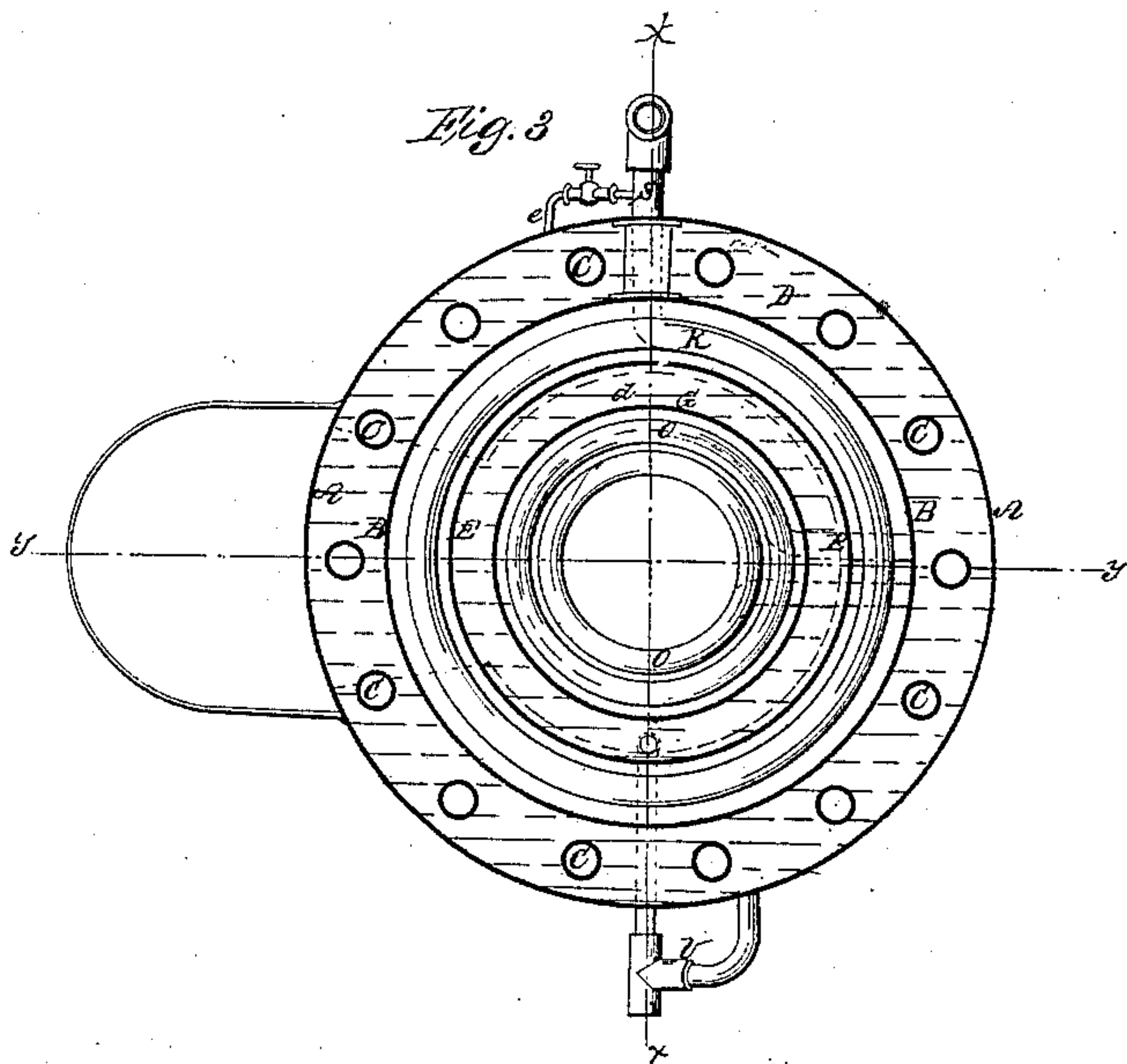
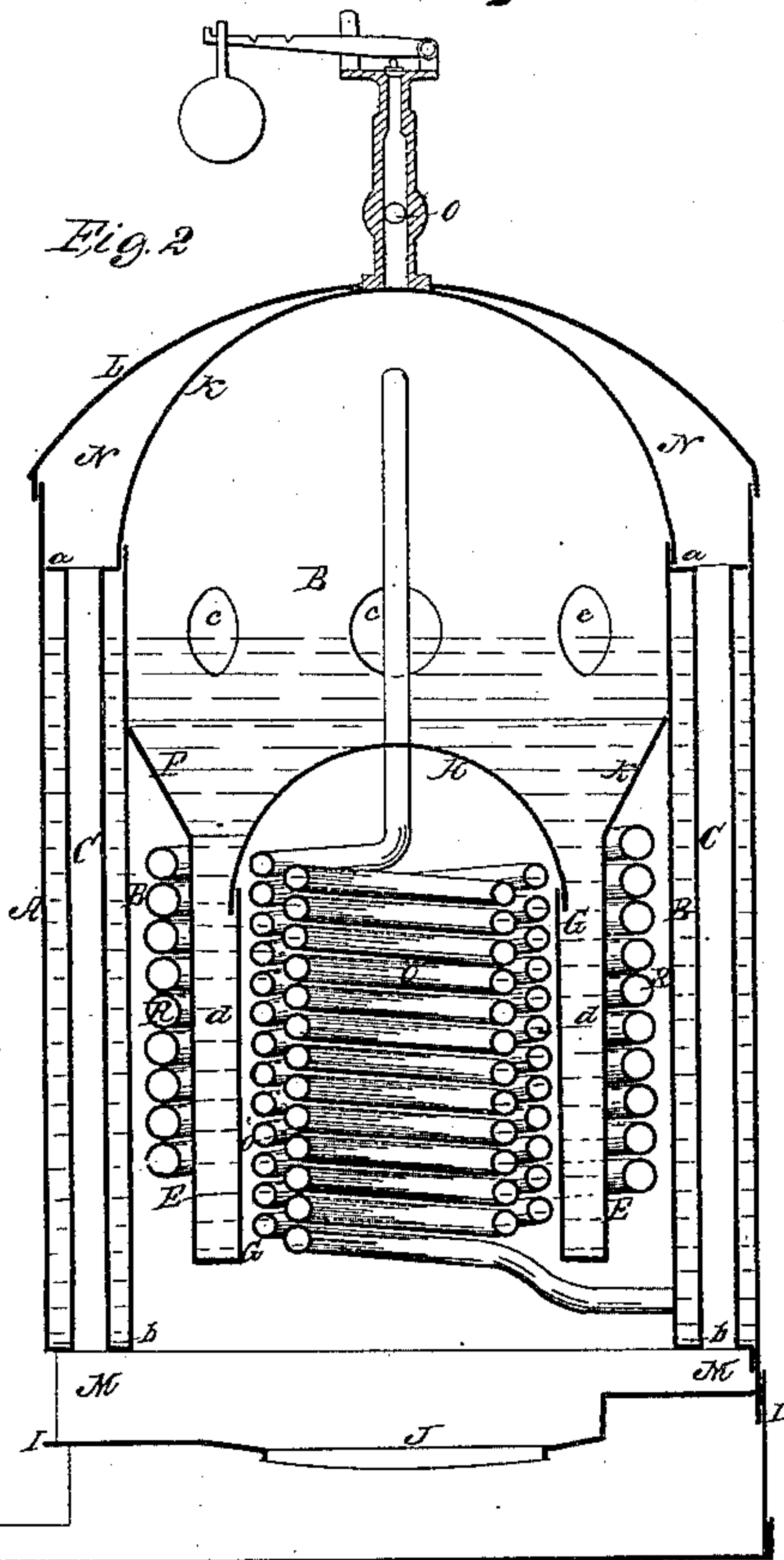
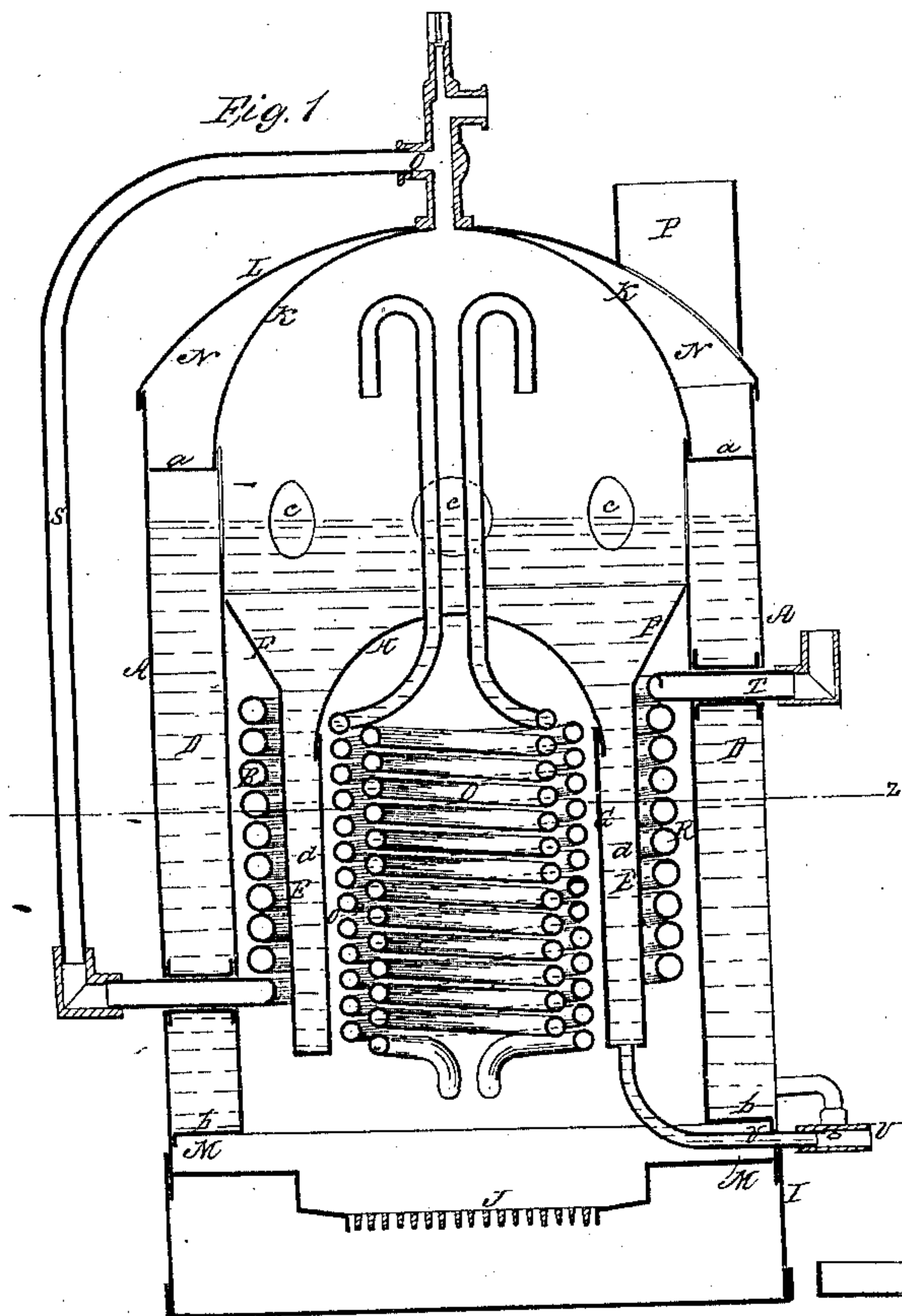


B. Irving,

Steam-Boiler Water-Tube.

N^o 9,971.

Patented Aug. 30, 1853.



UNITED STATES PATENT OFFICE.

BENJAMIN IRVING, OF GREEN POINT, NEW YORK.

IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. 9,971, dated August 30, 1853.

To all whom it may concern:

Be it known that I, BENJAMIN IRVING, of Green Point, in the county of Kings and State of New York, have invented certain new and useful Improvements 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—

Figures 1 and 2 are vertical sections taken at right angles to one another through the center of a boiler constructed according to my improvements. Fig. 3 is a horizontal section of the same.

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

The improvements which are comprehended in this invention have in view chiefly to secure a more perfect combustion of the gases generated by the consumption of fuel, and to present a large extent of heating-surface without subjecting any part of it, when working properly, to a very intense heat, to guard against explosions of the boiler, to gain more compactness and strength in structure, and to diminish the necessary weight of metal and quantity of water. The results claimed for these improvements are, economy in amount of fuel and in expense of construction, safety from explosions, increased strength and durability, and adaptedness for the use of coal or wood to propel engines on railroads, and for all other purposes.

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

The outer shell of the boiler consists of a vertical cylinder A, within which is a smaller cylinder B, of nearly the same height. The shell A and the cylinder B are united at the bottom and near the top by two annular plates *a* and *b*, to which are fitted the ends of a series of tubes C C, which are placed at equal distances in the annular space D. The cylinder B terminates at the upper end in a dome K, and the cap of the shell A consists of a dome I, which is less concave than K and meets it near the center.

Within the cylinder B is a shorter and smaller cylinder E, whose upper end is united by a hollow frustum of a cone F, with the cyl-

inder B some distance from its top, and whose lower end does not extend quite to the bottom of B aforesaid. Within the cylinder E is another cylinder G, still smaller, united to E at the bottom and terminating in a dome H at the top.

I is a circular base or foundation, upon which rests the cylinders A and B, and which forms the ash-pit and fire-place and supports the fire-grate J, which is of circular form, and lies directly below the cylinders E G.

Around the top of the fire-place and below the annular plate is a circular flue M, which is connected by the tubes C C with the flue N between the domes K and L.

The base I may be made of cast-iron, cast in one or more pieces, or may be made of metal plates with a water-bottom, to be connected by a pipe or pipes to the shell A.

O O are two coils of pipe within the smallest cylinder G, whose lower ends communicate with the lowest part of the outer cylinders A and B, and whose upper ends rise through the dome H and empty their contents into the steam-chamber.

The space D between the shell A and the cylinder B, and the space *d* between the cylinders E and G not occupied by the pipes C C are "water-jackets," and the lower ends of these water-jackets are connected by a common blow-off pipe U.

c c are holes, forming communications between the inner and outer water-jackets, and, together with the pipe or pipes U unite the two water-jackets at top and bottom, having the effect to keep the water in them level.

R R is a coil of pipe inside of the outer water-jacket and entering it at the lower end, which may be used to dry the steam or to generate steam. When used for the former purpose, the steam is conducted from the steam-chamber K through the pipe S into the coil R and carried out for use by a pipe T. The steam may be slightly moistened, if desired, by a small quantity of water, admitted through a small pipe *e* from the lower part of the outside water-jacket to the pipe S. When the outside coil R is used to generate steam, the pipe S is dispensed with and the upper end of the coil R is carried through the dome H, and its contents are emptied, like those of the inner coils, into the steam-chamber by con

nections not shown in the drawings. There may be one or more coils within and outside of the inner water-jackets, as may be desired, and they may be connected at the bottom with either or both or other water-jackets. There may be one or more water-jackets within the outer water-jacket either with or without accompanying coils, or inner water-jackets may be entirely dispensed with in the application of this principle. The water is contained in the water-jackets, coils, and steam-chamber, and in the water-bottom when used for that purpose.

The forms of the water-jackets, coils, and their connections with each other and with the steam-chamber have the effect to preserve a water-level in the several water-jackets, but not in the coils for generating steam. The action of the heat upon the heating-surfaces has the effect of drawing the water from the water-jackets into the coils, and of driving it with force up through them and into the steam-chamber in a constantly-running stream or streams, so that the pipes are kept full while there is any water in the water-jackets, and the water is kept constantly moving through the coils into the steam-chamber and from the steam-chamber down through the water-jackets again into the coils. In case the water becomes low in the water-jackets the water that is forced through the coils into the steam-chamber has the effect to keep the surfaces always moist, thereby obviating danger from explosion and preventing the plates from burning.

The heating-surfaces of the boiler consist of the cylinders G and E, the greater part of the cylinder B, the coils, the domes H and K, the cone F, and the tubes C C. Gases escaping from the ignited fuel rise into the cylinder G and between the cylinders B and E, where they are consumed and made to heat the coils and other surfaces. The products of combustion descend and pass off into the

circular flue M, from whence they escape through the tubes C C into the circular flue N, which is in immediate communication with the chimney P. The steam generated from all these heating-surfaces rises into the dome or steam-chamber K, from whence it is taken off in the pipe Q or from any other part of the steam-chamber. It will be observed that a very large heating-surface is presented and is covered by a small quantity of water, which, consequently, is quickly converted into steam; but, although the heating-surface is very thinly covered, the boiler may be worked with perfect safety with the smallest quantity of water. It is intended to be kept full with the exception of the dome K, which will afford sufficient steam-room, and therefore it is almost impossible that the level could be reduced by accident in the water-jackets to such a degree as to be dangerous.

The form of the boiler is well adapted to withstand pressure without the aid of braces or stays.

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

1. A boiler composed of an external water-jacket D of cylindrical or other form, with a steam-chamber at the top, and with or without one or more inner water-jackets *d*, connected with the outer water-jackets, substantially as described, when either water-jacket contains one or more vertical coils of steam-pipe O O, whose lower ends connect with one of the water-jackets and whose upper ends discharge into the steam-chamber, substantially as set forth.

2. Drying the steam by passing it through a coil within or between the water-jackets, substantially as set forth.

BENJAMIN IRVING.

Witnesses:

S. H. WALES,

EL. POLHAMUS.