L. K. SNELL.

HYDROCARBON MOTOR.

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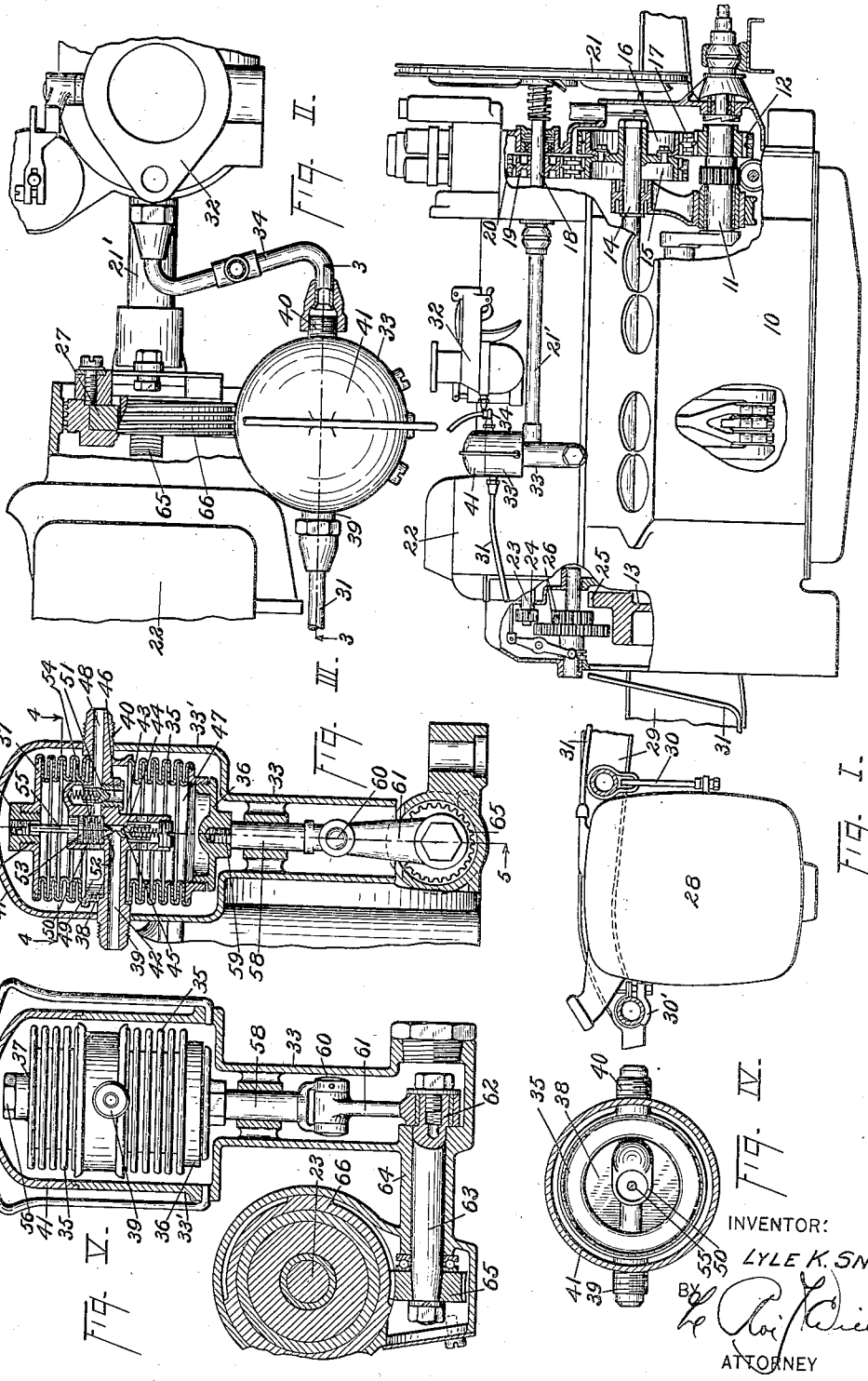
1,330,919.

Patented Feb. 17, 1920.



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HYDROCARBON-MOTOR.

1,330,919. Specification of Letters Patent. Patented Feb. 17, 1920.

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To all whom it may concern:

Be it known that I, LYLE K. SNELL, a citizen of the United States, and resident of Detroit, Wayne county, State of Michigan, have invented certain new and useful Improvements in Hydrocarbon - Motors, of which the following is a specification.

This invention relates to hydrocarbon motors, and particularly to a fuel supply system therefor.

One of the objects of this invention is to provide means for feeding fuel to the carbureter at a substantially constant pressure regardless of the changes in position of the motor and various elements of the fuel feeding system such as would take place in motor vehicle installations.

Another object of this invention is to provide means for lifting fuel from a lower level to a higher one without the disadvantages attending the use of pressure systems.

A preferred embodiment of my invention comprises a fuel tank arranged at a lower level than the carbureter, with a self contained unit for lifting the fuel to a point above the tank by atmospheric pressure and then forcing the fuel above that point by mechanical pressure means.

My invention also comprises a self-contained unit having means for lifting fuel by suction as well as pressure, with an excess pressure relief valve for returning fuel to the suction chamber from the pressure chamber, under predetermined conditions. This unit, in general, consists of a sealed corrugated collapsible tube having a stationary partition arranged therein intermediate its ends. The lower end of the tube is adapted to be reciprocated for forming alternately a sucking and forcing action. The lower part of the tube may be considered a suction or pumping chamber. That portion of the tube above the partition may be considered a pressure or regulating chamber. The partition is provided with automatically-controlled valved inlet and outlet ports through which fuel may be forced from the suction chamber to the pressure chamber. The partition is formed with another valve-controlled relief port adapted to be actuated by the free end of the pressure chamber, and to permit the return of fuel to the suction chamber when the pressure in the other chamber exceeds a predetermined amount.

The various objects of my invention will clearly appear from the following description, taken in connection with the accompanying drawing which forms a part of this specification, and in which:

Figure 1 is a side view, more or less diagrammatic, with portions broken away, of a motor vehicle embodying this invention;

Fig. 2 is a plan view, with portions broken away, of the fuel-lifting device, its operating connections, and the carbureter;

Fig. 3 is a vertical section substantially on the line 3—3 of Fig. 2;

Fig. 4 is a transverse section substantially on the line 4—4 of Fig. 3; and

Fig. 5 is a vertical section substantially on the line 5—5 of Fig. 3.

Referring to the drawing, 10 is the usual crank case, in which may be suitably mounted a crank shaft 11 having a gear 12 suitably secured to its forward end and a flywheel 13 secured to its rear end. The usual cam shaft 14 is also suitably arranged in the crank case and has a pair of gears 15 and 16 keyed and bolted to its forward end. The gear 16 on the cam shaft is adapted to be driven by the gear 12 through the chain 17, and the gear 15 on the cam shaft is adapted to drive another suitably-mounted shaft 18 and gear 19 by a chain 20. The usual fan 21 may be driven from one end of the shaft 18, and an alined shaft 21′ driven from the other end thereof.

The motor generator 22, having an armature shaft 23, may be suitably mounted on the crank case 10 and suitably secured in position. The rear end of the armature shaft 23 is provided with a gear 24 which is adapted to drive the gear 25 on the flywheel 13 through the sliding gear reduction pair 26. The shaft 21′ has an overrunning clutch connection 27, of any well-known form, with the armature shaft 23. The overrunning clutch connection is such that when the armature shaft 23 is driving the crank shaft 11 through the gear 25, the shaft 21′ is automatically disconected therefrom, but when the armature shaft 23 ceases to drive the crank shaft, it is automatically connected in driven relation with the shaft 21′.

A fuel tank 28, is swung from the frame

29 by hangers 30 and 30'. A conduit 31 connects the interior of the fuel tank with the motor carbureter 32 through the fuel-transfer mechanism 33 and connecting pipe 34; said pipe 34 discharging into the usual float chamber of the carbureter, hereinafter referred to as an auxiliary fuel supply tank; in the preferred embodiment of my invention disclosed in this application. The mechanism 33 comprises a housing 33' in which is arranged a collapsible metallic corrugated tube or bellows 35 and end walls 36 and 37. A partition 38 is arranged across the interior of the chamber formed by the walls 35, 36, and 37. The partition is formed with a nipple 39 connected with the conduit 31 and with another nipple 40 connected with the pipe 34. These nipples are adapted to be clamped in a stationary position between the housing 33' and the cap 41, thus maintaining the partition 38 stationary. The partition 38 is provided with a cored-out passage 42, a thimble 43, and an inlet port 44. An adjustable spring-closed inlet valve 45 is arranged in the thimble 43, for controlling the inlet port 44. The partition is also provided with an outlet port 46, connecting the chamber 47 with the discharge port 48 and the pressure chamber 49 through the passage 50, respectively. A valve mechanism 51 is provided for controlling the outlet port 46. The passage 50 has a relief port 52 connecting it with the passage 42 and the port 46. A valve mechanism 53 may control the relief port 52, and is adapted to be actuated by the combined action of the spring 54 and the stem 55, adjustably mounted in a plug 56 threaded as at 57 in the end wall 37. The upper end of a connecting rod 58, is threaded or otherwise secured as at 59 to the end wall 36 of the suction chamber 47, and the lower end of the rod 58 has pivotally connected thereto as at 60, a pitman 61. The pitman 61 is adapted to be operated by means of an eccentric 62, formed on a horizontal shaft 63 mounted in a bearing 64 of the housing 33'. A worm gear 65 is suitably secured to the shaft 63 in mesh with a gear 66 which is secured to the armature shaft 23.

The foregoing construction may be described to operate and function as follows:

Assuming the starting motor 22 to be energized and the gear pair 26 to be slid into operative position, the armature shaft 23 will turn over the crank shaft 11, and simultaneously the gear 66 on the motor shaft will reciprocate the end wall 36 of the mechanism 33. A downward movement of the end wall will create a vacuum in the chamber 47, thereby causing atmospheric pressure to act on the surface of the fuel in the tank 28 and lifting a portion of the fuel through the conduit 31, passage 42, and inlet port 44, to the interior of the chamber 47. An upward movement of the wall 36 will close the inlet port 44 by means of the valve mechanism 45 and simultaneously force fuel through the outlet port 46 through the passage 48 to an auxiliary fuel supply tank such as the usual float chamber or reservoir of the carbureter 32 and also through the passage 50 to the interior of the pressure chamber 49.

The plug 56 and the rod 55 will be so adjusted that the valve 53 remains in closed position until the pressure within the chamber 49 and the passage 48 exceeds a predetermined amount, at which time the end wall 37 will be forced upwardly, permitting the valve 53 to hold open the relief port 52, and fuel will be returned from the pressure chamber 49 to the suction chamber 47 until conditions again become normal. The mechanism 33, being arranged in proximity to the carbureter 32, will thus maintain a substantially constant head or pressure of fuel at the carbureter, regardless of the amount of fuel in the tank 28 or of the variations in the position of the tank.

While I have described and will specifically claim what I deem to be a preferred embodiment of my invention, it will be obvious to those skilled in the art that various changes and modifications may be made without departing from the spirit and scope hereof.

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

1. In combination, a hydrocarbon motor and means for supplying fuel to the same including a collapsible vessel comprising a flexible tubular corrugated side wall and end walls connected with the opposite ends thereof, said vessel being provided with valve controlled inlet and outlet ports, respectively, means for maintaining one of said end walls stationary, and positively operated means actuated by the motor for reciprocating the other end wall.

2. In combination, a hydrocarbon motor and means for supplying fuel to the same including a collapsible vessel comprising a flexible tubular corrugated side wall and end walls connected to the opposite ends thereof, said vessel having valve-controlled inlet and outlet ports, respectively, means for holding one of said end walls stationary, means for reciprocating the opposite end wall, means interiorly of said vessel, comprising a valve-controlled port for connecting said outlet port with said inlet port, the valve in said means being normally closed and adapted to be opened by a rise of the pressure in said vessel, above a predetermined normal.

3. In combination, a hydrocarbon motor and means for supplying fuel to the same including a vessel comprising a collapsible

tubular corrugated wall and oppositely disposed end walls connected thereto, said vessel being provided with valve-controlled inlet and outlet ports, respectively, a by-pass connecting said ports, a valve in said by-pass, means for maintaining a portion of said tubular wall stationary, and means for reciprocating one of said end walls.

4. In combination, a hydrocarbon motor and means for supplying fuel to the same including a vessel comprising a collapsible tubular corrugated wall and oppositely disposed end walls connected thereto, said vessel being provided with valve-controlled inlet and outlet ports, respectively, a by-pass connecting said ports, a valve in said by-pass, means for maintaining a portion of said tubular wall stationary, means for reciprocating one of said end walls, and means connecting the opposite side wall and the valve in said by-pass, as and for the purpose set forth.

5. In combination, a hydrocarbon motor and means for supplying fuel to the same including a vessel comprising a collapsible tubular side wall and oppositely disposed end walls connected thereto, said vessel being provided with a pumping chamber and a regulating chamber, said pumping chamber being provided with a valve-controlled inlet port, means comprising a valve-controlled port connecting said chambers, a valve-controlled by-pass connecting the regulating chamber with said inlet port, and means for expanding and contracting said pumping chamber.

6. In combination, a hydrocarbon motor and means for supplying fuel to the same including a vessel comprising a collapsible tubular side wall and oppositely disposed end walls connected thereto, said vessel being provided with a pumping chamber and a regulating chamber, said pumping chamber being provided with a valve-controlled inlet port, means comprising a valve-controlled port connecting said chambers, a valve-controlled by-pass connecting the regulating chamber with said inlet port, means for expanding and contracting said pumping chamber, and means connecting the end wall of said regulating chamber with the valve in said by-pass, whereby a rise of pressure in said latter chamber, above a predetermined normal, permits the release of the valve in said by-pass.

7. In combination, a hydrocarbon motor and means for supplying fuel to the same including a collapsible vessel comprising a tubular corrugated side wall, and oppositely disposed end walls and an intermediate wall, means for maintaining said intermediate wall stationary, means for reciprocating one of said end walls, said vessel being provided with a valve-controlled inlet port, said intermediate wall being also provided with a valve-controlled port, a valve-controlled by-pass connecting said ports, means connecting the other end of said vessel with the valve in said by-pass, as and for the purpose set forth.

8. In combination, a hydrocarbon motor and means for supplying fuel to the same including a collapsible vessel having a tubular corrugated side wall, oppositely disposed end walls and an intermediate wall, means for maintaining said intermediate wall stationary, means for reciprocating one of said end walls, said vessel being provided with an inlet port and an outlet port, and a valve in said inlet port, said intermediate wall being provided with a valve-controlled port, as and for the purpose set forth.

9. In combination, a fuel tank, a carbureter, and a single pipe line connection therebetween, comprising a vessel having a collapsible tubular corrugated side wall and oppositely disposed end walls, said vessel having a valve-controlled inlet port and an outlet port, an excess pressure relief in said vessel, and means for causing relative movement between said end walls.

10. In combination, a fuel tank, a carbureter, and a single pipe line connection therebetween, comprising a vessel having a collapsible tubular corrugated wall and oppositely disposed end walls, said vessel having a valve-controlled inlet port and an outlet port, and means for causing relative movement between said end walls, said vessel having a valve controlled by-pass substantially as described.

11. In combination, a fuel tank, a carbureter, and a single pipe line connection therebetween, comprising a vessel having a collapsible tubular corrugated wall and oppositely disposed end walls, said vessel having a valve-controlled inlet port and an outlet port, and means for causing relative movement between said end walls, said vessel being provided with a bypass connecting the interior thereof with the pipe line at a point intermediate said tank and said inlet port.

12. In combination, a fuel tank, a carbureter, and a single pipe line connection therebetween, comprising a vessel having a collapsible tubular corrugated wall and oppositely disposed end walls, said vessel having a valve-controlled inlet port and an outlet port, and means for causing relative movement between said end walls, said vessel being provided with a bypass connecting the interior thereof with the pipe line at a point intermediate said tank and said inlet port, and a valve mechanism in said bypass.

13. In combination, a fuel tank, a carbureter, and a single pipe line connection therebetween, comprising a vessel having a collapsible tubular corrugated wall and oppositely disposed end walls, said vessel having

a valve-controlled inlet port and an outlet port, and means for causing relative movement between said end walls, said vessel being provided with a bypass connecting the interior thereof with the pipe line at a point intermediate said tank and said inlet port, a valve mechanism in said bypass, and means connecting one of said end walls with said latter-mentioned valve mechanism, as and for the purpose set forth.

14. In combination, a fuel tank and a carbureter, arranged at different levels, means connecting said tank and carbureter, comprising a vessel arranged adjacent said carbureter, said vessel having a corrugated tubular wall and rigid end walls connected thereto, said vessel having a valve-controlled inlet port and an outlet port, and positively operated means actuated by the motor with which the device is used for causing a relative movement between said end walls.

15. In combination, a fuel tank and a carbureter, arranged at different levels, means connecting said tank and carbureter, comprising a vessel arranged adjacent said carbureter, said vessel having a corrugated tubular wall and end walls connected thereto, said vessel having a valve-controlled inlet port and an outlet port, means for causing a relative movement between said end walls, and a bypass connected interiorly of said vessel at a point intermediate said tank and said inlet port.

16. In combination, a fuel tank and a carbureter, arranged at different levels, means connecting said tank and carbureter, comprising a vessel arranged adjacent said carbureter, said vessel having a corrugated tubular wall and end walls connected thereto, said vessel having a valve-controlled inlet port and an outlet port, means for causing a relative movement between said end walls, a bypass connected interiorly of said vessel at a point intermediate said tank and said inlet port, and a valve mechanism in said bypass, said valve mechanism being adapted to be opened when the pressure in the interior of said vessel rises above the predetermined normal.

17. The combination with a fuel receiving device, a fuel tank, and a single pipe line connection through which fuel is supplied to said fuel receiving device, of a fuel supply mechanism included in said pipe line and comprising a pumping portion, and a feed regulating portion having a collapsible resilient wall exposed to the pressure of the fuel operated upon by said pumping portion.

18. A hydrocarbon motor, and a starting motor, in combination, with means for forming a driving connection between said motors, a fuel tank and a carbureter arranged at different levels, a pipe line for connecting said tank and carbureter, a diaphragm pump for lifting fuel from said tank to the level of said carbureter, and means for connecting said pump with said starting motor.

19. A hydrocarbon motor, and a starting motor, in combination, with means for forming a driving connection between said motors, a fuel tank and a carbureter arranged at different levels, a pipe line for connecting said tank and carbureter, a diaphragm pump for lifting fuel from said tank to the level of said carbureter, and means for automatically driving said pump from either of said motors.

20. A hydrocarbon motor, and a starting motor, in combination with means for forming a driving connection between said motors, a fuel tank and a carbureter arranged at different levels, a pipe line for connecting said tank and carbureter, a diaphragm pump for lifting fuel from said tank to the level of said carbureter, and means for driving said pump from either of said motors.

21. The combination, with a hydrocarbon motor, a starting motor adapted to be connected therewith, and main and auxiliary tanks arranged at different levels, of means for connecting said tanks, said means including a device for lifting fuel from one tank to the other, said device being adapted for operation by either of said motors.

22. The combination, with a hydrocarbon motor, a starting motor adapted to be connected therewith, and main and auxiliary tanks arranged at different levels, of means for connecting said tanks, said means including a device for lifting fuel from one tank to the other, said device being arranged above the level of said lower tank and adapted for operation by either of said motors.

23. The combination with a fuel receiving device, a fuel tank, and a single pipe line connection through which fuel is supplied to said fuel receiving device, of a fuel supply mechanism included in said pipe line and comprising a pumping device, and a feed regulating device having a collapsible resilient wall exposed to the pressure of the fuel operated upon by said pumping device, and operable by rise of pressure in said pipe line to interrupt the operation of said fuel supply mechanism.

24. In combination, a fuel tank, a hydrocarbon motor having means for feeding fuel thereto in varying amounts, a single pipe line for supplying fuel from said tank to said fuel feeding means, and a pump arranged in said single pipe line for taking fuel from said tank and delivering the same to said fuel feeding means at a constant pressure, a by-pass passage from the discharge to the inlet side of said pump, and a pressure operated valve for controlling said by-pass passage.

25. In combination, a fuel tank, a hydrocarbon motor having means for feeding fuel thereto in various amounts, a single pipe line for supplying fuel from said tank to said fuel feeding means, a pumping device having the interior thereof closed to the atmosphere and arranged in said single pipe line for taking fuel from said tank and delivering the same to said fuel feeding mechanism at a constant pressure, and pressure operated means for interrupting the operation of said pumping device when the pressure in said pipe line rises above a predetermined point.

26. In combination, a hydrocarbon motor, a starting motor, a fuel tank, a pipe line for supplying fuel from said tank to said hydrocarbon motor, a pump included in said fuel line for delivering fuel from said tank to said hydrocarbon motor and which pump is operable by either of said motors, and means for operatively connecting one or the other of said motors separately and independently, and to the exclusion of the other motor, with said pump.

27. In combination, a hydrocarbon motor, a starting motor, a fuel tank, a pump operable by either of said motors for supplying fuel from said tank to said hydrocarbon motor, and means for operatively connecting one or the other of said motors separately and independently, and to the exclusion of the other motor, with said pump.

28. In combination with a hydrocarbon motor and means for supplying fuel thereto, and a fuel tank; a fuel supply conduit through which fuel is supplied from said tank to the means aforesaid for supplying fuel to the motor; a pump adapted to force fuel through said conduit and which pump comprises an expansible and collapsible corrugated tubular member one end of which is secured to a fixed support and the other end of which is secured to a movable end wall; positively operated means actuated by the motor aforesaid and operatively connected with said movable end wall and through which motion is communicated thereto; and valve mechanism for controlling the flow of fuel from said tank to said pump, and from said pump to the fuel supplying means aforesaid.

29. In combination with a hydrocarbon motor and means for supplying fuel thereto, and a fuel tank; a fuel supply conduit through which fuel is supplied from said tank to the means aforesaid for supplying fuel to the motor at constant pressure; a pump adapted to force fuel through said conduit and which pump comprises an expansible and collapsible corrugated tubular member one end of which is secured to a fixed support and the other end of which is secured to a movable end wall; mechanically operated means actuated by the motor aforesaid and operatively connected with said movable end wall and through which motion is communicated thereto; valve mechanism for controlling the flow of fuel from said tank to said pump, and from said pump to the fuel supplying means aforesaid; and means the operation of which is dependent upon a rise of pressure of the fuel supplied to said fuel supplying device for interrupting the operation of said pump when the pressure of the fuel pumped thereby exceeds a predetermined pressure.

30. In combination with a hydrocarbon motor and means for supplying fuel thereto, and a fuel tank; a fuel supply or pipe line leading from said fuel tank to said fuel supplying means and through which fuel is supplied thereto; a pumping device associated with said pipe line and adapted to force fuel therethrough and to the means aforesaid for supplying fuel to the hydrocarbon motor, and which pumping device includes an expansible and collapsible corrugated tube and means for positively expanding and collapsing the same; and means the operation of which is dependent upon an increase in pressure of the fuel pumped by said pumping device for interrupting the pumping action of said pumping device when the pressure within said pipe line rises above a predetermined amount.

In testimony whereof I affix my signature.

LYLE K. SNELL.