fire-box sheet, thus connecting with the water-space around the same, causing the water to circulate through said tubes, and creating a violent agitation or very rapid circulation of the water lying in and around the flue-sheet *t*, and water space surrounding the fire-box. These tubes may be put in tight before the fire-box is put into its



place. The damper K in the head E, is operated by means of a lever or handle from the outside of the boiler, and when open admits of easy access to the tubes and upper portion of the boiler through a door made for that purpose in the smoke-box N. In the drawing I have shown this smoke-box as being a continuation of or supported upon the outer casing J, but in practice it is my intention to extend the upper head E, and support the smoke-box on the same, thus making it independent of the outside casing, so that if said outside casing is made of sheet-iron it can readily be taken down without disturbing the stack or box, thus allowing free access to the whole boiler for repairs, or any other purpose. The grate in the fire-box A is hollow, and so constructed as to give a free circulation of water between the boiler and the grate, and for the escape of steam generated in the same. This grate consists of a number of pipes, *v v*, or tubing bent so as to form an arched grate or the section of a sphere. They are cast or otherwise fastened into a circular pipe, S, and the entire grate may be made in sections or in a whole, as desired. This form and shape of grate gives the best possible chance for the circulation of air through the fuel for the combustion of the same, being a great improvement over the flat surface bar in general use. This grate is connected with the boiler below the flue-sheet *f*, by means of one or more pipes *w*, running outside of the outer casing, and the ends bent inward, as shown in Fig. 2. These pipes *w* are also connected with the water-space around the fire-box, thereby making a free circulation of the water not only through the boiler, but also through said pipes and the grate. The arrangement of the steam-drum M, as above described, in addition to the steam-space L in the boiler, obviates any tendency to carry over water or work wet steam.

I have also arranged a steam-heater for the feed water. It consists of a wrought or cast cylinder or shell, T, in which is inserted a spiral coil, *x*, of wrought-iron pipe passing in at the top end and out at the bottom. The top end of this pipe is connected with the pump and the lower end to the boiler below the water line.

In this boiler the various parts are so combined as to unite both strength and durability, there being no parts but what are easy of ac-

cess, avoiding all that is complicated, the whole being very compact, and occupying very little more room than the ordinary vertical boiler. The shape and construction of the furnace or fire-box, being conical as shown, allows of any desired amount of grate surface, in proportion to the boiler, and is also one of the best forms for constructing that class of furnaces.

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

1. In an upright return flue-tubular boiler, the arrangement of the ends of the return flues G above the corresponding ends of the flues C, and the extension of the return flue-sheet *d* inward, so as to form the steam-space L, and with the flue-sheet *f*, the combustion-chamber D, substantially as herein set forth.
2. The casing *a*, extending downward from the lower end of the boiler-shell *b* to near the base, and forming with the outer shell B, of the furnace, the chamber H, substantially as and for the purposes herein set forth.
3. The hollow chamber *k* in the base P, surrounding the ash-pit O, substantially as herein set forth.
4. The slide *m* arranged in the ash-pit O to open communication between the same, and the hollow chamber *k*, in the base, substantially as and for the purposes herein set forth.
5. The register *n*, arranged as described, to open and close the communication between the chambers H I, and the chamber *k* in the base, substantially as herein set forth.
6. In combination with the steam-space L, in the within-described boiler, the steam-drum M with connecting-pipes *h h*, substantially as and for the purposes herein set forth.
7. The combination of the circular perforated pipe *p*, connecting-pipes *r r*, and registers R R with the boiler, all constructed and arranged substantially as and for the purposes herein set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 26th day of December, 1871.

ISAAC BARTON.

Witnesses:

C. L. EVERT,  
A. R. MOORE.