W. HOPKINS.

Steam-Boiler.

No. 213,422. Patented Mar. 18, 1879.

Fig. 1.

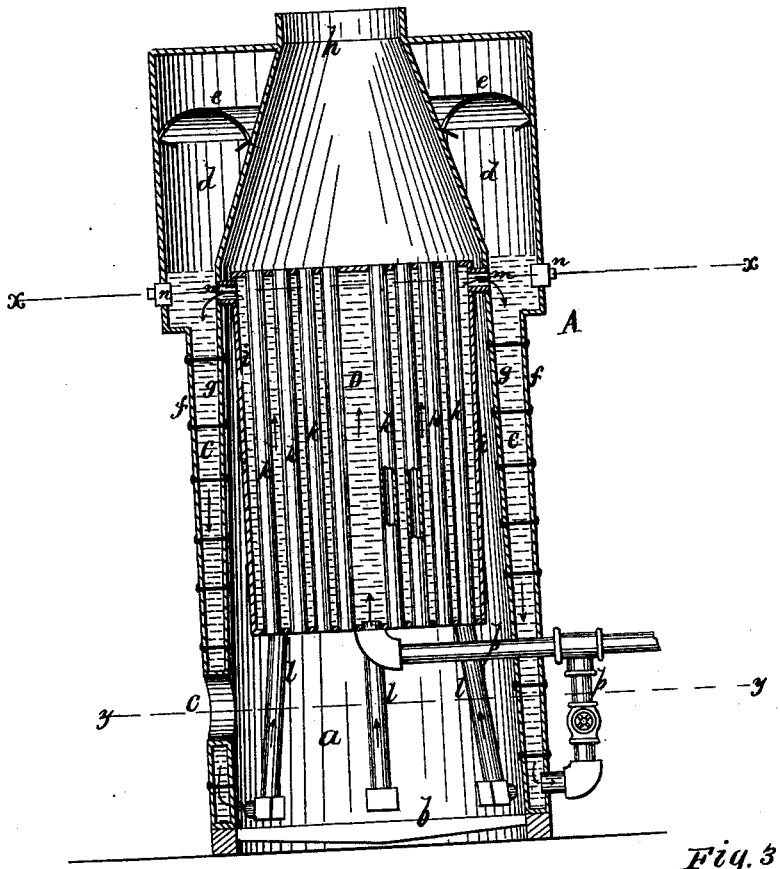


Fig. 2.

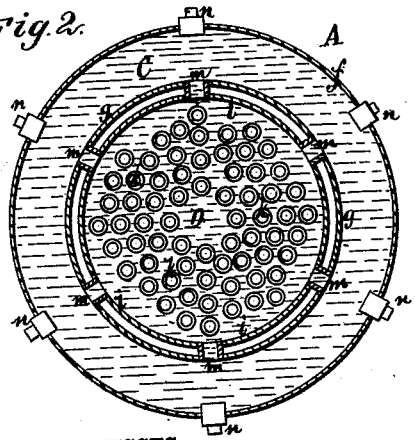
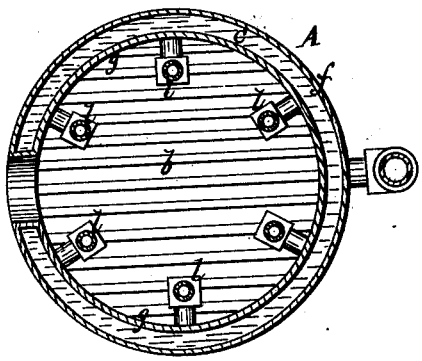


Fig. 3.



WITNESSES:

Henry N. Miller

C. Sedgwick

INVENTOR:

W. Hopkins

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

WILLIAM HOPKINS, OF DUBUQUE, IOWA.

IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. **213,422**, dated March 18, 1879; application filed December 26, 1878.

To all whom it may concern:

Be it known that I, WILLIAM HOPKINS, of Dubuque, in the county of Dubuque and State of Iowa, have invented a new and useful Improvement in Steam-Boilers, of which the following is a specification:

My invention has for its object to obtain a great amount of heating-surface in proportion to the size of boiler; to prevent sudden changes in the temperature of the tubes; to obtain a perfect circulation of the water and perfect and economical combustion of fuel.

My invention consists in a steam boiler or generator having an annular water-space formed by vertical concentric shells, and an inner box or water-space through which the tubular flues pass. The inner and outer water-spaces are connected at intervals near the top and at the bottom by tubes passing through the combustion-chamber, and the products of combustion have free passage between the two water-spaces.

In the accompanying drawings, Figure 1 is a vertical section of my improved boiler. Fig. 2 is a sectional plan on line *x x*. Fig. 3 is a sectional plan on line *y y*.

Similar letters of reference indicate corresponding parts.

A is the boiler, of which *a* is the fire-space; *b*, the grate-bars; *c*, the fire-door; *d*, the steam-dome, and *e* plates in the dome to prevent water rising or priming of the boiler.

f is an outer, and *g* an inner, shell made of boiler-iron, the inner shell, *g*, being somewhat smaller than *f*, so as to form an annular water-space, C, that extends from the base to the upper part of the boiler, where *f* is enlarged to form the steam-dome. The inner shell, *g*, is slightly larger in diameter at the bottom, and above the water-line is formed with conical sides, and terminates in the smoke-pipe *h*. The two shells are connected by stay-bolts, as shown.

At the inside of the boiler, above fire-space *a*, there is a cylindrical shell, *i*, forming a water-space, D, through which the tubular flues *k* pass vertically. This shell *i* is supported by the water-tubes *l*, that extend from the under side of *i* around the inside of fire-space *a* into the lower part of water-space C. The water-space D also communicates with space C by short screw-tubes *m*, at intervals around the upper end, and these tubes *m* serve as an additional means of support for shell *i*. To permit of inserting tubes *m* after the shell *i* is put in place, the outer shell, *f*, is provided with openings closed by screw-plugs *n*, opposite to where tubes *m* are to be screwed in, as shown in Fig. 2, through which openings tubes *m* may be inserted.

By this construction there is an annular flue-space around shell *i*, in addition to flues *k*, so that when the fire-door is opened the cold air goes up between the shells instead of striking the tubes, thereby avoiding sudden contraction and expansion, which might cause the tubes to leak. The flame and heat may spread around and between the shell, thereby permitting complete mixture of air with the gases, rendering combustion more perfect and giving a large extent of heating-surface.

The circulation will be perfect. *p p* are the water-supply tubes, and the water passing up tubes *l* becomes heated before it enters water-space D. The direction of the circulation is shown by the arrows.

This construction furnishes a very compact and strong boiler, that has a large extent of heating-surface in comparison with its size, and will make steam rapidly.

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

In a steam-boiler, two concentric vertical shells with one water-space between them and another one on the inside, set over the fire, and through which the fire-tubes pass, said water-spaces being connected at top and bottom by tubes passing through the combustion-chamber, in combination with a conical outlet for the products of combustion, surrounded by a steam-dome having arch *e*, as shown and described.

WILLIAM HOPKINS.

Witnesses:
CHAS. B. DEAN,
GEO. A. FIFIELD.