

(No Model.)

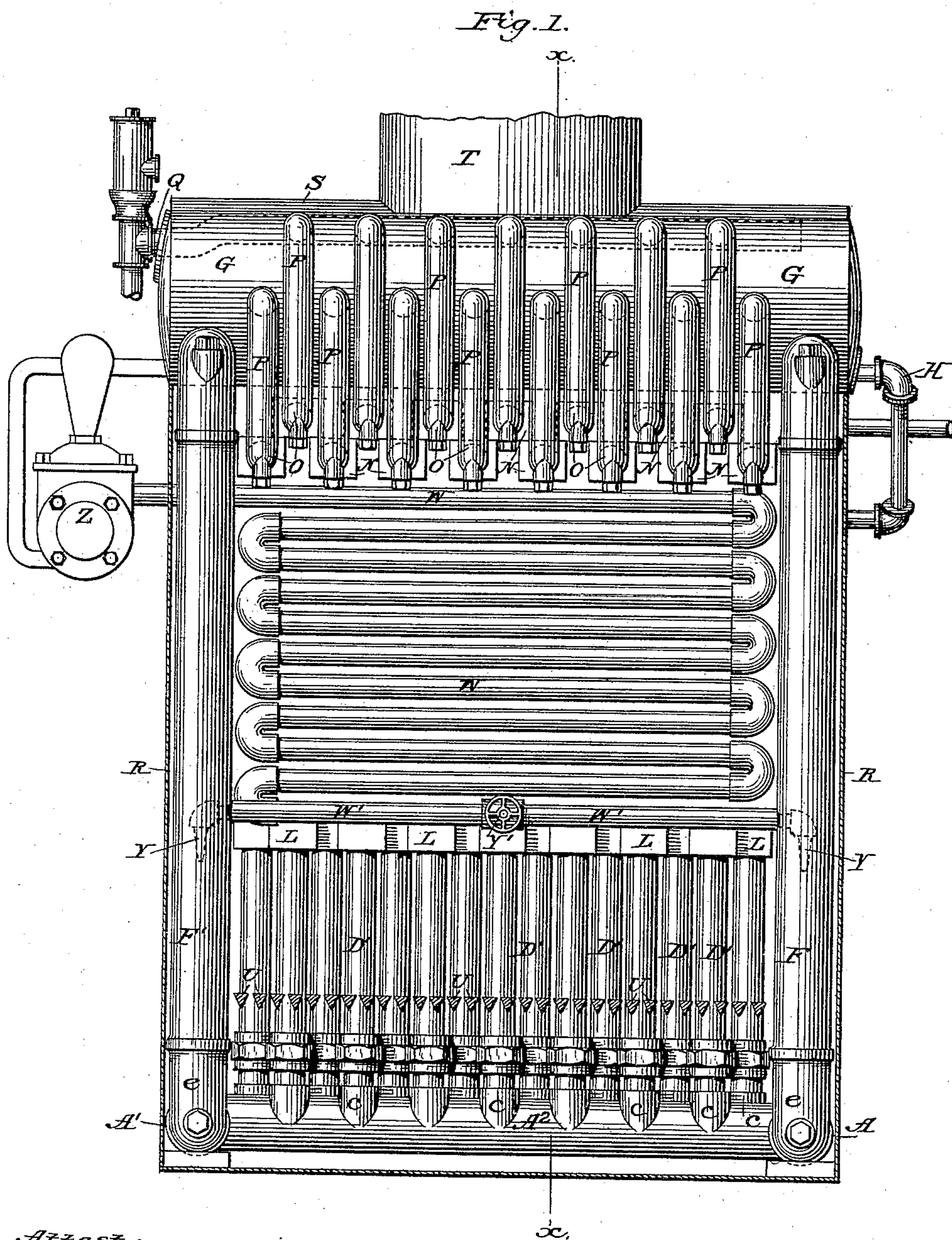
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C. L. SEABURY.

STEAM BOILER.

No. 387,186.

Patented July 31, 1888.



Attest:

*A. H. Jespersen.*  
*E. M. Watson.*

Inventor:

*Charles L. Seabury.*  
*By David A. Burr.*  
*Atty.*

(No Model.)

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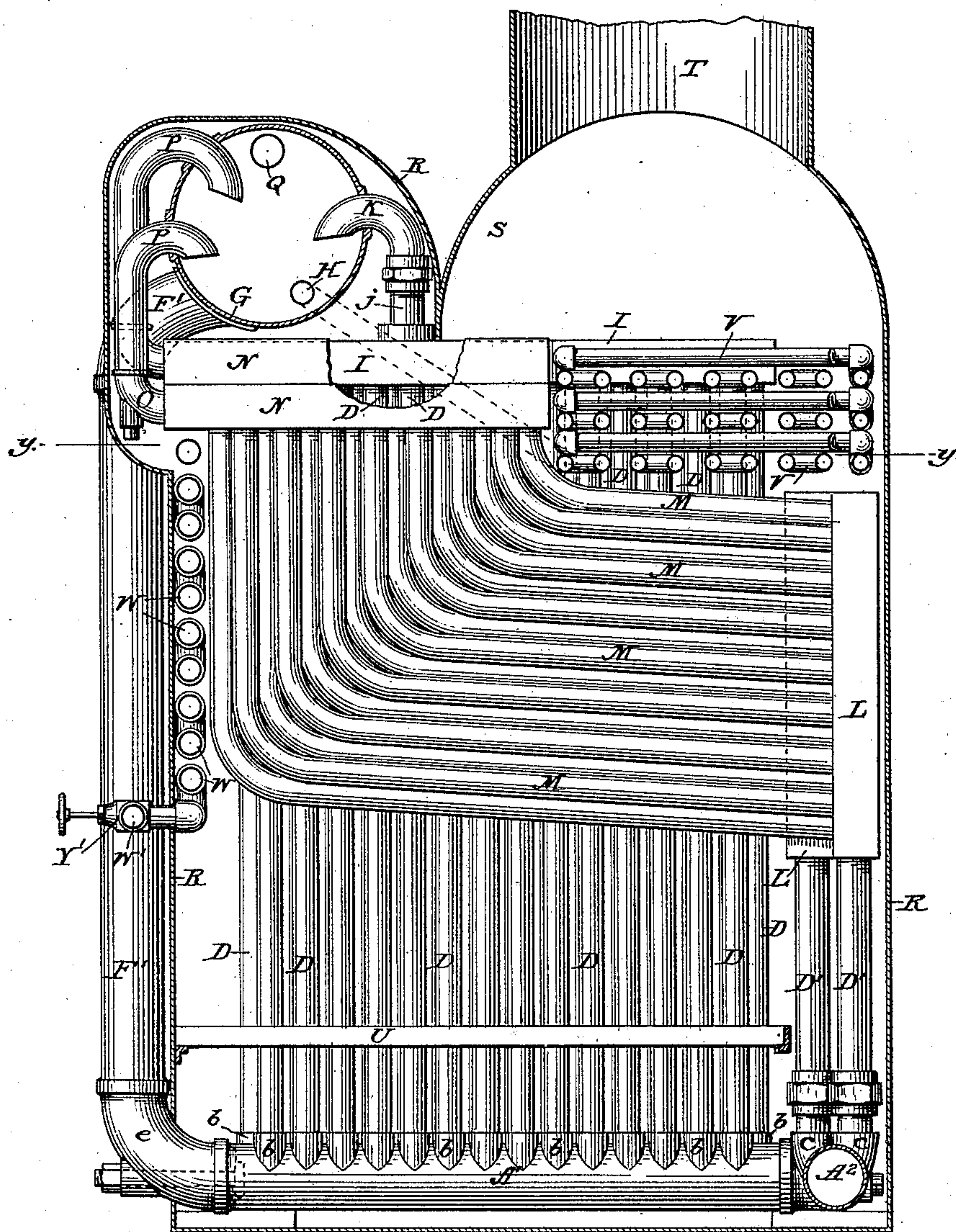
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Fig. 2.



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*Fig. 3.*

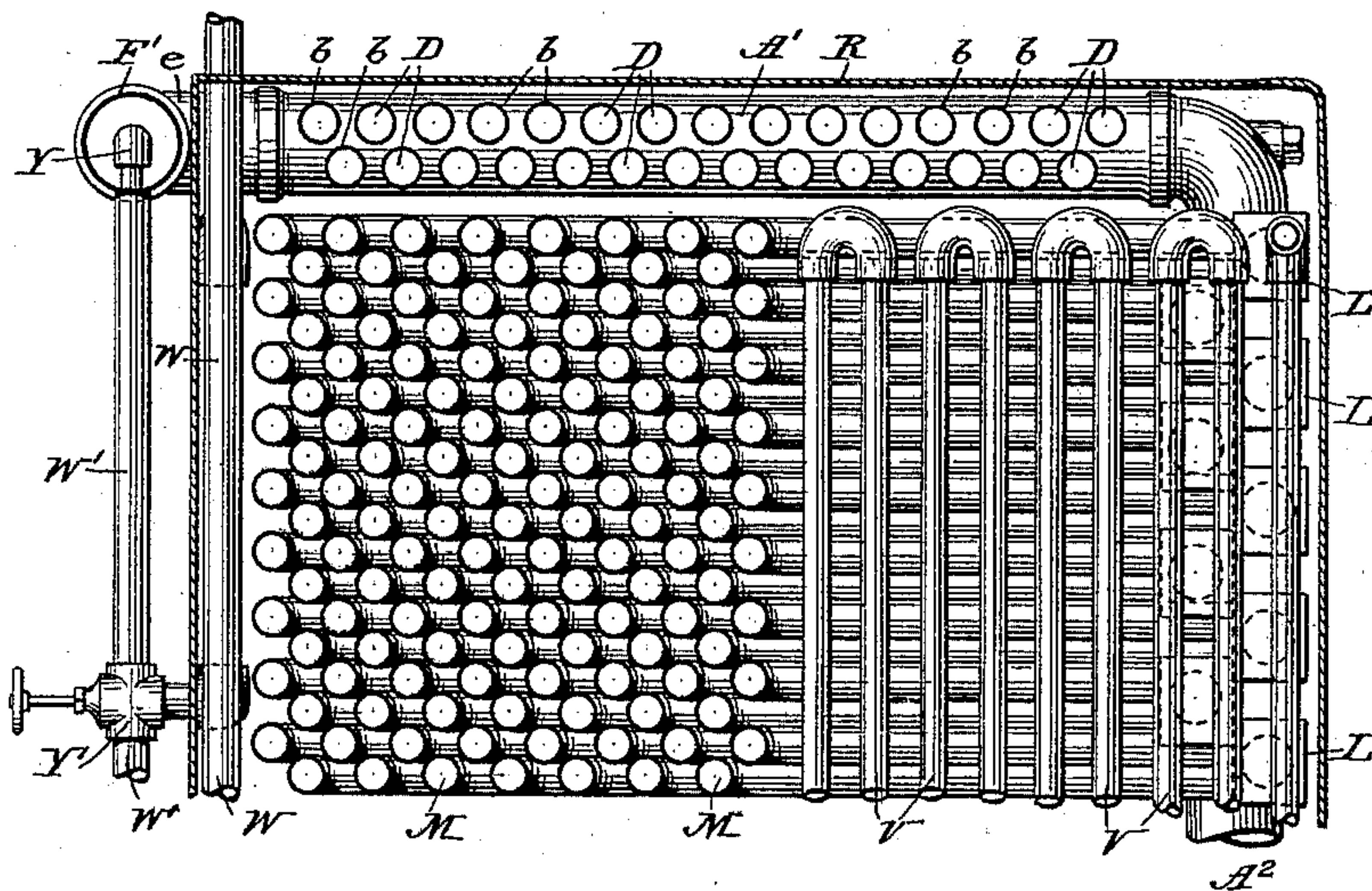
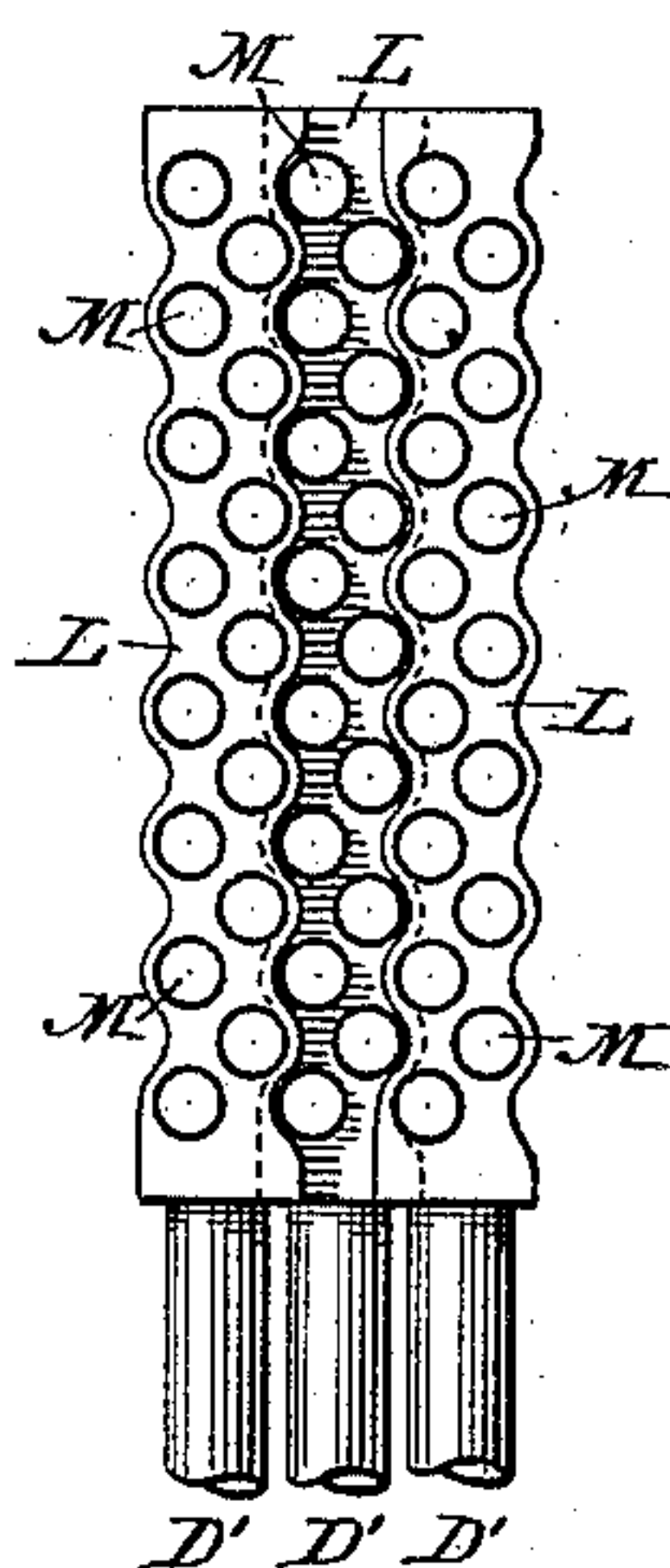


Fig. 4.



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# UNITED STATES PATENT OFFICE.

CHARLES L. SEABURY, OF NEW YORK, N. Y., ASSIGNOR TO THE GAS ENGINE  
AND POWER COMPANY, OF SAME PLACE.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 387,186, dated July 31, 1888.

Application filed November 18, 1887. Serial No. 255,461. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES L. SEABURY, of the city, county, and State of New York, have invented certain new and useful Improvements in the Construction of Steam-Boilers; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification, in which—

Figure 1 is a front elevation of the boiler with the front plate removed to expose the pipes therein. Fig. 2 is a vertical section in line *xx* of Fig. 1, showing one-half of the boiler only. Fig. 3 is a horizontal section in line *yy* of Fig. 2. Fig. 4 is an elevation of a portion of the upright manifolds, to which the rear ends of the bent heating-tubes are connected. Similar letters indicate like parts in all of the figures.

The object of my invention is to obtain within a given furnace area the largest possible heating-surface for converting the water admitted thereto into steam, and in such form as to admit of ready access to each and every part for repair or reconstruction; and it consists in the combination and arrangement in a furnace of a system of detachable and separable tubes and water-chambers, as hereinafter fully described.

In the accompanying drawings, A, A', and A<sup>2</sup> represent three large pipes, each fitted upon its upper side with a double row of threaded apertures (see at *bb*, Figs. 2 and 3) or nozzles, *c c*, (see Fig. 1,) to serve as manifolds for a series of vertical tubes, D D' D'. These three manifolds A, A', and A<sup>2</sup> are coupled together to constitute, respectively, the two sides and the rear end of a rectangular base for the boiler, and with the vertical tubes fitted thereto form a lining on the sides and rear for the ash-pit and fire-box of the furnace. The two side pipes, A and A', are each coupled at their front ends by elbows *ee* to upright stand-pipes F F' of the same diameter, whose upper ends are coupled, respectively, to the two ends of a steam drum or separator, G, mounted over the front end of the furnace parallel with the face thereof, as shown in Fig. 1.

A feed-pipe, H, from a suitable feed-pump or injector is fitted to the bottom of the drum or separator G, so that the water-supply for the boiler is delivered through said drum or separator, and flows thence down the two stand-pipes F and F', to pass through the manifolds A, A', and A<sup>2</sup> into the upright tubes D D' at the sides and rear of the fire-chamber. The upper ends of the side tubes, D D', are fitted to manifolds I, (see Fig. 2,) which are preferably rectangular in cross-section, and are mounted at the top of the furnace upon said side tubes and immediately under the drum G. Each of these lateral top manifolds is connected with the drum by a coupling-tube, *j*, terminating in a curved pipe, K, whose open end is bent downward within the drum, as shown in Fig. 2. The rear tubes, D' D', in the rear manifold, A<sup>2</sup>, at the back of the fire-chamber, are fitted each to the lower end of an upright manifold, L, which is made to reach from the top of the furnace to within a short distance of the grate-bars, the intervening space being merely sufficient to allow a proper height to the fire-chamber over the grate-bars. These upright manifolds are formed with rectangular ends. Their front and rear faces are made parallel; but their lateral faces are corrugated, as shown in Fig. 4, so that with one set of manifolds placed in the rear of the other the tubes projecting from the front faces of the rear set may pass out between the front set without changing the uniformity of the intervals between each horizontal tier of tubes. (See Fig. 4.)

A series of curved tubes, M M, are fitted to the front faces of these upright manifolds L L at the rear of the furnace, to extend thence forward in a nearly horizontal plane toward the front of the furnace, and, bending upward, are made to extend vertically to enter a series of manifolds, N N, the counterpart of the manifolds L L, which are mounted in two tiers in the top of the furnace, under its steam drum or separator G, as shown in Figs. 1 and 2. The lowermost series of the bent tubes M M extend from the rear quite to the front of the furnace and define the top of the fire-chamber. Each successive series of these bent tubes in order above the first are necessarily shorter than the one



below it, as shown in Fig. 2, and in this way the space between the top of the fire-chamber and the bottom of the separator is closely filled with these bent tubes, each connecting an up-  
 5 right manifold L at the rear of the furnace with a counterpart horizontal manifold N at the top.

Each of the top manifolds, N N, is connected with the separator G by a coupling-pipe, O, terminating in a curved pipe, P, entering the  
 10 separator, and fitted therein with its open end turned downward, as shown in Fig. 2, so that any water carried up with the steam through the tubes will be readily discharged into the  
 15 separator and the dry steam collected in the upper portion thereof to be discharged through a suitable delivery-pipe, Q.

The top and sides of the furnace are closed by a suitable casing, R, which is made to form  
 20 at the top a smoke-chamber, S, connecting with a flue or chimney, T, in the customary manner. The front of the furnace is also closed by a detachable plate, (not shown in the drawings,) in which are fitted the fire-doors and ash-  
 25 pit doors for the furnace.

The grate-bars U U are mounted, in the customary manner, at a level a little above the side pipes, A A', as shown in Figs. 1 and 2.

The space left in the upper rear portion of  
 30 the furnace above the bent tubes M M is utilized to receive a coil of pipes, V V, connected with the feed-pipe H and interposed between it and the pump or injector, to serve as a water-heater.

The joints of the elbows for the stand-pipes with the basal manifolds, as well as of the curved connections of the stand-pipes and of the top  
 35 manifolds with the separator, are secured each by means of a bolt extending outwardly through a seat in the elbow or bend, and having at its inner end a T-head adapted to engage a cross-bar within the pipe, (see dotted lines in Fig. 2,) so that the joints may be readily uncoupled by loosening the bolt.

Each of the top manifolds, N, is coupled separately from the others to a corresponding upright manifold by a series of pipes, so as to form one section, and each section is coupled to the drum G and to the basal manifold A<sup>2</sup> at  
 45 the rear independently of all the others, so as to admit of being separately detached and drawn out at the front of the furnace after the front plate is removed. In like manner either stand-pipe F or F', with the basal manifold A  
 50 or A', to which it is attached, may, after being uncoupled from the drum G and from the rear manifold, A<sup>2</sup>, be readily drawn out for inspection or repair independently of the rest of the boiler.

To facilitate the circulation from and to the drum G through the stand-pipes, manifolds, and heating-tubes, I contemplate fitting a coil, W, at the front of the furnace, inside of its front plate, to connect with a steam-pump, Z,  
 65 (see Fig. 1,) taking its supply from the drum G, and to communicate by branch pipes W'

W' with injectors Y Y, fitted within the stand-pipes F F', as shown in Fig. 1. The water forced into the coil W is converted therein  
 70 into steam, so that a much higher pressure is produced in said coil than in the pipes F F', whereby a powerful jet may be produced at each injector, which will force the circulation in the pipes. The operation of these injectors is controlled by means of a valve, Y'.  
 75

In the operation of the boiler the drum G is fed with a water-supply introduced through the heating-coil V V, placed in the upper rear portion of the furnace, and in which the water becomes heated by the waste heat escaping  
 80 from the furnace. From the drum G the water flows down through the stand-pipes F F' to the basal manifolds A A' A<sup>2</sup>, and thence up through the series of vertical tubes D D' and curved tubes M M, lining the sides and rear  
 85 and filling the upper portion of the furnace, and, being vaporized therein, is discharged into the drum or separator G in the form of steam and water, the water being automatically separated from the steam within said drum.  
 90

The products of combustion of the fuel upon the grate-bars U U pass up around the many tubes, which are all fully exposed to the heat thereof, and out of the smoke-stack T, being carried over the water-heating coil V after  
 95 leaving the boiler-tubes.

Since the several parts and sections of the boiler admit of being readily detached and removed, each in a measure independently of the other, in manner as described, the repair  
 100 or replacement of any part is readily effected.

I claim as my invention—

1. The combination, in a steam-boiler, of the basal manifolds A A' A<sup>2</sup>, connected and arranged to form a rectangle and inclose the  
 105 furnace, lateral manifolds I I, placed, respectively, above the two lateral basal manifolds A A' and parallel therewith, interposed vertical tubes D D, connecting said upper and lower lateral manifolds, a series of upright mani-  
 110 folds, L L, mounted vertically above the rear basal manifold, A<sup>2</sup>, vertical tubes D' D', connecting the upright manifolds severally with the rear basal manifold, A<sup>2</sup>, a series of horizontal manifolds, N N, placed between the two  
 115 upper lateral manifolds, a series of bent tubes, M M, connecting each of said horizontal manifolds with one of the upright manifolds L, a steam drum or separator mounted transversely above the upper manifolds, coupling-pipes  
 120 connecting separately each of the several upper manifolds with said drum, stand-pipes connected, respectively, with the front ends of the lateral basal manifolds A A' and with the bottom of the drum or separator, an outer  
 125 casing inclosing the entire set of tubes and manifolds, a chimney connected with the upper part of said casing, and a water-supply pipe and steam-discharge pipe connected with the steam-drum, all substantially in the man-  
 130 ner and for the purpose herein set forth.

2. The combination, in a steam-boiler, of a



series of sections, each constructed of two manifolds, L and N, arranged in a vertical plane at a right angle to each other and connected by a series of bent tubes, M M, a steam-drum 5 mounted transversely over the sections, a coupling-pipe connecting each horizontal manifold with said drum, a basal manifold, A<sup>2</sup>, placed transversely beneath the sections, a coupling tube or tubes, D' D', connecting the 10 lower end of each upright manifold L with said transverse basal manifold A<sup>2</sup>, and pipes, substantially as described, connecting said basal manifold with the drum, to permit a circulation through each of said sections, substantially in the manner and for the purpose 15 herein set forth.

3. The combination, with a stand-pipe, F, a drum, G, with which it communicates at its

upper end, and a system of heating-pipes, substantially as described, connecting the 20 lower end of said stand-pipe with said drum, of an injector, Y, fitted in said pipe, a steam-generating coil, W, to which said injector is connected and which is supplied from the drum G, and a pump, Z, interposed between 25 and connected to the coil and drum to produce a pressure within the coil, all substantially in the manner and for the purpose herein set forth.

In testimony whereof I have signed my name 30 to this specification in the presence of two subscribing witnesses.

CHAS. L. SEABURY.

Witnesses:

A. N. JESBERA,  
E. M. WATSON.