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H. PRAVAZ

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CATALYTIC HEATING APPARATUS

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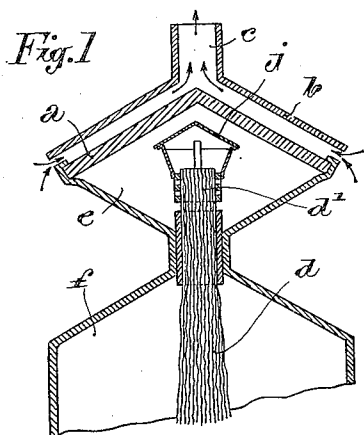


Fig. 6

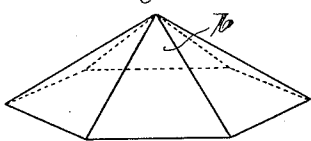


Fig. 7

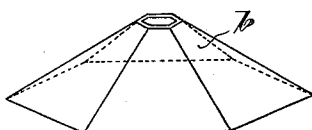


Fig. 9

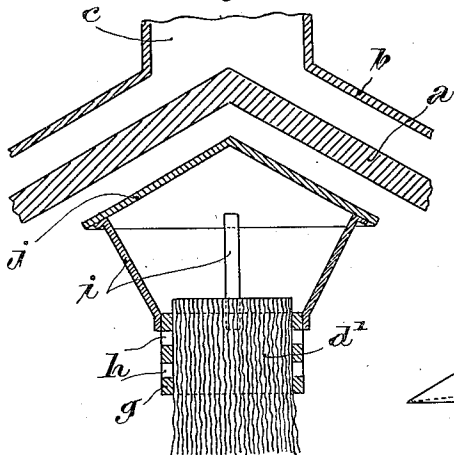
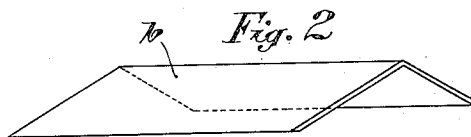


Fig. 3

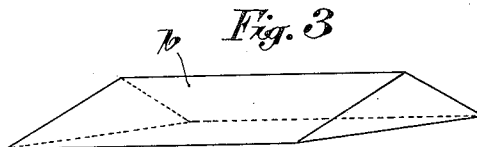


Fig. 4

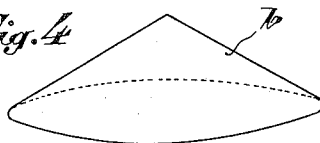


Fig. 5

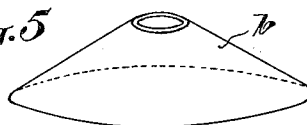


Fig. 8

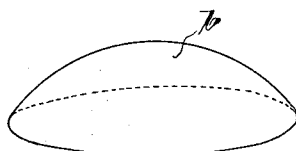


Fig. 10

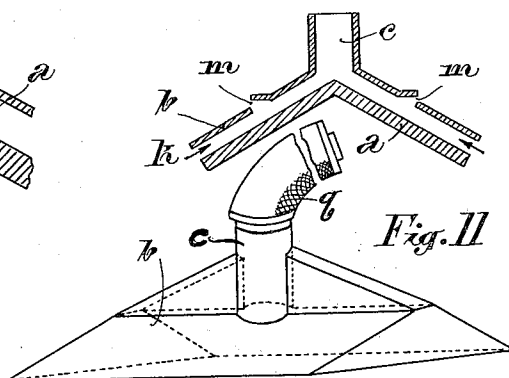


Fig. 11

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UNITED STATES PATENT OFFICE

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CATALYTIC HEATING APPARATUS

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8 Claims. (Cl. 158—96)

The present invention relates to catalytic heaters for liquid fuel.

One object of the invention is to provide a heater of this type which is adapted to burn normal motor fuels.

Another object is to produce a heater in which at the tip of the wick a high temperature is obtained which is sufficient to volatilize even the heaviest components of normal fuel for combustion engines.

Still another object of the invention is to produce a catalytic heater in which a considerable draft is generated which suffices to carry to the catalytic member a quantity of oxygen insuring a rapid combustion of the fuel gases at a high temperature.

A still further object of the invention is to produce a catalytic heater in which the lower part of the wick and the fuel tank can be maintained at a low temperature while a simultaneous evaporation of all constituents of the fuel is effected at the hot tip of the wick.

I accomplish these and other objects which will become apparent as the specification proceeds by the new arrangement and combination of elements set forth in the following detailed description, defined in the appended claims and illustratively exemplified in the accompanying drawing in which:

Fig. 1 is a vertical section through a catalytic heater according to the invention.

Figs. 2 to 8 illustrate, respectively, seven different shapes which may be given to the screens.

Fig. 9 shows on a larger scale in vertical section the upper part of the wick and parts of the different screens.

Fig. 10 is a vertical section of a catalytic screen and a reflecting screen provided with supplementary airholes.

Fig. 11 is a perspective view of another possible shape of the screen.

Referring to the drawing, and first to Figs. 1 and 9, *a* denotes a porous catalytic screen of platinum coated asbestos wool or a similar suitable material. The screen *a* may have substantially the shape of a symmetric open-sided gable roof with a pitch of about 30° to the horizontal (see Fig. 2). The catalytic screen *a* is supported on a fuel tank *f*. A wick *d* emerges from the fuel tank in upward direction and has its tip *d'* disposed vertically below the ridge of the catalytic screen *a* in the closed evaporation chamber *e*. A solid screen *b* of a shape substantially corresponding to that of the catalytic screen *a* is disposed at a distance of about 15 to 20 mm. above the catalytic screen *a* and

parallel thereto, said screen *b* being provided with a highly reflecting lower surface. The narrow space *k* between the catalytic screen *a* and the reflecting screen *b* forms an upwardly inclined draft channel which opens at its highest point into a single exhaust duct *c* for the burnt gases. The tip *d'* of the wick *d*, which is disposed in the evaporation room *e*, carries, at a distance from the fuel tank portion from which the wick emerges, a metallic collar *g* having perforations *h* and supporting by means of brackets *i* of heat conductive material immediately below the catalytic screen *a* a heat collecting screen *j*. The screen *j* consists of heat conductive material and has a shape similar to that of the catalytic screen *a* but is smaller than the latter.

The device operates as follows: The liquid fuel rises from the tank to the tip of the wick *d* where all its constituents are simultaneously evaporated owing to the elevated temperature prevailing at the wick tip *d'*. The generated gases enter the evaporation chamber *e* through the holes *h* in the collar *g* and between the arms of the bracket *i*, and pass upwardly through the catalytic screen *a*. At the upper surface of the screen *a* the gases encounter the oxygen-carrying air flowing upwardly in the draft channel *k* between screens *a* and *b* and are burnt without a flame. Part of the developed heat is given off to the screen *b* which reflects this heat back to the catalytic screen *a* which latter radiates heat in the general direction of the wick tip *d'*. Immediately below the screen *a* the heat radiating from the screen *a* downwardly is collected by the screen *j* from where it flows through the bracket *i* and collar *g*. As the metallic heat conduction in downward direction is interrupted at this point, no heat is dissipated into the tank body and the total of the collected heat is concentrated onto the wick tip *d'*. Thus an extraordinarily high temperature is obtained at the wick tip *d'* facilitating the complete volatilization of fuels containing heavy components. At the same time, owing to the effective draft produced on the upper surface of the catalytic screen *a*, a complete combustion of the fuel gases at a very high temperature in the neighborhood of 500° C. is effected.

Each screen, instead of being shaped as an open sided symmetric gable roof, may have the shape of a symmetric gable roof with closed sides (Figs. 3 and 11) or the shape of a cone (Fig. 4), of a trunk of a cone (Fig. 5), of a hexagonal pyramid (Fig. 6), of a trunk of a pyramid (Fig. 7), or of a spherical calotte (Fig. 8). Any other shape may be used provided only each screen comprises a slope portion disposed at an oblique angle to the horizontal.

Preferably, each screen may have substantially the shape of a tapered hood with a slope angle of about 30° to the horizontal.

In order to increase the supply of oxygen to the draft channel *k* between the catalytic screen *a* and the reflecting screen *b*, supplementary slit-shaped air inlets *m* may be provided in the screen *b* as shown in Fig 10. In this case, the screen *b* is formed with turned up lip portions overlapping said air inlet slits *m* so as to present a practically uninterrupted reflecting surface.

The device according to the present invention is particularly adapted for the heating of aircraft engines. Heretofore, catalytic heaters for air-craft engines had to be placed under the hood of the aeroplane, which was dangerous and greatly inconvenient.

With the above described arrangement the combustion temperature is greatly higher, and it is possible to connect with the outer end of the duct *c* an eduction pipe *q* (see Fig. 11). The eduction pipe *q* is by preference a flexible metallic pipe which is heat insulated in order to avoid any loss of heat. Owing to this arrangement, the combustion gases leave the upper end of the pipe *9* at a high temperature (of about 200°). The upper end of the pipe *9* may thus be introduced through a suitable orifice at the bottom of the hood of the aeroplane to effect a sufficient heating of the engine. The catalytic heater is then placed outside of the hood and the difficulties experienced heretofore are thus obviated.

Although the highest temperature prevailing in the catalytic heating body, and with still more reason, that prevailing at the eduction outlet of the gases, is generally notably inferior to the temperature of the flashing point of the essences, fuels and lubricating agents used in combustion engines, a fine grate (not shown) may be inserted at the eduction outlet of the gases, this grate being similar to that used in miner's lamps.

I claim:

1. A catalytic heater comprising a fuel tank, a wick emerging upwardly from said tank, a porous catalytic screen disposed above said wick and including a slope portion disposed at an oblique angle to the horizontal, a draft channel including a solid screen of a shape substantially corresponding to that of the catalytic screen and disposed

immediately above and parallel to the latter, said solid screen having a highly reflecting lower surface adapted to reflect heat to said catalytic screen so as to increase the heat radiation from said catalytic screen towards said wick, and a single exhaust duct for burnt gases at the highest point of said solid screen in communication with said draft channel.

2. A catalytic heater, as claimed in claim 1, in which the distance between the catalytic screen and the solid screen is between 15 mm. and 20 mm.

3. A catalytic heater, as claimed in claim 1, including a heat conducting screen of heat conducting material having a shape similar to that of the catalytic screen and being smaller than the latter, said heat conducting screen being disposed immediately below and parallel to said catalytic screen to collect the heat emanating from the latter, a perforated heat conducting collar surrounding the tip of the wick, said collar being spaced from the portion of the fuel tank from which the wick emerges, and heat conducting means connecting said heat conducting screen with said collar.

4. A catalytic heater, as claimed in claim 1, in which each screen has substantially the shape of a symmetric gable roof having its ridge disposed vertically above the tip of the wick.

5. A catalytic heater, as claimed in claim 1, in which each screen has substantially the shape of a truncated cone with a circular base, the imaginary tip of said cone being disposed vertically above the tip of the wick.

6. A catalytic heater, as claimed in claim 1, in which each screen has substantially the shape of a truncated hexagonal pyramid, the imaginary tip of said pyramid being disposed vertically above the tip of the wick.

7. A catalytic heater, as claimed in claim 1, in which said solid reflecting screen is provided with supplementary slit-shaped air inlets and includes turned up lip portions overlapping said air inlets so as to present a practically uninterrupted reflecting surface.

8. A catalytic heater, as claimed in claim 1, including a heat insulated flexible eduction pipe connected to said single exhaust duct.

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