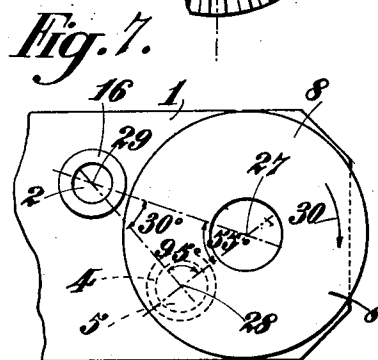
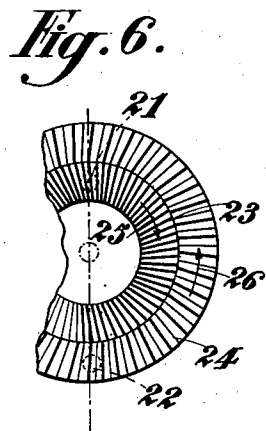
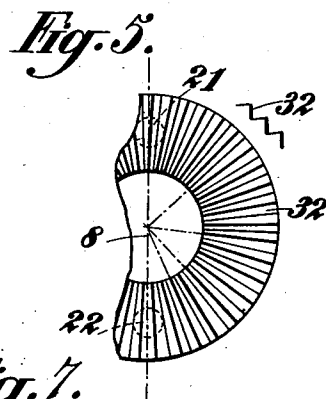
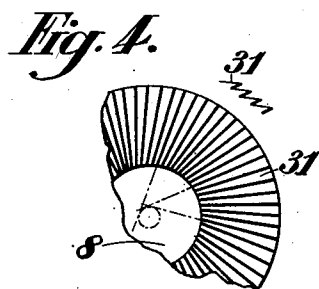
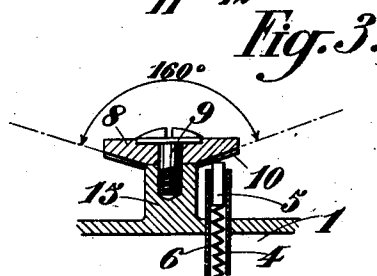
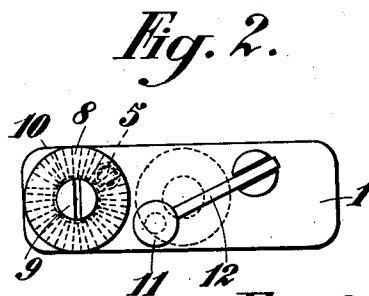
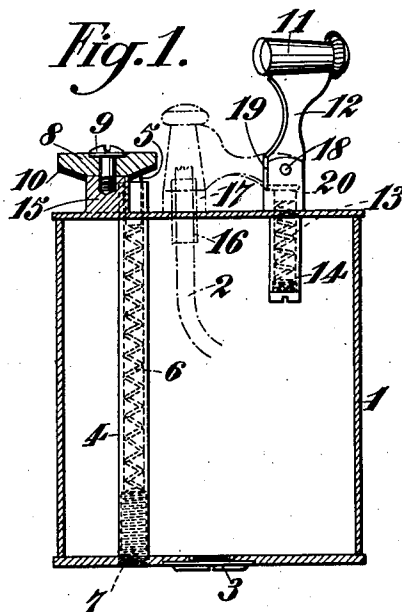


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FERROCERIUM LIGHTER
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FERROCERIUM LIGHTER.

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The present invention relates to ferro-cerium lighters and is more especially concerned with certain improvements, the aim of which is to improve their operation and to render them more easily handled.

Lighters using ferro-cerium, whether in combination with petrol or a wick of amadou or tinder, comprise a tube containing the ferro-cerium and a disc or wheel against which the ferro-cerium is forced by a spring. Usually the wheel acts by friction upon the ferro-cerium by means of its periphery which, with this end in view, is provided with teeth or grooves, the wheel being actuated by pressure of the finger upon this edge, but the contact of the finger with the toothed portion of the wheel renders this latter greasy or damp, which prevents the proper formation of the spark. Furthermore, owing to its friction against the ferro-cerium, the wheel becomes clogged and blackened so that the finger is soiled on contact therewith. In order to obviate this drawback it has been proposed to cause the wheel to act upon the ferro-cerium, not by its peripheral edge but by means of one of its faces, the peripheral edge however being provided with a fluted or milled portion which offers a larger engaging surface for the finger when it is desired to rotate the wheel. But this device is subject to the drawback that it is difficult for the sparks produced to move sufficiently away from the wheel in order to reach the wick to be ignited, the result of which is frequent misfires. These misfires are also due to the fact that in the case of the lighters in which the wheel acts by one of its faces, the wick to be ignited has always been placed outside of the range of action of the sparks. The direction followed by these latter coincides substantially with a tangent passing through the point of application of the ferro-cerium upon the circle of friction of this latter on the face of the wheel, and up to the present the axis of the wick to be lighted has always been arranged in the same plane as the axes of the wheel and of the ferro-cerium, so that, only the sparks which form the boundaries of the stream are capable of reaching the wick, which reduces to a considerable extent the likelihood of ignition.

The improvements forming the subject of the present invention remedy these various drawbacks and they are furthermore intended to facilitate the assembling and the manipulation of this kind of lighters.

The invention consists in giving the working face of the wheel a convex conical form so as to separate its edge from the surface of ferro-cerium upon which it acts and thus to enable the sparks to pass.

The invention furthermore consists in arranging the wheel, the ferro-cerium tube and the tube containing the wick upon the upper face of the lighter, the relative positions of these parts being such that their respective axes are parallel and constitute the apexes of a triangular prism.

The invention finally consists in the arrangement of a spring plunger acting upon the pivot of the lever carrying the hood for the wick so as to immobilize it in its extreme opening and closing positions.

Various forms of execution of the invention are shown, but merely by way of example, in the accompanying drawing.

In this drawing, Fig. 1 shows a vertical section of a lighter constructed according to the present invention.

Fig. 2 is a corresponding plan view.

Fig. 3 shows a section to a larger scale of the wheel and the tube containing the ferro-cerium.

Fig. 4 is a partial view to a still larger scale of the lower working face of the wheel.

Fig. 5 shows a modification of the toothed portion of the wheel.

Fig. 6 shows a further modification.

Fig. 7 is a plan view of a portion of the lighter showing the relative positions of the wheel, the tube containing the ferro-cerium and the tube containing the wick.

The lighter according to the present invention comprises, in the usual way, a reservoir 1 which carries at its upper end a wheel 8, a tube 4 containing the ferro-cerium and a tube 16 containing the wick 2, which latter may be of cotton if the lighter is intended to use petrol, otherwise the wick should be made of amadou or of tinder. The tube 4 containing the ferro-cerium passes through the entire height of the reservoir 1 and at its lower portion is closed by a screw 7, its

upper portion projecting sufficiently from the lighter to enable the piece of ferro-cerium 5 to be held constantly in contact with the wheel 8 by means of the spring 6. The wheel 8 is mounted upon a boss 15 of the lighter by means of a screw 9 which allows it to turn freely under the action of the finger. The tube 16 containing the wick 2 projects from a boss 17 on the lighter, this boss serving as a support for a hood 11 which is designed so as to cover up the free end of the wick 2 in order to protect it. The hood 11 is carried by an arm 12 pivoted at 18 and having at it pivot, two flats 19 and 20 upon which a spring plunger 13, mounted in a tube 14 can act, according as the arm 12 is in the inoperative position (raised) as shown in full lines in Fig. 1, or in its working position (swung down) shown in dotted lines in the same figure.

A screwed plug 3 is provided for the purpose of refilling the reservoir 1.

In order to obtain the maximum number of utilizable sparks with a ferro-cerium lighter of the class just described, it is necessary to arrange the various parts of the lighter (wheel, ferro-cerium, wick) in such a manner that each of them gives the maximum efficiency. For example, it is indispensable that the working face of the wheel shall be formed, as has already been stated, so as to allow the sparks to issue freely, and that the wick shall be located, relative to the point of the wheel where the spark is produced, substantially in the direction followed by the axis of the stream of sparks.

Arrangements which render it possible to obtain these results have been provided in the lighter which has just been described and these arrangements form a portion of the present invention.

Since the stream of sparks produced by the friction of the wheel upon the ferro-cerium stone develops both as regards height and as regards width, the forms of wheels used up to the present only enable the lower sparks of the stream to move away, the upper sparks being arrested by the face of the wheel itself. In the case of wheels acting by one of their faces and not by their peripheries, the working face is plane so that, starting from the point where it is produced, the stream of sparks can only expand laterally and downwardly but not upwardly. According to the invention on the other hand, the wheel is shaped in such a manner as to enable the stream of sparks to flow in all directions so that all the sparks produced can thus have a useful effect. With this end in view, the working face of the wheel is given a slightly convex conical form, the result of which is to enable the upper sparks of the stream produced to issue freely. It has been found in practice that the angle at the top of the cone formed

by the working face of the wheel should be about 160° in order to enable the entire stream of sparks to be released. An arrangement of this kind is shown in Fig. 3 which shows the inclination given to the toothed portion 10 of the wheel 8.

Furthermore, in order to be able to obtain the highest possible efficiency of the action of the teeth of the wheel upon the ferro-cerium, the teeth should only act obliquely upon this latter during the rotation of the wheel and in these circumstances it appears advantageous to cut these teeth not radially to the axis of the wheel but eccentrically as can be seen at 31, Fig. 4. This eccentricity may furthermore be relatively slight and it will be sufficient in the majority of cases for the edge of the teeth to form a tangent to a circle whose radius is about one-tenth of that of the wheel.

It is known that the direction of rotation of the wheel is not without effect upon the production of sparks. It is evident that in order to bite the ferro-cerium, the teeth must act in the direction of their cutting edge. In order to avoid any hesitation in the manipulation of the lighter, it will therefore be preferable to be able to turn the wheel in one direction or the other without fear of misfires. According to the invention this aim is attained by the arrangement, in the lighter, of two ferro-cerium tubes placed parallel to each other on each side of the plane passing through the axes of the wheel and of the wick. Each of the ferro-cerium stones of these two tubes 21 and 22 (see Fig. 5) is arranged so as to only cause formation of a stream of sparks for one direction of rotation of the wheel. In order to ensure that the wheel bites upon one and the other of the ferro-cerium stones whatever may be its direction of rotation, this wheel could be constituted by an emery wheel or a steel plate having asperities, or again the toothed portion could be given a special form such as shown in Fig. 5. In this example the two faces of the tooth are symmetrical and of the same inclination and the teeth are cut radially relative to the axis of the wheel as shown at 32.

It would also be possible, as shown in Fig. 6, with the same end in view, to form two toothed portions 23 and 24 upon the working face of the wheel, these toothed portions being arranged concentrically and their teeth being made inversely eccentric relative to the axis of the wheel and directed respectively in opposite directions. By means of this double toothed portion, when the wheel is caused to turn in the direction of the arrow 25, only the toothed portion 23 will act upon the ferro-cerium 21, the other ferro-cerium 22 not producing any sparks, while the reverse is the case when

the wheel is turned in the direction of the arrow 26.

It has also been found out by experience that the relative position of the axis of rotation of the wheel and the axes of the tubes containing the ferro-cerium and the wick, are not without effect upon the obtention of a maximum of sparks in a lighter of this kind. Up to the present, these three axes have been arranged parallel to each other, and in the same plane, this being done simply for the sake of convenience. As the spark has a tendency to be formed with a slight retardation, and furthermore tends to move in the direction of rotation of the wheel along a tangent to the circle passing through the point of application of the ferro-cerium upon this wheel, the stream of sparks produced at this point can only attain the wick by accident if it is placed perpendicularly to this tangent. In order to obviate this drawback and to obtain the maximum useful effect of the stream of sparks, the wheel, the wick, and the ferro-cerium are arranged upon the lighter, according to this invention, in such a manner that their axes are parallel as before, but constitute the edges of a triangular prism as can be seen in Fig. 7. In this figure the axis of the wheel 8 is located at 27 while the axes of the ferro-cerium stone 5 and the wick 2 are respectively at 28 and 29.

It will be understood that if the wheel 8 rotates in the direction of the arrow 30, the stream of sparks produced at 28 will tend to move away along a tangent to the circle passing through this point and having its center at 27, that is to say, substantially along the straight line 28—29. Experience has shown that the best results are obtained when, on the one hand, the distance from the axis 28 of the ferro-cerium to the axis 27 of the wheel is half that which separates this axis 27 from the axis 29 of the wick, and when on the other hand, the angles formed by the straight lines cutting these axes are respectively 55° at 27, 95° at 28 and 30° at 29.

Various modifications in detail could be made in the arrangements which have just been described, for example the peripheral edge of the wheel could be made to extend slightly beyond the body of the lighter so as to enable this latter to be rotated by friction against any hard body such as the

sole of a boot, a wooden panel, and the like (see Fig. 7).

We claim:

1. A lighter comprising a reservoir, a tube containing ferro-cerium, a wick-holder, a convex conical wheel having a toothed portion on its convex conical face and rotatable by hand and a spring forcing the ferro-cerium against said toothed portion.

2. A lighter comprising a reservoir, a tube containing ferro-cerium, a wick-holder, a convex conical wheel having a toothed portion and rotatable by hand, the internal angle of the apex of the cone being approximately 160° , and a spring forcing the ferro-cerium against said toothed portion.

3. A lighter comprising a reservoir, a tube containing ferro-cerium, a spring in said tube, a convex conical wheel having a toothed portion and rotatable by hand, a wick holder, said tube, wheel, and wick-holder being mounted upon the reservoir, their axes constituting the edges of a triangular prism.

4. A lighter comprising a reservoir, a tube containing ferro-cerium, a wick-holder, a convex conical wheel rotatable by hand, a spring forcing the ferro-cerium against said wheel, a lever pivoted upon said reservoir, a hood on said lever adapted to conceal or expose said wick and a spring pressed plunger adapted to hold said hood in its two extreme positions.

5. A lighter comprising a reservoir, a tube containing ferro-cerium, a convex conical wheel having a toothed portion and rotatable by hand, a wick-holder, the axis of the wheel being located at a distance from the axis of the ferro-cerium substantially half the distance separating the wheel-axis from the axis of the wick-holder, and a spring pressing said ferro-cerium against said wheel.

6. A lighter comprising a reservoir, a tube containing ferro-cerium, a convex conical wheel having a toothed portion and rotatable by hand, a wick-holder, a spring pressing said ferro-cerium against said wheel, the axes of tubes, wheel, and wick-holder being arranged so that the planes passing through these axes form angles respectively of 95° at the ferro-cerium and 30° at the wick.

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