

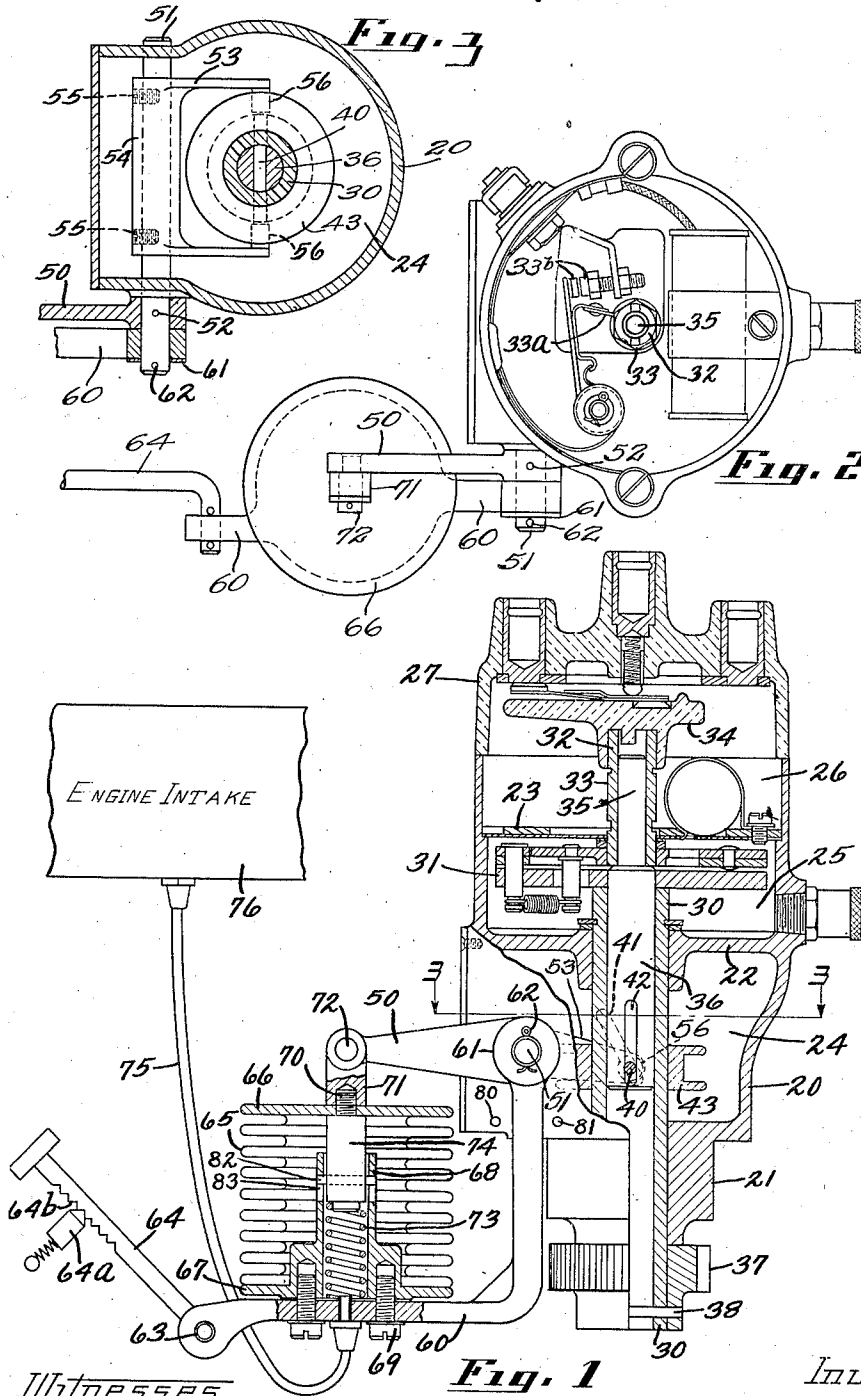
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1,590,827

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IGNITION SYSTEM.

Filed May 1, 1923



Witnesses  
 Geo. E. Pasco  
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Fig. 1

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## UNITED STATES PATENT OFFICE.

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## IGNITION SYSTEM.

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REISSUED

This invention relates to ignition apparatus for internal combustion engines and has among its objects to provide improved means for controlling the ignition in response to engine load conditions as well as by means responsive to engine speed or by means capable of manual control. More particularly it is an object to provide a device which can be easily attached to conventional forms of ignition apparatus having either the manual or the speed responsive control of the ignition timing or both, said device providing a control of ignition timing in response to engine load.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred form of embodiment of the present invention is clearly shown.

In the drawing:

Fig. 1 is a sectional view of ignition apparatus provided with the present invention.

Fig. 2 is a plan view of the apparatus shown in Fig. 1, with the distributor head removed.

Fig. 3 is a sectional view on line 3—3 of Fig. 1.

In the drawings 20 designates an ignition timer housing provided with a cylindrical shank at 21 adapted to be received by an aperture in an engine frame. Housing 20 is divided by a partition 22 and by a breaker lever plate 23 into compartments 24, 25 and 26, the compartment 26 being covered by a distributor head 27. The shank 21 and the partition 22 provide bearings for a hollow shaft 30, which supports at its upper end a speed responsive device 31 of the conventional "flat weight" type, a type well known in the art. This device 31 is connected with a hollow sleeve 32 providing a timer cam 33 and a seat for a distributor rotor 34, and is connected with a shaft 36 which is located within the shaft 30 and capable of relative movement thereto. Sleeve 32 is rotatably mounted upon a reduced end 35 of shaft 36. Cam 33 cooperates with a breaker lever 33<sup>a</sup> to separate contacts 33<sup>b</sup>.

The shaft 30 carries a driving gear 37 attached by pin 38. Shafts 30 and 36 are connected by means of a pin 40 which ex-

tends through diametrically opposite spiral slots 41 in shaft 30 and through a longitudinally extending notch 42 adjacent the lower end of shaft 36. Pin 40 is supported at its end by means of a grooved collar 43 slidable axially along the shaft 30.

Motion is transmitted from the gear 37 and from shaft 30 to the shaft 36 by means of the pin and slot connections mentioned. From the shaft 36 motion is transmitted to the cam 33 and rotor 34 by means of the speed responsive device 31 in the usual manner. The device 31 functions to produce relative movement between the cam 33 and the shaft 36 in response to variations in engine speed. By shifting the collar 43 axially the shaft 36 can be moved relative to the shaft 30 in order to control the ignition timing by means other than in response to variations in engine speed.

The means for shifting the collar 43 includes a lever 50 mounted on a shaft 51 and attached thereto by means of a pin 52. Within the chamber 24 there is located a yoke 53 having its hub 54 attached by set screws 55 to the shaft 51 and having its branches provided with pins 56 for cooperating with the grooved collar 43. The lever 50 constitutes a movable member supported by the ignition housing or support 20, and lever 50 is adapted to be actuated manually or by other means for controlling the timing of the ignition. In conventional types of ignition apparatus such levers are generally connected with the spark lever on the steering column of an automobile in any suitable fashion.

In one of its aspects the present invention provides an attachment for types of ignition apparatus which are provided with a movable member such as the lever 50 for controlling the ignition timing. This attachment provides for the control of ignition timing in response to engine load conditions, while at the same time permitting the operation of the movable member 50 manually. This attachment includes a bracket 60 which is pivoted loosely upon one end of the shaft 51 and is held in position by means of a washer 61 and pin 62. The bracket 60 is attached at 63 to a manually operable rod 64 located within convenient reach of the automobile driver, and is held in positions of manual adjustment by a spring pressed

plunger 64<sup>a</sup> which cooperates with notches 64<sup>b</sup> in rod 64. To transmit motion from the bracket 60 to the lever 50 there is provided mechanism which constitutes an adjustable link connecting the bracket 60 with the lever 50. This mechanism comprises a bellows 65 sealed at its upper end by a plate 66, and at its lower end by the flange 67 of a tube 68 attached by screws 69 to the bracket 60. The plate 66 is attached by means of a screw 70 to a link 71 connected by means of a stud 72 with the lever 50. A spring 73 is interposed between the bracket 60 and the head 74 of the screw 70 and tends normally to hold the bellows 65 in the position shown in Fig. 1. The interior of the bellows 65 is connected by means of a flexible tube 75 with the engine intake 76.

The operation of the invention is as follows: To adjust the ignition timer manually the rod 64 is moved and motion is transmitted to the ignition timing lever 50 by means of the adjustable link mechanism described. When the engine is operating under partial load the throttle will be only partly open, therefore the engine intake suction will be higher than when the throttle is wide open. Therefore there will be a partial vacuum in the bellows 65 tending to shorten the linkage between bracket 60 and lever 50. The collar 43 will be moved upwardly for the purpose of advancing the spark as engine load decreases. On the other hand when the engine load increases the throttle will be open relatively wide and the suction in the engine intake will decrease thereby relieving the vacuum in the bellows 65 and permitting the spring 73 to increase the length of the linkage between bracket 60 and lever 50. This action tends to move the collar 43 downwardly to retard the spark. The action of collar 43 is based upon the assumption that the rotation of the cam 33 is counterclockwise. If the rotation of the cam 33 were clockwise it is obvious that the direction of the spiral slots 41 would need to be reversed.

Instead of connecting the pipe 75 with the engine between the engine intake and the throttle of the carburetor the pipe 75 could be connected in such a manner that as engine load increased the suction in the bellows would increase instead of decrease. Then it is obvious that the direction of the spiral slot 41 would be reversed in order that upward movement of the collar 43 would retard instead of advance the spark with increasing suction in the bellows 65. Such connections with the carburetor are shown in the patent to Kennington No. 1,360,758 and in the patent to Berdon No. 1,388,628, which make provisions for retarding the spark when the engine is idling as well as retarding with increasing engine load.

Stop pins or studs 80 and 81 project from the housing 20 into the path of movement of the bracket 60 so as to limit the manual movement of said bracket to a predetermined degree of advance and retard. The screw head 74 is provided with a pin 82 which extends through elongated holes 83 provided in the member 68, whereby the movement of member 74 relative to member 68 is limited. In this manner the amount of advance and retard produced by engine suction is limited to a predetermined amount.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What I claim is as follows:

1. In ignition apparatus for internal combustion engines, the combination with a breaker lever element and a cam element; of means for moving one of the elements relative to the other in response to engine suction, said means including a suction chamber having a movable wall; and means for manually moving said element, said manual means including the suction chamber through which motion is transmitted from the operator to said element.

2. In ignition apparatus for internal combustion engines, the combination with a breaker lever element and a cam element; of means for moving one of the elements relative to the other in response to engine suction, and including a metal bellows connected with the engine intake; and means for manually moving said element, said manual means including the metal bellows through which motion is transmitted axially of the bellows from the operator to said element.

3. In ignition apparatus for internal combustion engines, the combination with a breaker lever element and a cam element; of mechanism including a lever for angularly displacing one of the elements relative to the other; a metal bellows connected with the intake of the engine and having one end wall connected with said lever; and manual operated means including an operating handle for moving said lever, said manual means being connected with the other end wall of the bellows and operating through the bellows to move the lever; and means for yieldingly maintaining said handle in adjusted position thereby maintaining stationary said other end of the bellows.

4. In ignition apparatus, the combination with a breaker element and a cam element and a support for said elements; of a shaft mounted on said support; means for moving one of said elements relative to the other including a lever attached to said shaft; engine suction responsive means including a

collapsible element mounted on said shaft and manually operable means for moving both the collapsible element and said lever. 10

5 In ignition apparatus the combination with a breaker element and a cam element and a support for said elements; of a shaft mounted on said support; means for moving one of said elements relative to the other including a lever attached to said shaft; engine suction responsive means including a bellows; a bracket pivotally mounted on said shaft and supporting said bellows; means connecting the bellows with the lever; and manually operable means connected with the bracket. 15

In testimony whereof I hereto affix my signature.

JOHN H. HUNT.