Dec. 15, 1953 O. REICH 2,662,590

GAS BURNER AND FLOW RESTRICTOR

Filed June 29, 1948

2 Sheets-Sheet 1

Fig.1

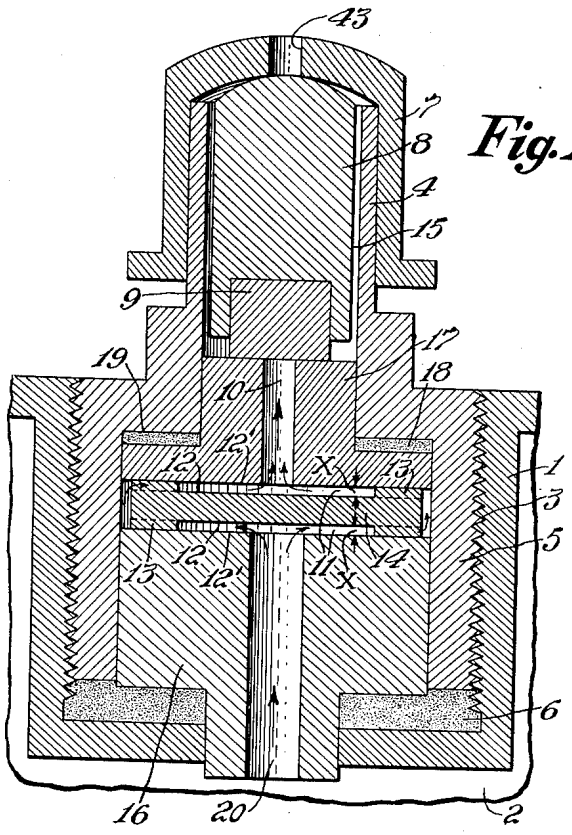


Fig.2

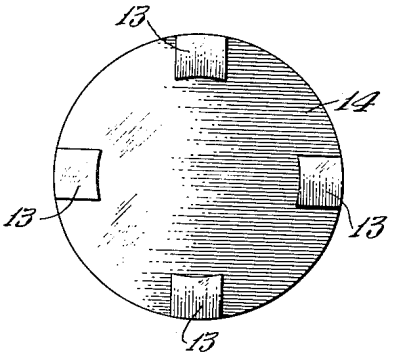


Fig.3

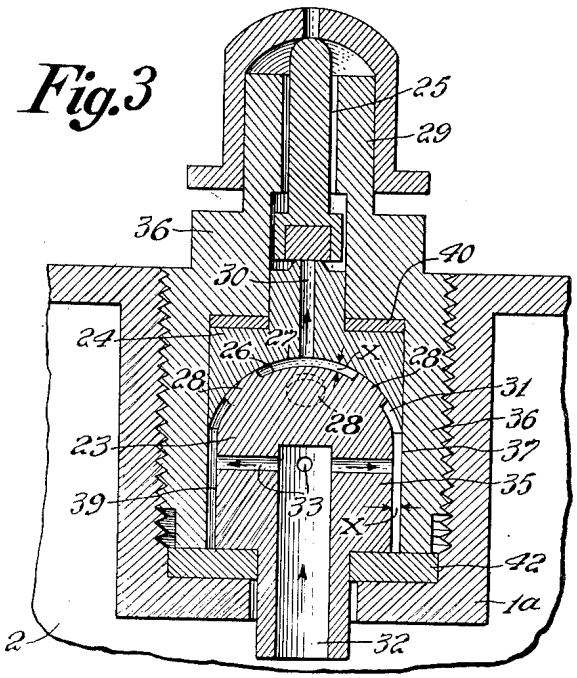
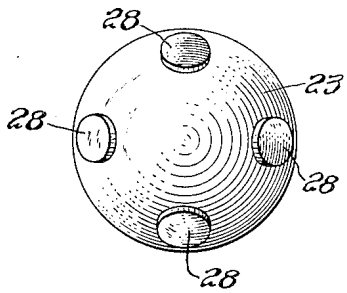


Fig.4



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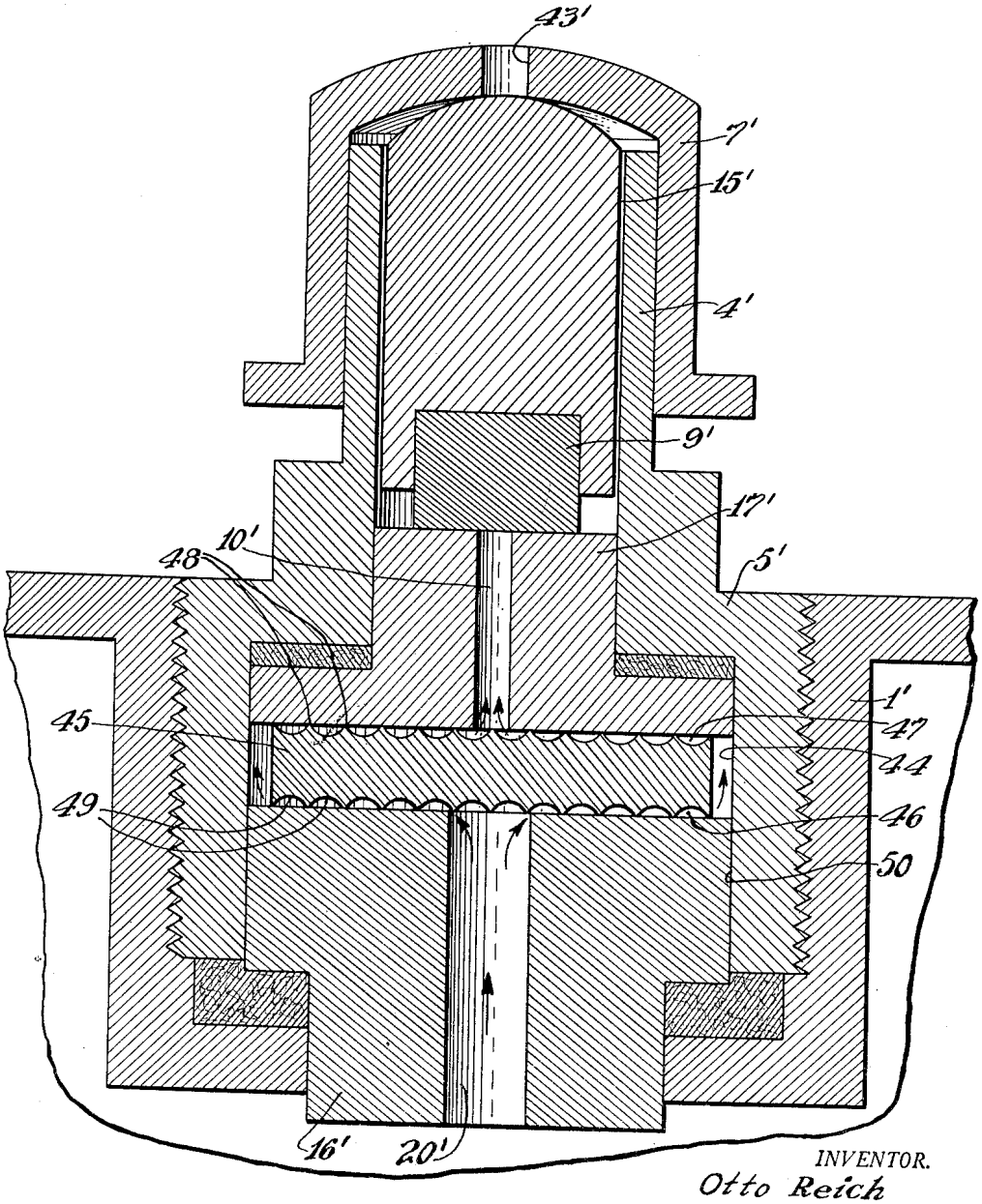
2 Sheets-Sheet 2

Fig. 5



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UNITED STATES PATENT OFFICE

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GAS BURNER AND FLOW RESTRICTOR

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Application June 29, 1948, Serial No. 35,761

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6 Claims. (Cl. 158—99)

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This invention relates to a gas burner, particularly for use in gas-fueled lighters, comprising a fuel tank filled with compressed or condensed gas, and fissurelike throttling passages leading from said fuel tank to the burner tube. The object of the invention is to construct the pressure-reducing device that is required for the formation of the height of the flame so as to avoid the empirical adjustment and readjustment of the fissurelike throttling passages that has been necessary so far.

In accordance with the present invention, the above and other objects, features and advantages are obtained by providing an areal passage for converting liquefied combustible gas into gas, an inlet channel for conducting the liquefied gas from a source of fuel supply to said gasifying area, and an outlet channel for conducting the gas from the gasifying area to the burner. I provide at least one insert within a chamber, and the areal passage is formed between the outer surface of the insert and the chamber-confining wall, whereby a major portion of the areal passage is of a width of capillary magnitude. The areal passage conducts the liquefied gas as delivered by the inlet channel divergently to all peripheral portions of the upstream side of the insert and convergently to the outlet channel, and causes thereby the gasification. Nondeformable spacing elements are located between the surfaces confining the areal passage to hold said surfaces at invariable distances from each other.

Wherever in the following description the terms "fissurelike," "fissure" and "throttling passage" are used in relation to the present invention, they apply to the referred to areal passage.

In previous constructions with fissurelike throttling passages the fissure has been formed by the empirical deformation of spacer means, which at the same time serve as packing. As a rule, said means are deformed by screwing together the enclosures containing said fissure-forming elements, deforming said elements to such an extent as to provide the desired throttling effect. That practice renders impossible the use of several capillary fissures, as the spacer elements, which at the same time serve as packing, can never be compressed so evenly as would be required for the formation of throttling fissures of uniform capillarity throughout. The use of a single throttling fissure, whose dimensions are, of course, restricted by the usual dimensions of the burner or lighter, would have the required

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throttling resistance only if such a fissure would be so extremely narrow as can hardly be achieved in practice. It has been found that if one fissure only would be provided, this fissure would have to be so narrow that it would soon be frozen up or blocked when the burner is used. In the known constructions, moreover, only a very limited part of the capillary fissure can become effective, namely only that part that lies between the two throttling channels opening into the fissure.

As contrasted with these known constructions, the object of the invention enables the mathematically exact fixation of the limiting surfaces of the throttling passages, which surfaces form the several fissures. This is achieved without requiring deformation steps as are necessary in the empirical deformation of the fissure, which steps anyway can provide the required dimension of fissure only by chance, by no means in every case. According to the invention this aim is achieved by keeping the fissure-forming limiting surfaces of the throttling passages at an invariable distance from each other by means of non-deformable spacer elements dimensioned according to the capillary distance between said limiting surfaces, an empirical adjustment and re-adjustment of the fissure-like throttling passages thus being avoided.

The drawings illustrate examples of carrying out the invention.

Fig. 1 shows in a sectional view an embodiment in the form of a lighter;

Fig. 2 represents the appertaining plan view of an insertion that participates in forming the throttling passages;

Fig. 3 is a sectional view of another embodiment of the invention; and

Fig. 4 is a plan view of the insert shown in Fig. 3.

Figure 5 is a sectional view of the burner showing a modified form of the insert which forms the throttling passages.

In Figures 1 and 2, numeral 1 refers to that part of the fuel tank which lies immediately adjacent to the burner arrangement proper. The compressed or condensed combustible gas is stored in the interior chamber 2 of said tank. A hollow body 5, which extends upward to form the burner tube 4, is screwed by means of a thread 3 into said cylindrical part 1, which projects into the interior chamber 2. The hollow body 5 rests on a preferably deformable pack-

ing 6 inserted between said hollow element and the bottom of part 1. Upon the burner tube 4 is placed a cap 7. The latter in its closed position, that is, the inoperative condition of the burner, urges a member 8 and a packing 9 downwardly, whereby the packing seals the gas channel 10. On raising the cap 7, the member 8 and packing 9 are lifted by the gas pressure exerted on the bottom of the member 8 and packing 9. The packing opens the channel 10, thus freeing the flow of gas through the annular space 15 to the opening 43 in the cap 7. Throttling passages 11, which reduce the gas pressure, are arranged in the interior of the hollow element 5. These passages lead to the channel 10 and thereby to the burner tube 4. The passages have substantially the form of a fissure or crevice as resulting from a split of an undivided body. They are confined by the surfaces 12, 12', which are kept at a fixed capillary distance x from each other by spacer elements 13. In the embodiment according to Figs. 1 and 2, two fissure-like throttling passages are provided, the confining surfaces 12 of which are provided by the surface-ground outside surfaces of a disc-like insert 14, which has spacedly arranged spacer projections 13, by means of which the confining surfaces 12 are held at a uniform capillary distance x from the confining surfaces 12'. The latter are formed by the corresponding surfaces, which are likewise surface-ground, of counterbodies 16, 17, between which the insert 14 is fitted and which, like the insert, are arranged within the hollow body 5, that is, are fitted into it. These counterbodies may be considered, with respect to the chamber formed interiorly of the body 5, as inserts like the insert 14. Downwards, the counterbody 16 rests on the same packing 6 as does the hollow body 5, while the counterbody 17 presses a separate packing ring 18 upwards against the annular shoulder 19 of the hollow body 5. By proper screwing in of the hollow body 5 into the part 1, the insert 14 and the two counterbodies 16, 17 are pressed together, like a stuffing-box, out of their respective positions as shown in Fig. 1. The central gas supply channel 20 leading from the interior 2 of the tank to the throttling passages 11, is provided in the counterbody 16, while the aforementioned sealable delivery channel 10 is provided in the counterbody 17. The course of the flowing gas when the burner tube is open is indicated by arrows. The disc-like insert 14 with the spacer projections 13 may suitably be made by stamping, followed by surface grinding of the seating and fissure-confining surfaces.

In the embodiment according to Fig. 3, the two inserts 23, 24 are joined spherically, leaving the uniform capillary distance x between them. The insert 23 has the form of a spherical calotte, upon which the second insert is placed, leaving free the fissure-forming distance x. As in the embodiment according to Figs. 1 and 2, the capillary distance between the two fissure-forming surfaces 26, 27 is maintained by spacer projections 28 spacedly arranged at the insert 23, the hollow calotte of the insert 24 resting upon said spacer projections. The channel 30 leading to the annular space 25 in the burner tube 29 and serving for the further delivery of the combustion gas, whose flow has been throttled by the capillary areal passage 31, is provided in the insert 24. The channel 32, supplying the combustion gas from the interior 2 of the tank to the throttling device, is provided in the insert 23.

Laterally from said channel 32 extend bores 33, which lead to the cylindrical circumferential confines of the lower part 35 of the insert 23. Said cylindrical circumferential confines are also spaced by the capillary distance x from the hollow body 36 that embraces the inserts 23, 24, that is, from the cylindrical inside wall 37 of said hollow body. Due to this construction a second capillary fissure 39 is created, which when seen in the direction of the flowing gas precedes the capillary fissure 31 and is immediately followed by the calotte-shaped fissure 31. The packing ring 40 is fitted between the insert 24 and the hollow body 36, the packing ring 42 between the hollow body, the insert 23 and the fuel tank 1a. The direction of the flow of the combustion gas to the burner tube provided on the hollow body 36 is again illustrated by arrows.

In the embodiment of Fig. 5, a hollow body 5', which forms a chamber 50 and encloses two counterbodies or inserts 16' and 17' and which extends upwardly to form a burner tube 4', is screwed into a part 1'. The counterbodies or inserts 16' and 17' enclose another chamber 44 in which is placed another insert 45 so as to form capillary throttling passages 46 and 47. While it is deemed unnecessary to describe all those parts which are similar to the corresponding parts of the construction of Fig. 1, it appears necessary to specifically point out the properties of the throttling device. The insert 45 is made to have surface irregularities (shown to enlarged scale), whereby the minute protuberances 48 serve as spacers to hold the insert in place. The valleys 49, which are in multiple communication with one another, form the narrow passages 46 and 47 which for practical reasons may be considered to be plane and of a continuously uniform width, the average width being about the same as the width x indicated in Figs. 1 and 4.

The function of this construction is like that explained above in connection with the construction of Fig. 1. The combustible gas is supplied to the fissurelike passages 46 and 47 through a channel 20' and passes on in throttled condition through the channel 10' to the burner tube. In the inoperative condition of the device, the channel 10' is closed by a packing 9', whereas, upon raising the cap 7' by a turning or sliding movement, the channel 10' opens to allow the combustible to flow through the annular space 15' to the opening 43'.

It should be noted that while in the construction selected for illustration in Fig. 5 the protuberances 48 engage even, for instance, evenly ground surfaces of the counterbodies 16' and 17', it is, of course, also possible to provide for the surfaces of the counterbodies to be similarly rough as the surfaces of the insert 45. In the latter case, a larger capillary width of the passages is obtained.

The roughening of the surfaces in question may be carried out in any way, for instance, grinding, etching, rough-stamping. If the adjacent surfaces of the insert 45 and counterbodies or inserts 16' and 17' are roughened, for instance, by etching processes of the same intensity, it will be understood that a capillary fissure of about double average width is obtained as compared with the width obtained by etching just the surfaces of the insert, provided the counterbodies have even surfaces. If an insert in the location of the insert 45 is to be used with even surfaces of counterbodies, but the insert is to be roughened by etching, it appears advisable

first to grind the insert evenly so that all of the minute protuberances created by the etching process contact the even counterbody surfaces with uniform pressure.

The direction of the flow of gas in the burner shown in Fig. 5 is again indicated by arrows.

What I claim is:

1. In a gas burner, particularly for use in pocket lighters, means forming an areal passage for converting liquefied combustible gas into gas, an inlet channel for conducting the liquefied gas from a source of fuel supply to said gasifying area, an outlet channel for conducting the gas from the gasifying area to the burner, said means enclosing a chamber, and at least one insert arranged within said chamber so as to form said areal passage between the outer surface of the insert and the chamber-confining wall, said means also including nondeformable spacing elements located between the surfaces confining the areal passage to hold said surfaces at invariable distances from each other, a major portion of the areal passage being of a width of capillary magnitude, said areal passage being so arranged that all material passing from one of said channels to the other must pass through said portion, the inlet channel opening directly into the areal passage, the areal passage being arranged to conduct the liquefied gas as delivered by the inlet channel divergently to all peripheral portions of the upstream side of the insert and convergently to the outlet channel, thereby causing the gasification.

2. In the burner according to claim 1, said channels extending generally longitudinally, and said insert being arranged substantially transversely to the general direction of the flow of gas.

3. In the burner according to claim 1, said means including nondeformable spacer projections integrally provided on said insert.

4. In the burner according to claim 1, said means including at least two inserts arranged within said chamber so as to form the areal passage between the inserts and between the inserts and the chamber-confining wall.

5. In the burner according to claim 1, said nondeformable spacing elements being formed by independent protuberances projecting from the surface of the insert and touching the chamber-confining wall, said wall being evenly ground.

6. In the burner according to claim 1, said nondeformable spacing elements being formed by independent protuberances projecting from the surface of the insert and from the chamber-confining wall.

OTTO REICH.

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