May 19, 1936. V. W. THOMAS 2,041,500

ADJUSTING APPARATUS

Filed Sept. 17, 1934 2 Sheets-Sheet 1

Fig. 1

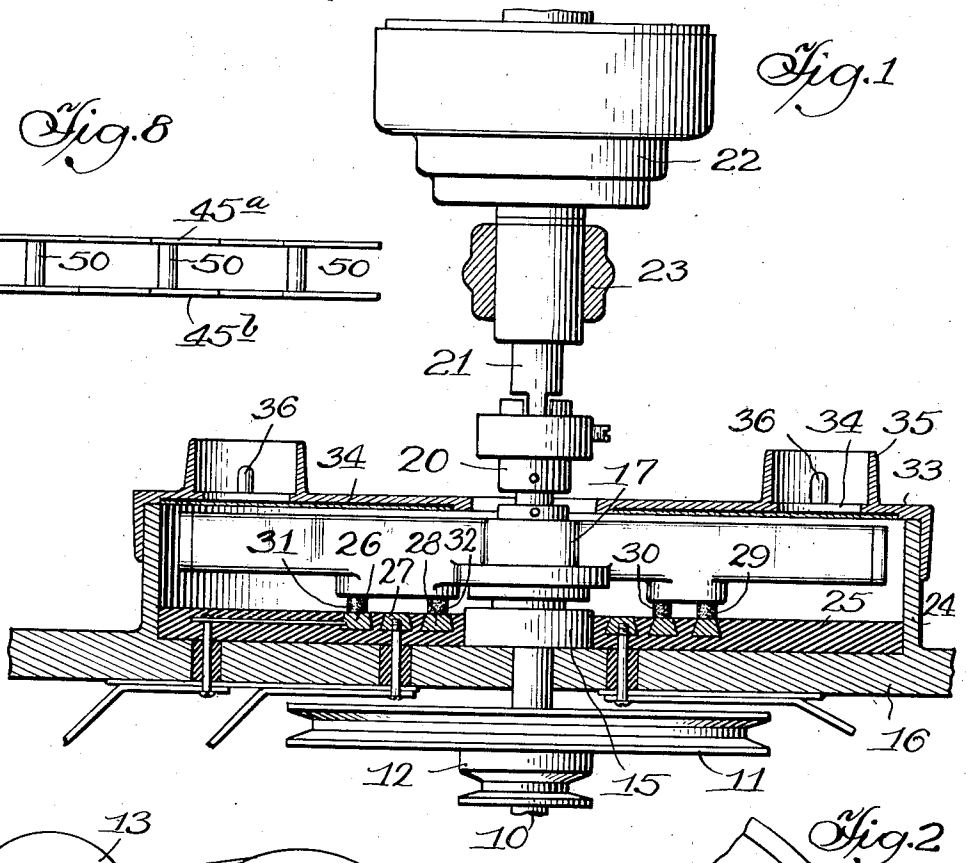


Fig. 8

Fig. 2

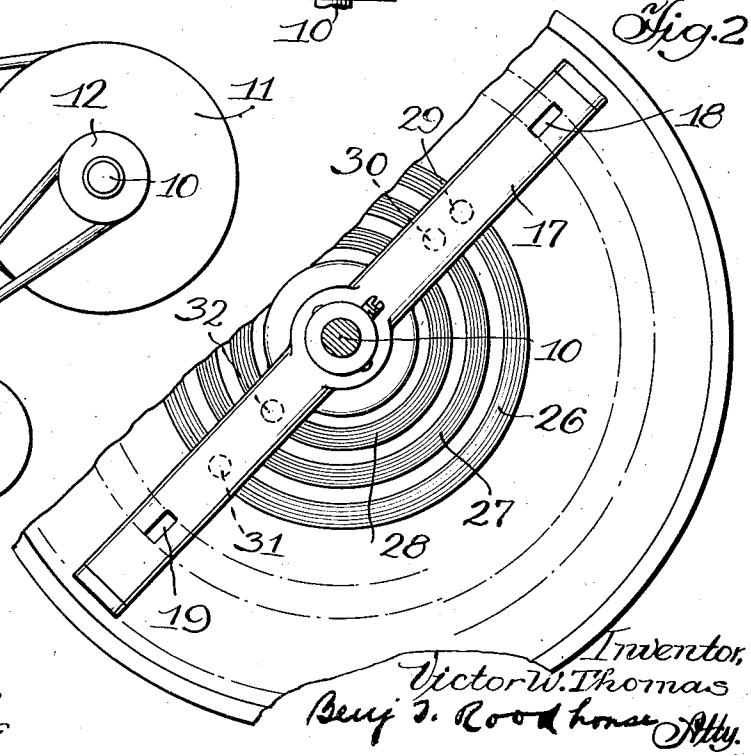


Fig. 3

Witness:
Chas. K. Kousek.

Inventor,
Victor W. Thomas
Benj. F. Rood Thomas Atty.

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ADJUSTING APPARATUS

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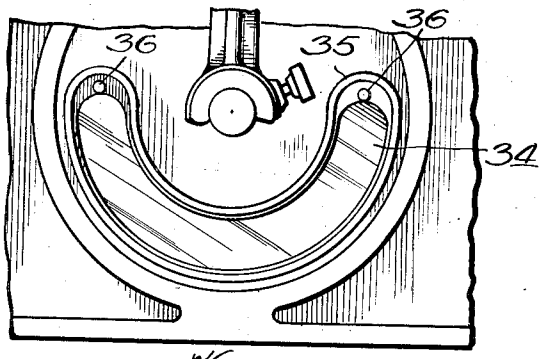


Fig. 5

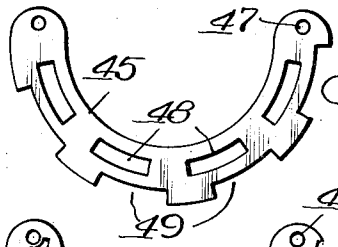


Fig. 6

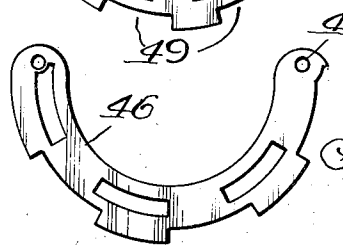
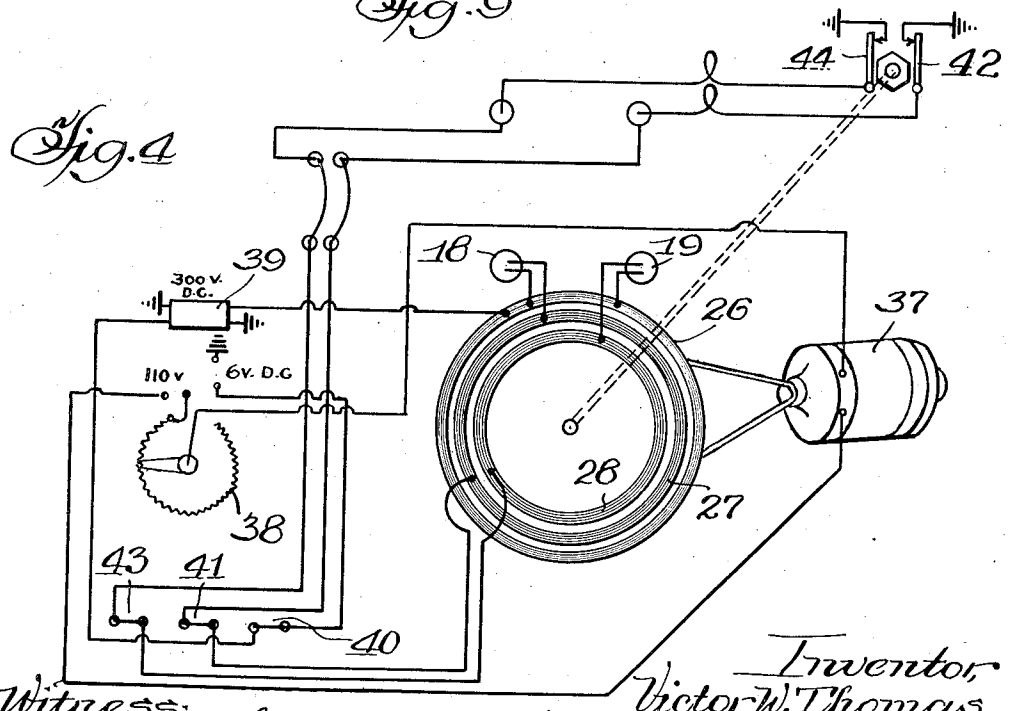


Fig. 7

SYSTEM	MODEL	MAKE of CAR	TEMPLATE Nº
DELCO-REMY	622-C	CHRYSLER	2
" "	622-H	PLYMOUTH	2
" "	622-S	OLDSMOBILE	3
" "	622-T	STUDEBAKER	2
AUTO-LITE	1B-4001	ESSEX	2
" "	16C-4001	HUPMOBILE	2
" "	16E-4001	NASH	4
" "	16K-4001	NASH	5
" "	16M 4001	LINCOLN	4
NORTH-EAST	TBU-10834	GRAHAM-PAIGE	4
	TBU-10849	DE SOTO	2

Fig. 9

Fig. 4



Witness:
Chas. E. Lovell.

Inventor,
Victor W. Thomas
Benj. D. Woodhouse Atty.

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UNITED STATES PATENT OFFICE

2,041,500

ADJUSTING APPARATUS

Victor W. Thomas, Waukegan, Ill., assignor to Edward A. Harrington, Waukegan, Ill, trustee

Application September 17, 1934, Serial No. 744,387

3 Claims. (Cl. 177—311)

My present invention relates to improvements in adjusting apparatus for breakers and distributors for ignition systems for internal combustion engines, and has more particular application filed June 14, 1934 to improvements in apparatus disclosed in my co-pending application, Serial No. 730,588, which produces arcuate illuminated and dark areas corresponding with the portions of the revolution of the cam at which the primary circuit of the sparking coil is respectively closed and opened. The apparatus described in the aforementioned co-pending application provides for the concurrent showing of the action of a pair of plurality of breaker bars and is provided with a protractor scale for measuring the illuminated and dark areas, but after such measurements have been made, which involves the highly skillful operation of scaling the arcs, I am not much better off in the practical adjustment of the timing operation than I was before the measurements had been taken.

For instance, the setting of the breaker points, or contacts, determines the point at which a cam engages the striking or rubbing block on the breaker arm, the portion of the circumference during which engagement is maintained is when the primary circuit is open, and the portion of the revolution during which the striker block is out of engagement with the cam is when the primary circuit is closed. But the length of the arcs when the circuit is respectively opened and closed are not convertible into time until the factor of engine speed is taken into account, because as the engine speed changes from low speed, or idling, to high speed, the time during which the cam angles pass through the arcs substantially diminishes. The practical result is that at low speeds, or idling, there is generally ample, and even too much, current to saturate the coil during the periods when the circuit is closed, but at high speeds the time for building up the field of the coil is cut down to, and sometimes beyond, the limit of efficiency and even operation. The manufacturers of motor cars and ignition systems, in view of their experience with the apparatus, have selected, and recommend, a setting of the breaker points, which is the best compromise, in their experience, between the superabundance during low speeds and practical operating conditions at high speeds.

There is no measuring of the arc which can be substituted for the manufacturers' experience without disregarding and losing the advantage of such experience. The adjusting of the separation of the breaker points either increases or diminishes the lengths of the arcs at both ends and as the apparatus has been designed and built for providing sparks in definite cam positions the measuring of the arcs, when combined with spark gap adjustment, is more liable to get the apparatus out of adjustment than it is to facilitate its proper adjustment.

In view of the foregoing the objects which I have in mind in connection with the present invention are, first, the doing away with the necessity of scaling or measuring the arcs, second, the doing away with the necessity of translating the length of arc into breaker point separation, and more particularly the particular breaker point separation at which the particular timing apparatus was designed to be operated, and, third, I have greatly facilitated the easy and accurate location of the portions of the revolutions where the primary circuit opens and closes when the apparatus is operating in accordance with the experience of its maker at its highest point of efficiency, considering the divers engine speeds at which it is called upon to operate.

I have attained the aforementioned objects by means of the structure illustrated in the accompanying drawings, in which—

Fig. 1 is an elevation, partially in central section, of apparatus for circumferentially showing the cam action.

Fig. 2 is a fragmental plan of the rotating arm carrying the light and indicating the circular conductors with which it co-operates and the paths over which the lights rotate.

Fig. 3 is a bottom plan view of the mechanism employed for driving the light carrying arm at indicated rates of revolution.

Fig. 4 is a diagram of the electrical circuits employed in the apparatus.

Fig. 5 is a fragmental plan of the top of the apparatus in which the window for viewing the illuminated and unilluminated arcs is shown.

Fig. 6 is a plan of a shield or template for inserting in the viewing window.

Fig. 7 is a plan of a different shield or template for inserting in the viewing window.

Fig. 8 is a side elevation of a form of shield or template, such as is shown in Figs. 6 and 7.

Fig. 9 is a fragmental portion of a tabulation showing makes and models of ignition systems and makes of cars with the appropriate template indicated for use with the respective apparatus.

Similar reference characters refer to similar parts throughout the respective views.

The apparatus consists of a shaft or spindle 10

having on one end pulleys 11 and 12, pulley 11 being driven by a motor 13, the speed of which is controlled as hereinafter explained, and pulley 12, being employed for driving a tachometer 14 for indicating the speed of rotation of the shaft 10. Shaft 10 is journaled in suitable bearings 15 mounted on a platform or support 16 through which the pulley carrying end of the shaft 10 extends.

Suitably fixedly secured to the shaft 10 is an arm 17 in the respective ends of which are installed suitable illuminating bulbs, the light from which, when they are illuminated, show through windows or fenestra 18 and 19, located at different distances from the center of the shaft 10. The upper end of the shaft 10 is provided with a chuck 20, or other suitable means, for engaging the shaft or spindle 21 of a breaker and distributor, the stem of the casing 22 of which is secured in desired relation with the chuck 20 by means of a clamp 23. Platform or support 16 is extended or built up to provide vertical walls 24 encircling the area in which the arm 17 rotates.

In the bottom of the compartment formed by the platform 16 and walls 24 is inserted a disk of insulating material 25 which is cut out at the center to accommodate the bearing or journal 15 and is provided with three annular, concentric, conductor rails 26, 27 and 28. For energizing the lamp or bulb illuminating window 18 of arm 17 are provided brush contacts 29 and 30 co-operating respectively with conductor tracks 26 and 27, and for illuminating window 19 of arm 17 are provided brush contacts 31 and 32 co-operating respectively with ring conductors 26 and 28.

Fitting over the tops of the walls 24 is a cover plate 33 having an arcuate window 34 therein disposed above the paths in which the windows 18 and 19 of arm 17 rotate. About the window 34 is provided a hood 35 which renders the observation through the window 34 easier and more accurate and at the respective ends of the window 34 and within the hood 35 are positioning or locating pins 36.

Referring now to the diagram Fig. 4: The motor 37 which drives the shaft 10 and the tachometer 14, as shown in Fig. 3, is controlled by the rheostat 38 so that the rate of rotation of the shaft 10 may be adjusted at any desired point, the circuit connecting the motor 37 and rheostat 38 being shown in Fig. 4.

A dynamotor or convertor 39 is provided which will produce a current suitable for energizing the bulbs or lamps carried by the arm 17. To operate the convertor 39 switch 40 is closed. One side of the generated current from the convertor is grounded and the other side is connected with the conductor ring 26. Brush 29 receives current from ring 26 for lamp behind window 18 from which it is returned by brush 30 to ring 27, from which it passes through switch 41 to one of the breaker arms 42 in the breaker and distributor head 22. Current for lamp behind window 19 is taken from ring 26 by brush 31 and is returned from the lamp behind window 19 by brush 32 to conductor ring 28, from which it passes through switch 43 to breaker arm 44 in the breaker and distributor casing 22. The fixed contacts in the breaker are grounded in accordance with the usual practice. This arrangement permits me, by the manipulation of switches 41 and 43, to see the action of the breaker arms 42 and 44 either concurrently or separately.

There are quite a number of makes of cars and makes of ignition systems which differ more or less in details of construction, but the principles upon which these divers automobiles and ignition systems are designed are much less numerous so that correspondence in cam action exists between many of the different automobiles and ignition systems. This has enabled me to produce a relatively small number of shields or templates 45 and 46, as shown respectively in Figs. 6 and 7, to fit in the bottom of the hood 35 with perforations 47 to engage the locating pins 36. These shields or templates are numbered consecutively and are formed of opaque material or coated with opaque material with openings or fenestra 48 and 49 of a size and location to indicate during what portion of the revolution of the cam the primary circuit should be opened or closed to operate throughout the divers motor speeds, in accordance with the maker's experience, to the best advantage.

The presence of the opaque portions of the shield or template prevents any uncertainty in reading which may, or does, result from the reflection or dispersal of light from the illuminated to the unilluminated area.

In order to facilitate the use of my shields or templates I have provided a tabulation showing in one column the makes of cars now in use and in another column the manufacturer's name of the ignition systems employed with the respective makes of cars and in a third column the models of the ignition systems employed with the respective makes of cars and in a fourth column the number of the shield or template in which the cam action is located for the car and make and model of ignition system appearing in the same horizontal line.

Fig. 9 shows a portion of such a tabulation taken from the actual tabulation, and it will be seen by examining the column "Template No." that the same template is applicable to quite a number of different cars and breaker and distributor models.

I prefer to make the shields or templates, as shown in Fig. 8, of two layers, 45*a* and 45*b*, each cut identically, as shown in Fig. 6, the two layers being held in spaced relation by pillars or posts 50. The top layer 45*a* is preferably rendered non-reflecting by giving it a dead black finish, and the under layer 45*b* is colored white. In this way a person using the device can line up the edges of the respective layers with the ends of the illuminated and non-illuminated arcs, thereby being certain that he is directly over the apparatus which is necessary to an exact location of the arcs.

The measuring of the lengths of the arcs with a protractor scale, as disclosed in the heretofore referred to co-pending application, is only indirectly useful in securing the desired relation of the arcs, provided such relation is previously known, whereas, in the present shields or templates, the relation which the maker had found through experience to be best is directly shown in a manner considerably more accurate and easier to see.

The foregoing remarks apply more particularly to a single path of illuminated or unilluminated arcs. When the path of the arcs of a plurality of breakers are shown in juxtaposition, the difficulties are much increased as one of the breakers is adjustable and not only must the organization of the particular apparatus to be adjusted be known, but computations involving the use of formulae are necessary before a protractor scale alone is employed.

Having described my invention what I claim

is new and desire to secure by Letters Patent is:

1. In combination with apparatus for producing in a circular path arcuate illuminated and dark bands corresponding respectively to the closed and open circuit portions of the revolution of the cam of a breaker mechanism for ignition systems, a casing enclosing said apparatus having an arcuate opening therein over the path in which said arcuate illuminated and dark bands are produced, a template of opaque material having arcuate fenestra of such size and shape and so spaced as to form a correct pattern with which the illuminated and dark bands produced by the apparatus should coincide when the apparatus is adjusted as it was designed to operate, and means for detachably mounting said template in proper position over said opening in the casing.

2. In combination with apparatus for producing in a circular path arcuate illuminated and dark bands corresponding respectively to the closed and open circuit portions of the revolution of the cam of a breaker mechanism for ignition systems, a casing enclosing said apparatus having an arcuate opening therein over the path in which said arcuate illuminated and dark bands are produced, a template of opaque material consisting of spaced layers having identical arcuate fenestra of such size and shape and so spaced as to form a correct pattern with which the illuminated and dark bands produced by the apparatus should coincide when the apparatus is adjusted as it was designed to operate, and means for detachably mounting said template in proper position over said opening in the casing.

3. In combination with apparatus for producing in a circular path arcuate illuminated and dark bands corresponding respectively to the closed and open circuit portions of the revolution of the cam of a breaker mechanism for ignition systems, a casing enclosing said apparatus having an arcuate opening therein over the path in which said arcuate illuminated and dark bands are produced, a template of opaque material consisting of separated elements colored so as to be readily distinguishable having identical arcuate fenestra of such size and shape and so spaced as to form a correct pattern with which the illuminated and dark bands produced by the apparatus should coincide when the apparatus is adjusted as its was designed to operate, and means for detachably mounting said template in proper position over said opening in the casing.

VICTOR W. THOMAS.