

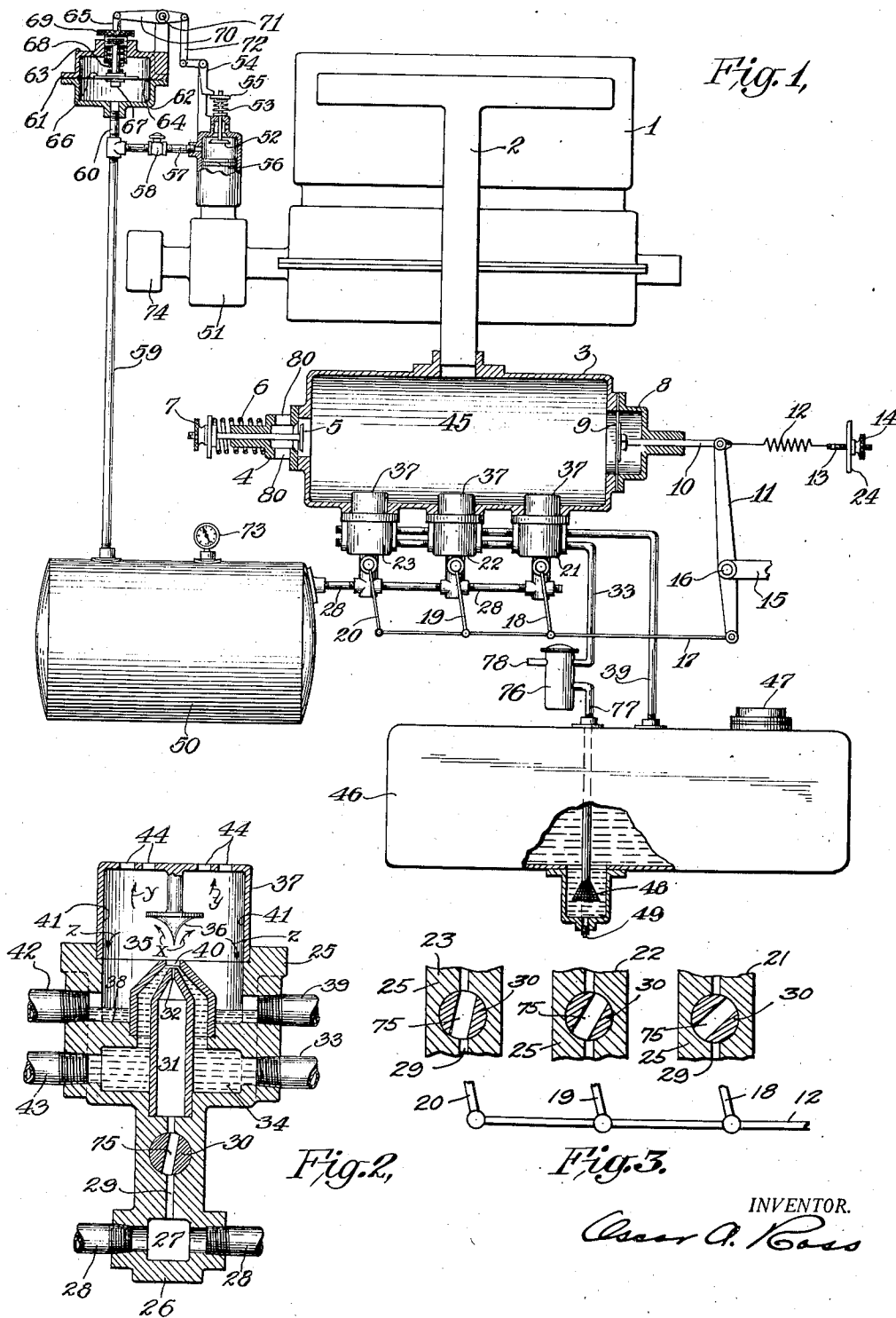
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O. A. ROSS

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SYSTEM OF CARBURATION FOR HYDROCARBON MOTORS

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OSCAR A. ROSS, OF NEW YORK, N. Y.

SYSTEM OF CARBURATION FOR HYDROCARBON MOTORS

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This invention belongs to that class which pertains to systems of carburation for hydro-carbon motors and has for its more prominent object the attainment in a more efficient and economical manner of the results or operations specified below.

This system pertains more particularly to the carburation of the heavier hydro-carbons as for example, kerosene, distillate, or even crude oil, and has the decided advantage that it is not necessary to pre-heat the fuel before consumption. This avoids the necessity of using an auxiliary fuel for starting as for example, gasoline.

A very distinguishing feature of this invention is that no attempt is made to gasify the oil before entrance into the cylinder, but to pulverize it into so finely a divided state that it is capable of being held in suspension in still air. By such fine pulverization a homogeneous nebular mixture is produced which gives ideal combustion.

By this system of nebulized carburation a still further advantage is obtained in that it is not necessary to employ the high compression incident to the use of heavy oils which are not pre-heated before entrance into the cylinder. I refer to the type of motors commonly known as the Diesel type.

This system has the further advantage that a motor may be initially started from cold state substantially as easily as if the cylinder thereof had been heated, or if the combustible mixture thereto were preheated before reaching said cylinders. Furthermore the power developed by the motor under such conditions of cold starting is substantially as great, proportionally to the combustible mixture supply, as if the motor had been previously "warmed up" and is obtained without an abnormal supply of fuel which in ordinary motors is unburned and acts as a diluent of the lubricating oil thereby interfering with the proper lubrication of said motors.

All the above and other claims sought and

attained will be evident as the description of one embodiment of my invention, as shown by the accompanying drawing, progresses, and in which Fig. 1 is a semidiagrammatic and elevational view of the various parts employed for my system of nebulized carburation showing one of the parts in section, and Fig. 2, is an enlarged sectional view of one of the atomizing units shown in Fig. 1. Fig. 3 is a detail view of the fuel valves.

None of the several parts employed are, or need be of any special form or construction, but for a more ready understanding of the invention and its operation a preliminary description may be apposite.

To the hydro-carbon motor 1, is secured the usual inlet manifold 2 having a throttle valve (not shown) of well known form and function, terminating in housing 3, in one end of which is housing 4, containing auxiliary air inlet valve 5, normally seated by spring 6, the pressure of which is adjusted by nut 7. At the other end of said chamber is secured housing 8, having clamped therebetween diaphragm 9, to which is attached rod 10, the outer end of which is pivoted to lever 11, and also has secured thereto spring 12, the tension of which is adjustable by means of screw 13 and nut 14 operating against stop 24.

Lever 11, is fulcrumed on rigid member 15, by pivot 16, and has pivotally secured to its lower end rod 17, which is likewise pivotally connected to valve handles 18, 19, and 20 of nebulizing units 21, 22 and 23. Each one of said units is composed of a housing 25 having an appendage 26, with a chamber 27, into which compressed air enters from pipe 28. Leading from chamber 27 is passage 29 controlled by valve 30, operated by a handle as 18, 19 or 20, said passage terminating in nozzle 31 secured to housing 25 and has injector opening 32.

As shown by Fig. 3, the valves 30 of units 21, 22 and 23 open sequentially, it being assumed that motor 1 is operating at one third

load and therefore valve 30 of unit 23 is completely open, whereas the similar valve of unit 22 is about to open and will be completely opened when the motor is operating at substantially two thirds load, valve 30 of unit 25 still remaining completely open, and as said motor increases its load to full load valve 30 of unit 21 will open, the valves 30 of units 22 and 23 still remaining completely open, rod 17 having moved completely to the right, and, as the load of said motor decreases, said rod moves to the left closing said valves in sequential order.

Fuel from pipe 33 enters chamber 34, whence through action of air from opening 32 it is carried into chamber 35 through opening 40, being nebulized as it passes through said opening. As all the fuel is not nebulized into the desired state as it leaves opening 40, a deflector 36 is provided whereby as the more solid particles of fuel pass upward, they strike said deflector and are diverted as shown by arrows X and Z whereby they strike wall 41 of housing 37 and return to the fuel tank through pipe 39. Pipe 42 serves to convey non-nebulized fuel from the adjacent nebulizing units as 22, and pipe 43 also serves to convey fuel from chamber 34 to said adjacent units.

All thoroughly nebulized fuel passes from chamber 35 through openings 44 to chamber 45, from whence it passes to the engine through manifold 2.

Auxiliary reservoir 76 is of the well known vacuum type having feed pipe 77 communicating with fuel tank 46, said pipe being supplied with the suitable strainer 48. Said vacuum unit has the usual outlet fuel pipe 33, which communicates with the nebulizing units 21, 22 and 23 as hereinbefore described. Pipe 78 is connected to the inlet manifold of motor 1 at any convenient point and supplies the vacuum for raising the fuel from tank 46 to reservoir 76 in a manner which is well known to those versed in the art.

Compressed air to nebulizing units 21, 22 and 23 is conveyed from tank 50 through pipe 28, said tank receiving its supply as follows: Compressor pump 51, preferably driven by motor 1 has inlet valve 52 normally closed by spring 53, but adapted to be held continuously open by bell crank 54, latching over collar 55, secured to valve 52. Air compressed under action of piston 56, is forced through pipe 57, check valve 58 and pipe 59 to tank 50. Pipe 59 has a branch 60, terminating in control unit 61, made up of lower housing 62 and upper housing 63, clamped between which is diaphragm 64, having secured thereto rod 65, by means of washer 66 and nut 67. Rod 65, and therefore diaphragm 64, is normally forced downward by spring 68, the pressure of which is adjusted by nut 69. Pivottally secured to the upper end of rod 65, is lever 70, fulcrummed on extension 71, its outer end connecting with link

72 which is also pivotally connected to bell crank 54. A manually operated air pump (not shown) is also connected to tank 50 for priming purposes in case the pressure in tank 50 is not sufficient for starting the motor.

The operation of applicant's system is as follows: Motor 1, is cranked by self-starter 74, which may be air or electric, as desired. As the motor 1 turns over, and by well known action, a partial vacuum is generated in manifold 2, and therefore likewise in chamber 45 causing diaphragm 9 to be drawn inward against the action of spring 12, in this manner actuating handles 18, 19 and 20 through lever 11, and rod 17. The annular displacement of the axes of opening 75 and handle 18 of nebulizing unit 21 is greater than said displacement of nebulizing unit 22, and the said displacement of the said last named unit is greater than that of unit 23. When motor 1 is in-operative, all the opening 75 are closed. As the handles 18, 19, and 20 are moved to the left by rod 17, the opening 75 in nebulizing unit 21 is first to open, further movement of said rod to the left opens the similar opening in unit 22, and still further similar movement of said rod opens the similar opening 75 in unit 23. In other words, the openings are sequentially opened. To prevent the openings 75—75 from oppositely closing in units 21 and 22 as rod 17 is moved to the extreme left, said openings are made of substantially larger diameter than the passage 29.

As valve 30 opens, compressed air from tank 50 flows through pipe 28 to chamber 27 and thence through passage 29, valve 30 and nozzle 31, escaping through openings 32 and 40. This produces a siphonic action between openings 32 and 40 causing a vacuum in chamber 34, in this manner causing fuel to be drawn from reservoir 76 through pipe 33 and thence to chamber 34 and opening 40, at which point the compressed air issuing from opening 32 causes said fuel to be broken up into various sized particles or bodies, a large portion of which consists of particles so small that they will remain suspended in still air.

The effect upon the fuel is such that it is nebulized in the same manner as a fluid body becomes nebulized by being broken up into the finest particles possible, these particles approximating atoms in size, whereafter the said minute particles supported by air, and which the applicant chooses to call a nebulized combustible mixture, is carried into chamber 45.

The heavier particles of fuel after striking deflector 36 are directed as shown by arrows X and Z against walls 41 and fall by gravity and capillary attraction to the floor 38 of chamber 36 returning via pipe 39 to the fuel tank 46.

The nebulized fuel passes upward as indicated by arrows Y—Y through openings

44—44 to chamber 45, and thence to manifold 2 passing into the cylinders of motor 1.

Proper mixture of air and nebulized fuel mixture is obtained by the adjustment of nut 7 controlling spring 6 whereby as the vacuum produced in chamber 45 operates on diaphragm 9 to cause pulverization of fuel by units 21, 22 and 23, it likewise opens valve 5 and air is drawn in through openings 80—80.

It is to be noted that this system the fuel is converted into a nebulized mixture before being taken into the cylinders this being accomplished without the addition of heat. By thus maintaining a low temperature of the explosive mixture until compression begins, a maximum volumetric efficiency is obtained in the motor. Further, due to the fact that the fuel is nebulized and not in gaseous or atomized form, combustion is prolonged whereby a more uniform pressure during the power cycle is obtained. This permits the use of longer stroke pistons, in this manner increasing the efficiency of the motor.

In usual practice the housing 3 would be made integral with motor 1, the inlets for each cylinder opening directly into it, in this manner dispensing with manifold 2.

It will be obvious to those skilled in the art that various other modifications may be made without departing from the spirit of my invention, and therefore I do not wish to limit myself to the exact construction shown and described but claim:

1. In a system for producing combustible mixtures for internal combustion motors, an internal combustion motor, a supply of liquid fuel therefor, a source of compressed air produced independently of the vacuum caused by the intake cycle of the motor, a plurality of jets through which the air may escape, a valve for each jet controlling the flow there-through, means co-operating with each jet whereby the escaping air will disperse the fuel into the escaping air to form the combustible mixture, devices for delivering the fuel from the source to the dispersion means, devices for operating the valves in sequential order to increase or decrease to supply of combustible mixture, and connections for conducting the mixture from the dispersion means to the motor.

2. In a system for producing combustible mixtures for internal combustion motors, an internal combustion motor, a liquid fuel supply therefor, a source of compressed air produced independently of the vacuum caused by the intake cycle of the motor, a plurality of jets through which the air may flow from the source and a valve for controlling the flow thereof from each jet, means co-operating with each jet whereby the flowing air will disperse the fuel into the flowing air to form the combustible mixture, devices for delivering the fuel from the source to the dispersion

means, devices controlled by the motor for automatically opening and closing the valves in predetermined order to increase or decrease the supply of dispersed fuel, a chamber into which the dispersed fuel is projected by the air jets, and connections whereby operation of the motor will effect a flow of the dispersed fuel from the chamber to the motor.

3. In a system for producing combustible mixtures for internal combustion motors, an internal combustion motor, a source of liquid fuel therefor, a source of compressed air produced independently of the vacuum produced by the intake cycle of the motor, a plurality of jets through which the air may escape from the source and a valve for each jet controlling the flow of the air there-through, means co-operating with each jet whereby the air escaping therefrom will disperse a portion of the fuel into the escaping air to form the combustible mixture, devices for supplying the fuel from the source to the dispersion means, devices controlled by the motor for opening the valves successively to increase the supply of the dispersed fuel and closing the valves successively to decrease the supply thereof, means for conducting the dispersed fuel from the dispersion means to the motor, and connections with the dispersion means for returning the non-dispersed fuel to the source.

4. A system for producing combustible mixtures for internal combustion motors exteriorly of the cylinders thereof, which comprises, an internal combustion motor, a source of liquid fuel therefor, a source of combustion supporting gas unaffected by the induction of the motor, means affected by a continuous flow of the gas from the source for reducing the fuel to a mixture comprising nebular particles of the fuel uniformly distributed and gas tensionally suspended in the gas, means operated by the induction of the motor for controlling the nebulizing means, and means for conducting the mixture from the nebulizing means to the motor.

5. A system for producing combustible mixtures for internal combustion motors exteriorly of the cylinders thereof which comprises, an internal combustion motor, a source of liquid fuel therefor, a source of combustion supporting gas unaffected by the induction of the motor, means affected by a continuous flow of the gas from the source for reducing the fuel to a mixture comprising nebular particles of the fuel uniformly dispersed in the gas, means operable by the motor induction for controlling the nebulizing means, means for conducting the mixture from the nebulizing means to the motor, and means for supplying a combustion gas to the motor independently of the nebulizing means.

6. In a system for producing combustible

mixtures for internal combustion motors, an internal combustion motor, a source of compressed air produced independently of the induction of the motor during the operation thereof, a source of liquid fuel, means responsive to a flow of the compressed air from the source for dispersing a flow of the fuel from the fuel source therein to form a combustible mixture, means for conducting the mixture to the motor cylinders, means responsive to the operation of the motor for normally effecting a continuous flow of the compressed air from the source to the dispersing means for dispersing the fuel therein, and means responsive to the operation of the motor for supplying air thereto independently of the dispersing means.

7. The process of producing combustible mixtures for internal combustion motors which comprises, establishing a continuous dispersing action flow of compressed combustion supporting gas from a source produced independently of the induction of the motor, then subjecting a flow of liquid fuel from a source to the dispersing action of the continuous gas flow for dispersing the fuel therein to form a combustible mixture, and then varying the volume of the continuous gas flow for dispersing the fuel in response to the variation in the induction produced in the motor during the operation thereof.

8. The process of producing combustible mixtures for internal combustion motors which comprises, establishing a continuous dispersing action flow of compressed combustion supporting gas from a source produced independently of the induction of the motor, then subjecting a flow of liquid fuel from a source to the dispersion action of the continuous gas flow for dispersing the fuel therein to form a fuel gas mixture, then mixing the fuel gas mixture with a combustion supporting gas from a source independent of the compressed combustion supporting gas source, to form a combustible mixture, and then varying the volume of the continuous dispersing action flow of compressed combustion supporting gas from the source in response to the variation in the induction produced by the motor during the operation thereof.

9. In a system for producing combustible mixtures for internal combustion motors, an internal combustion motor, a source of compressed air produced independently of the induction of the motor, a source of liquid fuel, means responsive to a flow of the compressed air from the source for dispersing a flow of the fuel from the fuel source therein to form a combustible mixture, means for conducting the mixture to the motor, means responsive to the induction of the motor for effecting a continuous flow of the compressed air from the source for dispersing the fuel therein during the operation of the motor, the volume of the continuous flow being proportioned to the

variation in the induction of the motor during the operation thereof.

10. Apparatus for producing combustible mixtures for internal combustion motors comprising in combination, an internal combustion motor, a source of liquid fuel therefor, an air compressor operated by the motor for producing a supply of compressed air, an explosive mixture forming device arranged to receive fuel from the fuel source and compressed air from the compressed air supply for forming a combustible mixture, means for conducting the mixture to the motor, and means responsive to the pressure of the compressed air supply normally rendering the compressor operative to compress the air, arranged to cancel the operation thereof upon a predetermined increase in the pressure thereof.

11. The system for producing combustible mixtures for internal combustion motors comprising, an internal combustion motor, a source of liquid fuel therefor, a source of compressed air produced independently of the induction of the motor, a plurality of nozzles through which the compressed air may escape, fuel dispersing means associated with each nozzle for subjecting a flow of fuel from the source to the action of the air escaping from the nozzles for forming a combustible mixture, a valve for each nozzle controlling the flow of the compressed air from the source thereto, means responsive to the operation of the motor for successively opening and closing the valves for supplying a greater or lesser flow of the compressed air from the nozzles, and means for conducting the combustible mixture to the motor.

12. The process for producing combustible mixtures for internal combustion motors wherein the mixture is supplied to the cylinders of the motor during the induction cycle thereof which involves, compressing a combustion supporting gas independently of the induction of the motor and then successively establishing a plurality of jets of the compressed gas for atomizing liquid fuel to form the combustible mixture, the number of jets being successively increased and decreased in response to the variation of the induction of the motor during the operation thereof.

13. The process for producing combustible mixtures for internal combustion motors wherein the mixture is supplied to the motor during the induction thereof which comprises, compressing a combustion supporting gas independently of the induction of the motor, then establishing a continuous flow of the compressed gas for dispersing a flow of liquid fuel to produce the combustible mixture and during the continuous flow of the compressed gas varying the quantity of the flow in response to variation in the operation of the motor.

14. The system for producing combustible

mixtures for internal combustion motors comprising, an internal combustion motor, a source of compressed air produced independently of the induction of the motor, a source
5 of liquid fuel, fuel dispersing means arranged to direct a continuous flow of the compressed air from the source for engaging a flow of the liquid fuel from the source for producing the combustible mixture, and means responsive to the variation in the operation of
10 the motor for varying the quantity of the continuously flowing compressed air from the source to the fuel dispersing means.

OSCAR A. ROSS.

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