Dec. 17, 1929. T. E. MURRAY 1,739,767

HEATER

Filed June 17, 1924 2 Sheets-Sheet 1

Fig. 1.

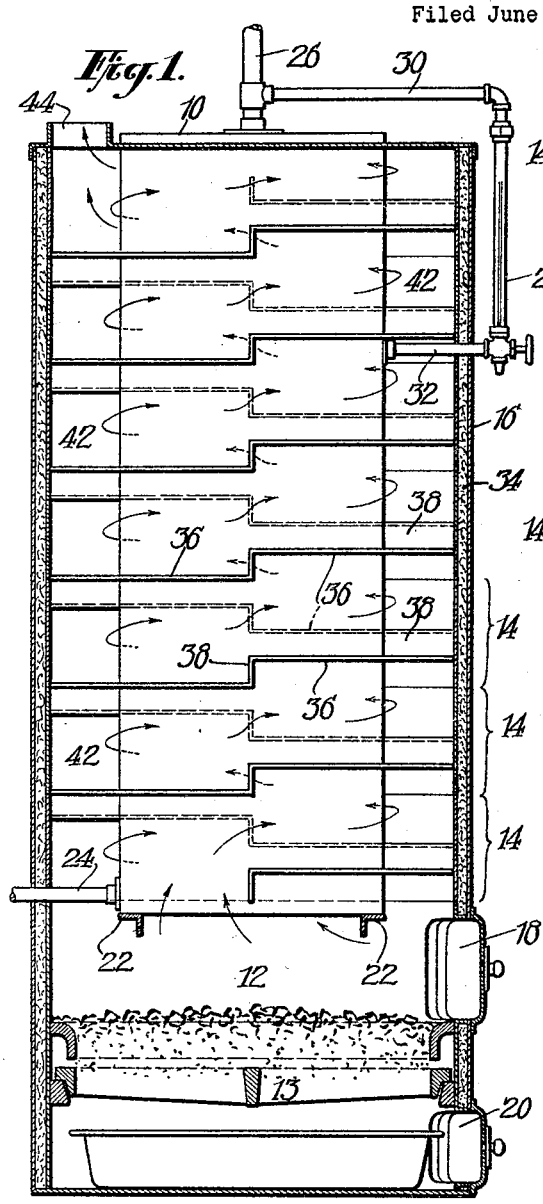



Fig. 2.

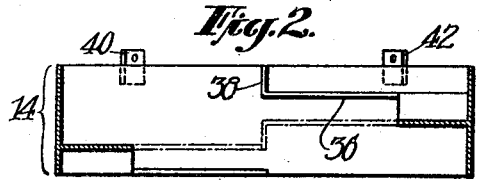



Fig. 3.

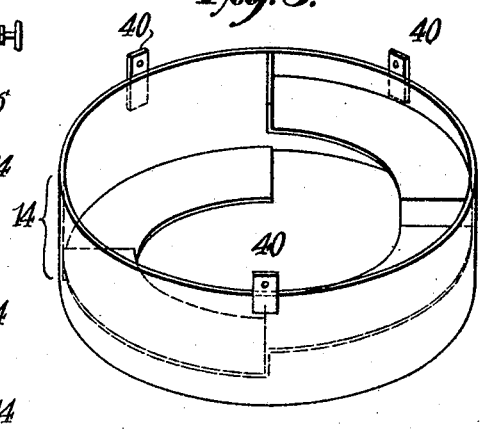



Fig. 4

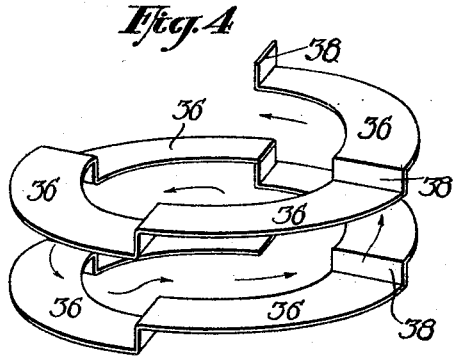
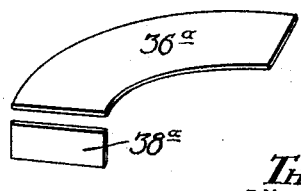



Fig. 5.

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Dec. 17, 1929. T. E. MURRAY 1,739,767

HEATER

Filed June 17, 1924 2 Sheets-Sheet 2

Fig. 6

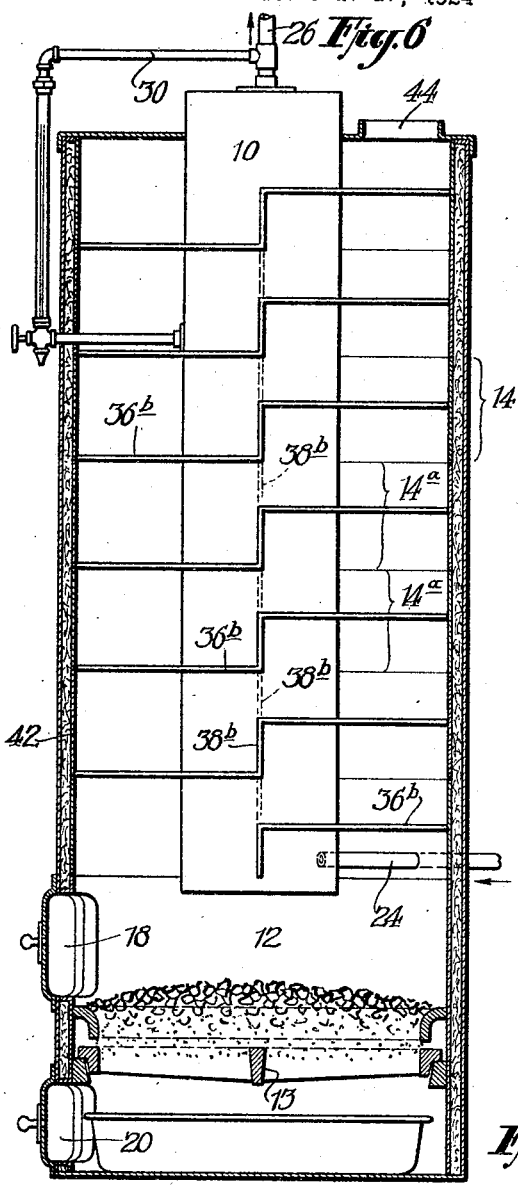



Fig. 7.

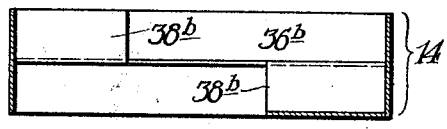
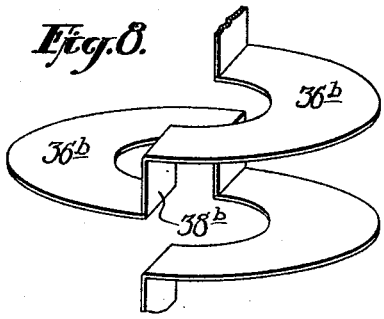



Fig. 8.

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Patented Dec. 17, 1929 1,739,767

# UNITED STATES PATENT OFFICE

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## HEATER

Application filed June 17, 1924. Serial No. 720,486.

This invention relates to heating apparatus and while not limited thereto the embodiments of the invention illustrated are adapted for use in household or domestic heating systems. The heater may be used in connection with either steam or hot water systems.

In the drawings, Fig. 1 illustrates one embodiment of the invention;

Fig. 2 and Fig. 3 are respectively a central section and perspective view of a sectional unit forming part of the shell of the heater shown in Fig. 1;

Fig. 4 is a perspective view showing the construction of extended surface members shown in the foregoing figures;

Fig. 5 is a perspective detail;

Fig. 6 is a view similar to Fig. 1 in which the substantially helical extended surface members are of slightly different construction;

Fig. 7 is a detail section of one of the sectional units of the shell of the heater shown in Fig. 6;

Fig. 8 is a perspective view of the extended surface members of Figs. 6 and 7.

Referring to the embodiment of the invention illustrated in Figs. 1 to 5 inclusive, the heater comprises in general a central vessel 10, combustion chamber section 12 including grate 13, a plurality of shell sections 14 and an outer casing 16. The casing 16 is formed with a suitable fire door opening 18, and ash pit opening 20 for the introduction of fuel and the removal of ash, respectively. The vessel 10 is suitably supported by means of angle bars or similar bearing members 22 secured to or forming part of the combustion chamber section 12. The vessel is supplied with water fed through an inlet pipe 24 and the heated water leaves by a pipe 26 to be circulated through the heating system or to provide hot water for domestic purposes. A suitable water gauge 28 is provided to indicate the level of water in the vessel 10 if the heater is used as a steam boiler, this gauge being connected by means of pipes 30 and 32 with the pipe 26 and intermediate portion of the heater 10. I preferably interpose a layer of heat insulating material 34 between the shell sections 14 and the outer casing 16 in order to conserve the heat energy of the apparatus as much as possible.

Heaters heretofore constructed have proven to be somewhat inefficient in that they do not recover for useful purposes anything like the amount of heat units contained in the fuel which is consumed. In other words, the conventional heaters heretofore in general use pass a great quantity of valuable heat up the stack which is wasteful. My improved heater aims to provide means whereby an increased amount of heat is obtained from the products of combustion and this heat is transferred to the water or other medium circulated through the system. In order to transfer a maximum number of heat units from the fuel burned to the water in the vessel 10, I provide a novel arrangement of members which furnish a greatly extended surface which the products of combustion contact with. These members are heated by convection from the combustion products and transmit the heat by conduction through the walls of the vessel 10 containing the heat medium. The combined surface area of the extended surface members is calculated to absorb the greater part of the heat units from the combustion gases passed through the heater. The members which form this extended surface as shown in the drawings comprise a multiplicity of flat arcuate segmental plates 36 which are spaced apart both longitudinally and circumferentially as best shown in Fig. 4. The several plates 36 are connected by means of longitudinally extending plates 38. As shown in Figs. 1 to 4 this arrangement provides a substantially helical baffle wall, there being four plates 36 per turn of the helix. Each turn of the helix may be made of one continuous sheet of metal or as shown in Fig. 5, the members may be made up of separate plates $36^a$ and separate step plates $38^a$. Whether the members are made of separate pieces as in Fig. 5 or of single pieces forming a complete turn, they can be conveniently secured to the shell section 14 as shown in Fig. 3 so as to form a unit therewith. As thus arranged, the complete heater is assembled by placing a number of sections 14

one over the other, the adjacent sections being secured to one another in any suitable manner for example by means of connecting strips 40 shown in Fig. 3 which may be riveted, bolted, welded or otherwise secured to the adjoining sections. When the parts are assembled the various plates 36 and 38 of the several sections 14 will define a tortuous passage-way 42 which the products of combustion from the chamber 12 must traverse as indicated by the arrows in Fig. 1 in order to escape through the stack outlet 44. To obtain the miximum heat absorption by the heater, I preferably weld or in some other suitable manner unite the extended surface members 36 to vessel 10 in order to get the maximum heat conductivity from these members to said vessel.

In Figs. 6 to 8, I have illustrated a slightly modified form of heater wherein the shell of the heater is made up of sections $14^a$ similar to those above described each section containing extended surface members $36^b$ which are connected by step plates $38^b$. Each plate $36^b$ extends 180° around the member 10, hence, there are two plates per turn of the helical member here shown. The other parts of the heater are substantially the same as those shown in Fig. 1 and the corresponding parts are similarly numbered.

The extended surface members illustrated may be secured in different ways to the vessel which contains the water or other medium to be heated. With the segmental helical members the joint between the latter and the vessel can be made by welding or soldering the parts as each successive section is added to build up the structure. It is important that the joint be of such a character that it will form an efficient means for conducting the heat from the plates to the vessel. Various materials may be used for the construction of the heater such as sheet iron, steel or copper. The latter is a particularly desirable material because of its high heat conducting value.

Though I have described with great particularity the particular embodiments of the invention herein illustrated, it is not to be construed that I am limited thereto as various changes and modifications may be made without departing from the invention as defined in the appended claims.

What I claim is:—

1. In a heater the combination with the vessel in which the fluid to be heated is contained, of a sectional shell surrounding the same comprising a plurality of separate units placed one over the other, and means for forming a tortuous passage-way between the vessel and the shell comprising a multiplicity of flat arcuate plates spaced apart both longitudinally and circumferentially and connected by longitudinally extending plates.

2. In a heater, means for forming a tortuous passage between inner and outer cylindrical members comprising a multiplicity of flat arcuate plates spaced apart both longitudinally and circumferentially and connected by flat longitudinally extending plates.

3. A heater including a combustion chamber, a shell, positioned above said combustion chamber, a vessel within said shell, said shell comprising a series of sections arranged one over the other each section including a plurality of substantially horizontal arcuate plates spaced apart both longitudinally and circumferentially and connected by longitudinally extending members.

4. A heater including a sectional unit having a shell said shell including a plurality of arcuate sheet metal plates spaced apart both longitudinally and circumferentially and connected with one another by longitudinally extending plates to form a stepped helical structure.

In witness whereof, I have hereunto signed my name.

THOMAS E. MURRAY.