

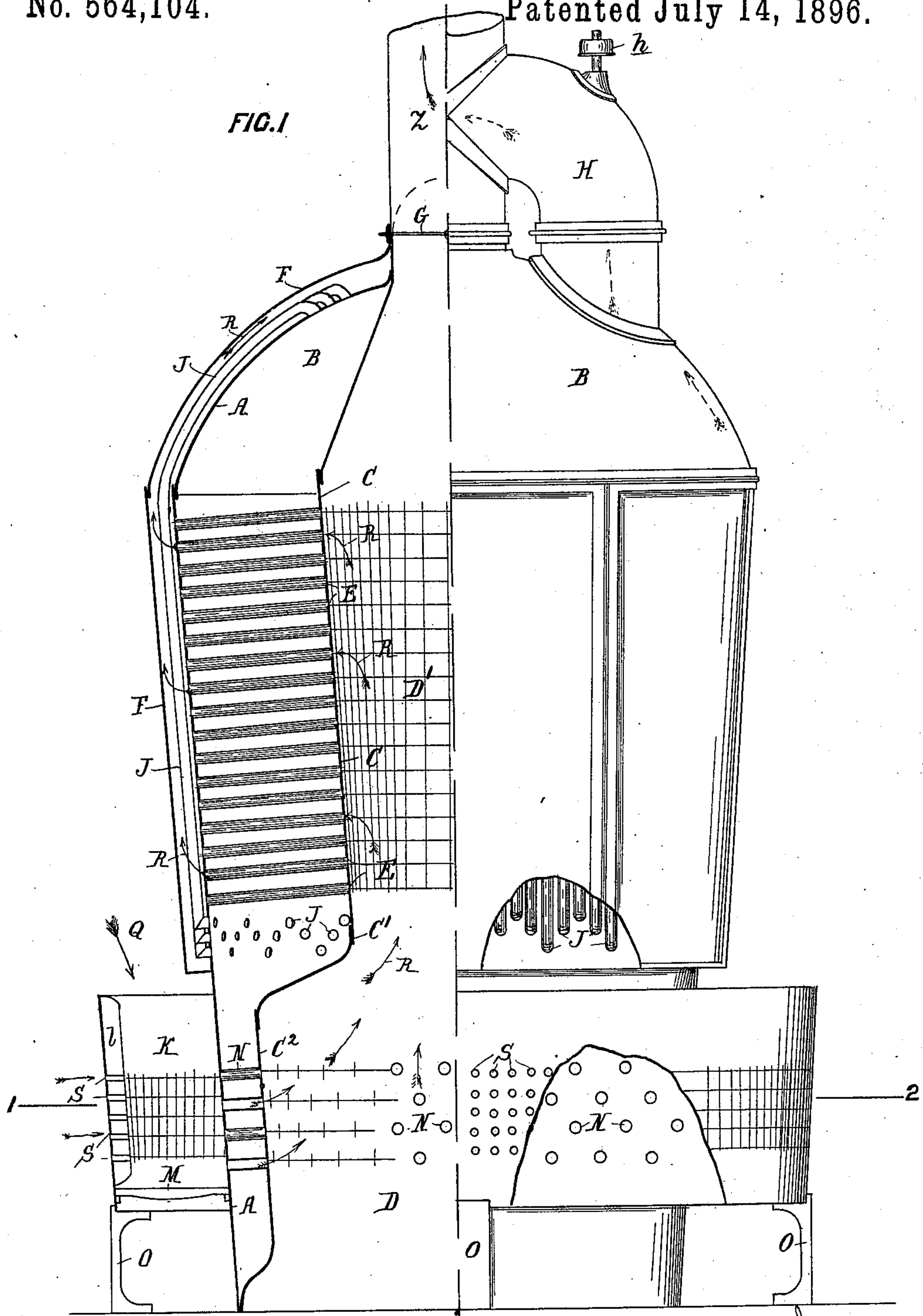
(No Model.)

2 Sheets—Sheet 1.

J. RICHARDSSEN.  
STEAM BOILER.

No. 564,104.

Patented July 14, 1896.



Witnesses  
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(No Model.)

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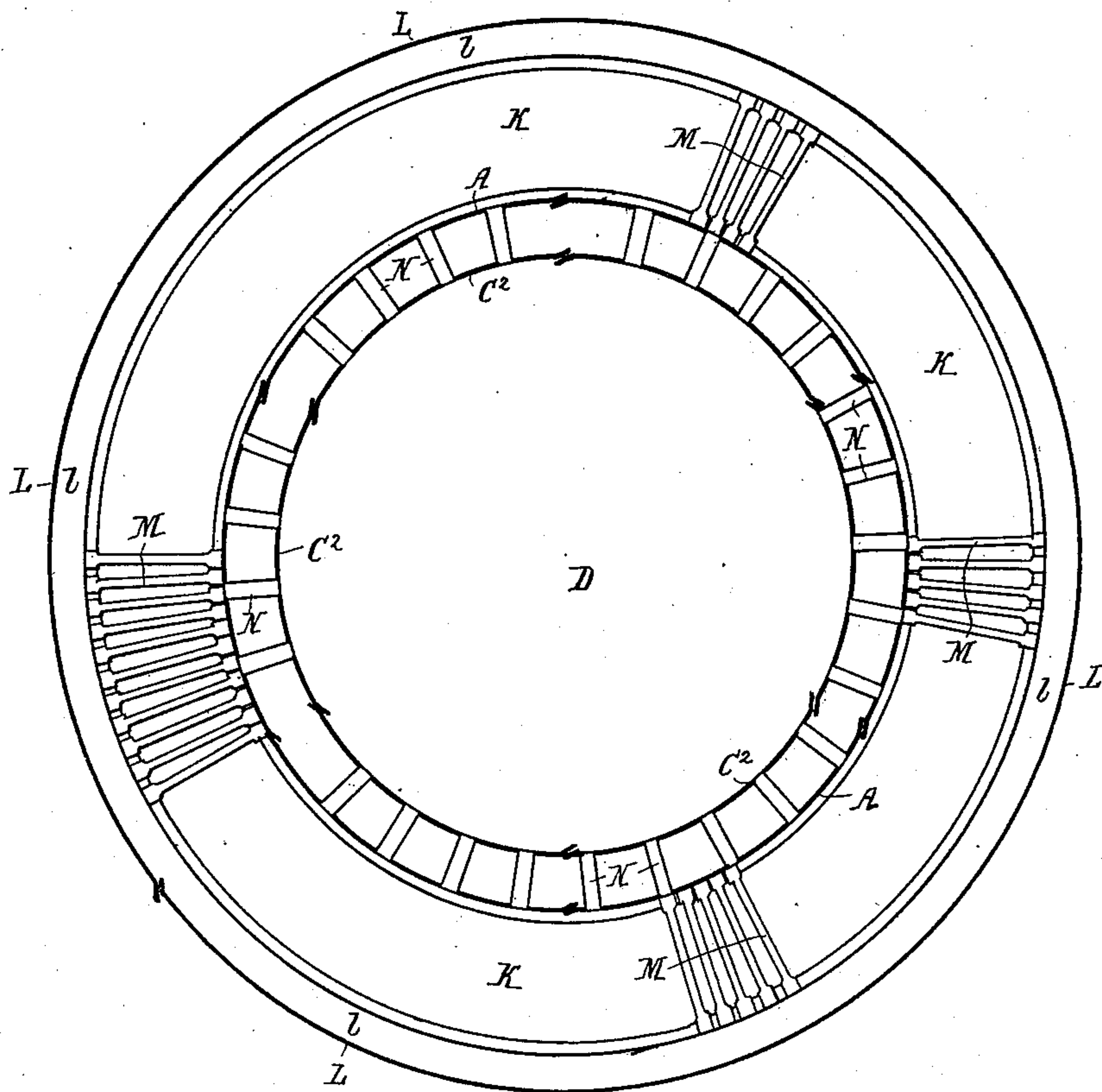
2 Sheets—Sheet 2.

STEAM BOILER.

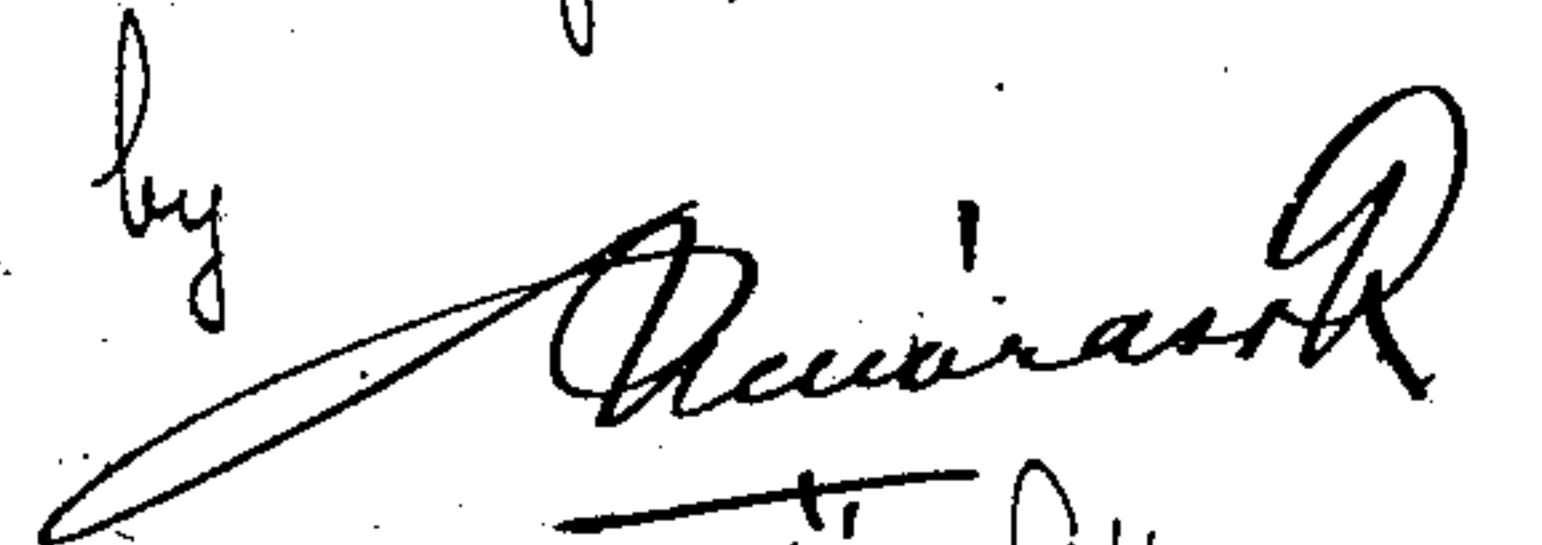
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FIG. 2



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# UNITED STATES PATENT OFFICE.

JOSEPH RICHARDSSEN, OF SYDNEY, NEW SOUTH WALES, ASSIGNOR TO THE RICHARDSSEN & SCHROEDER PATENT SMOKE CONSUMING, FUEL ECONOMIZING AND STEAM BOILER COMPANY, OF SAME PLACE.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 564,104, dated July 14, 1896.

Application filed November 4, 1895. Serial No. 567,925. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH RICHARDSSEN, boiler-maker, a subject of the Queen of Great Britain and Ireland, residing at Sydney, county of Cumberland, in the Colony of New South Wales, have invented a new and useful Improved Steam-Boiler and Mode of Heating the Same, of which the following is a specification.

10 The boiler is annular in form, and consists of an outer shell that is in the form of an inverted truncated cone. This shell proceeds uniformly down to the foundation. The inner shell, which is parallel with the outer  
15 shell, widens out toward the bottom, so as to have a large space in the center of the boiler just above the foundations. Fire-tubes are expanded into the inner and outer shells at right angles thereto; thus there will be a  
20 large space above the foundation near the base of the boiler, which opens into an inverted cone-shaped uptake up which the products of combustion will proceed, and will pass from the central flue through the fire-tubes  
25 to the exterior of the boiler. In order to prevent escape of the heated gases, the apertures of the tubes in the external shell of the boiler are surrounded by a jacket, within which the gases will be conducted to the chimney. The  
30 top end of the central flue is closed by a damper and a connection is made by an auxiliary flue from the jacket to a point in the chimney above the damper. Within this auxiliary flue a fan or other appliance for  
35 creating an induced or forced draft is placed, or the draft apparatus may be located in any other suitable position, or under favorable conditions a natural draft may prove to be sufficient.

40 The furnace that heats the boiler is placed externally, and consists of a circular wall of larger diameter than the base of the boiler, thus inclosing between the external shell of the boiler and the internal face of the circular wall an annular space, which is the fire-  
45 place. Within this space and at a suitable distance from the ground the fire-bars are placed.

The heated gases from the combustion of the fuel enter the large space within the boiler through fire-tubes that are expanded into the shells of the boiler. Draft-holes may be made in the wall of the furnace.

It is important to remark that no air can enter the large space within the boiler except through the fire-tubes leading from the fireplace.

In order that the invention may be thoroughly understood, reference will be made to the accompanying sheet of drawings, in which—

Figure 1 is an elevation, half being in vertical section, of the boiler. Fig. 2 is a horizontal section taken on the line 1 2 of Fig. 1.

A is the external shell of the boiler, which proceeds uniformly downward from the dome B to the foundation.

C is the inner shell of the boiler, which proceeds downward parallel to the outer shell A until it reaches the point C', when it widens out and then proceeds downward, as at C'', parallel to the external shell A, thus leaving a large space or chamber D immediately above the foundations. Both the inner and outer shells A and C are circular and present the appearance of an inverted truncated cone.

Fire-tubes E E are expanded into the shells A and C at right angles thereto, whereby communication is established between the central flue D' and a space exterior to the shell A, which is inclosed by the jacket or shell F. The upper end of the shell A is shaped so as to form a spherical-shaped dome B, and the inner shell C is continued upward conically until it joins therewith. The outer shell or jacket F is also continued upward parallel to the shell A. At the point of junction of these three shells is the commencement of the chimney, and at this point a damper G, of any suitable construction, is placed. An auxiliary flue H enters the dome-space between the shells A and F and effects communication with the chimney Z at a point above the damper G. Within this auxiliary flue H is placed a fan or other apparatus for inducing or forcing a draft within the fire-spaces of the



boiler. This fan or draft apparatus, if mechanical, may be driven externally by the pulley *h*. As a means of promoting the circulation of the water within the boiler, water-tubes *J* are expanded into the boiler in the position as shown in the drawings, and passing upward within the jacket or shell *F* debouch into the dome of the boiler at the point *F'*. In order that the outer shell of the boiler shall not be weakened by the openings of these tubes, they are expanded into the boiler, so as to break line, as may be seen in the drawings, at the two points where they debouch into the boiler.

The fireplace is placed externally, and consists of an annular space *K*, that is inclosed within a circular wall *L*. This wall may be constructed in a variety of ways. The mode adopted and shown in the drawings consists of a circular wall of boiler-plate that is lined with fire-clay *l* above the fire-bars *M*, but a great many different modes of construction may be adopted in the construction of this annular wall.

The furnace will be fed through its open top. The products of combustion from the consumption of fuel and the heated gases will enter the chamber or space *D* within the boiler through a number of fire-tubes *N N*, that are expanded into the two skins *A* and *C*<sup>2</sup> of the boiler. It is only through these tubes that any air or heated gases can enter the chamber *D*. This is a point that is of considerable importance in the successful working of the boiler. The wall *L* of the furnace does not reach down to the ground, but is supported at a suitable height from the ground by means of standards or other supports *O*, or if the circular wall *L* does reach down to the ground its lower part must be arched, so that the ashes falling from the furnace may be cleared away and the fire-bars raked from below. The fire-bars may be of any approved construction. In the drawings they are shown as ordinary fire-bars arranged radially, but it might be found convenient to adopt circular fire-bars arranged concentrically around the center of the boiler, or the fire-bars might be tubular.

The circular wall of the furnace is perforated with holes or apertures *S* for the purpose of admitting additional air to the fire to support combustion, and it is through these holes or apertures *S* that the bulk of the air will pass to support the combustion of the fuel.

The whole of the boiler and furnace should be constructed in segments, so that by loosening any rivets or bolts a whole segment might be removed and replaced by another and similar segment. This will materially facilitate any repairing operation to those parts of the boiler that are not easily accessible—such, for instance, as the fire-tubes *E* or *N N*.

It will be convenient now to follow the course of the heated gases through the boiler.

A fire is built on the fire-bars *M* and is stoked from the top by throwing the fuel in in the direction of the arrows *Q*. The fan or other draft apparatus in the auxiliary flue *H* being started, the air will pass through the unconsumed fuel and through the apertures *S*, through the incandescent fuel, through the fire-tubes *N* into the space *D*, then upward in the direction of the arrows into the central flue *D'*, but as the damper *G* would be closed the heated gases will take the line of least resistance and will pass through the fire-tubes *E E* into the external annular space formed by the shell *F*, into the dome-space above and will be drawn by the induced draft into the auxiliary flue *H*, and be thence projected into the chimney *Z* above the damper *G*. The course of the heated gases is shown by the arrows *R*.

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

1. In combination, a boiler-chamber that is in the form of an inverted truncated-cone-shaped annulus, that is provided with an inverted-cone-shaped central flue, a circular inclosed chamber at the bottom of the central flue, radial fire-tubes that connect the two shells of the annular boiler together, an external annular smoke-jacket, a damper *G* at the top of the central flue and an auxiliary flue leading from the smoke-jacket to the chimney at a point above the damper, and an apparatus within such auxiliary flue for forcing or inducing a draft within the fire-spaces of the boiler as herein specified.

2. In combination a boiler-chamber that is in the form of an annulus the internal and external shells of which are united together by radial fire-tubes, an external annular smoke-jacket into which the mouths of the radial fire-tubes debouch, an external annular fireplace that entirely surrounds the lower part of the boiler and fire-tubes near the bottom of the boiler through which the products of combustion from the fireplace can enter the central space within the boiler as herein specified.

3. In combination, an external annular fireplace that surrounds the boiler, an internal inclosed chamber, that is within the boiler, communication being established between the fireplace and the inclosed chamber by means of fire-tubes or apertures in the boiler, a central flue within the boiler leading upward from the top of the inclosed chamber and means for forcing or inducing a draft of air through the furnace whereby such air and the products of combustion from the fuel shall be drawn or forced from the fire through the fire-tubes into the inclosed chamber and up the central flue as herein set forth.

4. In combination, in a boiler, the inner shell having an enlarged lower part forming a chamber and an upper chamber *D'*, the outer shell *A* extending about the inner shell



and forming an upper and a reduced lower water-chamber, the fire-tubes extending through the upper chamber, the annular external fireplace, the fire-tubes N extending  
5 therefrom through the lower reduced water-space into the enlarged lower chamber and the smoke-jacket about the shell, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

JOSEPH RICHARDSEN.

Witnesses:

MANFIELD NEWTON, C. E.,

JAS. T. HUNTER.