L. D. LOVEKIN.

STEAM GENERATING BOILER.

APPLICATION FILED SEPT. 1, 1909.

1,014,238.

Patented Jan. 9, 1912.

2 SHEETS—SHEET 1.

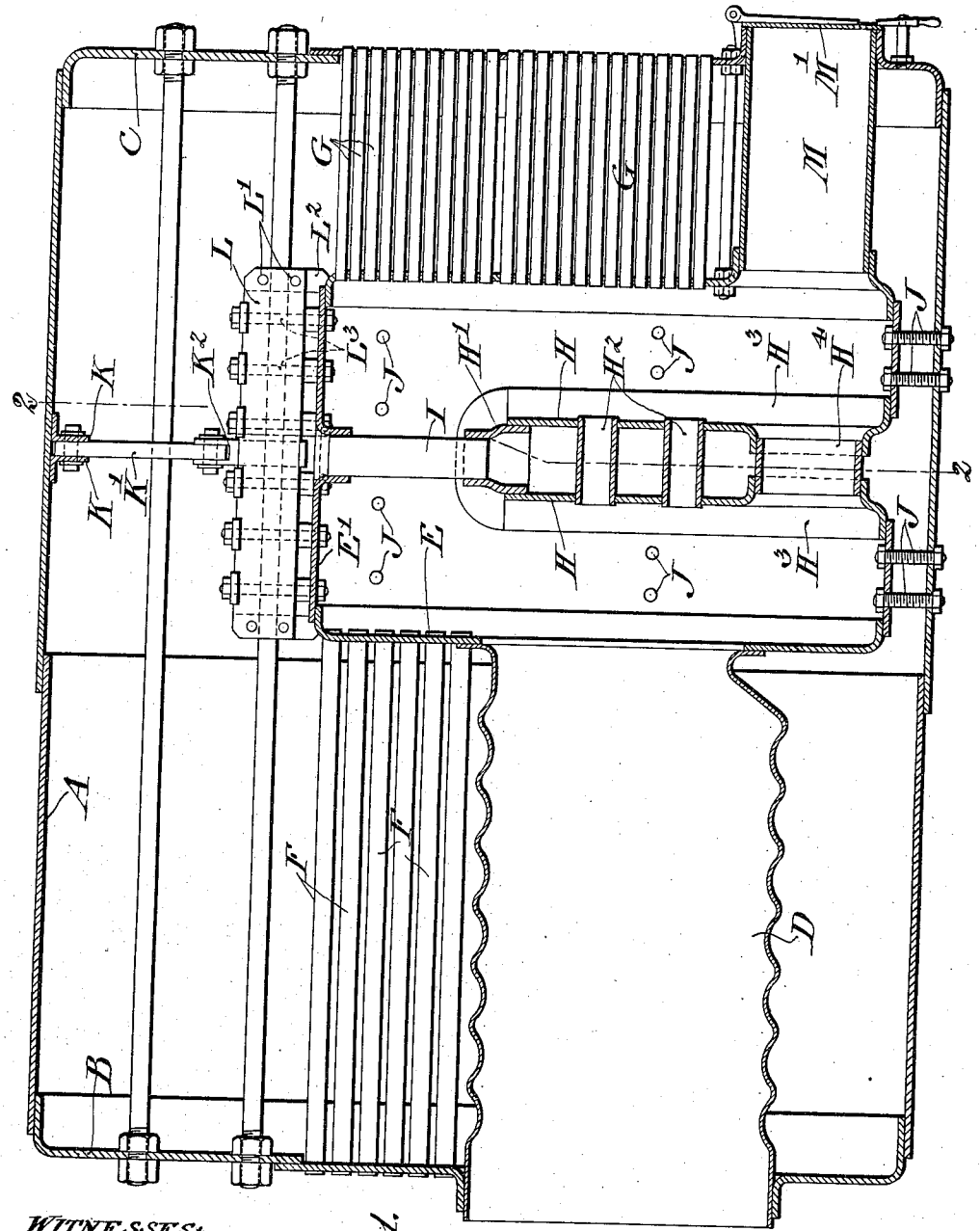


Fig. 1.

WITNESSES:

INVENTOR

Luther D. Lovekin,

by John E. Hubbell

Attorney.

L. D. LOVEKIN.

STEAM GENERATING BOILER.

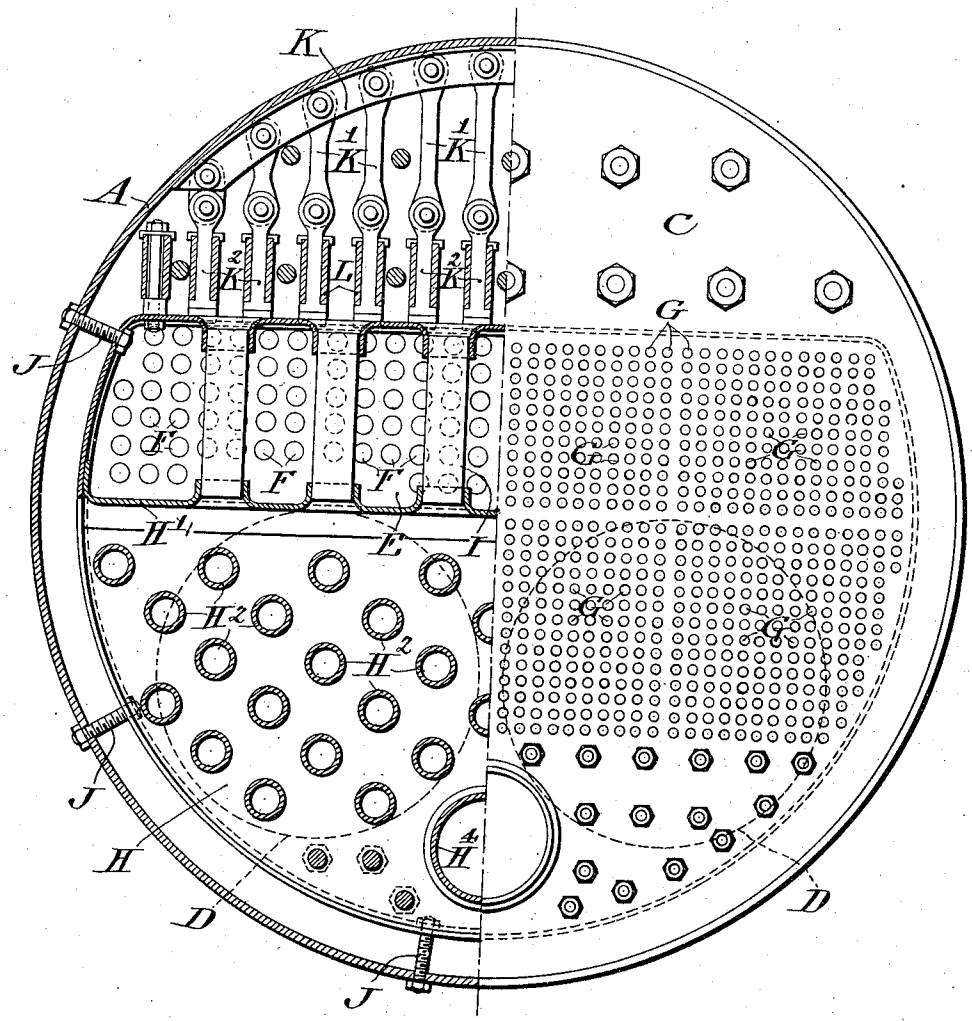
APPLICATION FILED SEPT. 1, 1909.

1,014,238.

Patented Jan. 9, 1912.

2 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

INVENTOR:
Luther D. Lovekin,
by
John E Hubbell
Attorney.

UNITED STATES PATENT OFFICE.

LUTHER D. LOVEKIN, OF PHILADELPHIA, PENNSYLVANIA.

STEAM-GENERATING BOILER.

1,014,238. Specification of Letters Patent. Patented Jan. 9, 1912.

Application filed September 1, 1909. Serial No. 515,632.

To all whom it may concern:

Be it known that I, LUTHER D. LOVEKIN, a citizen of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Steam-Generating Boilers, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My present invention relates to steam generating boilers, and particularly to boilers of that type in which the furnace or furnaces are located within the boiler shell, and the main object of the invention is the provision in a boiler of the kind specified, of a flue arrangement whereby a boiler, more effective and compact and less expensive to manufacture than those heretofore known, is obtained.

Other objects of the invention are the provisions of certain features of construction and arrangement whereby the boiler is made simple and durable, and at the same time may be easily overhauled and repaired.

Heretofore, two varieties of boilers of the type specified have been in common use. In one form, known as the return tubular, or "Scotch" boiler, a combustion chamber is located within the boiler shell adjacent one end thereof, and is connected to the opposite end of the boiler by one or more furnace chambers, within which the grate and other furnace provisions are located, and by return flues through which the products of combustion pass from the combustion chamber back to the end of the boiler shell at which the furnace chambers open. The other variety of boiler referred to is known as the "gunboat" boiler. In the gunboat boiler, the tubes, by which the products of combustion pass from the furnace chambers, run from the furnace chamber or chambers, or from a combustion chamber into which the latter open, to the end of the boiler remote from the end of the boiler through which the furnaces are charged.

In accordance with the present invention a combustion chamber is located within the boiler shell and is separated from each end thereof by a substantial distance. One side of the combustion space is connected to the corresponding end of the boiler shell by one or more furnace chambers and by return flues as in the Scotch boiler, and the other end of the combustion chamber and the adjacent end of the boiler shell are connected by tubes as in the gunboat boiler, and in operation the products of combustion pass from the combustion chamber in opposite directions to the opposite ends of the boiler shell, instead of all passing to the front end of the boiler as in the Scotch boiler, or to the back end of the boiler as in the gunboat boiler. In consequence of this arrangement, my new boiler possesses certain substantial advantages over both the Scotch boiler and the gunboat boiler. As only a portion of the hot gases from the combustion chamber pass back to the end of the boiler through which the furnace chambers are fired, the return flues running from the front end of the boiler to the combustion chamber may be substantially less in number, and the diameter of the boiler shell may therefore be substantially less than in a Scotch boiler of the same capacity. The reduction in diameter is in itself an advantage from space considerations, and permits the use of thinner boiler plate and simpler and less expensive construction. Since only a portion of the hot gases pass from the combustion chamber to the rear end of the boiler, assuming an aggregate area of such flues equal to the aggregate flue area of a gunboat boiler, the flues running to the rear end of the boiler may be substantially shorter than the flues in a gunboat type of boiler of the same capacity, while at the same time insuring the proper abstraction of heat from the gases passing through such flues.

From what has been said, it will be apparent that my boiler may be smaller in diameter than a Scotch boiler of similar capacity, and shorter in length than a gunboat type of boiler of the same capacity, and that my boiler possesses the following advantageous features in combination to a substantial extent not found in either the Scotch or the gunboat boiler; namely, a cylindrical boiler shell relatively small in diameter and short in length, and generally

compact, large furnace chamber space, large water volume, large steam space, large steam liberating area, and large heating surface in proportion to grate area.

Preferably, I locate the combustion chamber nearer to the rear end of the boiler shell than to the front end, and in such case in order to obtain a proper division of flow of the hot gases from the combustion chamber to the front and rear ends, respectively, of the boiler, I arrange the tubes so that the average resistance per unit of length to the flow of hot gases for the rear tubes is in excess of that for the front tubes to such an extent that the difference in the rate of flow of the hot gases through the two sets of flues insures a substantial equality of temperatures of the escaping gases at the outer ends of the two sets of flues. This may be accomplished in a simple manner by making the shorter tubes running to the rear end of the boiler smaller in diameter than the longer tubes running to the front end of the boiler.

I am aware of course that double ended boilers of the Scotch type have been proposed and used in which the combustion chamber of each boiler is located midway between the ends of the boiler, and furnace chambers, and return flues are run from each end of the boiler to the combustion chamber. A boiler of this type, however, is practically the same as two Scotch boilers placed with their rear ends together, and is inherently of greater diameter, less compact and efficient, and more expensive to manufacture than a boiler of the same capacity constructed in accordance with the present invention.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, and the advantages possessed by it, reference may be had to the accompanying drawings and descriptive matter in which I have illustrated and described one of the forms in which the invention may be embodied.

Of the drawings, Figure 1 is a longitudinal sectional elevation of the boiler, and Fig. 2 is an end view of the boiler shown in Fig. 1, with the left hand side of the boiler in section on the line 2—2 of Fig. 1.

In the drawings I have only thought it necessary to illustrate the boiler construction proper, and have not shown the furnace grates, stack connections, boiler housing, or supports or like parts.

Referring to the drawings, A represents the cylindrical wall of the cylindrical boiler shell, and B and C the front and rear ends, respectively. Within the boiler shell, and separated from the front and rear ends thereof by substantial though unequal distances, is located the combustion chamber E which is in the general form of a cylinder having its upper side flattened as indicated at E′, the cylinder being coaxial with, but somewhat smaller in diameter than, the cylindrical wall A. The front end wall B of the boiler shell, and the front end of the combustion chamber E, are connected by the walls of one or more tubular furnace chambers. In the form shown there are two of these chambers D, the wall of each being in the form of a corrugated cylinder. Above the chambers D, which are located in the lower half of the boiler proper, the combustion chamber and the front wall B are connected by a set of return flues F. The rear end wall C of the boiler shell, and the rear end of the combustion chamber E are connected by a set of flues G. As shown, the combustion chamber is appreciably nearer to the rear wall C of the boiler than to the front wall B. In consequence, the tubes G are shorter than the tubes F, and in order that each tube G may offer substantially greater resistance per unit of length to the flow of gases through it from the combustion chamber, than is offered by one of the tubes F, the tubes G are made appreciably smaller in diameter than the tubes F. The tubes G are much more numerous than the tubes F, however, not only because of their decreased diameter, but because they extend from the portion of the combustion chamber in line with the furnace chambers D as well as in line with the tubes F. To obtain uniform and effective operation, the aggregate area of the flues F, as well as their resistances to the flow of gases therethrough, should be so proportioned to the aggregate area of the flues F, their resistance to the flow of gas through them, and the heating effectiveness of the walls of the furnace chambers D, that the steam generation at the opposite ends of the boilers shall be approximately the same per unit of length of the boiler. The exact proportions between the lengths, numbers, and diameters of the flues F and G will depend upon conditions of service and upon the dimensions of the boilers. Those skilled in the art will find what I have said relative to the general principles of construction sufficient, however, to enable them to readily apply the invention in the construction of a boiler of any given capacity and dimensions for operation under any specified conditions.

In order to increase the heating surface of the boiler and to insure the proper mechanical strength and durability of the parts, as well as in some respects, to regulate the circulation of the hot gases through the combustion chamber, I preferably form the lat-

ter with a hollow division member extending through it transversely to the length of the boiler. This division member comprises transverse walls H and a horizontal top wall H'. The walls H are in the form of segments, the curved edges of which are flanged at H^3 and secured against the inner curved surface of the combustion chamber which is cut away to place the space between the walls H' in direct communication with the boiler shell. The end walls H of the divison member are connected by short tubes H^2 through which the hot products of combustion may pass directly through the division member. The top wall H' of the division member is connected to the top wall E' of the combustion chamber by tubes I which serve as stays for holding the parts in place and to permit a circulation of water between the space above the combustion chamber and the interior of the hollow bridge member. The latter space, as before stated, is open at its curved margin to the interior of the boiler shell proper. The curved wall of the combustion chamber is connected to the curved wall A of the boiler shell proper by stays J. Above the combustion chamber E, and midway between its ends, arc shaped ribs K are secured to the wall A, and from the ribs K extend a set of parallel vertical stay links K' pivoted at their lower ends to stay members K^2 which are clamped each between a pair of parallel plates L extending longitudinally of the boiler above the flat wall of the combustion chamber and connected at their ends by rivets L' and spacers L^2. Each pair of plates L are connected to the top wall of the combustion chamber at intervals by stay bolts L^3 which are arranged in a series between the plates and are provided with nuts and washers at their upper ends engaging the upper edges of the plates. Preferably the combustion chamber is connected at its lower end to the rear end of the boiler by a clean out tube M closed at its outer end by a suitable door M'. To facilitate the cleaning out of the combustion chamber, the walls H of the hollow division member are preferably connected by a tube H^4 in line with the tube M. It will be apparent that the boiler illustrated in detail is characterized by its simplicity and satisfactory mechanical construction. It will also be apparent that the boiler may be cleaned and repaired with comparative ease. In this connection I call attention to the fact that the tubes I are short enough so that they may be got at and removed from the steam space of the boiler above the top wall of the combustion space.

While, in accordance with the provisions of the statutes, I have herein described and illustrated the best form of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of the invention, and that certain features of the invention may be used with advantage in some cases without a corresponding use of other features of the invention.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is:

1. In a boiler of the type specified, the combination with the boiler shell, of a combustion chamber located therein and separated from each end of the boiler shell by a substantial distance, one or more furnace chambers and return flues extending between the combustion chamber and one end of the boiler shell, other flues in line with the furnace chambers and said return flues extending from the combustion chamber to the rear end of the boiler shell, a hollow division member in the combustion chamber, open at its lower edge to the space in the boiler shell proper, tubular stays connecting the top of said division member to the top of said combustion chamber and permitting of a circulation between the space above the combustion chamber and the interior of said hollow division member, and other tubular stays connecting the front and rear walls of the said division member and permitting of a circulation through the division member between portions of the combustion chamber at the opposite ends of said division member.

2. In a boiler of the type specified, the combination with the boiler shell, of a combustion chamber located therein and separated from each end of said shell by substantial but unequal distances, furnace chambers and return pipes extending between the combustion chamber and the more remote end of the boiler shell, and other flues extending from the combustion chamber to the less remote end of the boiler shell, said other flues being arranged to offer a greater average resistance per unit of length to the flow of gases therethrough than the resistance per unit of length of the said return flues.

3. In a boiler of the type specified, the combination with the boiler shell, of a combustion chamber located therein, and separated from each end of the boiler shell by substantial but unequal distances, one or more furnace chambers and return flues extending between the combustion chamber and the more remote end of the boiler shell, and other flues extending from the combustion chamber and the less remote end of the boiler shell, said other flues being smaller in diameter than said return flues.

4. In a boiler having a combustion chamber and furnace chambers and flues leading

from the combustion chamber to a boiler end, the combination of a hollow division member in the combustion chamber directly open at its lower edge to the space in the boiler shell proper, and tubular stays connecting the top of said division member to the top of said combustion chamber and permitting of a circulation between the space above the combustion chamber and the interior of said hollow division member.

LUTHER D. LOVEKIN.

Witnesses:
ARNOLD KATZ,
D. STEWART.