

(No Model.)

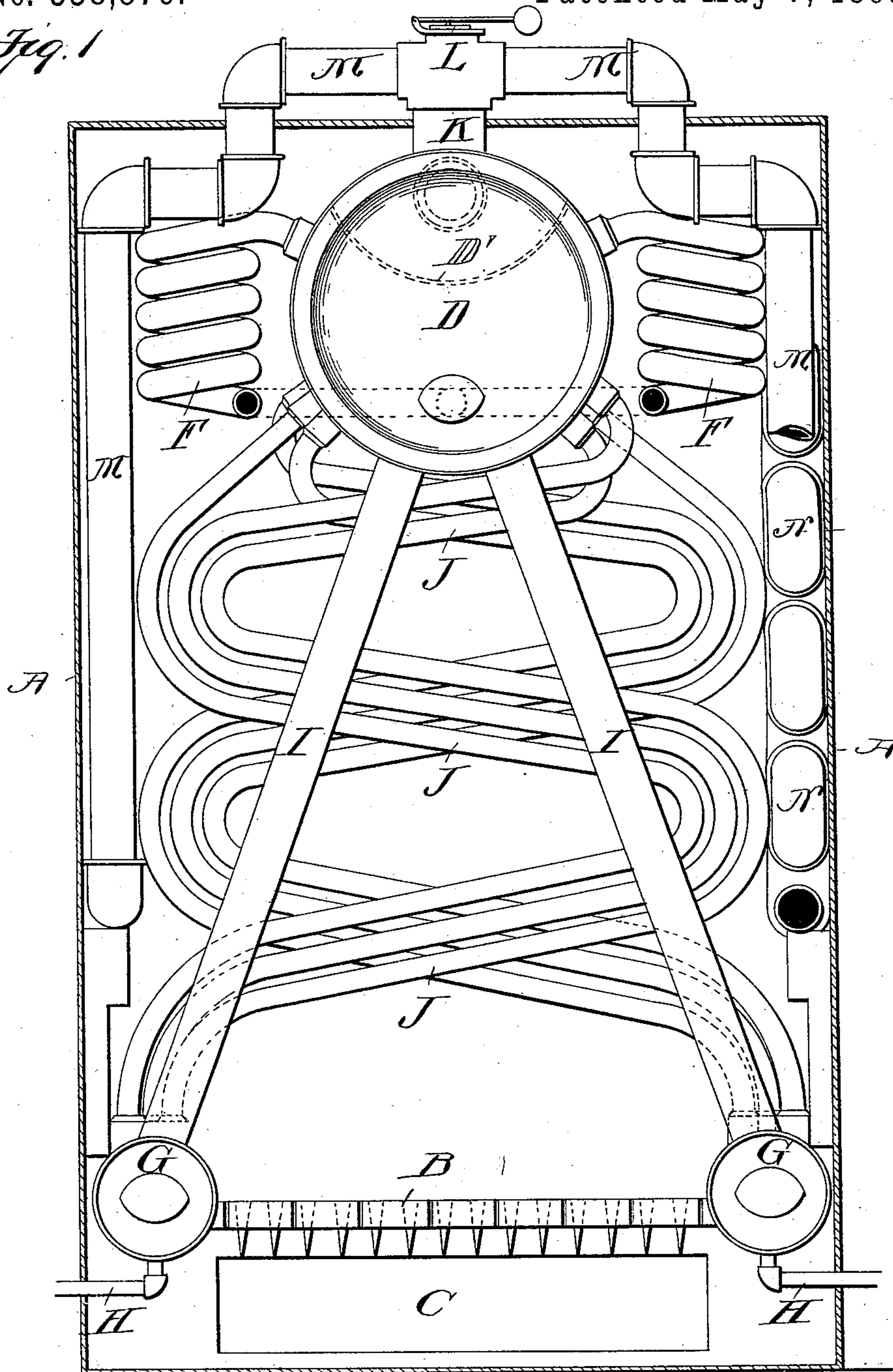
2 Sheets—Sheet 1.

J. H. & J. D. LUCAS.  
STEAM BOILER.

No. 538,876.

Patented May 7, 1895.

*Fig. 1*



Witnesses:  
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*Hugh K. Wagner*

Inventors  
*James H. Lucas,*  
*John D. Lucas.*  
by *Paul Bakewell*  
*their atty.*

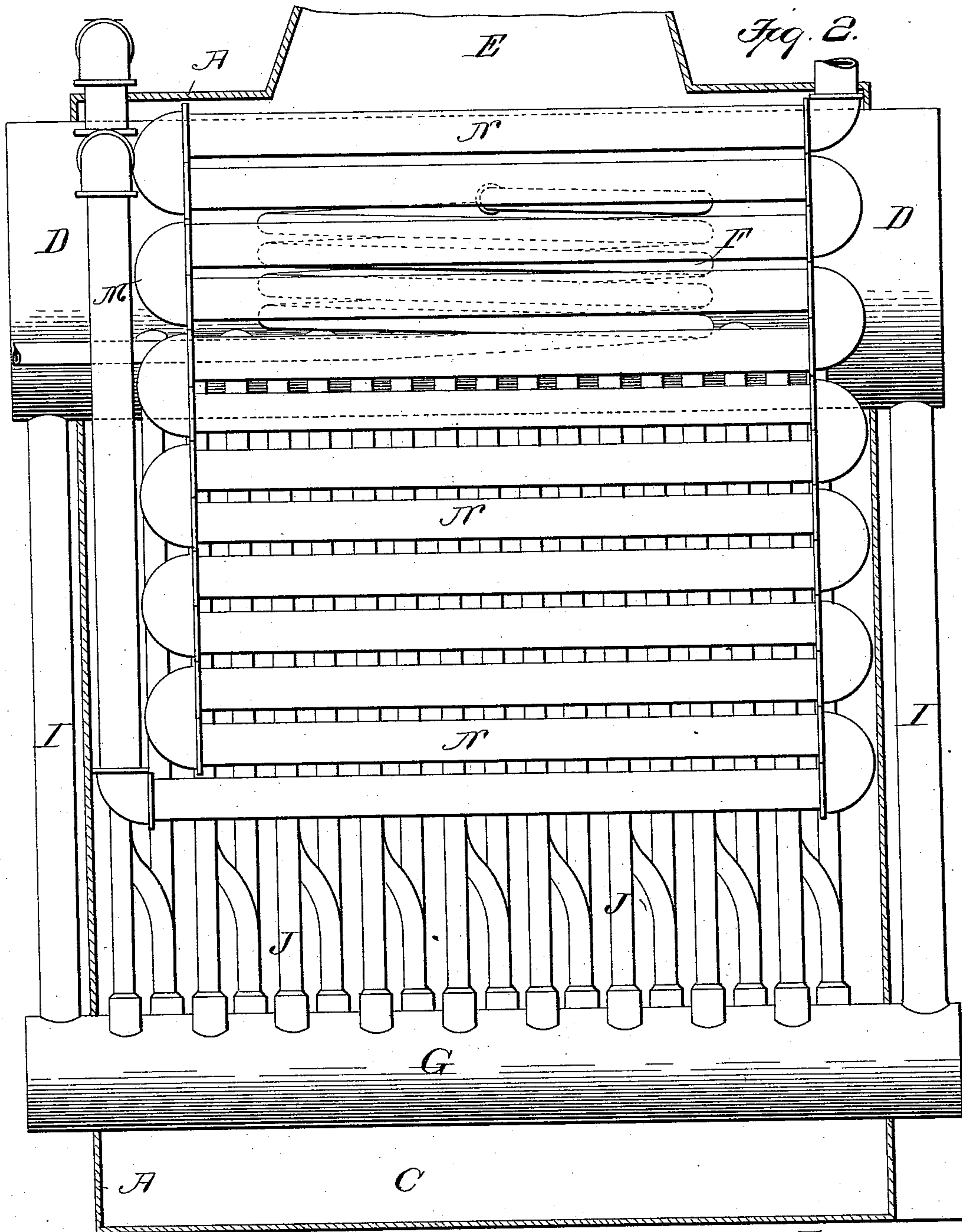
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# UNITED STATES PATENT OFFICE.

JAMES H. LUCAS AND JOHN D. LUCAS, OF ST. LOUIS, MISSOURI.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 538,876, dated May 7, 1895.

Application filed March 9, 1895. Serial No. 541,125. (No model.)

*To all whom it may concern:*

Be it known that we, JAMES H. LUCAS and JOHN D. LUCAS, citizens of the United States, and residents of St. Louis, Missouri, have invented a certain new and useful Improvement in Steam-Boilers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, wherein—

10 Figure 1 is a front elevational view showing the interior arrangement of our improved boiler, the shell or casing being in section. Fig. 2 is a side elevational view, the near side wall of the shell or casing being removed to  
15 more clearly show the interior arrangement.

This invention relates to a new and useful improvement in steam boilers, the object being to construct a boiler which will be efficient, cheap, and compact.

20 With this object in view the invention consists in the construction, arrangement, and combination of the several parts, all as will hereinafter be described and afterward pointed out in the claims.

25 In the drawings A indicates an inclosing shell or casing, B the grate bars, and C the ash-pit. Arranged in the upper part of the shell, and projecting out at each end in the front and back is a drum D. This drum is  
30 located beneath a stack E, and directs the products of combustion which pass upwardly and around the generating coil, to divide and pass through and around the feed coil F. These feed coils are preferably connected at  
35 their lower end to a common supply pipe, and the water passing therethrough is heated and fed into the boiler above the water line. In this manner any steam generated in the feed coils, enters the boiler above the water line.  
40 Arranged near the bottom of the shell, and on each side of the grate-bars are water-legs G whose ends protrude outside the shell at the front and back. If desired mud-valves H may lead from the bottoms of these legs.

45 Connecting the bottom of the drum D with the tops of the water-legs F are down-flow pipes I arranged outside of the shell, so as not to be affected by the heat within the shell. Rising from the water-legs are generating  
50 coils J which are arranged in zigzag form so as to present the largest heating surface, said coils intersecting each other about midway

their straight inclined lengths. In approaching the drum D, the coils from one leg separate, and go to opposite sides of the drum. 55 The coils in the drawings are shown arranged as three deep, in which instance one coil of a series will enter the drum at one side, and the other two will enter the opposite side, while the next adjacent coils will be arranged 60 in the opposite manner. The coils are secured to the drum and water-legs by right and left hand threaded nipples, which are staggered, and to arrange three of the coils, or more if desired, in vertical alignment, so 65 as to leave the greatest possible space between the coils at their points of intersection, we bend one or more of the side coils into line with the aligned coils.

The drum D is preferably provided with a 70 priming shield D', above which is arranged a dry pipe K which leads up into a cross. Closing the upper opening of this cross is a safety valve L whose function is well understood. Extending laterally from the cross 75 are pipes M which lead down to the bottom of a series of superheating coils N arranged along the inside of the shell. These superheating coils at their other ends are preferably connected, and the dry superheated 80 steam led off to an engine or other desirable point.

The operation is as follows: The fire being built on the grate bars will be drawn up through and around the generating coils J, 85 the products of combustion being divided by the drum D and forced to assume two paths, in which are introduced the feed water heating coils leading to the boiler. The products of combustion are deflected in their upward 90 course somewhat by the inclination of the generating coils, and directed to the sides of the boiler against the superheating coils. The cold feed water being forced or otherwise introduced into the lower ends of the feed 95 coil, is heated, and enters the drum D above the water line, so that any steam which might have been generated in the feed coils will not be chilled by the cold water in the drum. The cold water in the drum is carried down, 100 on the outside of the shell, from each end of the drum and through the downflow pipe I, into the water-legs. From the water-legs it circulates up through the generating coils,



being heated as it rises, and is discharged into the bottom of the drum D and on each side thereof. The steam thus generated passes up through the pipe K into the pipes M down to the bottom of the series of superheating coils, through which it rises, and is conducted off at the other end.

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

1. In a boiler, the combination with the inclosing shell, of a drum located in the upper portion thereof, water-legs located in the lower portion of the shell, and generating coils connecting the water-legs with the bottom of the drum, said coils being in zigzag form and two, three or more deep, the inclined portion of the coils from one water-leg intersecting the inclined portion of the coils from the other water-leg, the coils from each water-leg diverging at their upper ends and leading to opposite sides of the drum; substantially as described.

2. In a boiler, the combination with an in-

closing shell, of a drum located in the upper portion thereof, water-legs located in the lower portion of the shell, generating coils connecting the water-legs with the drum, said coils being arranged in zigzag form and two, three or more deep in vertical alignment, the inclined portions of the coils from one water-leg intersecting the inclined portion of the coils from the other water-leg, the coils from each water-leg diverging at their upper ends and going on each side of the drum, and superheating coils arranged at the sides of the shell, against which the products of combustion are directed by the inclined portions of the coils; substantially as described.

In testimony whereof we hereunto affix our signatures, in presence of two witnesses, this 1st day of March, 1895.

JAMES H. LUCAS.  
JOHN D. LUCAS.

Witnesses:

F. R. CORNWALL,  
HUGH K. WAGNER.