Jan. 8, 1929.

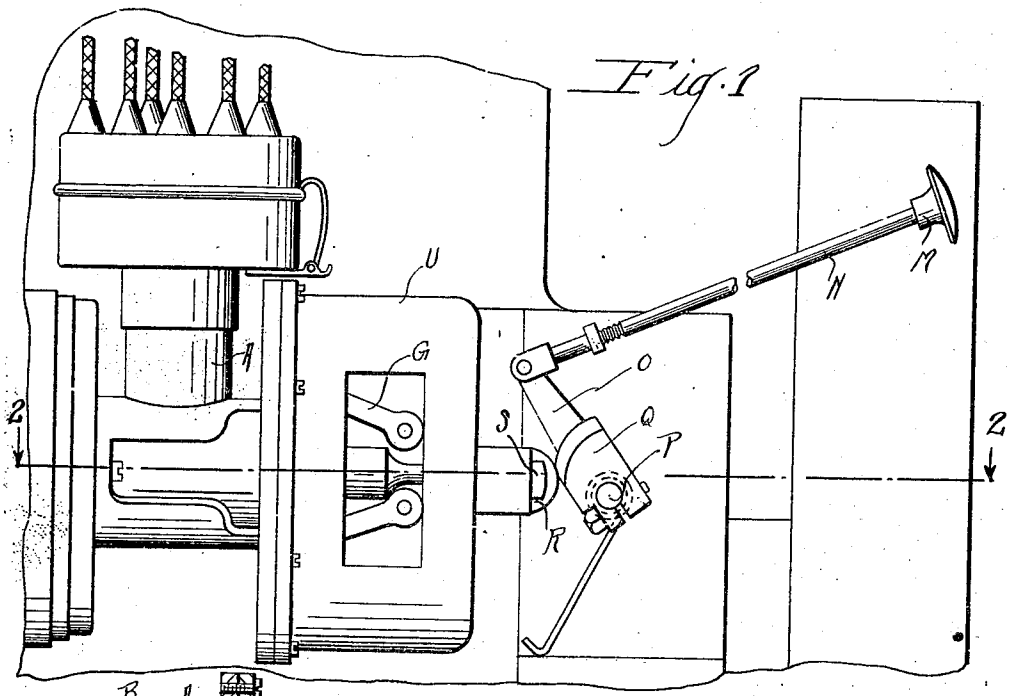
1,698,089

C. E. FURGASON

SPARK ADVANCING MECHANISM

Filed Jan. 18, 1926

Fig. 1



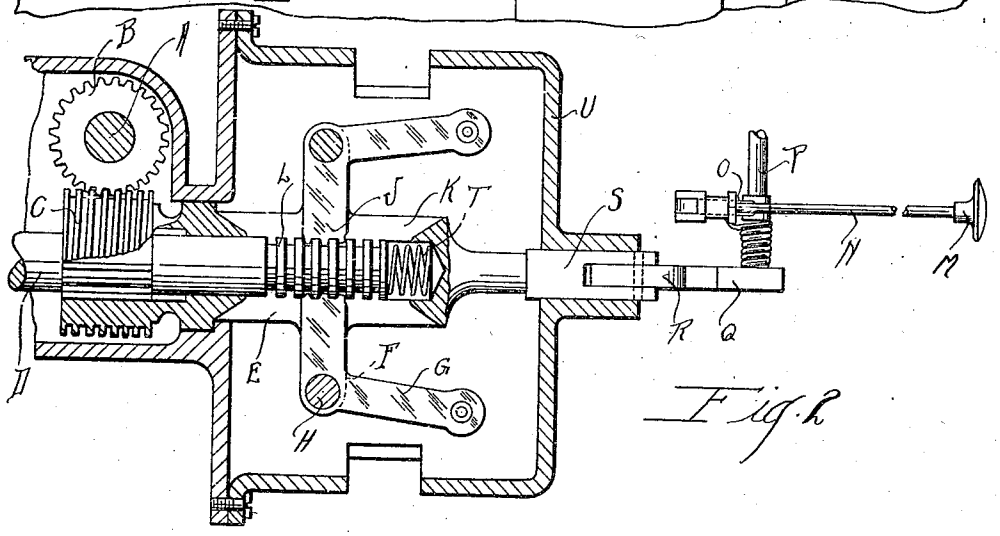


Fig. 2

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Patented Jan. 8, 1929. 1,698,089

UNITED STATES PATENT OFFICE.

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SPARK-ADVANCING MECHANISM.

Application filed January 18, 1926. Serial No. 82,160.

The invention relates to spark advancing mechanisms such as used in connection with motor vehicle internal combustion engines.

In the present state of the art it is usual to provide a hand controlled spark advancing lever associated with the steering wheel of the motor vehicle. It is also quite common to provide automatic adjusting means which is controlled by the speed of the motor and in many installations both the automatic and the manually controlled devices are used in conjunction. With the latter construction the object of the manually controlled device is to permit of extreme retarding of the spark as for instance, where it is necessary to hand crank the engine, and further to supplement the automatic device by adjustment varying according to the condition of load. However, the average driver makes little use of this manual adjustment and many accidents have occurred through failure to fully retard the spark before hand cranking.

On the other hand, where the attempt is made to control the spark advance solely by the speed of the engine, it is impossible to obtain both the highest efficiency in operation and safety under all conditions.

It is the object of the present invention to obtain a construction which is fully automatic and which is nevertheless both efficient and safe. This I have accomplished by associating with automatic advancing and retarding means governed by the speed of the engine, an auxiliary automatic adjustment corresponding to variation in throttle opening. The construction is also such as to avoid too great retardation under conditions where the speed of the engine is insufficient to control the spark. The invention therefore consists in the means employed for accomplishing this purpose as hereinafter set forth.

In the drawings;

Figure 1 is a diagrammatic side elevation of my improved spark control mechanism.

Figure 2 is an enlarged horizontal section on line 2—2 of Figure 1.

My improvements are applicable to any of the various types of spark advancing mechanisms but as specifically shown, the adjustment is accomplished by a change in the timing of the rotor of the distributor. Thus, as indicated, A is the rotor shaft which is driven through the medium of spiral gears B and C from a shaft D running in fixed timed relation to the crank shaft of the engine. The spiral gear C is rotatably fixed but longitudinally adjustable upon the shaft D which permits of changing the timing of the shaft A by such longitudinal adjustment.

Any type of governor may be used for longitudinally adjusting said gear upon variation in speed of the engine. As shown, the gear C is splined to the shaft D and is provided with a shank portion E having the radially extending ears F to which weighted arms G are pivotally attached at H. The arms G are also provided with segmental gears J which extend through slots K in the member E and engage racks L on the shaft D. The arrangement is such that centrifugal action will cause the outward movement of the arms G upon increase in speed of rotation of the shaft D and gear C and through the reaction of the gears J with the racks L will adjust the gear C longitudinally upon the shaft D. This will advance the relative position of the shaft A to D thereby producing an advancement of the spark.

The mechanism just described responds only to changes in speed. If, however, the engine is idling and the operator, desiring to pick up the load, gradually throws in his clutch, it is customary to simultaneously open the throttle through the operation of the accelerator. This may not produce any marked change in the speed of the engine or it may even retard the engine speed but with an enlarged throttle opening. I therefore utilize this adjustment of the accelerator for an initial advancement of the spark which may operate before any increase in motor speed. The amount of adjustment is so limited that even under conditions of extreme load the spark will not be too greatly advanced but on the other hand the advancement is sufficient to increase the efficiency. This also permits of setting the adjustment for idling speed much lower than would otherwise be desirable and in that way guarding against danger in case of hand cranking.

As specifically shown, M is the accelerator button having a shank N attached to the rock arm O on the rock shaft P which latter controls the throttle by suitable connections not shown. Mounted on the shaft D is a cam Q for actuating a roller bearing R on a slidable rod S which is arranged in axial alignment with the shank E. The cam Q is fashioned to quickly actuate the slide S during the usual movement of the accelerator and to then more

gradually actuate the same. This cam is fashioned to give an initial or partial advance to the spark of approximately between 12° and 15°. The total advance imparted to the spark is between 84° and 90° which represents the maximum advance limits for various types of motors. After the initial advance imparted to the spark by the cam Q, the governor advances the spark the remainder of the range of advancement aforesaid. Obviously, inasmuch as the cam Q has only a bearing contact with the roller R, after the initial partial advance imparted by the cam, the governor will continue to move the gear C to advance the spark, and any further movement of the cam Q will be an idle movement. However, with the accelerator depressed and the cam Q in operative position, the spark cannot retard to a point lower than a 12° or 15° advance. All of these parts are returned to a normal position by suitable means such as the spring T between the end of the shaft D and the end of the recess in the shank E receiving such shaft. A suitable housing U may be arranged to enclose the weighted arm G.

In operation when the engine is idling the gear C and shank E thereof are held in a position which times the shaft A for fully retarded spark. If the operator throws in his clutch the simultaneous actuation of the accelerator M will cause the cam Q to quickly actuate the slide S and through the medium of the shank E to adjust the gear C so as to advance the spark. This will occur whether or not the speed of the engine is increased. When, however, the engine speed does increase centrifugal action will cause the weighted arm G to react and thereby adjust the gear C to a position corresponding to the speed attained. Thus, all of the advantages of speed control of the spark are retained and in addition thereto an adjustment is effected in a change from idling to a loaded condition of the motor.

What I claim as my invention is:

1. The combination with a timing mechanism for internal combustion engines, of a throttle, an engine operated speed governor for controlling said timing mechanism through the higher speed range of said engine, and means operated upon actuation of said throttle for independently controlling the timing mechanism through the lower speed range of said engine.

2. The combination with a timing mechanism for internal combustion engines, of a throttle, an engine operated speed governor for controlling the timing mechanism through the higher speed range of said engine, and means including a cam actuated upon the operation of said throttle for controlling said timing mechanism through the lower speed range of said engine.

3. The combination with an internal combustion engine, of a timing mechanism, a fuel throttle, an engine operated governor for controlling said timing mechanism in accordance with the speed of said engine and operating through and upon the attainment of the higher speed range of said engine, and means operated upon movement of said throttle for partially advancing and controlling said timing mechanism prior to the attainment of the engine speed at which said governor functions.

4. The combination with an internal combustion engine, of a timing mechanism, a fuel throttle, an engine operated governor for controlling said timing mechanism through a certain speed range of said engine, and means operable in dependence upon the operation of said throttle for automatically controlling said timing mechanism until such time as the engine attains a speed sufficient to cause said governor to function.

5. The combination with a throttle controlled internal combustion engine, of a spark timing mechanism therefor, a centrifugal governor for advancing and retarding the timing mechanism upon changes of engine speed, and automatic means operable upon the movement of said throttle for initially advancing said spark timing mechanism.

6. The combination with a throttle controlled internal combustion engine, of a spark timing mechanism therefor, a centrifugal governor for advancing and retarding said timing mechanism upon the changes of engine speed, and automatic means operating independent of said governor to partially advance said timing mechanism simultaneously with the movement of said throttle to open position.

7. The combination with a throttle controlled internal combustion engine, of spark timing mechanism therefor, governor means automatically operating with changes of speed of said engine for correspondingly advancing or retarding said timing mechanism, an accelerator for actuating said throttle, and automatic means operated by said accelerator for independently imparting an initial advance to said timing mechanism.

8. In an internal combustion engine, a spark timing mechanism, a fuel throttle, an engine operated governor for controlling said spark timing mechanism in accordance with variations of speed of the engine, and automatic means operating directly upon said timing mechanism for initially advancing the same upon actuation of said throttle.

9. In an internal combustion engine, a spark timing mechanism, a throttle actuating mechanism, an engine operated governor for controlling said timing mechanism in accordance with variations in the speed of said engine and means associated with said throttle actuating mechanism for partially advancing said timing mechanism prior to the

attainment of an engine speed at which said governor functions.

10. In an internal combustion engine, a spark timing mechanism, a throttle actuating mechanism, an engine operated governor for controlling said timing mechanism in accordance with variations in the speed of said engine and a cam associated with said throttle actuating mechanism for initially advancing said timing mechanism prior to the attainment of an engine speed at which said governor functions.

11. The combination with an internal combustion engine having a governor controlled timing mechanism, of a throttle, and means operable upon the opening of said throttle independent of the speed of the engine for partially advancing said timing mechanism.

12. The combination with an internal combustion engine having a timing mechanism and a throttle, of a gear shiftable to advance and retard said timing mechanism, a governor for shifting said gear, and means operable by said throttle for shifting said gear.

13. The combination with an internal combustion engine having a timing mechanism and a throttle, of a gear shiftable to advance and retard said timing mechanism, a governor for shifting said gear, and means operable upon movement of said throttle for moving said gear to initially partially advance said spark.

14. The combination with an internal combustion engine having a timing mechanism and a throttle, of a gear shiftable to advance and retard said timing mechanism, a governor for shifting said gear, and cam means operated by said throttle for adjusting said gear to initially partially advance said spark.

15. The combination with an internal combustion engine having a timing mechanism and a throttle actuating mechanism, of a governor for automatically controlling said timing mechanism and a member actuated by said throttle for initially advancing and limiting retardation of said timing mechanism.

16. The combination with an internal combustion engine having a timing mechanism and a throttle, of a member movable to control said timing mechanism, a governor for actuating said member, and means engaging said member and operable upon the initial opening of said throttle for moving the said member to partially advance said timing mechanism.

17. The combination with a throttle controlled internal combustion engine, of a spark timing mechanism therefor, a centrifugal governor for advancing and retarding the timing mechanism upon changes of engine speed, and automatic means operable only upon the initial opening of said throttle for initially advancing said spark timing mechanism.

18. The combination with a throttle controlled internal combustion engine, of a spark timing mechanism therefor, a centrifugal governor for advancing and retarding the timing mechanism upon changes of engine speed, and automatic means operable upon movement of said throttle for initially advancing the spark timing mechanism, said means also being operable in the open position of the throttle for limiting retardation of said timing mechanism.

19. The combination with an internal combustion engine having a timing mechanism and a throttle, of a member movable to control said timing mechanism, a governor for actuating said member, and means engaging said member and operable upon the initial opening of said throttle for moving the said member or partially advance said timing mechanism, said means being disposed in the path of travel of said member in a direction to retard the timing mechanism to limit the retardation thereof.

In testimony whereof I affix my signature.

CLAUDE E. FURGASON.