

## PATENT SPECIFICATION

458,615

Application Date : Sept. 14, 1935. No. 25581/35.

Complete Specification Accepted: Dec. 23, 1936.



## COMPLETE SPECIFICATION

## Improvements in or relating to Pyrophoric Lighters

Communication from ART METAL WORKS INC., a corporation organised under the laws of the State of New Jersey, United States of America, of 46—50, 5 Center Street, City of Newark, State of New Jersey, United States of America.

I, ARTHUR HAROLD STEVENS, B.Sc. (Lond.), F.C.S., a Fellow of the Chartered Institute of Patent Agents, a Subject of the King of Great Britain, of the firm of Stevens, Langner, Parry & Rellinson, Chartered Patent Agents, 5/9, Quality Court, Chancery Lane, London, W.C.2, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

20 This invention relates to pyrophoric lighters of the type comprising a torch utilizable for actuating the lighter mechanism to thereby produce a shower of sparks which ignite the charge of fuel held in suspension by the torch wick.

The invention has for its object to provide improvements in the general class of pyrophoric lighters noted above, such improvements contributing to the ease and efficient operation of the automatic mechanism forming an important part of the pyrophoric lighter.

According to the present invention there is provided a pyrophoric lighter of the type specified above comprising a sparking unit, a movable torch-actuated member disposed in the path of sparks projected from said unit and a tubular member forming a passage in which said torch is normally seated, said tubular member being disposed laterally of said path and closely adjacent said sparking unit. It will be appreciated that such an arrangement of the sparking means, 45 torch actuated member and torch receptacle or tubular member is advantageous and desirable both from the user's point of view and from the manufacturing standpoint.

50 Furthermore according to the invention, a pyrophoric lighter of the type specified above is provided comprising a sparking unit and a movable torch-actu-

ated member disposed in the path of sparks projected from said unit, the said member being a substantially straight bar having a laterally disposed torch-engaging section at the top thereof.

For an understanding of the invention and for an illustration thereof, reference is had to the accompanying drawing, in which:

Figure 1 is a vertical sectional view, partly in elevation, of the pyrophoric lighter.

Figure 2 is a plan view of the pyrophoric lighter.

Figure 3 is a transverse, horizontal sectional view, taken on the line 3—3 of Figure 1 looking in the direction of the arrows;

Figure 4 is a transverse vertical sectional view of the pyrophoric lighter substantially on the line 4—4 of Fig. 2.

Figures 5 and 6 are sectional views, partly in elevation, showing the construction of the torches and

Figure 7 is a fragmentary detailed view illustrating a modification of a part of the mechanism.

As shown on the drawing, the device of this invention comprises a base 1 adapted to rest upon any suitable supporting surface, said base preferably having a sheet of felt 2 adhesively or otherwise suitably secured to the lower surface thereof. Secured to and upstanding from the base 1 are a pair of vertical standards 3 to which a top plate 4 is suitably secured, as by the screws 5. As illustrated, the mechanism of the invention is disposed mainly within a casing 6 which, if desired, may have an upper surface engaged by the periphery of the plate 4 and a lower flanged surface 6a resting upon the base 1. The shape of this casing 6 is clearly shown in Figures 1—4 inclusive. It will be understood that such casing may be of other suitable configuration and otherwise arranged as may be desirable.

Suitably secured, as by the screws 40, to the lower surface of the plate 4 is a secondary plate 8 which forms the direct support for the various actuating members hereinafter described,

[Price 1/-]

As shown in Figure 4, the plates 4 and 8 are apertured to provide a passage through which extends the threaded upper end of a vertical tubular member 9 having a flange 9a engaging the lower surface of the plate 8. Secured to said upper end of the member 9 is a nut 10 threaded against the upper surface of the top plate 4 and which serves, therefore, in conjunction with the flange 9a, to anchor the tubular member 9 in vertical position as shown.

As disclosed on the drawing, the tubular member 9 serves as a support for a fuel casing 11 which, as shown, is filled with a mass of cotton 12 or other absorbent material, fuel, such as high test gasoline, being introduced in suitable manner into said fuel casing, as by passage through the opening normally closed by the closure cap 12a. As stated, the tubular member 9 supports the fuel casing 11 and, to this end, said fuel casing 11 may comprise an upwardly extending tubular extension 11a to which the lower end of the tubular member 9 is threaded. Further, it is desirable that the fuel casing 11, in alignment with the extension 11a, be formed with a downwardly extending tubular extension 11b utilizable for anchoring in vertical position any suitable tubular structure 13 of felt, cotton or the like. The tubular structure 13 is adapted to receive or cooperate with the lower end of a torch T or T<sup>1</sup> and, more particularly, said tubular structure 13, if desired, may be of the detailed character disclosed in British Letters Patent No. 435,667.

As shown in Figure 4, a pair of spaced frame members 14, 15 are disposed in parallel relation below the plates 4 and 8, the frame member 14, preferably, being formed integrally with the plate 8 and the frame member 15 being suitably anchored, as by soldering, in the position shown in Figure 4.

The aforesaid frame members 14 and 15 support a horizontal pin or member 16 on which a sleeve 17 is disposed for free rotatable movement, this sleeve having a first projecting lever arm 18 secured thereto and said lever arm, in turn, having a lateral pin 18a projecting therefrom. As shown in Figure 1, a second projecting lever arm 19 is formed integrally with the lever arm 18, the remote end of said lever arm 19 having a pin-and-slot connection with a reciprocatory-actuating bar 20, the lower end of which is freely slidable in a lateral extension 15a of the aforesaid frame member 15, the upper section of said actuating bar 20 being freely slidable in

aligned openings formed in the plates 4, 8, the extreme upper end of said actuating bar 20 terminating in a lateral bifurcated section 20a formed with a slot 20b, Figure 2. The actuating bar 20 is biased in an upward direction by a spring 21 which is confined between the frame member extension 15a and a shoulder formed on the actuating bar 20, Figure 1.

Freely rotatable on the aforesaid sleeve 17 at one end thereof is a second sleeve 22 to which a disk 23 is secured for rotatable movement therewith.

Projecting laterally from a forward section of this disk is a pin 23a to which one end of a coiled spring 24 is secured, the other end of said spring being secured to the aforesaid pin 18a.

The aforesaid frame member 15 comprises an extension 15b which carries a lateral pin 25 to which, at the end of a spacing sleeve 26, a pawl 27 is pivoted, the pawl being biased in a counterclockwise direction, Figure 1, by a suitable spring 28. As illustrated in Figures 1 and 3, this pawl is adapted to be maintained by the spring 28 in clutching relation with a lateral section 23b of the aforesaid disk 23.

The pawl 27 comprises a section 27a, Figure 1, adapted, as hereinafter described, to be engaged by a nose 18b of the aforesaid lever arm 18 whereby said pawl 27 is rocked in clockwise direction, Figure 1.

The aforesaid disk 23 is of such diameter that it extends through aligned slots formed in the plates 4 and 8, said disk 23 terminating above the latter in a gear segment 23c disposed in meshing relation with a pinion 29 freely rotatable on a horizontal pin or member 30 mounted in fixed position in any suitable manner. Thus, for example, one end of the pin 30 may be mounted in an integral section 31 of the aforesaid plate 8, said section 31 being formed as a standard which projects upwardly through a passage formed in the plate 4. The other end of the pin 30 may be mounted in an extension 15c of the frame member 15, said extension 15c projecting upwardly through aligned slots formed in the plates 4 and 8.

In accordance with the form of the invention herein disclosed, the aforesaid pinion 29 is mounted on and rotatable with the hub 32a of a ratchet wheel 32, this ratchet wheel 32 and its hub being freely rotatable and also freely movable longitudinally on the aforesaid pin 30. As shown in Figure 4, a helical spring 33, disposed around the pin 30, is utilized to bias the ratchet wheel 32 in a direction from left to right, Figure 4.

Rotatably disposed on the pin 30 is a hub 34a of a second ratchet wheel 34, this hub 34a carrying, for rotative movement therewith, a wheel 35 having a serrated or roughened face coactable with a pyrophoric element 36 projecting in part from a tube 37 extending downwardly through the plates 4 and 8 and being anchored, preferably, to the aforesaid frame member 15. As shown in Figures 1 and 3, the lower end of the tube 37 has a cap nut 38 threaded thereinto, this nut maintaining under compression a helical spring, not shown, which is disposed within the tube 37 and which biases the pyrophoric element 36 into engagement with the serrated wheel 35.

The ratchet wheels 32 and 34 are provided with surfaces disposed transversely of the pin 30, these surfaces facing each other and being provided, respectively, with sets of ratchet teeth which coact with each other as indicated in Figure 2. These sets of ratchet teeth are so arranged that, during movement of the pinion 29 in a counterclockwise direction, Figure 1, said pinion idles with respect to the serrated wheel 35. However, during movement of the pinion 29 in a clockwise direction, Figure 1, the sets of ratchet teeth are in clutching relation and, therefore the serrated wheel 35 is caused to move with the pinion 29 during clockwise movement of the latter.

Lighting mechanisms have, of course, been provided having fixed and movable ratchet surfaces of the type specified, and this feature is not broadly claimed as new per se.

As clearly appears from a consideration of Figure 2, the lateral section 20a of the actuating bar 20 and particularly the slot 20b thereof is disposed in alignment with the serrated wheel 35. Accordingly, when said lateral section 20a is depressed into its lowermost position, as hereinafter described, it results that said lateral section 20a is in the direct path of sparks produced by action of the serrated wheel 35 on the pyrophoric element 36.

As illustrated, the sparking means described above is covered by a casing 39 which is suitably secured to the plate 4, as by the screws 40. This casing, between said sparking means and the actuating bar 20, is open so as to permit free passage of the pyrophoric sparks from right to left, Figure 1.

A torch of any suitable character may be used for actuating the herein described mechanism. At present, however, a torch T or T<sup>1</sup> of the general character disclosed in Figures 4 and 5 is preferred.

As shown, the torch T comprises a handle section 41 provided preferably

with a knurled head 41a. Disposed interiorly of and projecting from one end of the handle section 41 is a sleeve 42 having a peripheral flange 42a engaged by an interior shouldered surface of a cap member 43 which may be freely moved over the surface of the sleeve 42 and then threaded to the lower end of the handle section 41. Threaded to the interior surface of the sleeve 42 is a second sleeve 44 which, at its lower end, is attached to one end of a wick 45 of any suitable type, for example, as well known in the pyrophoric lighter art, this wick, as shown, being adapted to extend slightly beyond the lower surface of the sleeve 42, which is provided with a shoulder 42b forming a neck of restricted diameter for the end of said wick. The handle section 41 is utilized to move the sleeve 44 interiorly of and with respect to the sleeve 42. To this end, any suitable arrangement may be utilized such, for example, as herein exemplified by the square or other polygonal rod 46 fixed to the handle section 41 and which extends, in freely slidable relation, interiorly of a passage of corresponding configuration formed interiorly of the sleeve 44.

As will readily be understood, the above noted cap member 43 prevents longitudinal movement of the sleeve 42 with respect to the handle section 41 while permitting free rotative movement of said sleeve and handle section with respect to each other. Accordingly, the exposed surface of the sleeve 42 may be held in the fingers of one hand while rotating the handle section 41, this operation causing the sleeve 44 and the thereby-carried wick 45 to be so moved that the wick end is moved either into or out of the lower neck section of the sleeve 42. With such an arrangement, the length of the protruding wick section may be adjusted with nicety and, as the wick burns away, new surfaces thereof may be exposed for use as desired. Obviously, such an arrangement is highly desirable because rendering the use of a long wick practical, in a torch of the character described, such long wick having the advantageous function that it is capable of storing a relatively large quantity of fuel.

In the modified form of torch T<sup>1</sup> shown in Figure 6, there is provided a handle section 48 having a serrated operating surface 48a. One end of a sleeve 49 is received in a passage formed in one end of said handle section, this sleeve being secured to the handle section for rotatable movement only by a sleeve nut 50, the latter engaging a shouldered surface 49a of the sleeve 49 as shown. Disposed

interiorly of the sleeve 49 is a tubular wick 51 formed of suitable material as known to the art. Secured to the handle section 48 is a rod 52 of square or other polygonal configuration, this rod extending interiorly and longitudinally of the wick 51 in close-fitting relation and being of somewhat greater length than the sleeve 49. The latter, namely, the sleeve 49 is provided, adjacent its lower end, with interior screw threads 49*b*, these threads being closely engaged by the wick 51.

The wick 51 normally projects beyond the lower end of the sleeve 49 to some extent as indicated. When it becomes desirable to advance or retract said wick, the sleeve 49 is held by the fingers of one hand and the handle section 48 is turned in one direction or the other. The rod 52 turns with the handle section 48 and the wick 51 turns with said rod 52. The rod 52 crowds the exterior surface of the wick 51 against the threads 49*b* and, since said wick turns with respect to the stationary threads 49*b*, it results that the wick is either retracted or advanced as desirable.

With a torch T<sup>1</sup>, the lower end of the rod 52 engages a cup-shaped member or other part carried by the actuating bar 20, or equivalent. With a torch T, the shoulder 42*b*, or equivalent, engages a surface defining a recess in the actuating bar. As will clearly appear, the wick end of the torch T to be ignited is disposed, ordinarily, below the lateral section 20*a* of the actuating bar whereas with the torch T<sup>1</sup>, the ignitable wick end ordinarily, is disposed above said lateral section, or equivalent.

In order to effect operation of the herein disclosed mechanism, the torch T is withdrawn from the tubular member 9. At this time, the exposed wick end will have taken up a charge of fuel from the fuel casing 11. Thereupon, the extreme lower end of the torch sleeve 42 is passed downwardly through the slot 20*b* of the actuating bar 20, such downward movement of the torch T continuing until the sleeve shoulder 42*b* engages the surface defining said slot 20*b*. Thereupon, the application of downward pressure to the torch T causes the actuating bar 20 to be moved downwardly from the position thereof shown in Figure 1. In so doing, the lever arm arrangement 18, 19 is swung in a counterclockwise direction, Figure 1, with the result that the pin 18*a* recedes from the nose 23*d* of the disk 23 to thereby substantially increase the tension of the spring 24. As stated, this spring 24 is connected to the lever arm arrangement 18, 19 and also to the

disk 23 but increase in tension of the spring 24 as just described does not cause movement of the said disk 23 because, during the movement of said lever arm arrangement described above, the disk 23 is locked by the pawl 27 in the position shown in Figure 1.

During continued movement of the lever arm arrangement 18, 19 from the position shown in Figure 1, the nose 18*b* of the lever arm 18 approaches and eventually engages the section 27*a* of the pawl 27. Thereupon, by application of pressure to said pawl 27 by the lever arm nose 18*b*, the pawl 27 is swung clockwise from the position shown in Figure 1 to thereby release the disk 23 at its lateral section 23*b* so that the latter moves counterclockwise, Figure 1, with a snap action under the influence of the energy just stored in the spring 24 as described above. This counterclockwise movement of the disk 23 continues until the nose 23*d* thereof again comes into engagement with the pin 18*a*.

When the above described counterclockwise movement of the disk 23 occurs, the lower end of the torch T has moved to such a position that it is only slightly above the upper plate 4 of the herein described mechanism, said lower end of the torch T, at this time, being in the direct path of sparks produced by action of the serrated wheel 35 on the pyrophoric element 36.

The sparks just referred to are produced by the herein described snapping movement of the disk 23 in a counterclockwise direction, Figure 1. Said disk 23, when moving in the direction last noted, causes the pinion 29 to partake of a step of clockwise movement, Figure 1. When the pinion 29 thus moves, the ratchet faces of the members 32 and 34 are in clutching relation and, therefore, the serrated wheel 35 partakes of a step of movement in a clockwise direction. Figure 1, corresponding with the step of movement imparted to the pinion 29. As a result, a shower of pyrophoric sparks are produced, these sparks passing along a path tangentially of the serrated wheel 35 to thereby ignite the charge of fuel at the lower end of the wick 45.

In this manner the torch T is caused to have a freely burning flame which may be utilized for any desired purpose. Thus, the flaming torch may be utilized for the ignition of cigars, cigarettes, pipes, gas burners, and the like, and, in so doing, the torch may be passed from hand to hand as desired. When the torch T has served its intended purpose, it may be reinserted in the tubular member 9,

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either before or after the flame at the lower wick end has been extinguished although, preferably, such flame is extinguished prior to reinsertion of the torch T in the tubular member 9.

As soon as the torch T is removed from the lateral end 20a of the actuating bar 20, the various parts automatically return to their respective normal positions as shown on the drawing. Thus, the spring 21, which previously had been compressed in response to downward movement of the actuating bar 20, is released for expansion. When thus expanding, the spring 21 elevates the bar 20 to its normal position as shown in Figure 1, the lever arm arrangement 18, 19 and the disk 23 moving substantially as a unit in a clockwise direction, Figure 1, until these parts have returned to their respective positions shown in Figure 1. While thus moving the pin 18a remains in engagement with the nose 23d of disk 23 and, eventually, at the conclusion of such return movement, the pawl 27 returns to latching position with respect to the lateral section 23b of the disk 23.

When the disk 23 moves clockwise to its normal position as shown in Figure 1, counterclockwise movement Figure 1, is imparted to the pinion 29. During such counterclockwise movement of said pinion 29, the ratchet face associated therewith idles with respect to the adjacent ratchet face, this action occurring in a ready manner inasmuch as the pinion 29 is freely movable longitudinally of the pin 30 against the biasing action of the spring 33.

In the manner noted above, the various parts are returned to their respective normal positions as shown on the drawing and, when thus normally positioned, the device is in condition for subsequent operation which occurs in the manner hereinbefore described in detail when the actuating bar 20 is again depressed by the application of pressure thereto by the torch T.

An important feature of the present invention relates to the arrangement wherein the lower necked end of the torch T is adapted to be passed into and through a recess such as the recess 20b shown in Figure 2, the shoulder 42b coming into engagement with the surface defining said recess. With an arrangement of this character, the lower wick end is disposed in the path of the pyrophoric sparks in a very advantageous manner.

In Figure 2, the opening in the lateral section 20a forming the bifurcation is smaller than the diameter of the sleeve neck section below the shoulder 42b. Therefore, said neck section may not be

passed laterally through said opening.

In Figure 7, a modified construction is shown wherein a lateral section 20d of the actuating bar is provided with a V-shaped notch adapted to have the shouldered end 42d of a torch sleeve passed laterally thereinto, the arrangement being such that the torch sleeve, when thus positioned, has its associated wick in the direct path of sparks projected from the adjacent serrated wheel 35.

While the invention has been described with respect to certain particular preferred examples which give satisfactory results, it will be understood by those skilled in the art after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention and it is intended therefore in the appended claims to cover all such changes and modifications.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, (as communicated to me by my foreign correspondents) I declare that what I claim is:—

1. A pyrophoric lighter of the type hereinbefore described comprising a sparking unit, a movable torch-actuated member disposed in the path of sparks projected from said unit and a tubular member forming a passage in which said torch is normally seated, said tubular member being disposed laterally of said path and closely adjacent said sparking unit.

2. A pyrophoric lighter of the type hereinbefore described comprising a sparking unit and a movable torch-actuated member disposed in the path of sparks projected from said unit, the said member being a substantially straight bar having a laterally disposed torch-engaging section at the top thereof.

3. A pyrophoric lighter according to claim 1 comprising a base plate, a pair of standards rising therefrom, and a support carried by said standards, wherein the sparking unit and movable torch actuated member are carried by said support.

4. A pyrophoric lighter according to claim 3, in which the torch actuated member comprises a vertical bar reciprocating in said support.

5. A pyrophoric lighter according to claim 3 or 4, in which said support comprises a horizontal plate secured to said standards, and a second plate secured to said horizontal plate, the sparking unit and torch-actuated member being carried by said second plate.

6. A pyrophoric lighter according to

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- claim 5, which includes a casing enclosing said standards and forming a continuous unbroken surface with the base and said horizontal plate.
- 5 7. A pyrophoric lighter according to claim 1 comprising a serrated wheel, a pyrophoric element adapted to coact therewith, ratchet means for imparting uni-directional movement to said serrated wheel, said ratchet means comprising laterally fixed and movable ratchet surfaces, and means for biasing the movable ratchet surface toward the fixed ratchet surface.
- 10 8. A pyrophoric lighter according to claim 7, in which said serrated wheel is operated by gear means and said ratchet means comprises a combined pinion and ratchet wheel mounted on the horizontal
- 15 20 rotative axis of the serrated wheel, said pinion meshing with said gear means, and said ratchet wheel co-operating with a ratchet wheel rotatable with said serrated wheel.
9. A pyrophoric lighter according to claim 8, in which said serrated wheel is mounted on the hub of one ratchet wheel and said pinion on the hub of the other ratchet wheel.
10. A pyrophoric lighter according to any of claims 7 to 9, in which said biasing means comprises a spring.
11. A pyrophoric lighter constructed substantially as hereinbefore described, with reference to the accompanying
- 25 30 35 drawings.

Dated this 14th day of September, 1935.  
 For ARTHUR HAROLD STEVENS,  
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[This Drawing is a reproduction of the Original on a reduced scale.]

