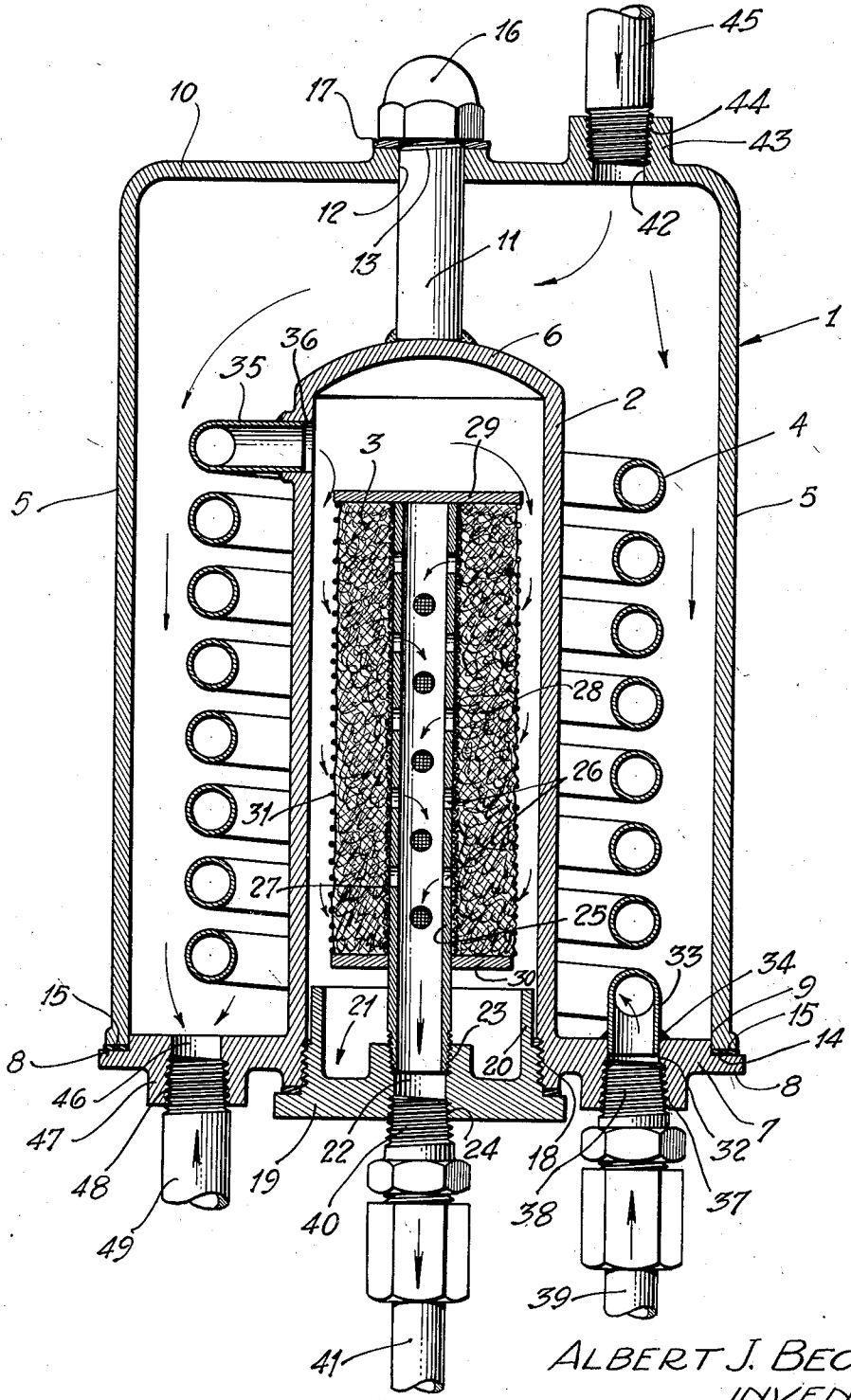
Aug. 25, 1942. A. J. BECK 2,294,107

GAS FILTER

Filed Feb. 18, 1941



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Patented Aug. 25, 1942

2,294,107

UNITED STATES PATENT OFFICE

2,294,107

GAS FILTER

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Application February 18, 1941, Serial No. 379,449

11 Claims. (Cl. 62—1)

This invention relates to gas filters, and particularly to a type of device for use with butane or liquid petroleum gas.

At the present time, butane is being used for internal combustion engines due to the fact that the octane rating is approximately 100, its general cheapness, no likelihood of crank case oil dilution, and no dangerous fumes.

The average motor, which has a compression under 75 pounds to the square inch is not adaptable for use with butane, but for such motors as are adaptable and have a high compression, the butane conversion is oftentimes desirable. Most butane conversions that the inventor is aware of are fairly costly and incorporate numerous separate devices, such as a filtering system for the liquid, separate strainers, pressure regulators, and a vaporizer. The inventor has found that so many devices are unnecessary when the invention about to be described is utilized. Instead of filtering the butane which is in liquid form, it has been found expedient to filter the gas in such a manner that all non-volatile liquids in the butane as well as solids are removed from the gas. This is accomplished through the medium of a heat exchanger and a single filter, both of which are encased within a housing and thereby form a single unit. The only other units necessary in addition to the device of the present invention are a pressure regulator unit and the usual butane or natural gas carburetor. In certain installations, it is possible to use the carburetor already incorporated with the engine by either removing or fastening the float and its needle valve, as it is obvious that butane gas is dry and, therefore, there would be no use for the float.

An object of the present invention is the provision of a butane or natural gas filter and heat exchanger so constructed and arranged that proper vaporization of the liquid butane is assured, together with the removal of all unwanted substances from the gas prior to passage thereof through a pressure reduction unit to the carburetor, or directly to the carburetor in certain instances. By way of example, it may be stated that often two pressure regulators are incorporated, one prior to conversion of the butane liquid into a gas and for the purpose of regulating the pressure thereof, and a second regulator after the butane has been converted into gas. This second regulator is not always essential but is required by law in certain districts.

A further object is the provision of a device of the character stated, which is simple of structure, economical in cost of manufacture, and capable of producing superior results.

Another object is the provision of a device for use with butane and natural gas which is easily installed by any mechanic, has few parts, all parts being readily accessible, and practically no part liable to damage or the likelihood of getting out of order.

With the above mentioned and other objects in view, the invention consists in the novel and useful provision, formation, construction, association, and relative arrangement of parts, members and features, all as disclosed in a certain embodiment in the accompanying drawing, described generally, and more particularly pointed out in the claims.

In the drawing the figure is a vertical sectional view of the improved heat exchanger and filter for use with butane and natural gas.

Referring now with particularity to the drawing, the improved device as an entirety is designated by the numeral 1 and the same includes a filter casing 2 adapted to enclose filter means 3, a heat exchanger 4 exterior of the filter casing 2, and a housing or shell 5 spacedly surrounding the heat exchanger 4.

The filter casing 2 is capped at one end 6, the opposite end portion being provided with an annular base 7. The base is formed with an annular shoulder 8. The shell or housing 5 is open-ended at 9 and provided with an integral end piece at 10. The end 6 of casing 2 externally carries a post 11 adapted to be passed through an opening 12 of end piece 10 of housing 5. The post 11 is screw-threaded at 13. In the assemblage, it is intended that a gasket 14 be carried on the shoulder 8 and that foot portion 15 of housing 5 should bear against said gasket. Thus, when a nut 16 is upon the threads 13 of post 11, a turning of the nut will bring the foot portion 13 into forcible engagement with the gasket 14 and assure a fluid-tight fit between the base and the said shell 5. A washer 17 may be interposed between the base of the nut 16 and the external portion of the shell 5 surrounding the opening 12.

The filter casing 2 is internally threaded at 18 to receive nut 19. Nut 19 has an annular shank 20 to provide a sump or well portion 21. The nut is provided with a central bore 22 which is threaded at 23 and 24. An elongated tube 25 is threaded at one end for engagement with threads 23 and said tube is formed with a series of diametrical bores 26. Surrounding the periphery of the tube 25 and covering the said dia-

metrical bores, is a screen 27. Surrounding the screen 27 is a filter pack 28 formed of any suitable material, such as felt or cotton waste. This filter pack is interposed between disc members 29 and 30 at ends of the filter pack, and surrounding the filter pack is a further screen 31.

The heat exchanger 4 comprises a spaced series of coils spacedly surrounding the filter casing and substantially intermediate the annular space included between the periphery of the filter casing 2 and the inner surface of the housing or shell 5. One end of the coil communicates with the interior of the filter casing while the opposite end is adapted to communicate with the source of butane or natural gas supply. The base 7 is transversely bored at 32 and the inlet end of the coil is formed with a part 43 received within said bore 32 and held in position by welding, brazing, or by any other suitable means, as for instance illustrated at 34. The opposite end of the coil or the outlet portion thereof is provided with a piece 35 received in a transverse bore 36 at the upper end of the casing 2. The outer surface of the base 7 is enlarged in the zone of the bore 32 and internally screw-threaded at 37 to receive a threaded nipple 38. A pipe 39 through the medium of the customary fitting, communicates with the nipple and likewise with a source of supply for liquid butane or natural gas. A threaded fitting 40 is in engagement with threads 24 of nut 19 and with a pipe 41 which leads to a suitable carburetor, pressure regulator, or other device. The top 10 of housing 5 is provided with a transverse bore 42, and said top is enlarged at 43 externally of the top and internally screw-threaded at 44 to receive the threaded end of pipe 45. This pipe is adapted to communicate with a source of heat, or with a liquid, such as hot water. The base 7 is provided with a transverse bore 46, and the base externally is enlarged at 47 and internally screw-threaded at 48 to accommodate the threaded end of a pipe 49, which pipe is an outlet for the heated liquid.

The operation, uses and advantages of the invention are as follows:

When the present device is to be used with an internal combustion engine, it is intended that pipes 45 and 49 communicate with the cooling system of said engine. The pipe 49 may directly communicate with the intake side of the water pump and pipe 45 with the outlet or discharge side of the pump. Thus, the liquid, such as water, which is ordinarily used for cooling an internal combustion engine, is forced into pipe 45, thence filling the space included between filter housing 2 and housing or shell 5, and outwardly through pipe 49 in a continuous flow. This hot water surrounds the coils of the heat exchanger 4 and causes vaporization of the liquid received therein, with the result that gas is discharged into the filter casing. This gas flows through the filter pack, through the transverse or diametric bores of the tube, thence into pipe 41. Any foreign material or non-volatile material will immediately drop from the gas by gravity and be received within the sump or well 21 of the nut 19.

Butane, when used in place of gasoline, is supplied in liquid form. As butane vaporizes at a low temperature, slight heating of the coils of the heat exchanger causes ready vaporization of the liquid.

It is evident that the device is readily cleaned and any material received within the sump or well portion 21 of the nut 19 is easily removed by merely removing the nut, whereupon the filter pack may be moved longitudinally of the filter casing and either renewed or cleaned, and any material in the sump removed.

Inspection of the heat exchanger coils is accomplished by the removal of nut 16 which releases post 11 and allows the shell 5 to be separated from the base 7. Thus, all parts of the device are readily accessible and replaceable, as the necessity arises.

It is to be observed that the heated liquid received within the space between the casing 2 and shell 5 tends to heat the wall of the casing 2. Thus, while vaporization of the butane or natural gas is assured in its passage through the coils of the heat exchanger 4, complete volatilization or gasification is maintained as said gas passes through the filter pack and into tube 25.

I deem it important when the device is in operation, that the interior of the filter casing likewise be maintained at a temperature, as non-volatile liquids and solids are assured of being released from the gas and deposited in the sump or well 21. I have also found that a device of this character functions better and produces superior results over devices which provide separate entities, such as filters interconnected by pipes and leading to some form of vaporizer. By incorporating the heat exchanger with the filter, in a single unit, the vaporized gas has a shorter flow passage and proper vaporization and filtering is assured.

I claim:

1. In a device of the character disclosed, a housing closed at one end, a shell closed at one end, said shell adapted to spacedly surround the housing, a base piece between the housing and said shell, a post externally carried by the closed end of the housing and extended through the closed end of the shell, and a nut carried by the post and adapted to externally bear against the closed end of the shell for holding the shell against the base.

2. In a device of the character disclosed, a tubular housing closed at one end and open at the other end, said tubular housing formed with internal threads extended inwardly from the open end thereof, a nut for engagement with the threads of the housing, said nut formed with a well portion, a perforated tube carried by said nut, the tube received within said housing, and a filter pack surrounding said perforate tube; and means whereby a gas may be passed into said tubular housing for passage through the filter pack and into the said perforate tube.

3. A gas filter and heat exchanger for liquid petroleum gas including a filter housing, an annular base secured at one end of said housing, a shell spacedly surrounding said housing and engaging said base, a coiled tube surrounding the filter housing and within the space between the said housing and shell, one end of said tube communicating with the interior of the housing, and the opposite end of said tube secured to the annular base, means whereby a liquid petroleum gas may enter said coiled tube at the base, means for introducing a hot liquid into the space between said housing and shell for heating the coiled tube to vaporize the liquid petroleum into gas for gas passage into the housing, a perforate tube extending longitudinally of said housing, and a filter pack surrounding said perforate tube and through which pack said gas must pass for entrance within the perforate tube,

and means for conducting said gas from said perforate tube.

4. In a gas filter and heat exchanger for liquid petroleum gas including a pair of housings spaced apart and concentrically arranged one within the other; a coiled tube between said housings with one end thereof opening within the inner housing, means for introducing a plus temperatured liquid between said housings for contact with the coils of said tube, means for introducing a liquid petroleum into said coiled tube to be gasified by heat exchange caused by the plus temperatured liquid heating said coils, a filter pack spacedly positioned within the inner housing, a perforate tube centrally disposed within said filter pack, and means for conducting any gas from said perforate tube externally thereof.

5. In a gas filter and heat exchanger for liquid petroleum gas including a pair of housings spaced apart and concentrically arranged one within the other; a coiled tube between said housings with one end thereof opening within the inner housing, means for introducing a plus temperatured liquid between said housings for contact with the coils of said tube, means for introducing a liquid petroleum into said coiled tube to be gasified by heat exchange caused by the plus temperatured liquid heating said coils, a filter pack spacedly positioned within the inner housing, a perforate tube centrally disposed within said filter pack, means for conducting any gas from said perforate tube externally thereof, and a nut threaded within said inner housing and carrying said perforate tube.

6. In a gas filter and heat exchanger for liquid petroleum gas including a pair of housings spaced apart and concentrically arranged one within the other; a coiled tube between said housings with one end thereof opening within the inner housing, means for introducing a plus temperatured liquid between said housings for contact with the coils of said tube, means for introducing a liquid petroleum into said coiled tube to be gasified by heat exchange caused by the plus temperatured liquid heating said coils, a filter pack spacedly positioned within the inner housing, a perforate tube centrally disposed within said filter pack, means for conducting any gas from said perforate tube externally thereof, and a nut threaded within said inner housing and carrying said perforate tube, said nut formed with an annular sump for receiving non-volatile liquids and solids dropped from said gas upon entrance within the inner housing.

7. In a device of the character disclosed, a filter housing closed at one end, a nut threadedly secured to said housing at the opposite end, a perforate tube carried by said nut, a fibrous filter pack surrounding the perforate tube and spaced from the inner wall of said housing, a jacket spacedly surrounding the filter housing, a coil tube within the space between the jacket and filter housing, one end of the tube communicating with the interior of the filter housing and the opposite end with a source of liquid petroleum, means for introducing a heated liquid within the jacket for heating the coil tubes to gasify the liquid petroleum for gas entrance within the filter housing.

8. A vaporizer comprising a housing, a filtering chamber member within said housing, a vaporizing coil surrounding said filtering chamber with its inlet end leading through the lower end of said housing and its outlet end leading into the upper end of said filtering chamber, means for circulating hot water through said housing, an outlet pipe leading from said filtering chamber, and a filter pack surrounding said outlet pipe and in communication therewith.

9. A vaporizer comprising a housing, said housing including a shell, open at its lower end, and a detachable base for closing the lower end of said shell, a filtering chamber upstanding from said base within said shell, a stud upstanding from the upper end of said filtering chamber through an opening in the upper wall of said shell, a nut threaded on the upper end of said stud against the upper wall of said shell for holding said base in liquid-tight contact with the lower end of said shell, a vaporizing coil surrounding said filtering chamber with one end leading through said base and its other end leading into said filtering chamber, means for circulating hot water through said housing, an outlet pipe leading from said filtering housing, and a filter pack surrounding said outlet pipe and in communication therewith.

10. A vaporizer comprising a housing, said housing including a shell, open at its lower end, and a detachable base for closing the lower end of said shell, a filtering chamber upstanding from said base within said shell, a stud upstanding from the upper end of said filtering chamber through an opening in the upper wall of said shell, a nut threaded on the upper end of said stud against the upper wall of said shell for holding said base in liquid-tight contact with the lower end of said shell, a vaporizing coil surrounding said filtering chamber with one end leading through said base and its other end leading into said filtering chamber, means for circulating hot water through said housing, a nut threaded in the lower end of said filtering chamber, said nut being provided with a bore extending therethrough, an outlet pipe in said filtering chamber threaded at its lower end in said nut, and a filter pack surrounding said outlet pipe and in communication therewith.

11. A vaporizer comprising a housing, a filtering chamber in said housing, a vaporizing coil surrounding said filtering chamber with its inlet end leading through the lower end of said housing and its outlet end leading into the upper end of said filtering chamber, means for circulating hot water through said housing, a nut threaded in the lower end of said filtering chamber, said nut being provided with a bore extending therethrough, an outlet pipe in said filtering chamber threaded at its lower end in said nut, and a filter pack surrounding said outlet pipe and in communication therewith.

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