

(No Model.)

3 Sheets—Sheet 1.

E. MAKIN, Jr.
STEAM BOILER FOR MARINE ENGINES.

No. 599,854.

Patented Mar. 1, 1898.

FIG. 2.

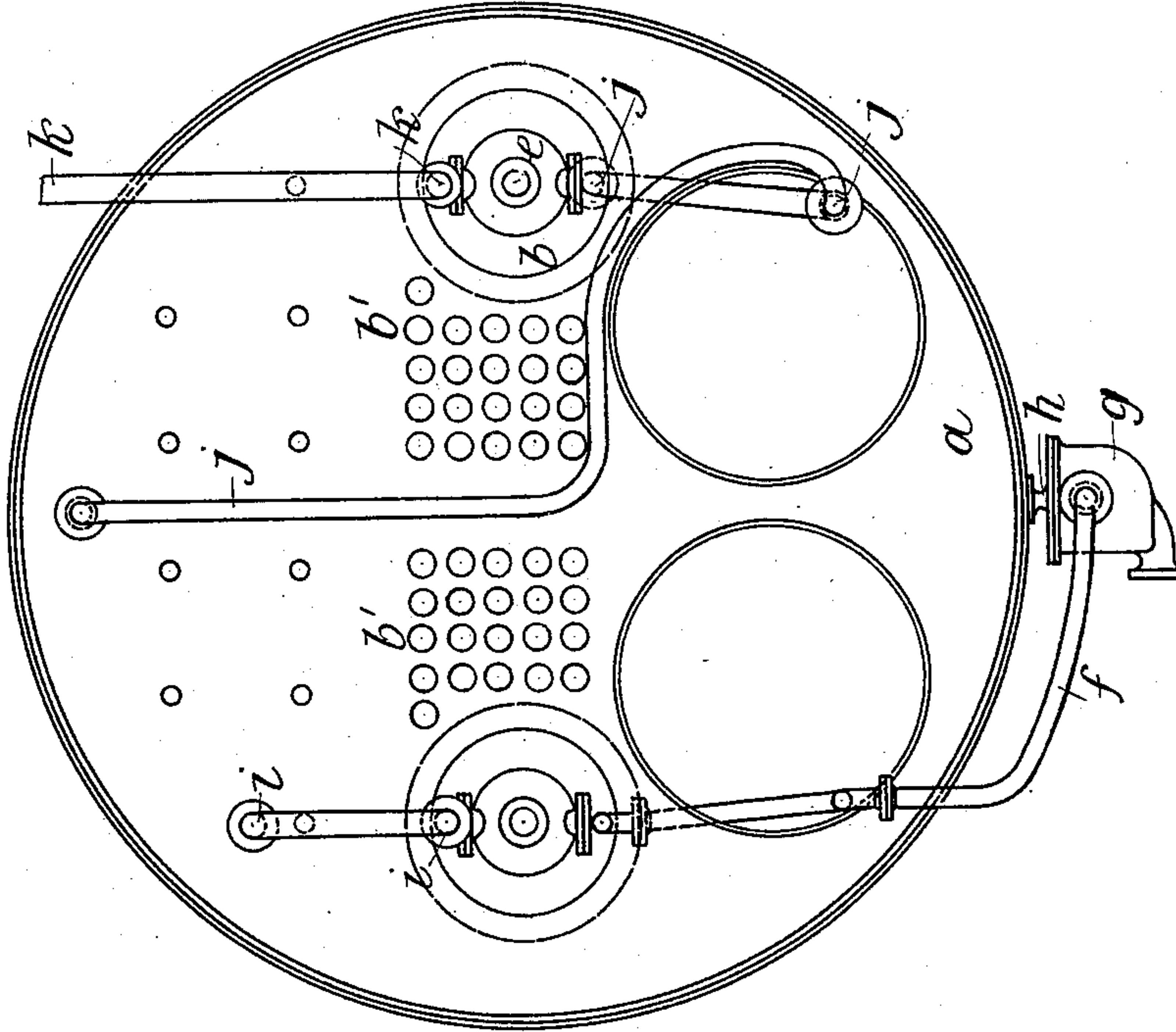
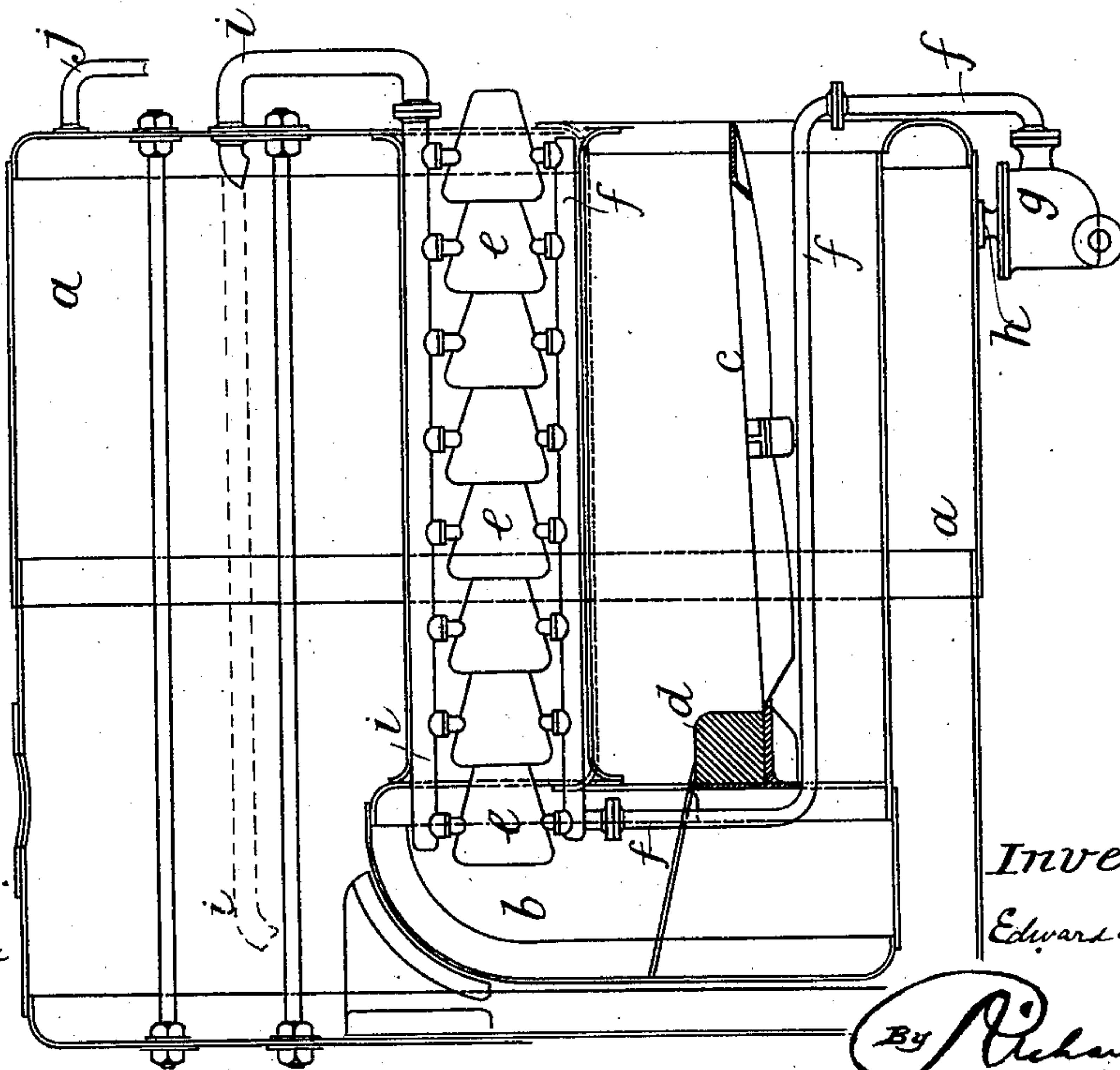


FIG. 1.



Witnesses:
E. R. Kotton
[Signature]

Inventor:
Edward Makin Jr.

By [Signature]
his Attorneys.

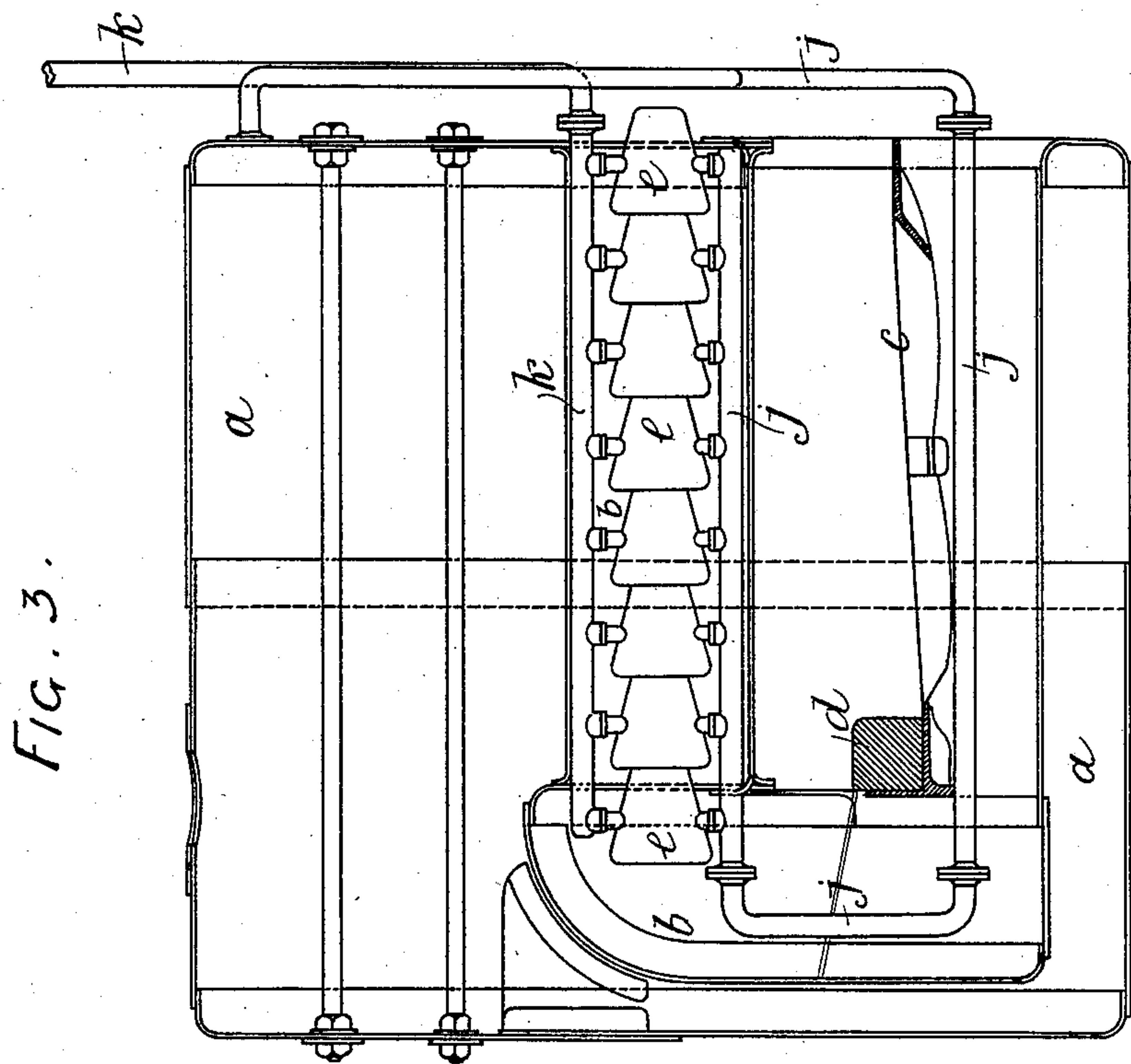
(No Model.)

3 Sheets—Sheet 2.

E. MAKIN, Jr.
STEAM BOILER FOR MARINE ENGINES.

No. 599,854.

Patented Mar. 1, 1898.



Witnesses:

E. R. Bolton

Edmund

Inventor.

Edward Makin Jr.

By *Richardson*
his Attorneys.

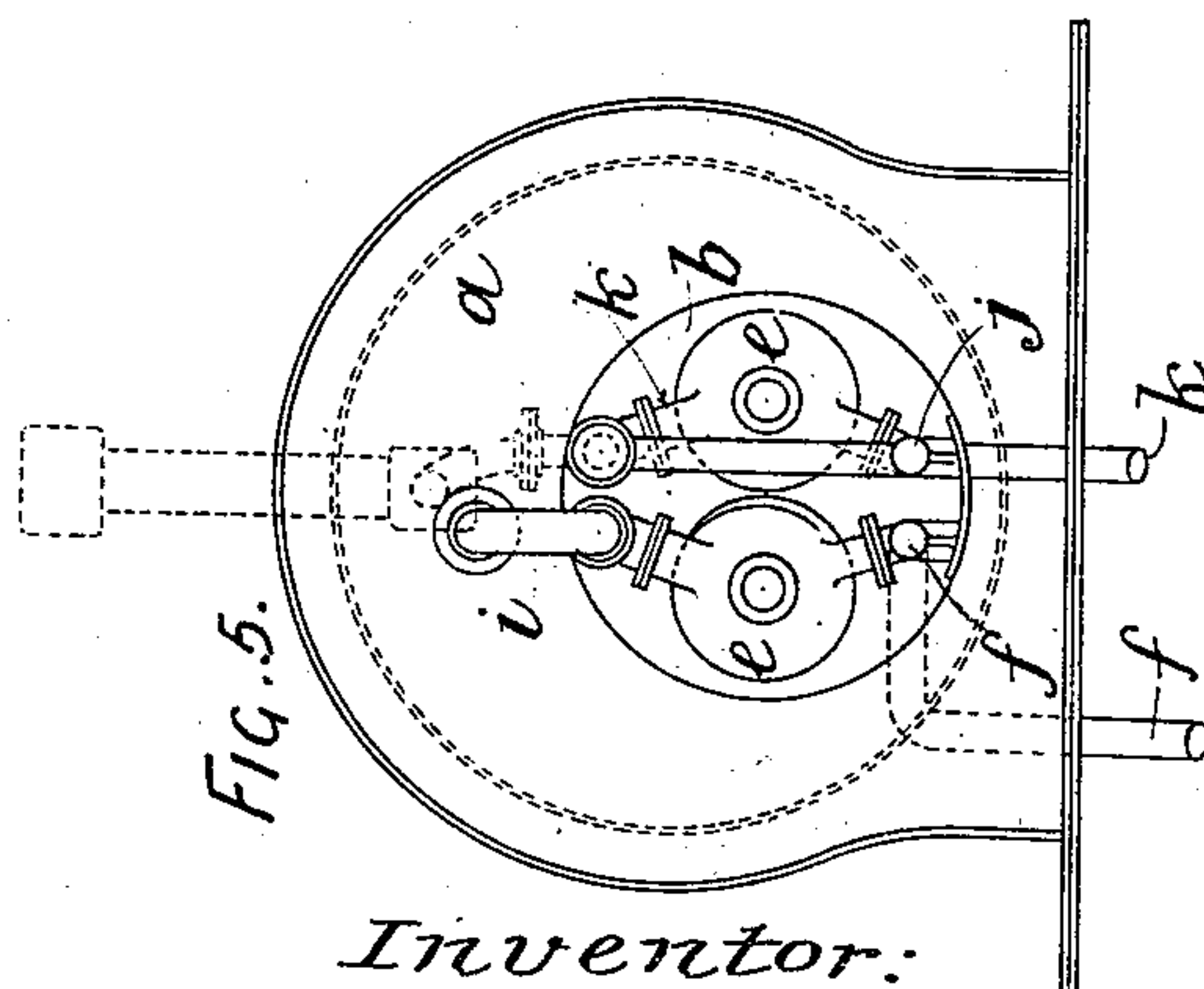
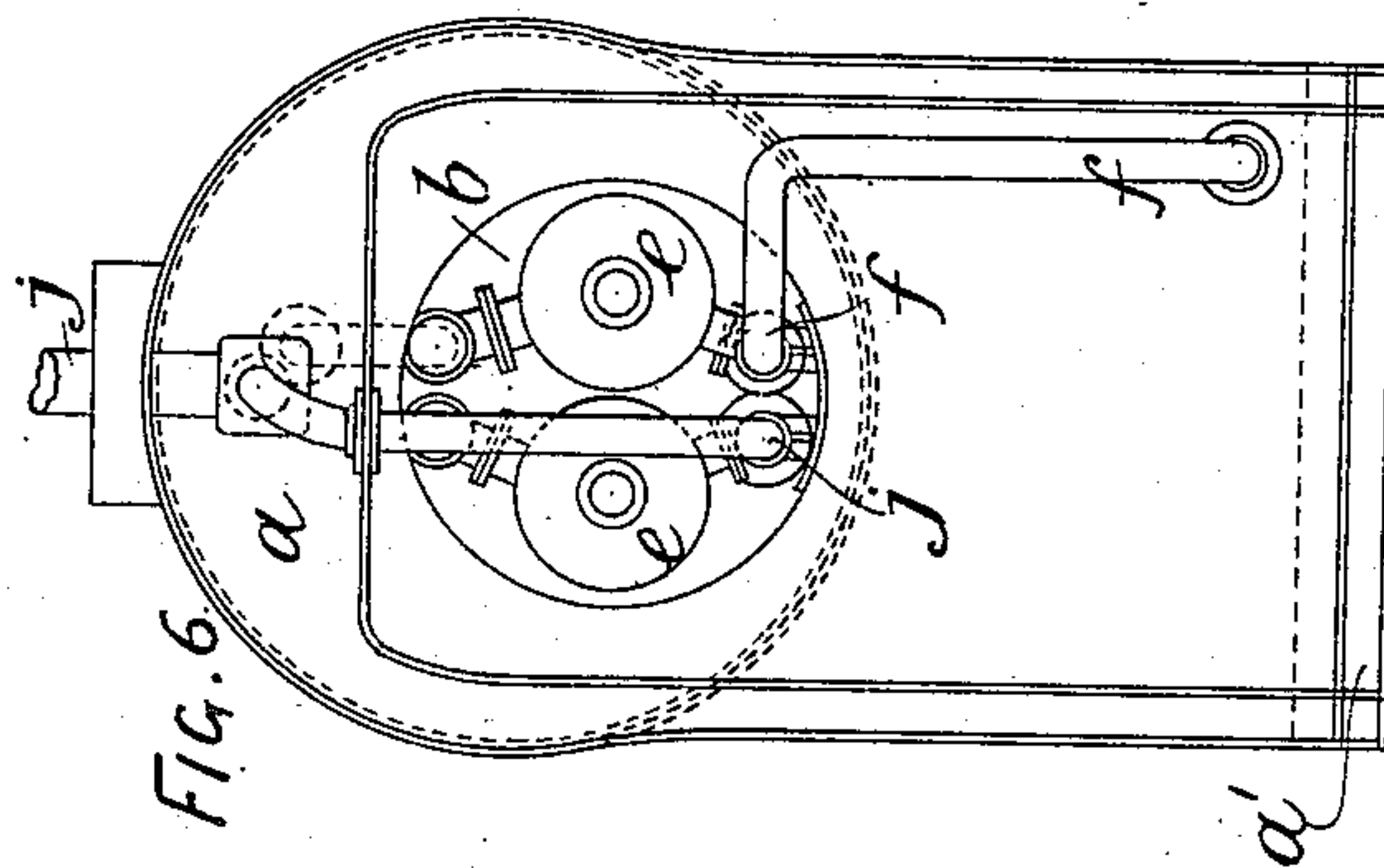
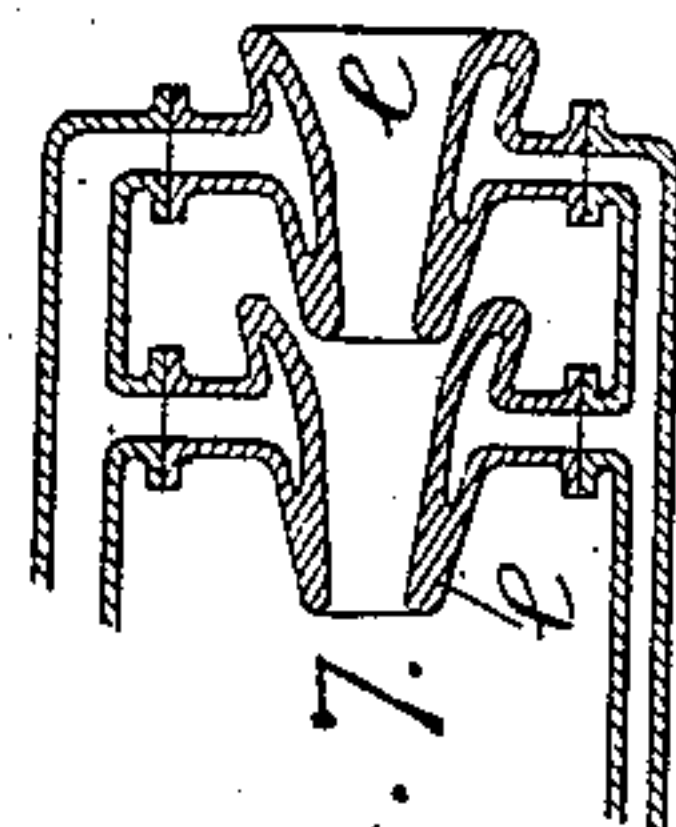
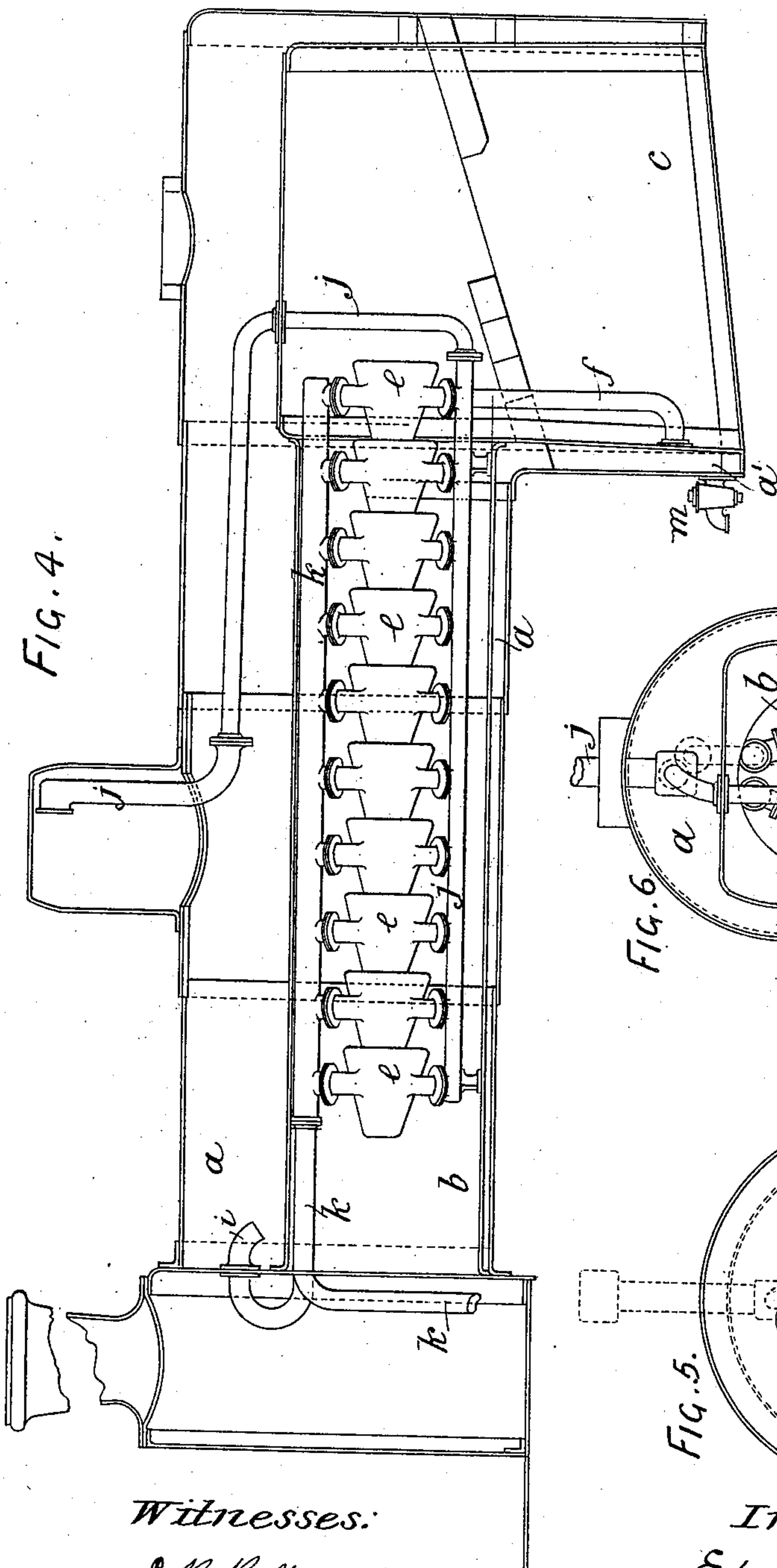
(No Model.)

3 Sheets—Sheet 3.

E. MAKIN, Jr.
STEAM BOILER FOR MARINE ENGINES.

No. 599,854.

Patented Mar. 1, 1898.



Witnesses:

E. R. Bolton

Attorney

Inventor:

Edward Makin Jr.

By Richard

his Attorneys.

UNITED STATES PATENT OFFICE.

EDWARD MAKIN, JR., OF MANCHESTER, ENGLAND.

STEAM-BOILER FOR MARINE ENGINES.

SPECIFICATION forming part of Letters Patent No. 599,854, dated March 1, 1898.

Application filed May 20, 1897. Serial No. 637,393. (No model.) Patented in England August 6, 1896, No. 17,358.

To all whom it may concern:

Be it known that I, EDWARD MAKIN, Jr., a subject of the Queen of Great Britain, and a resident of 40 New Brown street, Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Steam-Boilers for Marine Engines, Locomotive, Tramway, and Road Engines and the Like, (for which I have obtained Letters Patent in Great Britain, No. 17,358, bearing date August 6, 1896,) of which the following is a specification.

My invention relates to improvements in steam-boilers of the type in which the furnace-gases usually pass through a series of tubes; and the chief objects of my improvements are to enable steam to be raised more quickly than in an ordinary boiler of this type, to prevent formation of scale, to superheat the steam, and generally to increase the power and efficiency of the boiler.

In applying my improvements to a boiler of the type indicated I substitute for some or all of the ordinary smoke-tubes any suitable number of tubes or flues of a larger diameter—namely, of such a size that I can apply in each tube or flue a steam-generating apparatus, consisting of a series of any convenient number of hollow-walled vessels of any suitable shape or form, but preferably a series of conical hollow-walled shells arranged, preferably, with their larger ends toward the furnace and preferably with the larger end of each shell overlapping the smaller end of the previous one, but without touching it, so as to leave a passage for the furnace-gases between, around, and through the shells, in order that as large a surface as possible may be exposed to the action of the heated gases.

The hollow-walled vessels are supplied with water from the boiler or from any convenient feed, and the vessels are preferably all connected together by circulating pipes or passages and to the steam or water space of the boiler or steam-separating vessel. In the same flue or in a separate flue I arrange similar apparatus for the purpose of superheating the steam, which is supplied at the inlet end from the steam-space in the boiler or steam-separating vessel and is delivered at the outlet end of the superheating apparatus to the cylinder of the engine or elsewhere, as required.

In the accompanying three sheets of drawings, Figures 1 and 3 are longitudinal sectional elevations of a marine or similar boiler fitted with my improved steam-generating apparatus, Fig. 1, and steam-superheating apparatus, Fig. 3; and Fig. 2 is a front elevation of the same. Fig. 4 is a longitudinal sectional elevation of a locomotive or similar boiler fitted with my improved steam-generating and steam-superheating apparatus. Figs. 5 and 6 are end elevations of the same, and Fig. 7 is a sectional detail of the preferred form of hollow-walled shells employed in both types of boilers.

Referring first to the marine type of boiler illustrated by Figs. 1 to 3, *a* designates the shell of the boiler; *bb*, the two furnace-flues, which I substitute for all (or in this case some) of the small smoke-tubes *b'*; *c*, the furnace fire-bars; *d*, the bridge, and *e* the two series of hollow-walled conical shells. (Shown also in the sectional detail, Fig. 7.)

The series of hollow-walled cones *e* in the left-hand flue *b* (shown in the longitudinal section, Fig. 1,) are for steam-generation and are supplied with water through a feed-pipe *f*, connected to a mud-drum *g*, in communication through a pipe *h* with the boiler *a*. Each of the hollow-walled cones *e* is connected by branches to the feed-pipe *f* and also to a discharge or delivery pipe *i*, which is connected to the boiler, preferably at or about the water-level. In like manner the series of hollow-walled cones *e* in the right-hand flue *b* (shown in section, Fig. 3) are for steam-superheating and are supplied with steam through a pipe *j*, connected to the steam-space of the boiler *a*. Each of the cones *e* is connected by branches to the steam-supply pipe *j* and also to a steam-delivery pipe *k*, by which the steam is conveyed to the engine-cylinder. (Not shown in the drawings.) In this arrangement some of the heated gases from the furnace pass through the ordinary smoke-tubes *b'*, but the remainder and greater portion pass along the large flues *b*, between, around the outsides, and through the space inside the hollow-walled vessels *e*, within the walls of which in one case steam is rapidly generated and in the other case the steam is superheated.

As already stated, I may dispense with all

the smoke-tubes *b'*, or I may retain part, as shown, or I might retain all and place the series of hollow-walled vessels *e* in the fire-box, or as a further alternative I might dispense
5 with some or all of the smoke-tubes and place the hollow-walled vessels *e* in the fire-box as well as in the flues *b*.

The arrangement of boiler of the locomotive type illustrated by Figs. 4 to 7 is practically the same as that already described;
10 but instead of placing the two series of hollow-walled cones *e* in separate flues they are in this arrangement preferably placed in one and the same flue *b*. Also in place of having
15 a separate mud-drum *g* the space *a'* is used as a sediment or depositing chamber and a blow-off cock *m* applied thereto, the feed-pipe *f* being preferably connected to the side of the boiler immediately above the space *a'*.
20 The remaining parts correspond with those bearing similar letters and which have already been described with reference to Figs. 1 to 3.

As already stated, I may employ hollow-

walled vessels of any other suitable shape or
form, and I may connect each vessel separately
to the water-space of the boiler below and to
the steam or water space of the boiler above. 25

Having now particularly described and as-
certained the nature of my said invention and
in what manner the same is to be performed,
I declare that what I claim, and desire to se-
cure by Letters Patent of the United States,
is— 30

In combination with the boiler, a steam-
generator comprising a series of hollow-walled
cones with pipe connections, and a steam-
superheater comprising a series of hollow-
walled cones with pipe connections, said gen-
erator and superheater being confined within
a fire tube or tubes, substantially as described. 35 40

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

EDWARD MAKIN, JUNIOR.

Witnesses:

S. D. GILLET,

HERBERT R. ABBEY.