This invention relates to gas burning cigarette lighters of the simple kind in which a gas reservoir is provided within a casing fitted with a hinged lid upon opening of which a valve is opened so that gas is supplied to the burner and this gas is ignited by manual rotation of a flint wheel under the lid.

With this kind of lighter, some provision must be made for keeping the valve which controls the flow of gas to the burner shut when the lid is closed and for opening this valve as the lid is opened. In the usual arrangement for this purpose, the burner valve has an upwardly extending projection which, when the lid is closed, is engaged by a spring loaded plunger fitted to the lid. This plunger presses the projection downwards and holds the gas valve closed and, upon opening of the lid, the plunger is moved out of engagement with the projection and the valve opens of its own accord.

One disadvantage of this arrangement is that the valve opens and remains open if for any reason the lid has to be held open for example whilst cleaning or adjusting the flint igniting mechanism. Also, it may be necessary to withdraw the gas reservoir and igniting mechanism from the casing of the lighter in order to enable the reservoir to be refilled or the flint to be replaced, and while this is being done the valve is also necessarily opened so that gas is wasted.

According to this invention, the lid of such a lighter is held closed by a spring loaded link which is pivoted on the body part of the lighter and acts upon a part of the lid to hold the lid closed, but when the lid is opened manually the link is acted upon by the spring of its past a dead center position in which it is then held by its spring and this link is fitted with a resilient extension which, when the link is in the position which it occupies for holding the lid closed, engages with a projection on the burner valve and holds this valve closed, the extension moving away from the valve to allow the valve to open as the lid is opened.

The spring plunger assembly which has previously been provided had to be accurately fitted in position on the inside of the lid and this fitting entailed a separate burner and this gas is ignited by manual rotation of a flint wheel under the lid.

There is a slight disadvantage in the arrangement in accordance with the invention insofar as if the lid of the lighter is pushed shut very slowly, the friction which acts on the link and the pressure of the valve on the resilient extension tends to prevent the link moving fully to its closed position. The valve is still held closed by the resilient extension, but there is then a clearance between the lid and the link, and this means that the lid is not held tightly shut and is able to rattle. This is not very satisfactory, and, what is more, dirt is able to enter the lighter under the imperfectly closed lid.

To overcome this difficulty, according to a further feature of the invention, in a lighter in which the link acts on one side of a cup fixed in the lid to hold the lid closed, further spring or other resilient part is provided which, when the lid is closed, acts between the other side of the cup in the lid, that is the side of the cup remote from that which is acted upon by the link, and produces a reaction on the link along a line of action parallel to that of the force exerted directly by the link on the cup and this increases this force to balance the force exerted by the resilient part on the cup.

In this way the link is held firmly in the cup without any clearance at all so that even if the lid is closed slowly, it is still held firmly and fully closed by the link and cannot rattle.

The spring is preferably attached to the inside of a cup, but it may alternatively be fixed to the link and project from the edge of the link remote from the edge which pressed against the cup to hold the lid shut.

When the link is S-shaped as is preferred, the spring which acts on the link to hold the lid shut is advantageously a leaf spring which acts on the bottom of the link.

If a metal strip is wrapped around part of the edge of the link which engages with the leaf spring, this arrangement has the further advantage that it enables the link and its extension to be formed by moulding out of nylon or other similar plastic material. The surface of the link which rubs against the leaf spring is then protected by the additional strip wrapped around it so that it does not wear away and also squeaking of the nylon rubbing against the leaf spring, which we found otherwise happens, is prevented. Indeed, when the additional spring is fixed to the link, the additional spring may be formed integrally with the metal strip which is then a spring strip.

The resilient arm which extends from the pivoted link and holds the burner valve closed may take various forms. It may be a spring strip which forms a leaf spring and projects from the link; it may be a stiff arm which is pivoted on the link with a spring acting between the arm and the link to make the arm resilient, or preferably, especially when the link is moulded or die cast, the resilient arm may be moulded or cast integrally with the link and have a socket containing a plunger or ball which engages with the projection on the burner valve and is spring loaded to provide the necessary resilience.

When an inner casing on which the igniting mechanism is mounted and which holds the gas tank is provided, it may have an open bottom from which the reservoir is removable. The sparks produced by the igniting mechanism must be accurately directed at the gas issuing from the burner on the gas tank and also the burner must be held accurately in position to ensure that the resilient extension keeps the burner valve shut when the lid is closed and for these reasons the gas tank must be accurately located and retained within the inner casing. This gives rise to another feature of the present invention which may be used in combination with the burner valve closure device or by itself.

According to this further feature, the gas tank has an
inlet valve fitted in one face and is held in position in the inner casing by engagement of a protruding rim of the inlet valve in an opening in the adjacent wall of the casing. The casing is slightly resilient so that the wall can be sprung away from the tank to disengage the rim from the opening and allow the tank to be withdrawn.

Preferably, parts of the casing are moulded to enable two opposite walls of the casing, on one of which is the opening, to be sprung apart to allow the rim to enter the opening.

As the rim of the inlet valve engages in an opening in the wall of the casing, the inlet valve itself is accessible and the tank can be refilled from a cartridge, without withdrawing the tank from the casing. As the tank is inserted into the casing the rim will force part of the wall of the casing outwards and when the tank reaches its correct position within the casing, the wall will spring back again as the rim enters the opening through it.

An example of a lighter in accordance with the present invention and some modifications are illustrated in the accompanying drawings, in which:

FIGURE 1 is a vertical section though the lighter; FIGURE 2 is a sectional detail as seen in the direction of the arrow II--II in FIGURE 1; FIGURE 3 is a section similar to part of FIGURE 1 by showing a modified arrangement for holding the burner valve closed; FIGURE 4 is a section similar to FIGURE 3, but showing a further modification; FIGURE 5 is another section similar to part of the section shown in FIGURE 1, but showing a still further modification of the arrangement for closing the burner valve; FIGURE 6 is a front elevation of the additional spring which acts between the link and the cup, and FIGURES 7 and 8 are sections similar to FIGURE 3, but showing two further modifications.

The lighter shown in FIGURE 1 has an outer casing 1 having an open upper end in which an inner casing 2 is a push fit. The inner casing 2 holds a gas reservoir 3 and forms a support for a flint wheel 4, a flint guide 5 and a spirally coiled spring 6 which pulls a flat 6a up the guide 5. The outer casing 1 has a lid 7 hinged to it by a hinge pin 7a. When the lighter is not in use, the lid 7 is held shut by an S-shaped link 8 which is pivoted on a pin 9 extending between two lugs 10 projecting upwards from the sides of the inner casing 2. The S-shaped link 8 is, in this example, made of synthetic rubber and is acted upon by a leaf spring 11. The link 8 fits inside a cup 12 which is fixed to the inside of the lid 7 adjacent the hinge and the link is biased in a clockwise direction as shown in FIGURE 1 by the spring 11 acting on the tip 13 of the link. The other tip 14 of the link 8 acts on the inside of the cup 12 and holds the lid 7 shut.

The bottom part of the link 8 is surrounded by a spring strip 13a which has a side part extending up the side of the link 8 and a top 14a which projects from the link. The very top of the strip 13a is bent over as shown at 15a to form a rounded corner 16a. The rounded corner 16a comes into engagement with the face of the cup 12 and, when the lid is closed as shown in FIGURE 1, the spring strip 13a is slightly bent so that the corner 16a exerts an outward force on the cup 12 and this increases the reaction of the other tip 14 of the link on the cup 12. As the line of action of the force exerted by the corner 16a on the cup 12 and that exerted by the tip 14 on the cup 12 are much the same, there is little or no resultant torque produced by the spring strip 13a on the cup 12 and therefore the hold of the lid 7 shut by the link 8 is not affected. All the clearance between the cup 12 and the link is however taken up by the spring 13a so that the lid cannot rattle even if it is pushed down slowly so that the link 8 does not assume its fully closed position.

As the bottom part of the spring strip 13a is wrapped around the bottom edge of the link 8 and it is the spring 13a and not the material of the link 8 itself which comes into contact with the leaf spring 11, the rubbing surfaces are maintained and the squeaking which was previously produced by the rubbing of the nylon against the metal when the nylon became impregnated with flint dust is now overcome. Wear of the rubbing surfaces is also reduced.

As shown most clearly in FIGURE 6, the bent over part 15a of the strip 13a is pointed and the projecting part has two notches 17a which reduce its width at the place where the strip leaves the surface of the link 8 so that it is here that most of the bending of the spring strip 13a takes place and the remainder of the strip remains firmly wrapped around the bottom part of the link 8.

The reservoir 3 is fitted with a burner valve 15 which has a pin 16 projecting from it. The pin 16 is connected to the valve closure member within the valve 15 and is biased in an upward direction by an internal spring 17 which is not shown. When the valve 15 is of a type well known for the burners of gas burners, the lower end of the valve is surrounded by the spring 13a and of its biasing spring, the valve is normally open if the pin 16 is left free. The valve can however be closed by pushing the pin 16 downwards.

To keep the valve 15 shut when the lid 7 is closed, the link 8 is provided with an integrally moulded arm 17 which projects from the upper part of the link 8 through a slot 18 in the right hand side of the cup 12. At the end of the arm 17 is a knob 19 having a bore 20 containing a light coiled compression spring 21. The spring 21 acts on a ball 22 contained within a metal cup 23 fixed to the bottom of the knob 19. The ball 22 is pressed downwards against the pin 16 by the spring 21 and holds the valve 15 closed.

When the lid 7 is swung in a counter-clockwise direction to open it, the cup 12 acts on the tip 14 of the link 8 and pushes the link 8 in a counter-clockwise direction. This causes the spring 11 to move over a dead centre position on the tip 13 so that it now acts on the link 8 in such a way that it urges the link in a counter-clockwise direction and holds it in a position in which it is swung through approximately 90° in a counter-clockwise direction from the position shown in FIGURE 1. This moves the ball 22 away from the pin 16 and allows the valve 15 to open. The valve 15 is then in the position shown in FIGURE 1 of the drawings so that the valve 15 is held closed by the ball 22. When the servicing is complete and the inner casing 2 has been returned to the outer casing 1, the link 8 must first be pushed into the open position before the lid 7 can be closed. To enable this to be done easily, the link 8 is provided with serrations 24 and the knob 19 is provided with further serrations 25 to enable either the link or the knob to be gripped easily.

The gas tank 3 is removable from the open bottom end of the inner casing 2 to enable it to be renewed or serviced, but to ensure that the valve 15 is in the right
position relative to the spark wheel 4 and to the ball 23 to ensure that the gas issuing from the valve 15 is readily ignited when the lid 7 is open and that the valve 15 is held closed by the ball 22 when the lid is shut, the tank 3 must be accurately held in position within the inner casing 2. This is done by means of an inlet valve 26 provided in the left side of the tank 3. The inlet valve 26 has a socket shown in detail in FIGURE 2 of the drawings for receiving the neck of a refill cartridge in the usual way and the socket 27 has a rim 28 which protrudes from the side face of the tank 3. The rim 28 is a close fit in a circular opening 29 in the edge of the casing 2. The side wall 30 of the casing 2 has a slot 31 and the other side wall which is not shown has a similar slot, so that the edge walls of the casing can be sprung apart slightly to allow the rim to pass between them as the tank 33 is inserted into the casing 2 and then to snap into position in the opening 29.

In the modification shown in FIGURE 3, the S-shaped link 8c and valve closing means of the link 8 shown in FIGURE 1, has a slot 33 in its upper end and a pin 34 spanning this slot. An arm 35 is pivotally mounted on the pin 34 and is urged in a clockwise direction by a coiled torsion spring 36. The tip of the arm 35 acts on the pin 16 and this arm takes the place of the arm 17 shown in FIGURE 1. The assembly which is carried by the said casing comprises as shown in FIGURE 4. Here the link 36 has a leaf spring 37 moulded into it and this leaf spring engages with the pin 16 to hold the valve 15 closed when the lid is shut.

The modification shown in FIGURE 5 of the drawings is more similar to the construction shown in FIGURE 1 than either of the modifications shown in FIGURES 3 or 4. In FIGURE 5, the S-shaped link 8c instead of having an arm 17 integrally moulded with it has a die cast arm 17a moulded into it. The arm 17a has a knob 19a similar to the knob 19 shown in FIGURE 1, but instead of the ball 22, there is a piston 22a held in position by a washer 28. The piston 22a is acted upon by a spring 21a and acts in exactly the same way as the ball 22.

In all the modifications illustrated in FIGURES 3 to 5 of the drawings, the links 8c, 8b and 8e are all provided with spring strips 13a which are just the same as the strip 13a shown in FIGURES 1 and 6 of the drawings.

The modification shown in FIGURE 7 is the same as the FIGURE 5 example except that the spring strip 13a has no upper part 14a which projects from the link 8. Instead, the tip 14 on the link 8d is urged into engagement with the cup 12 to prevent rattling of the lid 7, and a separate spring strip 14e which has a curved nose 15c engaging a lug 39 on the top of the link 8d. The strip 14b is spot welded to the inside of the cup 12.

In the final modification illustrated in FIGURE 8, the lid 7b and cup 12a are moulded or cast integrally together instead of being drawn as in the previous examples. The spring means are constructed as in FIGURE 5 but, as in the FIGURE 7 modification, the spring strip 13a has no upper part 14a. Instead, the tip 14 on the link 8c is urged into engagement with the cup 12a to prevent rattling of the lid 7b by a separate spring strip 14d which has a curved nose 16c engaging the link 8c. The strip 14c is secured within the cup 12a by means of a rivet 40 which also secures one arm 41 of the lid hinges to the lid.

I claim:

1. A cigarette lighter of the type comprising a casing, a gas reservoir within the casing, a burner carried by said casing near said reservoir, a valve for admitting gas from said reservoir to said burner, and a lid for covering said burner hinged to said casing for swinging movement between an open position and a closed position at opposite ends of its path of travel, the improvement which comprises valve closing means pivotally mounted on said casing and releasably connected to said lid so as to move therewith as said lid is opened from a valve closing position occupied by said valve closing means when said lid is in its closed position, to a valve releasing position normally occupied by said valve closing means when said lid is open, said valve closing means being manually movable relative to said lid away from its valve releasing position into its valve closing position when said lid is in its open position, and resilient means releasably retaining said valve closing means in its valve closing position.

2. In a cigarette lighter of the type comprising a casing, a gas reservoir within the casing, a burner carried by said casing near said reservoir, a valve for admitting gas from said reservoir to said burner, and a lid for covering said burner hinged to said casing for swinging movement between an open position and a closed position at opposite ends of its path of travel, the improvement which comprises valve closing means pivotally mounted on said casing and releasably connected to said lid so as to move therewith as said lid is opened from a valve closing position occupied by said valve closing means when said lid is in its closed position to a valve releasing position normally occupied by said valve closing means when said lid is open, said valve closing means being manually movable relative to said lid away from its valve releasing position into its valve closing position when said lid is in its open position, and resilient means releasably retaining said valve closing means in its valve closing position.

3. A cigarette lighter as claimed in claim 2, in which said valve closing means is releasably connected to said lid by means of a surface on said link which engages a cooperating surface carried by said lid when said lid is closed with said link in its second position thereby resisting opening of said link, but which swings away from said cooperating surface as said lid is opened and said valve closing means is brought into its valve closing position.

4. A lighter according to claim 3, in which the surface which the link engages in the inner surface of one side of a cup fixed in the lid, and an additional spring is provided which, when the lid is closed, acts between the side of the cup remote from said surface to produce a reaction on the link along a line of action substantially parallel to that of the force exerted directly by the link on the cup.

5. A lighter according to claim 4, in which the link is S-shaped and the spring which acts on the link to retain it in its first and second positions is a leaf spring which acts on the bottom of the link and said additional spring is a spring clip which is wrapped around at least part of the link bottom on which the leaf spring acts and has its end projecting away from the link into contact with the cup when the lid is closed.

6. A lighter according to claim 4, in which the link is S-shaped and the spring which acts on the link to retain it in its first and second positions is a leaf spring which acts on the bottom of the link and a spring clip is wrapped around at least part of the link bottom on which the leaf spring acts.

7. A lighter according to claim 2 in which said casing comprises an outer portion to which the lid is hinged
and an inner portion which is removable as a whole from the outer portion and which carries the reservoir, said inner casing portion having an open bottom through which the gas reservoir is removable, said gas reservoir having an inlet valve fitted in one face and said inlet valve having a protruding rim which engages in an adjacent wall of said inner casing portion to hold said reservoir therein, said inner casing portion being slightly resilient so that the wall can be sprung away from the reservoir to disengage the rim from the opening and allow the reservoir to be withdrawn.