Dec. 26, 1950 M. QUERCIA ET AL 2,535,452

LIGHTER USING GASEOUS FUEL

Filed June 26, 1947

Fig. 1

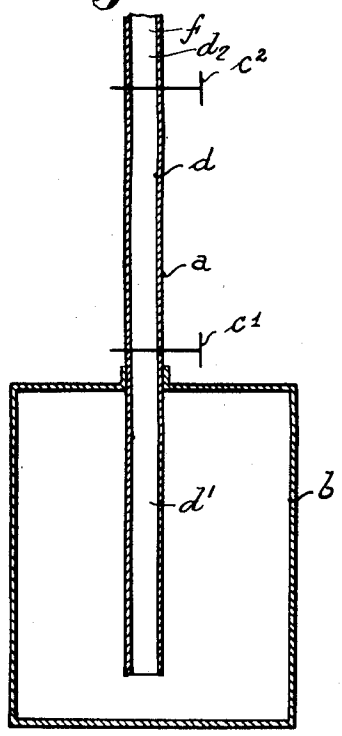


Fig. 2

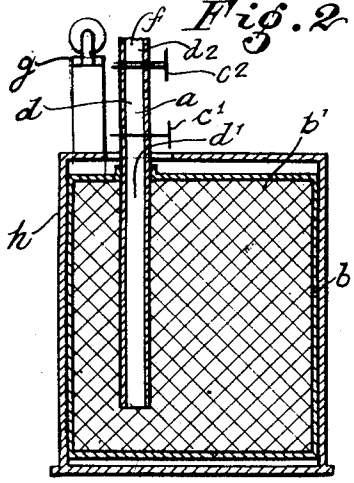
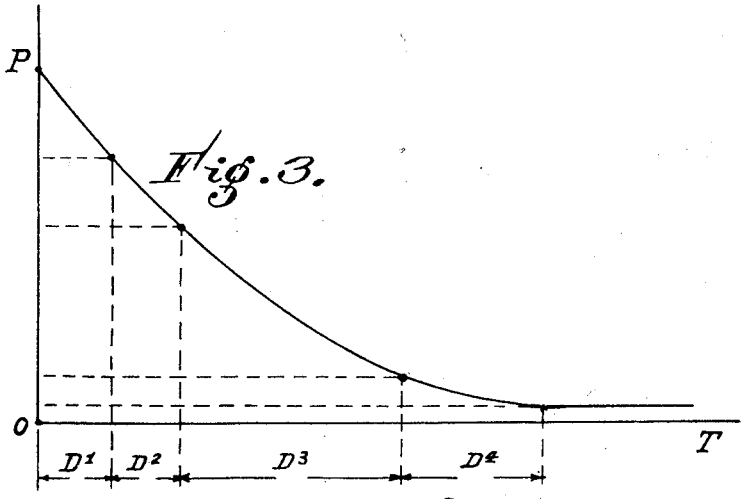


Fig. 3.



Inventors:
Marcel Quercia and
George Ferdinand
by Pendell & Johnson
Their Attorneys

Patented Dec. 26, 1950

2,535,452

UNITED STATES PATENT OFFICE

2,535,452

LIGHTER USING GASEOUS FUEL

Marcel Quercia, Paris, and Georges Ferdinand, Nogent/Marne, France

Application June 26, 1947, Serial No. 757,314
In France May 6, 1942

Section 1, Public Law 690, August 8, 1946
Patent expires May 6, 1962

9 Claims. (Cl. 67—4.1)

1

The present invention relates to lighters of the type utilizing as fuel liquified compressed gases.

It has for its object an improved lighter of this kind.

According to our invention, we provide a lighter of the type referred to characterized by the use of multiple and successive expansion of the gas before it escapes through the outlet nozzle, for the purpose of permitting the convenient and practical utilization of these gases for cigarette lighters.

The invention is applicable to all lighters, whether pocket or table lighters.

The multiple, i. e. double or triple expansion, is advantageously made adjustable and is obtained uniquely by mechanical means; it is advantageously obtained by means of a first expansion effected in the fuel container itself and is followed by one or more subsequent successive expansions produced by one or several mechanical pressure-reducing valves finally reducing the pressure of the gas when it escapes through the burner, to a pressure slightly higher than the atmospheric pressure.

Owing to the adjustments provided, the arrangement allows to utilize liquified compressed fuel gases of different types; it allows particularly the use of liquid fuels, the boiling points of which vary between —22° and 15°.

The first expansion effected in the container itself will be advantageously obtained by utilizing, in the latter, a solid absorbent material in any suitable form (pulverulent, fibrous, compressed or otherwise), intended to absorb the liquified gaseous fuel.

In the drawing

Fig. 1 is a diagrammatic view of a storage container, according to our present invention;

Fig. 2 is a diagrammatic view of a lighter equipped with a removable storage container in accordance with our present invention; and

Fig. 3 is an expansion curve obtained by means of the arrangement which constitutes the object of the invention.

The problem to be solved consists in reducing the pressure of the compressed liquified gas which is in the container to a pressure slightly superior to the atmospheric pressure when it escapes through the burner.

In accordance with our invention the combined gas expansion and outlet means for the storage container as shown in Fig. 1, consist of a cylindrical tube a projecting into the container b for the liquified gas. This tube is provided with

2

two devices c^1 and c^2, such as taps, needle valves, plates provided with apertures of adjustable sections, perforated plates provided with constant apertures of calculated sections, or any other adjustable or calibrated closure devices. These flow adjusting and closure devices c^1 and c^2 are preferably arranged in the outlet tube and spaced from each other and both ends of the outlet tube as clearly shown in Figures 1 and 2, so as to form three expansion chambers d^1, d, and d^2.

The adjustment of c^1 will reduce the pressure of the gas flowing through c^1 into the expansion chamber d to a pressure p^1 which is lower than the pressure P of the gas in expansion chamber d^1. The device c^2 will further reduce during operation of the lighter the pressure of the gas of the chamber d to a pressure p^2 in the expansion chamber d^2 which is lower than the pressure p^1 and in the neighborhood of the external pressure.

This arrangement permits to obtain at the burner f a flame which can be regulated from a few millimeters to several centimeters.

In the container b shown in Figure 2, the liquified fuel gas, for example butane, is absorbed by an absorbent material b^1 in the solid state, such as a silicate (asbestos, porous earth), cotton, peat, or other solid substance in the pulverulent compressed or porous state.

It is, therefore, in the expansion chamber d^1 between the absorbent material b^1 and the flow restricting device c^1 that the first expansion takes place, i. e. before the second expansion in the expansion chamber d, which is caused by c^1. Furthermore, by provision of the expansion chamber d^1, one will avoid the passage through c^1 of liquid particles which could upset the adjustment by creating eventually a liquid seal. A further expansion is obtained in the expansion chamber d^2 by means of valve c^2 as explained above.

The Figure 3 represents an expansion curve obtained by the above described arrangement: on this curve are plotted as abscissae the times T and as ordinates the pressures P; the portion D^1 of the curve represents the expansion in the solid absorbent material, the portion D^2 the expansion in the first expansion chamber d^2, the portion D^3, the expansion in the second expansion chamber d, and the portion D^4 the last expansion in the third expansion chamber d^2.

The ignition of the gas at the burner f may be effected by any one of the processes in current use, for example, a ferro-cerium flint g shown in Figure 2, platinum wire or sponge, or electric ignition.

It will be seen that the multi-pressure-reducing apparatus which constitutes the object of the invention is, either adjustable at will, or else may be adjusted once for all for a specified fuel. The above described self-contained fuel storage unit is applicable to all pocket-lighters and desk-lighters utilizing compressed liquified gaseous fuels.

As shown in Figure 2, the removable fuel storage unit, which is independent of the ignition system mounted on the lighter *h* and including the flint *g*, is constituted by the self-contained container *b* of liquified compressed fuel gas provided with all parts of its system of expansion and its burner, i. e. the outlet tube *a*, the valve means c^1 and c^2 and the burner *f*.

It goes without saying that the details of execution which have been represented and described above are only preferred examples of the realization of the invention and that the latter is capable of all possible variations.

Our U. S. Patent application Serial No. 757,313, entitled "Storage and the Utilization of Liquefied Gases" and filed on June 26, 1947, now abandoned, discloses certain features of the fuel storage units and lighter arrangements disclosed and claimed in the present application.

What we claim is:

1. A fuel storage and discharge unit for a lighter, comprising in combination, a closed storage container; solid absorbent material within said closed storage container; compressed liquified butane absorbed by said solid absorbent material; an outlet conduit connected at one end to said closed storage container communicating with the space within the same and being open at its other end; and adjustable flow-restricting means arranged in said outlet conduit spaced from said open end of the same.

2. A fuel storage and discharge unit for a lighter, comprising in combination, a closed storage container; solid absorbent material within said closed storage container; liquified butane absorbed by said solid absorbent material; an outlet conduit connected at one end to said closed storage container communicating with the space within the same and being open at its other end; flow-restricting means arranged within said outlet conduit spaced from said open end of the same and spaced from said solid absorbent material in said closed storage container so as to form a gas expansion chamber between itself and said solid absorbent material in said closed storage container; and valve means arranged in said outlet conduit between said open end of the same and said flow-restricting means.

3. A fuel storage and discharge unit for a lighter, comprising in combination, a closed storage container; solid absorbent material within said closed storage container; liquified butane absorbed by said solid absorbent material; an outlet conduit connected at one end to said closed storage container communicating with the space within the same and being open at its other end; and adjustable flow-restricting means arranged in said outlet conduit spaced from the open end of the same and said solid absorbent material in said closed storage container, so as to form two gas expansion chambers, one located between said solid absorbent material in said closed storage container and said flow-restricting means, and the other located in said outlet conduit between said flow-restricting means and said open end of said outlet conduit.

4. A lighter arrangement comprising in combination, a lighter; a self-contained fuel storage unit removably arranged in said lighter, said unit comprising a fuel storage container, solid absorbent material within said fuel storage container, compressed liquified butane gas absorbed by said solid absorbent material within said fuel storage container whereby a relatively large amount of said gas may be stored in said container at a relatively low pressure, an outlet conduit connected at one end to said fuel storage container communicating with the space within the same and being open at its other end, and valve means arranged in said outlet conduit; and ignition means on said lighter for igniting the gas escaping through said open end of said outlet conduit when said valve means arranged in said outlet conduit is in open position.

5. A lighter arrangement comprising in combination, a lighter; a self-contained fuel storage unit removably arranged in said lighter, said unit comprising a fuel storage container, solid absorbent material within said fuel storage container, compressed liquified butane gas absorbed by said solid absorbent material within said fuel storage container whereby a relatively large amount of said gas may be stored in said container at a relatively low pressure, an outlet conduit connected at one end to said fuel storage container communicating with the space within the same and being open at its other end, valve means arranged in said outlet conduit, and flow-restricting means arranged in said outlet conduit between said solid absorbent material within said fuel storage container and said valve means; and ignition means on said lighter for igniting the gas escaping through said open end of said outlet conduit when said valve means arranged in said outlet conduit is in open position.

6. A lighter arrangement comprising in combination, a lighter; a self-contained fuel storage container arranged within said lighter; solid absorbent material within said fuel storage container; compressed liquified butane gas absorbed by said solid absorbent material within said fuel storage container whereby a relatively large amount of said gas may be stored in said container at a relatively low pressure; an outlet conduit communicating at one end with the space within said fuel storage container and being open at its other end; valve means arranged in said outlet conduit; flow-restricting means arranged in said outlet conduit between said solid absorbent material in said fuel storage container and said valve means; and ignition means on said lighter for igniting the gas escaping through said open end of said outlet conduit when said valve means arranged in said outlet conduit is in open position.

7. A fuel storage and discharge unit for a lighter comprising in combination a closed storage container; solid absorbent material within said closed storage container; compressed liquified butane fuel gas entirely absorbed by said solid absorbent material within said closed storage container whereby a relatively large amount of said gas may be stored in said container at a relatively low pressure; an outlet opening in a wall of said closed storage container; and closure means for said outlet opening in said wall of said storage container.

8. A lighter arrangement comprising in combination, a lighter device; a self-contained fuel storage container removably arranged within said lighter device; solid absorbent material within said fuel storage container; compressed

liquified butane gas absorbed by said solid absorbent material within said fuel storage container whereby a relatively large amount of said gas may be stored in said container at a relatively low pressure; outlet means mounted in a wall of said container and communicating at one end with the interior of said fuel storage container and at its other end with the atmosphere, said outlet means including a valve located inwardly of the outer end of said outlet means; flow restricting means arranged in said outlet means inwardly of said valve, the interior of said container being filled with said solid absorbent material except for a space serving as an expansion space from which gas discharges to said flow restricting means; and ignition means on said lighter device for igniting the gas escaping through the open end of said outlet means when said valve is in open position.

9. A self-contained fuel storage and discharge unit for a lighter device which comprises a fuel storage container adapted to be removably inserted in said lighter device; solid absorbent material within said fuel storage container; compressed liquified butane gas absorbed by said solid absorbent material within said storage container whereby a relatively large amount of said gas may be stored in said container at a relatively low pressure; an outlet conduit mounted in a wall of said container in sealed position thereto and communicating at its inner end with the interior of said fuel storage container and at its outer end with the atmosphere; valve means associated with said outlet conduit inwardly of the outer end thereof openable and closable to permit the discharge of gas through the outer end of said conduit; and flow restricting means associated with said outlet conduit inwardly of said valve means and in flow communication with the interior of said outlet conduit and adapted to control the flow of gas from said container to said valve means, the interior of said container being filled with said solid absorbent material except for a space adapted to serve as an expansion space from which gas discharges to said flow restricting means.

MARCEL QUERCIA.
GEORGES FERDINAND.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
822,826	Coleman	June 5, 1905
1,608,155	Barnebey	Nov. 23, 1926
1,895,032	Fisher	Jan. 24, 1933
2,019,432	Lagerholm	Oct. 29, 1935
2,153,432	Reich	Apr. 4, 1939

FOREIGN PATENTS

Number	Country	Date
404,479	Great Britain	Jan. 18, 1934
815,729	France	Apr. 12, 1937