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INTERNAL COMBUSTION ENGINE

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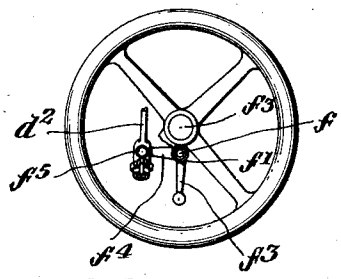

Fig. 3.

Fig. 1.

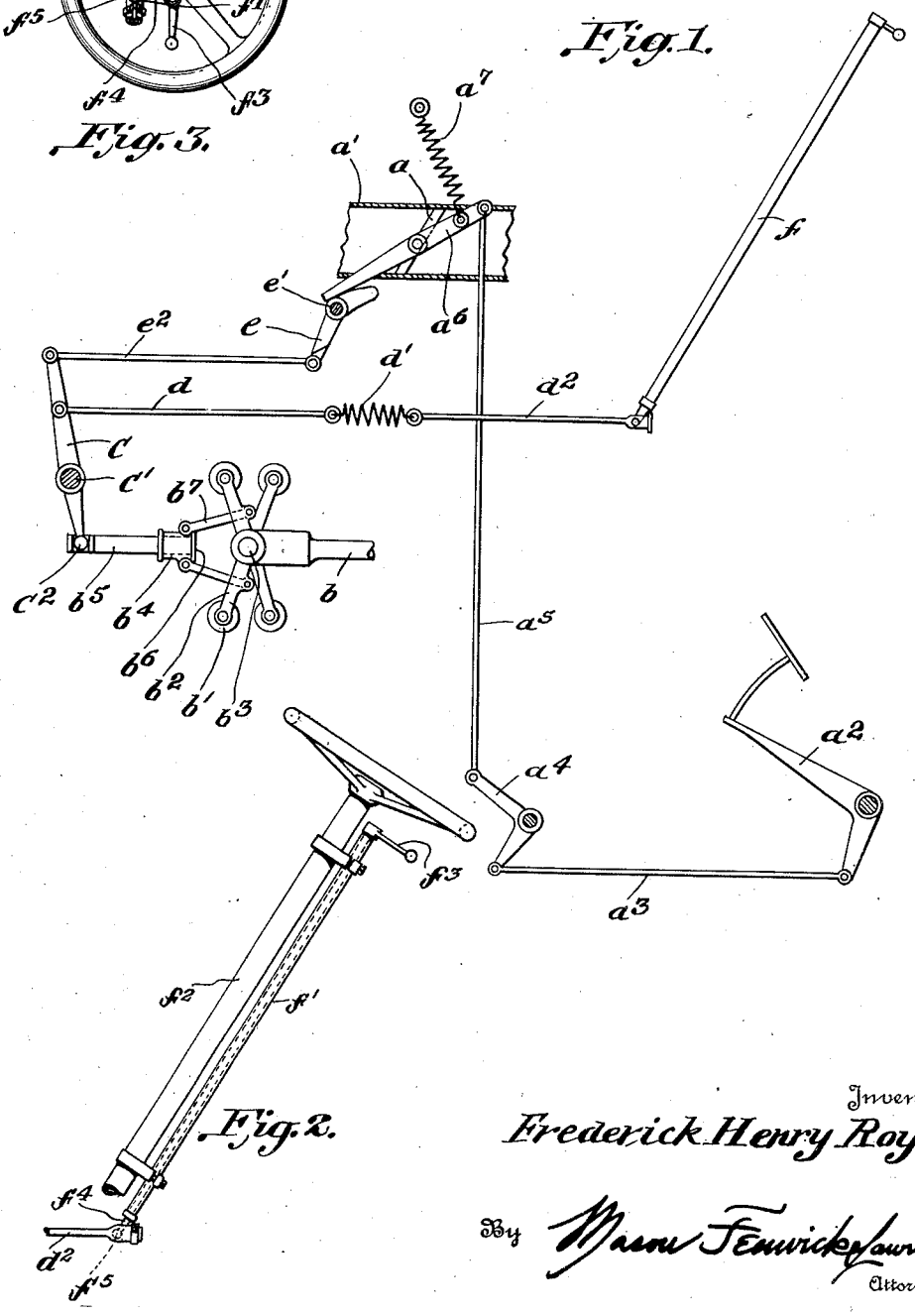

Fig. 2.

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INTERNAL-COMBUSTION ENGINE.

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This invention has reference to internal combustion engines in which one of two mechanisms controlling the throttle valve and operable by the driver has introduced into it an automatic governing device (consisting of weights rotating about an axis, and moving in relation thereto under centrifugal force, against the re-action of a spring) whereby, when such device is in effective operation the engine in automatically maintained at a constant speed, the driver (by means of mechanism whereby he can vary the anchorage of one end of, and so affect the tension in the spring) determining such speed or if desired rendering the mechanism for the time being inert.

In engines as heretofore made with throttle controls such as referred to the governor device is introduced into hand operated mechanism, the other mechanism being operated by a pedal lever.

For convenience in describing my invention the former mechanism is hereinafter referred to as the "governor mechanism" and the latter as the "pedal mechanism."

In most such throttle controls heretofore constructed the mechanism has been arranged so that the pedal mechanism (when operated) controls the governor mechanism that is to say, forces the governor weights to close towards their axis of rotation, out of the position they would otherwise have assumed, and opens the valve in opposition to the governor, which action has certain disadvantages. It has also been found necessary in some of such mechanisms to adopt for the throttle a piston valve which is not the most desirable.

Further in mechanism heretofore in use where a butterfly valve is adopted a heavy load is put on the centrifugal device at small openings of the valve owing to the great disparity of pressures on the inner and outer sides of the valve and the consequential pressure on the bearings of the valve spindle, which excessive load in the centrifugal device disturbs the proper working of the device.

The object of this invention is to remove these drawbacks and generally make an improved mechanism of the type referred to. The avoidance of control of the governor by the pedal mechanism may be achieved by an arrangement in which a lever forming part of the pedal mechanism is in operative connection with the valve to open it, and hold it open, against the reaction of a spring tending to close it, another spring, reacting between a moveable member and an anchorage, tends through the instrumentality of the said moving member to open the valve overpowering (when in effective operation) the first mentioned spring, a centrifugal governor driven by the engine tends (with an urgency dependent on the speed of the engine) to oppose the secondly mentioned spring, and hence to allow the first mentioned spring to close the valve. To render the governer mechanism adjustable the anchorage of the secondly mentioned spring is adjustable by the driver (within limits) towards, or away from the said moveable member.

The avoidance of the disturbance of the centrifugal device by the heavy load referred to may be remedied by affording to it greater mechanical advantage in the transmission as hereinafter explained.

An example of my invention is illustrated in the diagrammatic drawings accompanying this specification. Fig. 1 shows the general arrangement of the mechanism and Figs. 2 and 3 a side view and end on view of the steering column and lever attached. a is a butterfly valve in the throttle pipe a^1, a^2 is the pedal lever connected through rod a^3 lever a^4 and rod a^5 with the lever a^6, which is mounted on the spindle of the valve a, a^7 is a spring attached at one end to lever a and at the other anchored to the frame. b is a rotating shaft driven by the engine, carrying a centrifugal device which consists of four weights b^1 suspended between two parallel X frames b^2 (one only seen) the members of which are pivotally hinged and supported on projecting pivots (one only seen) b^3, the sleeve b^4 loosely mounted on the rod b^5 and secured thereon by the collar b^6, and connecting rods b^7 each pivotally hinged to the sleeve b^4 and to a member of the X

frame. c is a lever fulcrumed on a rod or shaft c^1, one arm having a cylindrical end c^2 which engages in an eye formed on rod b^5. d is a rod pivotally hinged at one end to the lever c and at the other to spring d^1, which spring is anchored to the rod d^2. e is a lever fulcrumed on a pivot e^1 one arm of which is cam-shaped and engages one arm of lever a^6 and the other arm of which is connected to the lever c by the rod e^2 which is pivotally hinged to them respectively. The shape and inclination of the arm of lever e which engages lever a^6 is designed so as to be at greater mechanical advantage when the valve is opened to a small extent. f is a rod rotating in a tube f^1 mounted on the steering column f^2 capable of being rotated by the driver (within limits) by lever f^3 in either direction. f^4 is a short lever projected from the rod f which engages by a ball and socket joint f^5 with the rod d^2 so that on any rotation of the rod f the anchorage of the spring d^1 will be shifted towards or away from the lever c. By this rod the driver can adjust the governor device to keep the engine at any given speed or to put the device out of action. The spring d^1 is such that its effect on the lever e having regard to the intervening mechanical advantages is greater than that of the spring a^7.

The operation of the mechanism when the driver has set the governor mechanism for any speed is as follows:—The governor spring will be under tension tending (through the instrumentality of the lever c), to open the valve, overpowering the pedal mechanism spring which tends to close it, and the centrifugal element will be countering and restraining the action of the spring d^1. If owing to variation of the load the engine speed should be reduced, the effect of the centrifugal element on the lever c will fall, and the spring d^1 will contract and actuate lever c to actuate lever e and in result open the valve. If on the other hand the engine speed should increase, the centrifugal element will exert greater force on the lever c to withdraw the action of lever e allowing the pedal mechanism spring to close the valve. Hence an approximately constant engine speed can be maintained, and this speed is under the control of the driver by varying the anchorage of the governor spring. Further the pedal mechanism can be operated to accelerate above the speed prescribed by the governor mechanism and that without interference from, or interfering with the governor.

What I claim is:—

1. In a motor vehicle, an engine having a butterfly throttle valve rotatable therein, a lever fixed centrally to said valve at the pivot axis thereof, a spring connected at one end to one arm of said lever and at its other end to a fixed part of the vehicle to maintain said valve normally closed, manually operated means connected to said arm to rotate said valve against the tension of said spring, a second lever pivoted about a fixed axis on said vehicle and having one arm shaped to provide a cam face in contact with the other arm of the first named lever, a governor rotatable by said engine, and means connecting said governor to the other arm of the second lever to control the operation thereof, said cam face being shaped to provide the greater mechanical advantages at small openings of the valve.

2. In a motor vehicle an engine having a butterfly throttle valve rotatable therein, a lever fixed at its center to said valve at the axis thereof, a spring connected at one end to one arm of said lever and at its other end to a fixed part of said vehicle to maintain the said valve normally closed, manually controlled means connected to said arm to rotate said valve against the tension of said spring, a cam member rotatably mounted on said vehicle and having a cam face in operable contact with the other arm of said lever, a second lever pivoted on said vehicle, a centrifugal governor rotatable by said engine, means for pivotally connecting said governor to one arm of said second lever, a link pivotally connecting the other arm of said second lever operably to said cam member, a tension spring having one end connected to the said other arm of the second lever, and a manually adjustable anchor connected to the other end of said tension spring, said cam face being shaped to provide its greater mechanical advantages at small openings of said valve.

3. In a motor vehicle, an engine having a butterfly throttle valve rotatable therein, a lever fixed at its center to said valve at the axis of rotation thereof, yielding means connected to said lever to hold said valve normally closed, manually operable means connected to one arm of said lever to rotate said valve in opposition to said yielding means, a rotatable cam member having a cam face engaging the other arm of said lever, a centrifugal governor rotatable by said engine, a linkage operably connecting said governor to said member to rotate the latter, yielding means connected to said linkage to resist rotation of said member by said governor, and manually controlled means to adjust the resisting tension of the last named yielding means.

4. In a motor vehicle, an engine having a butterfly throttle valve rotatable therein, a lever fixed at its center to said valve at the axis of rotation thereof, a spring connected to said lever to hold the valve normally closed, manually operable means connected to one arm of said lever to control the open-

ing of said valve against the tension of said spring, a rotatable cam having a cam face engaging the other arm of said lever and operating at greater mechanical advantage at small openings of said valve, mechanism operably connected to said member and responsive to the speed of said engine, and manually adjustable yielding means connected to said mechanism to control the rotation of said member by said mechanism.

In witness whereof I have signed this specification.

FREDERICK HENRY ROYCE.