

July 1, 1958

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2,841,124

MIDGET GAS FIRED HOT WATER BOILER

Filed Nov. 24, 1953

5 Sheets-Sheet 1

FIG. 1.

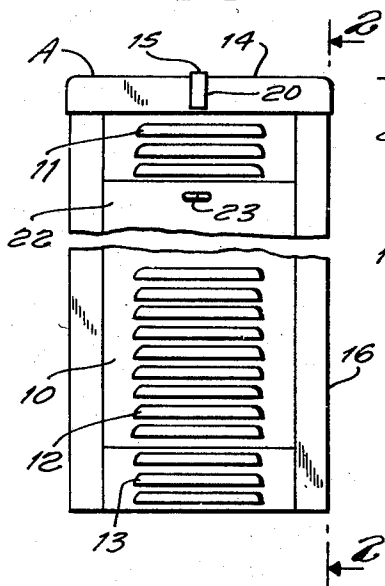


FIG. 2.

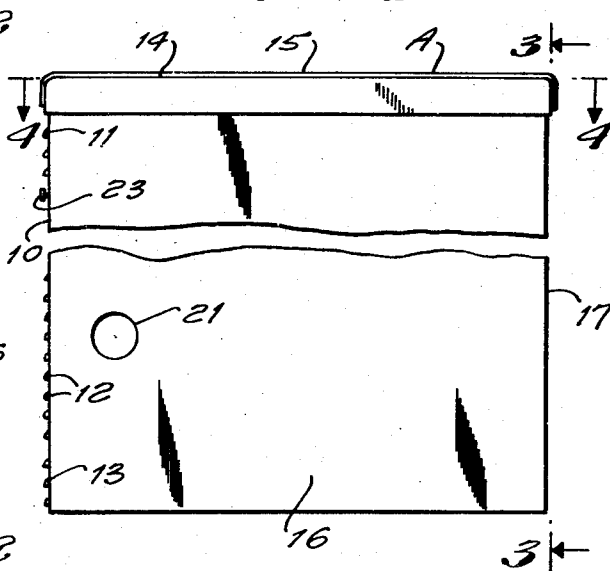
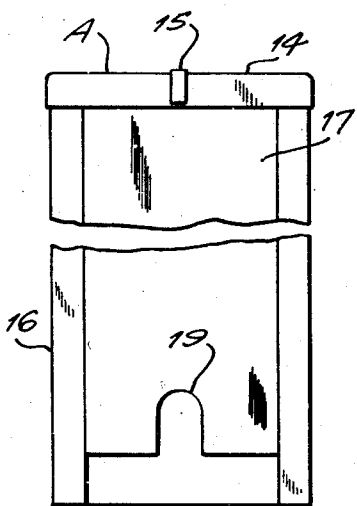


FIG. 3.

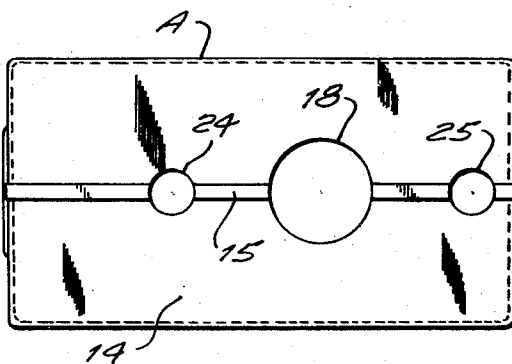


FIG. 4.

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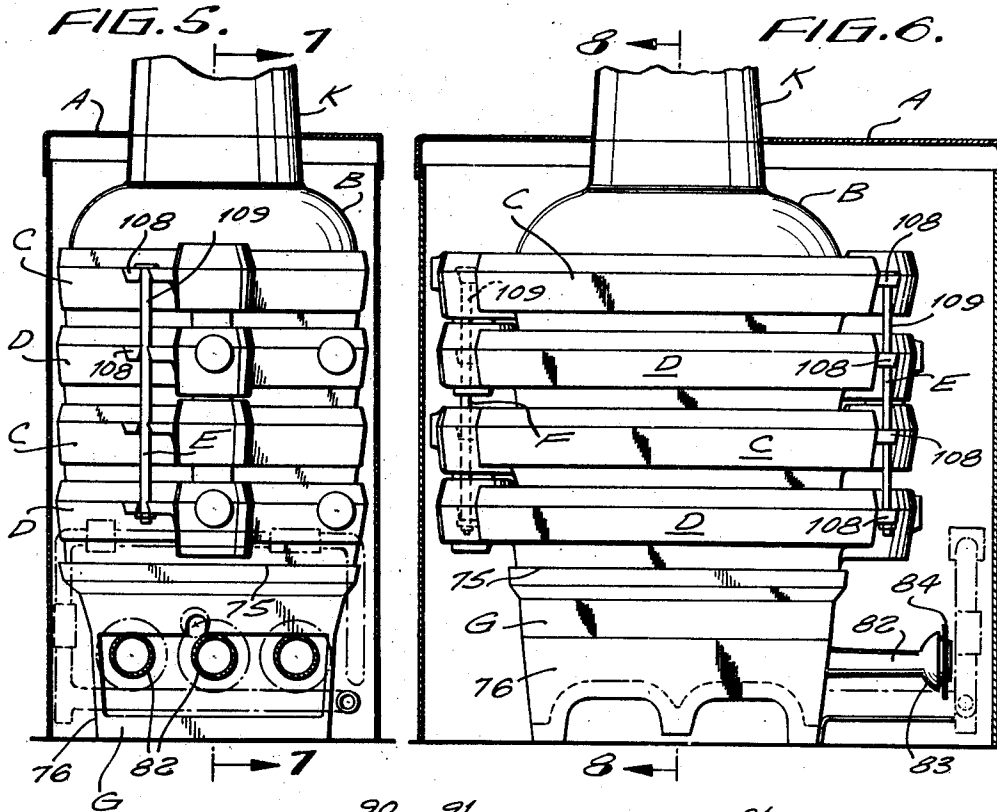
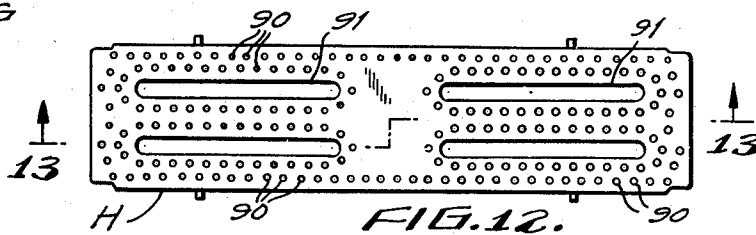
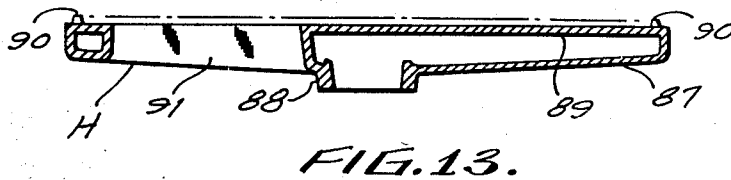
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MIDGET GAS FIRED HOT WATER BOILER

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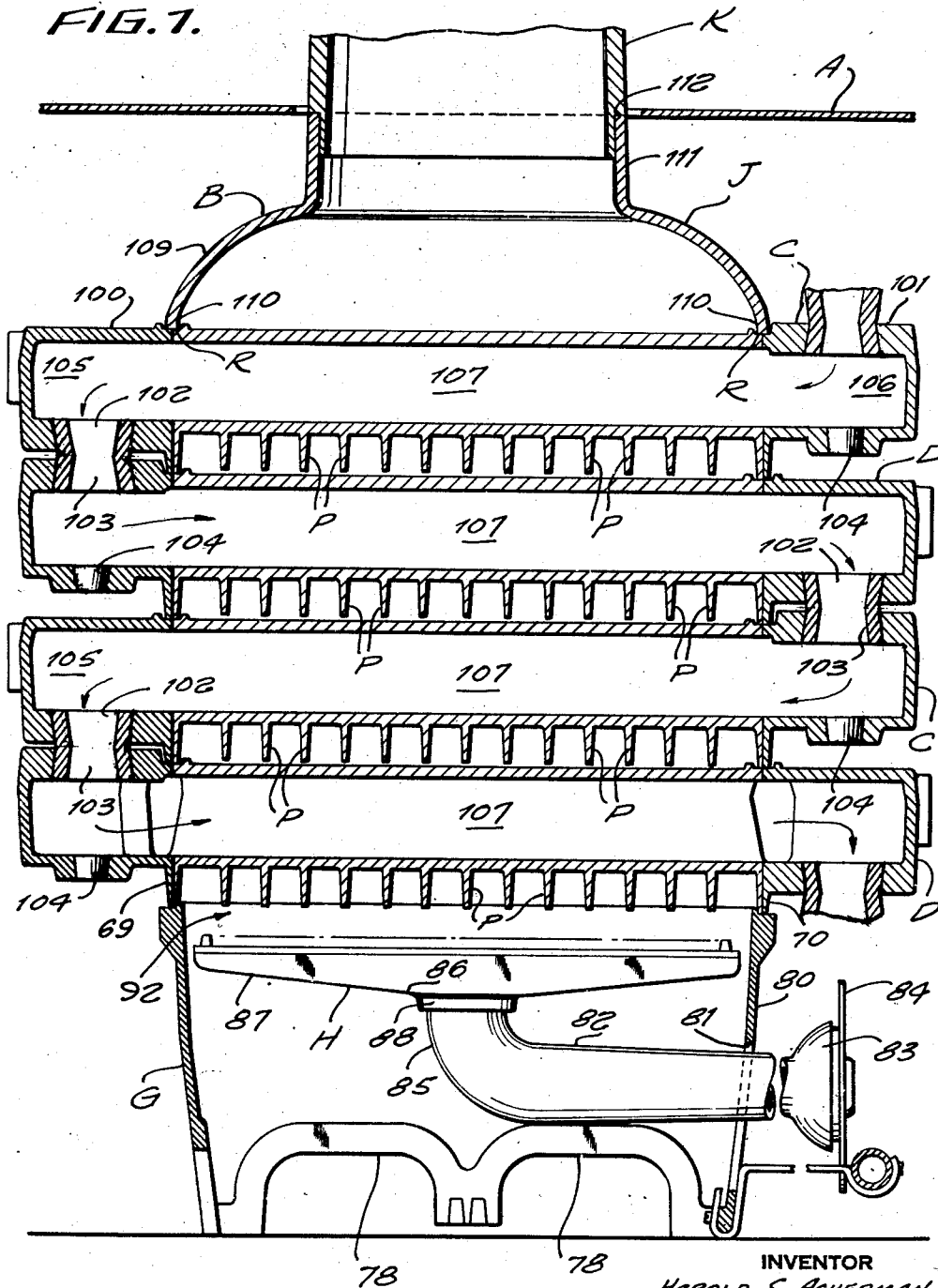
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MIDGET GAS FIRED HOT WATER BOILER

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FIG. 1.



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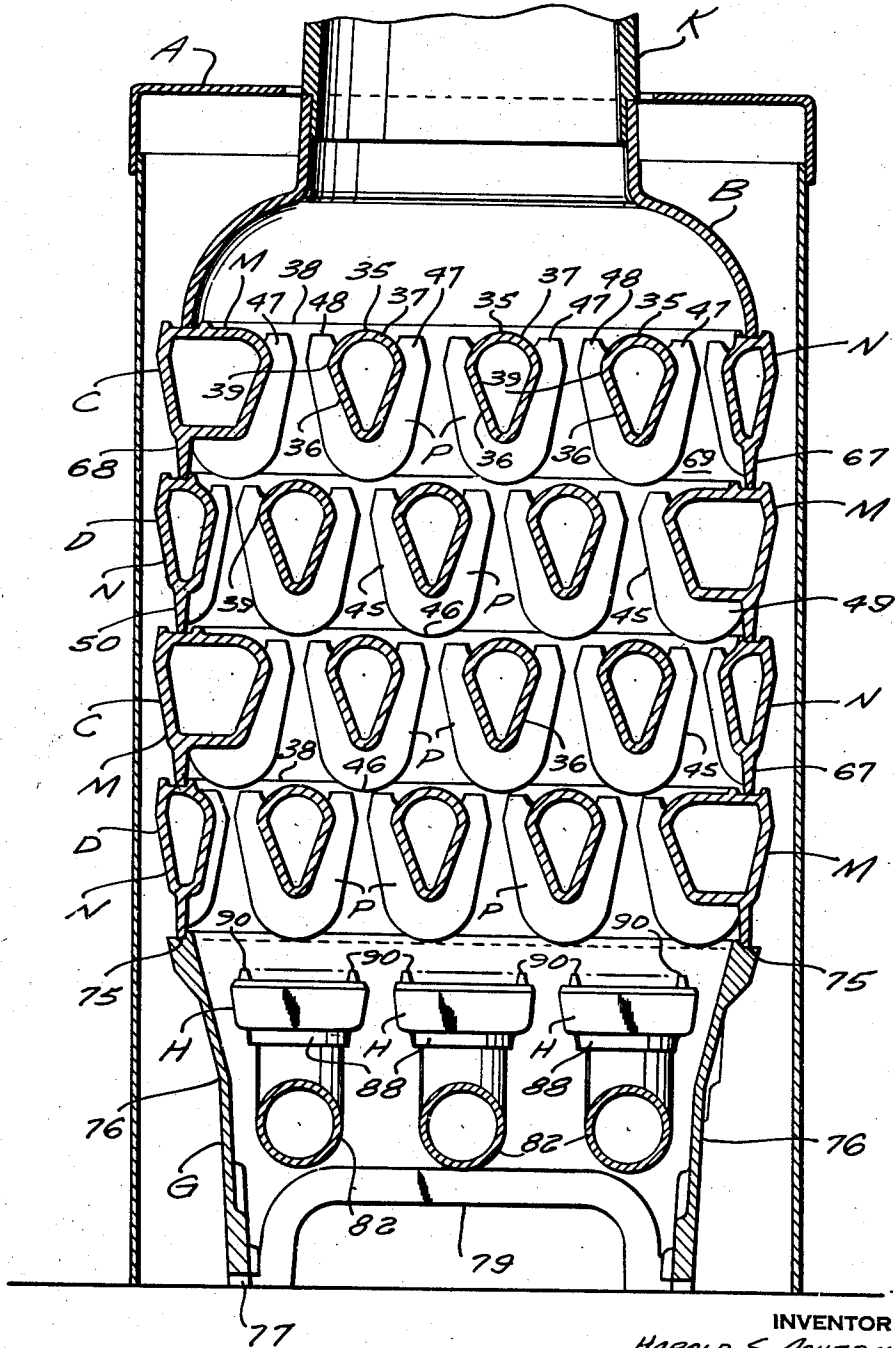
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MIDGET GAS FIRED HOT WATER BOILER

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FIG. 8.



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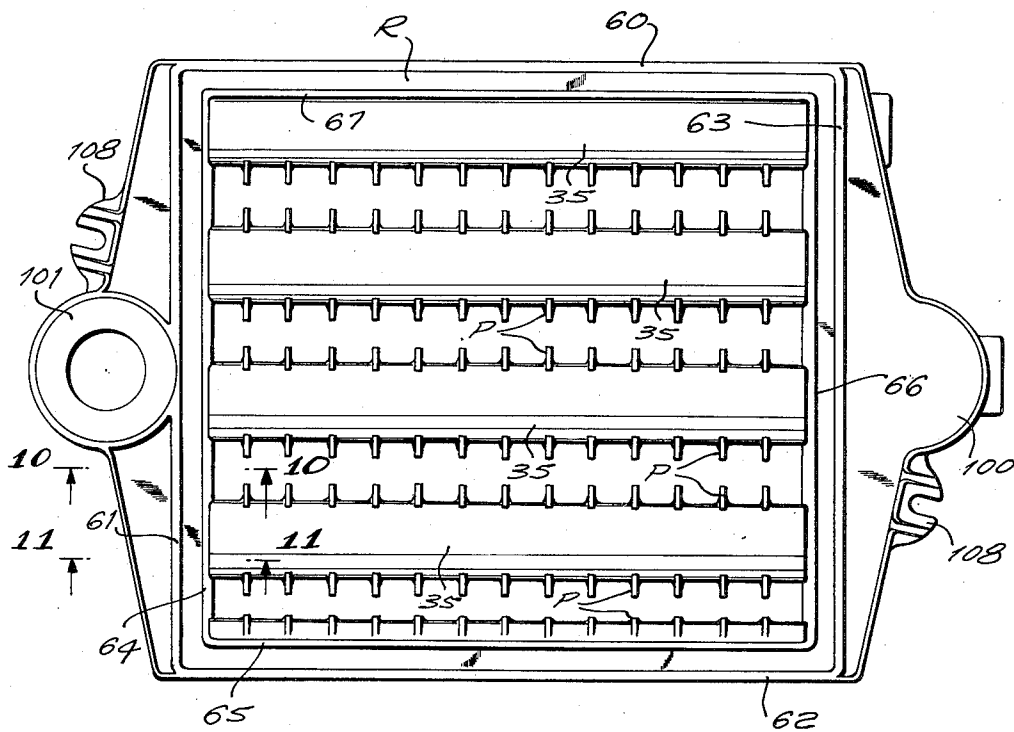


FIG. 9.

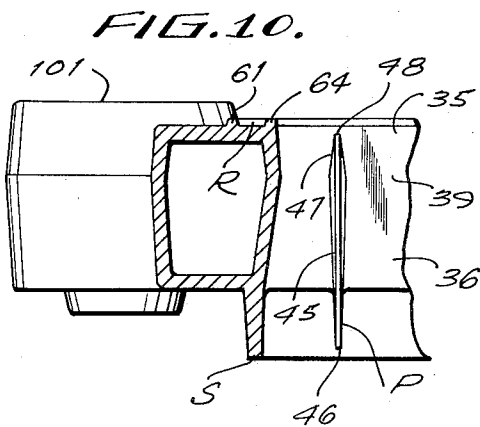


FIG. 10.

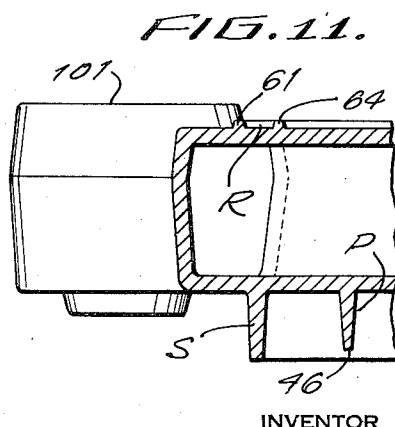


FIG. 11.

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MIDGET GAS FIRED HOT WATER BOILER

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Application November 24, 1953, Serial No. 394,005

6 Claims. (Cl. 122-214)

The present invention relates to a midget gas fired hot water boiler.

Although the present invention will be particularly described in this application to a midget type domestic boiler to which it has a particular and special application it is to be understood that the invention has a broader application to larger boilers, or to industrial boilers, which may generally be used for heating hot water in laundries, apartment houses, swimming pools, restaurants, and other industrial and business establishments.

It is among the objects of the present invention to provide a small size domestic gas fired hot water boiler of the character described, having horizontal instead of vertical sections in which the boiler is so designed that the iron or steel heat transference members are positioned very close to the gas burners so that there will be a most effective transference of heat from the production of combustion to the water circulating to the tubes of the boiler.

Another object is to provide a small gas fired hot water boiler of high capacity even though of comparatively small size in which in a limiting space the tubes will be so shaped and positioned in respect to the burners and hot combustion gas flow areas, there will be a maximum utilization of the available heat and a minimum wastage of heat up the stack.

Another object is to make a very compact domestic unit with a very large amount of iron in a small space to pick up the maximum amount of heat without waste or an excess of iron, and which at the same time requires relatively few and simple patterns for casting the same, and in which the size capacity may be readily varied by changing the number of superimposed sections and in which a standard section form may be used for each superimposed horizontal section.

A still further object is to design a compact small size superimposed horizontal section gas fired boiler with staggered parallel superimposed tubes which will not crack when cold water is introduced into the hot water boiler sections, and which will insure a smooth flow of hot gases with a very large heat absorbing surface directly in contact with the radiant flame or immediately adjacent thereto, and without direct contact with the flame of the iron, which will have a very high B. T. U. output per pound of iron and which will be effectively sealed without special wrappings or compositions or asbestos packing.

Still further objects and advantages will appear in the more detailed description set forth below, it being understood, however, that this more detailed description is given by way of illustration and explanation only and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

In accomplishing the above objects, it has been found most satisfactory according to one embodiment of the present invention to form the boiler of a series of superimposed horizontal sections, consisting of closely spaced

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steam tubes which converge downwardly and have sharply inclined triangular sides, and which have deep fins with the depth of the tube and the depth of the fin being substantially restricted to and falling within the section and not extending about and below the section.

A particular feature of the invention resides in the fact that the side walls of the boiler are formed in the shape of tubes with the top position of the terminal outside tubes having a groove in which an extension of the next upper terminal tubes may fit to form a seal. It has been found that there is no overlapping of the sections and that the avoidance of flange or side cover plates gives a particularly effective construction.

In order to be certain that the tubes in the superimposed sections are staggered in respect to one another when the horizontal sections are superimposed the terminal side of tube members are made of 1½ and ½ inches width, respectively, so that the terminal side tube on one side will be of ½ the standard width, while the terminal side tubes on the other side are 1½ times the standard width of the intervening tubes.

In this way a staggered superimposition may be readily obtained by merely horizontally reversing or swinging around the alternate sections an angle of 180°.

Desirably the boiler sections project in a fore and aft direction parallel to the tubes beyond the metal base or burner sections so that the alternate sections may be readily tied together beyond the burners by a single nipple or connection so that there will not be a rigid inflexible connection between the sections which would be subject to cracking with sudden change of incoming water, as, for example, where the water is hot.

It has been particularly found that the fins which encircle the tubes and are spaced along the length of the tubes should be more rectangular in cross section and they desirably should project beyond and above the maximum width of the tubes which in turn should be closely adjacent to the top of the tube.

In all construction, however, it has been found most satisfactory to have both the sides of the tube, as well as the sides of the fins, straight and convergent downwardly with the sides of the tubes being more sharply convergent than the sides of the fins.

With the foregoing and other objects in view the invention consists of the novel construction, combination and arrangement of parts as hereinafter more specifically described, and illustrated in the accompanying drawings, wherein is shown an embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which fall within the scope of the claims hereunto appended.

In the drawings wherein like reference characters denote corresponding parts throughout the several views:

Fig. 1 is a front elevational view of a boiler housing employed to enclose the horizontal section gas fired water boiler of the present invention.

Fig. 2 is a side elevational view.

Fig. 3 is a rear elevational view.

Fig. 4 is a top plan view.

Fig. 5 is a front elevational view of the assembled sections within the boiler housing.

Fig. 6 is a side elevational view of the assembled horizontal boiler sections within the boiler housing.

Fig. 7 is a transverse vertical sectional view upon the line 7-7 of Fig. 5 and upon a large scale as compared to Fig. 5.

Fig. 8 is a transverse sectional vertical view upon the line 8-8 of Fig. 6 showing the assembled boiler sections upon an enlarged scale as compared to Fig. 6.

Fig. 9 is a top plan view of the horizontal boiler section.

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Fig. 10 is a transverse fragmentary vertical sectional view upon the line 10—10 of Fig. 9 upon an enlarged scale as compared to Fig. 9.

Fig. 11 is a transverse fragmentary vertical sectional view upon the line 11—11 of Fig. 9 upon an enlarged scale as compared to Fig. 9.

Fig. 12 is a top plan view of one of the burners which is shown in end elevational view in Fig. 8 and side elevational view in Fig. 7.

Fig. 13 is a side sectional view taken upon the line 13—13 of Fig. 12.

The boiler as shown in Figs. 1 to 13 is devoid of controls such as the solenoid valve, the gas pressure regulator, and the main shut-off valve.

Referring to the casing as shown in Figs. 1 to 4 the casing A has the front wall 10 with the upper louvers 11 and the lower louvers 12 and 13, and has the split top wall 14, which may be split at 15.

The side walls 16 and the back wall 17 complete the structure.

The casing may be changed by one typical type of casing as shown in Figs. 1 to 4, and is about 27" in height, 16" in width, and 31" in length, and it may be of about 20-gauge material with Fiberglas insulation.

The top wall 14 is provided with an opening 18 for the draft hood connection, while the back wall 17 is provided with an opening 19.

The split top construction is covered as indicated by the strip member 20.

The side wall 16 has an opening 21, while the door section 22 of the front has a handle 23 with a catch.

The top wall 14 also has fore and aft openings 24 and 25. The top and side walls may be readily removed and disassembled and shipped in a knocked-down condition, and the height, width and length of the casing may be changed to fit the desired size of interior assembled boiler sections.

Referring to Figs. 5, 6, 7 and 8, the casing A is shown as enclosing an assembled boiler B, having four superimposed horizontal sections C and D, which are bolted together at forward and rear ends as indicated at E and F.

Below the assembled boiler sections is the metal base or stand G, which receives the burners H. Above the boiler sections is the dome J, which connects with the draft hood K.

The present invention is particularly directed to the size, shape and method of assembling the horizontal boiler sections.

Each section is formed of the intermediate tubes 35, which in cross section have sharply downwardly converged sides 36 (see Fig. 8), and circular top faces 37.

In the form shown, there are three intermediate tubes between the terminal end tubes.

The terminal side tubes M and N are of special construction so as to enable horizontal reversal of the boiler sections.

It will be noted that terminal side tube M has a width about $1\frac{1}{2}$ times the width of the intermediate tubes 35, while the terminal tube N has a width of about $\frac{1}{2}$ the width of the intermediate standard tubes 35.

It will also be noted that the position of these $\frac{1}{2}$ width and $1\frac{1}{2}$ width tubes is reversed from side to side as you go up or down the sections.

As a result, the intermediate tubes in each alternating section C and C will be superimposed and staggered so that it will be directly over the opening or space between the next lower tube.

Furthermore it will be noted that the tubes are all positioned so that they will be substantially adjacent or closely adjacent to the top terminal plane 38 of each section and substantially removed above the bottom of each section.

It will also be noted that the tube sections, exclusive of the fins, have a depth of about twice their maximum width at the point 39.

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The fins P also are of special shape and size. Their side edges as indicated at 45 converge downwardly but not as sharply as the side walls 36 of the tubes 35. They also have a curve or circular termination at bottom edge 46, which is substantially on the same level as the bottom terminal plane of their respective sections that extend as indicated at 47 to form two ears which project beyond and above the maximum width 39 of the tubes 35.

These upwardly projecting ears 37 terminate at 48 below the terminal upper horizontal plane of the horizontal section. These ears terminate substantially on the plane of the curved tops of the tubes 35.

The extra wide tubes M have fins 49 of the same outline but of greater width; the narrow terminal tubes N have fins 50 of same outside contour but again of greater decreased width.

A special feature of the present invention resides in the fact that the top of each section has a continuous groove R extending around the top of the entire periphery of each section and a continuous downwardly extending fin S extending around the periphery of each section.

The terminal groove or peripheral groove R is formed between the two ridges 60, 61, 62 and 63 on the outside of the top of each section and 63, 64, 65 and 66 on the inside periphery of each section.

This recess is designed to receive the peripheral fin S which extends downwardly from the periphery of the next section, as shown best in Figs. 7 and 8, this fin being made up of the side sections 67 and 68, the rear section 69 and the forward section 70.

It will be noted that the sealing is, therefore, accomplished by a mere engagement of the peripheral fins S in the recesses R in each next lower section and that the fins S like the fins P also act for heat transference purposes.

The fin of the lowermost section C or D are fit into the recesses 75 in the base section G. This base section as indicated has the downwardly converging side walls 76 and corner foot member 77 with the side openings 78 and the rear opening 79.

The front wall 80 of the base G has the opening 81 to receive the mixer tube 82 of the burner H. As shown in Fig. 8, there are three burners, each of which has mixer tube 82.

At the front end of the section, there is provided an enlarged head 83 with an adjustable vane 84 to control the mixture of air and gas.

The mixer tubes extend upwardly at 85 to join the bottom 86 of the burner base 87.

The burner base 87, as shown in Figs. 12 and 13, has a nipple projector 88 and it also has a top flat face 89, which receives a large number of the drilled or bored gas projecting nipples 90.

These nipples are separated by the openings 91 into banks with an additional supply of air flowing up into these longitudinal openings 91.

It will be noted that the burners are positioned closely adjacent to the lowermost tube section, there only being a small space, as indicated at 92, between the top of the burner and the bottom of the lowermost tube.

The ends of the sections project, as indicated at 100 and 101, beyond the base and beyond the fins and recess connections R and S.

These extensions 100 and 101 are designed to form the water connections between the superimposed sections and that alternating may be drilled with the large openings 102 and 103, which are connected together by the nipples and the small openings 104, which are plugged.

It will be noticed that the spaces 105 and 106 are substantially beyond the heating flow passage 107 of the superimposed tubes sections, as shown in Fig. 7.

The ends of the sections are also provided with the lugs 108 in both the bottom and rear, which are connected by the through bolts 109.

The dome J has the spherical top wall 109, which extends down at 110 to fit into the recess R in the uppermost section C or D.

The dome J has an upward extension 111, which receives the shoulder recess 112 at the lower end of the draft section K.

The boiler as shown has sections of about 16½" from front to back and about 14¼" from side to side with an over-all depth of about 3½½".

The tube sections themselves have a depth of about 2½½" and a maximum width for standard tubes of about 1¾".

The tube by itself without the fin has a width of about 1¾" as contrasted to a depth of 2½", while the tube with the fin has a width of 2¾" with a depth of 3½½".

The terminal side tube without the fin has a maximum width of 2½½" and a depth of 2½½" and with the fin has a maximum width of 3" and a depth of 3½½".

The narrow side terminal tube without the fin has a maximum width of 1½½" and a depth of 2½½" and with the fin has a width of 1½" and a depth of 3½".

It is thus apparent that the applicant has provided a novel, unique, interchangeable sectional midget gas fired boiler having a capacity for size and which may be readily installed in the limited space available in small homes.

It has a particularly high effectiveness in heat absorption for the amount of iron, and gives a much more effective utilization of heat available.

As many changes could be made in the above midget gas fixed hot water boiler and many widely different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

Having now particularly described and ascertained the nature of the invention, and in what manner the same is to be performed, what is claimed is:

1. A midget type assembled superimposed horizontal section gas fired water boiler with staggered downwardly converging tube sections, said tube sections having an inverted triangular cross section in which their longitudinal side walls will downwardly converge toward each other and join together at a longitudinally extending downwardly projecting edge and the base of the triangular cross section will be bulged and curved upwardly at the top of the tube, each said cross section being provided with a plurality of spaced parallel transversely laterally outwardly and downwardly projecting deep flanges and the tube sections in each adjacent upper and lower sections being offset so that the tube sections of each successive horizontal section will be staggered in respect to each other and be positioned opposite the spaces in the next upper and lower sections, said tube sections connected by single nipples at the ends of the sections, said sections having terminal tube sides of varying sizes so that alternate sections may be reversed and superimposed, each of said sections being of the same form, shape, size and dimension but being non-symmetrical so that each section can only be stacked in respect to the next higher and next lower section by being reversed by rotation of 180° on a vertical axis, each section having a plurality of parallel tubes in spaced side-by-side relationship of downwardly converging cross sectional areas with the intermediate tubes being of the same cross sectional area and the outside tubes being of much wider area on one side and much narrower area on the other side, each said section having a continuous parallelly extending downwardly projecting leg having about the same depth as the deep flanges and contacting the periphery of the next lower section, said flange supporting the section substantially above the next lower section so that the transverse flanges will clear the next lower section and each section having end liquid flow connection one at one side being in the top of the section and directed upwardly and connected with the next higher horizontal section and

the other at the other side being in the bottom of the section and directed downwardly and connected with the next lower horizontal section and said parallel tubes conducting the water parallelly between the nipples in one direction in one section and in an opposite direction in the next higher section with said nipples being disposed within said flow connections establishing communication between the successive superimposed horizontal sections.

2. A midget type assembled superimposed horizontal section gas fired water boiler with staggered downwardly converging tube sections, said tube sections having an inverted triangular cross section in which their longitudinal side walls will downwardly converge toward each other and join together at a longitudinally extending downwardly projecting edge and the base of the triangular cross section will be bulged and curved upwardly at the top of the tube, each said cross section being provided with a plurality of spaced parallel transversely laterally outwardly and downwardly projecting deep flanges and the tube sections in each adjacent upper and lower sections being offset so that the tube sections of each successive horizontal section will be staggered in respect to each other and be positioned opposite the spaces in the next upper and lower sections, said tube sections connected by single nipples at the ends of the sections, each of said sections having a peripheral recess on its upper side and a peripheral downwardly depending solid leg on its lower side so as to engage the recess of the next lower section, each of said sections being of the same form, shape, size and dimension but being non-symmetrical so that each section can only be stacked in respect to the next higher and next lower section by being reversed by rotation of 180° on a vertical axis, each section having a plurality of parallel tubes in spaced side-by-side relationship of downwardly converging cross sectional areas with the intermediate tubes being of the same cross sectional area and the outside tubes being of much wider area on one side and much narrower area on the other side.

3. A midget type assembled superimposed horizontal section gas fired water boiler with staggered downwardly converging tube sections, said tube sections having an inverted triangular cross section in which their longitudinal side walls will downwardly converge toward each other and join together at a longitudinally extending downwardly projecting edge and the base of the triangular cross section will be bulged and curved upwardly at the top of the tube, each said cross section being provided with a plurality of spaced parallel transversely laterally outwardly and downwardly projecting deep flanges and the tube sections in each adjacent upper and lower sections being offset so that the tube sections of each successive horizontal section will be staggered in respect to each other and be positioned opposite the spaces in the next upper and lower sections, said tube sections connected by single nipples at the ends of the sections, each of said tubes having straight downwardly converging sides and being of maximum widths closely adjacent to the top plane of the section, each of said sections being of the same form, shape, size and dimension but being non-symmetrical so that each section can only be stacked in respect to the next higher and next lower section by being reversed by rotation of 180° on a vertical axis, each section having a plurality of parallel tubes in spaced side-by-side relationship of downwardly converging cross sectional areas with the intermediate tubes being of the same cross sectional area and the outside tubes being of much wider area on one side and much narrower area on the other side, each said section having a continuous parallelly extending downwardly projecting leg having about the same depth as the deep flanges and contacting the periphery of the next lower section, said flange supporting the section substantially above the next lower section so that the transverse flanges will clear the next lower section and each section having end liquid flow

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connection one at one side being in the top of the section and directed upwardly and connected with the next higher horizontal section and the other at the other side being in the bottom of the section and directed downwardly and connected with the next lower horizontal section and said parallel tubes conducting the water parallelly between the nipples in one direction in one section and in an opposite direction in the next higher section with said nipples being disposed within said flow connections establishing communication between the successive superimposed horizontal sections.

4. A midjet type assembled superimposed horizontal section gas fired water boiler with staggered downwardly converging tube sections, said tube sections having an inverted triangular cross section in which their longitudinal side walls will downwardly converge toward each other and join together at a longitudinally extending downwardly projecting edge and the base of the triangular cross section will be bulged and curved upwardly at the top of the tube, each said cross section being provided with a plurality of spaced parallel transversely laterally outwardly and downwardly projecting deep flanges and the tube sections in each adjacent upper and lower sections being offset so that the tube sections of each successive horizontal section will be staggered in respect to each other and be positioned opposite the spaces in the next upper and lower sections, said tube sections connected by single nipples at the ends of the sections, each of said tube sections having a plurality of spaced flanges downwardly converging straight side edges, each said flange having upwardly projecting ears, each of said sections being of the same form, shape, size and dimension but being non-symmetrical so that each section can only be stacked in respect to the next higher and next lower section by being reversed by rotation of 180° on a vertical axis, each section having a plurality of parallel tubes in spaced side-by-side relationship of downwardly converging cross sectional areas with the intermediate tubes being of the same cross sectional area and the outside tubes being of much wider area on one side and much narrower area on the other side, each said section having a continuous parallelly extending downwardly projecting leg having about the same depth as the deep flanges and contacting the periphery of the next lower section said flange supporting the section substantially above the next lower section so that the transverse flanges will clear the next lower section and each section having end liquid flow connection one at one side being in the top of the section and directed upwardly and connected with the next higher horizontal section and the other at the other side being in the bottom of the section and directed downwardly and connected with the next lower horizontal section and said parallel tubes conducting the water parallelly between the nipples in one direction in one section and in an opposite direction in the next higher section with said nipples being disposed within said flow connections establishing communication between the successive superimposed horizontal sections.

5. A midjet type assembled superimposed horizontal section gas fired water boiler with staggered downwardly converging tube sections, said tube sections having an inverted triangular cross section in which their longitudinal side walls will downwardly converge toward each other and join together at a longitudinally extending downwardly projecting edge and the base of the triangular cross section will be bulged and curved upwardly at the top of the tube, each said cross section being provided with a plurality of spaced parallel transversely laterally outwardly and downwardly project-

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ing deep flanges and the tube sections in each adjacent upper and lower sections being offset so that the tube sections of each successive horizontal section will be staggered in respect to each other and be positioned opposite the spaces in the next upper and lower sections, said tube sections connected by single nipples at the ends of the sections, each of said tubes having about twice the depth as maximum thickness, each of said sections being of the same form, shape, size and dimension but being nonsymmetrical so that each section can only be stacked in respect to the next higher and next lower section by being reversed by rotation of 180° on a vertical axis, each section having a plurality of parallel tubes in spaced side-by-side relationship of downwardly converging cross sectional areas with the intermediate tubes being of the same cross sectional area and the outside tubes being of much wider area on one side and much narrower area on the other side each said section having a continuous parallelly extending downwardly projecting leg having about the same depth as the deep flanges and contacting the periphery of the next lower section said flange supporting the section substantially above the next lower section so that the transverse flanges will clear the next lower section and each section having end liquid flow connection one at one side being in the top of the section and directed upwardly and connected with the next higher horizontal section and the other at the other side being in the bottom of the section and directed downwardly and connected with the next lower horizontal section and said parallel tubes conducting the water parallelly between the nipples in one direction in one section and in an opposite direction in the next higher section with said nipples being disposed within said flow connections establishing communication between the successive superimposed horizontal sections.

6. A gas fired water boiler comprising a plurality of superimposed rectangular horizontal sections each having end headers and a plurality of water tubes extending longitudinally between said headers of the long dimension of section, each section having at one end a nipple connection leading to the next higher section and at the other end a nipple connection leading to the next lower section, each section having a plurality of intermediate tubes with the same inverted triangular cross section with an upwardly rounded top wall and longitudinally extending side walls downwardly converging toward one another to form elongated longitudinally extending lower edges at the bottoms of the sections and one outside tube being of wider triangular cross section and the other opposite outside tube being of much narrower triangular cross section than the intermediate tubes, and each tube having a plurality of spaced sidewardly and downwardly extending deep flanges extending substantially to the side and below the tube and a deep depending continuing peripheral solid leg extending around the entire bottom of each section and resting upon and supporting each section above the headers and tubes so that said flanges outside will clear the next lower sections, said leg extending downwardly from the bottoms of said outside tubes of one section and resting upon the tops of the outside tubes of the next lower section.

References Cited in the file of this patent

UNITED STATES PATENTS

2,247,796	Ackerman	July 1, 1941
2,490,693	Lennon	Dec. 6, 1949
2,580,033	Loweth et al.	Dec. 25, 1951