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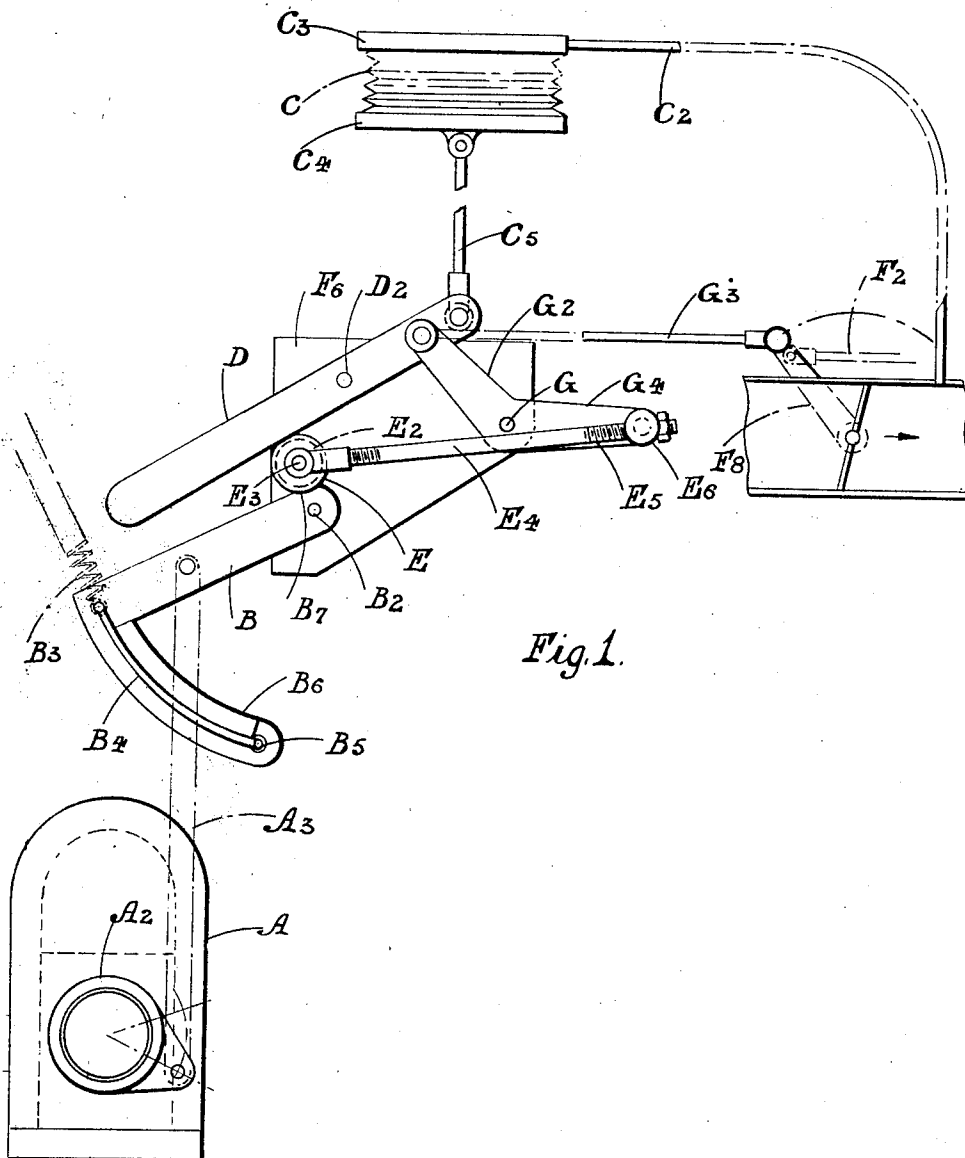
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E. DODSON

APPARATUS FOR CONTROLLING THE IGNITION POINT IN INTERNAL COMBUSTION ENGINES

Filed April 15, 1922

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

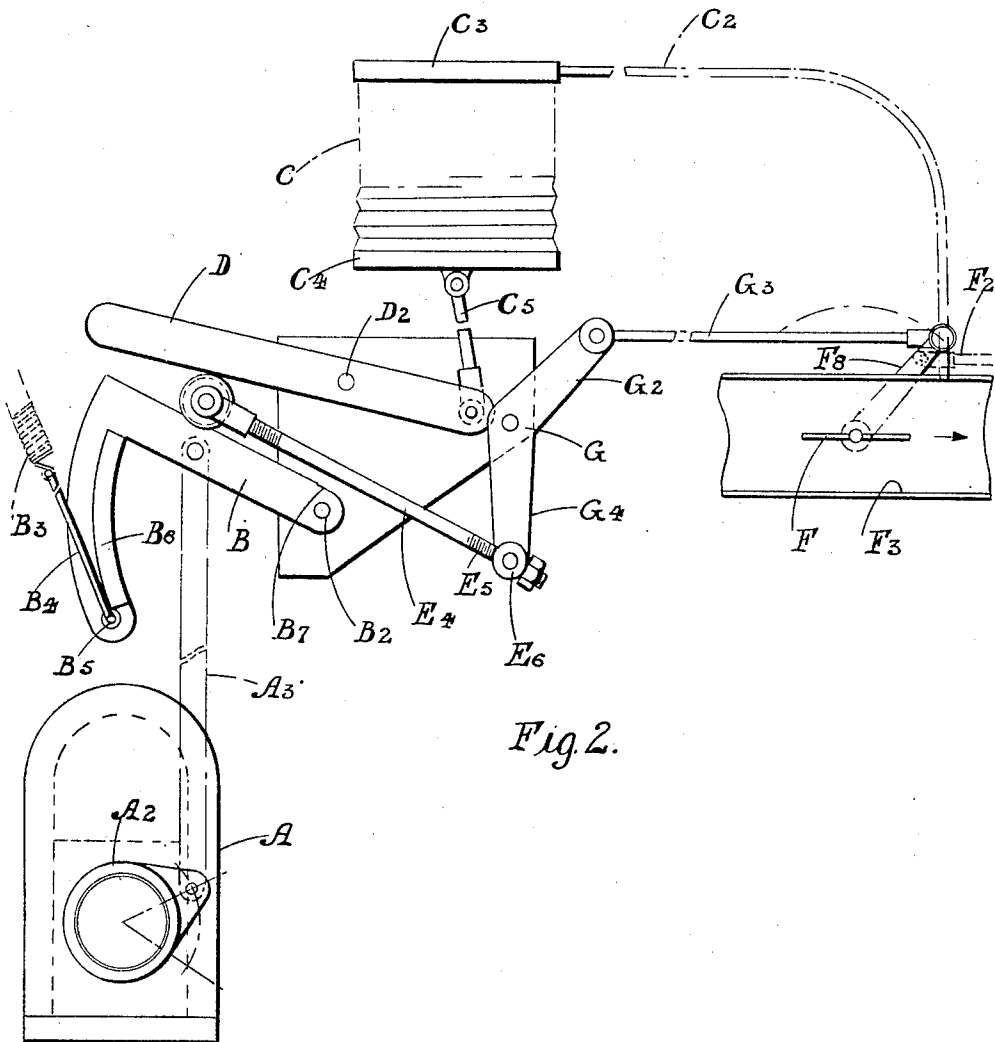


Fig. 2.

WITNESSES

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Aug. 28, 1923.

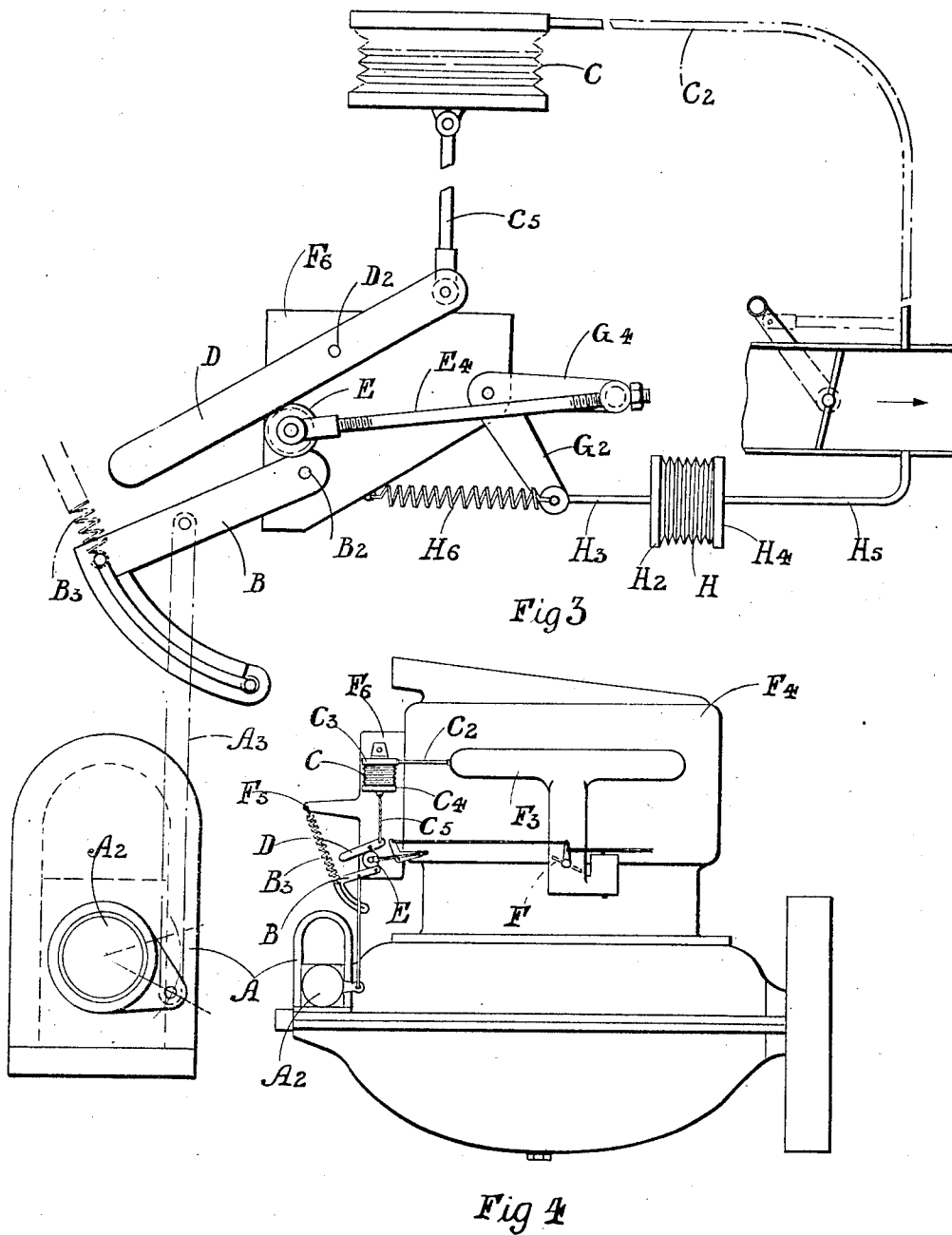
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3 Sheets-Sheet 3



WITNESSES

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UNITED STATES PATENT OFFICE.

EDWARD DODSON, OF LONDON, ENGLAND.

APPARATUS FOR CONTROLLING THE IGNITION POINT IN INTERNAL-COMBUSTION ENGINES.

Application filed April 15, 1922. Serial No. 553,280.

To all whom it may concern:

Be it known that I, EDWARD DODSON, a subject of the King of England, residing at London, England, have invented certain new and useful Improvements in Apparatus for Controlling the Ignition Point in Internal-Combustion Engines, of which the following is a specification.

My invention relates to apparatus for controlling the ignition point in internal combustion engines, of the kind in which the suction effect of the engine is employed to advance the point of ignition against the action of gravity or a spring tending always to retard the ignition.

It is the object of the invention so to control the spring effect relatively to the suction effect that the apparatus may be as sensitive at the open position of the throttle (when the changes of induction pressure are relatively slight), as at the partly-closed or closed position when they increase in magnitude.

According to this invention, means are employed to decrease the suction effect relatively to the gravitational or spring effect as the engine throttle is closed and vice versa, and these means may comprise either a lever (or a system of levers), the moment of which is variable by the agency of a member displaceable along the arm of the lever to or from its fulcrum (or this displaceable member may itself form the fulcrum), and actuated by the movements of the engine throttle, or, inasmuch as the closure or partial closure of the throttle valve produces a corresponding depression in the induction pipe, additional suction-operated apparatus may be employed to vary the position of the lever fulcrum, instead of actuating it by a connection with the throttle valve. With either arrangement the lever, which is operatively connected to the ignition member, tends to turn in one direction under the action of the engine suction, and in the opposite direction under the action of a spring or the like, and the movement of the throttle or the action of the additional suction device acts positively to weaken the moment of the spring, (or conversely to increase the moment of the main or primary suction device) when the throttle is fully open, and vice versa, when it is closed.

The manner of carrying out the invention

is illustrated diagrammatically by the accompanying drawings in which—

Figures 1 and 2 illustrate a construction in which there is an operative connection between the throttle valve and the movable fulcrum of the lever, Figure 1 shewing the relative positions occupied by the several parts when the throttle is closed (or nearly so), while Figure 2 shews the positions occupied when the throttle is fully open.

Figure 3 shews a modified construction in which the operative connection of the throttle and movable fulcrum is replaced by additional suction apparatus, the arrangement otherwise being as in Figure 1, and

Figure 4, to a smaller scale than the foregoing, shews the application to an engine of the apparatus shewn in Figures 1 and 2.

The ignition device shown at A is provided with the usual advance and retard mechanism A², connected by a hinged link A³ with a lever B pivoted at B² to a fixed member such as a part F⁶ carried by the engine to which the invention is applied. A tension spring B³ anchored at one end to a convenient fixed point F⁵, and at the other end connected to a flexible strip or the like B⁴ attached at B⁵ to a curved part B⁶ of the lever B, ensures a substantially constant leverage of the spring throughout the range of movement of the lever B.

In the position shewn in Figure 1, the ignition is in the fully advanced position, and the spring B³ acts continually to retard it. This action is opposed by the suction effect in the induction pipe F³, at a position between the closed throttle F and the cylinders F⁴, such effect being transmitted by way of a conduit C² to a bellows C anchored at one end C³ to a fixed part, and at the other end C⁴ connected by a hinged link C⁵ with a lever D fulcrumed at D² to a fixed member. The lever D is arranged side by side with the lever B, and interposed between them is a roller E, preferably divided into three separate rollers located side by side the middle one E² as shown by the broken line being slightly smaller in diameter than the outer ones so that it engages the lever B only, while the outer rollers engage the lever D only, which is there thickened sufficiently to permit this. The roller is thus engaged by the respective le-

vers on opposite sides of its centre E^3 and by its particular construction is adapted to be moved along them but with little frictional resistance.

5 As will be evident from the foregoing arrangement, the levers B and D are thrust towards one another by the respective action of the spring B^3 and the contraction of the bellows C when closed, and that their relative effect upon one another as to the
10 moments which they exert and the positions or equilibrium which they will ultimately attain is wholly dependent upon the position which the roller E occupies relative to the respective fulcrum B^2 and D^2 , and the amount of suction pertaining at the time. Accordingly, therefore, this roller is mounted at the end of a link E^4 which is operatively connected with the hand control lever F^1 of the throttle valve F located in the induction pipe F^3 .

As it is desirable that the movement of the roller E away from the fulcrum B^2 and D^2 should be relatively small at the nearly closed position of the throttle, but should continually increase in magnitude as the throttle F is opened, a toggle system of linkage is employed to effect this, comprising the bell crank lever G (pivoted to a fixed part) of which one arm G^2 is substantially parallel with the throttle arm F^3 upon the throttle valve F, and is connected with it by a link G^3 . The other arm G^4 of the bell crank lever constitutes with the link E^4 the toggle mechanism, being substantially in line with it when the throttle is closed, but approaching or reaching a position at right angles to it when the throttle is fully opened. Thus it will be evident that movement of the roller E acting to reduce the spring effect will be very slight while the throttle is partly closed, but will be considerably greater when the throttle is fully opened, and consequently the suction pressure is relatively small, the mechanism ensuring that at this position the spring B^3 shall have its least effect, or conversely, that the suction shall have its greatest effect.

To enable independent adjustment of the position of the roller E to suit particular types of engines and to effect this if necessary while the engine is running, the link E^4 has a threaded connection at E^5 with the member E^6 by which it is hinged to the arm G^4 of the bell crank lever G, any known or convenient arrangement being provided to ensure that its effective length is varied when it is rotated. Furthermore to facilitate starting and to ensure a correct location of the ignition device for this purpose, a notch may be provided at B^7 in the lever B so that the roller E will readily engage the notch, and thus ensure the correct position. The engagement of the roller with both levers B and D is at all times ensured by the

spring action and the suction effect which act in conjunction with one another to thrust the respective levers against the roller from opposite sides of it.

The use of the bellows C avoids frictional losses and/or leakages which are liable to arise if a cylinder and piston are employed, and it also tends thereby to render the apparatus more sensitive to changes of pressure.

The disposition of the parts as shown in Figure 2 will be clearly understood from the foregoing description of the apparatus, and it will be particularly noticed from this arrangement that although some change of leverage takes place with the lever D by reason of the movement of the roller E, is comparatively slight as compared with the changes of leverage of the lever B. If through reduction of load any increase of suction occurs with the throttle fully open, the increased suction will act to overcome the force of the spring B^3 , and will advance the ignition as is desirable, while any closure of the throttle, while it acts to move the roller nearer to the fulcrum of the levers B and D, will also at the same time produce a decrease of the suction effect which is tending to overcome the spring B^3 and to advance the ignition too much.

From the foregoing description, the modification illustrated in Figure 3 will be readily understandable, inasmuch as the only changes are in the manner of controlling the position of the roller E. For this purpose the link G^3 between the throttle valve and the bell crank lever G is eliminated, and the form of the latter is so modified as to permit of connecting its arm G^2 with a link H^3 extending from the movable wall H^2 of a bellows H constituting the additional or supplementary suction device. This latter has its fixed wall at H^4 , and from this a conduit H^5 extends to the induction pipe F^3 , placing the interior of the bellows in communication with the induction system at a position between the throttle valve F and the cylinders F^4 . A spring H^6 anchored to a fixed part such as the plate F^3 acts in opposition to the suction effect in the bellows and is connected to the arm G^2 of the bell crank lever G thereby to ensure its direct action upon the movable fulcrum E.

What I claim as my invention and desire to secure by Letters Patent of the United States is:—

1. In an internal combustion engine, the combination with the induction pipe and a throttle valve therein, of an ignition timing device, a suction-operated device communicating with the said induction pipe so as to advance the said timing device with each increase of suction, a lever system interposed between the said suction and timing

devices, a spring arranged to oppose the suction advance, and means actuated by a variation in the position of the said throttle valve to vary the position of the fulcrum of the

5 said lever system.

2. In an internal combustion engine, the combination with the induction pipe and a throttle valve therein of an ignition timing device, an induction pipe, a suction-operated device connected with said induction pipe and adapted to advance said timing device with increase of suction, a lever actuated by said suction device, a lever connected with said timing device, a displaceable member

15 forming an operative connection between said levers and movable along them to vary their respective acting leverages, a spring adapted to oppose suction advance and means dependent upon the position of said throttle for varying the position of said displaceable member connecting said levers.

3. In an internal combustion engine, the combination with the induction pipe and a throttle valve therein of an ignition timing device, an induction pipe, a suction-operated device connected with said induction pipe and adapted to advance said timing device with increase of suction, a lever actuated by said suction device, a lever connected with

30 said timing device, a displaceable member forming an operative connection between said levers and movable along them to vary their respective acting leverages, a spring adapted to oppose suction advance, means dependent upon the position of said throttle for varying the position of said displaceable member connecting said levers, and a toggle linkage system connecting said displaceable member with said means, adapted

40 to produce an increasing degree of movement of said member as said throttle approaches its fully open position.

4. In an internal combustion engine as claimed in claim 3, the combination with the displaceable member and the control means therefor, of an adjustable link adapted to vary the acting position of said displaceable member.

5. In an internal combustion engine, the combination with the induction pipe and a throttle valve therein of an ignition timing device, a suction-operated device connected with said induction pipe and adapted to advance said timing device with increase of

55 suction, a lever actuated by said suction device, a second lever side by side with the first-mentioned lever and connected to said

timing device, a roller located between said levers and displaceable along them, a spring acting upon said timing device and said lever connected therewith to cause said lever to bear against said roller and hold it against the first-mentioned lever, and an operative connection between said roller and the afore-said throttle valve whereby the leverage of

65 said levers is varied in accordance with the movements of the throttle valve.

6. In an internal combustion engine as claimed in claim 5, locating the levers connected respectively with the suction device

70 and the ignition timing device, so that when said roller is opposite the fulcrum of the ignition advance lever it is at a distance from the fulcrum of the suction actuated lever.

7. In an internal combustion engine, the combination with the induction pipe and a throttle valve therein of an ignition timing device, a control lever for said throttle valve, a bellows, a conduit connecting said bellows with said induction pipe at a point between said throttle valve and the cylinder of said engine, means for connecting said bellows with said ignition timing device, adapted to advance said timing device with increase of suction, said means comprising

85 two levers pivoted side by side, one connected with said bellows, the other connected with said timing device, a roller located between said levers and displaceable along them adapted to vary their effective leverages, a spring acting in opposition to the suction of said bellows upon said timing device, tending thereby to retard it and also to compress said displaceable roller between said levers, a toggle link system connecting said roller

95 and said throttle control lever, adapted progressively to increase the roller movement along said levers, as the throttle is opened, and vice versa, means for adjusting the position occupied by said roller at any given throttle position, and a notch in the lever connected with said timing device, located opposite the pivot of the lever connected with said bellows, constituting a location for said roller when said throttle

100 valve is in its closed position.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD DODSON.

Witnesses:

STANLEY W. HUGHES,
A. I. CRUMP.