

Jan. 21, 1941.

R. F. COLELL

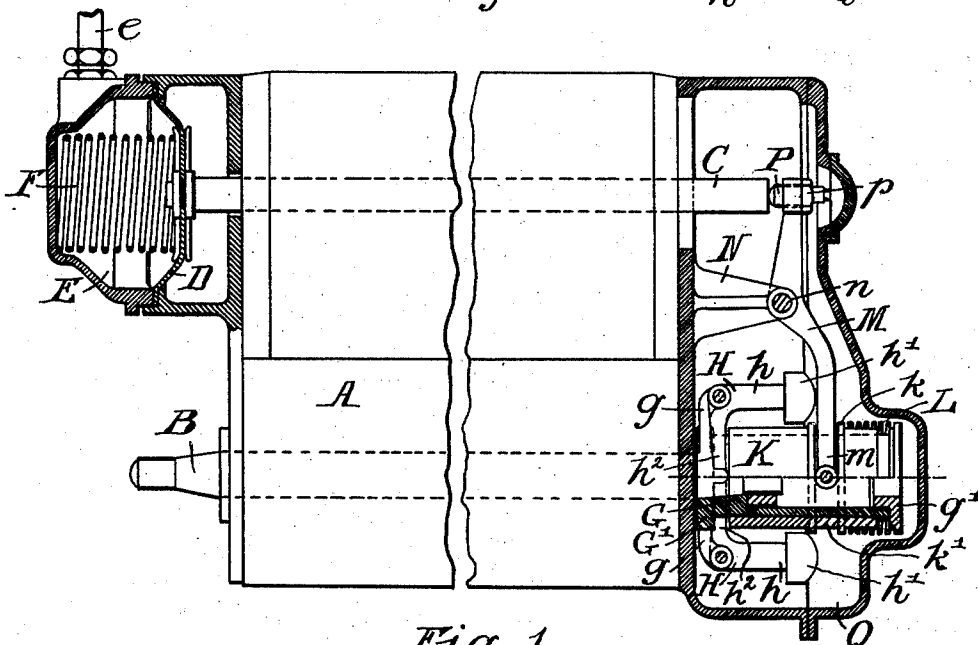
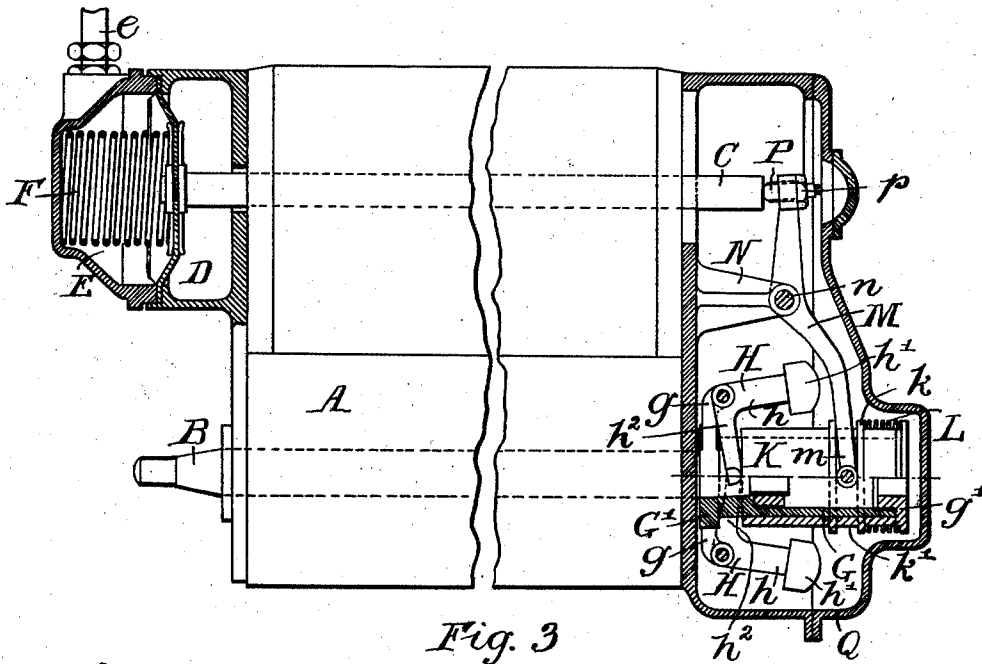
2,229,048

MEANS FOR FACILITATING THE STARTING OF INTERNAL COMBUSTION ENGINES.

FOR MOTOR VEHICLES USING A VACUUM-GOVERNED FUEL INJECTION PUMP

Filed Sept. 7, 1938

2 Sheets-Sheet 1



Inventor:
Richard Friedrich Colell
by Lester L. Sargent
his Attorney.

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2 Sheets-Sheet 2

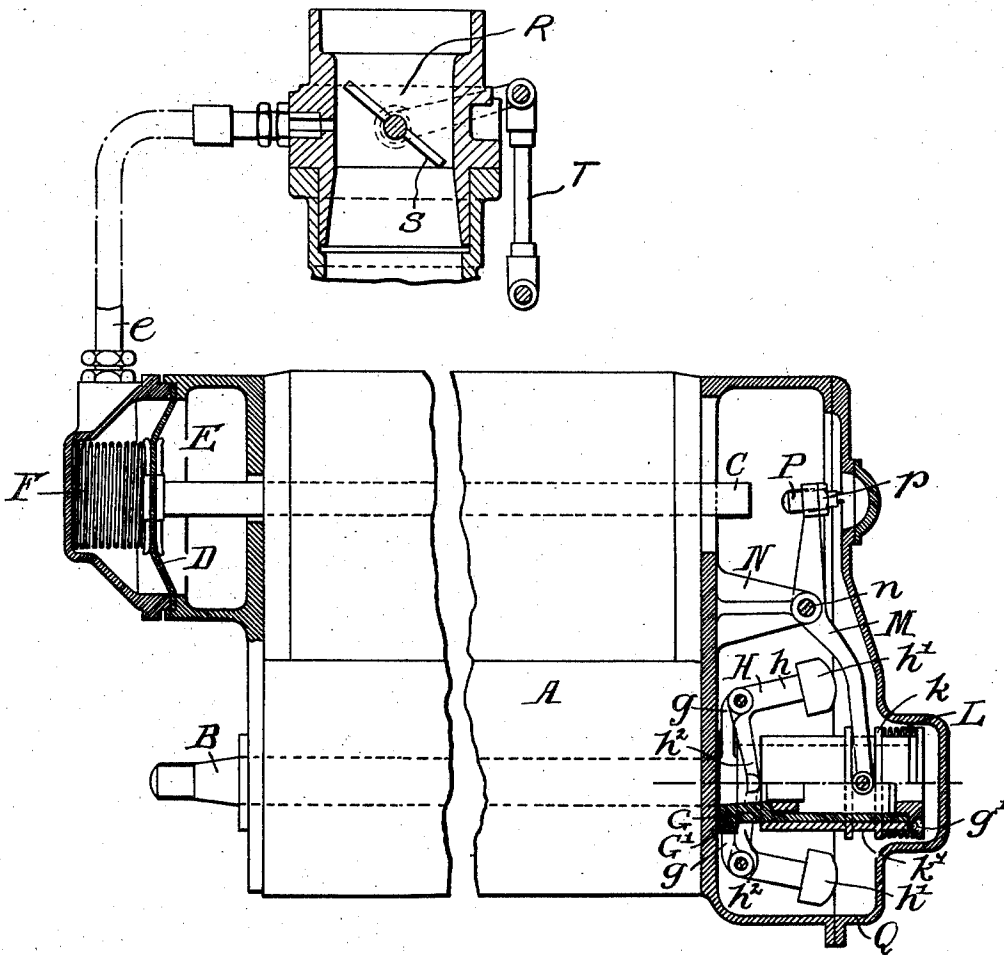


Fig. 2.

Inventor:
Richard Friedrich Colell

by Lester L. Sargent
his Attorney.

UNITED STATES PATENT OFFICE

2,229,048

MEANS FOR FACILITATING THE STARTING
OF INTERNAL COMBUSTION ENGINES FOR
MOTOR VEHICLES USING A VACUUM-
GOVERNED FUEL INJECTION PUMPRichard Friedrich Coiell, Edgbaston, Birming-
ham, England, assignor to The Austin Motor
Company, Limited, Northfield, Birmingham,
EnglandApplication September 7, 1938, Serial No. 228,870
In Great Britain September 8, 1937

3 Claims. (Cl. 123—140)

The invention relates to means for facilitating the starting of internal combustion engines for motor vehicles and of the type in which fuel is injected into the cylinder, or each cylinder, by a fuel injection pump, and in which the speed or power of the engine is under the control of a vacuum governor in which there is a diaphragm or piston moving the control rod or rack of the fuel pump, the diaphragm or piston being under the control of the vacuum or depression in the air induction system of the engine, which is varied by a throttle valve controlled by the operator by a hand lever or foot pedal. The diaphragm or piston acts in such a way that, if the vacuum increases, the fuel supply is decreased and vice versa.

It is found necessary, when the engine is running, to provide means to prevent more than a predetermined amount of fuel being injected per cycle whatever the speed of the engine, or whatever the load, may be. For this purpose it has been usual to provide a stop to limit the movement of the control rod or rack in the direction to increase the fuel supply, and it has been suggested to move such stop away by hand when it is required to start the engine, the stop then being in such position that it will allow the control rod or rack to move in a direction to admit more fuel than the said predetermined amount; and it has been arranged that, on the release of the hand-operated means, the stop is automatically reinstated by the movement of the control rod or rack in a direction to cut down the fuel supply. The object of the present invention is to provide means for facilitating starting which are independent of any action of the driver, and therefore can be entirely enclosed.

In a known type of engine means are provided whereby the stop which, under full load, limits the movement of the control rod or rack in a direction to increase the fuel supply, is automatically held in a position to allow of further increase of fuel when the engine is stationary or being started, and the stop has been automatically reinstated in its normal or running position as soon as the engine reaches a speed at which it will run under its own power.

According to this invention, the stop is moved from one of these positions to the other, and held there, by a centrifugal governor.

A convenient embodiment of the invention is described with reference to the accompanying drawings in which—

Figure 1 is a side view, partly in section, and

partly in elevation, of means according to the invention, and showing the parts in the positions they assume when the engine is stationary.

Figure 2 is a view corresponding to Figure 1, but showing the parts in the positions they assume when the engine has been started but is idling or running under no load conditions; and,

Figure 3 is a view also corresponding to Figure 1, but showing the parts in the positions they assume when the engine is running under full load.

In these drawings, A is the pump casing shown as partly broken away. B is the pump shaft by which the pump is driven. C is the pump rack controlling the amount of fuel delivered per revolution; and D is a diaphragm controlling the pump rack C and closing the front of a chamber E which is in communication, by a pipe e, with the engine suction, including a conventional air inlet passage R leading to the air inlet manifold of the engine, throttle valve S, and throttle valve lever T. F is a coil spring tending to press the diaphragm and pump rack in a direction to cause maximum fuel supply. The engine suction tends to force the diaphragm the opposite way against the force of the spring F and reduce the fuel supply. The parts above described constitute already known practice.

On the right hand end of the pump shaft B there is keyed a sleeve G having, at its inner end, a collar G¹ carrying two lugs g, g, to which are pivoted two bell crank levers H, H, each having a forward arm, or pair of arms h, carrying a weight h¹ at its or their forward end. Each bell crank lever has an inwardly extending arm h² adapted to lie, at its inner end, in front of the collar G¹ and adapted to bear forwardly against the rear end of an outer sleeve K which is slidably mounted on the sleeve G, but in such a manner that it will rotate therewith. For this purpose it may be keyed or splined on the sleeve G. The inner sleeve G has, at its forward end, a collar g¹ and between this collar and a collar k on the sleeve K may be placed a coil spring L tending to press the sleeve K rearwardly against the ends of the arms h². The spring L is not essential as its function can be performed by the spring F behind the diaphragm; but it is preferred to insert the spring L to steady the movement of the sleeve. The sleeve K also has a groove k¹, in which engages the forked lower end m of an upwardly extending lever M which is pivoted at n to a lug N carried by the casing A. The lever M extends up beyond its pivot axis and

carries at its upper end a set-screw P forming the stop to the forward movement of the pump rack C. The set-screw is adjustable in relation to the lever M and is secured in its adjusted position by a lock nut p.

The whole of the mechanism comprised in the auxiliary governor and the lever M and stop P are enclosed in a casing Q and are inaccessible to the driver of the vehicle.

- 10 Assuming that the engine is stationary, the parts are as shown in Figure 1. It will be seen that the sleeve K is being pressed by the spring L as far as it will go in a rearward direction so that the lower end of the lever M is also in its most rearward position and the stop P in its most forward position. There being no suction in the chamber E the spring F is pressing the pump rack C forwardly against the stop P. With the pump rack in this position and as soon as the engine is turned for starting the pump delivers fuel in excess of the normal maximum delivery, thus facilitating starting. When the engine has started the engine suction causes the pump rack C to move away from the stop; but so long as the engine has not reached a predetermined speed the centrifugal force of the weights h^1 is not sufficient to impel the sleeve K forwardly against the force of the spring L and the parts of the auxiliary governor as well as the stop P are still in the same position as that shown for these parts in Figure 1.

- As soon, however, as the engine reaches a predetermined speed the centrifugal force of the weights h^1 becomes sufficient to impel the sleeve K to its fully forward position, its forward end then coming against the collar g^1 of the sleeve G. The lower end of the lever M is thereby rocked forward and the stop P moved to its rearmost position. The engine is then in its idling condition and the parts are as shown in Figure 2.

- When the engine is put under load and the load increased the pump rack moves to the right, under the reduced suction, until, at full load, the pump rack encounters the stop P (see Figure 3).

The stop is, however, in its rearward position so that further increase of fuel is prevented. The movement of the stop P in a rearward direction, is, of course, limited by the engagement of the sleeve K against the collar g^1 .

Thus, for running of the vehicle, the fuel supply cannot exceed a predetermined controlled maximum per cycle; but for starting a supply in excess of such controlled maximum is obtained.

Having fully described my invention what I claim and desire to secure by Letters Patent is:

1. In an internal combustion engine of the fuel injection type, means for controlling the fuel supply comprising a throttle valve, a throttle lever to control the throttle valve, a hollow casing forming a vacuum suction chamber, a passage connecting said chamber to the engine section, a spring-pressed diaphragm in said vacuum chamber functioning as the main fuel governor operative at all engine speeds to control the fuel supply, a fuel injection pump, a control rod controlling the quantity of fuel supplied at each stroke of the pump and connected to said diaphragm in such a manner that as the vacuum decreases the control rod is moved in a direction to increase the fuel supply, a stop to limit the movement of said rod in said direction, said stop remaining in one definite position during all normal running speeds, and an auxiliary centrifugal governor by means of which said stop is moved out of said definite position to allow of the injection of an excess of fuel for starting and moved back to its definite position for running.

2. In combination with the means claimed in claim 1 said stop being carried on the end of one arm of a lever pivoted at an intermediate point, the other arm of the lever being connected to and operated by the said centrifugal governor.

3. In combination with means as claimed in claim 1, a casing by which the centrifugal governor parts are completely enclosed and rendered inaccessible.

RICHARD FRIEDRICH COLELL.