H. C. DAVIS.

FEED WATER HEATER, EVAPORATOR, AND THE LIKE.

APPLICATION FILED MAR. 21, 1917.

1,278,311. Patented Sept. 10, 1918.

2 SHEETS—SHEET 1.

Fig. 1.

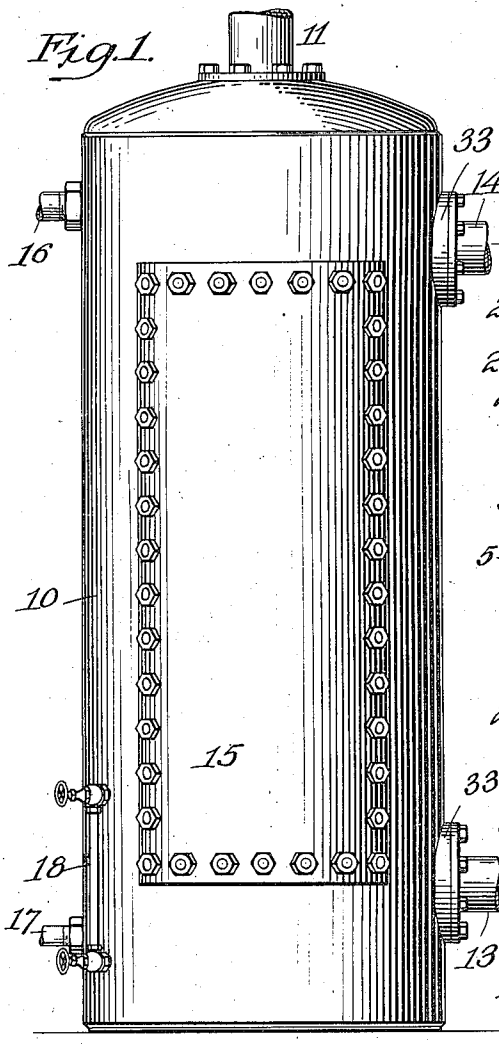
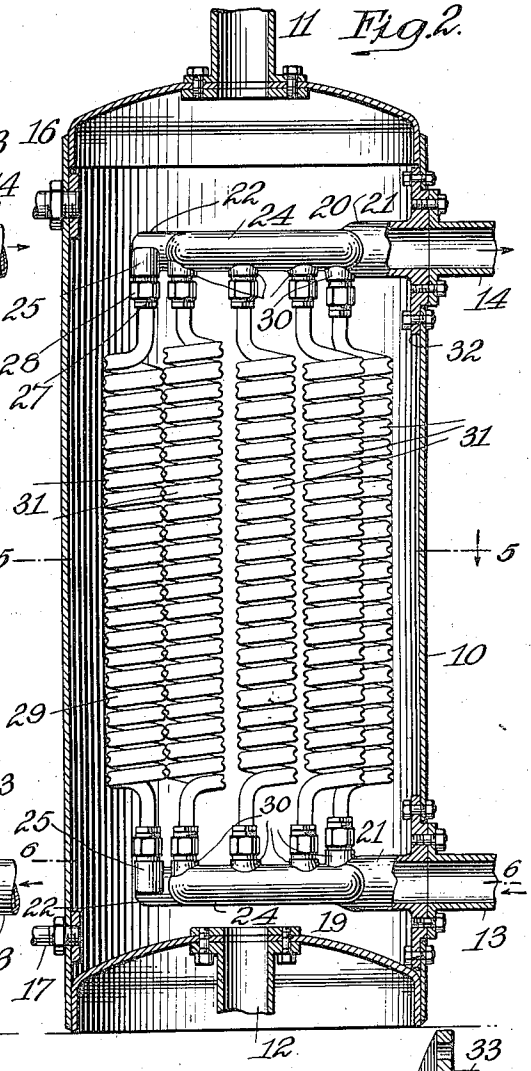


Fig. 2.



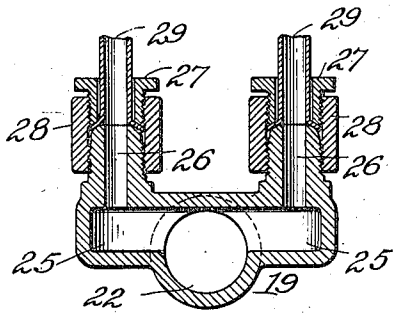


Fig. 3.

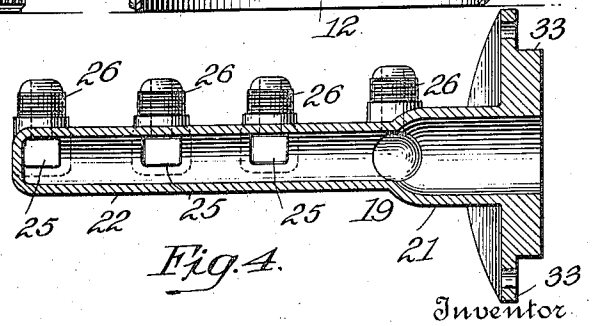


Fig. 4.

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2 SHEETS—SHEET 2.

Fig. 5.

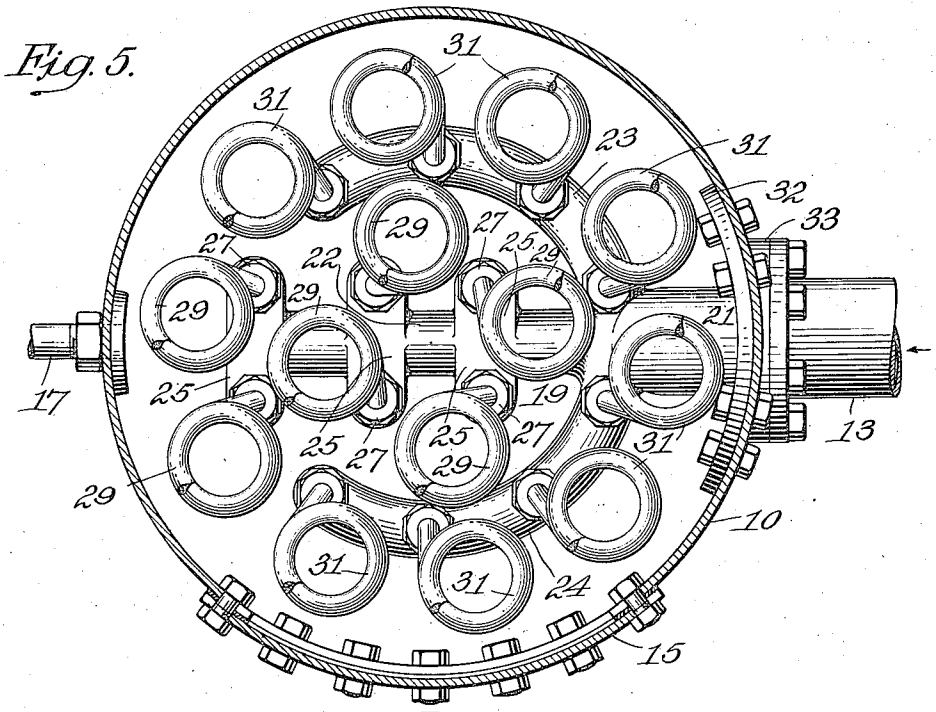
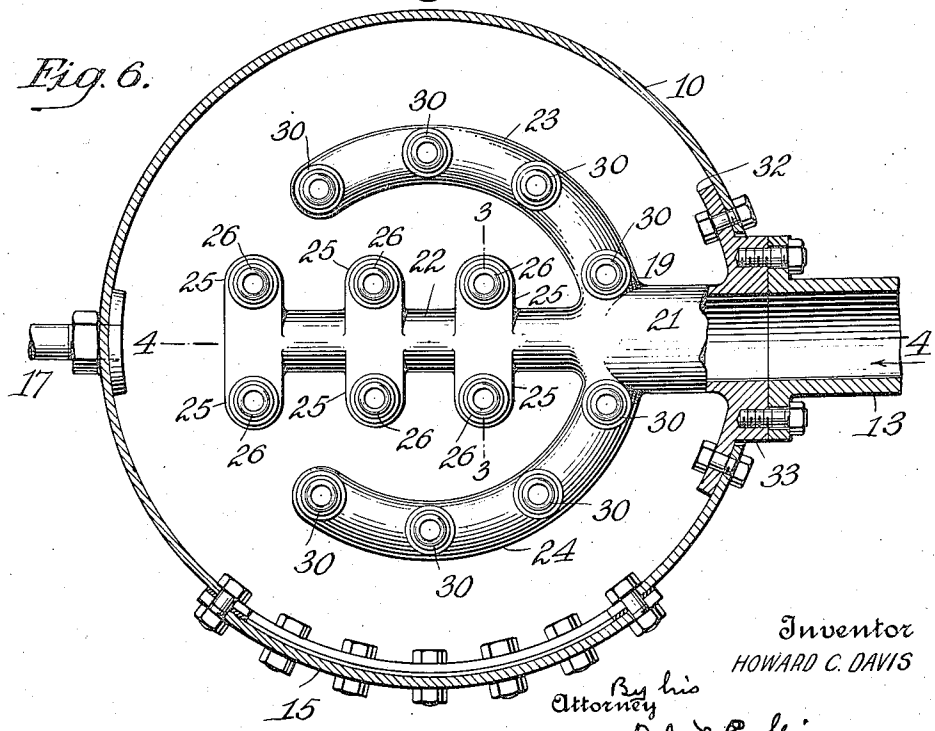


Fig. 6.



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UNITED STATES PATENT OFFICE.

HOWARD C. DAVIS, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO AMERICAN MARINE EQUIPMENT CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

FEED-WATER HEATER, EVAPORATOR, AND THE LIKE.

1,278,311. Specification of Letters Patent. Patented Sept. 10, 1918.

Application filed March 21, 1917. Serial No. 156,265.

To all whom it may concern:

Be it known that I, HOWARD C. DAVIS, a citizen of the United States, and a resident of Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Feed-Water Heaters, Evaporators, and the like, of which the following is a specification.

The invention pertains more particularly to feed-water heaters, and the object of the invention is to provide a highly efficient feed-water heater adapted to receive and permit the passage though it of exhaust-steam for thereby imparting heat therefrom to feed water passing through coils arranged within the shell of the heater and exposed to the steam.

I present my invention herein as embodied in a feed water heater adapted to receive all of the exhaust-steam from the hoisting-engines, pumps, steering-engines and other auxiliary engines to be found on modern steamships and to utilize the same in heating the water fed to the boilers.

One special purpose of the invention is the provision of improved manifolds to which the aforesaid coils are connected, one serving as the inlet and the other the outlet for the feed-water. Manifolds for this class of feed water heaters have been of various formation and frequently of complication and some of them have been in flanged sections bolted together. The manifolds of my invention are of special construction and insure not only a free flow of the water and the accommodation of as many coils as may be necessary, according to the size of the heater and manifolds, but may each be made in one integral casting of reliable and durable character, the construction presented by me tending to eliminate defects in the manifolds arising during the casting processes and especially "cold shuts" at portions of the manifolds at which, when they occur, the manifold is weak and defective although at times not visibly appearing to be so. The term "cold shuts" is one used by foundrymen to indicate defects in hollow castings at points at which the metal has not with the same uniformity as at other parts of the casting formed itself to create the required wall with respect to thickness or strength.

The manifolds of my invention may be of either cast iron or bronze and each in one integral piece, and each preferably comprises a central branch extending transversely of the heater and segmental branches at opposite sides thereof following the segmental outline of the shell of the heater, the several branches being at one end integral with a body portion fastened to said shell and at the other end free of one another, and said body portion being hollow and serving for one manifold as the inlet and for the other manifold as the outlet.

The invention will be fully understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, in which:

Figure 1 is a front elevation of a feed water heater embodying my invention;

Fig. 2 is a central vertical section through the same, with the coils and manifolds or headers mainly in side elevation;

Fig. 3 is a vertical transverse section through the lower manifold or header taken on the dotted line 3—3 of Fig. 6, a portion of the coils and their connections being shown in section;

Fig. 4 is a detached vertical longitudinal section through the lower manifold or header taken on the dotted line 4—4 of Fig. 6;

Fig. 5 is a horizontal section through the apparatus taken on the dotted line 5—5 of Fig. 2, and

Fig. 6 is a horizontal section, partly broken away, through the apparatus, taken about on the dotted line 6—6 of Fig. 2, the coils being omitted.

In the drawings, 10 designates the shell of the heater, 11 the exhaust-steam inlet to said shell, 12 the outlet therefrom, 13 an inlet pipe connection for the feed-water, 14 an outlet pipe connection for the feed-water 15 a removable door provided on the shell 10, as usual, 16 a connection for a safety and vacuum breaking valve, 17 a drain outlet connection, and 18 a water gage, all of the features just enumerated being of known character.

Within the shell 10 I provide corresponding lower and upper manifolds 19, 20. The manifold 19 is connected with the inlet 13 for feed-water, and the manifold 20 is connected with the outlet 14 for the heated feed-water, and each of these manifolds comprises a hollow body portion 21, a

branch 22 extending directly therefrom transversely of the shell 10, and segmental or arcuate branches 23, 24, extending laterally from opposite sides of the body portion 21 and preferably following the general curved outline in cross-section of the shell 10. The branches 22 are formed with oppositely projecting extensions 25 having or supplied with nipples 26, of known character, to which by means of bushings 27 and threaded sleeves or nuts 28, the ends of the coils 29 are securely connected. The branches 23, 24 on their facing sides are formed or supplied with nipples 30, similar to the nipples 26 aforesaid, and to these nipples by bushings and sleeves or nuts of the character shown in Fig. 3, are connected the ends of the pipe coils 31, these nipples, bushings and nuts being of known character in this art. The body portions 21 of the manifolds are formed with flanges 32 which engage and are bolted to the shell 10, and with hubs 33 which project through openings in the shell 10 and have bolted to them the flanges of the inlet and outlet connections 13, 14.

The inlet and outlet connections 13, 14 are in line with the body portions 21 of the manifolds, and the branches 22 of said manifolds are in line with said body portions 21, while the branches 23 curve laterally in opposite directions correspondingly therefrom. The body portions 21 are of greater cross-sectional area than the branch 22 or either of the branches 23, 24 of the manifolds. The branches of the manifolds, except where they unite at one end with the body portion 21, are separate from one another, and they have terminal outer end portions, which feature is of advantage in securing reliable castings devoid of "cold shuts." It is also of advantage that the manifolds may each be formed in one integral piece, each manifold being a duplicate of the other manifold, and one manifold when installed having its nipples projected upwardly, while the other manifold when placed in position has its nipples projected downwardly. The integral manifolds are of very durable and reliable character, and when constructed on the outlines described said manifolds insure a uniform and free flow of the liquid to and from the coils. The construction of manifolds presented herein also admits of the presence in the heater of a suitable number of the coils, according to requirements and the size of the heater. The heater illustrated in the drawings may be regarded as of medium size, having fourteen coils, as compared with larger heaters having sixty coils and smaller heaters having eight coils. In an eight coil heater the branch 22 is equipped with two coils and the branches 23, 24 with three coils each; and in a sixty coil heater the branch 22 is equipped with twenty coils, and the branches 23, 24 and body portion 21 with forty coils, nipples being provided at each side of the branches 23, 24 and at each side and along the middle of the branch 22. The nipples are sometimes cast integrally with the manifolds and at other times tapped into the manifolds, according to known practice.

In the operation of the heater, the water is pumped through the inlet 13 into the lower manifold 19, through which it circulates, and thence passes upwardly through the coils 29, 31, into the upper manifold 20, whence the heated water escapes through the outlet 14 leading to the boilers, while at the same time the exhaust-steam entering through the pipe 11 fills the heater and imparts its heat to the manifolds and coils and to the feed water passing through the same, the exhaust from the heater being through the outlet or drain 12.

It is preferable in the use of the apparatus to cause the feed water to flow upwardly through the piping to the outlet 14, but obviously the construction would remain the same if the liquid were caused to flow downwardly through the pipes or coils, under which condition the connection 13 would be the outlet.

I do not limit my invention to its use in connection with exhaust steam, nor to use on shipboard. Nor do I limit the invention to the employment thereof as a feed-water heater only, since this apparatus may also be used for other purposes, as, for illustration, an evaporator in which employment of the apparatus exhaust or other steam will be caused to pass through the coils 29, 31 and the water to be evaporated will be admitted to and partly fill the shell 10, the vapor passing off through the pipe connection 11. Should the apparatus be used as a condenser, the vapor could be passed through the coils and a condensing liquid supplied to the shell 10. I have designed the apparatus more particularly for use as a feed-water heater.

What I claim as my invention and desire to secure by Letters-Patent, is:

1. Apparatus of the character described, comprising a shell having suitable pipe connections, and inlet and outlet manifolds connected by piping and secured to said shell, said manifolds each being in one integral piece and having a body portion, a flange at the outer end thereof adapted to engage the inner wall of the shell and a hub portion projecting through an opening in the shell to receive a pipe connection, and said body portion at its inner end having a branch extending therefrom transversely of the shell and branches extending at opposite sides of said transverse branch.

2. Apparatus of the character described,

comprising a shell having suitable connections, and inlet and outlet manifolds connected by piping and secured to said shell, said manifolds each comprising a body portion, a branch extending therefrom transversely of the shell and having short branches extending from its opposite sides, and branches extending at opposite sides of said transverse branch and on segmental lines substantially following the cross-sectional outline of the shell.

Signed at New York city, in the county of New York, and State of New York, this 20th day of March, A. D. 1917.

HOWARD C. DAVIS.

Witnesses:

ARTHUR MARION,

CHAS. C. GILL.