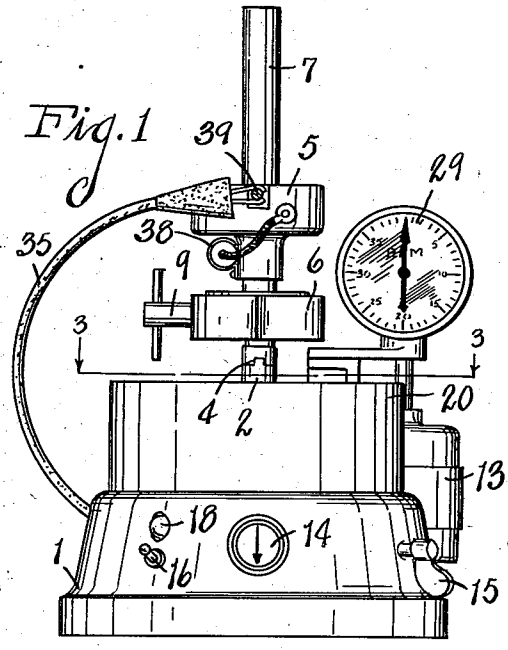
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DISTRIBUTOR TESTING APPARATUS

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Fig. 1



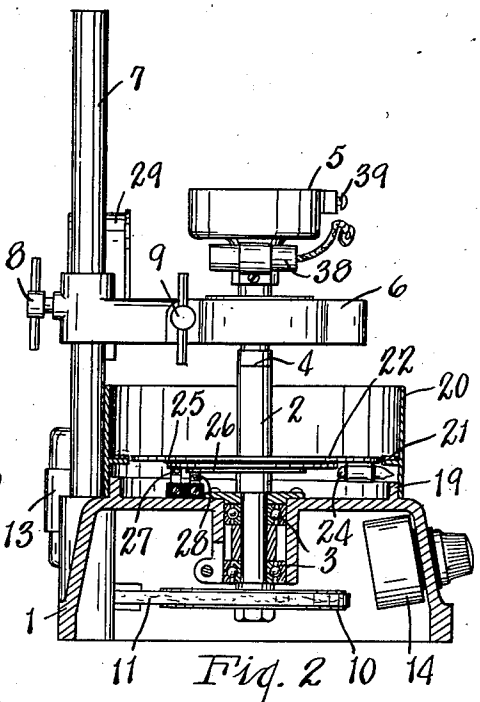


Fig. 2

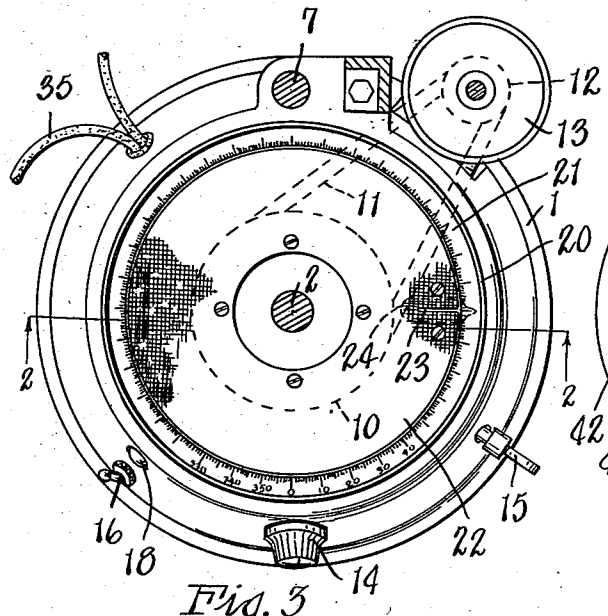


Fig. 3

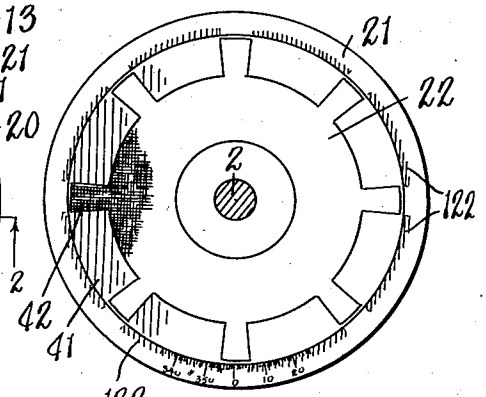


Fig. 4

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DISTRIBUTOR TESTING APPARATUS

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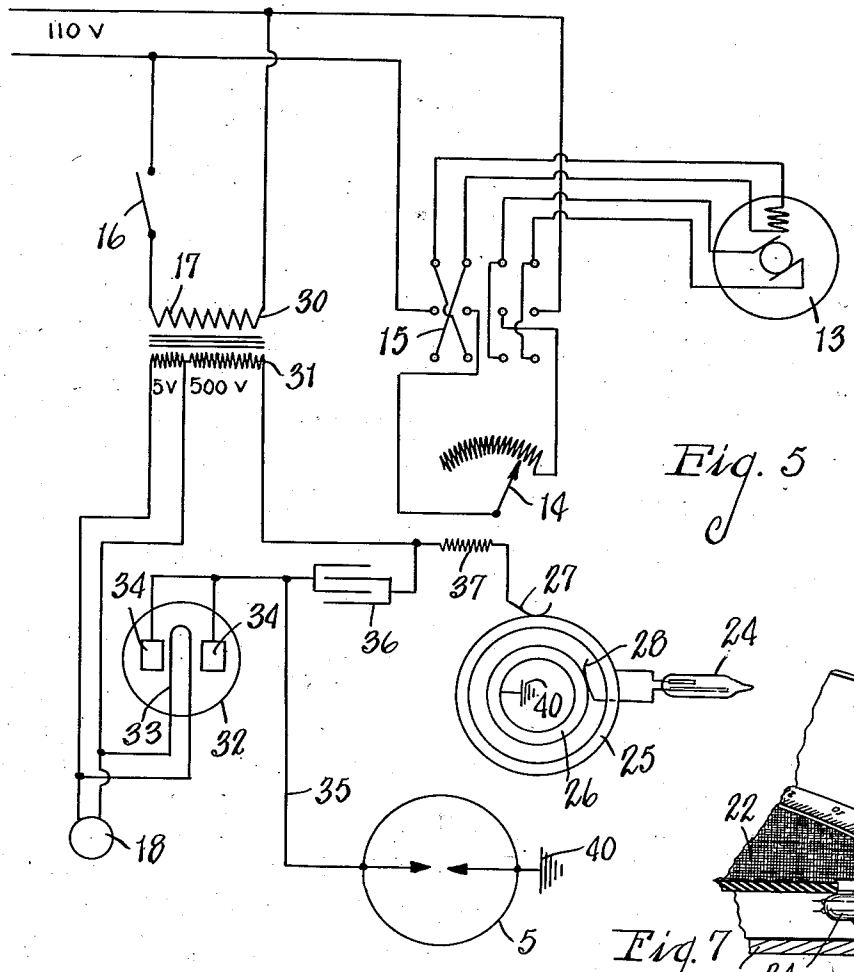


Fig. 5

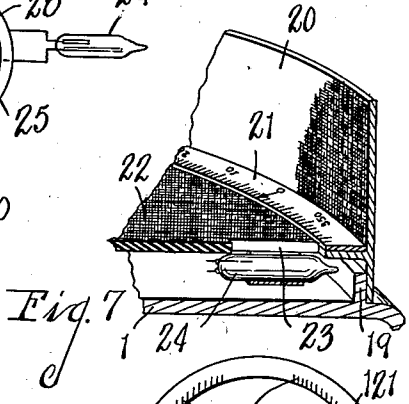


Fig. 7

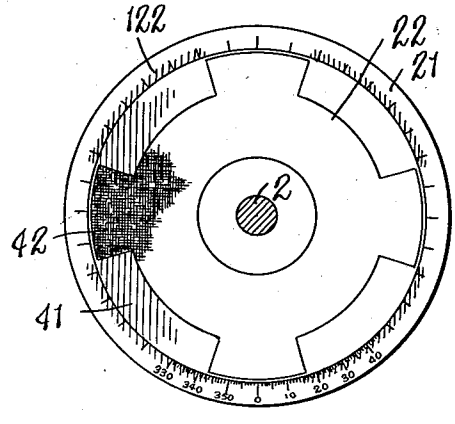


Fig. 6

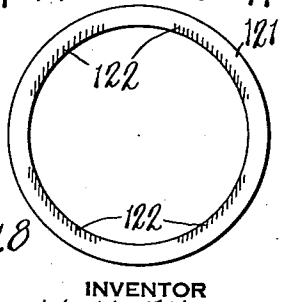


Fig. 8

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DISTRIBUTOR TESTING APPARATUS

Gerald H. Allen, Kalamazoo, Mich., assignor to Allen Electric & Equipment Co., Kalamazoo, Mich.

Application April 11, 1934, Serial No. 720,039

4 Claims. (Cl. 177—311)

This invention has for its objects:

First, to provide an improved apparatus for testing the breaker mechanisms of distributors of internal combustion engines.

Second, to provide such an apparatus in which a neon tube may be used most effectively to determine the length of time that the dwell of the cam of the breaker energizes the primary coil of the spark coil of an engine and the timing of the making and breaking without any error that results from viewing such an apparatus at an angle when the neon tube is revolved in ordinary apparatus of this sort.

Third, to provide such an apparatus with improved means for energizing the neon tube.

Fourth, to provide such an apparatus with cheaper, more efficient means for energizing the neon tube that may be run from ordinary 110 volt, alternating current.

Other objects and advantages pertaining to details of construction and operation will appear from the description to follow. A preferred embodiment of my invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a front view of my apparatus with a breaker mechanism in place for testing.

Fig. 2 is a view partly in section taken on line 2—2 of Fig. 3.

Fig. 3 is a plan view partly in section taken on line 3—3 of Fig. 1.

Fig. 4 is a view showing the pattern made by the revolving neon light when my apparatus is in operation testing the breaker mechanism for an eight-cylinder car.

Fig. 5 is a wiring diagram.

Fig. 6 is a view similar to Fig. 4 showing the pattern for a four-cylinder car.

Fig. 7 is a detail sectional view of the neon tube and its mounting.

Fig. 8 is a protraction ring for use in testing a particular engine.

Referring to the drawings, 1 is the base having journaled therein an upright shaft 2 supported in ball bearings 3 and having at its upper end a clutch 4 adapted to engage and drive the breaker mechanism to be tested, shown here at 5. The breaker mechanism is supported in a bracket 6 slidable on an upright support 7 and held adjustably by a set screw 8. Set screw 9 clamps the breaker head in position for driving.

At the lower end of shaft 2 is pulley 10 connected by a belt 11 to a pulley 12 of an electric motor 13 which may be of any suitable type, preferably an alternating current motor, which may be connected to an ordinary 110 volt alternating current. On the base 1 provide a rheostat 14 to control motor speed and a reversing switch 15 to permit driving the distributor in either direction, depending upon the make of internal combustion engine.

16 is a switch controlling current to the transformer 17. 18 is a tell-tale lamp adapted to indicate whether or not the current is on. A cylindrical flange 19 extends upwardly from the base around the shaft 2. A cylindrical shell 20 is slidably mounted on the flange 19 surrounding shaft 2 and has projecting from the inner walls thereof a flange 21 on which is laid out a protractor scale of 360°.

Mounted on the shaft 2 is a bakelite disk 22 positioned so that its upper face is substantially flush with the protractor scale of the flange 21. The disk 22 is keyed or otherwise fastened to the shaft 2 to be driven therewith and has at its periphery a radial slit 23.

A neon tube 24 is mounted on the back of the disk 22 and in register with the slit 23 so that when the tube is lighted, the slit 23 is illuminated.

On the under side of the disk 22 are distributor rings 25 and 26 having brushes 27 and 28 contacting therewith to supply current to the neon tube 24. I have illustrated only single brushes for each tube but have found that it is desirable to have two brushes for each ring so that a steady glowing of the neon tube is assured when current is flowing to the rings and thence to the tube. It would be possible to eliminate one of the brushes and ground the circuit of the tube through the bearings of shaft 2, but I have found that there is apt to be some slight interruption of the current which renders it unsuitable for the testing use if this type of ground is used.

29 is a tachometer to show the speed of revolution of the breaker mechanism 5. In this instance the tachometer is driven directly by the motor and the motor drives the distributor through a four to one ratio of pulleys. It will be understood that revolutions per minute can be recorded on the tachometer or that engine speed could be recorded if desired.

The motor 13 is provided with a rheostat 14 shown in Fig. 5 and a reversing switch 15 also shown, all connected to 110 volt, alternating current such as the usual house supply lines. The transformer 17 is connected in parallel with the motor and is likewise connected to the 110 volt, alternating current, the current passing through its primary coil 30. The secondary coil 31 is of a sufficient number of coils to produce

about five hundred volts, although a smaller voltage could be produced.

I provide in series with the secondary of the transformer a rectifier tube **32** which may be of any desired type. I have found that a half-wave rectifier may be used. The details of this rectifier form no part of the invention and it need not be described in full.

The tell-tale lamp is run from the secondary of the transformer, as shown in the diagram, with about five volts. This current also goes to one filament **33** of the rectifier tube which is also supplied with plates **34**. I provide, as shown at **35**, means for connecting the breaker mechanism of the distributor in series with the rectifier and secondary of the transformer and also in series with the neon tube **24**. A condenser **36** is used to bridge the circuit of the rectifier and the secondary of the transformer and forms a circuit in which the neon tube **24**, the condenser **36** and the breaker mechanism **5** are in series circuit relationship, the operation of the device being that the condenser discharges through the breaker mechanism and the tube when the rectifier is not delivering current to the tube and breaker mechanism.

I place a resistor **37** which in this instance is about a five thousand ohm resistor to prevent overtaxing of the neon tube **24**. The rectifier used by me is the usual half-wave type and I have found that this is satisfactory if a condenser of a size to maintain the uni-directional current through the tube and breaker is used. If a full wave rectifier is used, a smaller condenser is possible. I do not wish to limit myself to any size of condenser other than to indicate that one sufficient to maintain a constant voltage of the uni-directional current is used.

In the operation of my device, the breaker mechanism **5** is mounted in the clamp **6** and connected by clutch **4** to the shaft **2**. The condenser **38** of the breaker mechanism is disconnected, as shown in Fig. 2 and the connection **35** is connected to the pole **39** of the breaker mechanism. The other side of the breaker mechanism is grounded through the machine, as is indicated conventionally at **40**, see Fig. 5. The motor is then driven at a speed to drive the distributor at what compares to driving speed. The disk **22** revolves and as it revolves the breaker mechanism alternately turns on and shuts off the neon tube **24** which, being rotated, illuminates the rotating disk as shown in Fig. 4 for an eight cylinder engine or in Fig. 6 for a four cylinder engine, the parts indicated at **41** appearing to be bands of light and the parts **42** appearing dark. By adjusting the protractor scale on the flange **21** by sliding the cylindrical shell **20** around the revolving disk, the bands of light may be arranged to appear opposite 0°, 45°, etc. in a breaker for an eight cylinder engine, or 0°, 90°, etc. for a four cylinder engine, as is well understood by those skilled in the art. The length of time that the breaker contacts or closes can be determined by the length of the bands of light. This permits analysis of the dwell of the points and is an indication of how well the breaker is functioning to energize the primary coil of the spark coil of the engine. All of this is well known in the art and does not need description. My improvement has made possible a more accurate study of this condition because the slit **23** is in substantially the same plane as the protractor scale so that it is not necessary for one desiring a reading to be directly above the apparatus. In some former installations the neon tube is mounted in a plane different from and considerably removed from the plane of the protractor scale which leads to inaccurate readings. In my apparatus I also produce a direct current for the neon tube, which is essential in this type of testing, in a very cheap manner utilizing the ordinary alternating current with a very cheap and most efficient rectifying means, which not only rectifies the current but maintains it constant so that there will not be bands of light caused by the wavering of the neon tube.

I have found that in practice it is difficult to use a protractor marked in degrees because the mechanic operating the apparatus has to do a certain amount of figuring to determine whether or not the neon tube remains lighted for equal portions of the trip. I have also found that the breaker mechanism in various engines must have different dwells, and to simplify the use of the apparatus I provide a protractor ring **121** as shown in Fig. 8, in which segments **122** are colored to represent the pattern that the rotating neon lamp should make when the distributor to be tested is set properly. I have shown the segments colored red with the rest of the ring black or any suitable color to indicate the portions where the neon tube is not lighted. In use this ring is placed inside of the shell **20** on the flange **21** and is moved around until the colored segments **122** are in register with the pattern made by the rotating flashing neon tube. By a simple glance it is possible to tell whether all lobes of the breaker cam are properly shaped or whether they have become worn. It is also possible to tell whether the mechanism is properly set to give the proper length of make and break.

In practice it is desirable to have the protractors **121** representing the various engines most likely to be tested so that the operator merely has to select a disk to correspond with the engine of which the breaker mechanism is being tested.

In Fig. 6 I have shown the alternating colored segments on the protractor **21** on which the degrees from zero to 360° are laid out along with the colored segments.

I have described my invention in the embodiment preferred by me and wish to claim the same broadly as well as specifically, as pointed out in the appended claims.

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

1. In a device of the class described, the combination of a shaft, means for driving said shaft, means for supporting the breaker mechanism of a distributor of an internal combustion engine to be tested and means for engaging and driving said breaker mechanism from said shaft, a disk mounted on said shaft to rotate therewith and below said means for supporting said breaker mechanism and having a narrow radial slit therein, a neon tube mounted on the back of said disk and in register with said slit, a protractor scale around and substantially flush with the face of said disk, means for supporting said protractor scale, a source of current for said tube, and means to connect the breaker mechanism of the distributor to be tested in circuit relationship with said source of current and said tube to control the lighting of the tube by the

make and break of the breaker mechanism of the distributor.

2. In a device of the class described, the combination of a rotatable disk having a narrow radial slit therein, means supporting said disk, a neon tube mounted on the back of said disk and in register with said slit, a protractor scale substantially flush with and around the face of said disk, means supporting said scale, means for mounting the breaker mechanism of a distributor to be tested above said disk and means for driving said breaker mechanism and for rotating the disk in synchronism with said breaker mechanism, means to supply current to said tube, and means to connect the breaker mechanism in circuit relationship with said source of current and said tube to control the lighting of the tube by the make and break of the breaker mechanism of the distributor.

3. In a device of the class described for testing breakers of distributors of internal combustion engines in which device the breaker to be tested is supported above a rotating disk and driven in synchronism with the disk, means for supporting the breaker mechanism to be tested, said rotatable disk having a narrow radial slit therein, means supporting said disk, a neon tube mounted on the lower side of said disk and in register with said slit, a protractor scale substantially flush with said disk, means supporting said scale, and means for lighting said tube under control of the breaker to be tested, and means for rotating said disk.

4. In a unit of the class described for testing the breaker of a distributor of an internal combustion engine, the combination of a support for the breaker to be tested, a neon tube, means for supporting said neon tube for revolution about an axis, an alternating current motor for driving said breaker and for driving said neon tube supporting means in synchronism with said breaker, whereby said tube will revolve about said axis in synchronism with said breaker, a transformer, a rectifier, means to connect the breaker to be tested in series circuit relationship with said neon tube, said rectifier and the secondary of said transformer, and a condenser bridging the circuit of the rectifier and the secondary of the transformer to form a circuit in which said condenser and neon tube are in series circuit relationship with said breaker to be tested, whereby the operation of the breaker controls the lighting of the neon tube.

GERALD H. ALLEN.