Sept. 23, 1952 M. J. ZIRIN 2,611,837

TIMING ANGLE INDICATOR FOR AUTOMOTIVE ENGINE DISTRIBUTORS

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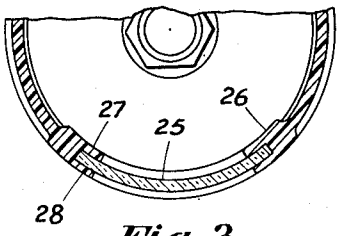


Fig. 3

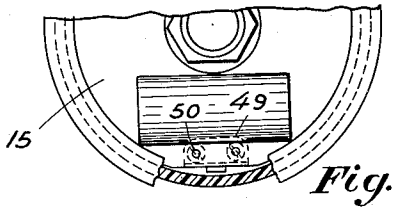


Fig. 6

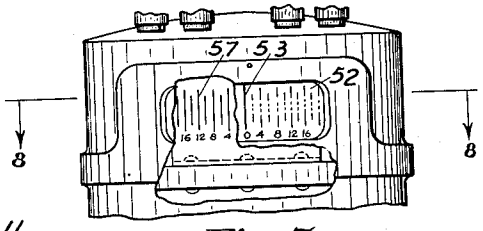


Fig. 7

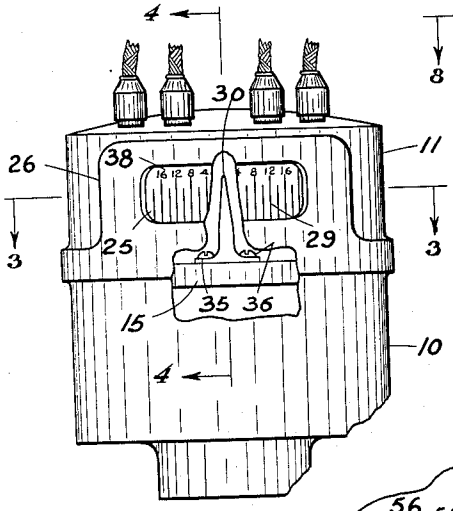


Fig. 1

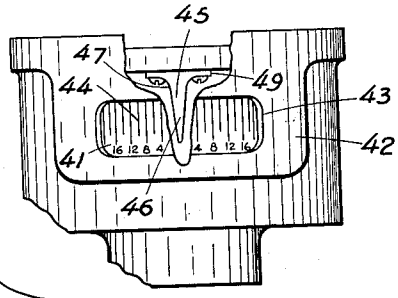


Fig. 5

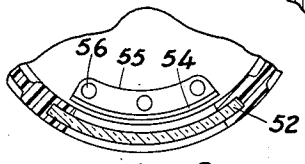


Fig. 8

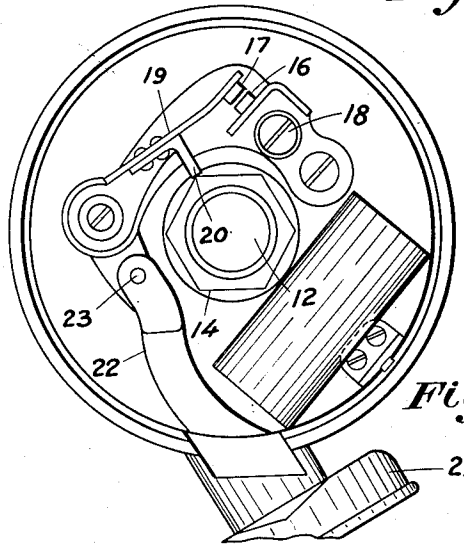


Fig. 2

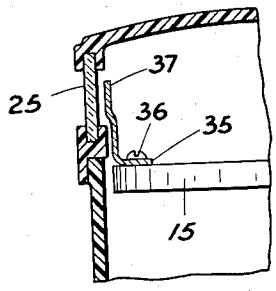


Fig. 4

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TIMING ANGLE INDICATOR FOR AUTOMOTIVE ENGINE DISTRIBUTORS

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Application July 17, 1951, Serial No. 237,113

10 Claims. (Cl. 200—19)

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This invention relates to distributors for multi-cylinder automotive engines, and is particularly directed to distributors, in conjunction with which an automatic centrifugal governor-controlled, or an automatic engine vacuum-controlled device, or both, are provided to advance and retard the timing of the ignition, by adjusting the angular position of the plate on which the breaker points are mounted, in accordance with the engine speed, and the load under which it is operating.

The adjustment and setting of the breaker point support plate, relative to the central cam, mounted on the distributor shaft, in order to obtain the proper spark advance for the requirements of maximum engine performance, normally require a high degree of skill on the part of the person making the adjustment, and usually require special instruments and equipment to determine the adjusted position.

In order to make the adjustments, it is necessary to remove the distributor cap from the case, when renders the distributor inoperative for the period during which the adjustments are made.

To enable a person of ordinary skill to check the angular position of the breaker point support plate, while the engine and distributor are in operation, I have provided an indicator mechanism which is incorporated in the distributor, to enable an operator to readily observe the angular position of the breaker point support plate, relative to either the distributor cap, or the case in which the distributor is mounted, so that the required angular adjustment can be gaged while the engine is in operation.

This enables the operator to remove the distributor cap, make the necessary angular breaker point support plate adjustments, after which the cap may be replaced and the adjusted position rechecked on the indicator, when the engine is again placed in operation.

The object of my invention is to provide a timing angle indicator, which may be incorporated in the conventional type of automotive engine distributor, to enable a person of ordinary skill to observe the angular position of the breaker point support plate, and therefore the degree of spark advance, while the engine is in operation.

A further object is to provide a timing indicator on the conventional type of distributor, which will enable the distributor to operate in its normal manner.

Another object is to provide a graduated indicator window in the distributor cap, or case, together with an indicating device, which can be

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produced at relatively low cost, and installed and adjusted by persons of ordinary skill.

A further object is to provide an indicating device, which can be incorporated in a wide range of distributor types and sizes, the essential features of the indicator being the same.

A primary object is to provide an indicating device, which is adaptable in its construction so that it can be mounted in the proper angular position, relative to the cap or case, without interfering with the operation of other parts of the distributor.

Another object is to provide an indicating device which can be used in conjunction with a distributor, fitted with a vacuum-controlled or governor-controlled automatic spark advance unit, or both, or other similar type of spark advance control unit, without interfering with the operation of the automatic spark position control, after the initial adjustment and setting is made.

The accompanying drawings, illustrative of one embodiment of my invention, and several modifications thereof, together with the description of their construction and the method of installation, operation, and adjustment thereof, will serve to clarify further objects and advantages of my invention.

In the drawings:

Fig. 1 represents a front elevation, partly broken away, of a distributor assembly with a window insert mounted in the cap.

Fig. 2 is a plan view of the distributor case assembly, shown in Fig. 1, with the cap removed.

Fig. 3 is a section through the cap and the window insert of Fig. 1, taken at 3—3, Fig. 1.

Fig. 4 is a vertical section through the window and a modification of the pointer, shown in Fig. 1, taken at 4—4, Fig. 1.

Fig. 5 is a front elevation, partly broken away, of a modification of the distributor, shown in Fig. 1, with the window insert mounted in the case.

Fig. 6 is a plan view of the breaker point support plate and the case, shown in Fig. 5, showing the pointer attached to the plate.

Fig. 7 is a front elevation of a portion of a modification of the distributor cap, shown in Fig. 1.

Fig. 8 is a section through the distributor cap of Fig. 7, and a partial plan view of the breaker point support plate, with an indicator segment attached thereto.

It will be understood that the following description of the construction and operation of

the timing angle indicator for automotive engine distributor, is intended as explanatory of the invention and not restrictive thereof.

In the drawings, the same reference numerals designate the same parts throughout the various views.

One embodiment of the distrbutor construction, shown in Figs. 1, 2 and 3, may be mounted in a substantially cylindrical hollow case **10**, made of a plastic material.

A cylindrical hollow cap **11**, made of the same material, may be removably fitted to the open end of the case, a plurality of latches being provided to retain the cap on the case.

A distributor shaft **12** may be rotatably mounted in the center of the case, as indicated in Fig. 2, the shaft being generally driven at one-half engine speed by a gear train driven by the engine crankshaft, in the usual four-stroke cycle engine.

A cam **14**, may be mounted on the distributor shaft, to open and close the breaker points, when each cylinder reaches its firing position, the number of lobes on the cam corresponding with the number of engine cylinders.

A substantially circular plate **15**, made of metal, a plastic material, or a combination thereof, may be mounted in the case, around the distributor shaft, the plate supporting the breaker points **16** and **17**.

The relatively fixed breaker point **16**, may be adjustably mounted on the plate by a bracket, an adjusting screw **18**, being provided to enable the relatively fixed breaker point to be moved, to adjust the gap formed in the open position between the fixed and the movable breaker points.

The movable breaker point **17**, may be attached to the plate by a pivoted arm **19**, one end of which is attached to the plate, with the breaker point mounted at the opposite end in axial alignment with the fixed breaker point.

The breaker point arm is moved into the open position by a cam follower **20**, attached to the arm, which engages the lobes of the cam to open and close the movable breaker point. The angular position of the cam follower **20**, controlling the movement of the breaker point **17**, relative to the cam, which controls the angular position of the engine crankshaft, at which the mixture in the cylinder is ignited, is adjusted by angularly moving the breaker point support plate **15** about the shaft.

In most distributors in use at the present time, automatic means are provided, either within the distributor or connected thereto, for angularly moving the breaker point support plate to advance or retard the spark, co-ordinated with the engine speed and the load imposed on it.

For advancing the spark with increases in engine speed, a centrifugal or other suitable type of governor may be mounted within the distributor case, under the plate **15**, the governor being connected to the plate to adjust the angular plate position, thereby advancing or retarding the point of ignition in co-ordination with an increase or decrease in engine speed. In an engine in which the crankshaft is rotated in the normal direction, the distributor plate is moved clockwise to retard the point of ignition, and counterclockwise to advance it.

In order to compensate for variations in engine load, a vacuum operated unit **21**, as indicated in Fig. 2, may be provided to supplement the governor, to retard the spark when the engine load is increased, and advance it when the load is decreased, the unit being controlled by the vacuum created in the intake manifold. A connecting arm **22**, or other suitable type of connection, may be provided between the vacuum unit and the breaker point plate, the opposite end of the arm being pivotally attached to the breaker point plate, or a bracket, attached thereto, by a rivet **23**, a screw, or other suitable attaching means, to adjust the angular position of the plate under control of the vacuum formed in the intake manifold.

In order to observe the angular position of the breaker point support plate **15**, relative to the case, a window **25**, of arcuate contour, conforming to the contour of the outer wall of the cap **11**, may be molded into, or otherwise supported in an opening formed in the outer wall of the cap, as indicated in Figs. 1 and 3. The window may be made of glass, a transparent plastic material, or other similar transparent material.

A border **26**, of increased wall thickness, may be formed integral with the vertical wall of the cap, a pair of frame flanges **27** and **28**, formed integral with the inner and outer faces of the wall border respectively, forming a pair of frames, which support the window **25**, which may be molded in place, between the flanges, in the manner indicated in Figs. 1 and 3.

In place of the forward frame flanges **28**, shown in Fig. 3, a detachable rectangular frame may be substituted, the frame being attached to the wall border by a plurality of screws, or other suitable attaching means, to retain the window in place.

A plurality of equally-spaced angular graduations **29**, may be engraved, or otherwise inscribed on the outer surface of the window **25**, to indicate the angular position of a pointer **30**, which may be attached to the outer circumference of the breaker point support plate **15**.

The pointer **30**, shown in Figs. 1 and 4, may be made of thin sheet metal, with a narrow vertical section, tapered at the top, with a flange **35**, formed substantially perpendicular to the plane of the vertical section of the pointer, and integral therewith, mounted on the upper or lower surface of the breaker point plate. A plurality of screws **36**, passing through openings formed in the flange and threadably inserted in the plate, or rivets, or other suitable attaching means, may be utilized to attach the pointer flange to the plate.

The tapered upper tip **37**, of the vertical section of the pointer, shown in Figs. 1 and 4, may be bent outward substantially parallel to the lower portion thereof, to move the pointer closer to the inner surface of the window, in the manner indicated in Fig. 4.

In a modification of the pointer construction, the pointer **30** may be made in the form of a T-section, with a narrow vertical section, tapered at the top, and a cross-bar, integral with and perpendicular to the vertical section. A plurality of openings may be formed through the cross-bar, screws inserted through the openings and threadably attached to the plate, or other suitable attaching means, being utilized to support the pointer on the plate.

In place of the screws, the pointer cross-bar may be imbedded in a slot cut through the outer circumference of the plate **15**, the pointer cross-bar being molded in place.

The graduations may be spaced to indicate crankshaft degrees of advance in the position of the engine firing, relative to the top dead center position, or they may be spaced in degrees of

angular rotation of the breaker point support plate, relative to the distributor cap, from which the angle of spark advance is determined.

In four-stroke cycle engines, with the distributor shaft rotated at one-half engine speed, one degree of plate movement would be equal to two degrees of spark advance on the crankshaft, so that the actual spacing of the graduations would have little, if any effect on the operation of the unit.

The central window graduation may be marked "0," or other suitable designation to indicate the normal spark advance when the engine is operated, before the breaker point plate is angularly adjusted by either the centrifugal governor, or the vacuum-controlled unit, hereinbefore referred to, or it may indicate the top dead center of the piston, depending upon the range of the graduations, and the normal spark advance for which a particular engine is designated.

Numerals **38** designating degrees of crankshaft angular position would be engraved, or otherwise indicated on the other graduations.

In operation of the unit, the engine is operated in the normal manner, with the distributor cap in the closed position, shown in Fig. 1. The angular position of the pointer may be checked against the graduations formed on the window **25**. The engine would be operated at various speeds and under varying load conditions, the operator observing the changes in angular position of the contact support plate, as indicated by the window graduations **29**.

In this manner, he is enabled to determine whether the breaker point plate is adjusted to the normal angle of spark advance for which the engine is designed, and can also gage from the changes in plate position caused by the centrifugal governor, which moves it in accordance with variations in engine speed, the vacuum controlled unit, which adjusts it in accordance with the manifold vacuum, which varies with the engine load conditions, or other type of automatic control mechanism for adjusting the spark timing position, thus enabling the operator to determine whether the governor, or the vacuum control unit, or both, are functioning properly.

After the various plate angle observations are made by the operator, he can shut off the engine, remove the distributor cap, and adjust the angular position of the breaker point support plate, by observing the pointer **30**, and making any repairs or adjustments required on the governor, or the vacuum controlled unit, after which the engine may be started again, and the angular position of the plate, as indicated by the position of the pointer against the window graduations, rechecked in the manner hereinbefore described.

Figs. 5 and 6 show a modification of the distributor construction, shown in Figs. 1 and 2. In place of the window **25**, mounted in the cap, a similar window **41** may be mounted in the vertical wall of the case **10**. A heavy border **42**, may be formed integral with the vertical wall of the case, a pair of flanges **43**, formed integral with the inner and outer faces of the wall border, forming a pair of frames, which support the window **41**, in a manner similar to that shown in section in Figs. 3 and 4. The window **41** may be molded in place in the case, in the manner shown in Figs. 3 and 5, or a separate forward frame, removably attached to the wall border, may be substituted for the forward integral frame, to removably support the window **41**.

A plurality of equally-spaced angular graduations **44** may be inscribed on the outer surface of the window **41**, in a manner similar to those shown in Fig. 1, the graduations being directed downward to indicate the angular position of a pointer **45**, which may be attached to the breaker point support plate **15**, in the manner indicated in Fig. 5. The pointer **45** may be constructed and attached to the breaker point plate in the manner shown in Fig. 5, with the tapered tip **46**, of the vertical section **47** of the pointer, directed downward in substantial alignment with the position, of the graduations **44**, as indicated in Fig. 5.

The pointer **45**, which is generally similar in construction, to that shown in Figs. 1 and 4, may be formed with a depending vertical section, the lower end of which is tapered, and an integral flange, perpendicular to the plane of the vertical section, formed at the top, as indicated in Fig. 5. The pointer flange may be attached to the plate in the manner shown in Figs. 1 and 4.

In the pointer shown in Fig. 5, a flange **49**, formed integral with the vertical section, may be mounted on the top or bottom surface of the breaker point support plate. A plurality of screws **50**, passing through openings formed in the flange **49**, and threadably inserted in the plate, or a plurality of rivets, passing through the flange and the plate, or other suitable attaching means, may be utilized to attach the pointer flange to the plate, in the manner indicated in Figs. 5 and 6, or Fig. 4.

The pointer **45** may be attached to the plate by means of the flange **49**, or the pointer flange **49** may be molded directly into the plate, adjacent the outer circumference thereof.

The depending tip **46**, of the vertical section of the pointer **45**, may be in substantial alignment with the vertical section of the pointer, or the tapered lower tip **46**, of the vertical section may be bent outward, in the manner indicated in Fig. 4, to bring it closer to the inner surface of the window.

The operation of the unit, shown in Fig. 5, is substantially the same as that shown in Fig. 1, and hereinbefore described, except that the angular position of the breaker point support plate **15** may be gaged through the window **41**, supported in the case, by observing the position of the tapered tip, of the depending vertical section of the pointer against the graduations **44**, inscribed on the surface of the window.

The only difference in the operation and adjustment of the distributor shown in Fig. 5, over that shown in Fig. 1, is the fact that after the angular position of the pointer **45**, relative to the window graduations, is observed through the window **41**, under various engine operating conditions of both speed and load. The angular position of the breaker point support plate may be adjusted by observing the position of the pointer against the graduations, through the window **41**, after the cap is removed, and while the adjustments are being made.

In another modification of the construction, shown in Figs. 7 and 8, a window **52**, similar to that shown in Fig. 1, may be mounted in the cap **11**, in substantially the same manner. Instead of the graduations **29**, shown in Fig. 1, a single hairline **53**, may be inscribed in the center of the outer surface of the window **52**.

An angle indicator segment **54**, of arcuate contour, substantially parallel to the window **52**, may be attached to the upper surface of the breaker point plate, a flange **55**, substantially perpendic-

ular to and integral with the segment 54, being attached to the plate by a plurality of rivets 56, screws, or other suitable attaching means.

A plurality of equally-spaced angle graduations 57, similar to those shown in Fig. 1, may be engraved or otherwise inscribed on the surface of the segment 54, in alignment with the window. The position of the angle graduations 57 on the segment 54, relative to the hairline 53, inscribed on the window, indicates the angular position of the breaker point support plate, in the same manner as the pointer 30, shown in Fig. 1, and hereinbefore described. The operation of the unit, shown in Figs. 7 and 8, and the adjustment thereof, is substantially the same as that shown in Fig. 1, and hereinbefore described.

In place of the construction, shown in Fig. 1, the entire cap 11 may be molded of a transparent plastic material, or other suitable transparent material, having the necessary heat-resistant and electrical non-conductive characteristics. The graduations 29 formed on the window 25, shown in Fig. 1, may be engraved, or otherwise inscribed directly on the surface of the outer wall of the transparent case, in substantially the same relative position.

The pointer 30 and the method of attaching the pointer to the breaker point support plate would be substantially the same as that shown in Figs. 1 and 4 and hereinbefore described.

The operation of a unit of this type would be substantially the same as that shown in Fig. 1, the angular position of the breaker point support plate being gaged by observing the angular position of the pointer against the graduations inscribed on the outer wall of the transparent case.

In place of the construction shown in Fig. 5, the entire case 10 may be molded entirely of the same type of transparent plastic material, the graduations 44, inscribed on the window 41, shown in Fig. 5, being formed directly on the outer wall of the case, thus eliminating the window 41.

The pointer 45, formed with a depending vertical section, would be substantially the same as that shown in Fig. 5, the pointer being attached to the breaker point support plate in the same manner.

The operation of the unit would be substantially the same as that shown in Fig. 5, and hereinbefore described. The angular position of the breaker point support plate being gaged by observing the tapered tip of the depending vertical section of the pointer through the transparent outer wall of the case, against the graduations inscribed on the outer wall of the case.

It will be apparent to those skilled in the art that my present invention is not limited to the specific details described above and shown in the drawings, and that various further modifications are possible in carrying out the features of the invention and the construction, adjustment and utilization thereof, without departing from the spirit and scope of the appended claims.

What I claim is:

1. In an internal combustion engine ignition distributor, mounted within a case, with a cap removably mounted on the case, a rotatable shaft supported within the case, a plate surrounding the shaft, and a set of breaker points supported by said plate, and means mounted on said shaft, controlling one of the breaker points, the combination of a transparent window mounted in said cap, means attached to the breaker point support plate indicating the angular position of the plate relative to the cap, and means formed on said window, indicating the angular movement of said indicating means, while the distributor cap is closed.

2. In an internal combustion engine ignition distributor, mounted within a hollow case, with a cap removably mounted on the case, a shaft rotatably supported within the case, a plate surrounding the shaft, a plurality of breaker points supported by said plate, and means mounted on said shaft controlling one set of the breaker points, the combination of a transparent window molded into the outer wall of said cap, means attached to the breaker point support plate, indicating the angular position of the plate relative to the cap, and means formed on said window indicating the variations in angular position of said indicating means.

3. In an internal combustion engine ignition distributor mounted within a hollow, substantially cylindrical case, with a cap removably mounted on the case, a shaft rotatably supported within the case, a plate surrounding the shaft, a set of breaker points supported by said plate, and a cam mounted on said shaft, controlling one of said breaker points, the outer wall of said cap having an opening formed therethrough, the combination of a transparent window attached to the wall of the cap in alignment with said opening, an indicating device attached to the breaker point support plate, normally visible through said window, said window having a plurality of angular graduations inscribed thereon, said graduations indicating the angular movement of the plate indicating device, while the distributor cap is mounted on the case.

4. In an internal combustion engine ignition distributor, mounted within a hollow, substantially cylindrical case, with a cap removably mounted on the case, a rotatable shaft supported within the case, a plate surrounding the shaft, a set of breaker points supported by said plate, and a cam mounted on said shaft, controlling one of said breaker points, the outer wall of said case having an opening formed therethrough, the combination of a transparent window attached to the wall of the case in alignment with said opening, a pointer, attached to the breaker point support plate, normally visible through the window, said window having a plurality of angular graduations inscribed thereon, said graduations indicating the angular movement of the plate, relative to the case.

5. In an internal combustion engine ignition distributor, mounted within a hollow, substantially cylindrical case, with a cap removably mounted on the case, a rotatable shaft supported within the case, a plate surrounding the shaft, a set of breaker points supported by said plate, and a cam mounted on said shaft, controlling one of said breaker points, the outer wall of said cap having an opening formed therethrough, the combination of a transparent window of arcuate contour, attached to the wall of the cap, in alignment with said opening, a pointer, mounted on the breaker point support plate, normally visible through the window, means attaching said pointer to the plate, said window having a plurality of angular graduations inscribed thereon, said graduations indicating the angular movement of the pointer and the plate, while the cap is in the closed position.

6. In an internal combustion engine ignition distributor, mounted within a hollow, substan-

tially cylindrical case, with a cap removably mounted on the case, a rotatable shaft supported within the case, a plate surrounding the shaft, a set of breaker points supported by said plate, a cam mounted on said shaft, controlling one of said breaker points, and means attached to said breaker point support plate, automatically rotating said plate to adjust the spark timing coordinated with variations in the engine speed and load, the outer wall of said cap having an opening formed therethrough, the combination of a transparent window of arcuate contour, attached to the wall of the cap, in alignment with said opening, a pointer, mounted on the breaker point support plate, normally visible through the window, said pointer comprising a vertical section, with a flange substantially perpendicular to the vertical section, means attaching the pointer flange to the plate, said window having a plurality of angular graduations inscribed thereon, co-ordinated with the pointer, said window having designations formed thereon, in alignment with the graduations, indicating the angular position of the graduations relative to a datum graduation, said graduations indicating the angular movement of the pointer and the plate, while the cap is in the closed position.

7. In an internal combustion engine ignition distributor, mounted within a hollow substantially cylindrical case, with a cap removably mounted on the case, a shaft rotatably supported within the case, a plate surrounding the shaft, a set of breaker points supported by said plate, a cam, mounted on said shaft, controlling one of said breaker points, and means attached to said breaker point support plate, automatically rotating said plate to adjust the spark timing coordinated with variations in the engine speed and load, the outer wall of said case having an opening formed therethrough, the combination of a transparent window attached to the wall of of the case in alignment with said opening, a pointer, mounted on the breaker point support plate, normally visible through the window, said pointer comprising a vertical section, with a flange substantially perpendicular to the vertical section, means attaching the pointer flange to the plate, said window having a plurality of angular graduations inscribed thereon, coordinated with the pointer, said window having designations formed thereon, in alignment with the graduations, indicating the angular position of the graduations relative to a datum graduation, said graduations indicating the angular movement of the plate, relative to the case.

8. In an internal combustion engine ignition distributor, mounted within a hollow substantially cylindrical case, with a cap removably mounted on the case, a shaft rotatably supported by the acse, a plate surrounding the shaft, a set of breaker points supported by said plate, a cam mounted on said shaft, controlling one of said breaker points, and means attached to said breaker point support plate, automatically rotating said plate to adjust the spark timing, coordinated with variations in the engine speed and load, the outer wall of said cap having on opening formed therethrough, the combination of a transparent window supported by the wall of the cap, in alignment with said opening, an arcuate indicator segment mounted on the breaker point support plate, in substantial normal alignment with the window, said segment having a plurality of angular graduations formed thereon, and means formed on said window, co-ordinated with the angular graduations, indicating the angular position of the plate relative to the cap, while the cap is in the closed position.

9. In an internal combustion engine ignition distributor, mounted within a hollow, substantially cylindrical case, with a cap removably mounted on the case, a shaft rotatably supported by the case, a plate surrounding the shaft, a set of breaker points supported by said plate, a cam mounted on said shaft, controlling one of said breaker points, and means, attached to said breaker point support plate, automatically rotating said plate to adjust the spark timing, coordinated with variations in the engine speed and load, the outer wall of said cap having an opening formed therethrough, the combination of a transparent window molded into the wall of the cap, in alignment with said opening, an arcuate segment mounted on the breaker point support plate in substantial normal alignment with the window, and means attaching said segment to the plate, said segment having a plurality of angular graduations formed thereon, said window having a hairline inscribed thereon, located in co-ordination with said graduations, said graduations indicating the angular movement of the plate relative to the window hairline, while the cap is in the closed position.

10. In an internal combustion engine ignition distributor, mounted within a hollow, substantially cylindrical case, with a cap removably mounted on the case, a shaft rotatably supported by the case, a plate surrounding the shaft, a set of breaker points supported by said plate, a cam mounted on said shaft, controlling one of said breaker points, and means attached to said breaker point support plate, automatically rotating said plate to adjust the spark timing, coordinated with variations in the engine speed and load, the outer wall of said cap having an opening formed therethrough, the combination of a transparent window supported by the wall of the cap, in alignment with said opening, an arcuate segment mounted on the breaker point support plate in substantial normal alignment with the window, a flange, integral with said segment, mounted on the plate, and means attaching said flange to the plate, said segment having a plurality of angular graduations formed thereon, said segment having designations formed thereon, in substantial alignment with the graduations, indicating the angular position of the graduations relative to a datum graduation, said window having a hairline inscribed thereon, located in co-ordination with said graduations, said graduations indicating the angular movement of the plate relative to the window hairline, while the cap is mounted on the case.

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