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L. J. LE PONTOIS.

HIGH TENSION CURRENT DISTRIBUTER FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED DEC. 13, 1904.

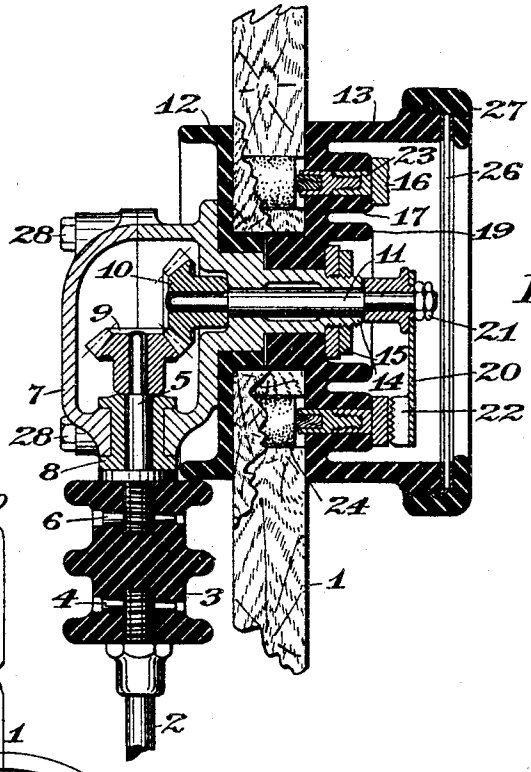

Fig. 1.

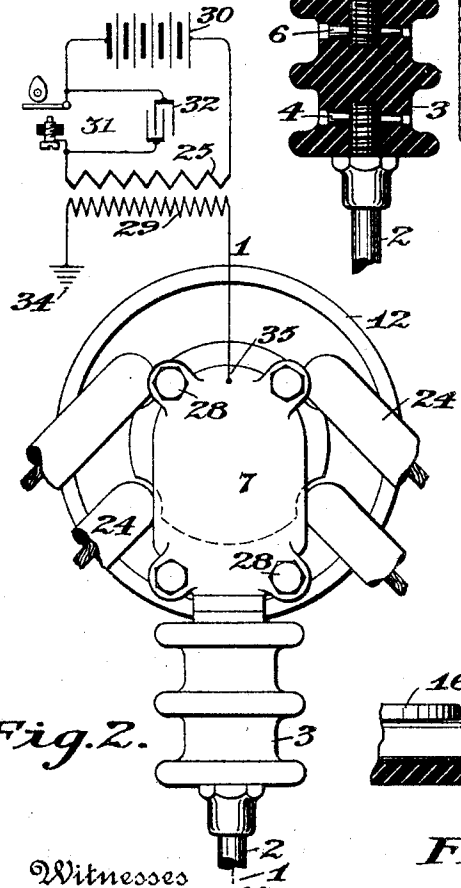

Fig. 2.

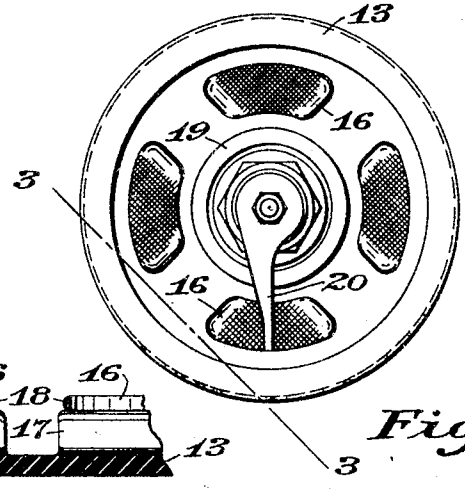

Fig. 3.

Fig. 4.

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UNITED STATES PATENT OFFICE.

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HIGH-TENSION-CURRENT DISTRIBUTER FOR INTERNAL-COMBUSTION ENGINES.

No. 809,453. Specification of Letters Patent. Patented Jan. 9, 1906.

Application filed December 13, 1904. Serial No. 236,664.

To all whom it may concern

Be it known that I, LEON JULES LE PONTOIS, a citizen of the Republic of France, and a resident of New Rochelle, Westchester county, New York, have invented certain new and useful Improvements in High-Tension-Current Distributers for Internal-Combustion Engines, of which the following is a specification.

My invention relates to improvements in means for successively distributing to jump-spark plugs of multiple-cylinder internal-combustion engines high-tension currents from one single-spark coil.

The means generally used consists in causing a brush in the electrical connection with the high-tension terminal to pass successively over metallic segments in electrical connection with the spark-plugs, the said segments being separated from each other by suitable insulating material. This method, however, presents the disadvantage in that metallic particles become detached by friction from the brush or segments and are strewn over the insulating-surface connecting consecutive segments.

It is a well-known fact that gases under compression oppose a considerable resistance to the passing of electrical discharges through their midst and that therefore a high-tension current sent to a spark-plug located in the cylinder in which the gases are under compression meets with a considerably higher resistance to its passage than if the gases contained within the cylinder were at atmospheric pressure or near thereto. It follows that the by-path offered by the metallic particles deposited over the insulation connecting two consecutive segments may be of sufficiently low resistance to allow the high-tension current to unduly cause a spark in the cylinder containing the gases at low pressure instead of allowing the spark to jump in the cylinder containing the gases under compression ready to be ignited.

For the reason above mentioned a high-tension-current distributer must be of large diameter, so as to offer a sufficiently large insulating-surface between consecutive segments in electrical connection with their respective spark-plugs. The difficulty, however, is increased if the time of sparking is modified by shifting the primary breaker without simultaneously and correspondingly shifting the high-tension-current distributer, because the segments must be of sufficient length to allow for an effective sparking range.

My invention has for its object a construction permitting me to remedy these causes of trouble while providing a more simple method of accomplishing the desired result and will be understood by reference to the accompanying drawings, in which—

Figure 1 is a central vertical section of the distributer apparatus, showing also the means of driving it. Fig. 2 is a rear view showing also the circuit. Fig. 3 is a face view of the distributer with the glass cover removed, and Fig. 4 is a detail sectional view.

Similar reference-numerals indicate similar parts in the several views.

The invention herein described is applicable to any well-known form of jump-spark system, and while I have shown a construction adapted to a four-cycle four-cylinder engine it may be equally applied to an engine having any number of cylinders. The invention may be used in connection with stationary engines or with those on self-propelled vehicles. If the latter, it may be attached by suitable means at any convenient point—as, for instance, to the dashboard 1—in such manner as to be readily accessible. When so used, it may be driven in any suitable manner, although it has been found preferable to drive it from the cam-shaft in the case of a four-cycle engine by means of a flexible shafting 2. Said shaft is screw-threaded into a hard-rubber bushing 3 and locked therein by means of a pin 4 and terminating, preferably, less than midway the length of said bushing, as shown in Fig. 1, so that said bushing is rotated upon the rotation of the shaft 2. In said bushing 3 is secured one end of a shaft 5 by a pin 6, the shaft 5 extending upwardly into a casing 7 through a bearing-bushing 8 and carries at its upper end a bevel-gear 9, which gear meshes with a similar gear 10 on the inner end of a shaft 11. Bolts 28 secure the two parts of the casing 7 together, the inclosed space being filled with a suitable lubricant. The shaft 11 has a bearing in an extension of the frame 7, as clearly shown in Fig. 1. An insulating-cap 12 of any suitable material, preferably hard rubber, protects

the casing 7 from possible grounding on the dashboard, as this casing is in communication with the high-tension terminal of the coil. An annular casing 13, preferably of rubber composition, has a central bearing on the extension 14 of the casing 7 and bears also against the dashboard. Both the insulating-cap 12 and the annular casing 13 are securely held in position and bound together by means of lock-nuts 15, screw-threaded upon the extension 14, said extension being provided with suitable shoulders, as shown.

The annular casing 13 is formed with four blocks or projections 17, upon which are secured by screws 23 four polar segments 16, the faces of which are roughened or corrugated, so as to present surfaces favorable to the production of silent brush discharges between them and the moving element 22 of the distributer, each segment 16 being made of sufficient length to cover the entire effective range of sparking. In order to prevent formation of direct brush discharges through space between contiguous segments, their edges 18, facing each other, are carefully rounded, as shown in Fig. 4, and polished. Also by reference to the same figure it will be seen that a long non-conducting surface is placed between contiguous segments, so as to prevent undue formation of two or more sparks simultaneously in different cylinders, this insulation distance being equal to the distance between two contiguous segments plus twice the height of the supporting blocks or projections 17. Said segments are also prevented from brush discharging with the extension 14 of the casing 7 by a circular wall 19, forming an integral part of the annular casing 13.

The moving element of the distributer consists of an arm 20, secured to the shaft 11 by lock-nuts 21 or any other suitable means, said arm 20 carrying at its outer end a comb 22, having numerous sharp teeth thereon, permitting the formation of numerous brush discharges. Such construction reduces considerably the electrical resistance of the spark-gap and gives a result for the desired purpose as good as that obtained from actual contact.

The arm 20 is so adjusted that the comb 22 as it rotates will pass within about one one-hundredth of an inch of the corrugated polar segments 16, there being at no time actual metallic contact between the comb and the segments. The segments 16 are secured to the insulated casing by means of suitable screws, and they have in their centers terminals 23, adapted to receive terminals secured at the ends of four heavily-insulated wires 24, leading to the different spark-plugs. The casing 7 is itself connected to the terminal of the high-tension coil at 35, as shown in Fig. 2, and it will be noticed that this casing is carefully insulated from the dashboard by the ring 12 and from the driving-shaft 2 by the bushing 3.

A transparent plate 26, held by a ring 27, screw-threaded on the annular casing 13, permits ready inspection of the polar segments and of the operativeness of the distributer. If the connections are not proper and there is a break in the circuit anywhere, the defect will be readily seen by the character of the brush discharges through the glass 26.

In operation as the shaft 11 is rotated the arm 20 and comb 22 will be carried thereby, so as to cause the latter to successively pass over the polar segments 16, which are in communication with the four spark-plugs in the engine-cylinders. Each segment 16 covers the effective range of sparking, so that while the comb 22 is passing over a segment 16 the primary 25 of the induction-coil will be broken at 31 by a suitable breaker, the high-tension current generated in the secondary 29 being delivered successively to the spark-plugs. One terminal of the secondary is grounded, as usual, the other terminal being connected at 35 to the casing 7, the high-tension current passing through shaft 11, arm 20, comb 22, where a silent brush discharge takes place between the teeth of said comb and the points on the roughened or corrugated surface of the polar segment 16, the current then flowing by cables 24 to the several spark-plugs located in the engine-cylinders as the comb 22 passes over them successively, and thence by the spark-gap of the spark-plug to ground, thus completing the circuit. A condenser 32 is placed across the gap of the breaker, as usual.

The formation of brush discharges issuing from many points considerably reduces the resistance arising in the circuit by reason of the air-gap between the comb 22 and the polar segments 16. Also the non-formation of disruptive discharges tends to prolong the life of the comb, inasmuch as a very small amount of metal is deposited from pole to pole.

As above described, the high-current distributing-arm 20 is insulated from the flexible shaft 2 by a bushing 3. By so doing a brush or moving contact which would otherwise be required to connect the arm 20 with the high-tension terminal of the induction-coil is dispensed with.

What I claim, and desire to secure by Letters Patent, is—

A high-tension-current distributer comprising a cylindrical casing of an insulating material, a plurality of projections extending from the base of said casing, metallic segments secured to said projections, each of said segments being connected to a terminal leading to a corresponding spark-plug, a shaft supported in a bearing carried by said casing, a current-distributing arm secured to the outer end of said shaft and adapted to pass

in close proximity to said segments, means to rotate said shaft and arm so as to cause the latter to distribute to said segments successively sufficient current for the efficient ignition of an explosive mixture, and a circular wall also projecting from the base of the casing and interposed between said bearing and said segments for the purpose described.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

LEON JULES LE PONTOIS.

Witnesses:
E. F. PORTER,
ALEXANDER S. RODMAN.