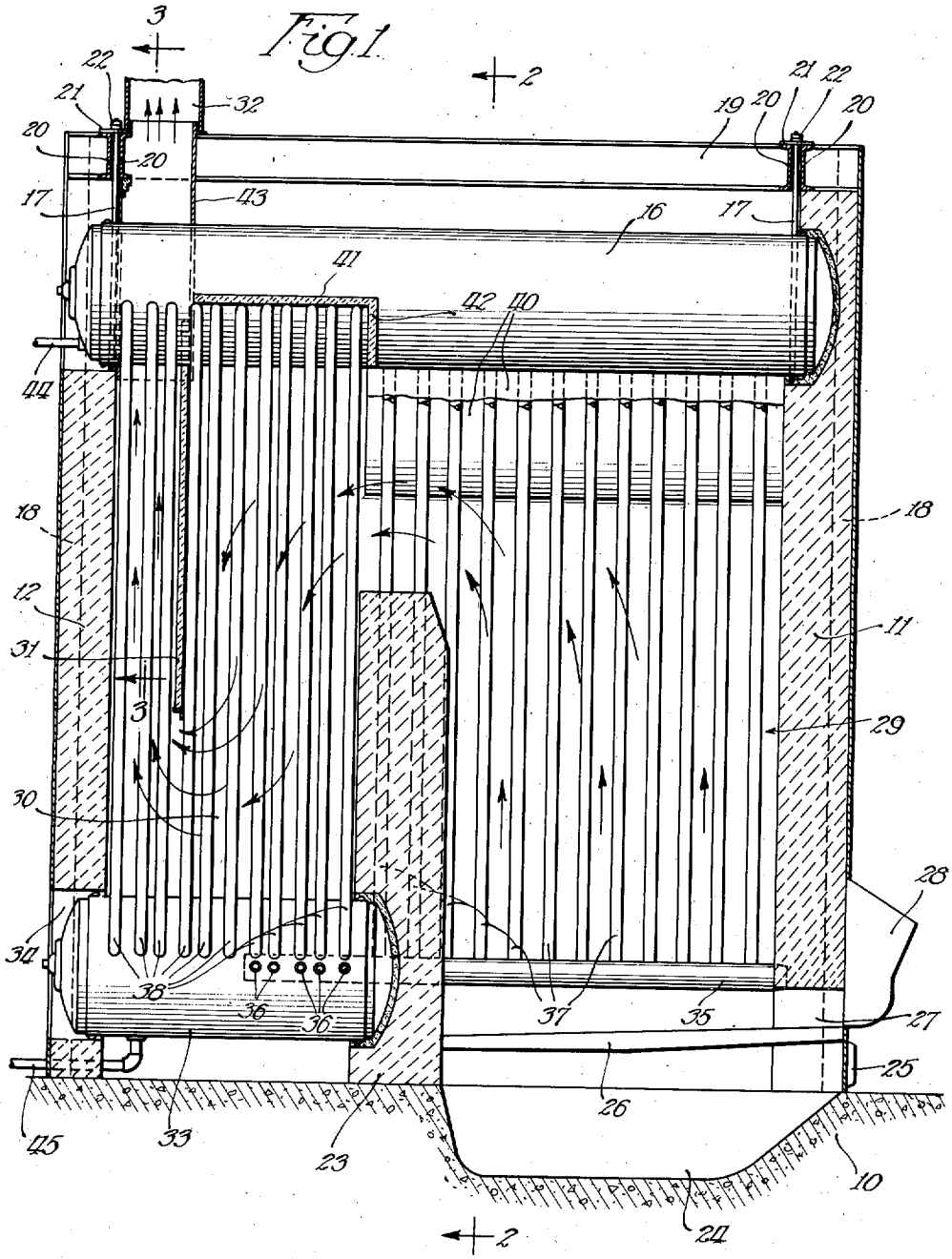
Sept. 30, 1941. C. LASKER 2,257,565

STEAM PRODUCER

Filed March 24, 1939 2 Sheets-Sheet 1

Fig. 1.



Witness
T. Siljander

Inventor
Charles Lasker

By Hill and Hill
Attys.

Sept. 30, 1941. C. LASKER 2,257,565

STEAM PRODUCER

Filed March 24, 1939 2 Sheets-Sheet 2

Fig. 2.

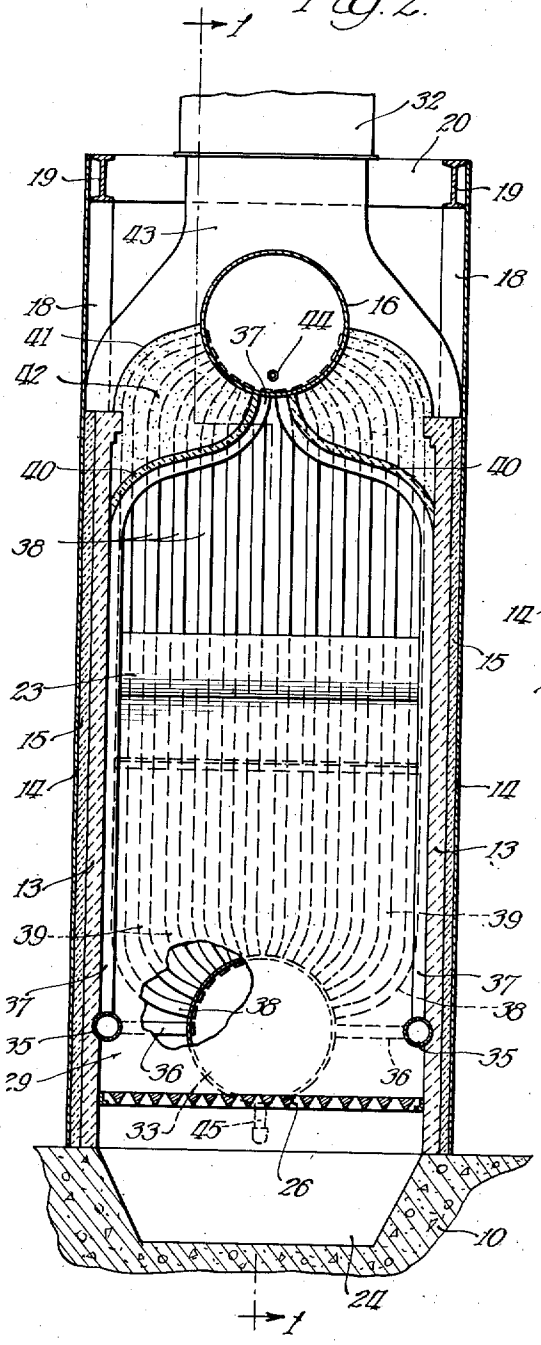
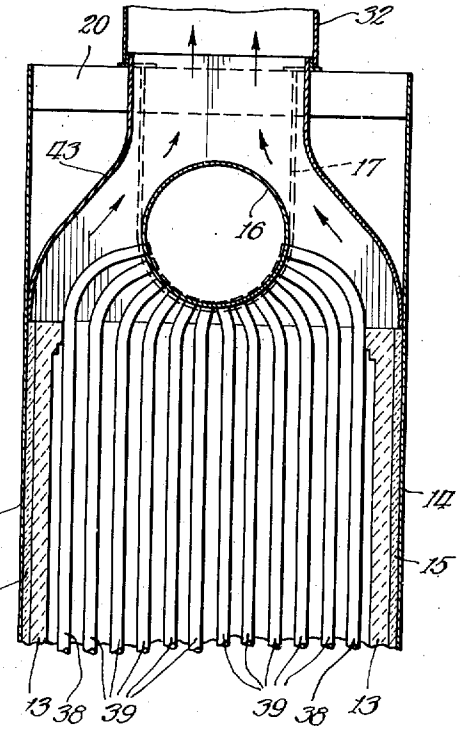


Fig. 3.



Witness:
V. Siljander.

Inventor
Charles Lasker
By: Hill and Hill
Attys

Patented Sept. 30, 1941 2,257,565

UNITED STATES PATENT OFFICE

2,257,565

STEAM PRODUCER

Charles Lasker, Chicago, Ill.

Application March 24, 1939, Serial No. 263,917

4 Claims. (Cl. 122—347)

The invention relates to steam producers of the type consisting of walls of refractory material providing a setting for a plurality of drums and connecting tubes exposed to heat from burning fuel whereby steam is rapidly generated from water circulating through said drums and connecting tubes.

Among the objects of the invention is the provision of improvements in the arrangement and position of drums and connecting tubular members to provide a compact and efficient steam producer wherein radiant heat losses are minimized, a maximum of steam generating surface is exposed to hot gases of combustion, and as a result, steam is rapidly and economically generated.

Another object of the invention includes the provision of improvements in the arrangement and construction of drums and connecting tubular members whereby certain of said members function to cool the walls of the producer and adapt the producer to be operated with higher working temperatures and pressures than would be otherwise possible without disintegration of the walls.

A further object of the invention is the provision of an improved arrangement of drums, headers and connecting tubular members whereby they are all constantly exposed to hot gases of combustion in a manner conducive to rapid and economical generation of steam.

Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the disclosure herein given.

To this end, the invention consists in the novel combination, arrangement and construction of parts herein shown and more particularly pointed out in the claims.

In the drawings, wherein like reference characters indicate like or corresponding parts:

Fig. 1 is a longitudinal vertical section taken through a steam producer embodying the principles of the invention, said section being taken substantially along the line 1—1 of Fig. 2;

Fig. 2 is a transverse vertical sectional view taken substantially along the line 2—2 of Fig. 1; and

Fig. 3 is a view along the line 3—3 of Fig. 1.

Referring now more particularly to the drawings, the numeral 10 generally designates a foundation or support of reinforced concrete or similar material for a setting enclosing and supporting the drums and tubular members comprising the steam producer. The supporting and enclosing setting also comprises a front wall 11, a rear wall 12 and oppositely positioned preferably parallel side walls 13, all constructed of fire brick or of other suitable refractory material. A metal casing or the like 14 surrounds the refractory walls and is spaced therefrom, as shown in Figs. 2 and 3, the spacing being filled by suitable heat insulating material 15.

A water and steam collecting drum 16 is mounted at the top of and extends the full length of the producer, the drum being disposed centrally of the structure, as shown in Fig. 1. The drum 16 is supported by a steel frame-work from which it is suspended adjacent each end by rods 17. The supporting steel frame-work consists of metal posts 18 positioned at each corner of the setting and longitudinally extending beams 19 at the top of the structure, the ends of the beams being fastened in any suitable manner to the contiguous corner posts 17. A pair of channel members 20, extending across the structure adjacent each end, are fastened to and supported by the beams 19. The channel members 20 comprising each pair are spaced apart as shown to receive the ends of the suspender rods 17. The rods 17 extend through plates 21 carried by the channel members and are provided with nuts 22 which transmit the weight of the drum 16 from the rods to the plates and thence to the channel members 20. The posts 18, beams 19, and channel members 20 are all protected or heat insulated by the refractory materials comprising the setting.

A transversely extending bridge wall 23 connects the side walls 13 of the setting and the foundation wall 10 is recessed in front of the bridge wall to provide an ash box 24, access to which is had by means of a door 25. Fuel is delivered into the structure and onto a grate 26 through an opening 27 in the front wall 11, by any suitable means such as an automatic stoker 28, shown diagrammatically in Fig. 1.

The bridge wall 23 extends upwardly a substantial distance above the grate 26 and divides the structure into a front combustion chamber 29 and a rear heating chamber 30. A baffle wall 31, extending downwardly in the heating chamber from the drum 16, overlaps the bridge wall 23. The arrangement of the bridge wall 23 and of the baffle wall 31 is such that hot gases ascending from the fuel burning on the grate 26 pass over the bridge wall and downwardly under the baffle wall and thence up-

wardly and out through a stack 32, as indicated by the arrows shown in Fig. 2.

A water drum 33, positioned in the bottom of the heating chamber 30 in longitudinal and vertical alignment with the drum 16, has its front end terminating in or adjacent the bridge wall 23 and its rear end terminating in and closely fitting an opening 34 provided by the rear wall 12.

The lower drum 33 is indirectly connected with that portion of the upper drum 16 extending across the top of the combustion chamber 29 by means of two headers 35 positioned on opposite sides of and near the bottom of the combustion chamber. The headers 35 extend the full length of the combustion chamber 29 and project through the bridge wall 23 and into the heating chamber 30 a substantial distance. The headers 35 are each directly connected with the lower drum 33 by a plurality of water circulating tubes 36 and are also directly connected with the front end of the upper drum 16 by rows of vertical tubes 37 positioned in close proximity to the side walls 13 of the furnace or combustion chamber 29. Certain of the tubes 37 are surrounded by and tend to water cool the bridge wall 23. The upper ends of the tubes 37 are inturned and connected with the bottom of the upper drum 16 and the circulation of water therein to the drum from the headers 35 serves to cool the side walls 13 of the combustion chamber 29. The drums 16 and 33 are directly connected by a plurality of vertical tubes 38 arranged in rows adjacent to the side walls of the heating chamber 30. The upper and lower ends of the tubes 38, respectively, open into the drums 16 and 33 in approximately horizontal alignment with the longitudinal axes of the drums. Water circulating through the tubes 38 cools the walls of the heating chamber 30 by reason of the close proximity of the tubes and walls. The drums 16 and 33 are also connected by a plurality of relatively closely spaced longitudinal rows of tubes 39. The number and spacing of the rows of tubes 39 and the number and spacing of the tubes in each row are such that the hot gases, passing from the combustion chamber 29 and over the bridge wall 23 into the heating chamber 30 in the paths indicated by the arrows, are constantly in close heat transferring proximity to the tubes.

Symmetrically curved walls 40 of refractory material provide a ceiling for the furnace or combustion chamber 29, the walls being water cooled by their proximity to the tubes 37 and to the lower portion of the drum 16. The ceiling of the heating chamber 30 comprises curved walls 41 of refractory material connected with the wall 40 by a vertical partition wall 42. The walls 41 are immediately above and in close proximity to the tubes 38 and terminate short of the rear end of the drum 16 to permit escape of the gases ascending between the baffle wall 31 and the rear wall 12, into a hood 43 from which the gases are discharged into the stack 32.

Water is delivered into the drum 16 through an inlet pipe 44 and may be discharged from the producer through a blow-off or drain pipe 45 connected with the lower drum 33. The joints between the tubes and the drums and headers are preferably constructed of expanded metal to metal whereby the use of gaskets, bolts or screw connections is eliminated. The producer is operated with the water level slightly above the longitudinal axis of the drum 16 so that all joints or connections of tubes, headers, and drums are prevented from being distorted by overheating, whereby leakage is avoided and the necessity for repairs is minimized.

Water is circulated between the upper drum 16 and the lower drum 33, the water travelling downwardly through the tubes 38 and 39 positioned in the heating chamber 30 in the rear of the baffle wall 31 and travelling upwardly through the tubes 38 and 39 which are positioned between the bridge wall 23 and the baffle wall 31. The down-comer tubes 38 and 39 serve as secondary heating elements in which the water flows oppositely to the hot gases ascending in proximity thereto. The up-comer tubes 38 and 39 positioned between the bridge wall 23 and the baffle wall 31 serve as primary heating elements in which steam is generated by contact therewith of the downwardly descending gases, which are then at maximum temperature since they have just left the furnace or combustion chamber 29. The tubes 37 in the combustion chamber 29 are also up-comer primary heating elements in which the water in general travels in the direction of the ascending gases. The steam generated in the various tubes and headers ascends and is collected in the upper portion of the drum 16 from which it may be drawn off as needed through a main, not shown.

Thus, it will be seen that the invention resides in the provision of a novel steam generator consisting of a setting comprising a forward furnace or combustion chamber separated from a rear heating chamber by a bridge wall, and comprises a full length water and steam collecting drum positioned at the top of the setting, a water drum in the bottom of the heating chamber, a plurality of relatively closely spaced vertical tubes positioned in the heating chamber and connecting the drums, and a plurality of tubes arranged in rows in proximity to the refractory walls of the combustion and heating chambers to water cool the walls. The provision of a steam producer consisting of a full length upper drum and a short lower drum in vertical and longitudinal alignment with the upper drum and vertical tubes connecting the drums and exposed to contact with hot gases provides a maximum of heat transferring surfaces in a compact space, minimizes the loss of radiant heat, and possesses numerous other advantages over known constructions wherein a plurality of drums are provided, but are not so arranged that tubular members connecting the drums are substantially vertical.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence I do not wish to be understood as limiting myself to the exact form, construction, arrangement and combination of parts herein shown and described, or uses mentioned.

What I claim as new and desire to secure by Letters Patent is:

1. In a steam boiler, a setting having side walls, a full length upper water and steam drum, a bridge wall extending transversely of said setting and dividing the interior thereof into a forward combustion chamber and a rear primary heating compartment, a relatively short lower water drum positioned in said heating compartment and longitudinally aligned with said upper drum, the rear ends of said drums being in substantially vertical alignment, headers extending for-

wardly and rearwardly along and between said side walls and overlapping the forward end of said lower drum, tubes connecting said lower water drum and said overlapping ends of the headers, tubes arranged in longitudinal rows and extending downwardly from said upper drum, the outermost rows of tubes extending downwardly adjacent said side walls, certain of said outermost tubes being connected to said headers and constituting water circulating tubes to assist in providing a constant supply of circulating water for water cooling said side walls and thereby inducing a water circulation in and to the upper drum, the other of said tubes being connected with said lower drum and constituting steam generating tubes, the upper ends of said water circulating tubes being curved inwardly and connected with the lowermost portion of said upper drum, a wall providing a curved ceiling immediately above and closely fitting said curved ends of the water circulating tubes, said steam generating tubes being connected with said upper drum at points above said curved ceiling, a wall providing a ceiling for the front of said heating chamber, a vertical wall connecting said ceilings, and a baffle plate extending downwardly from the rear edge of the ceiling of said heating chamber.

2. In a steam boiler, a setting having side walls, an upper water and steam drum extending the full length of the setting, a bridge wall extending transversely of said setting and dividing the interior thereof into a forward combustion chamber and a rear primary heating compartment, a relatively short lower water drum extending forwardly from the rear wall of the setting in longitudinal and vertical alignment with the upper drum, headers extending from the front wall of the setting along said side walls and in overlapping relation to said lower drum, tubes connecting said lower drum with the adjacent overlapping ends of said headers, a plurality of longitudinal rows of tubes symmetrically arranged about a vertical plane through the axes of said drums and extending downwardly from said upper drum, certain of the tubes comprising the outermost rows being connected to said headers and constituting water circulating tubes providing a constant supply of circulating water in and to the upper drum to and through the headers, the other tubes being connected with the lower drum and constituting steam generating tubes, the upper ends of said water circulating tubes being curved inwardly and connected with the lowermost portion of said upper drum, a wall providing a curved ceiling immediately above and closely fitting said curved ends of the water circulating tubes, said steam generating tubes being connected with said upper drum at points above said curved ceiling, a wall providing a ceiling for the front of said heating chamber, a vertical wall connecting said ceilings, and a baffle plate extending downwardly from the rear edge of the ceiling of said heating chamber.

3. In a steam generator, a setting having a smoke outlet at the rear thereof, an upper water and steam drum extending the length of said setting, a bridge wall extending transversely of said setting and dividing the interior thereof into a forward combustion chamber and a rear primary heating compartment, a lower water drum within said heating compartment and disposed behind said bridge wall in vertical and longitudinal alignment with said upper drum, a plurality of boiler tubes connecting said upper drum and said lower drum, said tubes being arranged in longitudinally extending rows symmetrically positioned with reference to a vertical plane through the axes of the drums, water wall headers extending along the inside of the side walls of said setting and disposed within said combustion chamber and extending into the primary heating compartment, certain of the tubes comprising the outside rows connecting said headers with said upper drum and the other of said tubes connecting the upper drum with the lower drum, and a plurality of horizontally extending tubes connecting the headers with said lower drum said combustion chamber having a ceiling wall underneath the upper drum the opposite sides of which converge to the lowermost edges of said drum, the forward end of said heating compartment having a curved ceiling positioned above the ceiling of the combustion chamber, a vertical wall connecting said ceilings, and a baffle plate extending downwardly from the rear edge of the combustion chamber ceiling.

4. In a steam generator, a setting having a smoke outlet at the rear thereof, an upper longitudinally extending water and steam drum, a bridge wall extending transversely of said setting and dividing the interior thereof into a forward combustion chamber and a rear primary heating compartment, a lower water drum within said heating compartment and disposed behind said bridge wall in alignment with said upper drum, a plurality of vertically extending boiler tubes, a water wall header positioned along each side wall of said setting and disposed within said combustion chamber and extending into the heating compartment, certain of said tubes connecting said headers with said upper drum and the other of said tubes connecting the upper drum with the lower drum, a plurality of transversely extending tubes connecting the headers with said lower drum, said combustion chamber having a ceiling wall underneath and converging upwardly towards the lower edge of the upper drum, the forward end of said heating compartment having a curved ceiling positioned above the ceiling of the combustion chamber, a vertical wall connecting said ceilings, and a baffle plate extending downwardly from the rear edge of the combustion chamber ceiling, that portion of said side walls to the rear of the baffle plate being convergent upwardly to provide a constricted conduit and discharge opening connected with said smoke outlet above said upper drum.

CHARLES LASKER.