Jan. 29, 1957 B. D. SMITH 2,779,179

LIGHTER

Filed Dec. 2, 1952 3 Sheets-Sheet 1

Fig. 1.

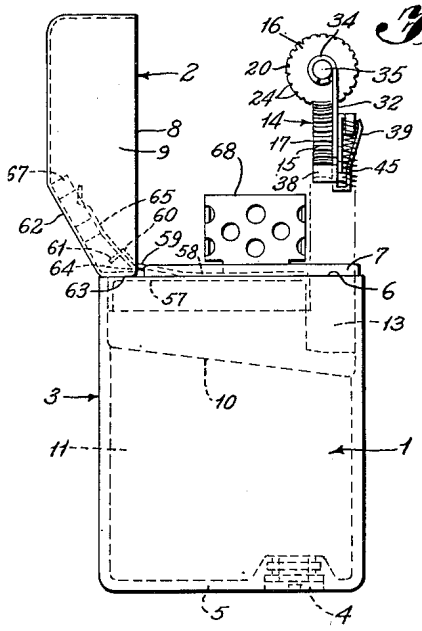


Fig. 5.

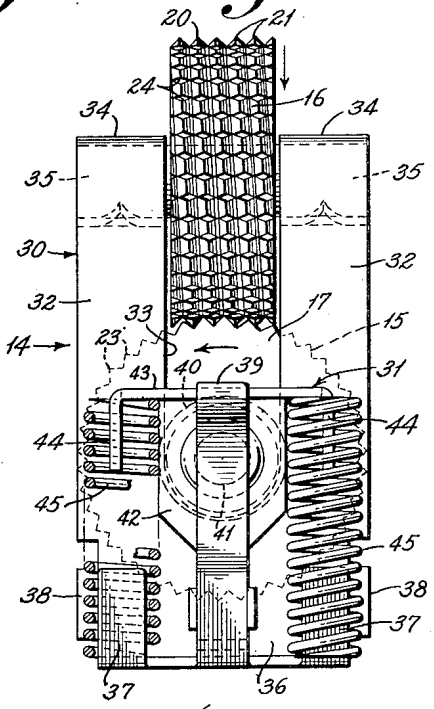


Fig. 6.

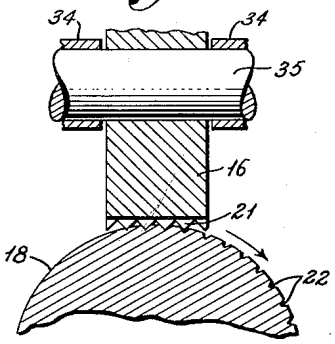


Fig. 7.

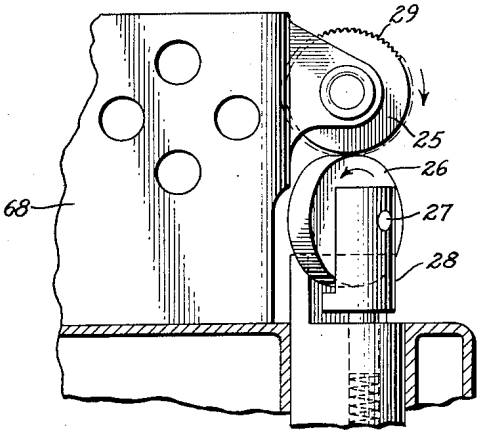
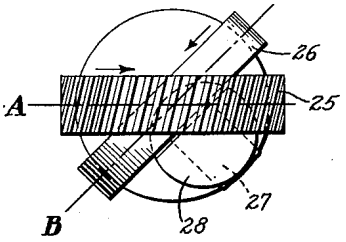


Fig. 8.



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Jan. 29, 1957 B. D. SMITH 2,779,179

LIGHTER

Filed Dec. 2, 1952 3 Sheets-Sheet 2

Fig. 2.

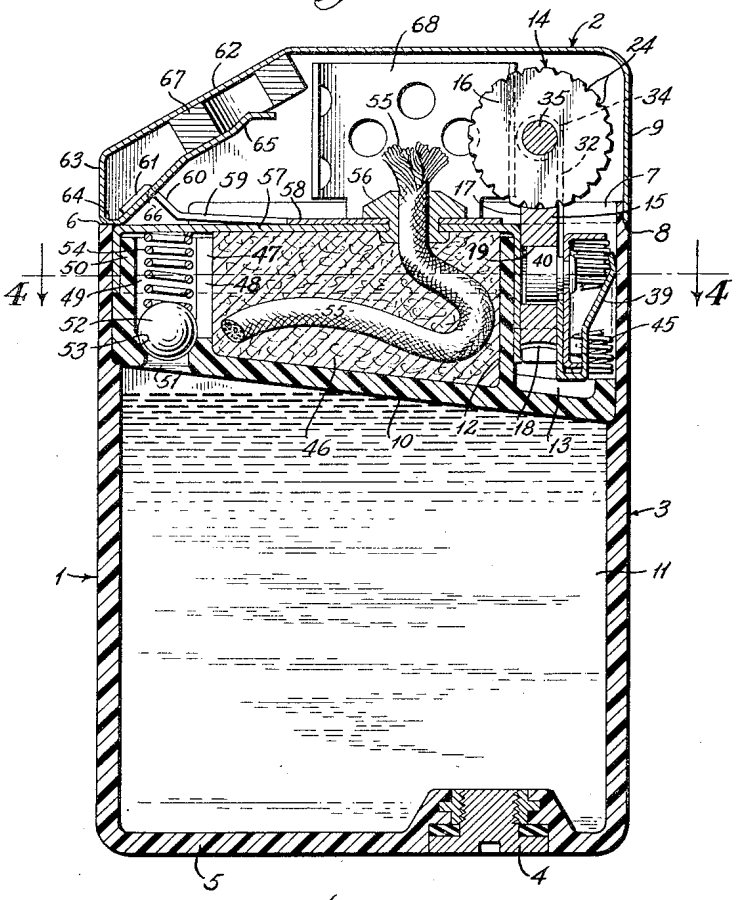
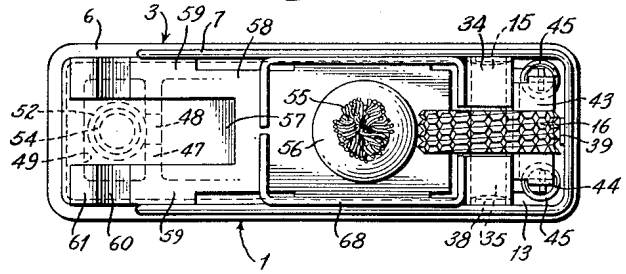


Fig. 3.



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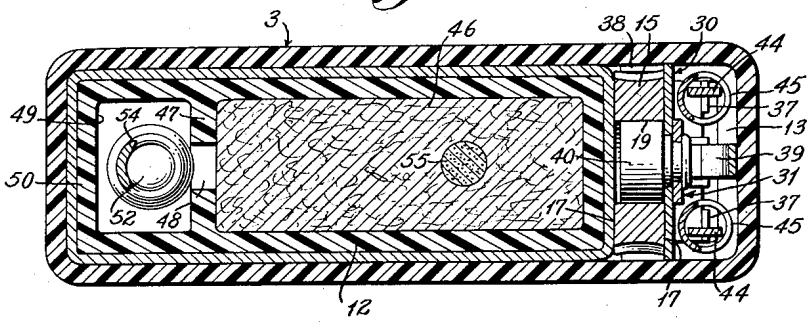
Filed Dec. 2, 1952 3 Sheets-Sheet 3

Fig. 4.



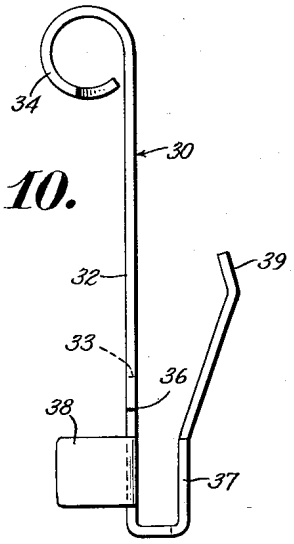


Fig. 10.

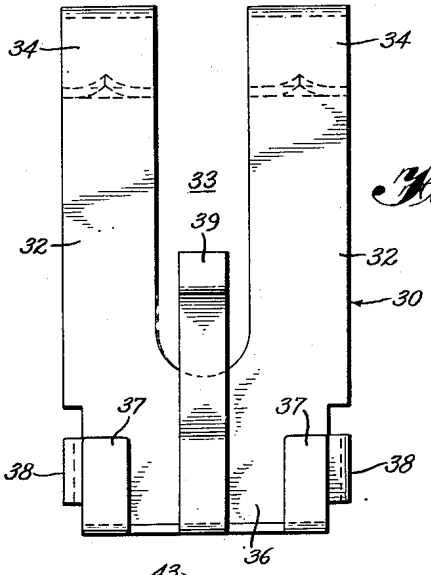


Fig. 9.

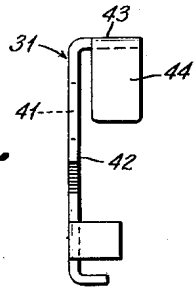


Fig. 12.

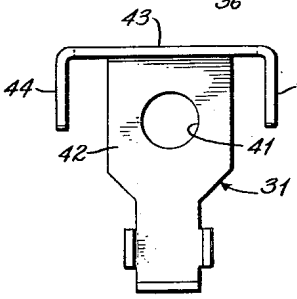


Fig. 11.

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2,779,179

LIGHTER

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Application December 2, 1952, Serial No. 323,541

12 Claims. (Cl. 67—7.1)

This invention relates to a lighter and more particularly to a pyrophoric lighter useful, for example, for lighting cigarettes, cigars and the like.

The present invention is directed broadly to the problem of providing an improved pyrophoric lighter of the type mentioned and more specifically to the problem of providing improved component parts that make up such a lighter. By virtue of having improved component parts, a lighter constructed in accordance with the teaching of the present invention is capable of giving better performance and has a greater useful life than conventional lighters now on the market.

Among the specific problems with which the present invention is concerned is the problem of providing an improved flint for such a lighter. As is well known, the flint of a pyrophoric lighter is worn away in use due to the action of the sparking member scraping across the flint to produce sparks. In time the flint becomes entirely worn away and must be replaced and, of course, the more the lighter is used the more frequent is the necessity for replacement. If a new flint is unavailable the whole lighter is useless. There is thus the problem of providing a flint which does not have to be replaced so often and thus has a longer period of usefulness than conventional flints.

Another specific problem with which the present invention is concerned is the problem of providing an improved sparking member and flint member assembly for such a lighter. This assembly is the spark-providing mechanism, or component, of the lighter and includes parts which are subject to frictional wear during normal use of the lighter. Usually, these parts become worn sooner than other parts of the lighter, such as the casing. The problem here is to provide such an assembly which, despite such frictional wear, is efficient and rugged and has a long period of usefulness. Furthermore, if it is necessary to replace a part of the assembly, such as the flint member, or even the entire assembly, there is the further problem of being able to make such replacement readily without having to replace the entire lighter.

Still another specific problem with which the present invention is concerned is substantially preventing loss of evaporation of lighter fluid from the lighter. Of course, the fluid is consumed as the lighter is used and this is intended. What is not intended is that the fluid simply evaporate from the lighter with the result that the lighter is dry sooner than it should be. By substantially preventing such evaporation of lighter fluid it is not necessary to refill the lighter as often and there is less likelihood that the lighter will be found unexpectedly to lack lighter fluid.

It is apparent from the problems mentioned above that, broadly speaking, an object of the present invention is to provide a new and improved pyrophoric lighter having new and improved component parts whereby the lighter is capable of giving better performance and has a greater useful life than conventional lighters now on the market.

In regard to the new and improved component parts that make up such a lighter, other objects of the present invention are: to provide a new and improved lighter flint; to provide a new and improved sparking member and flint member assembly for such a lighter; to provide a new and improved means whereby the sparking member and flint member assembly may be readily removed as a unit from such a lighter; and to provide a new and improved means for substantially preventing loss of lighter fluid from such a lighter because of evaporation.

In a preferred embodiment of a lighter constructed in accordance with the teaching of the present invention, the object of providing a new and improved lighter flint is achieved by making the flint in the form of a disc-shaped flint wheel. The flint wheel is supported for rotation about its axis and the outer circumference of the wheel is engaged by the sparking member to produce sparks. The manner of engagement is such that when the sparking member, or wheel, scrapes across a portion of the outer circumference of the flint wheel, the sparking wheel not only produces sparks from the flint wheel surface which it engages but also turns the flint wheel about the flint wheel axis to bring a new portion of the flint wheel circumference in position to be scraped the next time that it is desired to produce sparks. The result of the arrangement is that the entire flint wheel circumference can be utilized to produce sparks and it is thus possible to make available within the lighter a greater area of flint material which can be engaged to produce sparks than is the case with the conventional rod-like flints.

The object of providing a new and improved sparking member and flint member assembly is achieved in the aforementioned preferred embodiment of the present invention by making both the sparking member and the flint member in the form of wheels and so constructing and arranging them that the sparking wheel not only produces sparks from the flint wheel but also drives the flint wheel. Both the sparking wheel and the flint wheel are supported by brackets which maintain the respective wheels in proper edgewise relation to each other and, when the sparking wheel is rotated, it provides a worm-gear type of drive for the flint wheel. The brackets are slidably inter-engaged and spring members are located between portions of the brackets to cause the sparking wheel and the flint wheel to be maintained resiliently in engagement with each other.

The object of providing means whereby the sparking member and the flint member assembly may be readily removed as a unit from the body of the lighter is achieved, in the aforementioned preferred embodiment of the present invention, by providing an elongated chamber within the main body of the lighter and into and out of which the sparking member and flint member assembly may be slidably moved. The chamber has an open top which is substantially flush with the upper end of the body of the lighter and the chamber extends downwardly from its open top toward the bottom of the lighter. In cross-section transverse to its length, the chamber is preferably rectangular having two pairs of opposed smooth surface walls. The supporting brackets for the sparking wheel and the flint wheel include resilient arms so positioned that when the sparking wheel and flint wheel assembly is positioned into the chamber through the open top thereof, these arms press against opposed walls of the chamber to frictionally maintain the assembly in position in the body of the lighter. The assembly thus has a push fit and may be readily removed by sliding it out through the open top of the chamber. In this manner it is possible to replace a flint readily or, if necessary, to replace the entire assembly without having to replace the entire lighter.

The object of providing means for substantially preventing loss of lighter fluid because of evaporation is

achieved in the aforementioned preferred embodiment of the present invention by including a valve arrangement located between the reservoir and the wick compartment in order to control the flow of lighter fluid from the reservoir to the wick compartment. The reservoir communicates with the wick compartment through a valve chamber which opens into the wick compartment and which has another opening communicating with the reservoir. The last-mentioned opening is provided with a valve seat. A small metal ball is normally seated on the valve seat to block the flow of lighter fluid from the reservoir to the wick compartment. In order to so maintain the valve member or metal ball seated, a small coil spring engages the ball to keep it normally seated. Thus, unless some action is taken to unseat the ball and cause lighter fluid to flow into the wick compartment, the reservoir is normally closed and there will thus be substantially no evaporation of lighter fluid. The various parts are so designed that the metal ball can be unseated when desired, as by turning the lighter upside-down or by shaking it, in order to admit lighter fluid to the wick compartment.

Other objects and advantages of the present invention will become more apparent from the following detailed description taken in conjunction with the attached drawings, in which:

Fig. 1 is a front elevation view of a preferred embodiment of the present invention showing the lighter cap raised and the sparking wheel and flint wheel assembly moved out from the body of the lighter;

Fig. 2 is a sectional view in elevation of the embodiment shown in Fig. 1, the lighter cap being closed and the flint wheel and sparking wheel assembly being in position in the lighter body;

Fig. 3 is a top plan view of the lighter with the cap removed;

Fig. 4 is a sectional plan view taken on line 4—4 of Fig. 2;

Fig. 5 is a front elevation view of the flint wheel and sparking wheel assembly in accordance with a preferred embodiment of the present invention;

Fig. 6 is an enlarged detailed view showing a portion of the sparking wheel engaging a portion of the flint wheel according to a preferred embodiment of the present invention;

Fig. 7 is a partial view in elevation of the sparking wheel and flint wheel assembly according to another embodiment of the present invention;

Fig. 8 is a plan view showing the positioning of the sparking wheel relative to the flint wheel in the embodiment shown in Fig. 7;

Fig. 9 is a front elevation view of the supporting means for the sparking wheel shown in Fig. 5;

Fig. 10 is an end elevation view of the supporting member shown in Fig. 9;

Fig. 11 is a front elevation view of the supporting means for the flint wheel shown in Fig. 5; and

Fig. 12 is an end elevation view of the supporting member shown in Fig. 11.

In the preferred embodiment of the present invention shown in Figs. 1–4 of the drawings, the lighter is shown as having a shape which adapts it to be carried readily by the user. In other words, it is shown as a so-called pocket lighter. However, as will be evident from the detailed description which follows, inventive features of the present invention may be incorporated in pyrophoric lighters having shapes different from the one shown in the drawings.

Referring to the drawings, and more particularly to Figs. 1 and 2, the lighter shown there comprises a body member indicated generally by reference numeral **1** having a cap **2** attached thereto. The body member **1**, or main body of the lighter as it may be called, comprises a casing **3** having a closed bottom from which the casing side walls extend to the upper end of the casing as shown in Fig. 2. Casing **3** may be made of any suitable material but I prefer to make it of clear plastic material since the lighter fluid contained therein will then be visible through the casing.

A removable screw **4** is provided in the bottom **5** of casing **3** for the purpose of enabling lighter fluid to be put into the casing when such is needed. The upstanding side walls of the casing terminate in a top edge or rim **6** from which an inset upstanding flange **7** extends along three sides of the upper edge **6** as shown in Figs. 1–3. The lower edge **8** of the depending walls **9** of cap **2** seats against the upstanding flange **7** when the cap is closed as shown in Fig. 2.

A transverse wall **10**, which may be called a bridging wall since it extends transversely across and bridges the space within the casing, extends across the interior of casing **3** from side wall to side wall and is located below the upper edge **6** of the casing as shown in Fig. 2. Wall **10** defines together with the bottom and side walls of casing **3**, a reservoir **11** which is capable of receiving and containing lighter fluid. The transverse wall **10** is also preferably made of plastic material, although it may be made of any suitable material, and the plastic material will preferably be colored so that it will contrast with the clear plastic material of the casing **3**. The casing side walls are preferably inset slightly at the upper inner surfaces thereof in order to seat wall **10** within the upper portion of casing **3** in Fig. 2 and wall **10** will preferably be glued in position.

An upright wall **12** extends upwardly from the transverse wall **10** to adjacent the upper edge **6** of casing **3** as shown in Fig. 2. This upstanding wall **12**, which is preferably integral with and of the same material as wall **10**, defines together with wall **10** and side walls of casing **3** an elongated chamber **13** which is open at its upper end and extends downwardly from the upper edge of casing **3** to wall **10**.

A sparking wheel and flint wheel assembly indicated generally by the reference numeral **14** in Fig. 1 is positioned in elongated chamber **13** as shown in Fig. 2 with the flint wheel **15** projecting slightly from the chamber and the sparking wheel **16** being located above the chamber. Flint wheel **15**, which is preferably made of ferrocerium although it may be made of any suitable material capable of sustained use to produce enough sparks, is an important feature of the present invention. By making the flint in the form of a disc or wheel, it is possible to utilize the continuous outer periphery or circumference of the wheel as a spark-producing medium. This provides a continuous area which can be engaged again and again by the sparking wheel to produce sparks and by virtue of the driving relation, described later, between the sparking wheel and the flint wheel, the latter is not worn as rapidly as are conventional flints. This combination of features, namely, the continuous circumference and the manner in which the circumference is engaged by the sparking wheel results in a flint life many times that of convention flints.

In its preferred form, the flint wheel **15** is annular in shape having parallel radial sides **17**, a generally cylindrical outer periphery or circumference **18**, and a generally cylindrical inner periphery or circumference **19** which defines an opening extending centrally axially through the flint wheel.

Sparks are produced from the flint wheel **15** by means of sparking member of wheel **16** which engages and moves across the outer circumference **18** of the flint wheel as described hereinafter. Sparking wheel **16**, which may be called a scraper or abrading wheel, is preferably made of hardened tungsten steel as is generally customary for wheels of this type. As can be observed readily from viewing the drawings, sparking wheel **16** is positioned in substantially perpendicular edgewise relation to flint wheel **15** with a portion of the circumference **20** of the sparking wheel engaging a portion of the circumference

18 of the flint wheel. It is thus obvious that a plane through either wheel perpendicular to its central axis will be substantially perpendicular to, and thus be at a right angle to, a plane through the other wheel perpendicular to its central axis.

In order to successively use the entire outer periphery or circumference 18 of flint wheel 15 for spark-producing purposs, the flint wheel is caused to turn about its central axis when sparking wheel 16 is rotated about its axis. Furthermore, the actual turning movement or rotation of flint wheel 15 is caused by means on flint member or wheel 16. As can be seen from Figs. 3 and 5, a plurality of spaced-apart parallel ridges 21 are located on and extend about the outer circumference 20 of the sparking wheel. These ridges, or teeth, are parallel spiral ridges which extend about the sparking wheel in the nature of worm-gear teeth. When the sparking wheel is rotated, as can be accomplished by turning it with the thumb, the sharp edges of ridges 21 cut into the outer circumference 18 of flint wheel 15 causing grooves 22 to form therein as is shown occurring in Fig. 6.

Since the sparking wheel is perpendicular to the flint wheel and the spiral path of ridges 21 is inclined with respect to the axis of the flint wheel, the ridges engage a portion of the circumference of the flint wheel in worm gear relation and thus turn the flint wheel about its axis when the sparking wheel is rotated. In this manner, means on the sparking wheel cause the circumference of the flint wheel to move past the sparking wheel and thus successive portions of the flint wheel circumference are brought into contact with the circumference of the sparking wheel.

When the flint wheel 15 is first put into the lighter its outer circumference 18 is smooth. However, as mentioned above, when the sparking wheel 16 is drawn across the circumference of flint wheel 15, the hardened tungsten steel ridges or teeth 21 cut into the circumference 18 of the flint wheel and thus form the grooves 22 shown in Fig. 6. As the flint wheel is continued to be used to produce sparks, the grooves 22 become deeper and deeper until they conform to the spiral ridges 21. It is thus apparent that the spiral ridges 21, so to speak, cut teeth in the circumference 18 of flint wheel 15 until said circumference is provided with a plurality of spaced apart grooves or teeth adapted to mesh fully with the spiral ridges 21. The grooves or teeth so formed in the circumference 18 of flint wheel 15 are indicated at 23 in Fig. 5. By driving the flint wheel in the manner described above, the flint wheel circumference wears gradually and evenly, thus resulting in greatly increased flint life as compared to conventional flint arrangements.

In order to facilitate spark production, the outer circumference 20 of sparking wheel 16 preferably includes a plurality of spaced apart cross grooves 24 which are substantially parallel to the central axis of the sparking wheel and extend transversely across the spiral ridges or teeth 21, thus producing a knurled abrasive surface on the outer circumference of the sparking wheel. While any suitable number of such cross grooves may be employed, I prefer to have the cross grooves at 9° intervals about the circumference 20, and I furthermore prefer to have the cross grooves in the form of 60° notches. With regard to the pitch of spiral ridges or teeth 21, and by way of further illustration, I prefer to provide the ridges at the ratio of 40 to an inch since I find that this pitch provides effective driving or turning of flint wheel 15. Referring to Fig. 5, the sides of individual ridges 21 are illustrated as being sloped at approximately 45° to the horizontal, thus resulting in a 90° edge for each complete ridge.

While I find that it is definitely preferable to provide the spiral ridges 21 on sparking wheel 16 in order to drive flint wheel 15, it is possible to arrange the sparking wheel with relation to the flint wheel so that the sparking wheel drives the flint wheel even though the circumference of the sparking wheel does not contain spiral ridges 21. This alternative arrangement is illustrated in Figs. 7 and 8 where the sparking wheel 25 is shown as being positioned in substantially perpendicular, edgewise, or substantially tangential relation to flint wheel 26. The latter wheel is supported for rotation about a shaft 27 carried by a standard 28.

While sparking wheel 25 does not have spiral ridges or teeth on its outer circumference corresponding to the ridges 21, the outer circumference is roughened by cross grooves 29 as shown in Fig. 7. Referring to Fig. 8, it is seen that sparking wheel 25 is positioned with relation to flint wheel 26 so that a plane A through the sparking wheel perpendicular to its central axis is located at an inclined angle to a plane B through the flint wheel perpendicular to its central axis. As a result of this arrangement, when sparking wheel 25 is turned on its axis, in the direction indicated by the arrow shown alongside the sparking wheel, there is a force component acting upon the circumference of flint wheel 26 which causes the flint wheel to rotate or turn about its central axis in the direction shown by the arrow alongside the flint wheel. It is thus possible to cause the flint wheel to turn even though the sparking wheel does not contain spiral ridges or teeth on its circumference corresponding to ridges 21 but the latter are much to be preferred since they form a positive driving connection between the sparking wheel and the flint wheel.

The sparking wheel and the flint wheel are supported by individual supporting members or brackets which maintain the wheels in proper engagement with each other and make up, together with the wheels, the sparking wheel and flint wheel assembly which is another important feature of the present invention. It is this assembly which enables ready replacement of the flint and, if necessary, the whole assembly can be readily replaced as a unit. The assembly is shown at 14 in Fig. 1 in detached position from the body of the lighter and is shown in enlarged elevation in Fig. 5.

Referring to Fig. 5, and to Figs. 9–12, for a detailed showing of the supporting members shown in Fig. 5, it is seen that the sparking wheel and the flint wheel are supported respectively by supporting members or brackets indicated generally by the reference numerals 30 and 31. The sparking wheel supporting member or bracket 30 includes a pair of upstanding spaced apart parallel arms 32 which have a space or slideway 33 located between them. The upper ends of the arms 32 are turned about at 34 to provide journals adapted to receive a shaft 35 which carries the sparking wheel 16. The sparking wheel is thus supported for rotation about its central axis.

The body portion 36 of bracket or support member 30 has two upstanding spaced apart arms 37 extending upwardly from its lower edge as shown in Fig. 9. Furthermore, this body portion 36 has another pair of arms or tang members 38 extending rearwardly from its side edges and also has an arm or tongue 39 extending upwardly and outwardly from its bottom edge as shown in Figs. 9 and 10. The purpose of the arms or tangs 38 and tongue 39 is described later.

Flint wheel 15 is supported for rotation on a stud 40, see Fig. 2, and this stud is mounted in opening 41 of the flint wheel supporting member or bracket 31 shown in Figs. 11 and 12. The stud is headed over as shown in Fig. 2 so that it is securely retained in opening 41. When the flint wheel support member 31 and the sparking wheel support member 30 are assembled together, the stud 40 extends through the space 33 between the upstanding arms 32 of the sparking wheel bracket 30. This can be observed in Figs. 2 and 5. When the stud 40 is thus positioned, the main body of the stud is located on one side of the arms 32 while the head of the stud plus the flint wheel supporting member or bracket 31 are located on the other side of arms 32 as shown in Fig. 2. It is thus possible for

the flint wheel supporting stud to move slidably up and down along the space 33 between arms 32. Therefore, the sparking wheel supporting member or bracket 30 and the flint wheel supporting member or bracket 31 are slidably engaged.

The body 42 of flint wheel supporting member or bracket 31 has a horizontally extending top portion 43 from which depend a pair of arms 44 as shown in Figs. 11 and 12. When the parts are assembled together as shown in Fig. 5, the arms 44 are located in spaced apart opposed relation to the upstanding arms 37 on the sparking wheel bracket 30. Coil springs 45 extend between and surround the respective opposed pairs of arms 37 and 44 and engage and urge the flint wheel supporting member or bracket 31 upwardly with respect to sparking wheel supporting member or bracket 30. The result is that the flint wheel 15 is resiliently maintained in engagement with the sparking wheel 16 and thus successively presents its circumferential surface to the sparking wheel as the latter is rotated to cause the flint wheel to rotate.

With regard to the feature of having the sparking wheel and flint wheel assembly 14 movable as a unit into and out of the body of the lighter, it can be observed from Figs. 2 and 4 that the arms or tangs 38 and the tongue 39 engage inner surfaces of the walls which define the elongated chamber 13 and thus maintain the assembly in position in the chamber. The dimensions of the arms or tangs 38 and tongue 39 are such that they press against these wheels and thus frictionally maintain the assembly in position in the chamber. Since the brackets 30 and 31 are preferably made of spring steel, the members 38 and 39 have a certain amount of resiliency and this provides the push fit which maintains the assembly in position. In other words, the assembly may be pushed into chamber 13 and pulled out of chamber 13 which is the position in which it is shown in Fig. 1.

Another important feature of the present invention is the means for substantially preventing unintended loss of lighter fluid because of evaporation. Referring to Figs. 2 and 4, it will be observed that the transverse bridging wall 10, which is one of the reservoir defining walls, is also one wall of a wick compartment 46. Compartment 46 is defined by walls 10, 12 and another upstanding wall 47 which has an elongated opening 48 extending therethrough. Opening 48 connects compartment 46 with a valve compartment 49 defined by wall 47 and another upstanding wall 50 which extends upwardly from transverse wall 10. The valve compartment 49, which may be called a chamber, has an opening 51 at the bottom thereof which extends through transverse wall 10 and provides communication between the reservoir 11 and the valve chamber 49. The latter, in turn, communicates through opening 48 with wick compartment 46. In other words, wick compartment 46 is in communication with reservoir 11 by virtue of opening 51 when the latter is in fact opened.

Normally, opening 51 is blocked shut by a spherical valve member 52 which is preferably a steel ball. Valve member 52 seats on a valve seat 53 provided at the inner side of opening 51, as shown in Fig. 2, and the valve seat is of course properly shaped to fit the spherical contour of the valve member. A coil spring 54 normally maintains valve member 52 seated on valve seat 53 to block the passage of lighter fluid through opening 51.

When it is desired to admit lighter fluid from the reservoir 11 to the wick compartment 46, the valve member 52 can be unseated by turning the lighter upside-down and shaking it if necessary to cause lighter fluid to pass into the wick compartment 46 and saturate the waste therein. The weight of ball 52 and the strength of spring 54 are so proportioned as to allow this to occur and they, in effect, meter the flow of lighter fluid from the reservoid to the wick compartment. The result is that the wick compartment can be supplied with lighter fluid but the fluid is not allowed to evaporate directly from the reservoir. Of course, a wick 55 is located in and extends from wick compartment 46 through a grommet 56 as shown in Fig. 2 and is thus in position to receive sparks from sparking wheel 16. A windshield 68, in conventional form, is positioned about the exposed end of the wick as shown in Figs. 2 and 3.

The grommet 56 extends through a metal wall 57 which is located at the upper end of the lighter body 1 substantially flush with rim 6 as shown in Fig. 2. In fact, wall 57 extends across and forms the upper wall of the wick compartment 46 and the valve chamber 49. Grommet 56 also secures a spring metal plate 58 which is located on top of wall 57. A pair of substantially identically formed spring arms 59 extend from plate 58 and each of the arms 59 has at its free end an upturned portion 60 which terminates in a downturned end portion 61. The free end of each arm 59 thus has an inverted V shape as can be seen from Fig. 2.

Lighter cap 2 has an inclined top wall portion 62 from which there extends downwardly a relatively short side wall 63. The lower edge of wall 63 is turned under and inwardly to define a heel portion 64 for the lighter cap. From this inturned edge or heel portion there extends a flange which includes a spring arm or tongue 65, and from each side of the tongue, adjacent the base of the tongue, there extend shoulder edges 66 on which the downturned end portions 60, 61 of spring arms 59 bear.

The assembly which is described maintains the lighter cap 2 attached to the lighter body 1. Furthermore, the attachment is a hinge atachment since the cap can be raised to the position shown in Fig. 1 without becoming detached from the lighter body. When the cap is raised, the heel portion 64 slides onto the surface of upper wall 57 until the short end wall 63 becomes substantially parallel to wall 57 as shown in Fig. 1. During the course of the movement described, the heel portion 64 goes under the bottom shoulders 66 and the free ends of arms 59 or, in other words, goes past dead center with the result that the cap is maintained in its open position by the spring arms 59. To close the cap, it is merely necessary to press its forward end down until the edges 8 seat against the flange portion 7 as shown in Fig. 2.

The spring arm or tongue 65 extends to adjacent the underside of inclined top wall 62 of the lighter cap. So positioned, arm 65 holds a spare flint 67 against the underside of top wall 62 as is shown in Fig. 2. There is thus available a replacement flint.

It will thus be seen that I have provided an improved pyrophoric lighter in which the improvement in the overall lighter results from a number of improved component parts which make up the lighter. By providing the flint member in the form of a flint wheel and further providing, in effect, a worm gear drive between the sparking wheel and the flint wheel, I achieve an improved flint having a much greater life than conventional flints used in lighters of this general type. By providing an improved sparking wheel and flint wheel assembly, I not only achieve the above-mentioned driving relation between the sparking wheel and the flint wheel, but also make it possible to readily replace the flint wheel or even the entire assembly should this become necessary. The provision of a valve arrangement between the reservoir and the wick compartment substantially prevents waste or loss or lighter fluid by evaporation. Finally, I provide an effective hinge connection between the lighter cap and the lighter body which includes as a feature a means to retain a spare flint in an out of the way position under the lighter cap.

As previously stated, the flint wheel 15 is preferably made of ferrocerium material since this material readily emits sparks when scraped by the sparking wheel. However, the flint wheel may be made of any suitable material capable of sustained use to emit sparks and I use

the term "flint" in the phrases "flint surface," "flint member," or "flint wheel," to define such a material.

While I have described and illustrated embodiments of my invention, I wish it to be understood that I do not intend to be restricted solely thereto but that I do intend to cover all modifications thereof which would be apparent to one skilled in the art and which come within the spirit and scope of my invention.

What I claim as my invention is:

1. A lighter comprising a spark producing wheel having a central axis, means supporting said wheel for rotation about said axis, a scraper member, and means on said scraper member movable across the circumferential periphery of said wheel at an angle to a plane perpendicular to the wheel axis, said last-named means being engageable with the circumferential periphery of said wheel to produce sparks from said wheel and simultaneously turn said wheel on its axis.

2. A lighter comprising a spark producing wheel having a central axis, means supporting said spark producing wheel for rotation about its central axis, a scraper wheel having a central axis, and means supporting said scraper wheel for rotation about its central axis, a portion of the circumferential surface of said scraper wheel engaging a portion of the circumferential surface of said spark producing wheel in substantially tangential relation, said scraper wheel portion being movable across said spark producing wheel portion along a path of movement at an angle to the path of movement of said spark producing wheel portion whereby rotation of said scraper wheel causes sparks to be produced from said spark producing wheel and simultaneously causes rotation of said spark producing wheel.

3. A lighter comprising a disc shaped spark producing wheel having a central axis, means supporting said spark producing wheel for rotation about its central axis, a scraper wheel having a central axis, and means supporting said scraper wheel for rotation about its central axis, said scraper wheel having a plurality of parallel spiral ridges extending about its circumference, a portion of said spiral ridges engaging a portion of the circumferential surface of the spark producing wheel, said ridges extending across the spark producing wheel circumference at an angle thereto such that rotation of said scraper wheel engages said ridges with the circumference of said spark producing wheel to turn said spark producing wheel about its axis.

4. A lighter comprising a spark producing wheel having a central axis, means supporting said spark producing wheel for rotation about its central axis, a scraper wheel having a central axis, means supporting said scraper wheel for rotation about its central axis, the circumferential surface of said scraper wheel having thereon a plurality of spiral ridges extending about the circumference of the scraper wheel, said wheels being positioned in edgewise relation with a portion of said ridges engaging a portion of the circumferential surface of the spark producing wheel at an angle such that upon rotation of said scraper wheel said spark producing wheel is turned about its axis, the circumferential surface of said scraper wheel also having a plurality of spaced apart cross grooves extending transversely across said spiral ridges to produce a knurled surface and thus facilitate producing sparks from said spark producing wheel when said scraper wheel is turned.

5. A lighter comprising a spark producing wheel having a central axis, means supporting said spark producing wheel for rotation about its central axis, a scraper wheel having a central axis, means supporting said scraper wheel for rotation about its central axis, said wheels being positioned in substantially perpendicular edgewise relation to each other with a portion of the circumferential surface of said scraper wheel engaging a portion of the circumferential surface of said spark producing wheel, said scraper wheel having a plurality of spiral ridges extending about its circumference, and means maintaining said spark producing wheel in engagement with said scraper wheel when the latter is turned on its axis whereby, when said scraper wheel is turned, said spiral ridges engage the circumferential surface of said spark producing wheel to turn the spark producing wheel about its axis.

6. A lighter comprising a driving scraper wheel having a central axis, means supporting said scraper wheel for rotation about its central axis, a driven spark producing wheel having a central axis, and means supporting said wheel for rotation about its central axis, said wheels both having spaced-apart parallel ridges, in the nature of gear teeth, located about their circumferences, said wheels also being positioned in perpendicular edgewise worm gear relation to each other with ridges on said scraper wheel being in mesh with ridges on said spark producing wheel whereby rotation of said scraper wheel provides a worm gear drive for said spark producing wheels.

7. A lighter comprising a casing having an upper rim, opposed smooth surface walls defining a chamber located within said casing, said chamber having an open end located substantially flush with the upper rim of the casing, a spark producing member projecting from within said chamber and above the open end thereof, a scraper wheel located above said chamber and engaging said spark producing member, a bracket located in said chamber and supporting said spark producing member, and a bracket projecting from within said chamber and supporting said scraper wheel, said brackets having arms thereon pressing against the smooth walls of said chamber to maintain the brackets in position.

8. A spark producing assembly for a lighter, said assembly comprising a spark producing member, a scraper member engaging said spark producing member, a supporting member supporting said spark producing member, another supporting member supporting said scraper member, means slidably connecting said spark producing supporting member to said scraper member supporting member, and means engaging said respective supporting members to maintain said scraper member in engagement with said spark producing member.

9. A scraping member and spark producing member assembly for a lighter, said assembly comprising a spark producing member, a scraping member engaging said spark producing member, a bracket supporting said spark producing member, another bracket supporting said scraping member, and resilient means engaging said brackets to maintain said scraping member in engagement with said spark producing member.

10. A scraper member and spark producing member assembly for a lighter, said assembly comprising a spark producing member, a scraper member engaging said spark producing member, a first bracket supporting said spark producing member, said bracket having a pair of spaced-apart arms extending therefrom, a second bracket supporting said scraper member, said second bracket also having a pair of arms extending therefrom and said latter arms being located in spaced-apart opposed relation to said first bracket arms, a spring member extending between and engaging each pair of opposed bracket arms to maintain said scraper member in engagement with said spark producing member, and means slidably connecting said bracket members together.

11. A scraper wheel and spark producing wheel assembly for a lighter, said assembly comprising a spark producing wheel, a scraper wheel engaging said spark producing wheel, a first bracket supporting said spark producing wheel, said spark producing wheel being mounted for rotation on a stud extending from said first bracket, a second bracket supporting said scraper wheel, said second bracket including a pair of parallel spaced-apart arms having means at the ends thereof supporting said scraper wheel for rotation, said stud extending between and slidably engaging said arms for movement along the

space between said arms, and resilient means engaging said respective brackets to resiliently maintain said scraper wheel in engagement with said spark producing wheel.

12. A hood-type cap for a lighter comprising a top wall having an inclined portion, side walls depending from said top wall and defining a hollow space within said cap, and a spring arm extending from one of said depending side walls toward the underside of said top wall, said arm having a free end located adjacent the underside of the inclined portion of said top wall whereby a spare spark producing member may be maintained by said arm against the underside of said inclined portion of the top wall.

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