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FUEL DELIVERY DEVICE FOR INTERNAL COMBUSTION ENGINES

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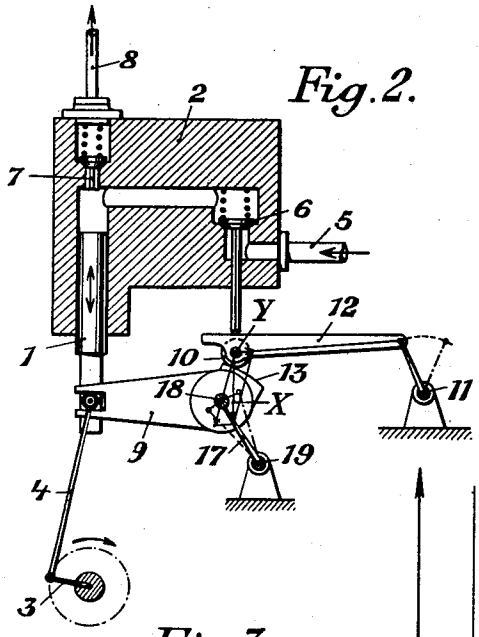

Fig.2.

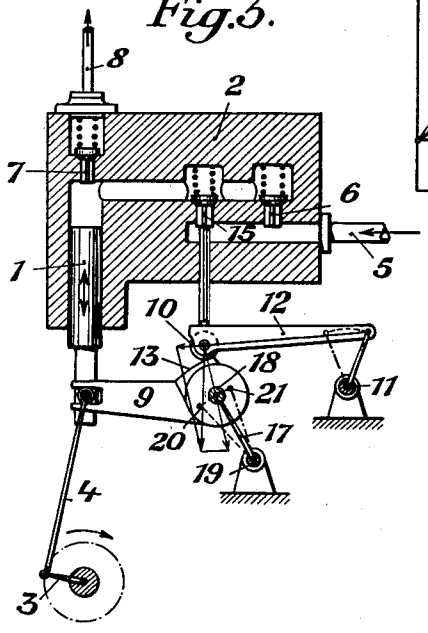

Fig.3.

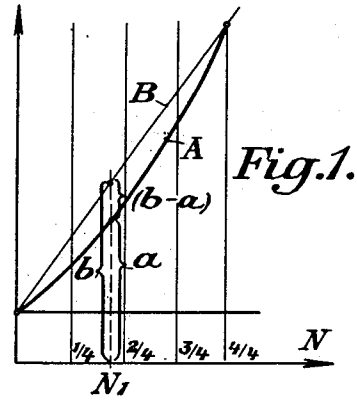

Fig.1.

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FUEL DELIVERY DEVICE FOR INTERNAL COMBUSTION ENGINES

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1 Claim. (Cl. 103—41)

This invention relates to fuel delivery devices for engines working with positive injection of fuel and is particularly applicable to such devices for use with compression ignition engines. In existing devices in which the regulation of the quantity of fuel delivered is effected by a governor the lift of which varies in proportion to the speed of rotation of the engine, which in turn must vary with the load, the disadvantage arises that the quantity of fuel delivered on the basis of the position of the governor does not correspond to the law of fuel consumption. As a result oscillations of the governor are produced and act disadvantageously on the operation of such an internal combustion engine. According to the present invention they are eliminated by including in the mechanism by which the quantity of fuel delivered into the working cylinder is controlled a member which serves to compensate at any load for the deviation of the lift of the governor from that which it should make to accord with the law of fuel consumption. The object is to deliver a quantity of fuel corresponding to the law of fuel consumption, not only for idle running and full load but also for intermediate loads or governor positions.

A fuel delivery device made in accordance with the invention is diagrammatically illustrated by way of example in the accompanying drawing, in which

Figure 1 shows at A the curve of the law of fuel consumption and at B the fuel supply effected in accordance with the load N by a governor, the lift of which varies in proportion to the engine load.

Figure 2 shows the fuel delivery device in section and

Figure 3 shows a modified construction.

In Figure 1 the ordinates of the curve A represent the amount of fuel which should be injected in accordance with the fuel consumption law, and those of the curve B the amount of fuel actually injected as a result of the action of the governor. For instance for a load N1, the cylinder requires a quantity of fuel a in accordance with the fuel consumption law, whilst under the action of the governor for the power in question a quantity of fuel b is delivered by the fuel pump. Thus an excess of fuel $(b—a)$ has been injected, that is to say the engine runs faster and the governor rises above its position of equilibrium in order to reduce the quantity of fuel to be injected. This renders the quantity of fuel delivered too small and the engine runs more slowly again. This leads, however, to hunting which, according to the invention, is avoided by using a special member which compensates at any load for the deviation of the governor which is represented by the difference between the curves A and B.

Referring to Figure 2 the piston 1 of the fuel pump built into a casing 2 is driven by a crank 3 and connecting rod 4 or by a cam and forces the fuel drawn from a pipe 5 through a suction valve 6 past a delivery valve 7 into a delivery pipe 8 which leads to one or more open nozzles or positively controlled admission members. A member 9 is actuated by the pump delivery mechanism and co-operates with a roller 10 on a lever 12 connected to the shaft 11. This shaft 11 is connected to the sleeve of a centrifugal governor not shown, and the crank connected to the shaft 11 moves between the two extreme positions shown in Figure 2 as the governor sleeve moves between its two extreme positions. The variation of the quantity of fuel to be delivered is effected from the governor through the shaft 11, which in the position shown in full lines in Figure 2 corresponds to idle running. It is to be understood that the actual control of the quantity of fuel is effected by regulation of the time of opening of the suction valve 6 during the delivery stroke of the piston 1, this valve 6 being opened at an early stage for idle running so as to interrupt the delivery earlier and at a late stage for full load.

The member 9 is provided with a cam track 13 which serves to compensate for the deviation referred to above. The cam track 13 is, therefore, so shaped that the fuel to be introduced is varied at the various governor positions, i. e. at the load N1 is reduced by the amount $b—a$, that is to say only the quantity a is injected. That is to say the cam surface is so formed as to render the relation between the engine load and the governor at least approximately linear.

The cam track 13 is mounted about an axis 18 carried by a rod 17 fixed to a shaft 19 so that by moving the rod 17 the position of the cam track can be adjusted. The latter is moreover arranged in such a manner that the action of the forces exerted by the fuel on the shaft 11 connected to the governor is reduced to a minimum. Thus if the force exerted by the fuel on the roller 10 is indicated by X, the crank on the shaft 11 will be subjected to a component Y which is only a relatively small fraction of the force X.

The construction shown in Figure 3 differs from that of Figure 2 in that the regulation of the quantity of fuel is effected through a separate

by-pass valve 15 instead of by the suction valve 6. The compensating member is again formed as a cam track 13 and co-operates with the by-pass valve 15 in the same way as the cam track 13 shown in Figure 2 co-operates with the suction valve 6. The shaft 11 is also shown in this figure in full lines in the idle running position in which the by-pass member 15 is opened relatively early and thus a small quantity of fuel is delivered. The axis of rotation 18 of the cam track is again adjustably mounted and can be moved between the positions 20 and 21 by means of the rod 17 which is adjustable by means of the shaft 19.

By means of the arrangement described compensation is made for the disadvantages of the existing constructions in which the delivery of the pump is correct only for two operating conditions of the engine, for instance for idle running and full load.

I claim:

A fuel feeding device for an engine working with positive injection of fuel comprising a fuel pump, a plunger therefor, means for reciprocating said plunger, a pivot, a member mounted at one end on said pivot and connected at its other end to the pump plunger whereby reciprocation of the plunger causes the member to be rotated about its pivot, said member having a cam surface on the pivot end thereof, a valve for regulating the amount of fuel injected into the cylinder, a transmission member operable by said cam surface and the rotation of said pivoted member for operating said valve, means operable by the governor for changing the position of said transmission member with respect to said pivoted member and means for varying the position of said pivot and the member rotatable thereabout to vary the degree of opening of the valve upon movement of the member about its pivot.

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