Dec. 1, 1931. M. J. GOLDBERG 1,834,125

ENGINE TIMING MEANS

Filed Jan. 16, 1929

FIG. 1.

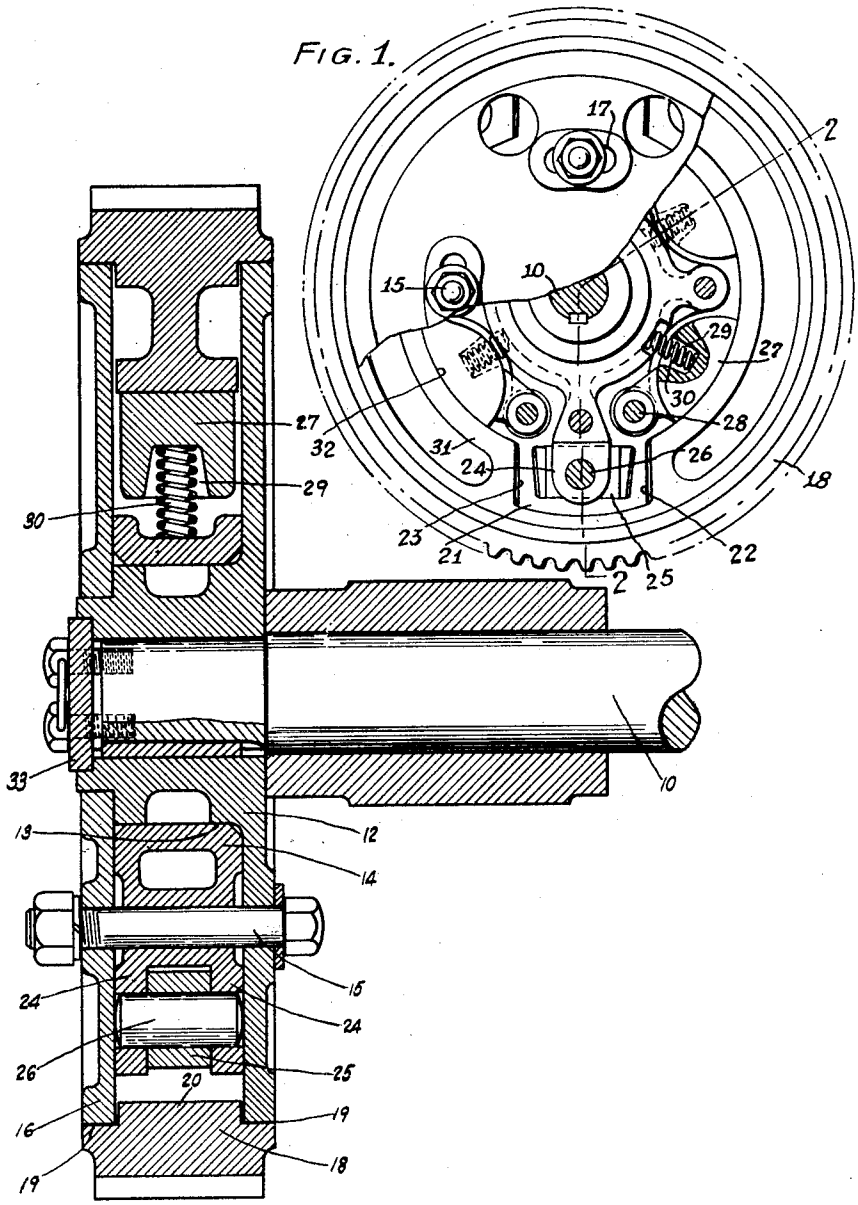


FIG. 2

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ENGINE TIMING MEANS

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This invention relates to improvements in engine timing means, and particularly to timing compensation means adapted for use on oil engines of the reversible type, in order to maintain the injection timing, in either direction of rotation of such engines.

In order to attain the best performance of engines of the solid injection type, it is essential that the timing of the oil injection be adjustable with precision, and further, that when the adjustment or setting is once determined, that it be maintained substantially constant for either direction of engine rotation.

An object of the present invention is, therefore, to provide an improved timing means, in which is embodied means for adjusting, for timing purposes, the driving connection to the fuel injection pumps, and which includes provisions for maintaining such adjustment.

A further object is to provide an improved engine timing device, which when once adjusted and set in a certain timed relation with respect to the engine, maintains such setting irrespective of any and all rotational reversals of the engine.

A still further object is to provide an improved oil engine timing apparatus which is neat and compact in arrangement, which will provide for ease of assembly, and which is economical to construct and maintain.

Further objects and advantages will appear from the following detailed description of parts, and the accompanying drawings, in which Fig. 1 is a view in elevation partially broken away, of the improved timing device; and Fig. 2 is a section taken along the line 2—2 of Fig. 1.

It will, of course, be understood that the present detailed description of parts and the accompanying drawings, relate to a single preferred executional embodiment of the present invention, and that substantial alterations may be made in the described construction and arrangement of the parts, without departing from the spirit and full scope of the invention.

Referring by numerals to the drawings, 10 designates a cam shaft upon which is keyed or otherwise secured, the usual cams or the like, for actuating the fuel injection pump rods (not shown). A disk or supporting plate 12 is preferably keyed to the shaft 10 and rotatable therewith. Upon a hub portion 13 of the plate 12, a supporting bracket 14 is preferably loosely and rotatably mounted, and is arranged to rotate with the shaft 10, by means of bolts 15 or the equivalent, which clamp the bracket 14 to the plate 12. The bracket or supporting spider 14 is enclosed by and clamped to an annular plate 16. Slotted openings 17 are provided in the plates 12 and 16 to permit angular adjustment of the bracket 14, relatively to the plates, so that the bracket may be moved and clamped in any angular position within the range of the slotted openings 17. This provision permits precision adjustment between the related parts, for a purpose that will hereinafter appear.

A gear 18 is rotatably supported on the peripheries 19 of the plates 12 and 16, and the gear is maintained in position by an internally projecting portion 20 of the gear, which, although permitting free rotational movement between the plates and gear, precludes any lateral movement of the gear. The gear 18 is provided, by preference, with a plurality of recessed portions 21 which serve to form opposed contact faces 22 and 23 for a purpose that will hereinafter appear.

The bracket 14 is provided, by preference, with projecting bifurcated lug portions 24 upon which are hingedly mounted, block elements 25 by means of pivot pins 26 or the equivalent. These block elements are arranged to occupy only a portion of the space between the faces 22 and 23, and thereby to permit a relative movement between the gear and bracket, such movement depending upon the spaced relation between the faces 22 and 23 of the recesses 21. It will be seen from Fig. 1, that the faces on each of the blocks 25, are relatively divergent, by which provision, together with the pivoted mounting of the blocks, full contact is insured between the faces 22 or 23, and one side of each block. By reason of the hinged mounting of the con-

tact blocks, a self-aligning relation is always effected between the engaging members.

In order to maintain a predetermined setting of the bracket relative to the shaft 10, and hence to the cams secured thereto, centrifugal weight elements 27 are disposed about the bracket, and are hingedly secured thereto by means of pins 28. Each element 27 is provided with a recessed portion 29, in which is positioned a coil spring 30, which exerts a slight spring pressure upon the adjacent surface of the bracket. The gear 18 may be bored internally to form a substantially cylindrical surface 31, and likewise the outer portions 32 of each element 27, may be shaped to snugly engage the bore. It will readily be seen that the pressure applied by each of the springs 30, urges the corresponding elements 27 into slidable and frictional contact with the bore, and thus prevents unintentional and casual relative movements of the bracket and gear. This frictional resistance, offered by the weights 27, is not sufficient to prevent, or interfere with, the ordinary operating movement of these related parts, which, as will appear, takes place upon reversing the engine.

The device is very simple and positive in operation. The gear 18 is driven from a mating gear (not shown) mounted, for example, on the engine crank-shaft, and thereby provides for rotation of the gear 18 in timed relation with the engine. Movement of the gear 18 is transmitted to the shaft 10, by the driving relation which exists between the rim of the gear, and the block elements 25 of the bracket 14. This driving connection is produced by the impingement, for example during forward rotation of the engine, of the faces of the recesses 21, upon the corresponding faces of the block elements 25. When this occurs, the entire assembly rotates as a unit, causing the cams to actuate the injection pump, in the usual manner, in timed relation with the engine. As the engine speed increases, the weights 27 are urged outwardly by centrifugal force, and the springs 30, against the internal cylindrical surface 31 of the gear, and thus tend to lock the gear to the bracket to prevent relative movement therebetween. This rotation of the shaft 10 continues until the direction of rotation of the engine crank-shaft is changed, or the engine is reversed. Upon reversal, the gear 18 being geared to the engine, immediately rotates in the reverse direction with the engine; but the bracket 14 and its related parts, with the shaft 10, remains stationary for a time, thus permitting the crank-shaft to rotate a predetermined angular distance, before the opposite faces 23 of the recess 21 impinge upon the block element 25. It will be readily understood that this automatic retardation of the cam shaft 10, allows the engine crank-shaft to rotate, independently of the cam shaft, the desired angular distance to insure the proper timing of the cams after beginning reverse rotation. Such a lost-motion driving connection constitutes a means for maintaining the proper timing relation between the crank shaft and the injection cams, in either direction of rotation of the engine.

In timing the injection, a coarse adjustment of cam shaft 10, within a range or limit of one tooth of the gear, is effected in the usual manner, by properly relating the gear 18 with the crank shaft gear. The present example of the invention provides a finer adjustment through the use of slotted openings 17 in the plates 12 and 16, which, with the bolts 15, permits angular adjustment of the bracket 14 with respect to the shaft 10, and further permits the angular displacement of the block elements 25, which changes the point of actuation of the cam shaft by these elements. It will readily be seen that a finer adjustment is provided by these means, than merely by shifting the gear, one tooth at a time. When the proper setting of the cam shaft has been found, this setting is maintained by the provision of the springs 30, which urge the elements 27 outwardly into frictional engagement with the interior arcuate surface of the bore in the gear 18. This provision prevents any casual disturbance of the proper setting of parts, due to back lash, or inertia effects in the system.

It will readily be seen that the parts are so disposed as to form a neat, compact and substantially enclosed assembly. The movable parts inside of the assembly are detachable, as a unit, from the shaft 10, by the removal of the bolts 15. The plate 12 is also removable, to permit the entire assembly to be withdrawn from the shaft 10, upon the removal of the plate 33, which secures the plates 12 against movement along the shaft.

The parts of the present device are simple and inexpensive to make and assemble, and are arranged to facilitate replacement in case of any necessary repair. The device is composed of but few rotating and wearing parts, and provides convenient, practical means for automatically timing an engine in a manner to insure the same engine performance and efficiency in either direction of rotation.

It will be seen from the drawings that the present example employs practically all the space available within the gear 18, for the small amount of added mechanism incidental to the present invention. In this manner, an automatic timing means for reversing engines, may be added as an accessory to existing power units, without providing extra housings or other space accommodations therefor.

I claim as my invention:

1. In an injection-timing device for internal combustion engines, a cam shaft, a gear arranged for driving said cam shaft, a

bracket adjustably secured to said cam shaft, and having a plurality of arms; there being recesses in said gear adapted to receive said arms, said arms and recesses being related for lost-motion driving engagement between said gear and said bracket.

2. In an injection-timing device for reversible internal combustion engines, a shaft for controlling a supply of fuel to said engine, a gear in driving relation with said shaft, a bracket carried by the shaft substantially internally of the gear, means forming a recess in said gear, and a pivoted projection on said bracket positioned within the recess, the recess being of greater angular extent than said projection whereby to effect a delayed driving engagement between said bracket and said gear, upon reversing the engine.

3. In a timing device for reversible engines, a cam shaft, a bracket secured to said cam shaft, projecting portions carried by the bracket, a gear having internally recessed portions, and members pivotally secured to said portions for rocking movement within the recesses upon effecting a driving connection between said projecting portions and the recesses in said gear.

4. In a timing device for reversible engines a shaft operable in timed relation with the engine, an engine driven member operatively associated with said shaft, means substantially enclosed within said member for effecting a lost-motion driving engagement between said member and said shaft, upon change in direction of rotation of the engine, and a spring-pressed member normally tending to effect a positive driving engagement between said driven member and said shaft.

5. In an injection-timing device for reversible internal combustion engines, a cam shaft, a member operatively related to the engine and means providing for rotation of said member, within limits, with respect to the cam shaft, and centrifugally-actuated means tending to prevent relative rotation between said member and shaft.

6. In an injection-timing device for internal combustion engines, a cam shaft, a gear operatively related to the engine and having an internal recess, means carried by the cam shaft including a member pivotally mounted within said recess, providing for restricted rotation of the gear with respect to said cam shaft, and spring-pressed means tending to prevent relative rotation between said member and said cam shaft.

7. An injection-timing device for reversible internal combustion engines, including a shaft, a gear operatively associated with the engine for actuating said shaft, means providing for a limited rotation of the gear relative to said shaft upon reversing the engine, and combined spring- and centrifugally-actuated means, tending to prevent relative rotation between said member and said shaft.

8. In a fuel-injection timing device, a shaft adapted to actuate fuel injection means, a bracket adjustably mounted on said shaft, a member rotatably mounted on said bracket and operatively associated with the engine, means for operatively connecting said member and bracket in lost-motion relation, and frictional engaging means, tending to prevent relative movement between said member and said bracket.

9. In a timing device for reversible engines, a cam shaft, a gear for driving said cam shaft, means forming a lost-motion driving connection between said shaft and gear, a spring pressed friction member engaging a surface internal of the gear, and tending to prevent the action of said lost-motion connection, and means whereby each of the aforesaid means is substantially enclosed within said gear and removable therewith, as a unit, from said shaft.

10. In a timing device for reversible internal combustion engines, a shaft for controlling the delivery of fuel to the engine, means for maintaining the timed relation of said shaft to the engine in either direction of rotation, a gear, a friction block pivotally connected to said shaft, and engaging a friction surface internal of the gear, said gear forming a housing for said means, and arranged for operatively connecting said shaft with the engine.

11. In a charge-timing device for reversible internal combustion engines, a cam shaft adapted to actuate a fuel pump, a bracket carried by said cam shaft, a cam-shaft gear driven by the engine, and arranged for a limited rotation relative to said bracket, said gear having internal, peripheral recesses therein; contact blocks pivotally mounted on said bracket and extending within said recesses in lost-motion relation with said gear; a spring-pressed friction shoe, pivotally carried by said bracket, and arranged for variable frictional engagement with a surface of said gear, and means for positioning said gear, and enclosing therewith the assembly of blocks, shoe, bracket and related elements, whereby the assembly is carried by, and removable, as a unit, from said cam shaft.

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