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PORTABLE LIGHTER AND REFILLING APPARATUS THEREFOR

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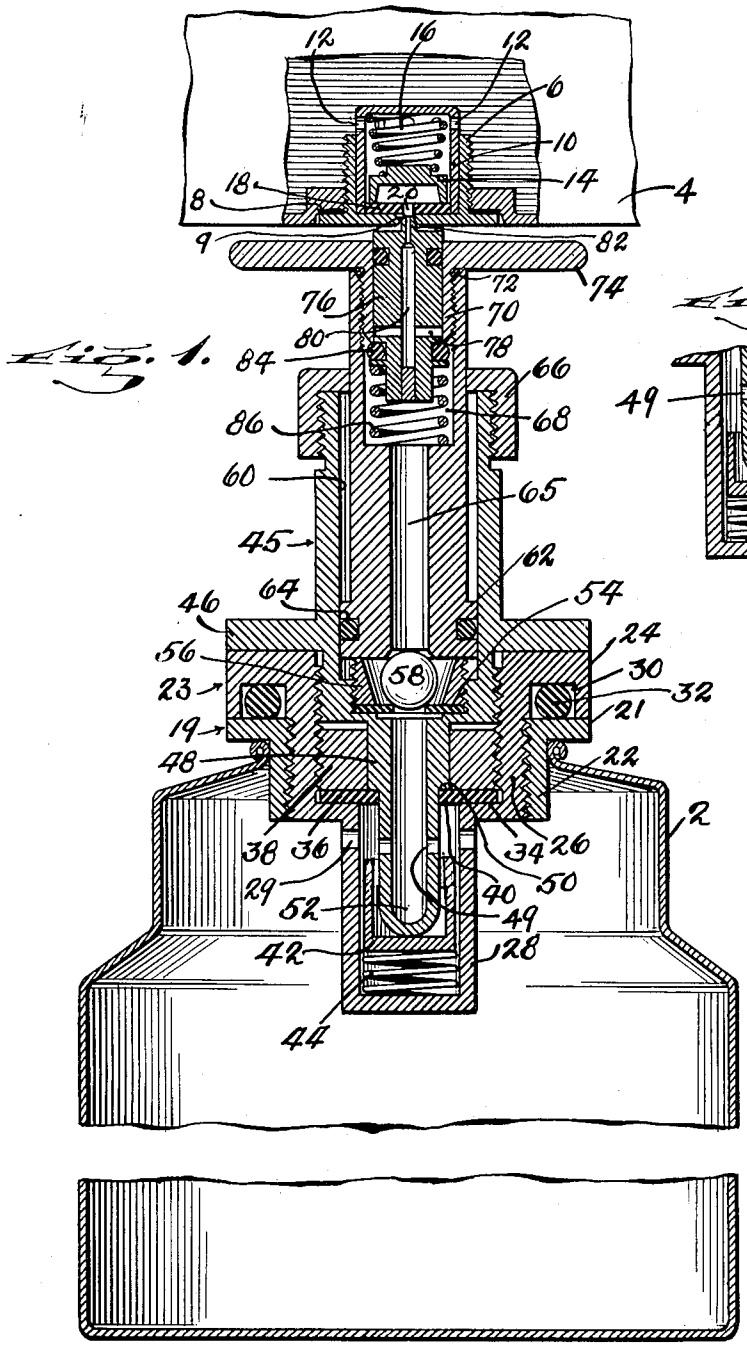



Fig. 1.

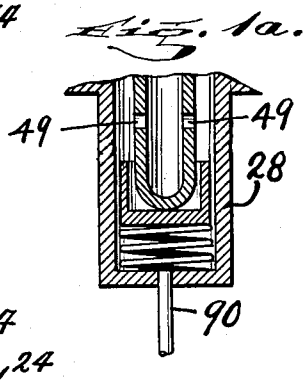



Fig. 1a.

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# PORTABLE LIGHTER AND REFILLING APPARATUS THEREFOR

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This invention relates to gaseous-fuel, portable lighters and refilling apparatus for replenishing the lighter fuel supply whenever necessary.

In portable lighters of this type, the fuel, propane or butane, for example, is stored in the lighter casing under pressure and is discharged therefrom in gaseous form when the lighter is being operated.

Prior to my invention, it has been necessary to return the lighter to the manufacturer or to a service station for refilling when the fuel supply has been exhausted. In some forms of gaseous-fuel lighters it has been customary to store the fuel in small containers, which are inserted in the lighter casing and may be removed as the necessity arises and full containers substituted.

The primary object of my invention is to provide refilling apparatus which can be supplied to lighter users so that any ordinary user may readily refill his lighter from time to time and thus avoid the necessity and nuisance of going to a service station or returning his lighter to the manufacturer for refilling.

In the accompanying drawings, wherein I have illustrated my invention,

Fig. 1 is a part-sectional elevational view of one embodiment of the invention; and

Fig. 1*a* is a fragmentary view of a modification of the embodiment shown in Fig. 1.

Referring to the drawings in detail and, first of all, to the embodiment of the invention illustrated in Fig. 1:

2 designates a refill tank which is adapted to be charged with gas, such as propane or butane, for example, stored under pressure so that it is partially in the liquid phase and partially in the gaseous phase.

4 designates the casing of a portable lighter of the gaseous fuel type to which the fuel, stored in refill tank 2, is to be transferred from time to time.

6 designates a thimble fitting, which is screwed into the bottom of the lighter casing 4 and sealed gas-tight therein by gasket 8.

The thimble 6 is provided with a refilling or charging port 9.

Fitting within the thimble 6 and rigidly secured thereto, as by soldering or welding or in other fashion, is an inverted cup-shaped member 10, provided with fuel outlet ports 12 to the casing interior.

The member 10 functions as the housing for refilling or charging valve 14, which, as clearly illustrated, is spring-loaded by loading spring 16 and seats on valve seat 18, which is provided with charging port 20, in constant communication with the charging port 9. The seat 18 is preferably of resilient plastic material to promote seating of the valve.

With the valve 14 seated, which is its normal condition, it is quite evident that the lighter casing 4 is sealed against the escape of any fuel therefrom.

The refilling tank 2 is provided in its upper end with a tubular fitting 19, composed of a head 21 at the exterior of the upper end or neck of the tank and with a shank 22, extending for a substantial distance into the tank



interior. A gas-tight seal is provided between the fitting or adapter just described and the tank 2 by welding, soldering, brazing, or in other convenient fashion.

Screwed into the shank 22 of the fitting 19 is a cup-shaped member 23, comprising a head 24, externally and internally threaded shank 26, and a reduced shank portion 28. The lower or underface of the head 24 is provided with an annular groove 30, and a resilient plastic sealing ring 32 lies in this groove. The sealing ring is circular in cross-section and may be of rubber or other resilient plastic. When the member 23 is screwed in place, the sealing ring prevents the escape of fuel from the tank 2 along the threads of shanks 26 and 22 and from thence to the atmosphere.

The shank 26, as above noted, is interiorly threaded, and seated on a shoulder 34, formed where the shank is reduced internally and externally to provide the reduced shank portion 28, is a sealing washer 36. This washer is clamped tightly against shoulder 34 by a clamping ring 38, which is screwed into the shank 26. It is to be noted that the bore in the sealing washer 36 is smaller than the internal diameter of shank portion 28 so as to project inwardly beyond the inner wall of shank portion 28, as illustrated at 40.

Disposed within the shank portion 28, near the bottom thereof, is a floating valve 42, which cooperates with sealing washer 36, a loading spring 44 being provided between the bottom of this valve and the lower end of shank portion 28.

Screwed into the upper end of the shank 26 of the cup-shaped member 23 is a fitting or adapter 45, formed intermediate its ends with an annular flange 46, which, when the parts are assembled, seats upon the head 24 of the cup-shaped member 23. The shank portion 48 of the fitting 45 passes through the clamping ring 38. At the lower face of the clamping ring 38 the shank of the fitting 45 is reduced in diameter, to provide a shoulder 50, which rests upon the sealing washer 36; the reduced portion of the fitting passes through 36 with a sealed fit and extends into the shank 28 of the cup-shaped member 23 into contact with floating valve 42.

The fitting 45 is bored longitudinally, as indicated at 52, from a point near the lower end of the fitting to and through the shank portion 48. At this point, the bore is enlarged appreciably and internally threaded to receive a non-metallic resilient sealing ring 54, which is centrally bored and rests upon the shoulder provided by the abrupt enlargement of the fitting bore, this sealing ring being clamped in place by an internally tapered clamping ring 56, containing a ball valve 58.

The bore of the member 45 is still further enlarged from the clamping ring 56 to the top or outer end of the fitting as indicated by 60, and mounted therein is a piston 62, provided with piston ring 64, similar to sealing ring 32 and with a longitudinal bore 65.

The shank of the piston 62 projects a substantial distance beyond the outer end of the fitting 45, the latter being provided with cap ring 66, through which the piston shank extends.

From a point just below the top of cap ring 66, the piston bore is enlarged, as seen at 68, and screwed into this enlarged bore is a member 70, sealed as shown at 72 and provided at its outer end with an enlarged head 74.

The member 70 is bored longitudinally for its entire length, to provide a cylinder for a piston 76, which is provided with a transverse bore 78, which intersects a longitudinal bore 80, with which the piston 76 is provided also.

The outer end of piston 76 projects beyond the head 74 and is provided with a tapered portion 82, which is adapted to cooperate with the charging port 9 of the lighter casing, this port being similarly tapered.

Just below the transverse port 78, the shank of the piston 76 is provided with a peripheral groove for the reception of a sealing ring 84, which cooperates with the inner end of the member 70, and below this ring the piston is provided with loading spring 86.

It will be appreciated from the description thus far given that the fitting or adapter 45 and all of the parts contained therein constitute a unit assembly and can be removed bodily from the tank 2. As this unit assembly is being withdrawn, the valve 42, under the action of its loading spring 44, will move upwardly past the ports 29, which are provided in shank portion 28, which is part of the member 23 and remains in place in the tank until the valve abuts the member 36, so that escape of fuel from the tank when the fitting or adapter is removed is prevented. When the tank 2 has been emptied or, for that matter, for its initial filling, it may be charged by simply inserting a charging nozzle into the shank portion 28 sufficiently far to push the valve 42 to open position, to permit fuel to flow through ports 29 to the interior of the tank.

Because of the construction and flexibility of my equipment just referred to, it will be appreciated that initially the lighter owner must be supplied with the complete refilling apparatus, but that thereafter it is necessary only for him to acquire a tank, it being a simple matter for him to screw his adapter 45 in place, escape of fuel from the tank during this operation, at which time valve 42 is unseated, being prevented by the sealing fit of the adapter shank in the sealing washer 36.

In use, the parts are, of course, assembled as illustrated on the drawings, and it is to be understood that the tank 2 contains a fuel, such as propane or butane, for example, which is under pressure, so that it is partially in the gaseous phase but mainly in the liquid phase. As a consequence, with the tank in an upright position, the upper part of the tank will contain gas in the gaseous phase. Accordingly, the tank is first turned upside down to allow liquid to displace the gas in the upper part of the tank, and the piston 62 is moved outwardly of 45. The valve 58, with the tank upside down, will have moved off its seat in ring 54. Under these conditions, liquified gas flows from the tank through ports 29 in shank portion 28 and ports 49 into bore 52 of shank portion 48 of the adapter 45, past the valve 58 and into the bore 60, which constitutes the cylinder for the piston 62. The tank is then righted, so that the valve 58 will seat by gravity on 54.

The lighter casing 4 is then placed upon the refiller with tapered tip 82 in the charging outlet 9 of the lighter casing.

A slight pressure is then imposed upon the casing, to press the piston valve 76 inwardly sufficiently to open port 78 to chamber 68 and until the bottom of the casing 4 engages the head 74. Continued pressure on the lighter casing will then move the piston 62 inwardly to force the liquid gas ahead of it along port 65 to chamber 68, ports 78, 80, and 20 to beneath valve 14 of the lighter casing. This lifts the valve, so that the liquid can continue past the valve and by way of ports 12 to the casing interior. As soon as the lighter casing is removed, the piston valve 76 closes automatically, preventing the escape of fuel from the refiller, and the lighter casing valve 14 closes automatically to seal the casing.

No attempt has been made to draw the parts to exact scale, but it is to be understood that the refiller may be so dimensioned that one such operation as that just described is sufficient to refill the casing. On the other hand, the parts may be dimensioned so that more than one operation is necessary for refilling. These factors are not material to my invention.

As above explained, the consumer or lighter owner originally must be supplied with the entire equipment described. However, after the tank 2 has been emptied, the consumer simply removes the fitting or adapter 45 and



purchases another tank or has the tank refilled. It is then necessary merely to screw the adapter 45 into the new tank or the refilled tank.

In my description of Fig. 1 I have explained the necessity of turning the tank upside down initially. In the embodiment illustrated in the fragmentary view of Fig. 1*a*, I have shown a construction wherein inverting of the tank is unnecessary. From this figure of the drawings it will be seen that I have provided the lower or inner end of the shank 28 with a tube 90, which extends into the liquid in tank 2 at all times. With such construction it is preferable to provide additional pressure on the fuel in tank 2 by storing nitrogen, for example, in the tank above the fluid therein.

From all of the foregoing, it will be seen that my invention provides a construction adapted for portable lighters of the gaseous fuel type whereby the consumer is relieved of the troubles heretofore experienced in refueling his lighter. It will be appreciated furthermore that, after the consumer is once equipped, it becomes necessary for him only to acquire a new tank 2 very occasionally in that the tank may be kept to a reasonable and commercially acceptable size and yet contain as much as several years' supply of fuel.

It is to be understood that changes may be made in the details of construction and arrangement of parts hereinabove described within the purview of my invention.

What I claim is:

1. In combination, a portable lighter of the gaseous fuel pressure type, refilling apparatus therefor comprising a tank for gaseous fuel under pressure, an adapter carried by the tank and extending thereinto, the lighter casing being provided with a charging inlet, a normally closed valve within the casing adapted to be opened by the pressure of the fuel in the tank, said valve controlling said inlet, a normally closed piston valve within said adapter having a tip adapted to be inserted in the said casing inlet for moving the said piston valve within said adapter to open position and establish communication, through the stem of the valve, between the interior of the said tank and the casing valve to effect opening of the latter.

2. Refiller apparatus for portable lighters of the gaseous fuel type, said apparatus comprising, in combination, a refill tank, an adapter removably mounted on the tank and extending into the same, a valve within the tank normally physically held open by the adapter to maintain communication betwen the tank and the interior of the adapter, and means for automatically seating said valve to seal the tank when the adapter is removed from the tank.

3. Refiller apparatus for portable lighters of the gaseous fuel type, said apparatus comprising, in combination, a refill tank; a cup fitting extending into the tank and sealed to the tank, the wall of said fitting being provided with a port in constant communication with the tank interior; an adapter removably mounted in said fitting; a valve for controlling the passage of fuel though said fitting port, said valve being unseated when the adapter is in operative position in the fitting; and means for actuating said valve to seat the same when the adapter is removed from the fitting.

4. Refiller apparatus for portable lighters of the gaseous fuel type, said apparatus comprising, in combination, a refill tank; an adapter extending into the tank; a piston within the adapter adapted to be reciprocated from the tank exterior, a cylinder for the piston, the shank of the piston being bored longitudinally for its entire length; said adapter within the tank being provided with a port for the passage of fluid from the tank to the piston cylinder as said piston is moved outwardly of the adapter; a check valve within the adapter for preventing the fluid which fills the piston cylinder on the outward piston stroke from returning to the tank on the return stroke of the piston; and piston discharge valve mechanism at the outer end of the said piston shank bore adapted to be opened

by inward movement of the piston for establishing communication between the piston shank bore and the exterior of the adapter.

5. Refiller apparatus for portable lighters of the gaseous fuel type comprising, in combination, a refill tank; a fitting projecting into the tank and permanently secured thereto, said fitting being provided within the tank with a discharge port; an adapter removably mounted in said fitting for effecting the controlled discharge of fuel from the tank; a valve in said fitting for controlling the fitting discharge port, placement of the adapter in the fitting effecting opening of said valve; and means for automatically closing said valve when the adapter is being removed.

6. Refiller apparatus for portable lighters of the gaseous fuel type comprising, in combination, a refill tank; a fitting projecting into the tank and permanently secured thereto; a discharge port in that part of the fitting which projects into the tank; an adapter removably mounted in said fitting for effecting the controlled discharge of fuel



from the tank; said adapter comprising a tubular shank extending into that part of the fitting which extends into the tank; a port in said shank normally in communication with the said fitting discharge port; a piston comprising part of the adapter and adapted to be reciprocated from the tank exterior; a valve within that part of the fitting which extends into the tank, for closing the said discharge port when the adapter is removed; and a discharge valve mounted in the piston shank and operable from the adapter exterior.

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