No. 829,773. PATENTED AUG. 28, 1906.

L. A. GARDNER.

STEAM GENERATOR.

APPLICATION FILED OCT. 2, 1905.

Fig. 1

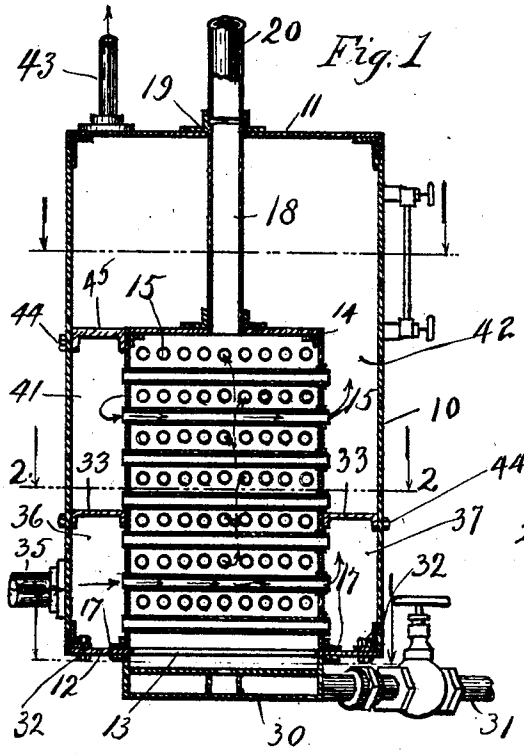


Fig. 4.

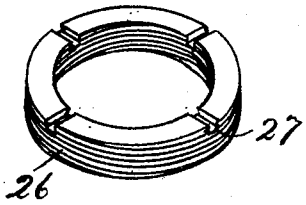


Fig. 7.

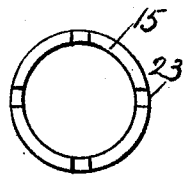


Fig. 5.

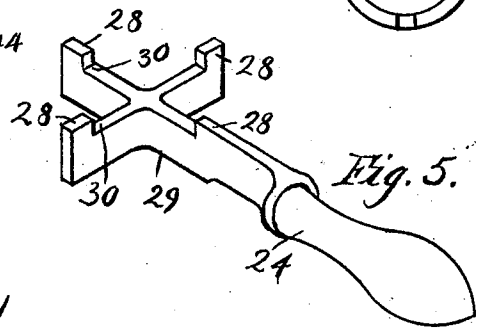


Fig. 6.

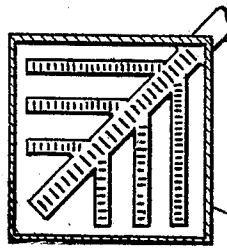


Fig. 2.

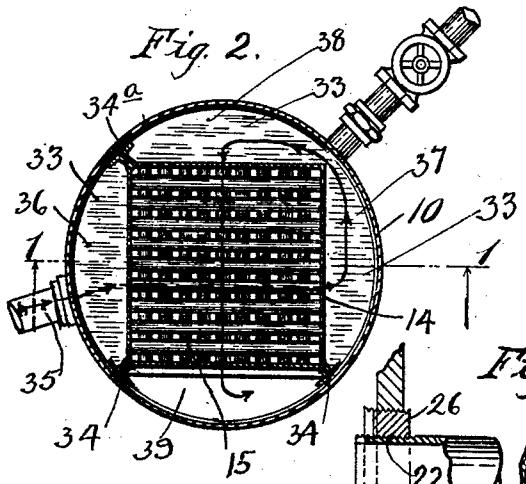


Fig. 3.

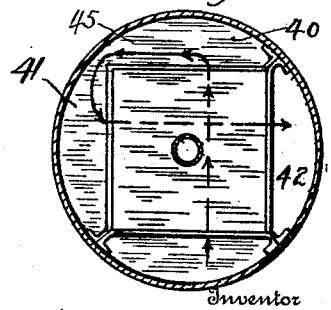
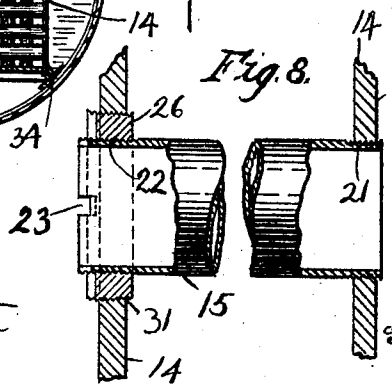


Fig. 8.



Witnesses

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UNITED STATES PATENT OFFICE.

LOUIS A. GARDNER, OF PROVIDENCE, RHODE ISLAND.

STEAM-GENERATOR.

No. 829,773. Specification of Letters Patent. Patented Aug. 28, 1906.

Application filed October 2, 1905. Serial No. 280,905.

To all whom it may concern:

Be it known that I, LOUIS A. GARDNER, a citizen of the United States, residing at the city of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in a Combination Steam Generator and Heater, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to a combination steam generator and heater, and has for its object to provide a device designed, essentially, to be used as a steam-generator, but which may be equally well adapted to be used as a heater for buildings by the use of either steam, hot water, or hot air.

A further object of the invention is to so arrange the tubes and baffle-plates within the casing as to cause the medium to be heated to pass several times over the fire before it is allowed to pass out.

A further object of the invention is the arrangement of the tubes and the manner of securing them in position in the inner shell of the boiler, so as to render them very accessible and easily removed and replaced, especially when repairs are necessary.

This device is, however, designed more particularly as a simple, efficient, and inexpensively-constructed generator for use on steam-propelled automobiles or the like.

The interior of the ordinary boiler used as a steam-generator for automobiles is quite inaccessible, rendering repairs on the same difficult and expensive; but with a boiler of my improved construction a leaking tube may be plugged or removed and replaced by a new one very readily, even while out on the road.

The invention is fully set forth in this specification and more particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a sectional side elevation of my improved device, illustrating the general construction of the two shells and the arrangement of the baffle-plates and tubes. Fig. 2 is a sectional plan view on line 2 2 of Fig. 1, illustrating the arrangement of tubes and the direction taken by the medium to be heated in traveling through the lower set of tubes. Fig. 3 is a sectional plan view on line 3 3 of Fig. 1, illustrating the direction of travel of the medium to be heated as it passes through the upper set of tubes on its way out. Fig. 4 is a perspective view of the securing-collar, which is threaded both internally and externally and slotted on its face to receive a wrench. Fig. 5 illustrates the double-faced wrench, which is adapted to screw up either the collar alone or the collar and tube together. Fig. 6 is a top view of the burner, which sits beneath the boiler, as illustrated in Fig. 1. Fig. 7 is an end view of one of the tubes, showing the position of the slots therein. Fig. 8 is an enlarged view of one of the tubes, illustrating the manner in which the tubes are connected to the boiler, showing the slotted-faced screw-collar in place on one end of each tube.

Referring to the drawings, 10 is the outer drum or shell of the generator or heater designed to hold the water or other medium to be heated and is made, preferably, in a circular form and provided with a head 11 at its upper end and another head 12 at its lower end, a portion of this latter head being cut out at 13 for the reception of the burner hereinafter described. Located within this outer shell is the inner shell 14, made, preferably, with square or flat sides, as shown in Fig. 2. This shell preferably extends down to the bottom of the outer shell and is provided with a flange 17, through which it is bolted in position, as illustrated in Fig. 1. The vent-pipe 18 extends from the upper end of the inner shell to the upper head 11 of the outer shell, where it screws into the flange-collar 19, which collar is in turn secured to the head 11 by bolts or other convenient fastenings. The vent-pipe 20 may be a separate pipe screwed into the upper portion of the said collar 19 and serves to conduct the spent heat and gases to any convenient place.

Fixed into the shell 14 are a plurality of open-ended tubes 15, through which the medium is allowed to circulate freely to be heated. By making the inner shell square the tubes may be run across in two directions—first one layer and then another crossing each other at right angles—presenting a large amount of heating-surface to the circulating medium compared to the size of the boiler.

One of the features of the invention is the simple arrangement by which the tubes may be readily inserted and as easily removed from the inner shell, which construction is best shown in Fig. 8. Each tube is threaded at both ends at 21 and 22 and is provided with a plurality of slots 23 at one end for the reception of the wrench 24. (See Fig. 5.)

At 26 is a screw-collar threaded internally to screw onto the tube and externally to screw into the shell. This collar is also provided with slots 27 in its face corresponding to those in the end of the tube 15. The wrench 24 is made in the form of a cross and is provided with two working edges or sides 28 and 29, the arms on the side 28 being cut away at 30, so that the ends 28 may engage the collar 26 to set it up without engaging the end of the tube 15. The opposite side 29 of this wrench is not cut away and is designed to engage the slots in both the collar and the ends of the tube to screw them up together. At 30 is any ordinary gas heater or burner that may be fixed beneath the tubes 15 and by which said tubes are heated. This burner is supplied with fuel through pipe 31 and operated in the manner usual with such burners.

Another feature of the invention is the arrangement of baffle-plates 33 and 45, that control the upward flow of the heated medium and also the arrangement of the vertical plates 34, that control the circular or spiral direction of flow of said medium, the direction of flow of which is as follows: The water or air to be heated enters through inlet-pipe 35 into the space 36, whence it travels directly across the inner shell through all the tubes running in that direction below the plate 33 into the space 37. From here it flows to the left into the space 38, thence through the tubes at right angles to those first mentioned, following the direction of the arrow in Fig. 2, being controlled in its circular movement or flow by the vertical plates 34 and 34ª. From space 38 it again passes through a series of tubes to the opposite side of the shell into the space 39, from which space the baffle-plate 33 has been removed, allowing the medium to rise to the next chamber above, the top of which is plate 45, and pass back to the opposite side through the next series of tubes above leading from said space into space 40. Thence, following the direction of the arrow in Fig. 3, it continues to the left into space 41, again crossing the inner shell through a further series of tubes into space 42, from which the plate 45 has been removed, it is free to rise to the large chamber above and pass out through the conductor 43. By this arrangement of plate and tubes it will be seen that the medium to be heated must necessarily pass at least four times over the fire before it is allowed to pass out, thus obtaining a high degree of efficiency from the heat supplied.

The operation of setting this boiler up is very simple: The tubes 15 are passed right through the large hole 31 in one side of the boiler and screwed into the opposite side by means of the wrench 24, applied to the slotted end of the same. The collar 26 being also in position on this slotted end, the whole is set up or screwed in together. When it is desired to set up or tighten the collar independent of the tube, the edge 28 of the wrench is applied to the slots 27 in said collar, by which means the same may be set up until tight. After the tubes are all in position the shell 14, containing the same, with its bottom portion 12, is brought up into position within the circular shell 10 and secured by the bolts 32, the baffle-plates 33 being also held in position by their bolts 44. The collar 19 may then be screwed onto the end of the vent-tube 18, which had been previously placed in position. All that remains then is the placing of the burner and filling the outside shell with the medium to be heated, and the device is complete and ready to be used either as a steam-generator or as a hot-air or hot-water heater.

When one or more of the tubes burn out, as is quite frequently the case in the ordinary steam-generator it is seen that with my simple and improved construction of tubes all that is necessary is to remove the bolts 32 and 44 and also collar 19, and the tubular portion of the boiler may be at once removed and the repairs very readily made. The construction whereby the medium to be heated is obliged to pass a great number of times over the fire renders the device very efficient when used for either a heater or a steam-generator.

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

1. A heater or generator comprising an outer shell having an inlet for the medium to be heated, an inner shell, a plurality of open-ended tubes passing through said inner shell from side to side thereof, said tubes being arranged in groups or layers each layer running at right angles to the adjacent layers, means for heating said tubes, a plurality of horizontally-arranged spaced-apart baffle-plates, and a plurality of vertically-arranged baffle-plates, whereby an approximately spiral flow is imparted to the medium being heated.

2. A heater or generator comprising a cylindrical outer shell, a rectangular inner shell, a plurality of open-ended tubes passing through said inner shell from side to side thereof, said tubes being arranged in groups or layers each layer running at right angles to the adjacent layers, means for heating said tubes, horizontally-arranged staggered baffle-plates between said shells, and means for securing the corners of the inner shell to the outer shell, passage-ways being formed between said outer shell and alternate corners of said inner shell, whereby an approximately spiral flow is imparted to the medium being heated.

3. A heater or generator comprising an outer shell, an inner shell having flat sides, a plurality of open-ended tubes passing through said inner shell, the ends of each of said tubes being threaded, one end of each tube being in

engagement with one wall of said inner shell, a collar internally threaded to embrace the other end of said tube, said collar being also threaded externally to engage the adjacent wall of said inner shell, means whereby said collar and tube may be simultaneously rotated, and means for heating said tubes.

4. A heater or generator comprising an outer shell, an inner shell having flat sides, a plurality of open-ended tubes passing through said inner shell, the ends of each of said tubes being threaded, one end of each tube being in engagement with one wall of said inner shell, a collar internally threaded to embrace the other end of said tube, said collar being also threaded externally to engage the adjacent wall of said inner shell, said collar and tube being each provided with contiguous slotted ends adapted to register, whereby said collar and tube may be individually or simultaneously rotated by a single wrench, and means for heating said tubes.

In testimony whereof I affix my signature in presence of two witnesses.

LOUIS A. GARDNER.

Witnesses:

HOWARD E. BARLOW,

E. I. OGDEN.