F. C. REINEKING.

SHORT CIRCUIT DETECTOR.

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966,766. **Patented Aug. 9, 1910.**

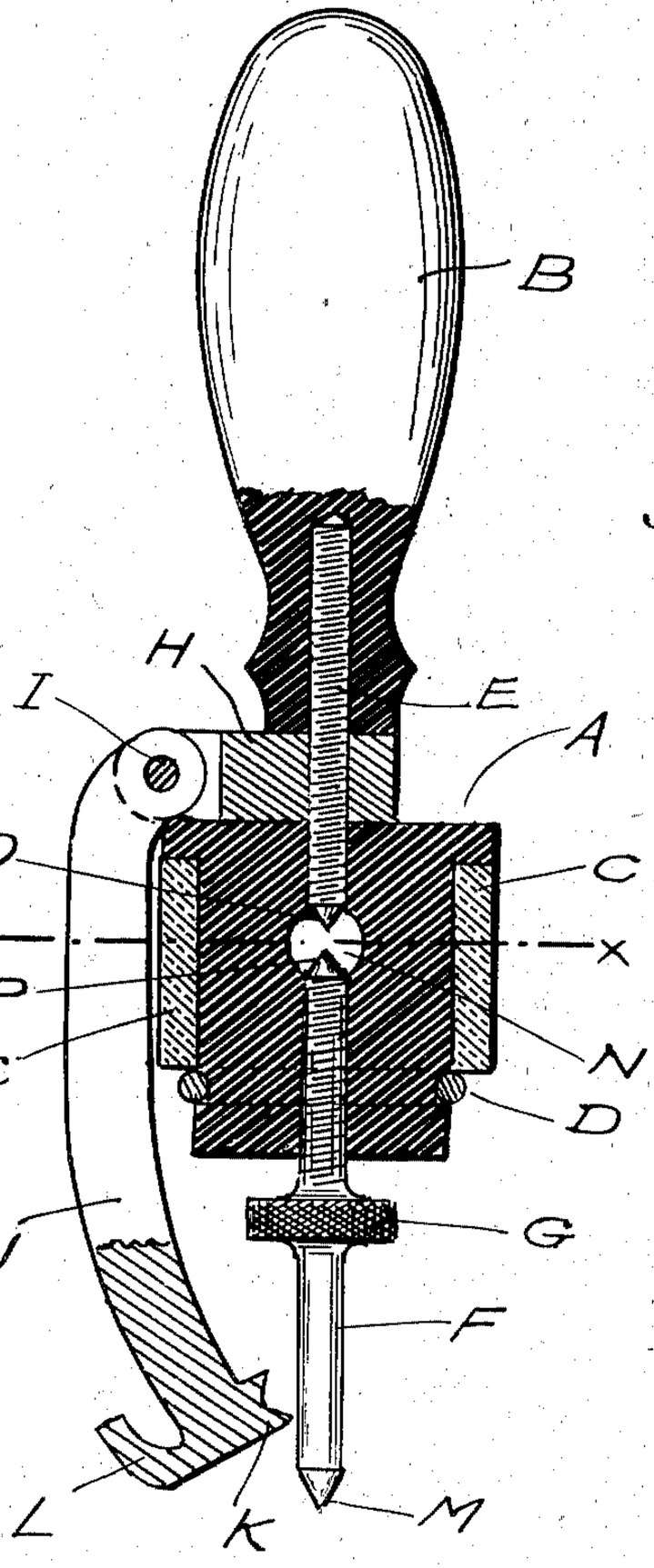

FIG. 1.

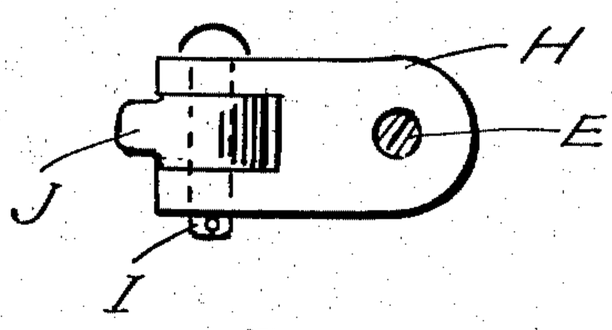

FIG. 3.

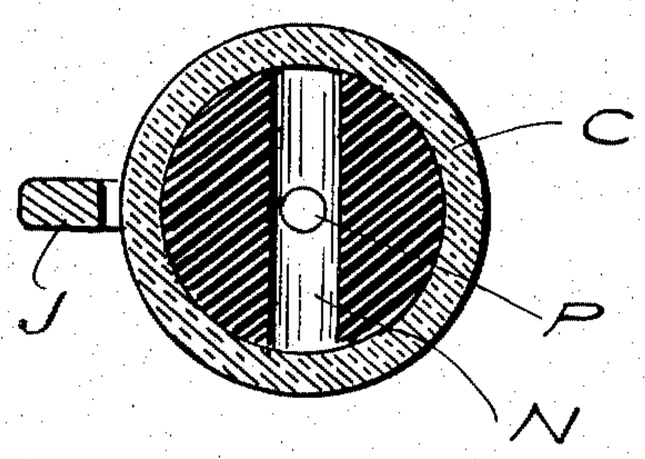

FIG. 2.

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SHORT-CIRCUIT DETECTOR.

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To all whom it may concern:

Be it known that I, FREDERICK C. REINEKING, a citizen of the United States, residing at 34 Lembeck avenue, in Jersey City, county of Hudson, and State of New Jersey, have invented a new and useful Improvement in Short-Circuit Detectors, of which the following is a specification.

My invention relates to short circuit detectors, and the object of my device is to furnish a simple, inexpensive method for visually detecting short circuits such as occur in spark plugs, wiring, magnetos, and other portions of the ignition apparatus of internal combustion engines and elsewhere, without the necessity of removing the spark plug or other portion of the said ignition apparatus from its place in the engine.

I accomplish this object by the device shown in the accompanying drawings, in which:

Figure 1 is a section in elevation of my device. Fig. 2 is a transverse section through spark space N. Fig. 3 is a transverse section through pin I.

A is a flanged cylinder of vulcanized rubber or other insulating material.

B is a handle of hard rubber or other insulating material.

C is a short length of glass tubing.

D is a retaining ring of brass or other metal to hold tube C in place on cylinder A.

E is a pin threaded into cylinder A and handle B.

F is a pin threaded into cylinder A.

G is a flat knurled handle integral with pin F.

H is a flat clip or boss threaded around pin E.

I is a pin at the outer end of clip H.

J is an arm swinging about pin I as a pivot.

K is a cup shaped recess at the lower end of arm J.

L is a hook shaped projection at the end of arm J.

M is a sharp point at the outer end of pin F.

N is a cylindrical open spark space bored across the middle of cylinder A.

O is a sharp spark point on the end of pin E.

P is a sharp spark point on the end of pin F.

By reference to the drawings, it will be observed that the lower end of arm J may be swung in or out about pin I as a pivot; and in this manner the distance between the lower end of arm J and the point M may be diminished or increased at will. The advantage of this arrangement is that contact may be made at any point within the range of the swing of arm J; and in many places, such as testing the terminals of a magneto, or in testing a spark plug, it is impossible to get uninsulated contacts except at certain specific points on the line to be tested, and the distance between these uninsulated points is rarely the same. It will be further observed by reference to the drawings, that the spark gap between terminals O and P may be diminished or increased at will. The advantage of this arrangement is that spark gaps of varying sizes in the line to be tested may be accurately measured.

The operation of my device is as follows: Before beginning the test, the distance between terminals O and P should be set so as to approximately equal the distance between the spark plug terminals in the particular engine which is to be examined. This adjustment is made by screwing pin F, by means of handle G, whereby terminal P is brought closer to or farther from terminal O. Start the engine running, and open arm J away from pin F, after the manner of a divider compass. Press point M firmly against the cylinder head; and press cup K firmly on the end of the pin at the top of the spark plug of the said cylinder. Now observe whether any spark shows in spark space N between terminals O and P. If a strong spark shows in space N, then it will be evident that there is no short circuit between the spark plug terminals inside the engine cylinder; for the reason that if the spark plug were short-circuited, then the electric current would run through such short circuit in the spark plug, and would not travel against the higher resistance due to the air space between terminals O and P. If, on the other hand, a weak spark or no spark at all shows in space N, it is evident that the terminals of the spark plug inside the cylinder are short circuited to a greater or less degree, and that the electric current is traveling through this short circuited path of low resistance, in preference to leap-

ing the high resistance gap between terminals O and P. In like manner, by applying point M to a cylinder and placing hook L in contact with a wire near the cylinder, it can be determined whether any short circuit exists between the wire and the cylinder; and in like manner, the condition of the entire ignition system may be examined.

In case the distance between the spark plug terminals is unknown, said distance may be measured by means of my device. Start with terminals O and P very close together. Then (unless the spark plug is entirely short circuited) a spark will show between terminals O and P. Now keep increasing the gap between terminals O and P until the spark ceases to leap between them. The distance between terminals O and P will then equal or very closely approximate the distance between the spark plug terminals inside the cylinder. Similar measuring tests of the magneto and other portions of the ignition system may be made.

I claim:

1. In short circuit detectors, in combination an insulating casing, a spark space in said insulating casing, two insulated terminals in said spark space; means for forming an electrical connection between one of said terminals and one point of the circuit to be tested; means for forming an electrical connection between the other of said terminals and another point of the circuit to be tested, in such manner that the particular point of the circuit which is under examination shall be between the two electrical connections aforesaid; means for making the distance between the outer ends of the two terminal connections, greater or smaller at will.

2. In short circuit detectors, in combination an insulating casing, a spark space in said insulating casing, two insulated terminals in said spark space; means for forming an electrical connection between one of said terminals and one point of the circuit to be tested; means for forming an electrical connection between the other of said terminals and another point of the circuit to be tested, in such manner that the particular point of the circuit which is under examination shall be between the two electrical connections aforesaid; means for making the spark space between said terminals greater or smaller at will.

3. In short circuit detectors, in combination an insulating casing, a spark space in said insulating casing, two insulated terminals in said spark space; means for forming an electrical connection between one of said terminals and one point of the circuit to be tested; means for forming an electrical connection between the other of said terminals and another point of the circuit to be tested, in such manner that the particular point of the circuit which is under examination shall be between the two electrical connections aforesaid; means for making the spark space between said terminals greater or smaller at will; means for making the distance between the outer ends of the two terminal connections, greater or smaller at will.

4. In a short circuit detector, an insulated casing having an opening extending through one of its sides and two orifices extending from the opening to the outer wall of the casing, two electrodes disposed in the orifices respectively, a transparent member disposed around the casing and across the opening therein, means for connecting the electrodes with the circuit which is to be tested by points at a distance from each other, means for varying the distance between the outer terminals of the connecting means.

5. In a short circuit detector, an insulated casing having an opening extending through one of its sides, two orifices extending from the opening through the outer wall of the casing, two electrodes disposed in the orifices respectively, means for increasing or diminishing the gap between said electrodes at will, a transparent member disposed around the casing and across the opening therein, means for connecting the electrodes with the circuit which is to be tested by points at a distance from each other.

6. In a short circuit detector, an insulated casing having an opening extending through one of its sides, two orifices extending from the opening through the outer wall of the casing, two electrodes disposed in the orifices respectively, means for increasing or diminishing the gap between said electrodes at will, a transparent member disposed around the casing and across the opening therein, means for connecting the electrodes with the circuit which is to be tested by points at a distance from each other, means for varying the distance between the outer terminals of the connecting means.

7. In a short circuit detector, an insulated casing having an opening extending through one of its sides and two orifices extending from the opening through the outer wall of the casing, two electrodes disposed in the orifices respectively, a transparent member disposed around the casing and across the opening therein, a member having electrical connection with one of the electrodes, and an arm hinged to the member.

8. In a short circuit detector, an insulated casing having an opening which extends through one of its sides and two orifices which extend from the opening through the outer surface of the casing, two electrodes having inner and outer terminals respectively, disposed in the orifices respectively, the inner terminal of the electrodes being disposed in the opening, the two outer terminals extending beyond the casing, a handle secured to the outer terminal of one of the

electrodes, an electrically-conductive member secured between the handle and the casing, and an arm hinged to the member.

9. In a short circuit detector, an insulated casing having an opening which extends through one of its sides and two orifices which extend from the opening through the outer surface of the casing, two electrodes having inner and outer terminals respectively, disposed in the orifices respectively, the inner terminals of the electrodes being disposed in the opening and the outer terminals extending beyond the casing, a handle secured to the outer terminal of one of the electrodes, an electrically-conductive member secured between the handle and the casing, an arm hinged to the said member, a glass cylinder disposed around the casing and across the opening therein.

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Witnesses:
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