

Dec. 11, 1928.

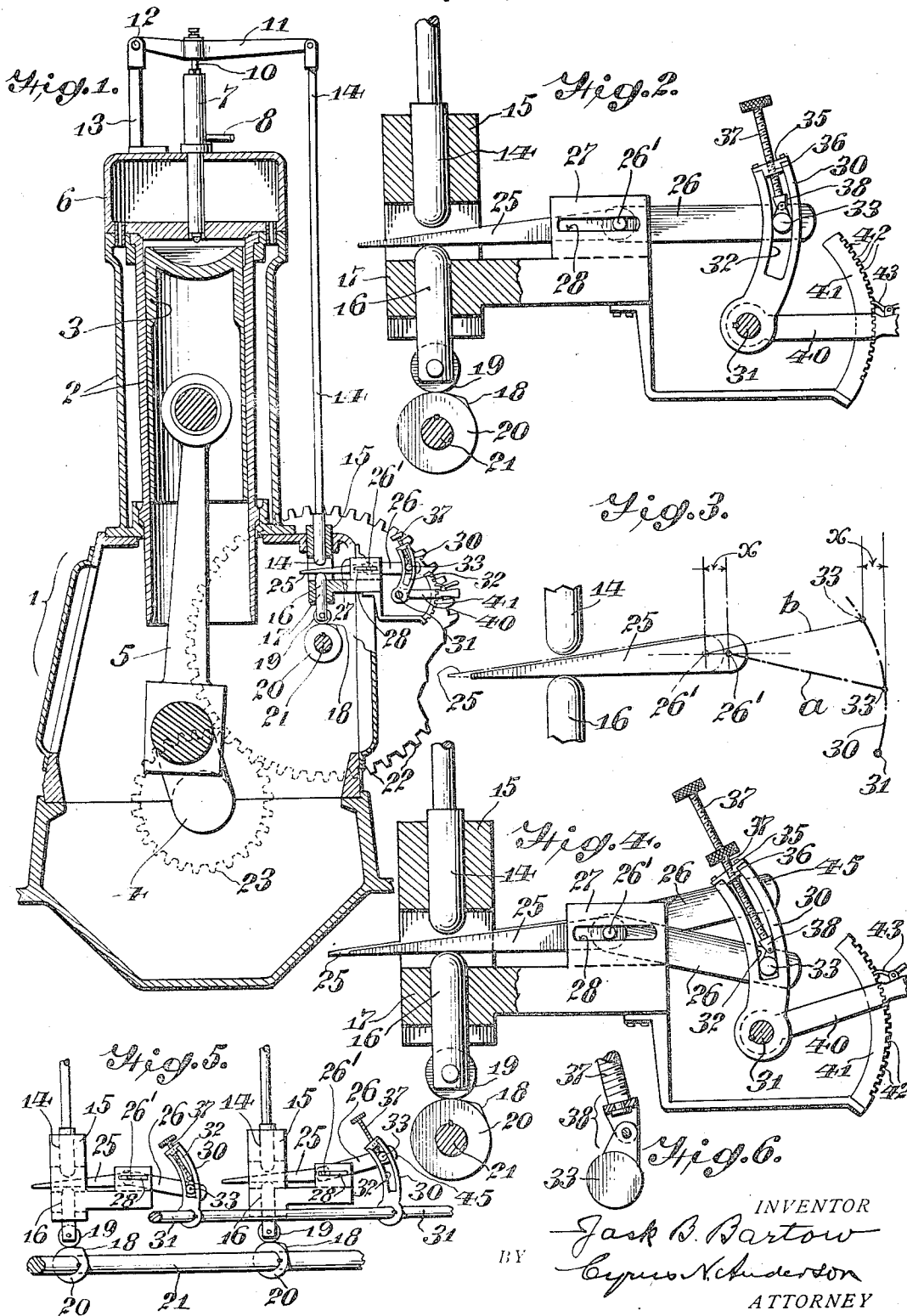
1,694,367

J. B. BARTOW

FEED CONTROL MEANS FOR INTERNAL COMBUSTION ENGINES

Filed Sept. 13, 1927

2 Sheets-Sheet 1



Dec. 11, 1928.

1,694,367

J. B. BARTOW

FEED CONTROL MEANS FOR INTERNAL COMBUSTION ENGINES

Filed Sept. 13, 1927

2 Sheets-Sheet 2

Fig. 7.

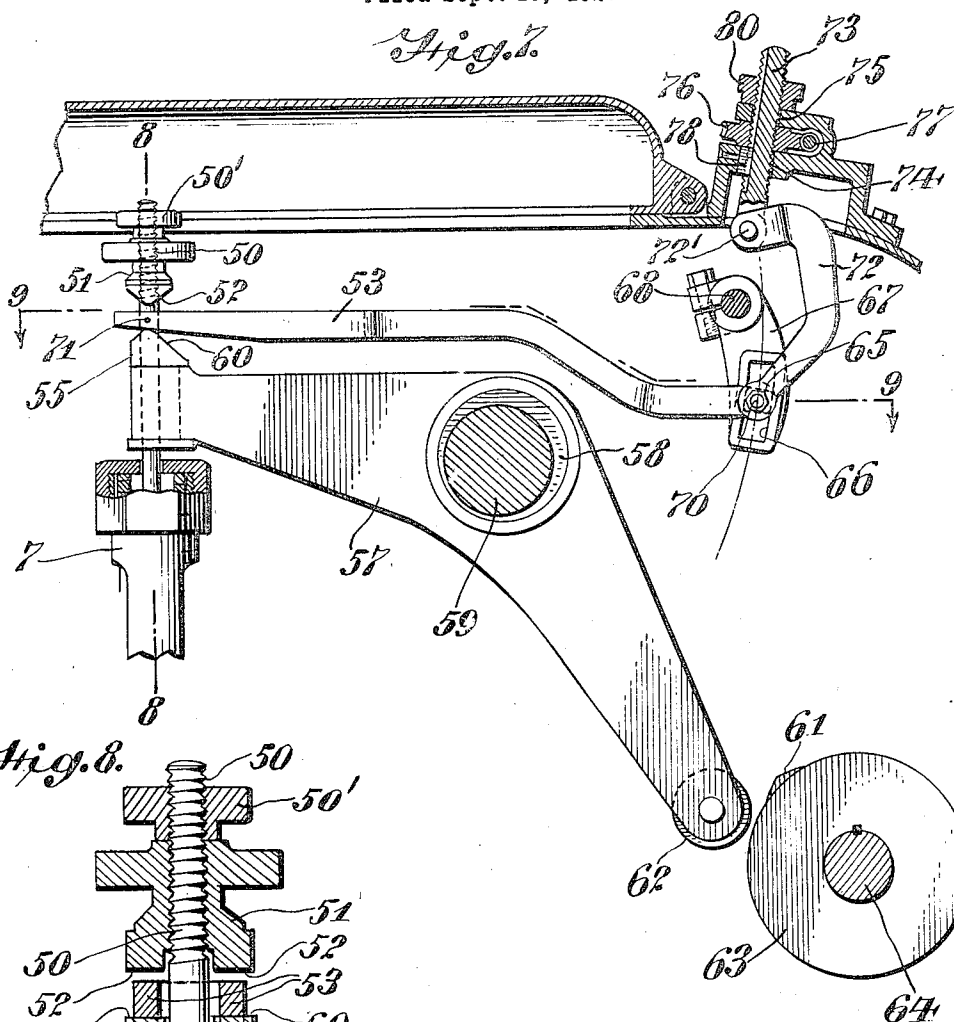


Fig. 8.

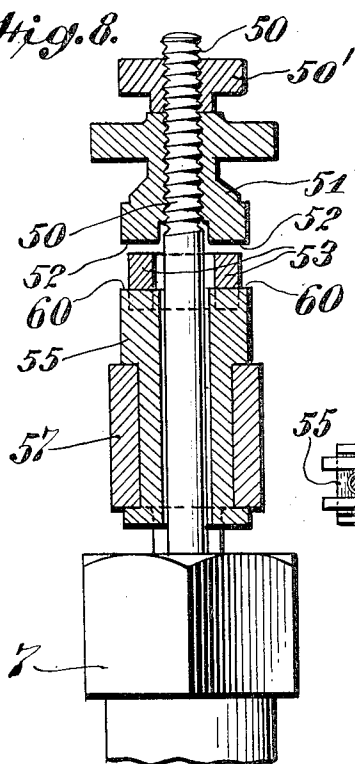
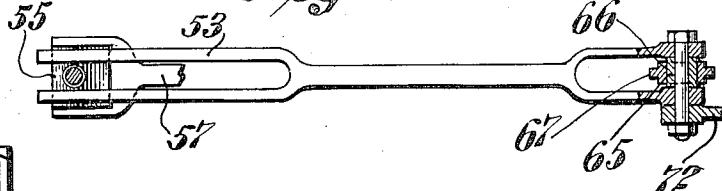


Fig. 9.



INVENTOR
Jack B. Bartow
BY *Cyrus W. Anderson*
ATTORNEY

UNITED STATES PATENT OFFICE.

JACK B. BARTOW, OF DARBY, PENNSYLVANIA, ASSIGNOR TO TREIBER DIESEL ENGINE CORPORATION, OF CAMDEN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

FEED-CONTROL MEANS FOR INTERNAL-COMBUSTION ENGINES.

Application filed September 13, 1927. Serial No. 219,199.

My invention relates to means for controlling the feed of liquid fuel to internal combustion engines and it has for its general object to provide novel devices of improved construction whereby the feed of fuel to any one of the cylinders of a multi-cylinder engine may be controlled independently of the others.

It also is an object of the invention to provide a construction of the character indicated including means whereby when the feed controlling devices are withdrawn to a certain predetermined normally inoperative position, all of the said devices are withdrawn to the same extent, regardless of the extent to which they may be projected when adjusted into operative relation to the feed actuating means.

I shall not here undertake to indicate all of the various objects and advantages characteristic of the invention, but other and additional objects thereof will either be referred to and pointed out in the detailed description thereof which follows, or will be apparent from such description.

In order that the invention may be easily understood and its practical advantages rendered more readily apparent, reference should be had to the accompanying drawings in which I have illustrated certain forms of mechanical embodiments of the invention. However, it will be understood that the invention is susceptible of embodiment in forms of construction other than those shown and that changes in the details of construction may be made within the scope of the claims without departing from the said invention or the principle thereof.

In the drawings:

Fig. 1 is a view in vertical section of an internal combustion engine provided with feed control means embodying the invention, the said means being shown in sectional elevation;

Fig. 2 is a view in sectional elevation of the portion of the feed control means embodying the invention which is shown in Fig. 1;

Fig. 3 is a diagrammatic view illustrating the manner in which the adjustment of a single adjustable controlling device is effected;

Fig. 4 is a view in sectional side elevation of the feed controlling device showing two

adjoining devices adjusted into different positions and indicating the means by which adjustments to different positions are effected;

Fig. 5 is a perspective of the two adjoining controlling devices shown in Fig. 4 and illustrating more clearly the manner in which different adjustments of the adjustable devices are effected;

Fig. 6 is a view partly in elevation and partly in section of a fragmentary portion of the structure showing more clearly the details of construction thereof;

Fig. 7 is a vertical sectional view of a modified construction of liquid fuel feed control means embodying the invention;

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 7; and

Fig. 9 is a horizontal sectional plan view taken on the line 9—9 of Fig. 7.

In the operation of internal combustion engines in which liquid fuel is employed as the exploding medium in the cylinders thereof, it not infrequently happens in the case of a multi-cylinder engine that for one reason or another, unequal amounts of fuel are discharged into the cylinders, thereby effecting the generation of greater power, for instance, in one or more cylinders than is generated in one or more of the other cylinders of the structure. This is objectionable because it creates an unbalanced condition which might possibly result in injury to the structure.

This unequal feeding may result from the clogging, for instance, of the openings in the spray nozzle through which the fuel is discharged into the engine cylinders. In case there should be a clogging and partial closing of the openings in any particular nozzle, the amount of fuel discharged therefrom may be equalized with respect to other nozzles by holding the valve thereof open for a longer period than is the case with the valves of other nozzles which supply fuel to other cylinders of the engine structure.

In structures of this character lost motion actuating means are employed for effecting the feed of fuel to the different cylinders of the multi-cylinder structure, there being lost motion actuating means associated with each cylinder of the structure. Such structures heretofore have included

devices whereby the amount of lost motion in the lost motion actuating means may be varied.

These lost motion controlling devices are in practice and should be capable of being withdrawn into such position that parts of the lost motion actuating means may be actuated without effecting the feed of fuel into the cylinders and these devices should be so supported that when the controlling means therefor is operated to withdraw them into inoperative relationship to the lost motion actuating means all of the said means is rendered inoperative, but heretofore in order to effect such adjustment simultaneously of all of the said lost motion controlling devices into inoperative position, it has been necessary that all of said devices should have occupied the same relative position when in operation. In the construction embodying my invention I have provided means whereby this relationship is rendered unnecessary as will appear from the detailed description of the said invention which follows.

In Figs. 1 to 5 of the drawings I have shown a crank casing 1, an engine cylinder 2 mounted thereon, a piston 3 for the said cylinder, a crank-shaft 4, a piston rod 5 connecting the said crank-shaft and the said piston together and operating to reciprocate the piston within the said cylinder, a cylinder head 6 and a spray nozzle 7, from which liquid fuel is adapted to be discharged into the upper end of the cylinder 2.

It will be understood that the cylinders, piston rods, etc., will be duplicated according to the number of cylinders and associated parts which may be embodied in the multi-cylinder engine structure.

Fuel is adapted to be supplied to the respective spray nozzle 7 through pipes 8 connected with a supply (not shown) of liquid fuel under constant required pressure. The discharge of fuel from the spray nozzle is controlled by a valve at the lower end thereof which usually is mounted upon or at the lower end of a rod 10, the upper end of which projects above the upper end of the spray nozzle and is connected with a cross-wise extending lever 11 pivoted at one end to a stationary pivot 12 upon the upper end of a post or standard 13 mounted upon the piston head 6 and the opposite end of which is connected to the upper end of a rod 14 constituting part of the feed actuating means. The lower end of the rod 14 is supported and guided in a stationary guide 15 and is in alinement with a member or section 16 supported in a stationary guide 17 and adapted to be reciprocated therein at intervals by the contact of a rotating cam projection 18 with a roller 19 mounted upon the lower end of the section 16. It will be understood that there are a number of these cams and feed actuating means. These cams

are mounted upon cam discs or wheels 20 which are secured to a cam shaft 21 which, in the construction as illustrated, is adapted to be driven by means of gears 22 and 23, the former being mounted upon the cam shaft 21 and the latter upon the crank-shaft 2. The construction as thus far described is known in the prior art and constitutes no part of my invention except as it may involve novelty in combination with elements more immediately associated with and forming parts of the mechanism to which my invention is directly related.

For the purpose of controlling the extent of actuation of the rod 14 of the feed actuating means to thereby control the feed of fuel to the engine cylinders, lost motion controlling means is adapted to be inserted and located between the opposing adjoining ends of the said rod 14 and the section or portion 16. In the construction as illustrated I have provided wedges 25 which rest at their inner ends upon the outer ends of the members or sections 16. The outer ends of these wedges are pivotally connected to the inner ends of adjustable links 26 by pivots 26'. The outer ends of said wedges and the inner ends of said links are slidably supported and guided in stationary supports 27, the said supports each having a slot 28 extending transversely therethrough, and occupying a horizontal position, within which the outer ends of its associated pivot 26' extend. The outer ends of the links 26 are connected respectively to arms 30 which are secured to and project upwardly from a rock shaft 31. These arms are located at intervals corresponding to the intervals between the fuel feed means and fuel feed controlling means associated with each of the engines of a multi-cylinder engine structure. The arms 30 are of arc shape and are provided with slots 32 of arc shape which are concentric with the centers of the pivots 26' when the rock shaft 31 has been rocked to move the arms 32 into position to withdraw the said wedges outwardly to render the feed actuating and controlling means inoperative. The outer ends of the links 26 are located in co-operative relation to these arms and are provided respectively with projections 33 which project into the arc shaped slots 32. The slots 32 are open at their upper ends and the said arms are provided upon their upper ends with caps 35 through which screw threaded openings 36 extend with which openings rods 37 are in screw threaded engagement. These rods may be regarded as devices for adjusting the projections 33 in one direction or the other in the slots 32. The lower or inner ends of the screw threaded rods 37 have rotatable and flexible connection with the projections 33 as indicated at 38. It will be apparent that the outer ends of any one of the links 26 may

be adjusted either up or down in its associated slot 32 and also it will be apparent that no matter to what positions in the slots the outer ends of the links may be adjusted, the wedges 25 will be withdrawn to identically the same positions upon the rocking of the rock shaft 31 to move the arms 30 into position to render the lost motion actuating means inoperative.

In Figs. 1 and 2 of the drawings I have shown the wedges 25 withdrawn into such position that the actuation of the member 16 by the cam 18 does not cause actuation of the rod 14 whereby the cam shaft 21 may continue to rotate without effecting in any way the fuel feed actuating and controlling means. When it is desired that the feed actuating and controlling means shall be operated or actuated, the wedge 25 and other wedges of like character are adjusted inwardly so as to bring the thicker portions thereof into position between the adjoining opposing ends of the rod 14 and the section or portion 16.

For the purpose of rocking the rock shaft 31 to effect simultaneous movement of the arms 30 and of the wedges 25 either inwardly or outwardly, depending upon the direction in which the said rock shaft 31 may be rocked, I have provided an arm or handle 40 rigidly secured preferably at one end of the shaft 31, the outer end portion of the said arm being located in adjoining operative relation to a quadrant 41, the outer convex edge of which is provided with notches 42 which are adapted to be engaged by a spring pressed catch 43 mounted upon the arm or handle 40 to hold the said arm or handle 40 and the rock shaft 31 with the parts carried and operated thereby, in any position to which the same may be adjusted.

As already indicated, the arm 30 is shown in Figs. 1 and 2 of the drawings in such position that the wedge which is shown (and other wedges not shown) are held in such position that the feed means is not actuated by the operation of the member or section 16 by contact with the lower end thereof of the cam projection 18. In order to adjust the said wedges into position to effect operation of the fuel feeding means, the rock shaft is rocked to the left to move the arms 30 mounted thereon inwardly into the position or positions, for instance, indicated in Figs. 4 and 5 of the drawings. When so adjusted, the links 26 are moved inwardly and cause a like inward movement of the wedges 25. Let it be assumed that less fuel is being discharged into the cylinder with which the link and wedge shown at the far side of Figs. 4 and 5 of the drawings are associated than is being discharged into the other cylinders of the structure and that it is desired to increase the amount of fuel discharged into the said cylinder to an amount equal to that which is

being discharged or delivered to the other cylinder. This may be effected by adjusting the outer end of the said link to the position as indicated at 45 in Figs. 4 and 5 of the drawings. It will be apparent from an inspection of these figures that when so adjusted, after the arms have been moved inwardly as described, the wedge connected to the said link will be moved inwardly to a greater extent than the other wedges in which the links are not so upwardly adjusted as shown. The consequence of such inward adjustment of a wedge is that the amount of lost motion between the parts 14 and 16 is decreased which results in maintaining the valve of the associated spray nozzle open for a longer period than the valves of other nozzles, thereby allowing a longer period of fuel discharge. By proper adjustment of the outer ends of the links 26 they may be moved into positions such as to provide for the discharge of equal amounts of liquid fuel into all of the cylinders of a multi-cylinder engine.

In Fig. 3 of the drawings, I have indicated diagrammatically the effect upon the wedge 25 by adjusting the outer end of the link connected thereto, into different positions with respect to the arm to which its outer end is connected. Upon reference to the said figure it will be noted that when the link is in position as indicated by the dash and dot lines *a* the wedge 25 occupies the position shown in full lines, whereas when the link occupies the position indicated by the dash and dot lines *b* the wedge will occupy the position indicated by dash and dot lines. It will be noted that the said wedge has moved inwardly a distance equal to that indicated at *x* in the said Fig. 3. In view of the fact that the slot 32, in the arm 30 is concentric with the center of the pivots by means of which the links 26 are connected to the wedges 25, it will be apparent that when the arms 30 are returned to their predetermined normal position, as shown in Figs. 1 and 2, all of the wedges will be drawn outwardly into the same relative position, regardless of the point of connection of the outer ends of the respective links 26 to their respective arms 30.

In Figs. 7, 8 and 9, I have shown a modified construction of feed controlling means embodying the invention, in which a portion only of a spray nozzle 7 is illustrated. The valve stem for controlling the valve of said nozzle projects upwardly therefrom and at its upper portion is screw threaded, as indicated at 50, for the reception of an adjustable internally screw threaded contact member 51, which is adapted to be locked in an adjusted position by a lock nut 50', in engagement with the screw threaded portion 50. The lower end of the contact 50 is wedge shaped as indicated at 52 and is

located directly above and in spaced relation to the outer bifurcated end of a wedge 53. The opposite sides of the bifurcated end portion of the said wedge are located upon the opposite sides of the adjoining portion of the said stem and are adapted to contact with the lower ends of the tapered portion 52 of the contact 51. The projecting upper end portion of the said valve stem, extends through a guide block 55 mounted in a notch or opening in the inner end of a rock lever 57, mounted upon an eccentric 58 upon a shaft 59. The upper end of the block 55 is tapered as indicated at 60 and the inner bifurcated end of the wedge 53 rests thereon. Rocking movement of the rock lever 57 is effected by the contact of a cam projection 61 with a roller 62 mounted upon the outer end of the said lever. The cam projection 61 is mounted upon a cam disc or wheel 63 which is rigidly secured to a cam shaft 64, rotation of which is effected by gearing intermediate the same and the crank-shaft of a multi-cylinder engine structure as in the previous construction.

The outer end of the wedge 53 is pivotally connected with a block 65 mounted in a slot 66 of arc shape, provided in an arm 67, rigidly secured to a rock shaft 68. The slot 66 is of arc shape and when in a pre-determined position, as shown in Fig. 7 of the drawings, is concentric with a line parallel with the axis at 70 of the pivotal connection of the outer end of the wedge 53 to the block 65, the said line being located at a point as indicated at 71 between the opposing ends of the contact 51 and the block 55. It will be understood that there are a plurality of the devices as thus far described in connection with Figs. 7 to 9 of the drawings corresponding in number to the number of cylinders of the engine structure, except of course, there is but one shaft 59, one cam shaft 64 and one rock shaft 68, each of which is common to a plurality of the parts as thus far described. The rock shaft 68 may be rocked in any suitable manner, as by manual means such as is illustrated in connection with previous figures of the drawings.

In view of the fact that the arc 66 and other like arcs in arms 67 (not shown) are concentric with a line 71 located as indicated in Fig. 7, it will be apparent that when the said arms are adjusted to positions corresponding to the position of the arm shown in Fig. 7, all of the wedges 53, will be drawn outwardly into the position in which the wedge illustrated in Fig. 7 is shown. With respect to the opposing ends of the contact 52 and of the block 55, the relation of the opposing ends of the contact 52 and of the block 55 to each other is such that when the wedges are in the position as illustrated

in Fig. 7, movement of the inner end of the rock lever 57, due to the contact with the outer end thereof of the cam projection 61, is not sufficient to effect upward opening movement of the valve actuating rod of the spray nozzle 7; consequently no fuel is fed to the cylinders of the engine structure. If it be found that less fuel is being delivered to one of the cylinders than to others, the delivery of fuel may be equalized by adjusting the outer end of the corresponding wedge 53 outwardly with respect to its associated arm, so that when the arms 67 are moved inwardly, such wedge will be moved inwardly to a greater extent than other wedges connected to other arms, so that the valve of the corresponding spray nozzle will be retained open for a longer period than the valves of other spray nozzles to permit the delivery of the requisite quantity of fuel to such cylinders.

In the construction as illustrated in Figs. 7 and 9, I have provided means for adjusting the outer ends of the wedges 53 in the arcuate slots 66, consisting of links 72 pivotally connected at their lower ends to the blocks 65, or otherwise to the outer ends of the wedges 53. The upper ends of the said links are pivotally connected at 72' to the lower ends of vertically adjustable rods or bars 73. These bars are mounted in aligned openings 74 and 75, provided in spaced stationary portions of the frame of the engine structure. The spaced portions within which these openings are located, provide housings or supports for worm gears 76, which are adapted to be rotated by worm shafts 77. The gears 76 are in screw threaded engagement with the adjusting rods or bars 73 as shown. Rotation of the adjusting rods or bars 73 is prevented by means of keys 78. It will be understood that there is one key for each adjusting rod or bar and also that there is one worm gear 76 and one worm shaft 77 for each bar. The rod or bar 73 may be adjusted either up or down. The links 72 being connected thereto and to the outer ends of the wedges 53, it follows that the outer ends of the latter are adjusted in like direction. After the rods or bars 73 have been adjusted to the desired position or positions, they are locked in such positions by means of lock nuts 80.

It will be seen that in either form of construction illustrated in the drawings, I have provided means whereby the lost motion controlling devices, associated with the fuel feeding means of different cylinders of the engine structure, may, when the engine structure is in operation, be caused to occupy different positions relative to the fuel actuating and feeding means, but which, when it is desired to discontinue the delivery of fuel to the cylinders of the engine, may all be withdrawn simultaneously to normal in-

operative position without the necessity of specially adjusting at such time any part of the mechanism.

By "normal" inoperative position is meant that position of the mechanism in which the wedges have been withdrawn to such an extent that the fuel actuating means is rendered inoperative with respect to the feeding means. When the said mechanism is in such normal inoperative position, the arc shaped slots in the arms for controlling the positions of the wedges are in concentric relation to the pivot points about which turn certain of the parts when their outer ends, which are connected within the said slots, are adjusted in one direction or the other therein.

Having thus described my invention, what I desire to secure by Letters Patent is:

1. In fuel feed control means for internal combustion engines, the combination of lost motion actuating means for controlling and actuating the fuel feeding means, devices for varying and controlling the amount of lost motion in the said lost motion actuating means, means for withdrawing the said devices into positions to render the said actuating means inoperative, the outer ends of said devices having operative pivotal connection with the said means, and means for adjusting such pivotal connections in arcs of circles which, when the said devices have been withdrawn into inoperative position, are concentric with the axes about which turn the portions of said devices which are connected with said withdrawing means when the said connections are adjusted.

2. In fuel feed control means for internal combustion engines, the combination of lost motion means for actuating and controlling the fuel feeding means, devices adapted to be moved inwardly and outwardly through the lost motion spaces of the said lost motion actuating means, a rock shaft, arms mounted thereon, means for adjustably connecting the outer ends of the said lost motion controlling devices to the said arms, the said arms being adapted to be moved into position to withdraw the said lost motion controlling devices into inoperative position, and means whereby the connection of the outer end portions of said devices to the said arms may be adjusted with respect to the latter in arcs of circles, which, when the said devices are in inoperative position are concentric with the axes about which the parts which are adjusted with respect to the said arms turn.

3. In fuel feed control means for internal combustion engines, the combination of lost motion means for actuating and controlling the fuel feeding means, devices adapted to be moved inwardly and outwardly through the lost motion spaces, a rock shaft having rock arms thereon equal in number to the said lost motion actuating means, said arms

being provided respectively with slots of arc shape, means for operatively connecting the outer ends of the lost motion controlling devices to the said arms, means mounted within the said slots for adjusting the outer end portions of said devices therein, the said slots, when the said lost motion controlling devices are in inoperative position, being concentric with the axes about which the portions of said devices which are connected with said arms rotate when the outer end portions thereof are adjusted in the said slots.

4. In fuel feed control means for internal combustion engines, the combination of lost motion actuating means for actuating and controlling the fuel feeding means, devices for varying the amount of lost motion of the said lost motion actuating means, means for adjusting the said devices with respect to the said lost motion actuating means, and means whereby upon adjustment of the said devices inwardly certain of said devices may be adjusted automatically to greater extent than others of said devices.

5. In fuel feed control means for internal combustion engines, the combination of lost motion means for actuating and controlling the fuel feeding means, wedges located in spaces between adjoining parts of the lost motion means, means for adjusting the said wedges inwardly and outwardly through the said spaces to vary the amount of lost motion of the said lost motion means, means whereby all of said wedges may be adjusted simultaneously inwardly and outwardly, and means whereby upon adjustment of the said wedges inwardly one or more of them is caused to move inwardly to a greater distance or distances than others thereof and whereby also all of the said wedges may be withdrawn simultaneously to normal inoperative position.

6. In fuel feed control means for internal combustion engines, the combination of lost motion means for actuating and controlling the fuel feeding means, wedges for varying the amount of lost motion in the movements of the said lost motion means, rock arms to which the outer ends of the said wedges have operative connection, the said arms having arc shaped slots in which the connections are adjustably mounted, means for effecting adjustment of the said connections in the said slots, the said arcs, when the said wedges have been withdrawn to inoperative position, being concentric with the axis about which the parts turn when the said connections are adjusted in the said arcs.

7. In fuel feed control means for internal combustion engines, the combination of lost motion means for actuating and controlling the fuel feeding means, wedges for varying the amount of lost motion of the said lost motion means, rock arms having slots there-

in of arc shape within which the outer ends of said wedges are pivoted, means for adjusting the said pivots in the said slots, means for rocking the said arms to withdraw
5 the said wedges into normal inoperative position, the said arcs when the wedges are in such position, being concentric with the axes about which the said wedges turn when their pivotal connections with the said arms are
10 adjusted in the said slots.

8. In fuel feed control means for internal combustion engines, the combination of lost motion means for actuating and controlling the fuel feeding means, wedges for varying
15 the amount of lost motion of the said means,

means for adjusting the said wedges transversely of the said actuating means within the lost motion spaces thereof, the said adjusting means comprising means whereby
20 all of the said wedges may be withdrawn simultaneously to normal inoperative position and whereby upon adjustment in the opposite direction selected wedges may be caused to move inwardly through greater distances
25 than others of said wedges.

In testimony that I claim the foregoing as my invention I have hereunto signed my name this 8th day of September, A. D., 1927.

JACK B. BARTOW.