2 Sheets—Sheet 1.

C. W. REED.

STEAM-BOILER.

No. 171,861. Patented Jan. 4, 1876.

Fig. 1.

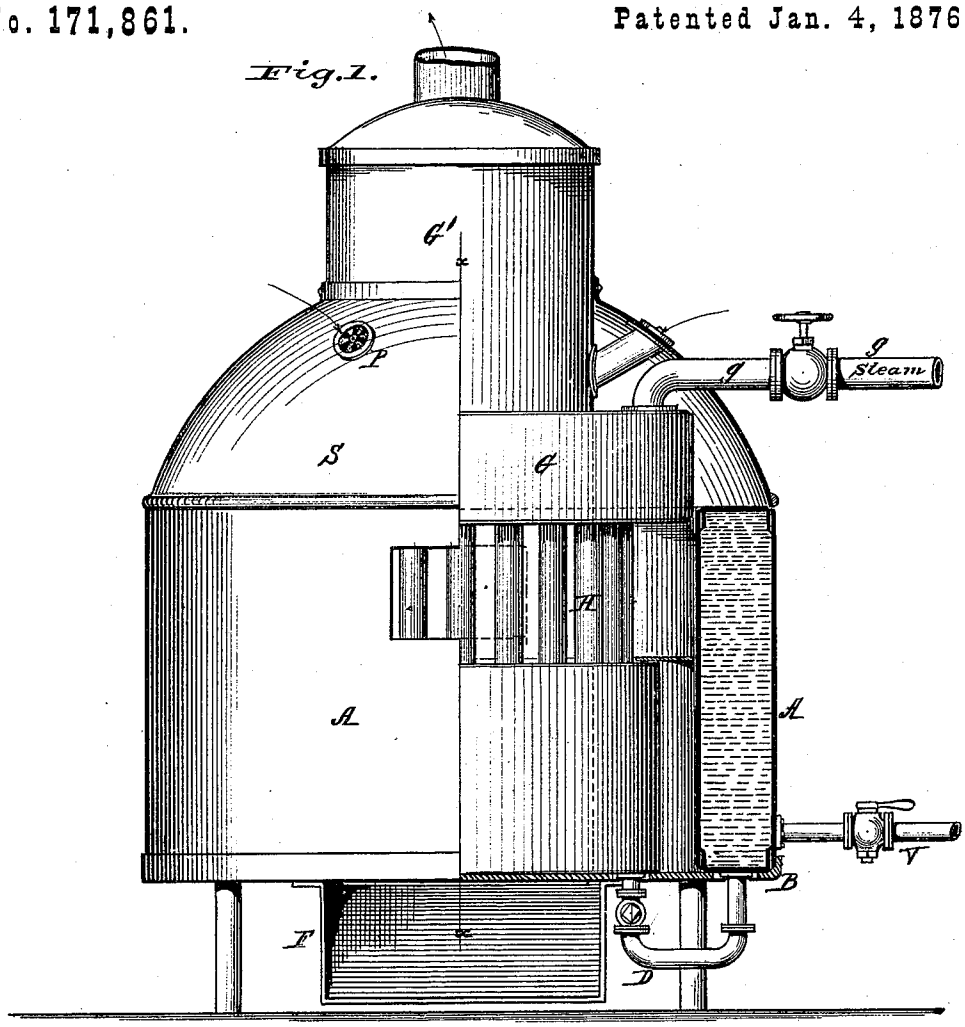
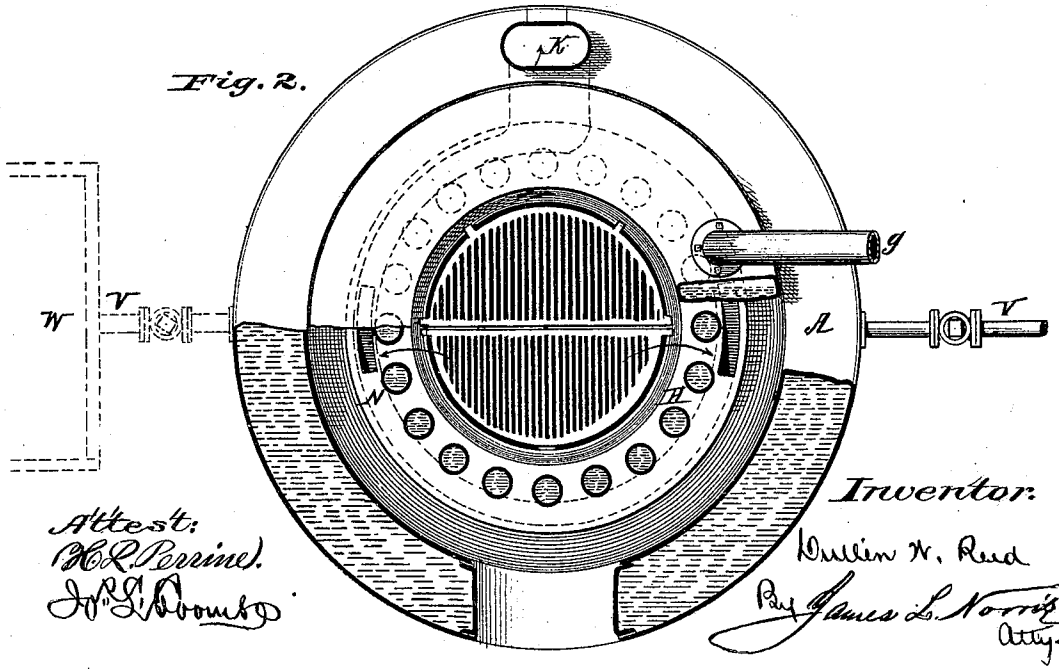


Fig. 2.



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Inventor:
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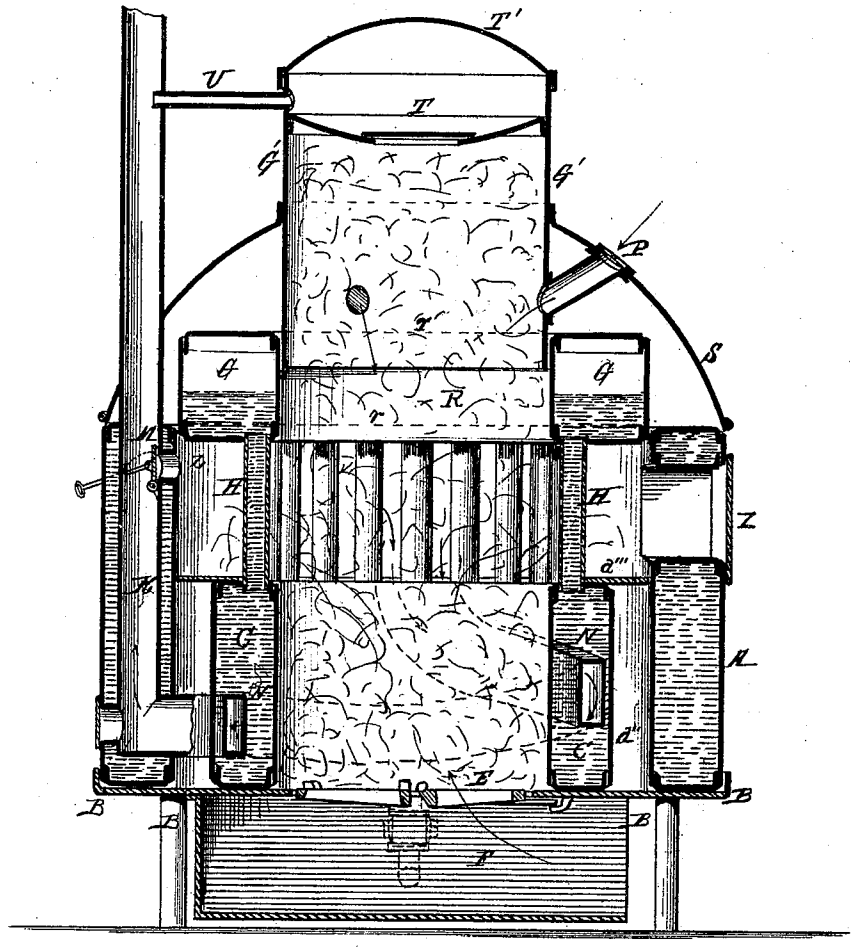
2 Sheets—Sheet 2.

C. W. REED.

STEAM-BOILER.

No. 171,861. Patented Jan. 4, 1876.

Fig. 3.



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UNITED STATES PATENT OFFICE.

CULLIN W. REED, OF CHAGRIN FALLS, OHIO, ASSIGNOR OF ONE-HALF HIS RIGHT TO H. N. WICKOFF & SON, OF SAME PLACE.

IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. **171,861**, dated January 4, 1876; application filed November 22, 1875.

To all whom it may concern:

Be it known that I, CULLIN W. REED, of Chagrin Falls, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification:

This invention relates to certain improvements in steam-boilers and other steam-generating apparatus, its object being to provide for the combustion of the fuel and the smoke, soot, and gaseous products arising therefrom, to concentrate the same in the most effective portion of the boiler, and to economize and utilize the whole or greater part of the heat generated thereby, for the purpose of heating the water and converting the same into steam.

My invention consists in a boiler composed of two annular chambers, one within the other, and communicating with each other at the bottom by means of a suitable pipe, or of an annular chamber within a sheet or jacket, the said inner chamber forming the fire-pot of the boiler, and communicating with an annular steam-chamber above by means of a series of tubes or their equivalents, the space between said steam-space and the inner chamber forming a flame-space or combustion-chamber, and the inner portion of the annular steam-chamber a coking-chamber, into which the fuel is fed from a magazine above the flame-space or combustion-chamber of the furnace communicating, by means of suitable flues, with the escape-flue of the boiler, in such a manner as to consume and burn the smoke and other combustible gases generated from the burning fuel, and utilize the same, as hereinafter more fully set forth.

In the drawing, Figure 1 represents a view, partly in elevation and partly in section, of my improved boiler. Fig. 2 represents a partial top view and a horizontal sectional view of the boiler, and Fig. 3 a vertical sectional view of the same.

The letter A represents the outer portion of the boiler, consisting of an annular chamber constructed of boiler-iron or other material possessing the requisite strength. Said annular chamber is supported upon an annular base-plate, B, and within it is located a smaller annular chamber, C, the two being connected at the bottom by means of a tube, D, Fig. 1, or other suitable means, which allows the water to circulate freely from one to the other. This inner chamber forms the fire-box of the furnace, its central space being provided at the bottom with a grate, E, below which is located an ash-pit, F, of any desired construction. The letter G represents an annular steam-chamber constructed like the other portions of the boiler, of boiler-iron, or other material of requisite strength, and provided with an eduction-pipe, *g*, the said chamber, in this instance, being located directly above the inner annular chamber C, and just at the top of the outer chamber A, and being connected with the chamber C by means of a series of pipes, H, the spaces between said steam-chamber and chamber C, and between the connecting-pipes H, forming a flame-space above the fire-pot, in which the smoke and combustible gases of the coal are thoroughly consumed and burned. Said flame-space communicates with the escape flue of the boiler (represented by the letter K) by means of a short flue, L, which is provided with a damper, M, and by two tortuous flues, N, extending from the top of the annular inner chamber C down through said chamber, and entering the bottom of said escape-flue, as shown. The damper M is so arranged that when thrown back, to open the flue L, it will close the escape-flue below said flue L, and cause the products of combustion to pass directly into said escape-flue K, in order to provide for starting the fire; and when closed, as shown in Fig. 3, will cause the products of combustion to take their course through the tortuous flues N, as indicated by the arrows. Above the steam-chamber G is located a cylindrical magazine, G′, the lower end of which sets in the upper end of the inner portion of said chamber G, said magazine being provided with a series of air-flues, P, provided with dampers, if desired, which flues enter just above its lower end, and serve to admit air to the coking-chamber R, which lies between the dotted lines *r r*, (shown in Fig. 3,) being formed by the interior portion of the steam-chamber G and that portion of the magazine below the flues P.

Upon the top of the outer annular chamber is secured a dome-shaped cover, S, which

serves to confine the heat around the steam-chamber, and prevent its escape. The magazine is provided with removable covers T T′, in order that it may be filled at convenience, the space between the two being connected with the escape-flue by means of a small tube, U, to carry off any light gases that may collect in said space, and prevent accidents.

The water is fed into the outer casing or chamber of the boiler through the pipe V, from a tank, W, in which it is previously heated by the exhaust steam of the engine. On entering the outer casing the heat is further increased, after which the water passes into the inner chamber C, where it is still further heated, and is converted into steam in the steam-chest G, the hottest portion of the boiler, by which means dry steam is always produced, which is a most important result in the generation of steam.

The letter Z represents a door through the outer cylinder or shell, for the purpose of providing access to the combustion-chamber. The letter *a″* represents an air-chamber, surrounding the inner water-chamber, that forms the fire-pot, forming a dead-air space, whereby the heat is retained between the inner and outer portions of the boiler. The ring *a‴*, at the top of said air-chamber, performs an important function by forming a partition between the flame or combustion chamber and the dead-air chamber, whereby the heat is, to a greater extent, concentrated upon the upper or superheating portion of the boiler.

It is evident that the details of my improved boiler can be materially varied without changing its nature, the invention consisting, essentially, in a boiler provided with a fire-pot, a coking-chamber, and a flame-chamber between the two, as set forth.

For instance, the outer annular cylinder may be made to serve the purpose of a heating-tank simply, the feed-water being introduced into the same from any proper source, and pumped from said outer annular chamber into the inner annular chamber by means of a suitable pump interposed at any convenient point in the connecting-pipe D, which, in such case, should be provided with a suitable valve to cut off communication between the two annular chambers, and prevent steam-pressure in the outer one when desired; or the outer annular chamber may be altogether omitted, and a simple jacket or shell substituted for the same, in which case the feed-water will be pumped directly into the inner chamber from a suitable tank or other source. The boiler as thus constructed, besides the advantages above enumerated, possesses many others, such as extreme simplicity of construction, rendering the taking apart of the same for repairs or cleaning an operation of comparatively little time or trouble, as the outer annular cylinder, after uncoupling the connecting-pipe, or the outer shell when employed may be lifted off the interior works, leaving said parts thoroughly open for inspection, the inner chamber and steam-chest being provided with suitable man-holes, by means of which entrance to the same may be effected, and by mounting the base-plate upon wheels the whole apparatus is made readily portable.

In case the apparatus is to be placed in positions that would interfere with the natural draft, any convenient blowing apparatus may be employed and connected with the draft-apertures either below the fire pot, or those entering through the magazine, or with both, as may be desired.

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

1. The combination in a steam boiler or generator of a water-chamber, the central space of which forms the fire-pot of the boiler, and a steam-chest, the central space of which forms a coking-chamber, the two being connected by a series of tubes, and the intervening space forming a combustion-chamber, in which the gaseous portions of the fuel are concentrated and consumed, substantially as described.

2. In a steam-boiler, the combination of the fire-pot and coking-chamber, constructed to have an upward and downward draft, respectively, with an intermediate combustion-chamber communicating with the escape-flues, in which chamber the flames of the burning fuel are concentrated for the purpose of intensifying the heat around the steam-chest or that portion of the boiler in which the steam is finally generated, in order to produce dry steam, substantially as and for the purposes set forth.

3. The combination of the annular chamber N, the combustion-chamber above the same, and tortuous flues leading from said combustion-chamber to the discharge-flue K, substantially as and for the purpose described.

4. The combination in a steam-boiler of the steam-chamber G and magazine G′, provided with flues D, forming a coking-chamber above the combustion-chamber, and leading into the same, substantially as and for the purposes set forth.

5. The combination of the outer cylinder, the inner cylinder, the steam chest or chamber, the connecting-flues, and the intervening combustion-chamber, substantially as herein set forth.

6. In combination with the magazine G′, the flue U leading to the escape-flue of the furnace, for leading off the light gases that may collect between the removable covers T T′, as and for the purpose herein set forth.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of the subscribing witnesses.

CULLIN W. REED.

Witnesses:

A. H. NORRIS,

JOS. L. COOMBS.