May 1, 1934. H. G. TERRET 1,956,749

CATALYTIC HEATING DEVICE

Filed May 16, 1931 2 Sheets-Sheet 1

Fig. 1

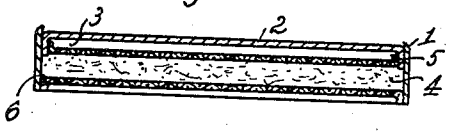


Fig. 2

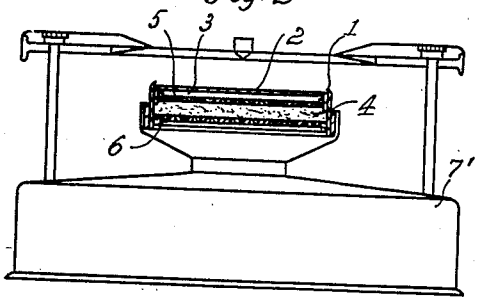


Fig. 3

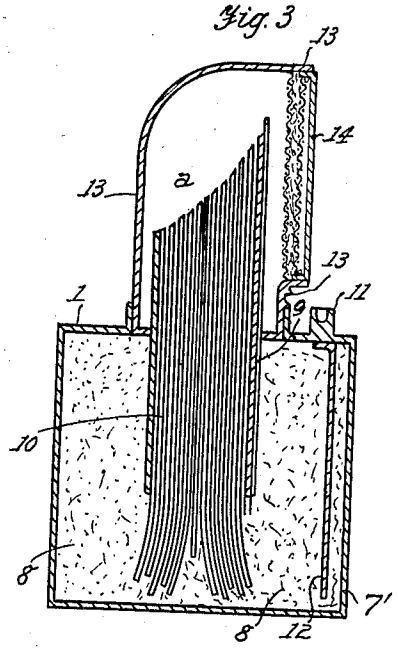
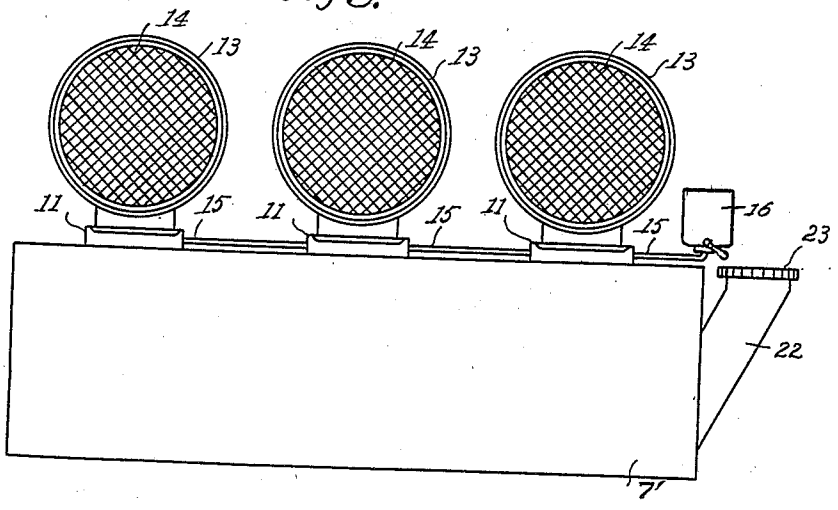


Fig. 5.



Witnesses:
E. David
M: De Wilde

Inventor
Henri Georges Terret
per
Attorney.

May 1, 1934. H. G. TERRET 1,956,749

CATALYTIC HEATING DEVICE

Filed May 16, 1931 2 Sheets-Sheet 2

Fig. 4

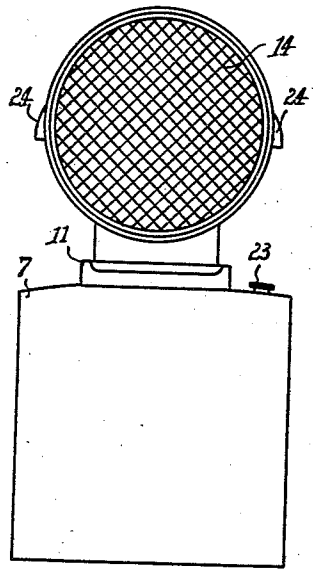


Fig. 7.

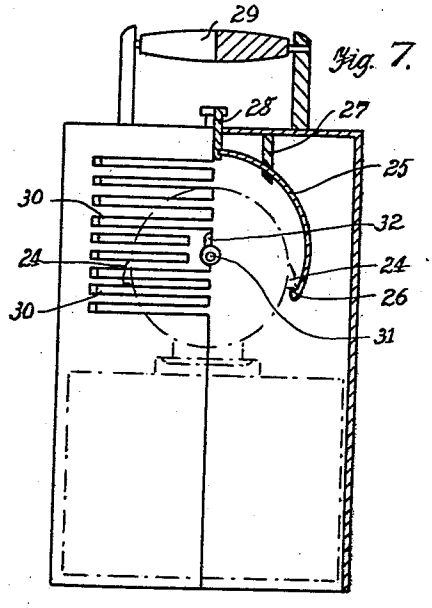
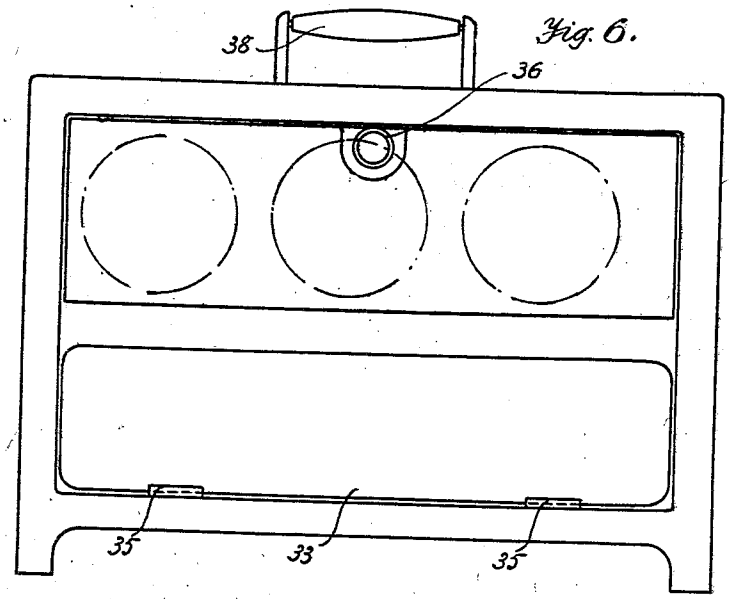


Fig. 6.



Witnesses:
E. David
M. de Wilde

Inventor
Henri Georges Terret
per Alex Ramsay
Attorney

Patented May 1, 1934 1,956,749

UNITED STATES PATENT OFFICE

1,956,749

CATALYTIC HEATING DEVICE

Henri Georges Terret, Alfortville, France

Application May 16, 1931, Serial No. 537,983
In Belgium January 9, 1931

8 Claims. (Cl. 158—96)

The operation of catalytic heating devices using combustible vaporized liquids or gases heretofore have been found unsatisfactory in many respects. Such devices have been deficient in permitting unburned vapors or gases to pass therethrough, and in making uncertain and unreliable the lighting or ignition of such vapors or gases notwithstanding intense pre-heating thereof. Furthermore, practical operation of such devices is not possible when exposed to the atmosphere, particularly when used in a drafty or windy location. Such prior devices have been also found to be inefficient since they fail to provide the maximum amount of heat due to the absorption by the catalyzing agent. The latter generally forms a brittle structure which after a short time in use becomes inoperative owing to the devitalization caused by impurities carried to the catalyzer in the vaporized or gasified liquids.

For the above reasons, catalytic heating devices have not been found practical so far as cleanliness, economy, simplicity and freedom from any risk of fire and explosion hazards are concerned.

My present invention has for its object the provision of certain improvements in the processes of and devices for catalytic heating, whereby all the objections and deficiencies aforementioned will be eliminated and make available catalytic heating in a practical and economical manner.

Catalyzing members heretofore used generally effected the catalysis of the vapors or gases in an interior portion thereof, such members being formed of two more or less thick layers of fine uncoated asbestos fibres. Arranged between these two layers is either a thin layer of fine asbestos fibres plated with platinum or a very thin layer of "spongy" platinum. When three layers are used, they are held in superimposed relation between two wire gauze sheets. The catalyzing member thus constructed is very brittle, subject to rapid devitalization and said wire gauze sheets absorb heat which is dissipated and lost. Such catalyzers also will release unburned vapors or gases of the combustible liquid due to the incomplete combustion which takes place in the interior portion thereof because the outer layers of fibre interfere with the combustion and permit the unburned vapors or gases to escape therefrom.

Other forms of catalyzers used heretofore, comprised an exposed platinum plated surfaced structure resting on a layer of asbestos. This construction, although an improvement over the above described catalyzing members, makes available a greater amount of heat because the vapors or gases of the combustible liquid more readily burn upon contact with the atmospheric air, yet is inefficient since such vapors or gases are not uniformly distributed for consumption and do not flow evenly through the catalyzing surfaced structure. The latter therefore although superior in operation to the first mentioned catalyzers, do not eliminate an escape of unburned gases or vapors, and consequently allow losses in available heat.

The heating device constructions proper heretofore have been found impracticable in that they cannot be operated exposed to the atmosphere, and particularly, in a windy or drafty location. In such constructions, the ignition thereof are found to be difficult and require a long time to accomplish. No operating adjustment means and extinguishing means have heretofore been provided. In certain cases, it has been found that the extinguishing of the devices heretofore was detrimental to the relighting. Briefly stated, catalytic heating apparatus have not been found practical in use.

The improvements forming the subject matter of my present invention reside in:

First, the provision of the catalyzer proper. The catalyzer may be of any geometrical shape and size. It comprises an asbestos fabric, the surface of which is platinum plated chemically and in such a way that the platinum or any other equivalent metal will be incorporated in the fabric itself and unable to be separated therefrom without chemical reaction.

Said catalyzer is held as tightly as possible by its rim in a metal frame. Spaced from said catalyzer below the platinum plated surface thereof, there is provided a thick layer of asbestos fibre or other incombustible material preferably impregnated with highly porous and hygrometric substance, for instance bone powder, which serves to filter the vapors or gasified combustible liquid and remove all impurities therefrom before passing through the catalyzer. The vapors thus purified will be accumulated in the intermediate space between the filtering layer and catalyzer and flow through the latter, at the same time burning under uniform pressure on the portion of the platinum plated surface exposed to the atmosphere, thus completely consuming said vapors, eliminating odors and releasing the maximum amount of heat, the vapors being burned upon contact with the atmospheric air only.

The filtering layer is arranged so as to be easily replaced.

The catalyzer constructed in this way may be placed in any desired position varying from the

vertical to the horizontal, facing either up or down.

Second, the provision of heating devices of improved construction. In such devices it is very difficult to pre-heat the vapors prior to the ignition thereof, such pre-heating taking a long time, and although such pre-heating may be intense, it is frequently necessary to repeat the pre-heating operation several times before the apparatus will continue to function.

My present invention eliminates such difficulties by providing a suitable heater made of heat conducting metal connected directly or indirectly to the catalyzer or pre-heater. Said heater absorbs a portion of the heat generated in the pre-heater and transmits same to the combustible liquid. Thus vaporization for hastening the starting of the combustion is assisted and is kept constant during the operation of the device so that the vaporized liquid to be catalyzed can be used up to the last drop yet permitting the adjusting of the flow of the vapors and the extinguishing of the device without effecting the ease of re-ignition.

Some auxiliary device, such as an automatic funnel for adjusting the amount of pre-heating alcohol, completes the apparatus.

The use of two or more catalyzers makes available a greatly increased amount of heat in a small space.

By providing an enclosure with openings for the catalyzers adapted to be adjusted, better draft and more efficient distribution of the heat is obtained, and by using a metal outer casing for the apparatus, a practical radiating air-stove is provided.

In the accompanying drawings there are illustrated some preferred embodiments of the invention. In these drawings:

Fig. 1 is a sectional view of the catalyzer.

Fig. 2 is a sectional view of the catalyzer mounted in position to serve as a burner.

Fig. 3 is a transverse section of an embodiment of the invention showing the catalyzer arranged for use in vertical position.

Fig. 4 is a front elevational view of the apparatus shown in Fig. 3.

Fig. 5 is a front elevational view of a heating apparatus constructed with a plurality of heating catalyzers mounted on a common liquid containing reservoir.

Fig. 6 is a front elevational view of a casing, for enclosing the heating apparatus such as shown in Fig. 5, and

Fig. 7 is a front elevational view partly in section, showing a casing for enclosing the heating apparatus such as shown in Figs. 3 and 4.

Referring to Figs. 1 and 2, 1 designates the outer frame of the catalyzer, said frame being of any desired shape, such as circular, square, elongated or the like, and having its upper rim slightly curved inwardly.

Arranged in said frame is the catalyzer having the activated surface 2. Said catalyzer may be formed of fabricated asbestos or any other incombustible material, platinum plated or impregnated with any other metal having like catalytic properties. Such plating or impregnation is preferably effected chemically at high temperature, so that the metal will form a part of the incombustible material, and provide the activated surface 2.

The rim edge portion of the catalyzer is firmly secured against the inwardly curved rim of the frame 1 by means of a fine wire gauze sheet 5 having a rim flange.

Provided between the wire gauze sheet 5 and catalyzer is a space or chamber 3 which permits a uniform distribution of gases to the catalyzer. Arranged evenly below the wire gauze sheet 5 is a layer 4 of asbestos fibre, or any other incombustible material, having bone powder or other hygroscopic material mixed therewith, which is disposed in the path of flow of the gases, for filtering same and for removing water vapor and other impurities.

Said layer 4 is secured in the frame 1 by means of a second coarse wire gauze sheet 6 which compresses said layer against the fine wire gauze sheet 5 but not so as to cause any appreciable loss of pressure in the flow of the gases passing therethrough.

The vapors or gases to be consumed pass successively through the wire gauze sheet 6 and the layer 4. The latter filters and purifies the gases before passing them into the space or chamber. In such chamber, the gases are accumulated in purified condition ready for combustion.

The gases pass from the chamber 3 through the catalyzer and coming in contact with the atmospheric air, will be ignited by and consumed at the red heated activated surface metal contained in the material of the catalyzer thereby releasing the maximum amount of heat contained in the gases without giving off any bad odors.

The apparatus shown in Figs. 3 and 5 comprises a receptacle 7' of suitable shape and construction. Said receptacle may be formed of metal and is filled with a liquid absorbing material 8, such as cotton, felt or the like, into which extends a metallic or wire gauze tube 9 which forms a holder for a cotton wick 10. The upper parts of said metal tube 9 and wick 10 extend above the receptacle 7' and if desired may be cut back at an angle as at *a* to provide a beveled end, the lower end of the wick 10 preferably being spread out in the bottom of the receptacle 7' as is clearly shown in Fig. 3.

The top side of the receptacle 7' is fitted with a head 13 which serves to support the catalyzer 14. Said head forms an end closure for the upper parts of the tube 9 and wick 10.

Also secured to the top of the receptacle in front of said head 13 is a cup 11 serving to receive suitable liquid fuel such as alcohol, required for preheating purposes. Secured to the wall of said cup 11 and extending down into the receptacle 7' is a rod or strip of heat conducting material 12.

Projecting from one end of the cup is a pipe 15 terminating in a funnel 16, said funnel being provided with a valve of any conventional design as indicated diagrammatically in Figure 5.

The capacity of the funnel is equivalent to the capacity of the cup 11, or when there is more than one catalyzer forming the heating unit, the funnel has a capacity equivalent to the capacities of all the cups 11 so that the funnel contains a sufficient charge of fuel available for preheating one or more catalyzers as required.

A spout 22, closed by means of a stopper 23 and extending up from the bottom end of one side of the receptacle 7', enables the latter to be filled without possibility of the liquid fuel over-flowing a predetermined level.

Fig. 7 shows one form of the outer casing for the heating apparatus shown in Fig. 3, as well as the manner of suspending the apparatus within the casing. Said casing carries a spring 25 with

a hooked end 26 supported on two small depending bars 27. Extending through the top of the casing is a bolt 28 secured to a central part of said spring. The head 13 of the apparatus has two ears 24 (see Fig. 4) intended to be engaged by the hooks 26 of the spring 25 whereby the apparatus will be suspended within the casing.

Part of the casing in front of the catalyzer is provided with openings, shutters or slits 30. The latter may be closed by suitable means such as the slidable plate 32 provided with a handle 31.

Fig. 5 shows the receptacle 7' constructed with a plurality of catalyzers each with its own cup, said cups being adapted to be filled with pre-heating fuel either directly or by means of the funnel 16 as described above. The receptacle 7' is filled with the gasifiable liquid through the spout 22 which is closed by means of the stopper 23 as described above.

Fig. 6 shows a casing constructed for the reception of the heating apparatus shown in Fig. 5. Said casing is provided with a door 33 hinged or otherwise connected at 35 to the casing, and provided with a handle 36. Said casing is also provided with a handle 38 to facilitate transportation of the apparatus.

The operation of the improved heating apparatus is now apparent. Referring to Figs. 4 and 5, the stopper 23 is removed and the gasifiable liquid to be catalyzed is poured through the spout 22 as shown in Fig. 5 or the opening shown in Fig. 4, into the receptacle 7' and the stopper 23 is tightly screwed in place.

The cup or cups 11 are then filled either directly, or the funnel 16 is first filled and said fuel caused to flow into the cup or cups 11. The pre-heating fuel in the cup or cups is then ignited and allowed to be completely consumed. The flame from the burning pre-heating fuel will bring the catalyzing surface 2 to a red heat and simultaneously the heat will be transmitted also from the cup down into the fuel receptacle by means of the metal strip 12 (see Fig. 3). The latter extends into the absorbing material 8, thereby aiding the vaporization of the liquid contained in the receptacle 7. By capillary action, the gasified liquid to be catalyzed will pass up the wick in the head 13 and hence through the catalyzer, that is, first through the filtering layer and then will be completely consumed on the catalyzer surface, giving up the maximum amount of heat contained in the vapor.

The metal of the catalyzer when once brought to a red heat by pre-heating, will be retained in this condition by the combustion of the gasified liquid.

I claim:

1. A heating apparatus of the type described comprising a catalyzer having an activating surface exposed to the atmosphere, a layer of porous material spaced from said catalyzer and forming a chamber therewith, and a fuel receptacle communicating with said layer of porous material, whereby fuel may successively traverse the porous material, chamber and catalyzer to burn on the activating surface of said catalyzer.

2. The heating apparatus defined in claim 1 including preheating means extending into the receptable in contact with said liquid.

3. The heating apparatus defined in claim 1 including an enclosing casing having openings and adjustable closures for said openings.

4. The heating apparatus defined in claim 1 including adjustable means for controlling the flow of the gasified liquid.

5. The heating apparatus defined in claim 1 having a cup mounted adjacent said surface adapted to receive a preheating fuel.

6. The heating apparatus defined in claim 1 having a cup mounted adjacent said surface adapted to receive a preheating fuel, and a measuring container connected with said cup for supplying a definite quantity of said fuel to the cup.

7. The heating apparatus defined in claim 1 having a cup mounted adjacent said surface adapted to receive a preheating fuel, a measuring container connected with said cup for supplying a definite quantity of said fuel to the cup, and a manually operated valve mounted in the connection between said container and cup.

8. The heating apparatus defined in claim 1 in combination with an enclosing casing therefor, and means in said casing for removably suspending the apparatus therein.

HENRI GEORGES TERRET.