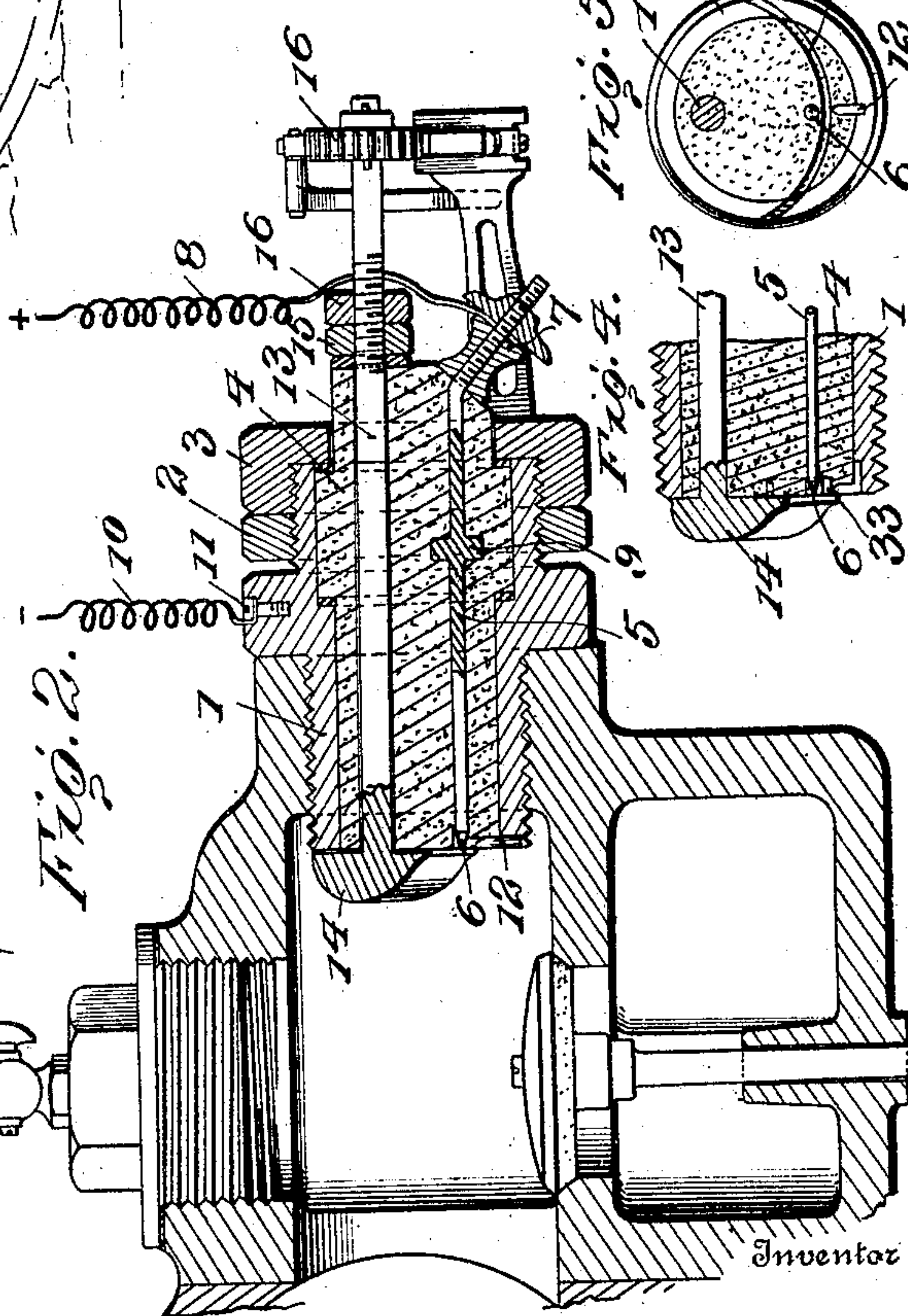
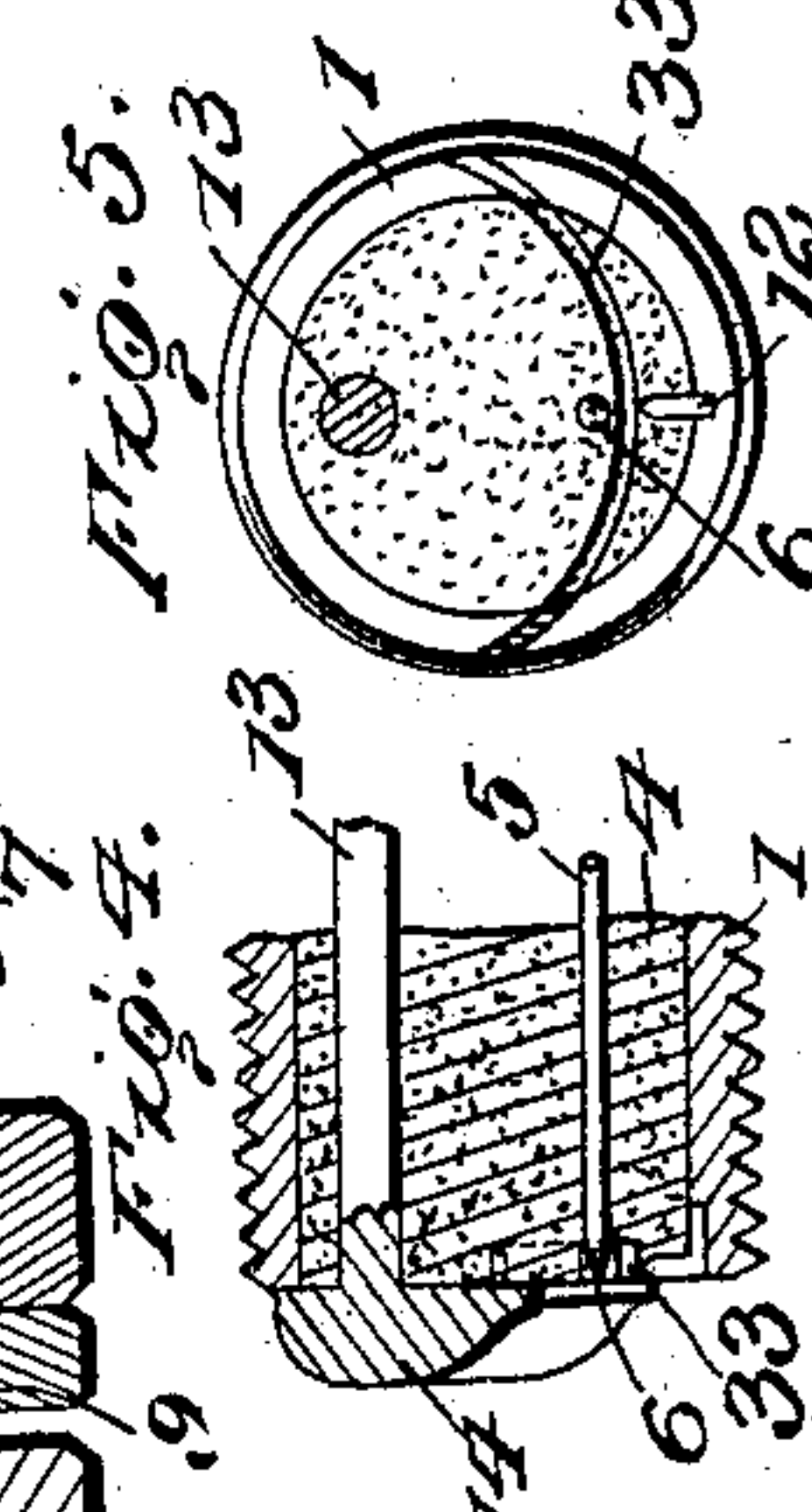
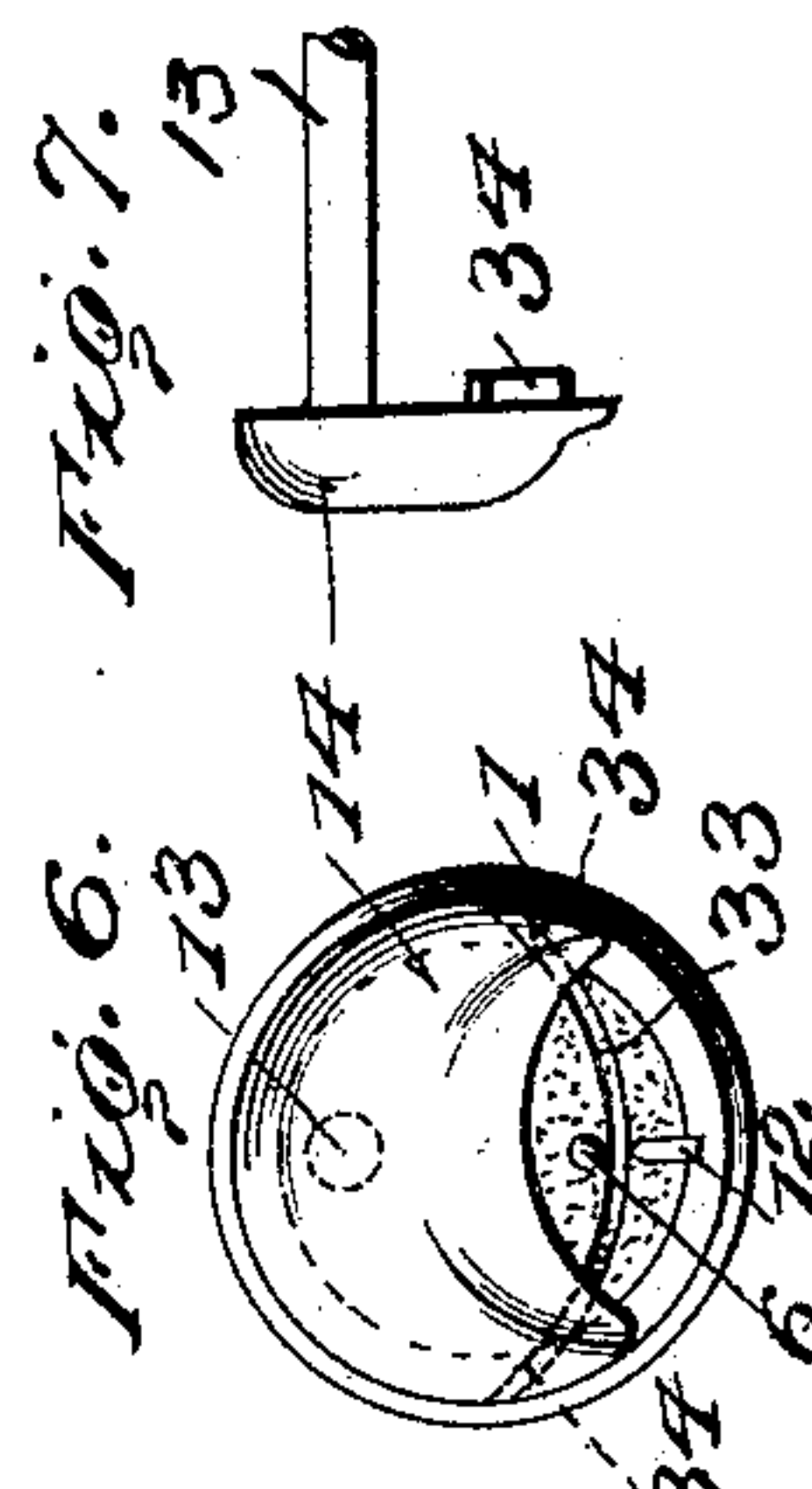
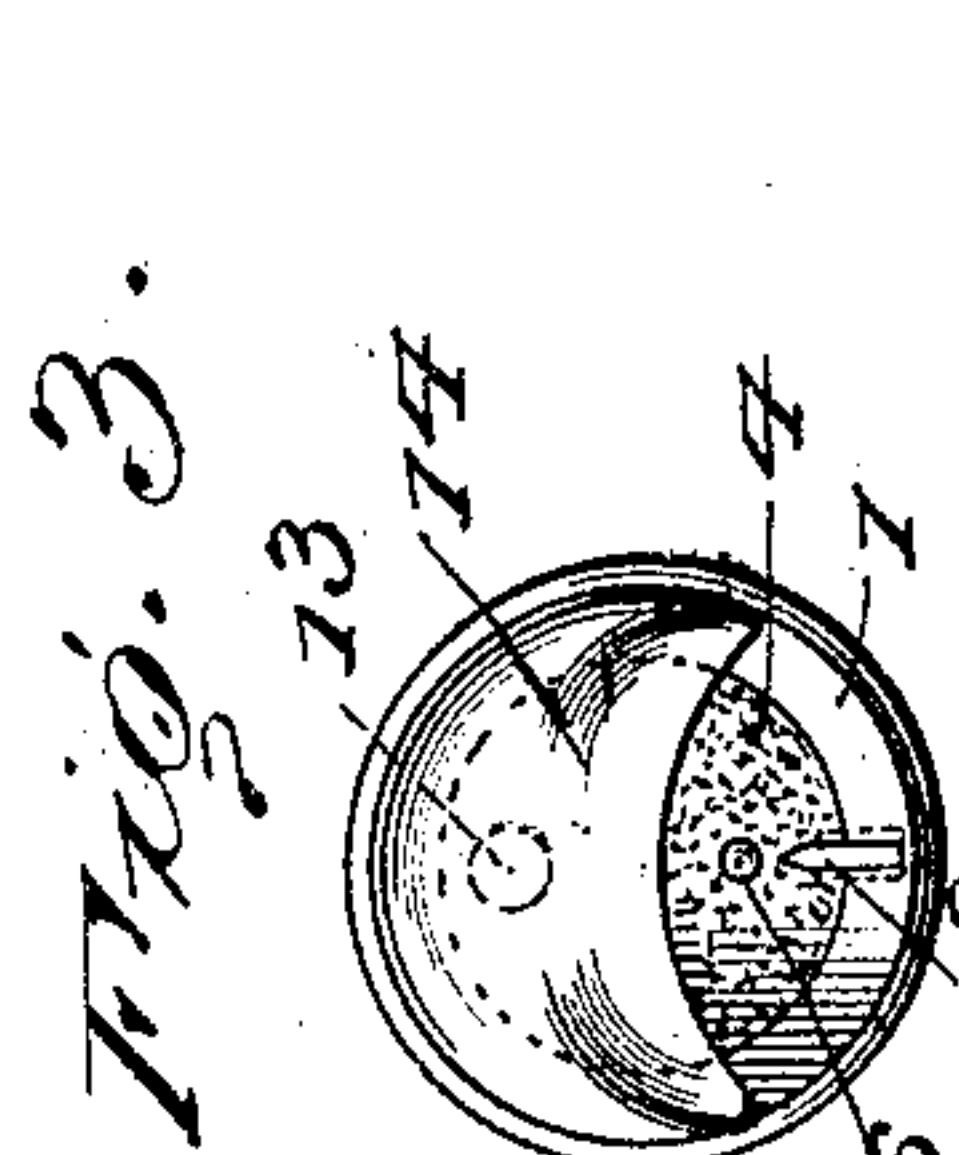
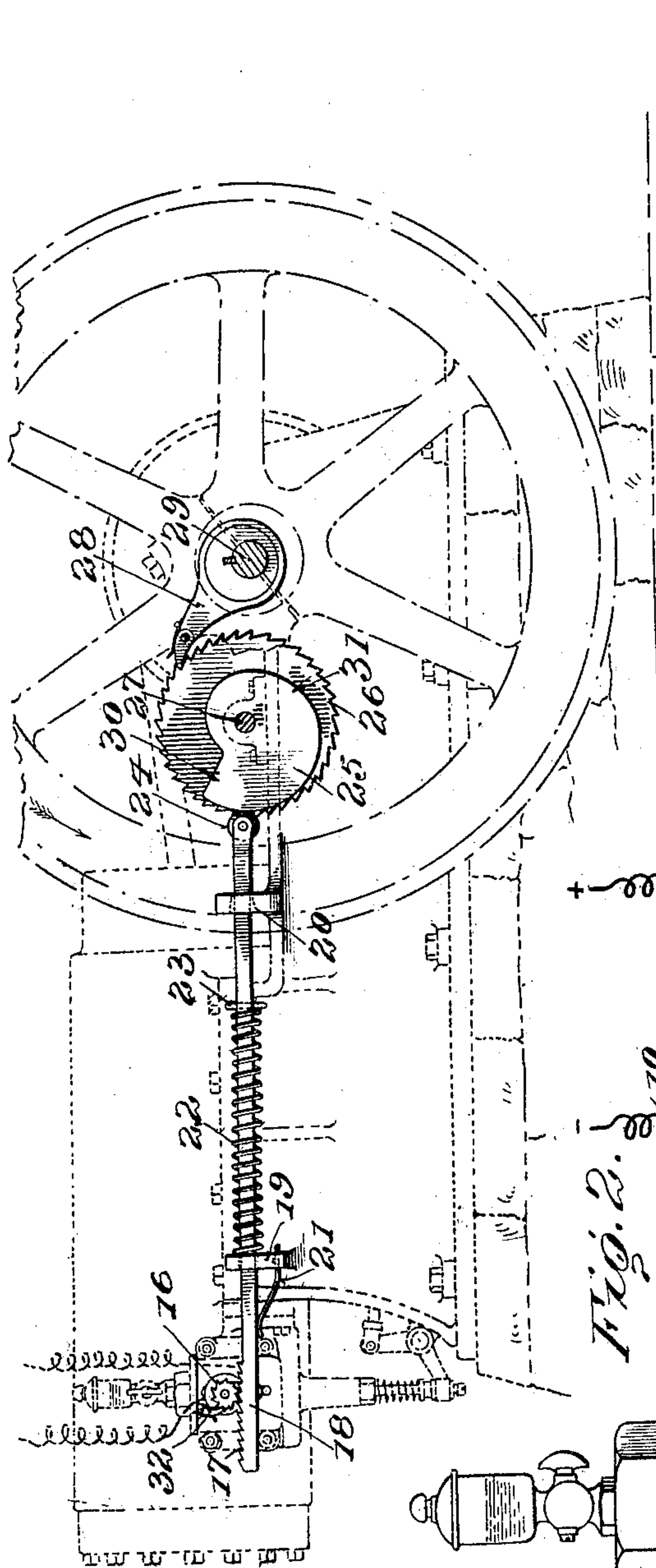


D. H. COLES.
SPARK PLUG FOR GAS ENGINES.
APPLICATION FILED MAR. 20, 1909.

Patented Sept. 21, 1909.
2 SHEETS—SHEET 1.

934,427.



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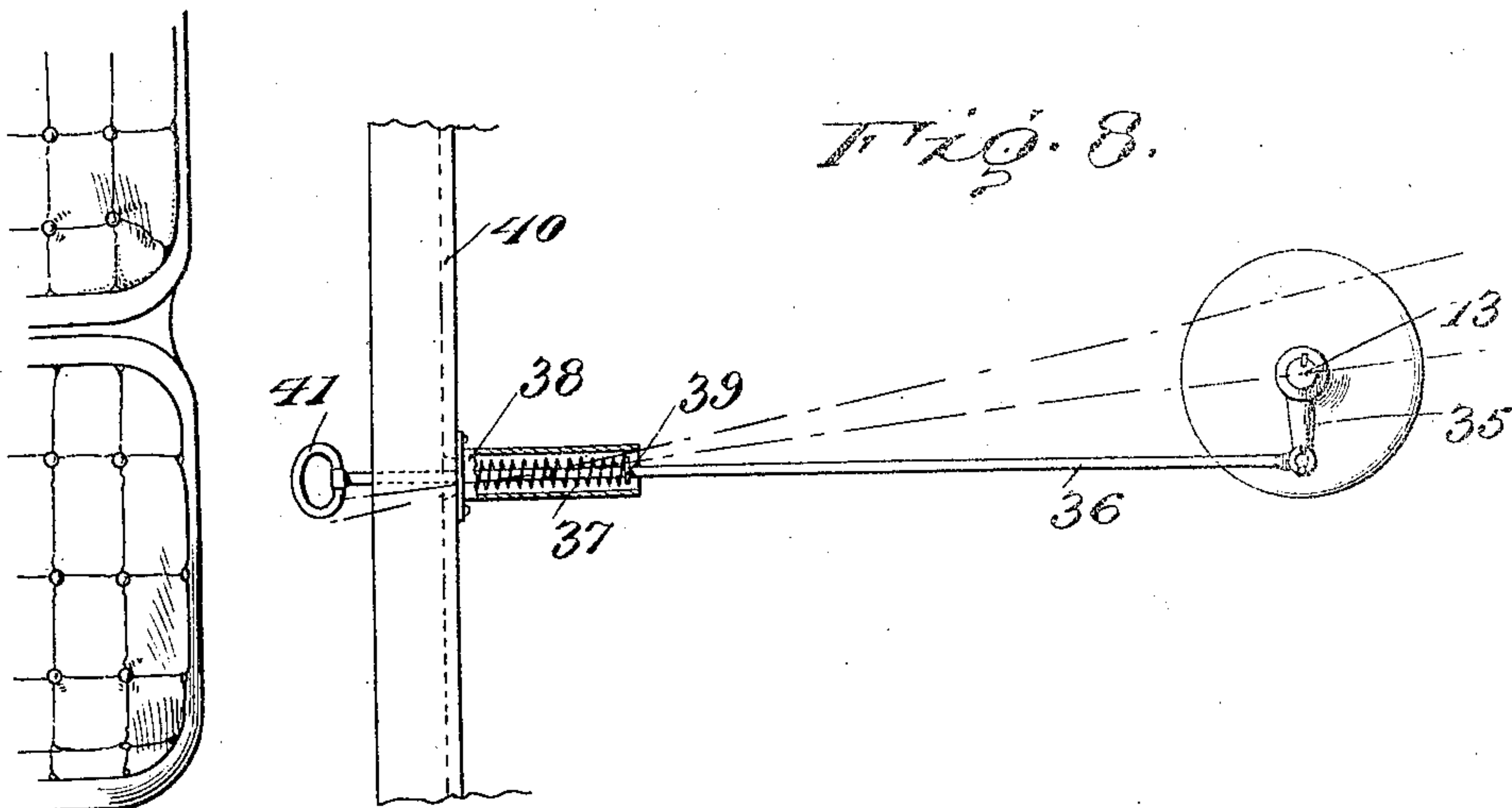


Fig. 9.

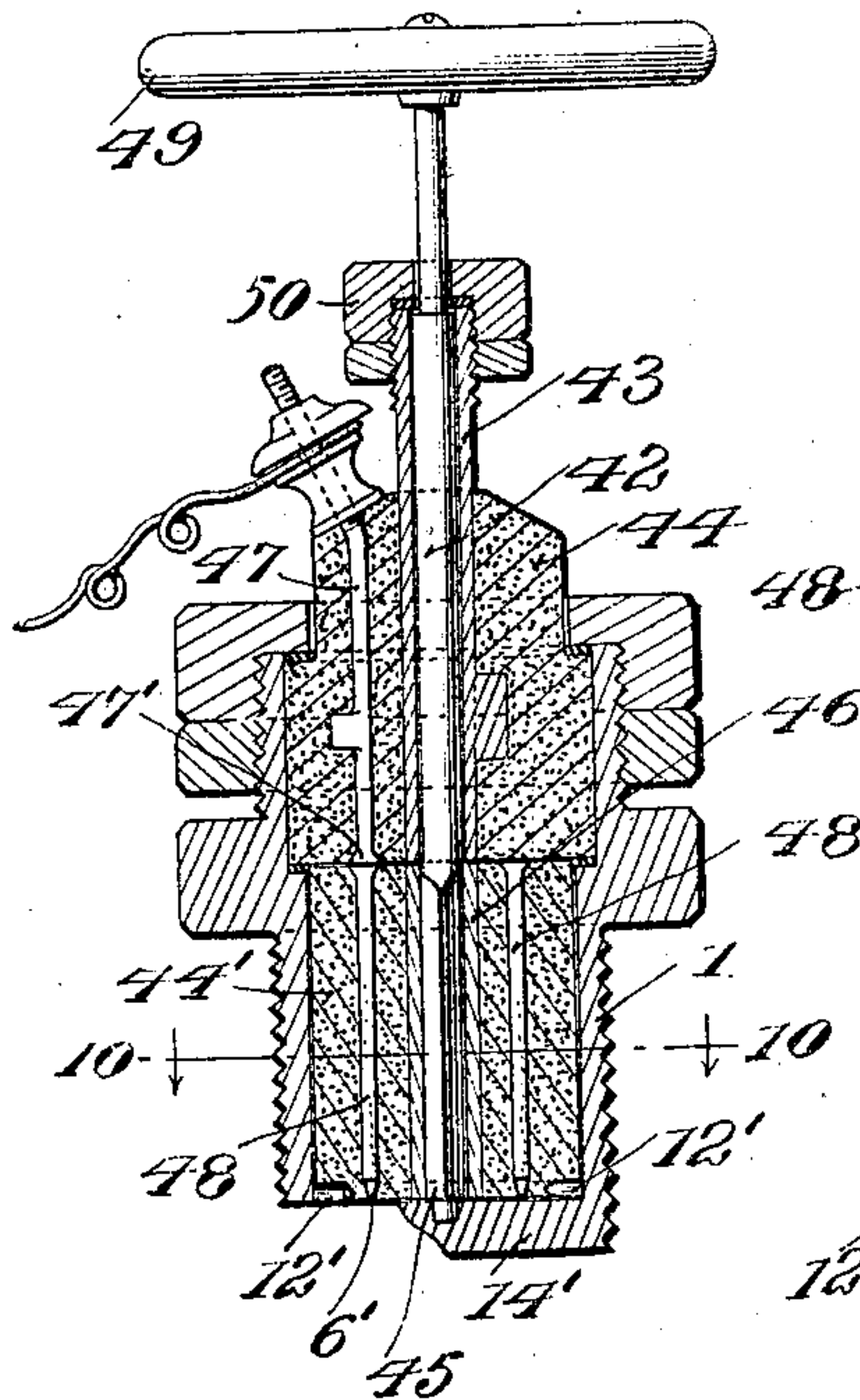


Fig. 10.

Fig. 11.

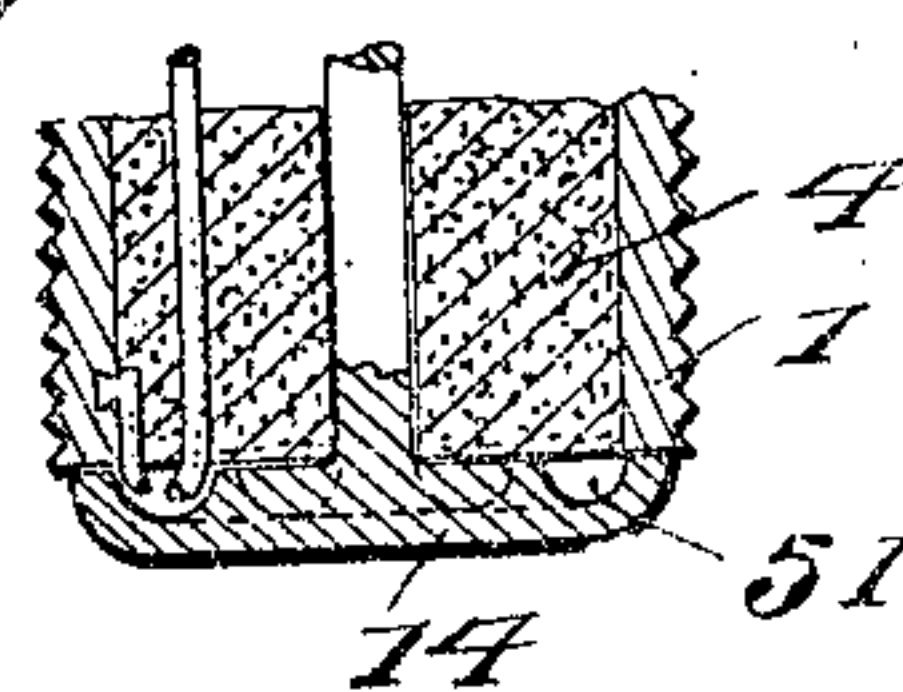
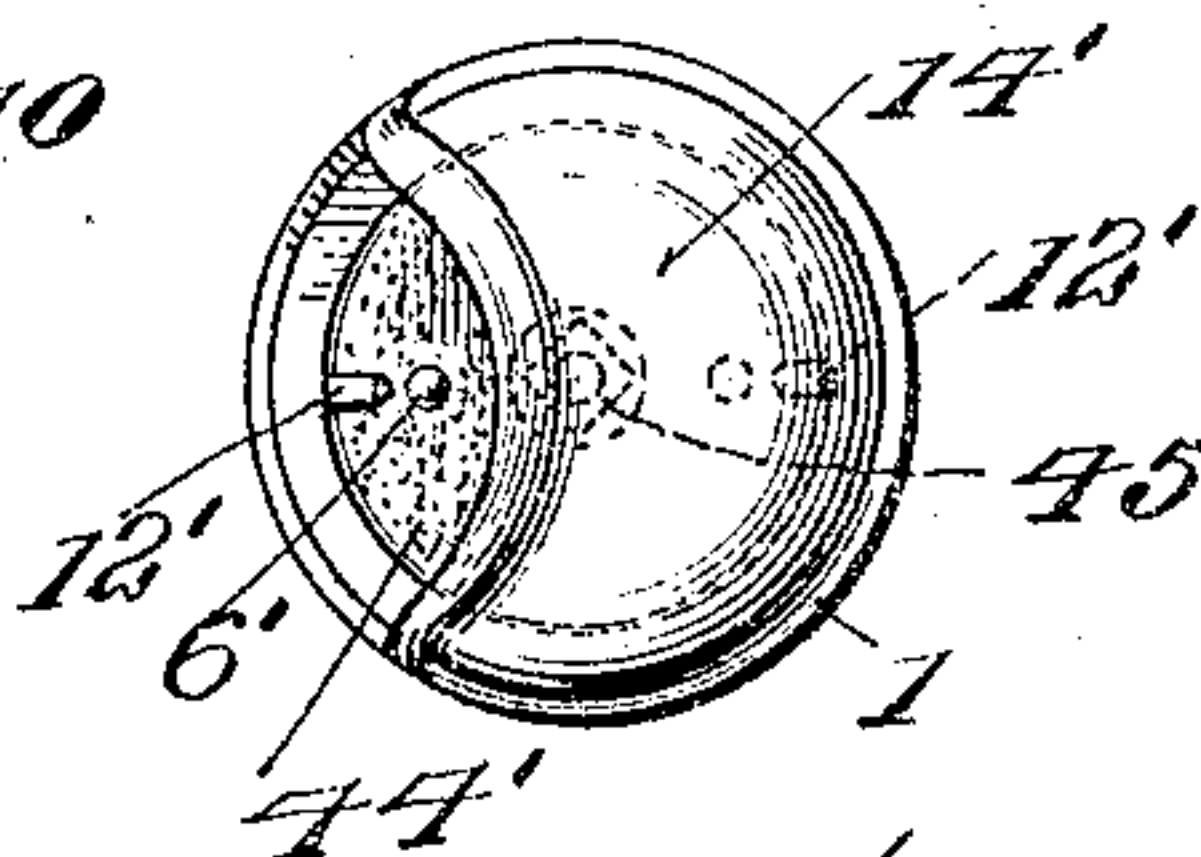


Fig. 12.



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UNITED STATES PATENT OFFICE.

DAVID H. COLES, OF BROOKLYN, NEW YORK.

SPARK-PLUG FOR GAS-ENGINES.

934,427.

Specification of Letters Patent.

Patented Sept. 21, 1909.

Application filed March 20, 1909. Serial No. 484,717.

To all whom it may concern:

Be it known that I, DAVID H. COLES, of Brooklyn, New York, have invented a new and useful Improvement in Spark-Plugs for Gas-Engines, which invention is fully set forth in the following specification.

This invention relates to spark plugs for gas engines.

One of the constant sources of annoyance in the use of spark plugs in engines of this kind results from the accumulation of carbon and other foreign matter upon or between the electrodes of the spark plugs, and resulting in the failure of the plug to properly perform its functions, and in spark plugs as heretofore constructed, it has been found necessary to frequently remove the plug from its position in the engine and clean the same, an operation which results in much loss of time and annoyance. Not only does this fouling of the spark plug cause the entire failure of the device to function, and the loss of time incident to cleaning the same, but in addition thereto, the efficiency of the plug gradually deteriorates, so that even while it is operating, it is not operating as effectively as would be the case if it were kept continually clean.

The object of the present invention is to provide means for keeping the spark plug clean, to the end that it may constantly be in a condition to operate at its highest efficiency, and may in fact never reach the point where it is completely thrown out of commission by reason of the collection of carbon and other foreign material around the electrodes.

With this object in view, the invention consists, generally stated, in a spark plug of suitable construction, provided with means for properly insulating the electrodes of the plug, and means operated periodically from the exterior of the plug, either by hand or automatically, for removing the collections of carbon or other foreign material that would operate to short-circuit or otherwise interfere with the proper functioning of the plug.

The invention may assume various forms, all of which, however, involve the idea of a revoluble element located in contact with, or proximity to, the inner face of the spark plug, which element is connected to a suitable operating stem or other means, extending through the plug to the exterior thereof, where it is provided with suitable means

for operating it. In some classes of machines, the operating means may be in the form of mechanism to be grasped by the hand of the chauffeur, and an occasional turn given to the device for cleaning the spark plug. In other cases the operating spindle may be provided with means for automatically turning it at stated intervals, so that the whole device becomes an automatic spark cleaner. The inventive idea involved is capable of receiving a variety of mechanical expressions, and for the sake of illustrating the invention, some of these mechanical expressions are shown in the accompanying drawings, in which—

Figure 1 is a side elevation of a portion of a gas engine, showing the exterior end of my spark plug in position in the engine, and automatic means for periodically operating the same to clean the plug; Fig. 2 is a sectional detail through the center of the plug of Fig. 1, showing the electrodes and cleaning device; Fig. 3 is an elevation of the interior end of the plug, with the cleaning device in position; Fig. 4 is a sectional view of another expression of the invention; Fig. 5 is a plan view of the inner end of the plug shown in Fig. 4, with the cleaning disk removed; Fig. 6 is a like front plan of the plug of Figs. 4 and 5, with the cleaning disk in position; Fig. 7 is a side elevation of the cleaning device of Fig. 6; Fig. 8 is a diagrammatic illustration of means for operating the cleaning disk by hand; Fig. 9 is a sectional view of still another mechanical expression of the invention; Fig. 10 is a cross-sectional view of Fig. 9, on the line 10—10; Fig. 11 is a broken sectional view of the inner end portion of Fig. 9; and Fig. 12 is a front elevation of Fig. 9.

Referring to the drawings, in which like reference numerals indicate corresponding parts, the plug is provided with a casing 1 screw-threaded on its interior portion for holding it in position in the cylinder of the engine, and 2 is a jam-nut engaging the exterior screw-threaded portion of the plug, while 3 is a screw-threaded cap plug likewise engaging the screw-threaded portion of the exterior end of the plug for clamping and adjusting the insulating core 4 in the casing 1. Running through the core 4 is a conducting wire 5 terminating at the interior face of the plug in a point 6, forming one of the electrodes, which wire is provided at its outer end with a binding post 7 for connect-

ing it to the wire 8, leading to the usual or any suitable source of electricity, as the positive side of a battery. This conducting wire 5 is suitably anchored in the insulating material 4 by means of a shouldered enlargement 9. Connection is made with the opposite or negative side of the battery by means of a wire 10, suitably connected, as by the screw 11, with the metal of the casing 1, and this casing has for the other electrode a suitable point 12 of platinum or other proper material, preferably embedded in the casing, and having the terminus of the electrode within proper proximity to the point of the electrode 6, as will be readily understood by inspection of Figs. 2 and 3.

Extending through the insulating material 4, and preferably eccentric to the plug, is a rod or stem 13, bearing on its inner end a disk 14, and provided on its outer end with any suitable means for turning the stem. As hereinbefore stated, this means may be either automatic mechanism connected with the engine, as shown in Figs. 1 and 2, or may be in the nature of a small lever or hand-wheel, as shown in Figs. 8 and 9. The disk 14 does not cover the entire face of the plug 1, but has a portion thereof cut away, as clearly shown in Fig. 3, so as to expose that part of the face of the plug where the electrodes 6 and 12 are located. That portion or edge of the disk which is adjacent to the points 6 and 12 is reduced, so as to form approximately a dulled knife or scraping edge, as will be appreciated by an inspection of Fig. 2. The projecting exterior end of the stem 13 is screw-threaded, as shown in Fig. 2, and has nut 15 and jam-nut 16 engaging it to securely retain it in position.

It will be understood that the rod or stem 13 is free to turn in the core 4, and when it is so turned, whether to the right or the left, the edge of the disk 14 scrapes over the electrodes 6 and 12, thereby effectually removing any carbon or other material that may have collected either on the points or on that portion of the insulating core adjacent to the points. As heretofore stated, this turning action of the stem 13 and the disk 14 for effecting the cleaning of the points of the spark plug may be either hand-operated or automatic. As shown in Figs. 1 and 2, the cleaning disk is operated automatically, and for this purpose the stem 13 has on the rear end thereof a pinion 16, which is engaged by a rack 17 on a rod 18, which rod is free to slide in brackets 19 and 20 attached to the frame of the engine. The rod also has some slight vertical play in the bracket 19, but is normally yieldingly held in its elevated position by spring 21 (see Fig. 1). The rod 18 is also surrounded by a spring 22 reacting between the bracket 19 and an abutment or shoulder 23 on the rod, and tending to throw the rod from left to right, as viewed in Fig.

1. The opposite end of the rod 18 from the rack 17 engages, preferably through the medium of an anti-frictional roller 24, with a cam 25 carried on a toothed wheel 26, which wheel is mounted on axis 27, and is actuated by a pawl 28 eccentrically mounted on some regularly revolving shaft or part of the machine, as the shaft 29. The cam 25 is formed, as shown in Fig. 1, with a straight, substantially radial face or portion 30, and a spiral portion 31, beginning at the interior end of the face 30 and terminating at the exterior end of said face 30. In addition to being engaged by the rack 17 on the rod 18, the pinion 16 is also engaged by a pawl 32, which operates to prevent the pinion 16 from turning in but one direction.

The automatic mechanism just described operates as follows: When the cam 25 has been revolved in the direction indicated by the arrow in Fig. 1, to the point where the anti-frictional roller 24 slips off of the exterior portion of the cam, the rod 18 is driven from left to right, until the roller reaches the interior end of the straight face portion 30 of the cam, and the proportion of the parts is such that this movement of the rod 18, under the influence of its spring 22, has been just sufficient to give the pinion 16, and consequently the stem 13 and cleaning disk 14, one complete revolution. Thereafter, the rod 18, and with it the rack 17, is slowly impelled from right to left against the tension of the spring 22, by the action of the cam portion 31 of the cam 25, the spring 21 yielding sufficiently to permit the teeth of the rack 17 to slip past the teeth on the pinion 16.

It will be seen that by this construction the cleaning disk 14 will be operated—once for every revolution of the toothed wheel 26, and this without any attention from the chauffeur.

As shown in Figs. 1, 2 and 3, the electrode 12 and the electrode 6 are just flush with the surface of the insulating material 4, and the cleaning action of the disk 14 is performed by scraping over the face of the insulating material. If desired, however, that portion of the insulating material lying between the electrodes 6 and 12 may be removed, and in Figs. 4, 5, 6 and 7, I have shown a construction of this character. In said figures, there is formed in the face of the insulating material a groove 33 concentric with the stem 13 of the disk 14, and there is formed on the interior face of the disk 14 a lug or feather 34, which enters the groove 33, so that upon the revolutions of the disk 14, the feather 34 effectually removes the carbon or other material from between the electrodes 6 and 12 traveling in the groove 33 to perform this function, while at the same time the disk cleans the carbon from the face of the plug, as described in connection with

Figs. 1, 2 and 3. If desired, there may be, and preferably is, a feather 34 on the interior face of the disk 14, on each side of the cut-away space, as clearly indicated by dotted lines in Fig. 6.

Referring to Fig. 8, 35 is a crank arm secured to the exterior end of stem 13 of the spark plug, as previously described, and 36 is a rod surrounded by a spring 37 reacting between a suitable abutment on a part of the machine and a pin or other abutment 39 on the rod, said rod extending through the dash-board 40 and terminating in a handle 41, by which the rod may be seized and pulled by the chauffeur, so as to produce a partial revolution of the stem 13 sufficient to revolve the disk to the point where it will clean the electrodes, as will be readily understood.

Referring to Figs. 9, 10, 11 and 12, there is shown a construction in which a scraping disk 14' is rigidly secured to, and indeed, may, if desired, form an integral part of, the casing 1. In this case, the cleaning disk does not revolve, but that portion of the insulating material carrying one or both of the electrodes is revoluble. In said figures, 42 is a centrally located stem, which extends through a bushing 43 anchored in the exterior portion of the insulating material 44, the stem 42 being free to revolve in the bushing 43. The lower end 45 of the stem 42 is squared, and takes into a suitable sleeve 46, fixed in the lower half of the insulating material 44', which portion 44' is loose within the casing 1, and free to revolve therein. 47 is the usual conducting wire, extending through the insulating material 44, and terminating at the inner face thereof, preferably with an enlarged face, as shown at 47', Fig. 9. This wire 47 has the usual binding post and conductor connected thereto. At diametrically opposite points within the revoluble portion 44' of the insulating material, are two conductors 48, 48. The wires 48 are such a distance from the center that when brought to rest at the proper point, one of them makes contact with the conductor 47 through the enlarged end 47' thereof, as shown in Fig. 9. A half revolution of the insulating material 44' will bring the other conductor 48 into relation with the conductor 47, as will be readily understood. In this construction, the electrode 12' is not secured to the casing 1, but is embedded in the face portion of the insulating material 44', in close contact with the interior of the metal forming the casing 1, as will be readily understood from an inspection of Fig. 9. The exterior portion of the stem 42 may have any suitable means for revolving it, as the hand-wheel 49. It will be apparent that upon revolving the hand-wheel 49, the insulating material 44', and with it the electrode points 6', 12', will

be revolved, passing under the cleaning disk 14', thus effectually removing the carbon from the points of the electrodes. Any suitable means for stopping the revolution at a point where the conductors 47 and 48 would exactly register each other may be employed, such, for example, as a lug on the shaft 42 engaging a removable stop on the jam-nut 50.

Referring to Fig. 11, there is shown a form of the device in which the electrode points, instead of lying flush with the insulating material 4, project slightly beyond the face of the insulating material, and in this case, the disk 14 is provided with a groove 51 for clearing the points of the electrodes, as will be readily understood from said figure.

It will be observed from the foregoing that I have provided an efficient means, operable from the exterior of the plug, for quickly and effectually cleaning the electrodes, without removal of the plug from its position in the engine, and that the cleaning operation may thus be performed in a minimum of time, if operated by hand, and if operated automatically, as shown in Fig. 1. the chauffeur need give no attention whatever to the same, being assured that at all times his plug is free from carbon or other material that would interfere with its proper functioning.

It will be understood that the particular construction of my spark plug as hereinbefore described, may be modified, the proportion and relative arrangement of the parts changed, and some of the parts used without using other parts, without departing from the real inventive idea involved; and all of these changes and modifications which do not contemplate a material change in the principle of the invention are meant to be included within the appended claims defining my invention.

What I claim is:—

1. In a spark plug, a casing, an insulating member inclosed by said casing, sparking terminals embedded in the inner face of said insulating member, a cleaning member in operative relation with the inner face of said insulating member, and means turning one of said members with relation to the other, whereby said terminals are cleaned.

2. In a spark plug, a casing, an insulating member inclosed by said casing, sparking terminals in close proximity to the inner face of said insulating member, a cleaning member in operative relation with the inner face of said insulating member, and automatic means turning one of said members with relation to the other, whereby said terminals are cleaned.

3. In a spark plug, a casing, an insulating member inclosed by said casing, sparking terminals in close proximity to the inner

face of said insulating member, a cleaning member in operative relation with the inner face of said insulating member, and automatic means intermittently turning one of said members with relation to the other, whereby said terminals are cleaned.

4. In a spark plug, a casing, an insulating member inclosed thereby, sparking terminals embedded in the inner face of said insulating member, a stem passing through said insulating member, a cleaning device on the inner end of said stem, and means on the outer end of the stem for turning the same.

5. In a spark plug, a casing, an insulating member therein, sparking terminals embedded in the inner face of said insulating member, a cleaning device in close proximity to said face, a stem extending from said cleaning device outward through said insulating member, and means for turning said stem, and thereby operating said cleaning device.

6. In a sparking plug, a casing, an insulating member therein, sparking terminals embedded in the inner face of said insulating member, a stem passing through said insulating member, a scraper disk carried on the inner end of said stem, and means on the

exterior end of said stem for turning the same.

7. In a sparking plug, a casing, an insulating member therein having on its inner face a groove, spark terminals embedded in the inner face of said insulating member and located on opposite sides of said groove, a scraper disk revolubly mounted on said plug and adapted to scrape the inner face of said member, and provided with a feather engaging said groove.

8. In a spark plug, a casing, an insulating member inclosed by said casing, a conductor having an enlargement anchored in said insulating member and provided with a spark terminal embedded in the inner face of said member, a second terminal embedded in said member, and a revoluble scraper disk on said plug adapted to scrape the inner face of said member and said terminals.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

DAVID H. COLES.

Witnesses:

RALPH L. SCOTT,
ACHSAH H. TAYLOR.