

(No Model.)

3 Sheets—Sheet 1.

C. WHEELER, Jr.

STEAM BOILER.

No. 322,226.

Patented July 14, 1885.

Fig. 1.

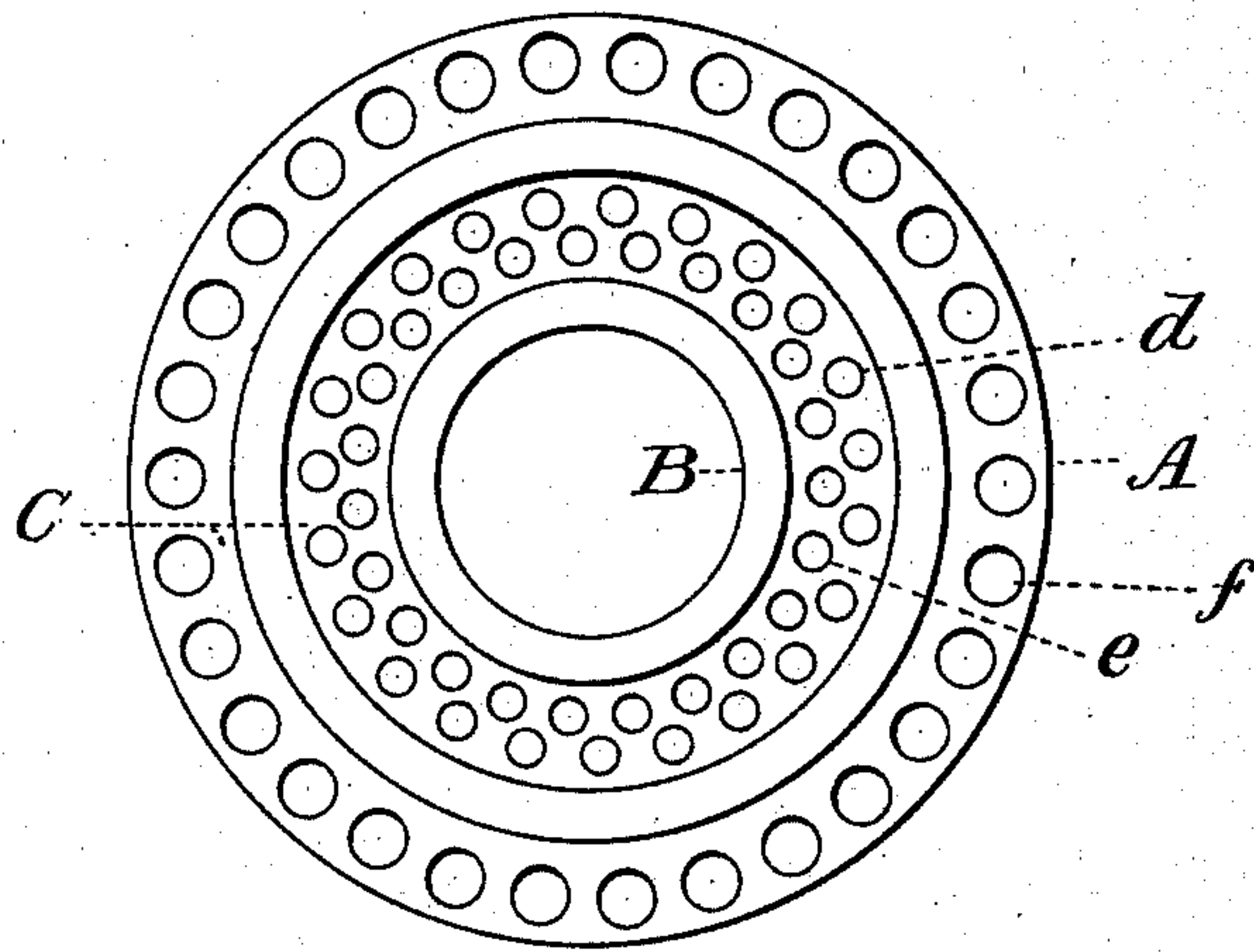
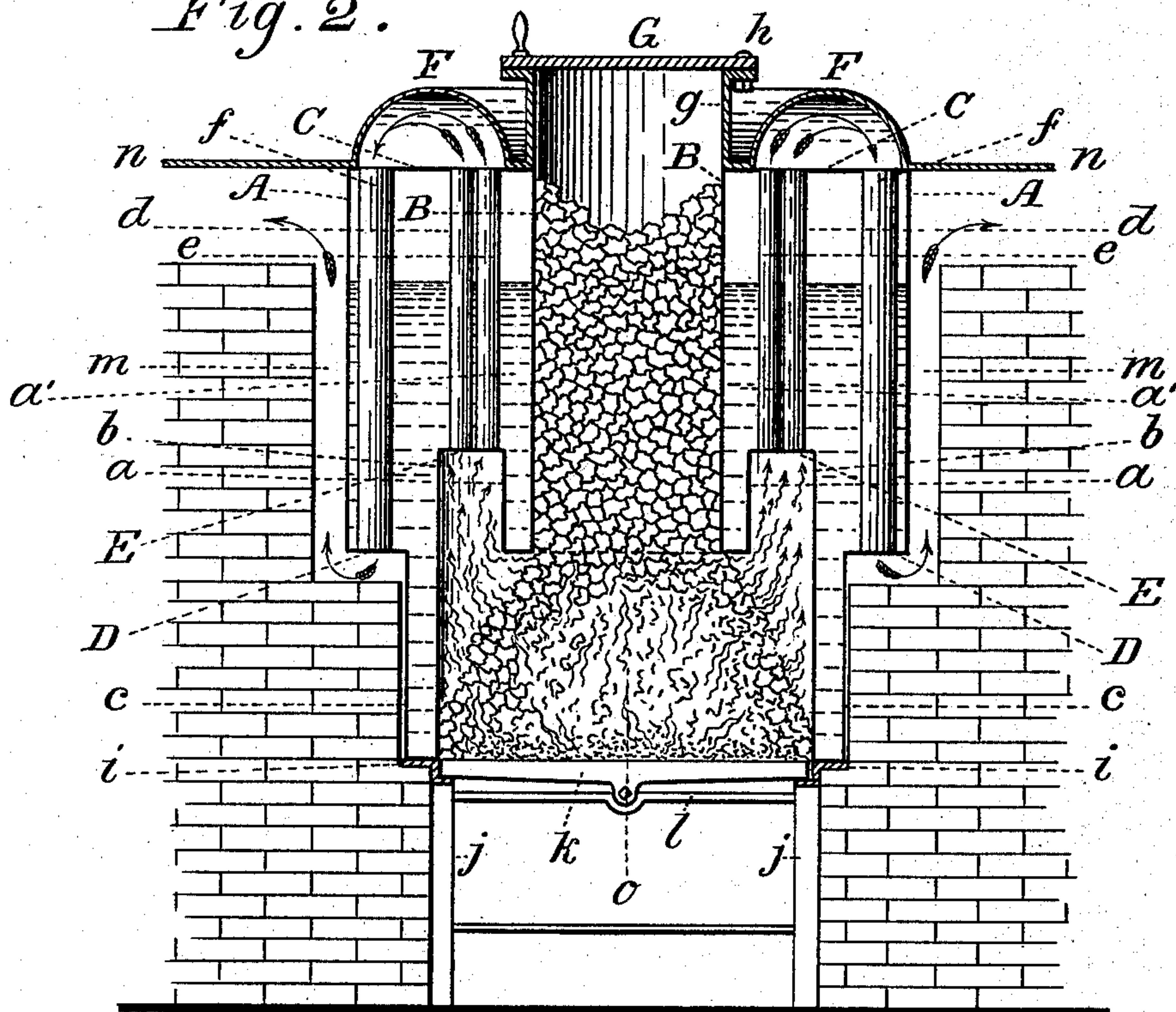


Fig. 2.



Witnesses:

H. N. Jenkins

L. G. Trevitt

Inventor:

Cyrinus Wheeler Jr.
by Alex Mahon
Attorney

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Fig. 3.

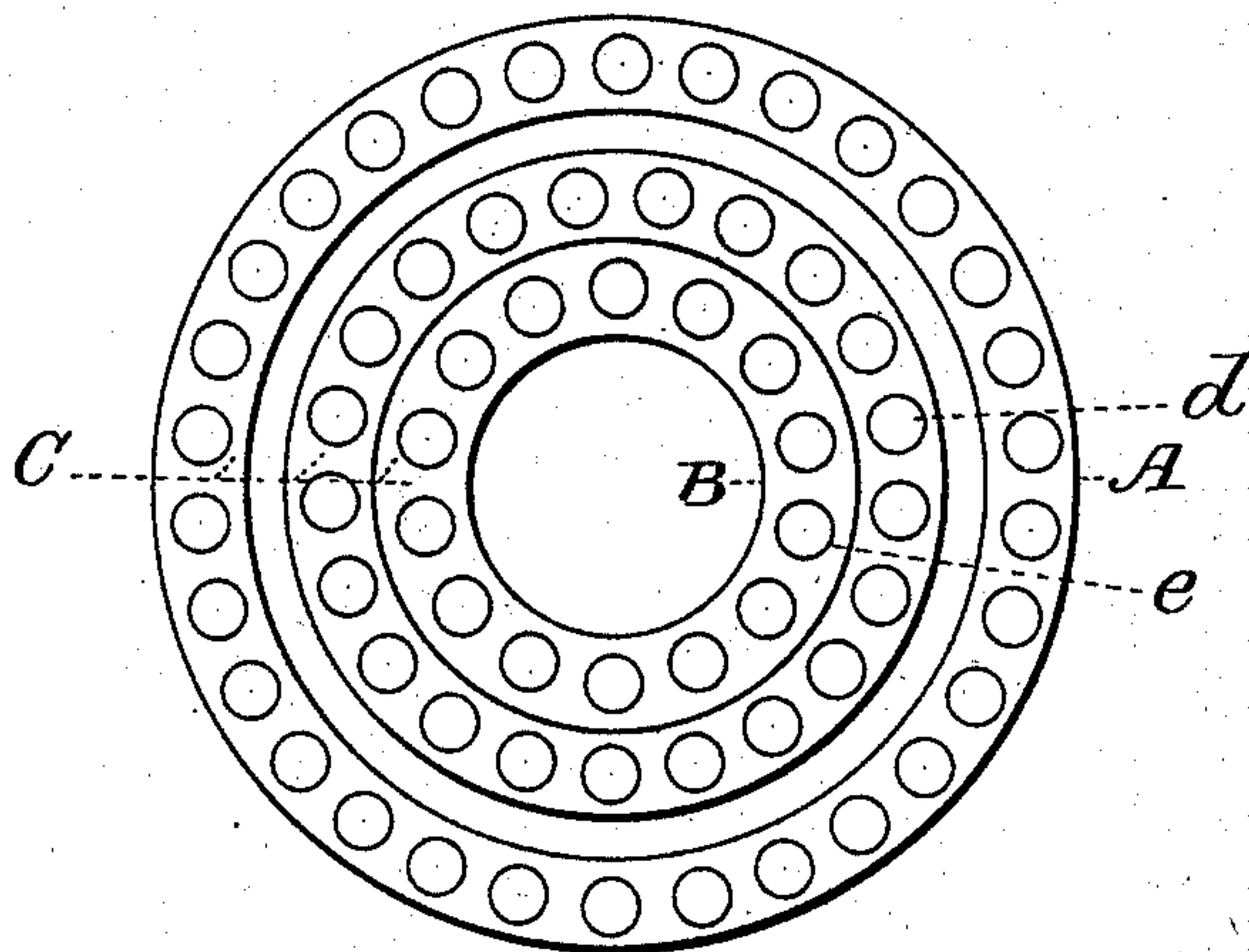
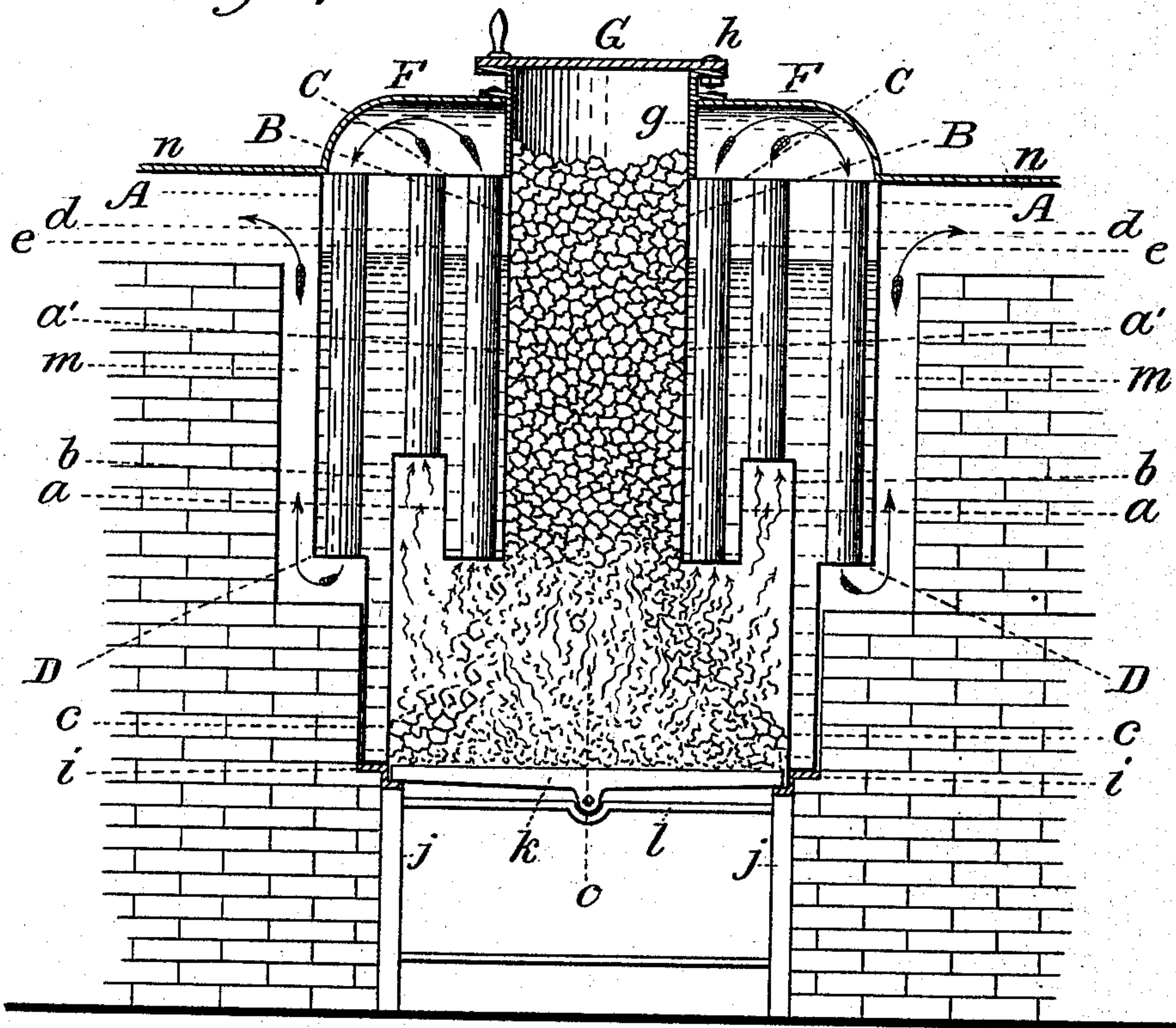


Fig. 4.



Witnesses:

H. N. Jenkins

C. G. Trevitt

Inventor:

Cyrus Wheeler Jr.
By Alex Mahon
Attorney

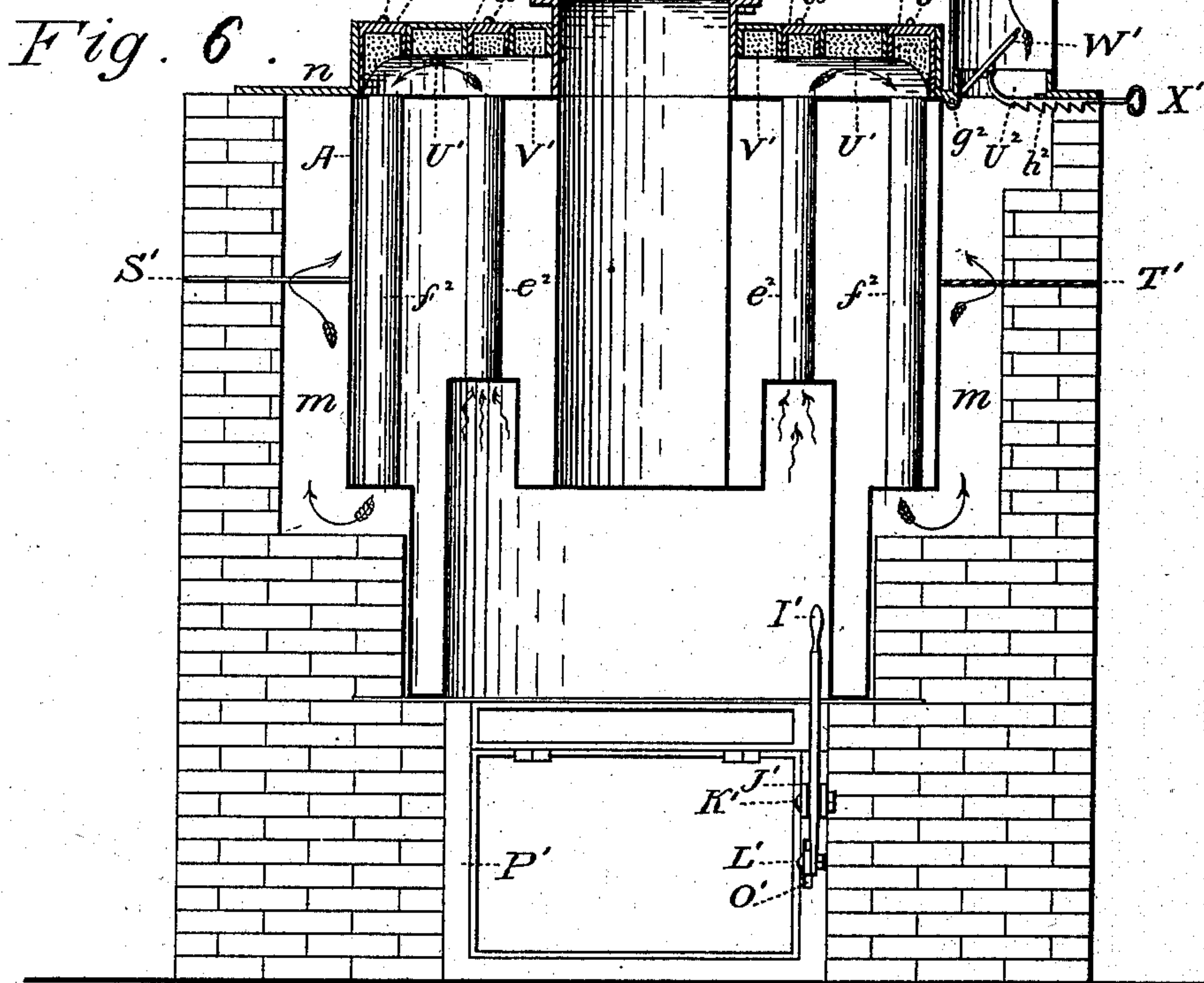
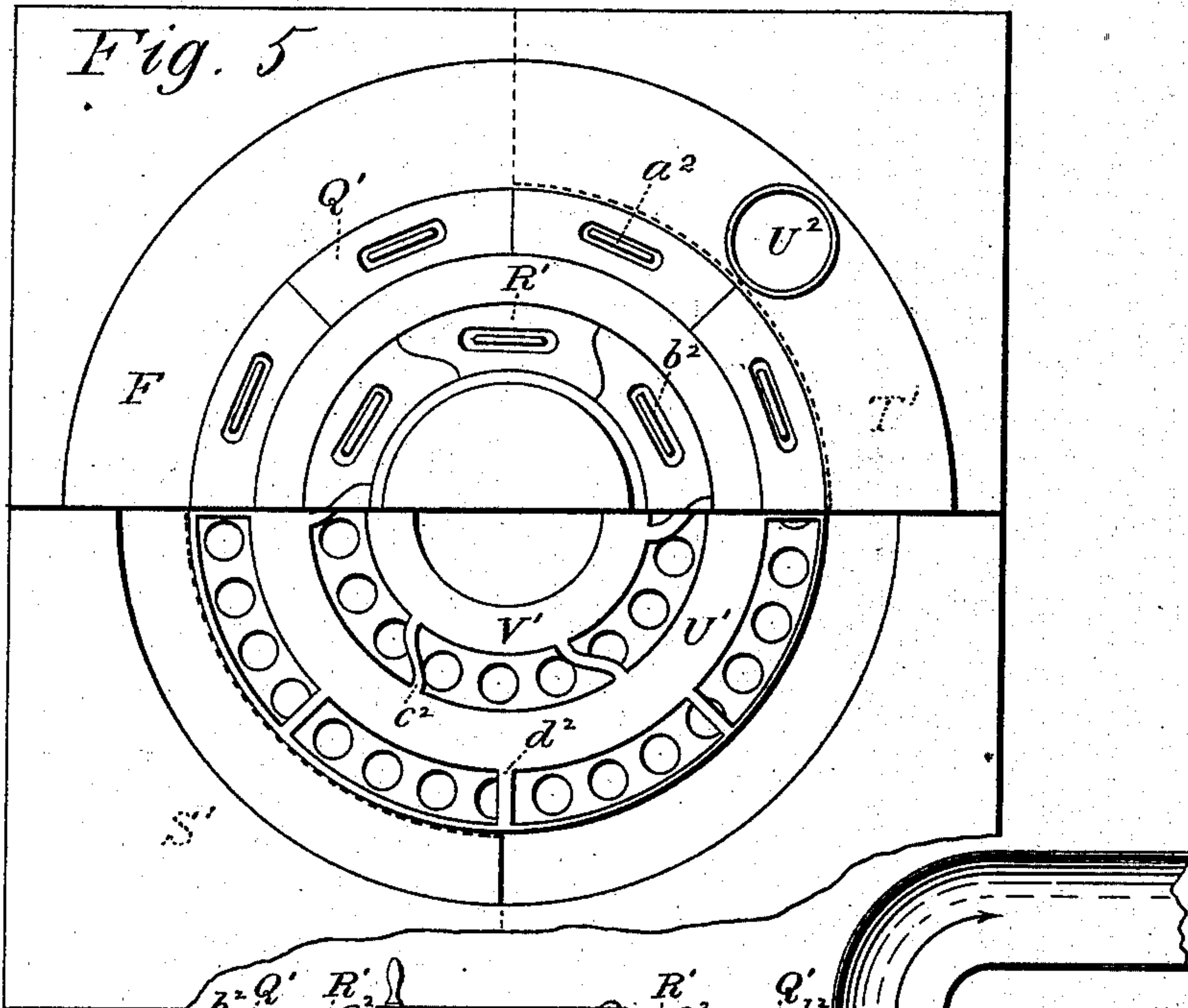
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3 Sheets—Sheet 3.

C. WHEELER, Jr.
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Witnesses:
H. N. Jenkins
C. A. Trevitt

Inventor:
Cyrus Wheeler Jr.
By Alex Mahon
Attorney

UNITED STATES PATENT OFFICE.

CYRENUS WHEELER, JR., OF AUBURN, NEW YORK.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 322,226, dated July 14, 1885.

Application filed June 19, 1884. (No model.)

To all whom it may concern:

Be it known that I, CYRENUS WHEELER, Jr., a citizen of the United States, residing in the city of Auburn, county of Cayuga, and State of New York, have invented new and useful Improvements in Steam-Boilers, of which the following is a full and exact description, reference being had to the accompanying drawings, making part of this specification.

My improvements are fully illustrated in the accompanying drawings on five sheets, in which Figure 1 is a plan view of the top of the boiler, showing the location and relative position of the vertical flues and coal-reservoir. Fig. 2 is a vertical section of the same through its center, showing the location and arrangement of the flues, the combustion-chamber, and the coal magazine or reservoir. It also shows the flue-cap over the boiler, the cover to the coal-magazine, the grates, ash-pit, and outside brick-work. Figs. 3 and 4 are modifications of the boiler shown in Figs. 1 and 2, which will hereinafter be described. Fig. 5 is a vertical plan view of the flue-cap in an improved form, and shown in semi-section, so that the same may be readily explained; and Fig. 6 illustrates modifications and improvements in the boiler, which will be hereinafter explained. The figure is a vertical section through center of the cover of the coal-magazine, the flue-cap, and the boiler.

Similar letters refer to similar parts throughout the several views.

The object of the improvements in the boiler is to produce therefrom a greater amount of steam from a smaller consumption of coal than can be secured from boilers as ordinarily constructed; and in the grate improvements my object is to secure a large amount of grate-surface within comparatively contracted limits, and to so distribute the coal thereon that combustion will be perfect.

Referring to the drawings, in Figures 1 and 2 A is the outer shell, and B the inner shell, of the boiler. C is the upper flue sheet or head, D the lower outside ring or flue-sheet, and E the lower inside ring or flue-sheet, of the boiler. The inner shell, B, extends several inches below the lower inside flue-sheet, E.

To the inner edge of the flue-sheet E is riveted the upper edge of a shell-piece, *a*, which

extends down parallel to the inner shell, B, its lower edge being united by a ring to the lower edge of the inner shell, B, the space between B and *a* being only sufficient for proper circulation of the water.

To the outer edge of the flue-sheet E is connected the upper edge of the shell-piece *b*, which extends down far enough below the bottom of B to form the fire-chamber.

To the inner edge of the lower outside ring or flue-sheet, D, is connected the shell-piece *c*, which extends down parallel to *b*, and with sufficient space between them for water-circulation, their lower edges being united by a ring. The outer edge of D is united to the lower edge of the outer shell, A. The upper edge of the outer shell, A, is riveted to the outer edge of the flue-sheet C and the inner shell, B, to the inner edge of flue-sheet C.

Two rows of vertical flues or tubes, *d* and *e*, are united to the flue-sheets C and E, and one row of vertical flues, *f*, of larger size, to the flue-sheets C and D.

On top of the sheet C, or head of the boiler, is placed a metal cap or flue-case, F, which rests on top of the boiler-head outside of the flues *f* and inside of the flues *d* and *e*. With this flue-case F is connected a short cylinder or ring, *g*, the internal diameter of which corresponds with the internal diameter of the shell B, and serves as an extension of that shell, to increase its capacity as a reservoir or magazine for the coal. A cover, G, is pivoted to it at *h*, and serves to close the same and give access to it for supplying with coal.

The boiler is supported by resting on a metal plate, *i*, which rests upon the framework *j* of the ash-pit.

A grate, *k*, is supported by a bar, *l*, the ends of which are held by the frame of the ash-pit. The boiler is placed in brick-work, so arranged as to give sufficient space, *m*, outside of the shell A, for the smoke, which can be made into one or more smoke-flues, as desired, connected with the brick-work under the outer extension, *n*, of the flue-case F.

The inner walls of B and *g* form the magazine for the coal. The coal, as it descends by gravity from the magazine, spreads out upon the grate-surface *k* and against the base of the shell-piece *b* forming the sides of the fire-

chamber. Above that part of b where the coal rests against it, and between it and a , and below E , is a space which serves as a combustion-chamber, o . The direction which the products of combustion take when the boiler is in operation is clearly shown by the arrows, and is as follows: Entering the flues or tubes d and e at their lower ends, they pass up to the chamber p formed by the flue-case F , and thence down through tubes f and up on the outside of sheet A of the boiler in the space m formed by the brick-work, and out through an opening in the brick-work under n .

In the flue-case F may be made an opening connecting with the smoke-escape, which can be closed by a damper, thus permitting of a direct draft through the ascending flues, for the purpose of more rapidly kindling the fire when first lighted, but which should be closed when the coal is sufficiently ignited.

An opening through the boiler into the fire-chamber, and closed by a door, (not shown in the drawings,) serves to give access to the fire-chamber when necessary.

It will be seen that the flues d and e are smaller than the flues f . While the latter, f , may be three inches in diameter, two inches will be sufficient for the diameter of the former, d and e .

Figs. 3 and 4 of Sheet 2 are a modification of Figs. 1 and 2 of Sheet 1 in respect to the size and arrangement of the vertical flues, and may by some be preferred. The flues are all of the same size; and it will be seen that one row or set of flues, e , Fig. 4, is placed in the downwardly-projecting portion of the boiler formed by the shell-pieces a and g , which are placed farther apart to give room for the flues. By this arrangement the flue e is of the same length as flue f on the outer rim of the boiler, and all of the flues are of a uniform size.

The other parts of this boiler and its attachments are, with the exception of a slight modification in the form of the flue-cap or case F , identical with those of Figs. 1 and 2.

In Figs. 5 and 6 I have illustrated still further modifications of my improvement. I modify and construct the flue-cap F so as to admit of a ready means of cleaning the several upright flues. I also insert deflecting semi-diaphragms S' and T' into the brick-work and across a portion of the outside space, m . I also make use of an adjustable cut-off or damper valve, W' , hinged in an outlet or opening, U^2 , of the extension n of the flue-cap F .

The flue cap or case F is made with two series of openings directly over the flues e^2 and f^2 . These openings are subdivided by connecting and supporting ribs c^2 and d^2 . The space between the outer and inner openings and the space between the inner openings and the shell-piece g have downwardly-projecting flanges or rings, between which is a filling of gypsum or other heat-resisting composition, as shown at U' and V' in Fig. 10.

The several outside and inside openings are provided with covers or traps Q' R' , fitting into and closing up the openings, as seen in Fig. 6. These covers or traps rest at either end upon the several connecting and supporting ribs c^2 and d^2 of the flue cap or case F , and are formed into a shell, which is filled with a fire-proof filling similar to that already mentioned. They are also provided with handles a^2 b^2 , by means of which they may be removed when it becomes necessary to clean the flues e^2 and f^2 .

S' and T' are plates of metal placed diagonally opposite each other, each plate occupying one-quarter or more of the plan area of the space m . These plates or semi-diaphragms are built into the brick-work, and extend across the space m to the shell of the boiler, as seen in Figs. 9 and 10. By this arrangement the current of combustible gases, after leaving the proximate outside flues, f^2 , is deflected in its upward course and caused to deviate to either side of the plates in a tortuous track before passing out of the opening U' . To still further retain the heat about the boiler and economize in the combustion of fuel, I hinge across the opening U^2 of the extension n of the flue-case F a valve, W' , provided with a notched rod for opening or closing the same or retaining the same in any desired position. This prevents, when partially closed, the too free and rapid escape of the gases of combustion, and insures, in conjunction with the semi-diaphragms S' and T' , already described, the utmost utilization of combustion and heat and the greatest economy in fuel.

Having described the construction of the several parts of the boiler, I will now describe their operation.

The fire being lighted and the internal magazine of the boiler being filled with coal, by the force of gravity the coal descends and spreads out upon the grate-surface. As the consumption of the coal goes on the supply is kept up by the descending coal in the magazine, the combustion of the escaping gases being secured by the combustion-chamber o , through which they pass to reach the ascending flues d and e , and down through the flues f , and up outside of the shell A of the boiler, as clearly shown by the arrows. Thus it will be seen that the large amount of surface of the boiler exposed to the products of combustion secures a perfect absorption of all the available heat produced by the fuel consumed in the fire-chamber.

By the arrangement of the magazine as shown its lower end, though extended down into the fire-chamber so as to form between it and the outer walls of the fire-chamber and the flue-sheet E a space for a combustion-chamber, is protected by a surrounding space of water, a' , which prevents the injurious heating of the lower end of the magazine, as would be the case without the protecting body of water, the over-heating of the coal and production of gases in the magazine without their proper combustion, and at the same time prevents

the rapid destruction of that part of the magazine exposed to a high heat without the water-protection, as shown.

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

1. In a boiler for generating steam, the combination of a vertical central coal-magazine extending down into the fire-chamber and having a protecting water-space formed in its projecting end, an inner set of flues communicating with the fire-chamber for carrying the products of combustion upward, and an outer set of flues for carrying the same downward, all arranged within the outer shell of the boiler substantially as and for the purpose set forth.

2. In a boiler for generating steam, a vertical central coal-magazine extending down into the fire-chamber and having a protecting water-space formed in its projecting end, and with inner flues communicating with the fire-chamber, in combination with a water-protected fire-chamber formed by the downward extension of the boiler outside the magazine and the outer flues arranged inside of the outer shell of the boiler, substantially as set forth.

3. In combination with a vertical central coal-magazine projecting down into the fire-chamber, having its walls protected by a water-space, the series of vertical flues, arranged substantially as described, whereby the products of combustion are caused to ascend through the inner set of flues and descend through the outer set of flues, and ascend from

thence outside of the boiler, substantially as and for the purpose set forth.

4. In a vertical steam-generating boiler, a central coal-magazine extending into the fire-chamber formed by the inner wall connecting with the outer rim of an inner flue-sheet, and its outer wall with the inner rim of an outer flue-sheet, united at their lower edges so as to form water-spaces around the coal-magazine and around said fire-chamber, substantially as described.

5. The combination, in a vertical steam-generating boiler, of the flues to carry the products of combustion upward from the fire-chamber and downward inside the outer shell, and the flue-case arranged on top of the boiler, having the curved outer wall for deflecting the products of combustion downward toward the outer flues, substantially as described.

6. In a boiler for generating steam, the combination of a central coal-reservoir, the outer and inner set of flues, and a cap or case arranged over the flues and forming a chamber through which the products of combustion pass from the inner to the outer flues, said cap or case having openings over the flues and removable covers for closing said openings, substantially as set forth.

In testimony whereof I have hereunto set my hand this 17th day of June, A. D. 1884.

CYRENUS WHEELER, JR.

Witnesses:

JOHN BRAINARD,

FRANK R. RATHBUN.