

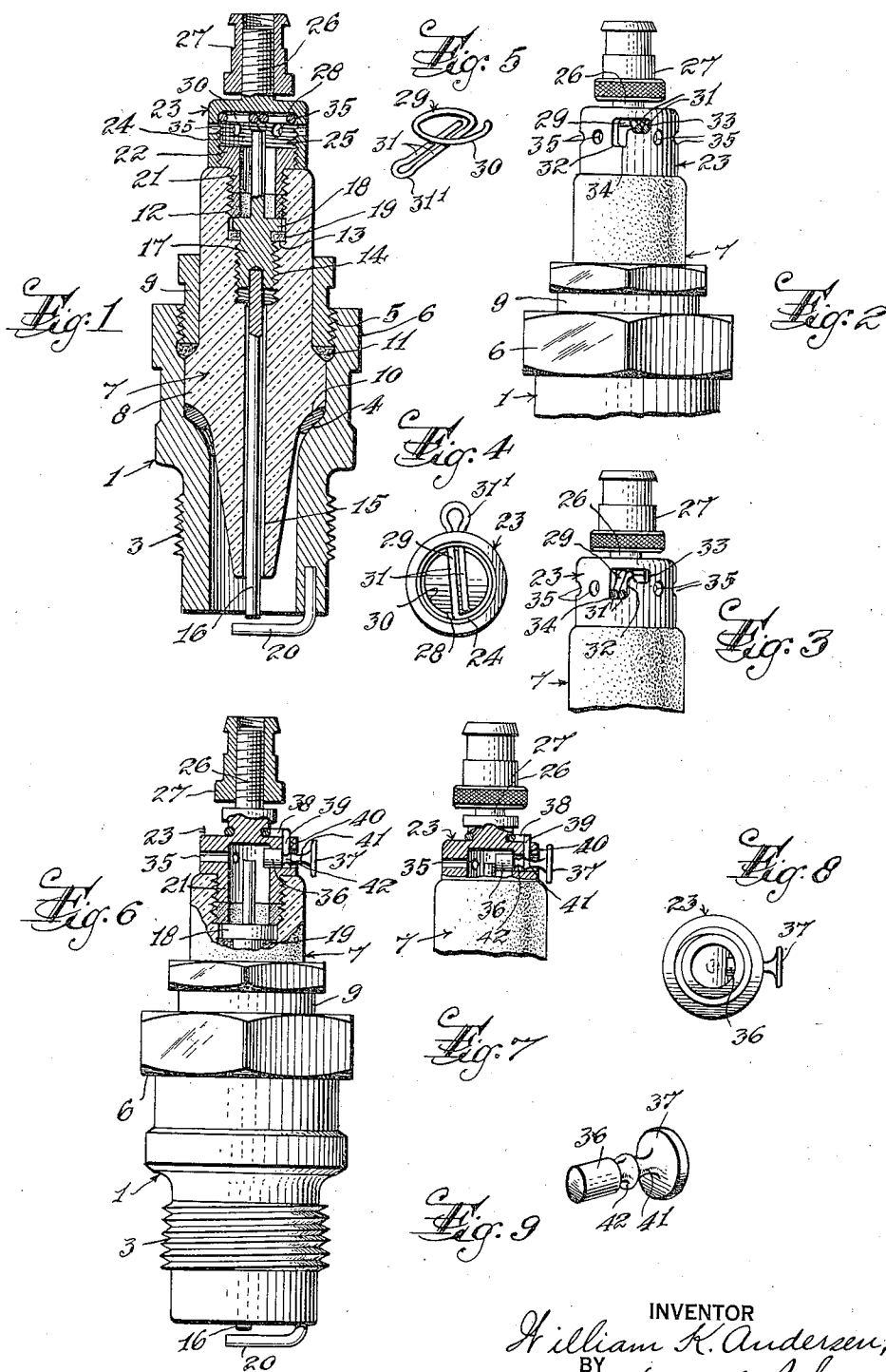
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SPARK PLUG

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SPARK PLUG

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My invention relates to spark plugs, and more particularly to improvements in spark plugs of the type including a main spark gap and an auxiliary spark intensifying gap.

5 Broadly stated the primary object of my invention is to provide a spark plug with improved means for forming or closing at will an auxiliary intensifying spark gap, the operation and condition of which may be readily observed at all times and which can be operated selectively only to
10 fully open or fully close the gap, so that when opened the gap shall be invariable from a predetermined proper length to prevent alteration in such a manner as to interfere with efficient
15 operation of the plug, said means being capable of quick and easy manipulation without the use of tools to close or open the auxiliary gap.

More specifically the principal object of my invention is to provide a spark plug equipped with
20 a novel form of auxiliary electrode and mounting therefor, said electrode being movable relative to a main electrode into gap forming and gap closing position, and tensioned for movement to the latter position so that it is incapable of permanently assuming an intermediate position, said
25 auxiliary electrode having a part projecting laterally from said plug for manual manipulation of the electrode to a gap forming position and said mounting and electrode being provided with
30 cooperating interengaging parts for holding the auxiliary electrode in gap opening position.

Other and subordinate objects, such as durability, low cost of manufacture, and simplicity of construction, will presently appear and the nature
35 of my improvements will be clearly understood when the following description and claims are read in conjunction with the drawing accompanying and forming a part of this specification.

Referring to the accompanying drawing in which corresponding and like parts are designated
40 throughout the several views by the same reference characters,

Figure 1 is a view in vertical section of a spark plug equipped according to my invention,

45 Figure 2 is a fragmentary side elevation illustrating an auxiliary electrode forming part of my invention, in a position of adjustment thereof,

Figure 3 is a similar view illustrating the auxiliary electrode adjusted to another position,

50 Figure 4 is a bottom plan view of a cap member, in which said auxiliary electrode is mounted, together with the electrode,

Figure 5 is a perspective view of the auxiliary electrode,

55 Figure 6 is a view partly in side elevation and

partly in section of a spark plug equipped with a modified form of auxiliary electrode and showing the latter in one position of adjustment thereof,

Figure 7 is a similar fragmentary view illustrating the modified form of electrode in another
5 position of adjustment.

Figure 8 is a bottom plan view of a cap member in which said modified electrode is mounted and

Figure 9 is a perspective view of the modified
10 form of electrode.

Specifically describing the illustrated embodiment of the invention reference character 1 designates the body shell or sleeve of the plug having a reduced lower end 2 externally threaded as at 3
15 for insertion into the cylinder head of an engine, an internal shoulder 4 substantially midway of the sleeve, internal threads 5 in the upper end, and the usual hexagonal portion 6 for the application of a wrench to the sleeve.

20 Secured in the sleeve 1 is a cylindrical core 7, of suitable insulating material, having a radial flange 8, substantially midway of its ends, clamped between the aforesaid shoulder 4 and a gland nut 9 threaded into the upper end of
25 the sleeve, suitable gaskets 10 and 11 being interposed between said flange and the shoulder 4 and gland nut 9 respectively. The upper end of the core 7 is provided with a threaded axial bore 12 terminating at its lower end in a shoulder 13
30 and opening into a relatively smaller threaded bore 14 which in turn opens into a smaller bore 15 opening into the sleeve 1.

Extending through said bores 12, 14 and 15 is a main electrode 16 secured therein by means of
35 an enlargement 17 intermediate its ends threaded into the bore 14, and having a radial flange 18 bearing against a gasket 19 seating in the shoulder 13. The usual grounding electrode 20 is secured in the shell 1 for cooperation with the lower
40 end of the electrode 16 to provide a main spark gap.

Referring now particularly to the embodiment of my invention illustrated in Figures 1 to 5 inclusive, threaded into the upper end of the bore
45 12 is a coupling sleeve 21 of conducting material, such as brass and having a flat externally threaded head 22 seating on the upper end of the core 7. A gasket, of insulating material may be interposed between the coupling member 21
50 and flange 18 whereby said coupling member serves as a lock nut preventing loosening of the main electrode 16 from engine vibration or other causes.

Surmounting the core 7 is a cylindrical cap 55

member 23 internally threaded, as at 24, for engagement with the head 22 and of the requisite depth to provide a sparking chamber 25 into which the upper end of the main electrode 16 extends. The usual binding post 26, having a nut 27 thereon, projects from the top of the cap member 21.

Mounted in the cap member 21 in an internal circular groove 28 formed therein by the threads 24 and the top of said member, is an auxiliary electrode 29. The auxiliary electrode 29 is formed preferably from a single piece of resilient wire or other rod like material bent upon itself to form a circular open loop 30 freely mounted in said groove 28, and subjacent diametrical sparking members 31 disposed side by side and tensioned to be normally urged downwardly, said members being of a length to extend laterally from the cap member 23 and terminating exteriorly thereof in an eye member 31' for manual manipulation thereof for a purpose presently seen. A bayonet slot 32 through which the sparking members 31 project, is formed in the side wall of the cap member and provides upper and lower detent notches 33 and 34, respectively, spaced apart circumferentially of said side wall and designed to seat said sparking members, as shown in Figures 2 and 3. Since the auxiliary electrode 29 is freely mounted in the groove 28 and the sparking members 31 are yieldingly urged downwardly said members may be lifted from either notch, as by means of the eye 31', and said electrode 29 rotated to position said members 31 over the other notch to seat therein with a snap action when said eye is released. When seated in the upper notch 33 said members 31 provide for an auxiliary spark gap between the same and the upper end of the main electrode 16 whereby the spark at the main gap is augmented or intensified in a manner well understood and therefore not requiring explanation. On the other hand when seated in the lower notch 34 said sparking members 31 are in direct contact with the upper end of the main electrode 16 and the auxiliary spark gap is closed and eliminated. By virtue of the two sparking members 31, side by side, provision is made for jumping of the spark at various points according to fluctuations of the ignition current. Sight openings 35 are provided in the side wall of the cap member 23 through which the operation and condition of the auxiliary electrode may be readily observed.

In the modification shown in Figures 6 to 9, inclusive, an auxiliary electrode is provided in the form of a cylindrical plunger 36 movable in the side wall of the cap member 23 radially of the upper end of the main electrode 16 and provided exteriorly of said cap member, with a head member 37 for manual manipulation thereof. A resilient wire 38 is coiled around the base of the binding post 26 and has a downturned detent end 39 projecting through a suitable aperture 40 in the top of the cap member 21 and adapted to seat in either of a pair of concave circular notches 41 and 42 arranged in said plunger so that the latter may be pulled outwardly, as in Figure 6, or pushed inwardly as in Figure 7, and yieldingly held in either position. In its outward position the inner end of the plunger 38 is spaced from the main electrode to provide an auxiliary spark gap; in its inward position said gap is closed.

The foregoing auxiliary electrode 29 and cap member 21 are easily assembled to provide a

manufacturing unit which may be applied to existing types of spark plugs. The wire electrode because of its resilient character is securely interlocked with the groove 28 while at the same time it may be easily rotated therein for the purpose described and readily removed for replacement as desired. The auxiliary electrode may be quickly adjusted to close or form the auxiliary gap without disturbing the connection to the binding post, and said cap provides for location of said post in the usual position. Said electrode and related parts ensure accurate adjustment of the auxiliary spark gap and thereby positively insure efficient operation of the plug when used either as a single or double gap type.

While a preferred embodiment and one modification thereof have been described in the foregoing it is to be understood that right is herein reserved to other changes and modifications falling fairly within the scope of the appended claims.

Having thus described the invention, what I claim is:

1. In a spark plug including a main electrode extending above the upper end thereof, a cap member mounted on the upper end of said plug and having a chamber into which said electrode extends, and an auxiliary electrode mounted in said cap member and including an elongate sparking member extending across the upper end of the main electrode and vertically movable into gap forming and closing positions, respectively, said cap member having a slot therein provided with a notch, said sparking member projecting through said slot for manual manipulation thereof to said positions and having interlocking engagement with said notch in said gap forming positions.

2. In a spark plug including a main electrode extending above the upper end thereof, a cap member mounted on the upper end of said plug and having a chamber into which said electrode projects and a slot in the side wall thereof provided with notches, and an auxiliary electrode mounted in said cap member and comprising an elongate sparking member extending across the upper end of said main electrode and through said slot, said sparking member having lateral hinging movement to gap forming and closing positions, respectively, and being tensioned for interlocking engagement with said notches in said gap forming position.

3. In a spark plug including a main electrode extending above the upper end thereof, a cylindrical cap member mounted on the upper end of said plug and having a chamber into which said electrode extends and a slot in the side wall thereof provided with notches spaced circumferentially of said wall, and an auxiliary electrode mounted in said cap member and comprising an elongate sparking member extending across the upper end of said main electrode and through said slot, said sparking member being laterally movable to gap forming and closing positions, respectively, and laterally movable for engagement with said notches in said positions.

4. In a spark plug including a main electrode extending above the upper end thereof, a cylindrical cap member mounted on the upper end of said plug and having a chamber into which said electrode extends and a slot in the side wall thereof provided with notches spaced at different levels and circumferentially of said wall, and an auxiliary electrode comprising an elongate sparking member mounted in said cap mem-

ber to extend across the upper end of said main electrode and through said slot, said sparking member having vertical movement to gap forming and closing positions, respectively, and rotary movement for location relative to said notches in said different positions, and being tensioned for interlocking engagement with said notches.

5. In a spark plug including a main electrode extending above the upper end thereof, a cylindrical cap member mounted on the upper end of said plug and having a chamber into which said electrode extends, a horizontally disposed circular groove in said chamber and a slot in the side wall of said member provided with notches spaced circumferentially of said wall, and an auxiliary electrode comprising a circular loop disposed in said groove, an integral elongate sparking member extending diametrically from said loop across the upper end of said main electrode and through said slot, said sparking member having vertical movement on said loop to different positions to vary its relation to the upper end of said main electrode, and for interlocking engagement with said notches in said different positions, respectively, the auxiliary electrode being rotatable in said groove for location of the sparking member relative to said notches.

6. A manufacturing unit, for use with a spark plug and comprising a cylindrical sleeve member closed at one end and having a binding post extending from said end, and a bayonet slot in the side wall thereof, and a single piece electrode comprising a circular open loop mounted in said sleeve for rotation about the axis of the latter and terminating at one end in an elongate member extending diametrically across said loop and through said slot and having hinging movement on said loop.

7. As an article of manufacture, for use with a spark plug, a cylindrical sleeve member closed at one end and having an annular internal groove adjacent said end and a bayonet slot formed in one side wall, and a threaded post projecting from said closed end.

8. As an article of manufacture, a single piece electrode of rod-like resilient material and comprising an open circular loop, and an elongate member extending from one end of said loop diametrically across and beyond the latter.

9. As an article of manufacture, a single piece electrode of rod-like resilient material and comprising an open loop and an elongate member extending from one end of said loop diametrically across and beyond the latter said member being bent back upon itself to form an eye at the end of said member.

10. As an article of manufacture, a single piece

electrode of rod-like resilient material and comprising, an open circular loop and an elongate member extending from one end of the loop diametrically across and beyond said loop said member being bent back upon itself to form a terminal eye and a second elongate member parallel with and contiguous with said first member.

11. A spark plug comprising a cylindrical core, having a series of axial communicating bores of successively smaller diameter from the upper end of said core, the upper and next succeeding bore having a shoulder therebetween, an electrode extending through said bores and core and having an enlargement intermediate its ends threaded into said next succeeding bore and terminating in a head adapted to seat against said shoulder, a sleeve member of conducting material threaded into said upper bore and projecting at its outer end from the same, an insulating gasket interposed, between said sleeve and head, a chambered cap member of conducting material threaded onto the projecting end of said sleeve and into which said electrode extends, and a second electrode in said chamber for forming a spark gap at the upper end of said first electrode.

12. In a spark plug including a main electrode, an auxiliary electrode movable relative to the main electrode to gap forming and closing positions, respectively, and tensioned for movement to one of said positions, said plug embodying devices cooperating with said electrode to lock the same in either position with a snap action.

13. In a spark plug including a main electrode extending above the upper end of said plug, a cylindrical cap surmounting said plug and having a chamber into which said electrode extends and an opening in the side wall thereof, and an auxiliary electrode slidably mounted in said cap member and comprising a sparking member movable relative to said main electrode into gap forming and closing positions, respectively, and projecting through said opening, and cooperating means on said electrode and cap normally influencing said electrode in one direction or the other and locking the electrode in said positions.

14. In a spark plug including a main electrode and a main spark gap, an auxiliary electrode adjustable relative to the main electrode between two fixed points for limiting its movement in opposite directions to close and form an auxiliary spark gap, respectively, and being incapable of permanent adjustment between said two points, and said plug and auxiliary electrode embodying cooperating devices for locking the auxiliary electrode at one limit of its movement, whereby a spark gap of fixed length is ensured.

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