Apr. 3, 1923. 1,450,896

A. PACHE

MEANS FOR LOCATING TROUBLE IN IGNITION SYSTEMS

Filed Apr. 26, 1918 3 sheets-sheet 1

Fig. 1.

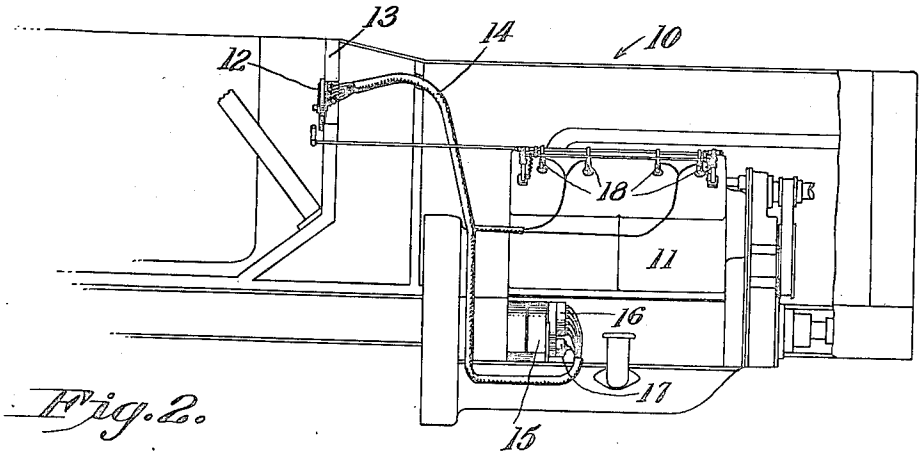
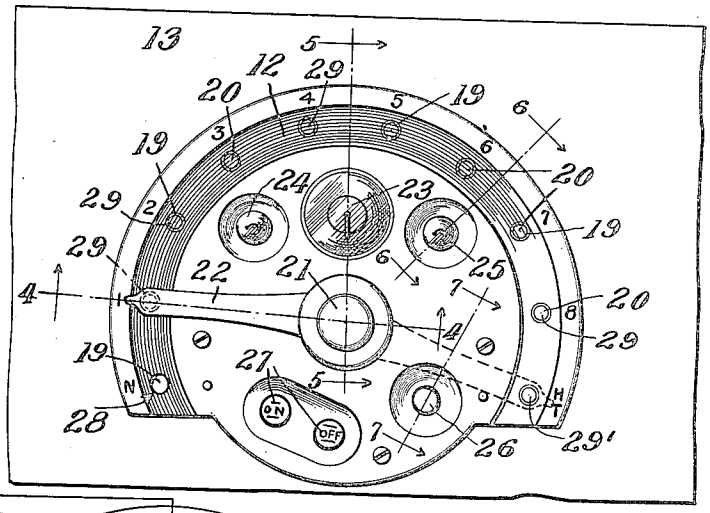


Fig. 2.



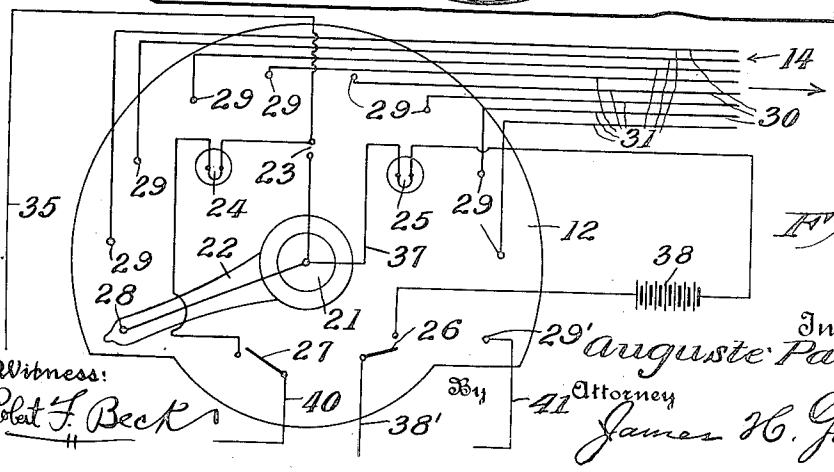


Fig. 8.

Witness:
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Inventor
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James H. Griffin

Apr. 3, 1923.

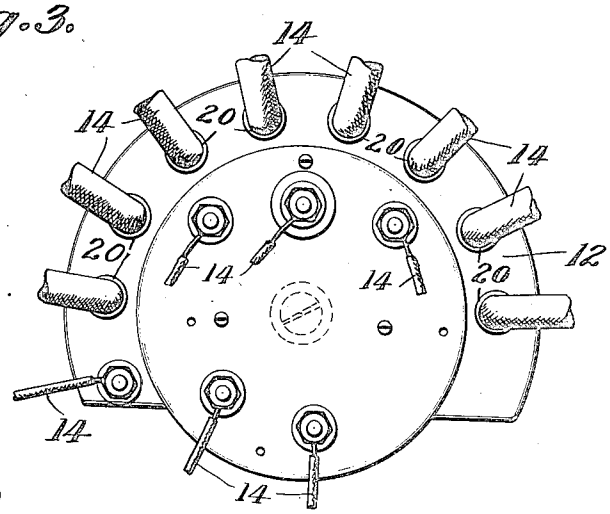
1,450,896

A. PACHE

MEANS FOR LOCATING TROUBLE IN IGNITION SYSTEMS

Filed Apr. 26, 1918 3 sheets-sheet 2

Fig. 3.



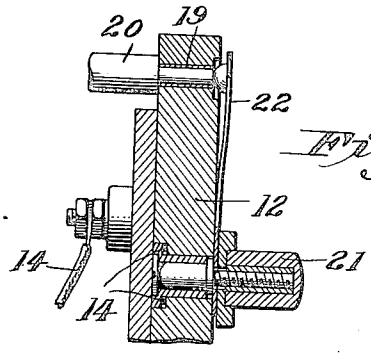


Fig. 4.

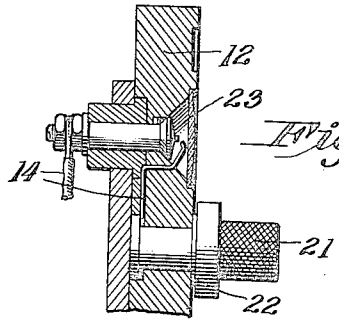


Fig. 5.

Fig. 6.

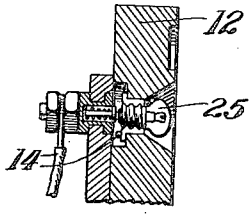
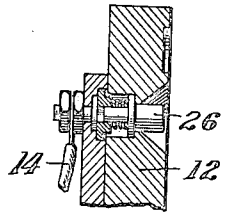


Fig. 7.



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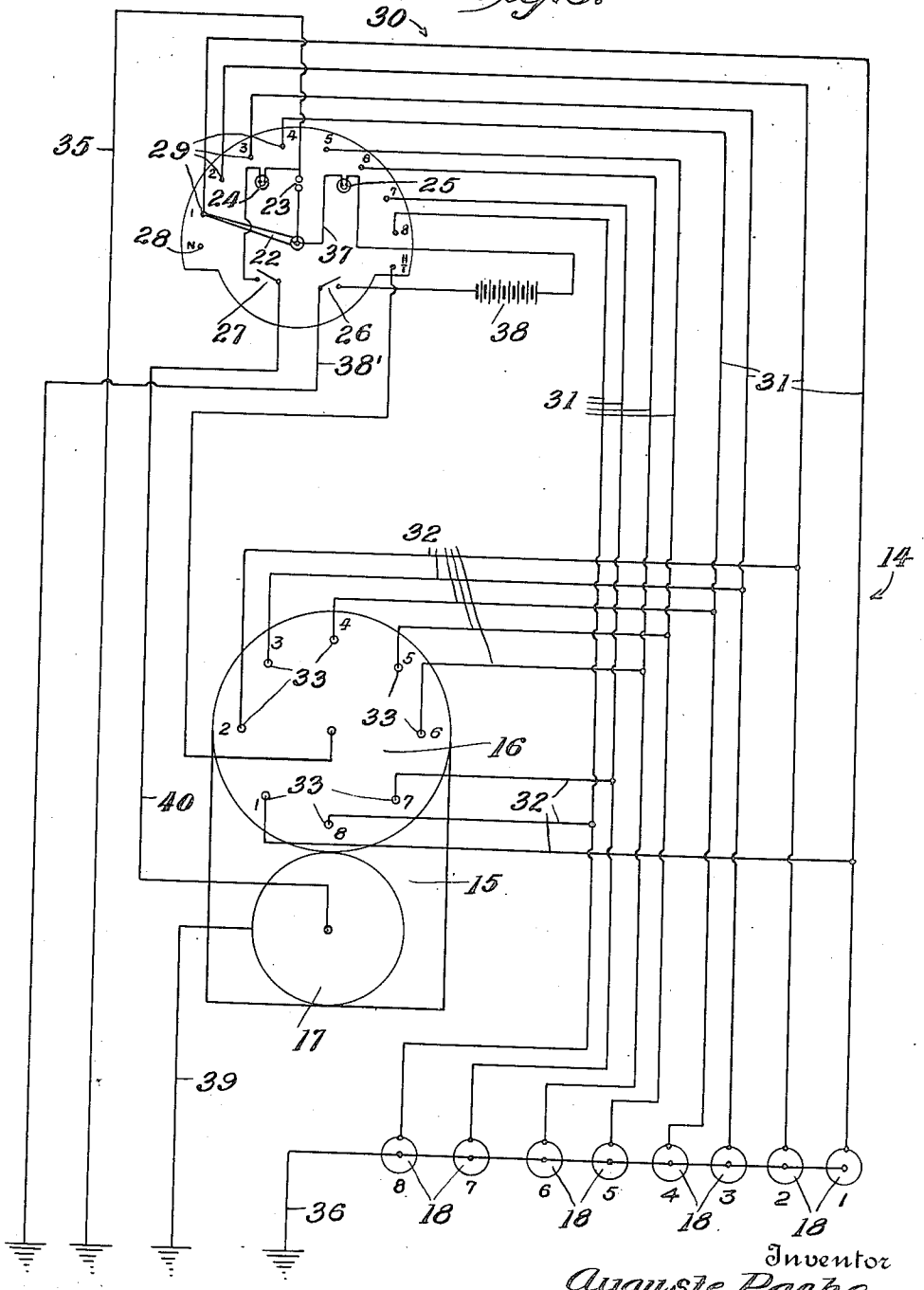
Apr. 3, 1923. 1,450,896

A. PACHE

MEANS FOR LOCATING TROUBLE IN IGNITION SYSTEMS

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Fig. 9.



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By Attorney
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Patented Apr. 3, 1923. 1,450,896

UNITED STATES PATENT OFFICE.

AUGUSTE PACHE, OF NEW YORK, N. Y.

MEANS FOR LOCATING TROUBLE IN IGNITION SYSTEMS.

Application filed April 26, 1918. Serial No. 230,975.

To all whom it may concern:

Be it known that I, AUGUSTE PACHE, a subject of Switzerland, residing in the city of New York, Borough of Manhattan, county and State of New York, have invented a certain new and useful Means for Locating Trouble in Ignition Systems, of which the following is a specification.

This invention is designed for use in aeroplanes, automobiles, boats and all other vehicles or carriers employing internal combustion engines, and has for its object the provision of an apparatus which will assist a driver in immediately locating trouble in the ignition system of such engine in an expeditious and efficient manner.

Among the main features of the invention, though not the exclusive ones, may be mentioned the following: To provide means whereby a person, whether he be skilled or unskilled, may quickly determine whether the ignition system of an engine is defective in whole or in part; means whereby definite knowledge as to the operativeness of any particular portion of the ignition system may be determined, and means whereby the failure of any portion of this system to operate may be quickly ascertained and the seat of such defect located.

A further feature of the invention is the provision of a device for locating trouble in the ignition system of an automobile, aeroplane or the like, while seated in a driver's seat and without necessitating the removal of the hood. This enables an aviator, for example, to determine, while seated in his machine, preliminary to making a flight, whether every part of his ignition system is operating properly, and should some part be defective, this will show up immediately so that corrections may be made before the plane leaves the ground.

Features of the invention, other than those specified, as well as the advantages thereof, will be apparent from the hereinafter detailed description, taken in conjunction with the accompanying drawings.

In the accompanying drawings, I have illustrated one practical embodiment of the invention, but the construction therein shown is to be understood as illustrative, only, and not as defining the limits of the invention.

Figure 1 is a side elevation of the ordinary type of eight cylinder automobile engine with the invention shown applied thereto;

Figure 2 is a front view of the switch-board;

Figure 3 is a rear view of the switch-board;

Figure 4 is a cross-section on line 4—4 of Figure 2;

Figure 5 is a cross-section on line 5—5 of Figure 2;

Figure 6 is a cross-section on line 6—6 of Figure 2;

Figure 7 is a cross-section on line 7—7 of Figure 2;

Figure 8 is an enlarged diagrammatic view showing the wiring of the switch-board; and

Figure 9 is a diagrammatic view showing the complete wiring system of this invention.

Referring to the drawings, 10 represents the ordinary type of automobile having an engine 11 assembled therein. 12 is the switch-board mounted on the dash 13, having the necessary wiring connections 14 to the magneto 15, distributor 16, interrupter 17 and spark plugs 18.

Referring to the switch-board 12, which may be mounted, as shown, or in any other convenient location, this is provided with a plurality of openings 19 having connecting plugs 20 inserted therein for the purpose of connecting switch-board 12 with a series of spark plugs 18 positioned on the engine 11. This switch-board 12 is further provided with a boss 21 to which is secured a contact arm 22 which also acts as a conductor for one of the circuits hereinafter to be described. Associated with this switch-board 12 is a spark gap 23, lights 24, 25, push-button 26 and an ordinary push-button switch 27, which are part of said circuits. The magneto 15 is of the usual type, embodying a distributor 16 and an interrupter 17 and is wired up with the various spark plugs 18 in the usual manner.

Distributor 16 is provided with the usual leads 32, one of which passes to each of the plugs in the usual manner, but each of said leads 32 is provided with a branch wire 31, as shown in Figure 9, which leads to switch board 12, and has the plug connection 20 for electrically connecting each secondary lead

31 to one of a plurality of contacts 29 arranged in annular relation to the axis of oscillation of the arm 22 and shown in Figures 2 and 9 of the drawings as numbered 1 to 8 inclusive, to correspond with the 8 cylinders of the internal combustion engine with which the device is here shown as associated. The switch board 12 is preferably formed of insulating material to insulate arm 22 from the "ground", but said arm is electrically connected to a terminal of the spark gap 23, while the other terminal of said spark gap is grounded as shown in Figure 9. The arm 22 may thus be said to be grounded through the spark gap 23. Thus if the arm 22 is rotated to engage with one of the contacts 29, through manipulation of the boss 21, and said contact 29 is the contact corresponding to cylinder No. 1, the position of the parts will be as shown in Figure 2, and as the engine turns over, and operates the magneto, the circuit instead of being delivered from the distributor 16 directly to the plug will be shunted through the corresponding secondary lead 31 to contact 1 of the switch board, through arm 22, and jump the gap 23 to the ground. This jumping of the gap 23 will be readily visible to the operator, and he will know thereby that the lead corresponding to cylinder No. 1 is functioning properly. In like manner, the arm 22 may be brought into engagement with any one of the contacts 1 to 8 for the purpose of trying the several leads from the distributor. In this regard it will be noted that the gap 23 is of smaller dimensions than the gap at the spark plugs 18, so that the current will jump the gap 23 before jumping the gap of the plugs. The switch board 12 is also provided with a lamp 24, one side of which is grounded through the ground wire 35, and the other side of which is connected through wire 40 to the primary circuit at the interrupter 17. In wire 40 is included the push button mechanism 27 for controlling the lamp circuit. If it is desired to ascertain whether or not the primary of the magneto is functioning properly, the switch 27 may be closed and if current is flowing through the primary, the lamp 24 will be illuminated. If it is not illuminated when the push button is closed, the operator will know that the primary of his magneto is dead.

Also included in the switch board is another lamp 25 included in a circuit energized by battery 38. One terminal of the battery is grounded through wire 38′, including a switch 26. The other terminal of the battery is connected through a wire 37, which, includes lamp 25, to the arm 22. Should any one of the plugs be short circuited this can be readily ascertained by pressing the button 26 and moving the arm over the contacts 1 to 8 inclusive of the switch board. As soon as the arm 22 engages with the contact corresponding to the plug which is grounded, the circuit of the lamp 25 will be completed through the grounded plug and the lamp will be illuminated. Thus, an operator can readily locate a short circuited plug, whether such short circuit be due to faulty installation, carbon in the plug or a cracked porcelain. The switch board 12 is further provided with the contact 29′, which is connected by a wire 41 directly to the high tension lead at the distributor. If the arm 22 is rotated to a position to engage with the contact 29′, the secondary of the magneto will be grounded through wire 41, contact 29′, arm 22 and wire 35, but sparks resulting at the gap 23 in such circuit will advise the operator that his secondary is functioning properly. If the sparks do not appear on the gap 23 when the circuit is established as described, the operator will know that the high tension system of the magneto is defective.

The switch board is, in practice, placed on the dash or on the instrument board of the vehicle or carrier with which the engine is associated, and is within easy access and sight of the driver or pilot, and it will thus appear that the person can readily determine whether the ignition circuit of the engine is in proper working order or, if it is not, is enabled to definitely locate the seat of the trouble. For example, if an engine fails to start, it is not necessary for the chauffeur to begin to over-haul the engine and take down the magneto in order to find out that he has a grounded primary in the magneto, and that a new magneto will be necessary. Neither is it necessary for him to test all of the plugs to find out that one is faulty. He can start his test either from the plugs back or from the primary forward by simply manipulating the switch board without leaving his seat in the vehicle. This may be done in the following manner, using, for example, an automobile.

Step on the starter and press the button 27. If a light shows in the lamp 24, the primary is all right. Release push button 27 and move the arm 22 to engage with contact 29′. This will give him a test of a secondary up to the distributor since if such secondary is all right sparks will show at the gap 23. Now move the arm 22 over the contacts 1 to 8. If no spark shows at the gap 23 while the arm is in engagement with any of said contacts, it is pretty clear that the trouble lies in the distributor. However, if the engine starts and it is found that one or more cylinders are missing, the movement of the arm 22 over the contacts 1 to 8 will produce sparks at the gap 23 if the various leads from the distributor are conveying current to the plugs. However, if one of the leads is grounded or a plug short circuited, the spark

will not show up at the gap 23 when the arm is in engagement with the corresponding contact on the switch board. This will immediately suggest to the operator that there is a ground in this portion of the circuit and he may readily substantiate his belief by leaving the arm 22 in position, and pressing on the button 26. If there is a ground or short circuit in the circuit of this particular plug, the light 25 will immediately come to view.

The present invention is susceptible to further manipulations for determining more uncommon troubles, but it is not considered necessary to enumerate them here as the foregoing will clearly render the operation of the invention well understood by those skilled in the art to which the invention pertains.

It will be apparent that the present invention fills a long felt want in that it will accurately and quickly locate ignition troubles of an internal combustion engine without necessitating minute manual inspection of the constituent parts of the engine or the circuits. After trying out an engine through the manipulation of the switch board as described, the operator will, if there is a defect in the system, know before he raises the hood just where to look for the trouble. Manifestly, this is a remarkable expedient as a time saver since it saves hours of arduous labor, particularly in the more complex ignition systems to locate the seat of trouble therein through the dismantling of parts of the system in the old and well known way.

It will be understood that slight changes may be made in the invention described, such as the substitution of equivalents, without departing from the spirit or substance of the invention, the scope of which is commensurate with the appended claims.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is:

1. An ignition system embodying a source of current supply, a plurality of spark plugs and leads from the magneto to the respective plugs, in combination with means for locating trouble in said system embodying a single spark gap, unitary means for selectively including the spark gap in any of the plug circuits, a signal, and means for including said signal in the primary circuit of the magneto.

2. An ignition system embodying a source of current supply, a plurality of spark plugs, and leads from the magneto to the respective plugs, in combination with means for locating trouble in said system embodying a visual signal common to all the spark plug leads, unitary means for selectively placing said visual signal into operative relation with any one of said leads to the exclusion of the remainder of said leads, another signal, and manually operable means for momentarily including said other signal in the primary circuit of the magneto.

3. An ignition system embodying a source of current supply, a plurality of spark plugs, and leads from the magneto to the respective plugs, in combination with means for locating trouble in said system embodying a visual signal, unitary means for selectively interposing said visual signal into the circuit of any one of the spark plug leads, another signal, and means for including said other signal in the primary circuit of the magneto.

4. An ignition system embodying a high tension magneto, a plurality of spark plugs, and circuits from the magneto to each of said plugs, in combination with visual signaling means, and means for selectively including, at the will of the operator, said visual signaling means in any one of the plug circuits, in a high tension lead of the magneto, or in the primary circuit of said magneto.

5. An ignition system embodying a source of current supply, a plurality of plugs, leads from the source of current supply to the respective plugs, a single spark gap, and unitary means for including the spark gap in the plug leads to test the source of current supply and the chosen lead, in combination with a battery circuit embodying a signal, and means for including in the battery circuit any particular plug and its lead, for the purpose of locating grounds or short circuits.

6. An ignition system embodying a magneto, a spark plug, and a lead from the magneto to the spark plug, in combination with an electrically operated signal, and means for diverting the current in the primary winding in the magneto to flow through and operate the signal for the purpose of ascertaining the operativeness of the primary winding independently of the plug lead.

7. An ignition system embodying a high tension magneto, a plurality of plugs, and leads from the magneto to the respective plugs, in combination with electrically operated visual signaling means, and means for including said signaling means in either the high or low tension circuits of the magneto, for the purpose of determining the operativeness of said circuits.

8. An ignition system embodying a high tension magneto, a plurality of spark plugs, and circuits from the magneto to the spark plugs, in combination with signaling means, and means for including said signaling means in any of the spark plug circuits, or directly into the high tension or low tension circuits of the magneto, for the purpose of locating defects in said circuit.

9. An ignition system embodying a high tension magneto, a plurality of spark plugs, and circuits from the magneto to the spark plugs, in combination with signaling means,

means for including said signaling means in any of the spark plug circuits, or directly into the high tension or low tension circuits of the magneto, for the purpose of locating defects in said circuit, and an electric signaling circuit adapted to be completed through any of the plugs for the purpose of locating grounds or short circuits in said plugs.

10. An ignition system embodying a source of current supply, a plurality of spark plugs, circuits connecting the spark plugs with the source of current supply, and a plurality of switch contacts, one of which is electrically connected with each plug circuit, in combination with a switch grounded through a connection provided with a signal, said switch being manually operable to selectively engage with any one of said contacts, to short circuit the corresponding plug through the signal, whereby the person manipulating such switch may ascertain the operativeness of the circuits of the respective plugs, and an electrical signaling circuit adapted to be completed through any one of the plug circuits for locating grounds and short circuits therein.

In testimony whereof, I have signed my name to this specification.

AUGUSTE PACHE.