

No. 606,847.

Patented July 5, 1898.

W. T. SYLVEN.  
MARINE BOILER.

(Application filed Jan. 6, 1896.)

(No Model.)

Fig. 2.  
Online 2.2.

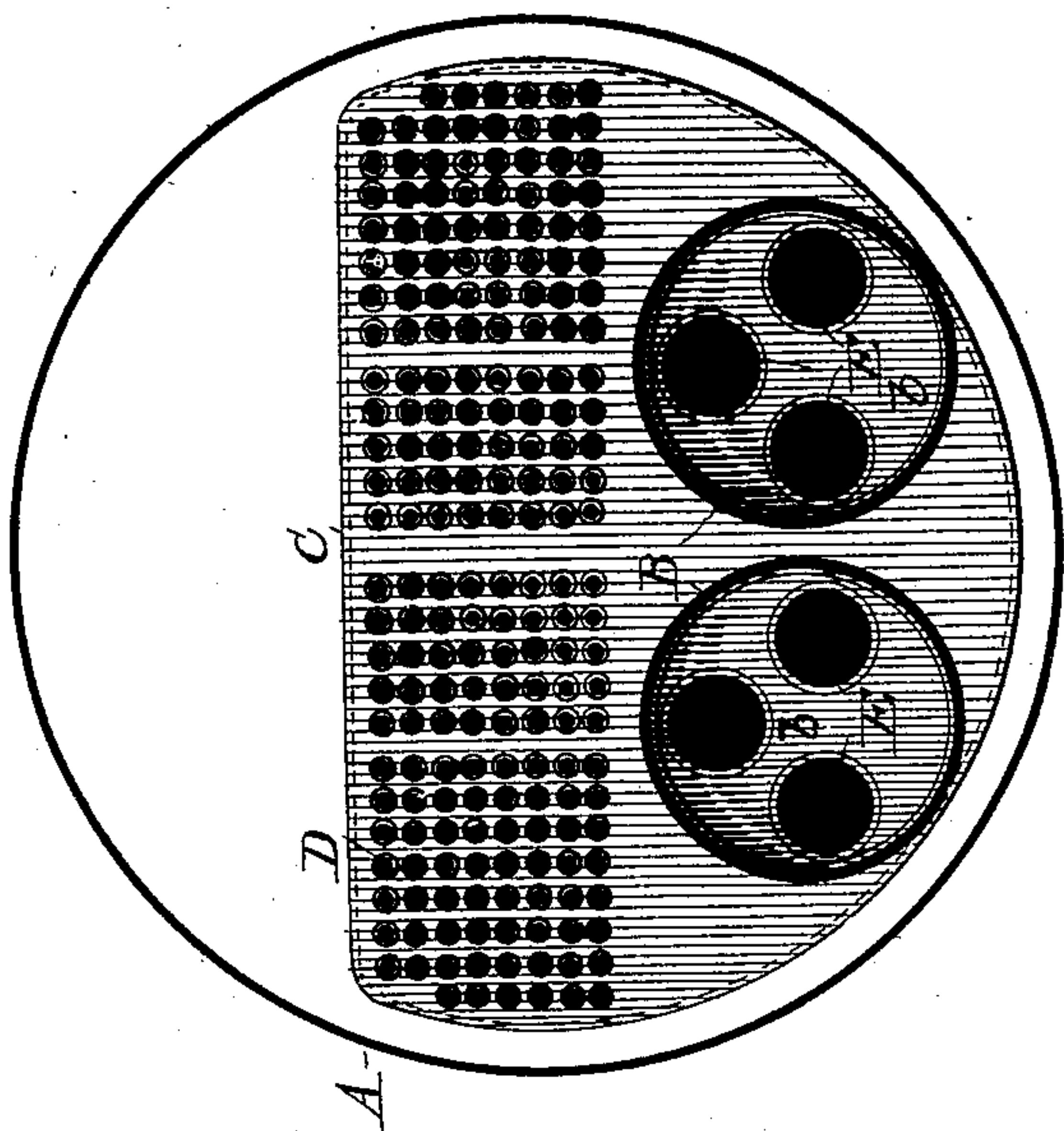


Fig. 1.

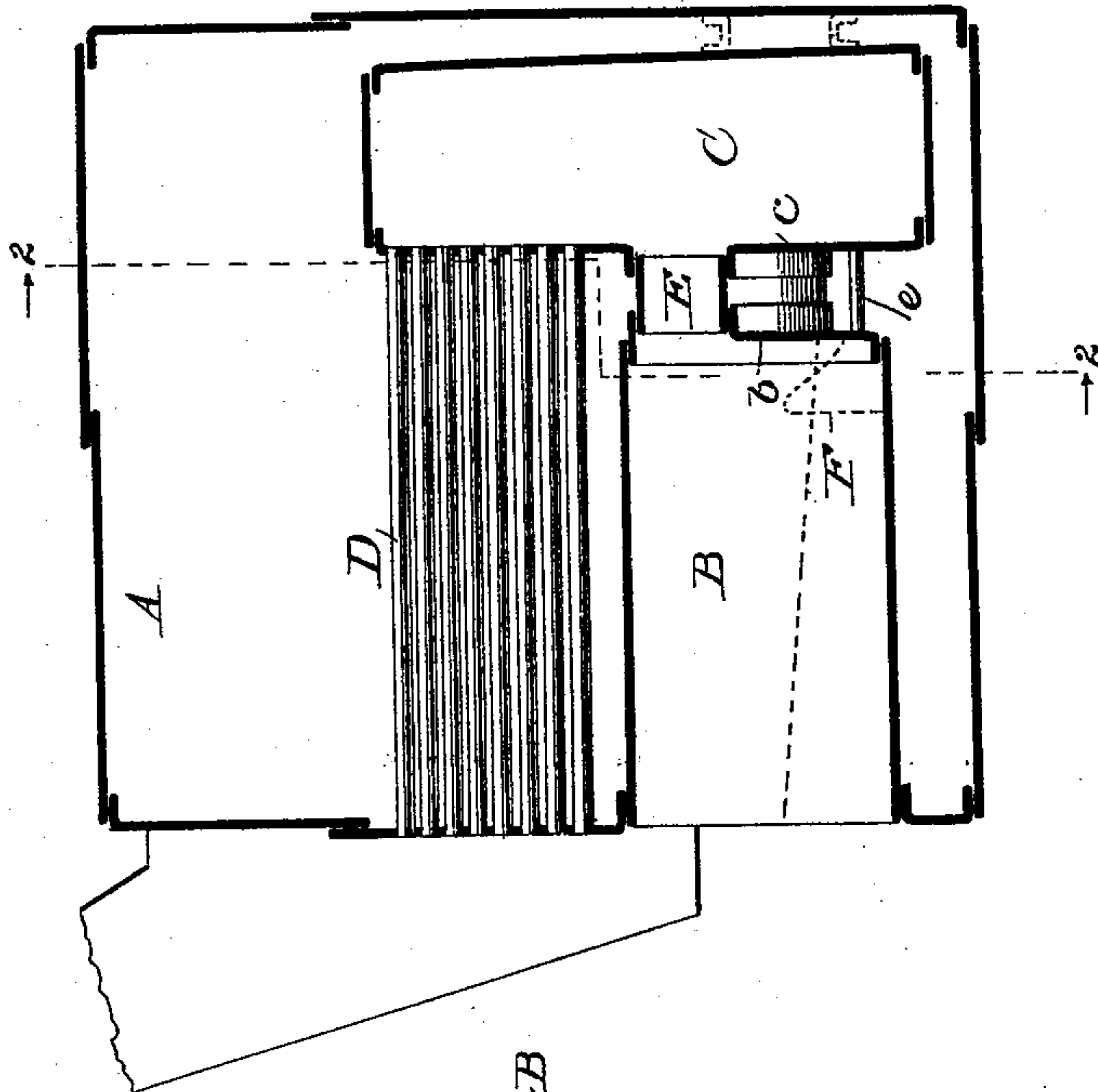
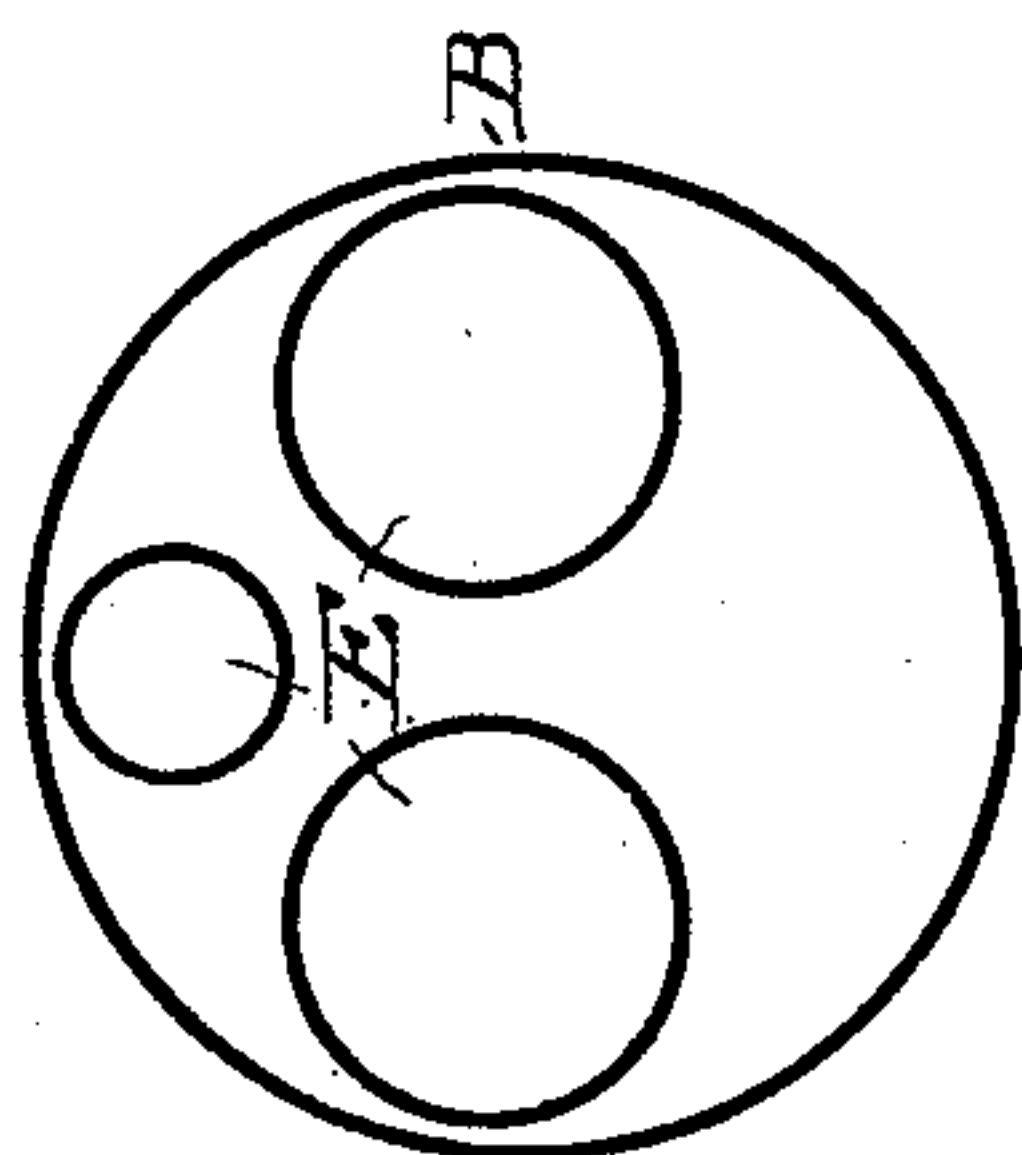


Fig. 3.



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# UNITED STATES PATENT OFFICE.

WALFRID THEODOR SYLVEN, OF WASHINGTON, DISTRICT OF COLUMBIA.

## MARINE BOILER.

SPECIFICATION forming part of Letters Patent No. 606,847, dated July 5, 1898.

Application filed January 6, 1896. Serial No. 574,506. (No model.)

*To all whom it may concern:*

Be it known that I, WALFRID THEODOR SYLVEN, of Washington, District of Columbia, have invented a new and useful Improvement in Marine Boilers, of which the following is a specification.

My invention has reference specifically to what are known as "Scotch" or "cylindrical" boilers, such as are extensively used in the United States Navy and which are constructed with a cylindrical shell or body and with a cylindrical furnace inserted wholly within the body and containing at the rear end a bridge-wall over which communication is had with the combustion-chamber at the rear. In this class of boilers there exists below the furnace and within the shell or body proper a shallow water-space, which, lying beneath the ash box or space, receives but little heat from the fire above. In consequence of this fact, of the large size of the tube-sheet, and of the fact that when the firing of the boiler is commenced the upper parts are subjected to a high temperature it is found that there is a great inequality in the expansion of the metal and that it is extremely difficult to prevent the internal joints from opening. This difficulty is so serious that it is now the practice to provide a donkey-boiler, a pump, and pipe connections through which hot water may be delivered from the donkey-boiler into the main boiler underneath the furnace in order to equalize the temperature and to initiate the circulation of the water, which may be readily maintained without artificial aid after a steaming temperature is attained.

It is the object of my invention to overcome the above-mentioned difficulties, to avoid the necessity for the supplemental boiler and pump, and to insure a natural and rapid circulation of the water as soon as the fire is started in the boiler. To this end I retain the cylindrical form of furnace inserted wholly within the boiler; but instead of extending the furnace to the first box and introducing a bridge-wall or plate I shorten the furnace, close its rear end and the front side of the combustion-chamber by plates separated a short distance, and establish communication by large flues connecting said plates at the top

of the furnace. Under this arrangement a column of water is maintained between the rear end of the furnace and the front side of the fire-box and around the elevated flues connecting them, so that when the fire is established this column of water, subjected in the first instance to the direct action of the heat, will be caused to rise and immediately establish a circulation of water around and under the furnace, thus preventing any wide variation in temperature between the top and bottom. This result has not to my knowledge been heretofore accomplished in a cylindrical or Scotch boiler, a type of boiler which differs widely from and is to be clearly distinguished from the locomotive or water-leg boilers having external or partly internal furnaces.

Referring to the accompanying drawings, Figure 1 represents a longitudinal vertical section through a boiler having my improvement incorporated therein. Fig. 2 is a vertical cross-section of the same on the correspondingly-numbered line of the preceding figure. Fig. 3 is a view of a modification.

Referring to the drawings, A represents the shell or body of the boiler, in the form of a horizontal cylinder closed by vertical plates at its ends, as usual.

B represents the furnace, also made in the form of a horizontal cylinder and inserted wholly within the shell through an opening near the bottom. The front end of the furnace is connected to the front of the boiler by a flange and rivets, as usual.

My furnace is made of a length somewhat less than usual in this class of boilers and is closed at the rear end by the sheet or head b.

C represents the combustion-chamber, located in the rear lower part of the shell and closed at its front by the vertical plate c.

D D are the customary flues leading from the front upper part of the combustion-chamber through the front end of the boiler. Communication is established between the rear end of the furnace B and the combustion-chamber by one or more large flues E. These flues, three of which are shown in the present instance, are secured at their ends through the sheets b c and are located at or near the top of the furnace, permitting the flame and



gases to pass from the furnace over into the combustion-chamber. The furnace will contain the usual grate, as indicated by dotted lines. When a fire is established in the furnace, the heat will be caused to act directly and effectively on the vertical column of water existing between the plates *b* and *c* and around the flue or flues *E*. This column of water being quickly heated in this manner will immediately rise and institute or inaugurate a circulation which will insure a substantially uniform distribution of the heat throughout the boiler and a substantially uniform temperature of the internal surfaces at the top and bottom of the boiler.

It will be observed that the lower part of the plate *b* serves the purpose of a bridge-wall in retarding the outflow of the heated products; but, if desired, a supplemental bridge-wall or plate *F* may be introduced, as indicated in dotted lines, the rear upper surface of this plate or wall being depressed in order that the heated gases may act effectively against the plates *b*. The flues *E*, being of large size, admit of an attendant passing through them from the furnace into the combustion-chamber; but, if desired, an additional flue may be extended from the combustion-chamber or "smoke-chamber," as it is sometimes termed, to the rear end of the boiler, a plate or cover being provided to close the same when the boiler is in use, as indicated by dotted lines in Fig. 1.

In order to brace and strengthen the lower portion of plates *b* and *c* and maintain them in rigid relation, I prefer to provide one or more braces *e*, in the form of a tube which is fixed between said plates and establishes a communication between the furnace and combustion-chamber. The heated products passing through the small tube or flue will assist the flues *E* in heating the vertical column of water between the plates.

On reference to Fig. 3 it will be seen that the upper flue *E* is of smaller diameter than the others. This is to admit of the placing of the other two flues higher in order to raise them from the furnace-bed, to the end that

there will be no liability of the fuel passing through them.

It is to be noted that my invention relates particularly to Scotch boilers, which have as distinctive characteristics a cylindrical body and horizontal furnaces of cylindrical form seated wholly within the body and extending from the front nearly to the rear end.

In carrying my improvements into practice the plates forming the rear end of the furnace and the walls of the combustion-chamber are arranged in vertical as distinguished from inclined positions, and the connecting-flues are made short and of large diameter and arranged horizontally, so that they will cause no retardation of the products of combustion. The vertical arrangement of the walls permits the fire-grate to be extended to the usual length and admits of the walls being stayed and secured in the customary manner.

What I claim is—

1. As an improvement in Scotch boilers, the cylindrical body *A* and flues *D* in combination with the cylindrical furnace *B* seated wholly within the body and closed at the rear end by a vertical plate, the combustion-chamber having a vertical front plate adjacent to the rear end of the furnace, and the short and relatively large tube extending horizontally from the furnace to the combustion-chamber.

2. In a Scotch boiler the furnace *B* extended to the rear part of the boiler and closed by a vertical rear plate, in combination with the smoke-chamber having vertical walls and one or more large short tubes extending from the furnace to said chamber without downward inclination; whereby an unimpeded draft is permitted and a prompt circulation of the water from beneath the furnace insured.

In testimony whereof I hereunto set my hand, this 28th day of December, 1895, in the presence of two attesting witnesses.

WALFRID THEODOR SYLVEN.

Witnesses:

EDWARD S. HOW,  
LYMAN F. W. CUSHING.