O. Z. BREWER.

TIMING MECHANISM.

APPLICATION FILED DEC. 4, 1919.

1,358,187. Patented Nov. 9, 1920.

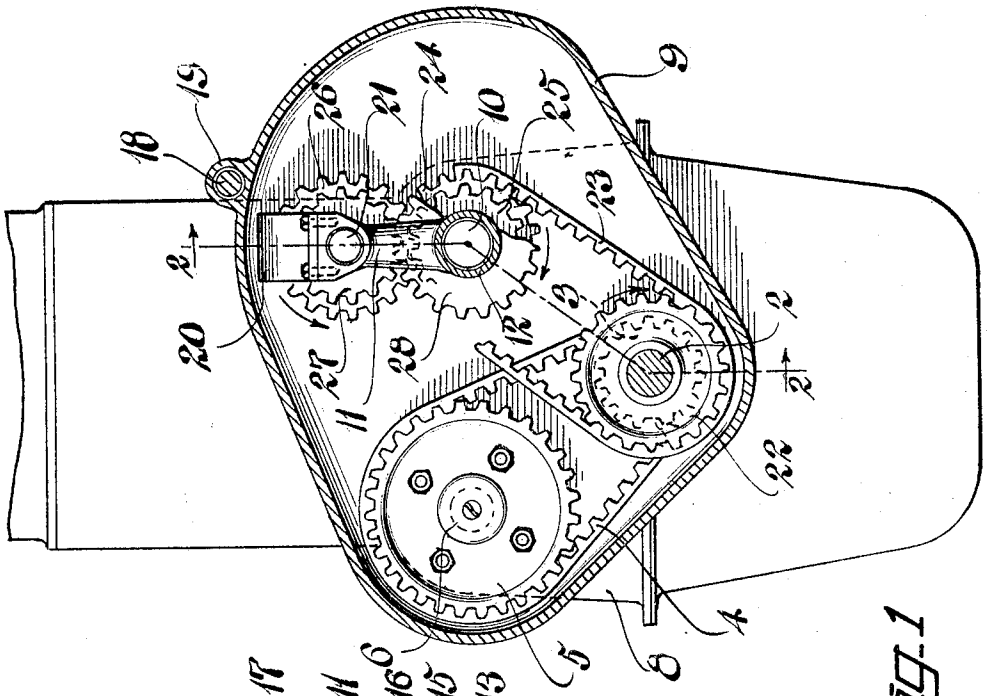


Fig. 1

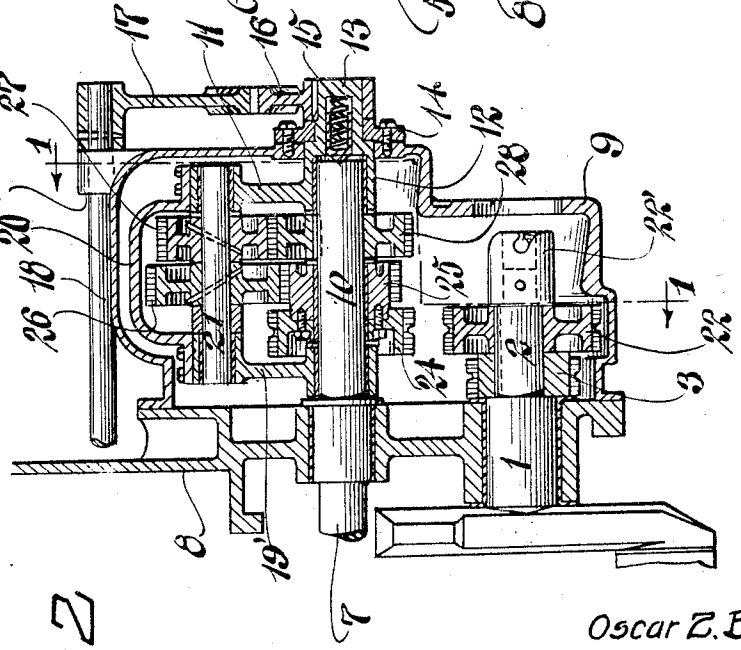


Fig. 2

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TIMING MECHANISM.

1,358,187. Specification of Letters Patent. Patented Nov. 9, 1920.

Application filed December 4, 1919. Serial No. 342,485.

To all whom it may concern:

Be it known that I, OSCAR Z. BREWER, a citizen of the United States, residing at Spokane, in the county of Spokane and State of Washington, have invented certain new and useful Improvements in Timing Mechanisms, of which the following is a specification.

The present invention relates to an improved timing mechanism for valve operating mechanism of internal combustion engines of the four cycle type, by means of which the action of the exhaust valve is altered in relation to the inlet valve through gearing instrumental in changing the peripheral position of the exhaust valve shaft in its relation to the crank shaft or driving shaft.

The alteration in the relation of the driven or exhaust valve shaft to the driving or crank shaft of the engine is accomplished during the suspension of the operation of the ignition system of the internal combustion engine, but the fuel charge, although not exploded, is admitted to the cylinder of the engine, and as a result of retarding or advancing the action of the exhaust valve with relation to the inlet valve, two compression strokes, the second and fourth of the cycle, are provided and through the medium of this compression a braking action is produced by the action of the piston in the cylinder to retard the movement of the engine and thus positively retard, as with a braking action, the motor vehicle to which the engine is applied for propulsion.

The change in the peripheral relationship of the exhaust valve shaft and the crank shaft or driving shaft to alter the timing of the valves, is accomplished by manually operated mechanism located at the steering column of the motor vehicle and connected with the gearing which effects the change, as set forth in a contemporary application for patent filed by me December 4th, 1919, Serial No. 342,482, and which illustrates the broad principles of the present invention.

In the accompanying drawings I have illustrated a compact and facile mechanism embodying the subject matter of the present invention, involving sprocket chain connections for operating the intake or fuel supply valve shaft directly at all times from the crank shaft, and also for actuating the exhaust valve shaft in a similar manner, with the addition of gearing whereby the relationship of the peripheral movement of the exhaust valve operating shaft may be varied as to the rotation of the driving shaft, all three shafts being revolved synchronously.

Figure 1 is a sectional view through the gear case attached to the crank or engine case of the engine, disclosing the inclosed gearing, the section being taken at line 1—1 of Fig. 2.

Fig. 2 is a view of the mechanism at line 2—2 of Fig. 1.

The crank shaft 1 is actuated as usual from the engine and for purposes of the present invention is provided with a reduced extension or journal 2, upon which a small sprocket wheel 3 is keyed, and from this sprocket wheel a sprocket chain 4 passes over the sprocket wheel 5, twice the size of the wheel 3 and keyed to the shaft 6 which controls the action of the intake valves of the engine in usual manner, the wheel 5 revolving at one-half the speed of the wheel 3.

The cam shaft for controlling the action of the exhaust valve or valves of the engine in usual manner, is indicated by the numeral 7, the three shafts 1, 6, and 7 being journaled as usual in the engine casing 8, and a gear casing 9 is utilized to cover the gearing and attached to the engine casing.

Beyond its bearing, the exhaust valve operating shaft 7 is fashioned with a reduced extension or journal 10, projecting into the gear casing and alined with the shaft, and at its extremity the extension bears a lever arm 11 loosely journaled thereon by means of its hub 12 which incases the extension, and the hub has an outwardly projecting boss 13, a retaining collar 14 surrounding the boss and attached to the gear casing 9 to retain the hub on its journal against the tension of a spring 15 incased in the hub and bearing against the end of the journal 13.

The lever arm 11 is thus free to oscillate or rock on its journal 10, and may be so rocked through the segmental rack 16 keyed on the boss 13 and actuated through the complementary rock arm 17 carried by the rock shaft 18 journaled at 19 in the gear case 9, and this rock shaft 18 may be operated from the steering column of the motor vehicle propelled by the engine, or in other suitable manner, for the purpose described.

The lever arm 11 forms part of an oscillatable frame, the other members of the frame being an arm 19′ loosely journaled on the

journal extension 10 near the bearing for the shaft 7, and an arch bar 20 rigidly connecting these two arms, and in the free ends of these arms a stud shaft 21 is loosely journaled, extending parallel with the enumerated shafts and revoluble about the axis of the exhaust valve shaft 7.

From the large sprocket wheel 22 retained on the extension 2 by the cap 22′, a sprocket chain 23 passes over a sprocket wheel 24 loosely journaled on the extension 10 and attached to revolve as a unit with a smaller gear wheel 25 which latter is continuously in mesh with a gear wheel 26 fixed on the stud shaft 21 and the latter wheel may roll on the wheel 25. A second, smaller, gear wheel 27, is also fixed on the stud shaft, which shaft it will be remembered is free to revolve in its bearings in the oscillatable arm or frame, and this wheel is continuously engaged with the gear wheel 28 fixed on the extension of the cam shaft 7. Thus it will be apparent that the crank shaft 1 drives the exhaust valve shaft through the medium of sprocket wheel 22, chain 23, sprocket wheel 24, gear 25, wheels 26—27 and fixed gear 28, the wheel 27 however, may be rolled about the wheel 28 with the shaft 7 as its axis of movement to change the relation of the peripheral movement of the exhaust shaft to the crank shaft, as the oscillatable frame revolves about the shaft 7.

Assuming the crank shaft 1 to turn in the direction of the arrow in Fig. 1, and the gears and sprockets move as indicated, the normal action of the gearing in operating the valves will be accomplished. The gearing for changing the timing of the exhaust valve is operated, manually, from the steering column as described and the boss 13 is moved to revolve the hub of arm 11 on the extension 10, and for the sake of clearness assume that the crank shaft 1 remains stationary. The gear 25 will be held stationary and gear 26 will be caused to roll on it, turning gear 27 through the same angle with respect to shaft 1. The combined movement of rolling gear 27 and the turning of the oscillatable frame 11—19′—20 will impart a motion to gear 28 on the exhaust valve shaft 7, and in this manner the peripheral movement of the shaft 7 is changed with relation to that of the driving shaft or crank shaft 1. The change gear train is so proportioned that one turn of gear 28 is effected by two turns of gear 22, therefore one stroke of the engine piston (180° turn of the crank shaft) will turn the gear 28 through an angle of 90°, and since an advance of the action of the exhaust valves of 160° or 180° with relation to the crank shaft produces the maximum braking effect, such action will be produced by the ratio of the diameters of the gears 25, 11 and 27 28 as shown.

What I claim is—

1. The combination with the driving shaft and driven shaft and driving connections comprising a sprocket wheel on each shaft and a sprocket chain, (the wheel on the driven shaft being loose) a gear fixed to said loose sprocket wheel on the driven shaft and a fixed gear on said shaft, of a frame oscillatable on the driven shaft and a loose shaft in said frame, and a pair of fixed gears on the stud shaft engaging the fixed and loose gears on the driven shaft respectively.

2. The combination with the driving shaft and driven shaft and driving connections therebetween, of an oscillatable frame journaled on the driven shaft and comprising a lever arm with a hub formed with an extended boss, a segmental rack fixed on the boss, a complementary rack and actuating means therefor, a gear wheel loose on the driven shaft forming part of the driving connections and a fixed gear on said shaft, a stud shaft journaled in the oscillatable frame and a pair of gears fixed on said stud shaft engaging respectively the loose gear and the fixed gear on the driven shaft.

In testimony whereof I affix my signature.

OSCAR Z. BREWER.