

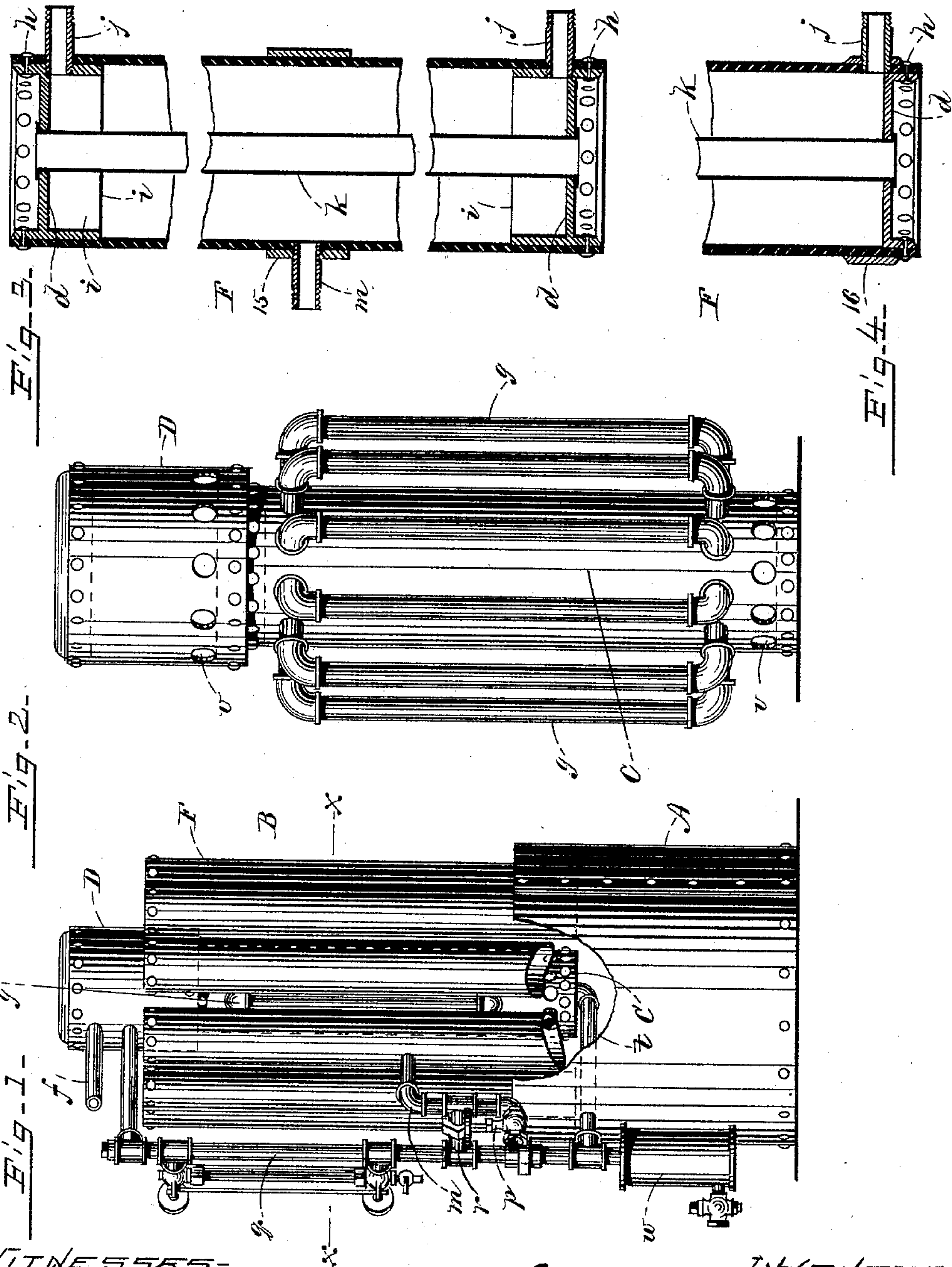
(No Model.)

2 Sheets—Sheet 1.

W. B. FOWLER.  
STEAM BOILER.

No. 462,975.

Patented Nov. 10, 1891.



WITNESSES:  
J. F. Eager  
S. C. Duffer

INVENTOR:  
Walter B. Fowler  
PER C. A. Shaw, Jr.  
ATTY.

(No Model.)

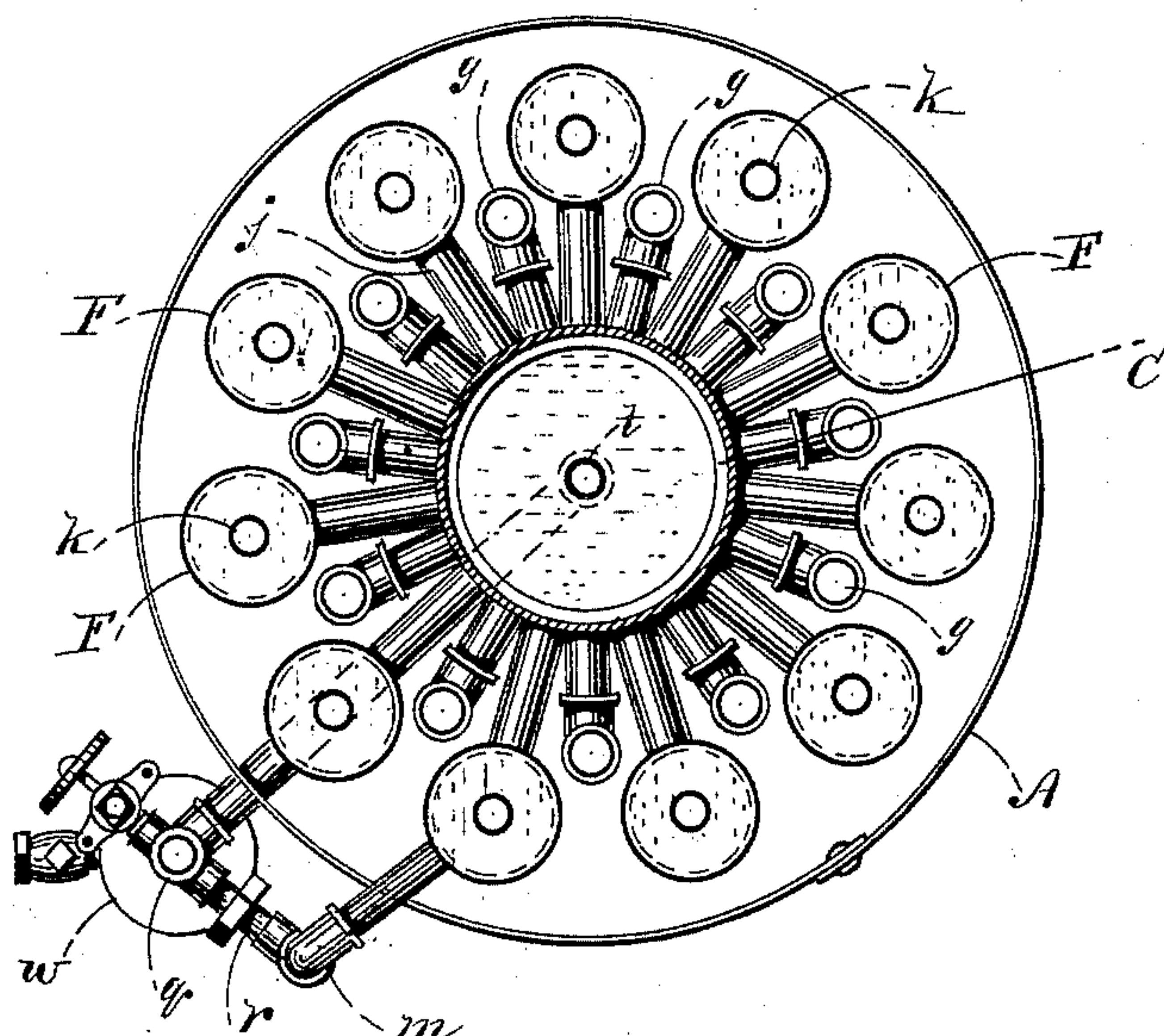
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Fig-5.



WITNESSES=  
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# UNITED STATES PATENT OFFICE.

WALTER B. FOWLER, OF LAWRENCE, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO LEWIS SAUNDERS, OF SAME PLACE.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 462,975, dated November 10, 1891.

Application filed May 23, 1891. Serial No. 393,895. (No model.)

*To all whom it may concern:*

Be it known that I, WALTER B. FOWLER, of Lawrence, in the county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a description sufficiently full, clear, and exact to enable any person skilled in the art or science to which said invention appertains to make and use the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is an elevation of my improved steam-boiler, a portion of the fire-box and tubes being broken away; Fig. 2, an elevation, enlarged, showing the inner circulation-tubes; Fig. 3, a vertical transverse section, enlarged, of one of the circulation-tubes, showing the method of attaching the heads and circulation-ducts; Fig. 4, a like view illustrating modification, and Fig. 5 is a horizontal section taken on line *xx* in Fig. 1.

Like letters and figures of reference indicate corresponding parts in the different figures of the drawings.

My invention relates especially to vertical boilers for marine engines, it being designed to enable extremely light material to be employed in the construction of the boiler-tubes to effect rapid generation; and it consists in certain novel features, hereinafter fully set forth and claimed, the object being to produce a simpler, cheaper, and more effective device of this character than is now in ordinary use. The nature and operation of the improvement will be readily understood by all conversant with such matters from the following explanation:

In the drawings, A represents the fire-box, and B the boiler considered as a whole.

The boiler comprises a central or body portion C, which is arranged vertically in the fire-box and which has its lower end closed by an inwardly-depressed head *d*, of the form shown in Fig. 3 and hereinafter described.

On the top of the cylinder C a steam-chest D is mounted, into which said cylinder opens, and from said chest a steam-discharge pipe *f* leads. Vertical supplemental circulation-tubes *g* are arranged around the body C and enter the same near its top and bottom.

Arranged in a circle around the body C and alternating with the supplementary pipes *g* there is a series of vertically-arranged circulation-tubes F. (Shown in detail in Fig. 3, and described and claimed in my application for United States Letters Patent for improvements in boiler-tubes filed May 23, 1891, Serial No. 393,894.) These tubes are of such length that they overlap the steam-chest slightly. Each tube comprises a metallic cylinder having its ends closed by inwardly-depressed heads *d*, secured by rivets *h* in said cylinder. Each head *d* is provided with an inwardly-projecting annular flange *i*, which re-enforces that portion of the cylinder. Horizontal ducts *j* are turned into the cylinder through said flange and open flush with the heads *d*. Said re-enforcing flange enables very light material to be employed in constructing the body of the cylinder and prevents the same from breaking where the ducts are tapped in. Draft-tubes *k* connect centrally through the heads *d*.

One of the tubes F is tapped centrally by a pipe *m*, through which the water-supply is pumped into the boiler. Said pipe is provided with a cock *p*.

A gage-pipe *q* taps the chest D and is connected by a branch *r* with the supply *m*. Said pipe *q* is also connected by a branch *t* with the main cylinder C, said branch passing centrally through the head *d* of said cylinder. Ports *v* open into said cylinder flush with said head and into the chest D to receive the horizontal circulation-ducts *j*, whereby the tubes F are mounted on the body.

A trap *w* is connected with the lower end of the pipe *q* for receiving refuse from the boiler.

To re-enforce the tube F, which is tapped by the supply *m*, a collar 15 is shrunk onto said tube and said port tapped therethrough. Instead of said collar a re-enforcing ring may be disposed within the tube F and effect the same result as the head-flange *i*, if desired. Said flanges *i* may be omitted from the head *d*, as shown in the modification illustrated in Fig. 4, and the tube re-enforced at its ends by a collar 16, shrunk onto the outer side.

The boiler is filled by water pumped into the supply *m*. Fire being started in the fire-box, the water in the body C circulates through



the tubes *g* and between said body and the tubes *F*, also through the pipes *t q* into the chest *D*. A large surface is exposed to the action of the heat, and by the peculiar construction described very light material can be employed in forming the tubes, enabling the water in the boiler to be rapidly heated.

Having thus explained my invention, what I claim is—

10 1. A vertical boiler comprising a cylindrical body closed at one end and enlarged at the opposite end to form a steam-chest, a series of circulation-pipes opening into opposite ends of said body, a series of circulation-tubes hav-  
15 ing their ends closed by inwardly-depressed heads connected by draft-tubes, and horizontal ducts flush with said heads and opening, respectively, into said chest and the lower end of said body, all being combined and arranged  
20 substantially as described.

2. A vertical boiler comprising a cylindrical body, a steam-chest at one end thereof, supplemental water-pipes opening at both ends into said body, vertical circulation-tubes ar-  
25 ranged around said body, horizontal ducts connecting said tubes with the chest and body, a supply for said tubes, a discharge for said

chest, and pipes connecting the body, supply, and chest, substantially as specified.

3. A fire-box, in combination with a vertical boiler mounted therein and comprising a main cylinder provided with a steam-chest, circulation-tubes opening into said chest and cylinder, flues connecting the heads of said tubes, a supply opening into one of said circulation-  
35 tubes, a discharge for said chest, and pipes connecting said chest and supply and the main cylinder, substantially as described.

4. The cylinder *C* and chest *D*, in combination with the tubes *g*, opening into said cylinder, the tubes *F*, having inwardly-depressed heads connected by draft-tubes and re-enforcing bands or flanges, ducts opening into said tubes flush with said heads and connecting, respectively, with said cylinder and chest, the  
45 supply *m* for said tubes, the discharge *f* for said chest, and the pipes *q t*, connecting said chest and supply with the main cylinder, substantially as described.

WALTER B. FOWLER.

Witnesses:

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KATHARINE DUFFEE.