Feb. 9, 1926. 1,572,381

I. COWLES

AUXILIARY CHARGE FORMING DEVICE FOR AUTOMOBILES

Filed April 5, 1922 3 Sheets-Sheet 1

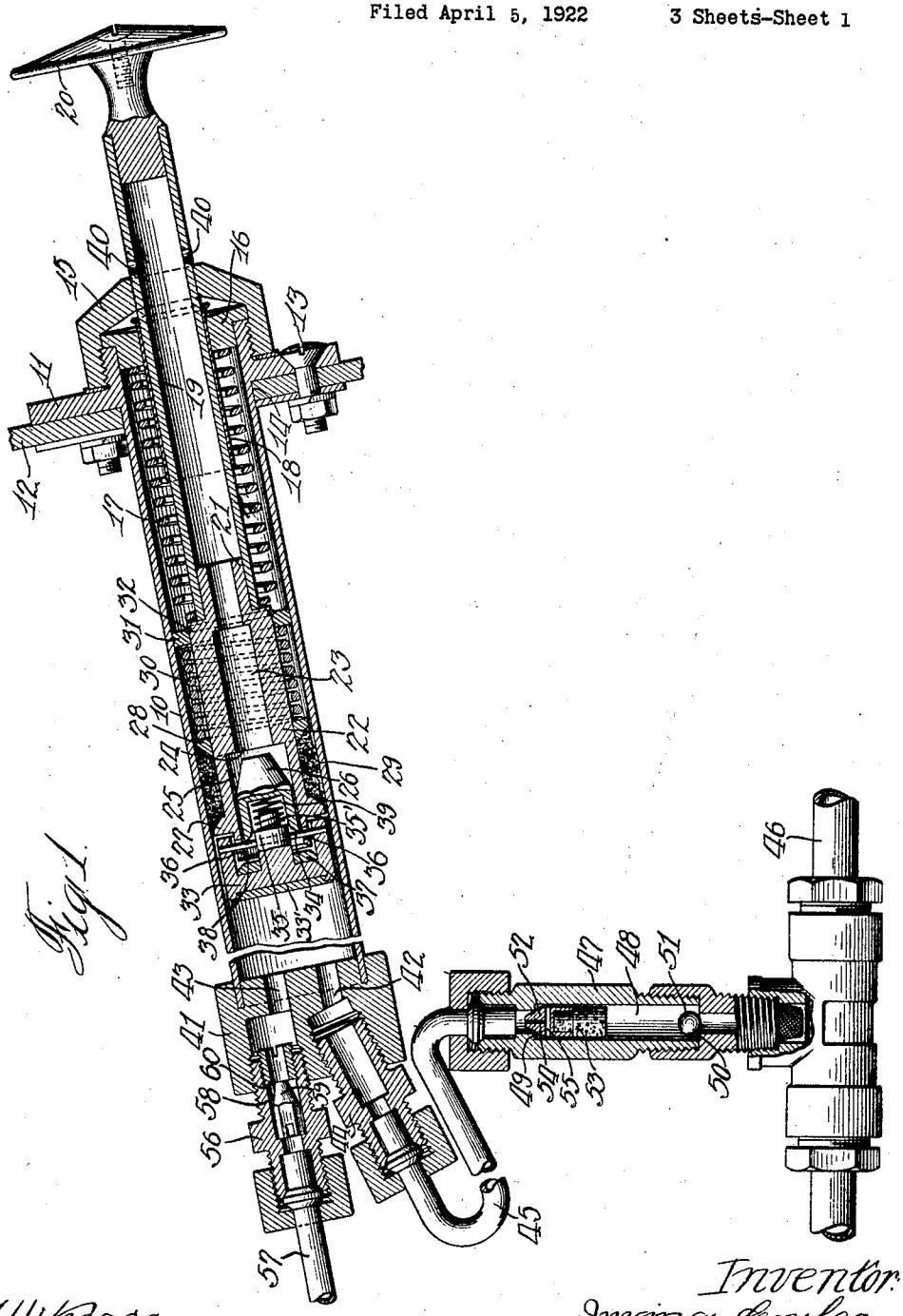


Fig. 1.

Witness:
Dave A. Magnusson

Inventor:
Irving Cowles:
By Samuel N. Ford.
Fibby

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Filed April 5, 1922 3 Sheets-Sheet 2

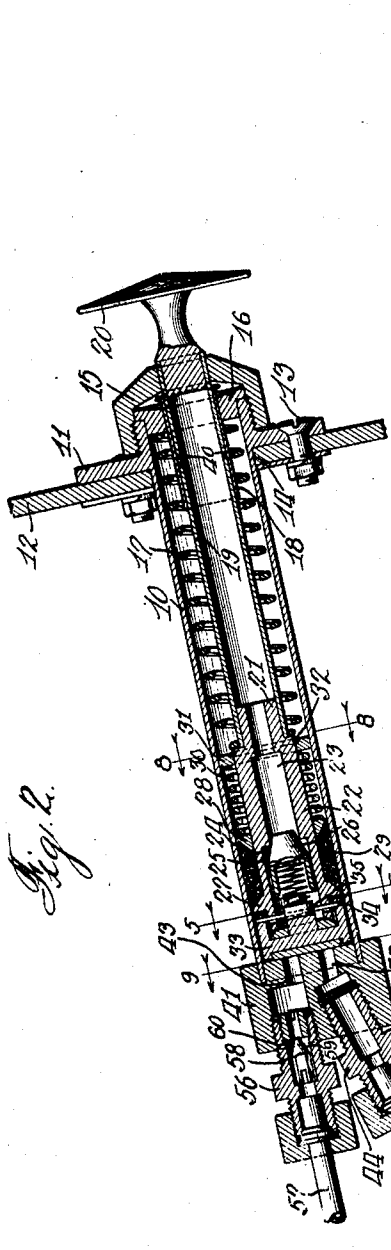


Fig. 2.

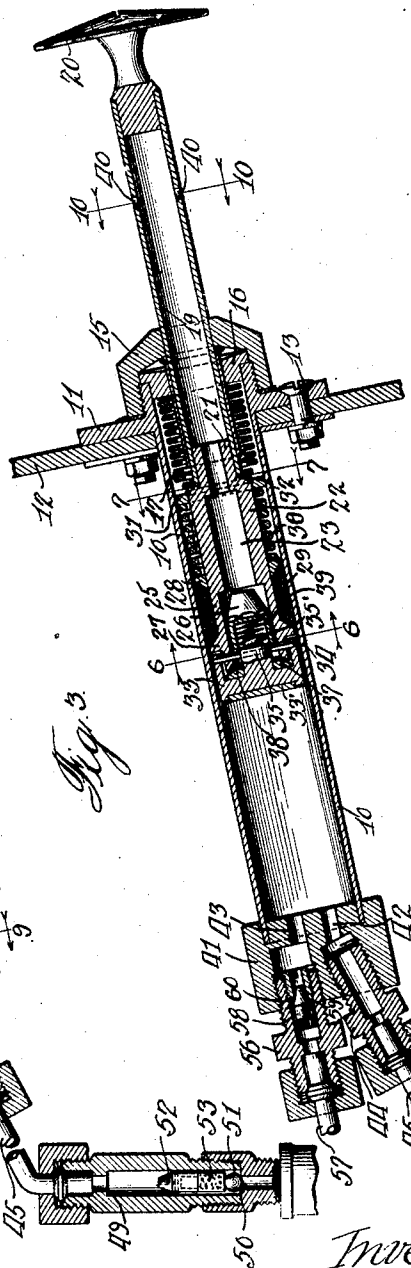


Fig. 3.

Witness:
David S Magnusson.

Inventor:
Irving Cowles.
By: Samuel N. Ford,
Atty

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Filed April 5, 1922 3 Sheets-Sheet 3

Fig 4.

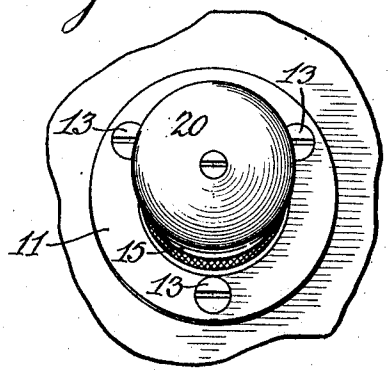


Fig 5

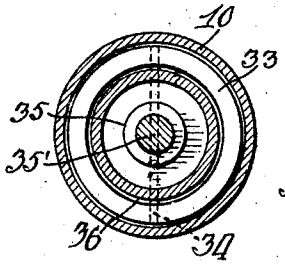


Fig 6

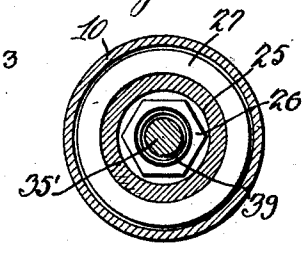


Fig 7

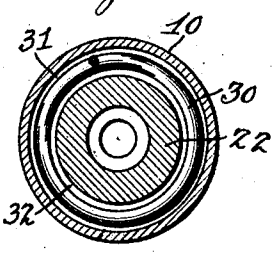


Fig 8.

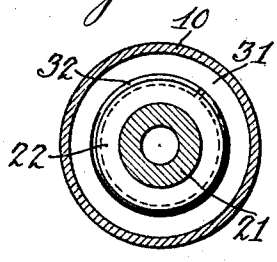


Fig. 9.

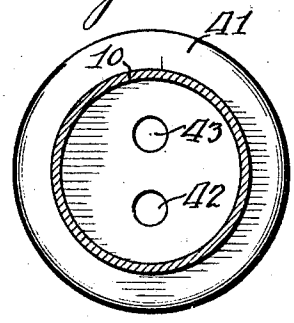
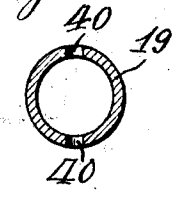


Fig. 10.



Witness:
Dave S. Magnuson.

Inventor:
Irving Cowles:
By: Samuel N. Pond
Attty

Patented Feb. 9, 1926. 1,572,381

UNITED STATES PATENT OFFICE.

IRVING COWLES, OF CHICAGO, ILLINOIS.

AUXILIARY CHARGE-FORMING DEVICE FOR AUTOMOBILES.

Application filed April 5, 1922. Serial No. 549,941.

To all whom it may concern:

Be it known that I, IRVING COWLES, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Auxiliary Charge-Forming Devices for Automobiles, of which the following is a specification.

This invention relates to devices for facilitating the starting of gas engines, and particularly hydrocarbon engines, when cold, through the introduction manually to the intake manifold of the engine of an explosive mixture of fuel vapor and air. Devices of this general character are mainly used for priming the engine in cold weather when the temperature of the manifold and engine cylinder is too low to effect vaporization of the gasoline or other volatile liquid fuel, and the obtaining of an explosive mixture often requires a considerable period of idle engine operation involving both battery and fuel waste, and other objectionable results.

Most all so-called primers operate on the principle of merely injecting liquid gasoline directly into the engine cylinder or intake manifold, in lieu of pulling gasoline in by suction strokes of the engine. Such primers are inefficient for the reason that, while they may reduce the muscular or battery energy required to raise the gasoline, yet they do not effect any vaporization and admixture of the latter with the air to form a charge which will explode when ignited. Other primers operate upon the principle of injecting into the cylinder or intake manifold an explosive charge previously prepared in the primer itself. This is the correct principle for a satisfactory and efficient primer, and is the broad type of primer to which my present invention relates. In this type of primer, however, it is quite essential, in order to secure the most satisfactory results, not only that liquid fuel be vaporized and mixed with air but that the two ingredients of the explosive charge be supplied in such predetermined and measured proportions that the working charge will instantly ignite and burn throughout when subjected to the electric spark; and hence one object of my present invention is to provide an improved device wherein, on each suction stroke of the piston or plunger thereof, an accurately and mechanically measured charge of gasoline or other liquid fuel will be introduced to the cylinder of the device irrespective of the varying heights of lift of the liquid supply to unite therein with the proper proportion of atmospheric air to form an explosive mixture.

A still further and important object of the invention is to provide a device of the character above outlined which shall possess the further function and capability of an auxiliary carburetor, to do away with the "choker" almost universally used to enrich the mixture when starting, and to thus avoid the objectionable results which accompany the use of the "choker",—too much liquid gas in the cylinders, over carbonization in the cylinders, and dilution of the lubricating oil in the crank case.

Another object is to provide an improved device for automatically and mechanically measuring the charge of liquid fuel admitted to the cylinder of the device on each suction stroke.

Still other objects and advantages of the invention will be apparent to persons skilled in the art as the same becomes better understood from the following detailed description, in which reference is made to the accompanying drawings showing one practical and approved embodiment of the invention, in which—

Fig. 1 is a longitudinal axial section showing my improved charge-forming device mounted on the dash of an automobile, with the piston or plunger at a position in which the device functions as an auxiliary carburetor to enrich the mixture;

Fig. 2 is a similar view showing the piston or plunger at the end of its inward or expelling stroke, in which position the intake and discharge ports are both sealed;

Fig. 3 is a similar view, omitting the measuring device, showing the piston or plunger at the limit of its outward or suction stroke;

Fig. 4 is an end elevation, viewed from the right of Fig. 1; and

Figs. 5, 6, 7, 8, 9 and 10 are cross sectional details taken on the corresponding lines of Figs. 2 and 3.

Referring to the drawings, 10 designates a pump cylinder provided near its outer end with a flange 11 fitting the dash board 12 of an automobile and rigidly attached thereto by screw bolts 13, the cylinder 10 extending through an opening 14 in the dash. The

outer end of the cylinder, beyond the flange 11, is threaded to receive a cap 15, and within the outer end of the cylinder is secured by the cap 15 a plug 16 that forms an abutment for the outer end of a long coil compression spring 17.

Within a central aperture in the plug 16 is fitted a thin metal valve sleeve 18, and through this sleeve and a registering aperture in the cap 15 extends a tubular piston rod 19, in the outer end of which is secured a handle or knob 20.

The inner end of the stem 19 is attached to the hollow stem 21 of a hollow piston or plunger body 22, this latter having a longitudinal bore 23 terminating at its lower end in a valve seat 24, and a valve chamber 25, within which is mounted a conical check valve 26. The chambered portion of the piston is formed with a permanent shoulder 27 and a sliding shoulder or gland 28, between which is an asbestos and graphite packing 29 that insures an air tight joint of the plunger with the wall of the cylinder, the gland 28 being backed by a compression spring 30 which in turn is footed on an annular washer 31 locked to the piston by a ring 32. This asbestos and graphite packing 29, which seals the plunger head, is not disintegrated by gasoline, like an ordinary cup leather, since it is a lubricant in the presence of gasoline.

Loosely articulated to the forward end of the plunger is a cap shaped metal valve head 33 of slightly less diameter than the internal diameter of the cylinder 10, and having on its forward face an insert 33′ of soft metal or the like. The head 33 is coupled to the plunger proper by a cross pin 34 extending through a central boss 35 of the head and through the circumferential wall of the latter and also passing through slots 36 in the forwardly projecting end portion of the valve chamber of the plunger which lies within the cap shaped head 33. Fitted within the cap shaped head 33 and encircling the boss 35 is an annular washer 37 formed with a convex outer side that constitutes, in co-operation with the beveled lower end 38 of the plunger head, a swivel joint between the plunger and the head 33, for a purpose hereinafter described. The boss 35 is formed with a reduced extension 35′ forming a mandrel for a light coil spring 39 lying within the hollow check-valve 26 and normally holding the latter to its seat 24. In the piston stem 19, somewhat inwardly of the knob 20 are formed a pair of air inlet ports 40.

The lower end of the cylinder 10 is closed by a head 41 suitably cored to provide an oil intake duct 42 and a mixture discharge duct 43 located above the oil duct. Tapped into the head 41 and communicating with the oil duct 42 is a hollow coupling 44 to the outer end of which is connected a gasoline line pipe 45 which, with an interposed measuring device, connects into the main gasoline pipe 46 extending from the tank to the carburetor. In the primer line 45 is incorporated a gasoline measuring device shown in Figs. 1 and 2 and consisting of a tubular casing 47 containing a measuring chamber 48 and upper and lower valve seats 49 and 50, the latter of which is controlled by an ordinary ball check valve 51. Within the chamber 48 is a measuring valve 52 that co-operates with the upper valve seat 49. This measuring valve 52, in order to render it sensitive to the suction impulses of the pump, is mounted on a cylindrical float 53 of cork or like material which substantially neutralizes the gravity effect of the metal head 52 of the valve and gives to the complete structure a combined specific gravity only slightly greater than that of the gasoline. The valve 52, 53 fits the chamber 48 with sufficient looseness to allow the gasoline to flow past the same, and the valve is preferably provided with minute longitudinal and transverse bleed ducts 54, 55, as shown in Fig. 1, for a purpose hereinafter described.

Into the duct 43 of the cylinder head 41 is tapped a hollow coupling 56 that communicates at its outer end with a pipe 57 leading into the intake manifold. Within the coupling 56 is a valve chamber 58 containing a tapered outwardly opening check valve 59 that co-operates with a valve seat 60 on the inner end of the coupling 56.

In the operation of the device for starting a cold engine, assuming that the parts are in the relative positions shown in Fig. 2, which is its normal idle position, the operator grasps the knob 20 and draws the plunger outwardly, compressing the spring 17. During the first portion of the outward movement the ports 40 of the plunger stem are covered by the sleeve 18 until the stem has reached the position shown in Fig. 1. This creates a partial vacuum below the plunger which first draws check valve 59 to its seat and then pulls a measured charge of gasoline through pipe 45 and coupling 44 into the cylinder until the ports 40 have passed the cap 15 as shown in Fig. 1. Thereupon atmospheric air flows through the ports 40 and hollow valve stem and plunger, instantly unseating the valve 26 and flowing thence over the opened cone washer 37, out of and around the head 33 and thence into the cylinder, commingling with the previously induced charge of gasoline. This gasoline charge is measured as to volume by the valve 52, the latter rising on the suction stroke of the plunger until it seats on the seat 49 and thus arrests the further flow of gasoline to the cylinder with the exception of the small amount flowing through the fine ducts 55.

54. It will be noted that no air is admitted to the mixing chamber until the ports 40 have been uncovered, whereby a sufficient degree of vacuum has been created to quickly overcome the resistance of the light valve spring 39 and cause the valve 26 to open admitting the air to the cylinder. At this point the check valve 51 drops to its seat and the measuring valve 52 also falls to its lowermost point. As the plunger continues its outward movement to the extreme position shown in Fig. 3, air also in a measured volume determined by the diameter of the cylinder and the length of the outward piston stroke after ports 40 have been uncovered flows into the cylinder and into the presence of the previously induced gasoline, forming with the latter a combustible charge. On the return or inward stroke of the plunger, the check valve 26, being no longer subject to suction, instantly seats itself under the thrust of its spring 39. The gasoline and air are thus trapped and, as the plunger moves inwardly, are further commingled and forced out past the check-valve 59 which still more thoroughly commingles them, into and through the discharge line 57, and thence into the intake manifold.

A few strokes of the pump plunger suffices to fill the intake manifold with an explosive mixture of gasoline vapor and air.

It will be observed that in the operation of the device the air is not drawn into the cylinder simultaneously with the gasoline, but the latter is first induced in a predetermined mechanically measured amount, and then the air is subsequently introduced in a measured volume through the balance of the outward stroke of the plunger the instant the ports 40 are uncovered, filling the remining space of the cylinder.

As stated in the preamble, the device may also be used as an auxiliary carburetor to enrich the mixture after the engine is started and before it reaches a normal working temperature. The position of the parts when the device is thus being used is illustrated in Fig. 1, wherein the plunger stem has been retracted sufficiently far to expose the air intake ports 40. The suction in the manifold draws a small amount of gasoline through the bleed ducts 55, 54 of the measuring valve 52, and this gasoline meets and joins a current of air induced through the hollow plunger stem and head. This mixture is somewhat richer than the normal mixture flowing through the carburetor, and consequently enriches the latter. As soon as the motor has reached a temperature condition at which the carburetor mixture alone is efficient, the knob 20 is released and the spring 17 returns the parts to the position shown in Fig. 2, in which position it will be noted the head 33, by reason of its swivel-joint connection to the plunger-head enabling it to automatically seat itself squarely on the inner face of the cylinder head, effectively seals the ports 42, 43, so that there is no leakage through the device, which leakage is a common fault of the ordinary primers.

The spring 17 is compressed on the outward or suction stroke, and its reaction aids the inward or forcing stroke, making the latter prompt and easy of performance. In fact, the knob or handle may be released at the end of each outward stroke, if desired, and the spring 17 relied upon to alone effect the compressing and forcing stroke as well as the sealing of the line against leakage.

In a companion application filed concurrently herewith, Serial No. 549,942, I have disclosed and claimed an improved vaporizing and spraying device which may advantageously be applied to the delivery end of the discharge pipe 57 within the manifold; but such device is not necessary so far as the functioning of the present device is concerned, and hence I have not illustrated the same herein.

I claim—

1. In an auxiliary charge forming device of the character described, the combination of a pump, a suction line connecting said pump to a source of liquid fuel supply, means external to said pump for establishing the charge of fuel induced by the suction stroke of said pump at a predetermined measured amount, means for admitting air to the cylinder of said pump in the presence of the fuel, and a valve-controlled discharge line from said pump.

2. In an auxiliary charge forming device of the character described, the combination of a pump, a suction line connecting said pump to a source of liquid fuel supply, a fuel measuring device associated with said suction line and operating to limit the amount of fuel passed to said pump on each suction stroke of the latter, means for admitting a predetermined measured amount of air to the cylinder of said pump in the presence of the fuel, and a valve-controlled discharge line from said pump.

3. In an auxiliary charge forming device of the character described, the combination of a pump, a suction line connecting said pump to a source of liquid fuel supply, a fuel measuring device in and forming a part of said suction line and functioning to pass uniform and equal amounts of fuel to said pump on the suction strokes of the latter, means for admitting air at atmospheric pressure to the cylinder of said pump in the presence of the fuel, and a valve-controlled discharge line from said pump.

4. In an auxiliary charge forming device of the character described, the combination of a manually operable pump adapted to be mounted on the dash of an automobile, a

suction line connecting said pump to a gasoline line pipe, a gasoline measuring device in and forming a part of said suction line and functioning to pass uniform and equal volumes of gasoline to said pump on the suction strokes of the latter, means incorporated in the pump structure for admitting a measured volume of atmospheric air to the cylinder thereof after the gasoline charge has been induced therein, and a valve-controlled discharge line from said pump.

5. A manually operable dash pump for supplying an explosive mixture to a gas engine manifold, comprising a cylinder having one head thereof communicating with a gasoline intake line and with a discharge line, a chambered piston having a hollow rod extending through the other cylinder head and ported to atmosphere, and a check-valve controlling the flow of air through said hollow rod and chambered piston.

6. A manually operable dash pump for supplying an explosive mixture to a gas engine manifold, comprising a cylinder having one head thereof communicating with a gasoline intake line and with a discharge line, a chambered piston having a hollow rod extending through the other cylinder head and ported to atmosphere, and a spring-pressed check-valve mounted in the chamber of said piston and seating on the inner end of said hollow piston rod.

7. A manually operable dash pump for supplying an explosive mixture to a gas engine manifold, comprising a cylinder having ports in one head thereof communicating with a gasoline supply line and a discharge line respectively, a piston, a piston rod extending through the other cylinder head, means for admitting air to said cylinder on the suction stroke of said piston, and a spring acting to force the front face of said piston into covering engagement with the supply and discharge ports of said cylinder head.

8. A manually operable dash pump for supplying an explosive mixture to a gas engine manifold, comprising a cylinder having one head thereof communicating with a gasoline intake line and with a discharge line, a chambered piston having a hollow rod slidably mounted in the other cylinder head, said rod having a lateral intake port for air located inwardly of its outer end, an operating handle on the outer end of said hollow rod, and a sleeve-valve for said air port surrounding said hollow rod inwardly of said other cylinder head.

9. A manually operable dash pump for supplying an explosive mixture to a gas engine manifold, comprising a cylinder having ports in one head thereof communicating with a gasoline supply line and a discharge line respectively, a piston rod extending through the other cylinder head, means for admitting air to said cylinder in advance of said piston on the suction stroke of the latter, a valve head swiveled on the face of said piston and of less diameter than the internal diameter of said cylinder, and a spring acting on said piston to force said valve head into closing engagement with the supply and discharge ports of said cylinder head.

10. A manually operable dash pump for supplying an explosive mixture to a gas engine manifold, comprising a cylinder having ports in one head thereof communicating with a gasoline supply line and a discharge line respectively, a chambered piston having a gas-tight sliding fit in said cylinder, a hollow piston rod extending through the other cylinder head and formed with a lateral intake port for air located inwardly of its outer end, an operating handle on the outer end of said hollow rod, a sleeve valve for said air port surrounding said hollow rod inwardly of said other cylinder head, a check-valve in the chamber of said piston, a valve head swiveled on the face of said piston and of less diameter than the internal diameter of said cylinder, and a compression spring in said cylinder behind said piston acting on the latter to force said valve head into closing engagement with the supply and discharge ports of said cylinder head.

11. In an auxiliary charge forming device of the character described, the combination with a suction pump, of a gasoline supply line connected to said pump, said supply line including a measuring device operating to pass a uniform predetermined volume of gasoline to the pump on each suction stroke of the latter, regardless of the height of lift of the gasoline.

12. In an auxiliary charge forming device of the character described, the combination with a suction pump, of a gasoline supply line connected to said pump, said supply line including a measuring chamber having a valve seat at the end thereof nearest said pump, and a valve in said chamber drawn to said seat on each suction stroke of said pump.

13. In an auxiliary charge forming device of the character described, the combination with a suction pump, of a gasoline supply line connected to said pump, said supply line including a vertical measuring chamber having a check valve at its lower end and a valve seat at its upper end, and a valve in said chamber of slightly greater specific gravity than gasoline and drawn upwardly by the latter into engagement with said upper valve seat on each suction stroke of said pump.

14. In an auxiliary carbureting device of the character described, the combination with a dash pump having means for admit-

ting a measured volume of air on its suction stroke, of a discharge line leading therefrom to the intake manifold of a gas engine, a gasoline supply line connected to said pump, means in said supply line permitting a limited continuous flow of gasoline through the latter, said pump, and discharge line to the intake manifold, under the suction of the latter and means incorporated in said pump through which the connection between the supply and discharge lines through the pump is normally cut off.

15. In an auxiliary carbureting device of the character described, the combination with a dash pump having an air inlet port adapted to be opened during the suction stroke of said pump to admit a measured volume of air to the latter, of a discharge line leading from said pump to the intake manifold of a gas engine, a gasoline supply line connected to said pump, a valve in said supply line permitting a limited continuous flow of gasoline through the latter, said pump, and discharge line to the intake manifold under the suction of the latter, and means incorporated in said pump through which the connection between the supply discharge lines through the pump is normally cut off.

16. In an auxiliary charge forming device of the character described, the combination with a dash pump having means for admitting a measured volume of air on its suction stroke, of a discharge line leading therefrom to the intake manifold of a gas engine, a gasoline supply line connected to said pump, said supply line including a gasoline measuring chamber, and a valve in said chamber measuring the volume of gasoline flowing therethrough on each suction stroke of said pump, said valve having a bleed duct permitting a limited continuous flow of gasoline through said measuring chamber, supply line, pump, and discharge line to the intake manifold under the suction of the latter, and means incorporated in said pump through which the connection between the supply and discharge lines through the pump is normally cut off.

17. The method of priming an internal combustion engine with an explosive mixture, which consists in successively bringing together in a confined space or chamber mechanically measured amounts of a volatile liquid fuel and atmospheric air, and then forcing the commingled fuel and air into the intake of the engine.

18. The method of priming an internal combustion engine with an explosive mixture, which consists in successively inducing by suction into a confined space or chamber mechanically measured amounts of a volatile liquid fuel and atmospheric air, and then forcing the commingled fuel and air into the intake of the engine.

IRVING COWLES.