May 26, 1942. L. BOLLE 2,283,909

PYROPHORIC LIGHTER

Filed April 1, 1940

Fig. 1

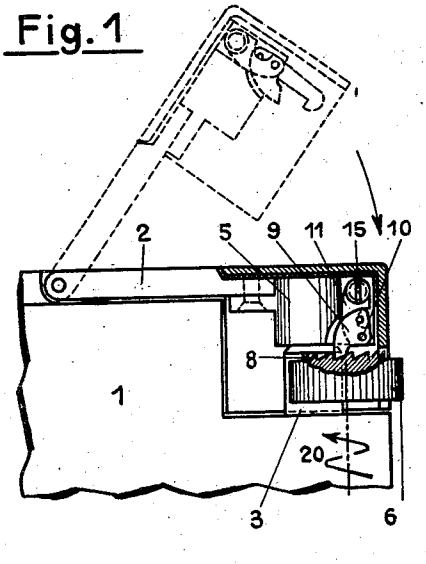



Fig. 2

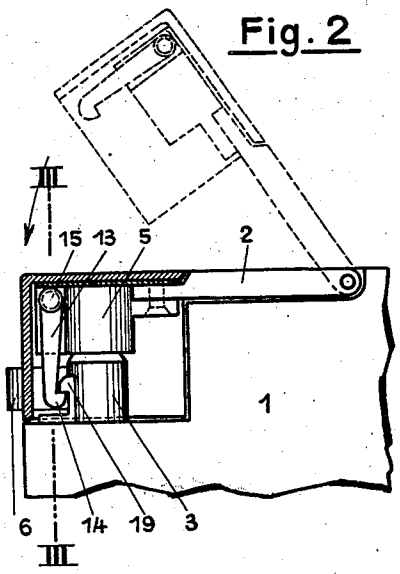
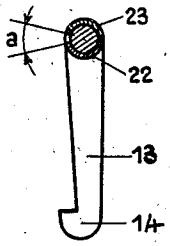



Fig. 4



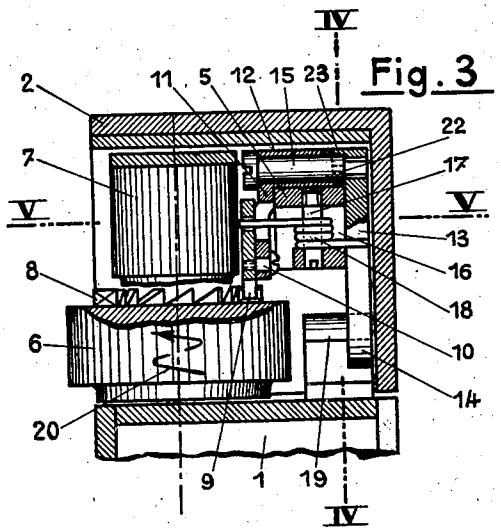




Fig. 3

Fig. 6

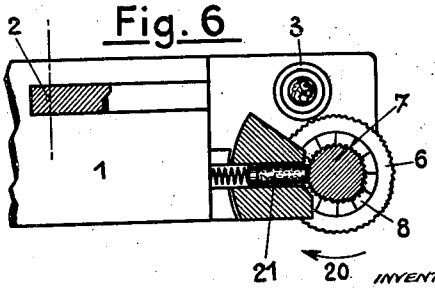
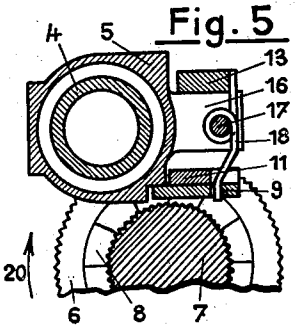



Fig. 5




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# UNITED STATES PATENT OFFICE

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## PYROPHORIC LIGHTER

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Application April 1, 1940, Serial No. 327,265
In Switzerland April 24, 1939

3 Claims. (Cl. 67—7.1)

Automatic pyrophoric lighters having a cover which opens automatically, are always provided with a retaining member for the cover, said member acting in the manner of a pawl and being actuated from the outside either by a simple knob or by a more complicated device for the purpose of rendering accidental lighting of the lighter in a pocket less probable. Besides this danger of accidental lighting, these lighters also have the disadvantage that when they misfire it is necessary for the smoker to close the lighter before making a second attempt to light the same. For eliminating these two disadvantages some automatic lighters with a spring-actuated cover have been constructed wherein, after the cover has been opened automatically, a second non-automatic movement is necessary to effect the lighting, which movement can then be repeated alone if the lighting has not taken place. These lighters however, when the cover opens accidentally, have the disadvantage of allowing the petrol to evaporate in the pocket from which it distributes a strong disagreeable smell.

The subject of the present invention is a semi-automatic lighter with a spring-actuated cover, and provided with a rotary friction wheel adapted to be actuated by hand, this lighter being characterised in that the rotary movement imparted to the friction wheel, which is in contact with a pyrophoric flint, for the purpose of effecting lighting, is used during the first portion of its movement for releasing the cover from its retaining member.

One form of construction of the subject of the invention is shown by way of example in the accompanying drawing, wherein:

Figs. 1 and 2 are views from opposite sides of the lighter, some of the parts being in section.

Fig. 3 is a cross-section to a larger scale on the line III—III of Fig. 2.

Fig. 4 is a detail view in section on the line IV—IV of Fig. 3.

Fig. 5 is a detail view in section on the line V—V of Fig. 3.

Fig. 6 is a plan view, with parts in section, of Figs. 1 and 2, the cover being removed.

In the drawing 1 indicates the body or casing of the lighter to which is hinged a cover 2 actuated by a spring, not shown, which always tends to hold the cover in the open position. 3 is the wick tube on which is placed a wick cap 4 which is located in the support 5 screwed to the cover. The pivoted cover 2, wick cap 4 and its support 5 constitute in effect a snuffer device.

On the body of the lighter 1 is mounted a rotary wheel 6 adapted to be actuated by hand and which is secured to a friction wheel 7 against which there bears resiliently the pyrophoric flint 21 (Fig. 6).

The wheel 6 is provided on one face with dog teeth 8 adapted to engage with a pawl 9.

The pawl 9 is hinged at 10 to an arm 11 mounted in such a manner as to be capable of oscillating on the support 5.

The support 5, which serves as a guide for the wick cap 4, is provided in the upper portion thereof with a transverse bore in which is mounted a tube 12 secured to the arm 11. Through this tube passes a screw 15 to the end of which there is shown secured a latch 13 terminating in a hook 14. A device is provided for ensuring the entrainment of the lever 13 by the lever 11, whilst enabling the former to move without entraining the latter. This is necessary so as to enable the end 14 of the latch 13 to pass over the hook 9 so as to come into engagement therewith without the pawl 9 being displaced rearwardly from its normal engaging position with one of the teeth 8 which would be liable, by reason of the friction of the flint 21 on the friction wheel 7, to prevent the hook, 14 from coming into engagement with the hook 19. For this purpose the tube 12 is provided at its end, opposite the latch 13, with a cut-away portion 22 which extends parallel to its axis so that the tube only extends over an arc of at least 180°. The latch 13 has a cylindrical portion 23 corresponding with the cut-away portion 22 of the tube, but of a smaller angle than the latter, so that the lever can turn with the screw or shaft 15 in the tube 12 through an angle $a$, corresponding with the angular clearance provided between the parts 22 and 23. This clearance is sufficient, when closing the cover, to enable the hook 14 of the latch 13 to pass over the hook 19 so as to assume the position shown in Fig. 2, without producing a movement of the pawl over the teeth 8.

Below the bore containing the tube 12, the support 5 is provided with a recess 16 through which passes a vertical spindle 17 on which there is mounted a small coiled tension spring 18 of which one end rests against the latch 13, whilst the other end thereof is located in an opening in the pawl 9. In order to enable the latter to move relatively to the arm 11 under the action of the spring 18, this arm is provided opposite the end of the spring with a shallow recess.

Adjacent the wick carrying tube 3 is mounted

a fixed hook 19 adapted to engage with the end 14 of the latch 13.

The operation of this device is as follows.

The cover 2, being closed as shown in full lines in Figs. 1 and 2, the latch 13 engages by means of its end 14 with the hook 19 under the action of the spring 18. In this position the pawl 9 engages with the teeth 8 of the wheel 6 also under the action of the spring 18.

When the wheel 6 is actuated in the direction of the arrow 20, the first portion of its movement entrains the pawl 9 and therewith the arm 11 on which it is mounted, against the action of the spring 18. As during this movement the arm 11 entrains the lever 13 through the medium of the tube 12, the hook 14 is disengaged from the fixed hook 19.

At this moment the cover 2 is released and is opened under the action of its spring.

It entrains therewith the support 5 carrying the members 11 and 13 with the pawl 9, as also the wick cap 4 which latter exposes the wick.

As the movement of the wheel 6 produces the movement of the friction wheel 7, bearing against the pyrophoric flint, ignition takes place when the cover is open (Fig. 6), the friction wheel then turning freely on its shaft without any resistance other than friction on the pyrophoric flint.

From the foregoing description it will be readily seen that when, during the closing of the cover, the pawl 9 is at the apex of one of the teeth 8, it can oscillate on the arm 11 without preventing the hook 14 of the latch 13 coming into engagement with the fixed hook 19.

By reason of the fact that all the movable members of the device are attached to the cover 2, which moves away from the wick at the moment when a spark is projected towards the latter, dust from the pyrophoric flint will not interfere with the movement of these members in the course of time. The mounting of these members is further facilitated by the fact that the movable members are mounted on the support 5 which itself is mounted on the cover 2.

As will be seen this device which only necessitates a single and the same rotary movement for producing both the opening and ignition of the lighter, also has the advantage of preventing in a practical and satisfactory manner, the accidental opening of the cover, as in order to effect this opening it is not only necessary to rotate the wheel, a movement which it is difficult to effect accidentally, but it is also necessary to overcome the resistance which the pyrophoric flint, which is pressed by a spring against the friction wheel, naturally opposes to this rotation.

The movable parts of the device, instead of being mounted on the cover, as shown in the example of construction described, may obviously also be mounted on the body of the lighter, in which case the cover is provided with a fixed hook or any other projection adapted to come into engagement with a movable retaining member.

The teeth adapted to come into engagement with the pawl may be formed in the friction wheel or in a member secured thereto. There may also be used directly for this purpose the teeth of the friction wheel, which teeth engage with the pyrophoric flint.

I claim:

1. In a pyrophoric lighter, the combination, comprising, a casing having a wall extending inwardly at right angles to an outer face thereof, a wick on said wall, a snuffer device for covering and uncovering the exposed end of said wick pivoted to the casing and spring biased to uncovering position, a flint, a friction wheel for the flint and mounted to rotate on a fixed axis disposed vertically to said wall, said wheel having a peripheral portion exposed at the face of the casing from which said wall extends inwardly, a hook fixed on the casing and having a keeper portion parallel to said wall, an annular ratchet on the side of the friction wheel opposite said wall, a latch pivotally carried by the snuffer device on an axis disposed at right angles to the axis of the wheel and ratchet and having its lower end adapted to engage and disengage said hook, an arm arranged parallel to the latch and having a right angular tubular portion coaxial with and surrounding the pivot axis of the latch, cooperating parts on the latch and tubular portion to provide relative idle movement therebetween, a pawl pivoted to the lower end of the arm for engaging the ratchet, said pawl when positively moved by the ratchet first causing the takeup of idle movement between the arm and the latch, and then causing the release of the latch from the hook, and spring means for normally urging the pawl toward the ratchet and also urging the latch toward the hook, said spring means also permitting relative idle movement of the pawl relative to the latch to prevent disengagement of the latter from the keeper hook as the pawl seats on the ratchet when the snuffer device is moved to wick covering position.

2. A mechanism for controlling the automatic opening of a spring-actuated cover pivotally mounted on the fuel container of a lighter, comprising, in combination, a friction wheel rotatably mounted on said container, an annular ratchet on the side of said wheel, a hook secured to the container, a support secured to the inner side of said cover, a tube rockably mounted in said support, an arm secured to said tube, a shaft rockably mounted in said tube, a latch keyed to the end of said shaft and adapted to engage said hook, said tube being cut away at its end adjacent said latch through an arc of at least 180°, an arcuate extension on said latch of less than 180° and engaging within the cut-away portion of said tube to permit of relative idle movement between said latch and said tube, a pawl pivotally mounted on said arm and engaging said ratchet whereby movement of the ratchet will rock the pawl and move the arm and its tube to rock the latch out of engagement with the hook, a spindle mounted in said support substantially parallel to and between said latch and arm, and a spring coiled around said spindle and having one end engaging said pawl to urge it toward the ratchet and having the other end engaging said latch to urge it toward the hook, and whereby when the cover is closed the pawl will be free to move from the apex of a tooth of the ratchet into the valley thereof without causing disengagement of the latch from the hook.

3. A mechanism for controlling the automatic opening of a spring actuated cover pivotally mounted on the fuel container of a lighter, comprising, in combination, a friction wheel including a peripherally exposed portion rotatably mounted on said container, an annular ratchet on the side of said wheel, a keeper hook secured to the container, cover controlling means carried at the inner side of the cover and cooperating with the said wheel, ratchet, and hook, said means including a latch for engaging the hook and a

pawl for engaging the ratchet when the cover is closed, said pawl and latch being joined by lost motion producing means and also normally spring tensioned respectively toward the hook and the ratchet, thereby to permit the latch to engage the hook regardless of the position of the pawl relative to the adjacent teeth of the ratchet when the cover is closed, said wheel when manually moved causing the ratchet to entrain the pawl and latch and thereby disengage the same from the keeper hook to permit the cover to open.

LÉON BOLLE.