To all whom it may concern:

Be it known that I, Gustave C. Nelson, a citizen of the United States, residing at Moline, in the county of Rock Island and State of Illinois, have invented certain new and useful Improvements in Vacuum Feed Systems, of which the following is a specification.

This invention relates to liquid fuel systems for explosive engines and it is particularly useful as an accessory to an automobile or truck engine.

The primary object of the invention is to provide means of simple and substantial construction, and comprising comparatively few and easily made parts, for connection with the fuel supply tank and the intake manifold of the engine, whereby a constant and regular gravity fuel feed to the engine will always be maintained.

Another important object of the invention is to provide for a quick "kick-over" which is a term employed in the trade to indicate the change between the vacuum producing position and the atmospheric pressure position, to prevent the cut-off from fluttering or floating between said positions.

A further object is to provide a float operated cut-off for the vacuum connection and for retarding the operation of the cut-off to close the vacuum connection until the liquid in the receiving chamber has reached a level which will provide an excess buoyancy for the float sufficient to overcome said retarding means and quickly operate the cut-off to close the vacuum connection.

Further objects of the invention are to provide a single cut-off disk for the vacuum connection and the receiving chamber air vent with means for insuring efficient operation and true seating thereof under all usual conditions of service; to produce a revolving movement of the float and cut-off disk whereby to insure their maintenance in good working condition; to eliminate delicate construction, complicated moving parts, springs and valve mechanisms which wear and get out of order and cause more or less annoyance to users; and to insure a constant and regulated feed to the engine.

In the accompanying drawings, I have illustrated the invention in two selected embodiments and referring thereto—

Fig. 1 is a vertical sectional view of a tank, as commonly referred to in the trade, embodying my invention in a preferred form.

Fig. 2 is an elevation of the head and float transverse to the position shown in Fig. 1.

Fig. 3 is a sectional view of a portion of a tank showing the air vent for the feed chamber located on the outside of the tank.

Referring to the drawings, 1 is a tank having a top 2 and a bottom 3 with an intermediate partition 4 dividing the tank into a receiving chamber 5 and a feed chamber 6. For convenience in manufacturing, I may make the partition 4 as a bottom for the receiving chamber and with the feed chamber a separate part secured to said bottom as shown. A conduit 7 extends from the bottom of the receiving chamber into the feed chamber and it is provided at its lower end with a flap valve 8. A tube 9 is mounted in the bottom 4 and top 2 of the receiving chamber and projects therethrough to provide a constantly open air vent for the feed chamber. A float 10 is carried by a sleeve 11 which has a free working fit upon the tube 9 and is provided at its upper end with a cut-off disk 12. The float may be provided with a conical top 10'' and a conical bottom 10'' as shown, the said having been found to be a desirable construction in actual practice, but I have also found that other forms of floats of common construction may be satisfactorily used and I do not limit myself to the particular construction illustrated because it may be found in commercial practice or for special reasons that other forms are more desirable.

In the present invention the top of the tank is provided with a downward extension 13 and the top and extension may be said to form the head of the tank. This extension may vary in size but I have found it convenient to make it of substantially semicircular shape with a centrally disposed opening 13' through which the vent tube 9 projects and into which the sleeve 11 projects. A slot 14 is cut in the head to receive the cut-off disk 12 and this slot is of sufficient width to enable the disk to have a limited amount of play therein. I have provided for a play of 1/16 inch and also 1/8 inch and variations therefrom but I now believe a play of 1/4 inch is amply sufficient and will provide for an efficient operation and
satisfactory results. I do not limit myself to particular dimensions in this or any other parts or features of the invention because I realize they may be changed without departing from the invention to meet different conditions and to produce the desired results. A vacuum producing connection 15 in the head is connected by a pipe (not shown) to the intake manifold of the engine and opens into the slot 14 at the top thereof and on one side of the vent tube 9. An air vent 16 is also provided in the head, preferably on the opposite side of the vent tube 9, and opens into the slot 14 at the bottom thereof.

I prefer to locate the vacuum connection and the air vent on opposite sides of the tube 9 and distant from each other to prevent any possibility of a direct connection during suction operation between the vacuum connection and the air vent which would have a tendency to float the disk and, perhaps, impart a fluttering action thereto.

I provide one or more vacuum cups in the head below the cut-off disk to hold the disk and temporarily retard it against upward movement under the buoyant action of the inflowing liquid in the receiving chamber. The vacuum cup comprises a chamber 17 opening into slot 14 at the bottom thereof and provided with a contract and opening 18 at its lower end to the receiving chamber 5. I have used one of these vacuum cups in substantially the form and location shown in Fig. 1 and found it efficient and satisfactory for the purpose but I may provide another vacuum cup in the head between the one shown and the air passage 16, or otherwise located, or I may use more than two cups if conditions require it or a plurality of cups may be found desirable.

The supply inlet 19 may be located in the head, as shown in Figs. 1 and 2 or in the side of the receiving chamber as shown at 19' in Fig. 3. In the form shown in Figs. 1 and 2, I prefer to continue the inlet down through the head and within the chamber to a position sufficiently above the float to permit a full and complete operation of the float under all required conditions but distant from the vacuum connection so that possibility of liquid fuel being sucked directly from the inlet through the vacuum connection to the intake manifold is wholly avoided.

In Fig. 3 I have shown the air vent 20 for the feed chamber 6 located outside of the tank instead of inside of the tank as shown in Figs. 1 and 2, this being an alternative construction which may be found desirable for some purposes. The liquid fuel flows from the feed chamber through an outlet 21 which is connected by a pipe (not shown) to the carburetor in a manner familiar in the art. In the construction of Fig. 3 the float, sleeve and disk are guided on the rod 9' which takes the place of the vent tube 9 in the construction of Figs. 1 and 2.

My invention provides a device or apparatus of extremely simple construction which comprises only one movable part, aside from the flap valve, and is entirely free from delicate and complicated parts and from parts which are liable to get out of order or wear rapidly. This is of great importance in connection with the vacuum tanks for automobiles and trucks because of the service which they must perform and the comparatively hard and irregular use to which they are subjected. In the present invention as illustrated in what I now consider its most desirable embodiment, the float is rigidly connected by sleeve 11 with the single cut-off disk and this disk alternately opens and closes the vacuum connection and the air vent. The action of the disk may be sufficiently quick for some purposes when influenced only by the level of the liquid fuel in the receiving chamber but for more efficient operation, that is to say, a quicker "kick-over," I prefer to provide the vacuum cup which holds, by suction, the disk against the lower seat in the slot until the liquid has reached a higher level than is necessary to float the float so that when the buoyancy of the liquid finally releases the disk from the suction of the vacuum cup the buoyant action of the liquid will not only float the float and raise the disk but it will perform this action very quickly, much quicker than if the disk were unrestrained. This will quickly cut-off the vacuum connection, open the air vent to the receiving chamber and stop the inflow of liquid to the receiving chamber. The float, sleeve and cut-off disk are restrained from excess lateral movement by the guide tube 9 or guide rod 9' but these parts have a free working fit on the guide and the suction of the suction cup will overcome any tendency to lateral movement which would be permitted by this working fit and thus insure proper seating of the disk against the lower seat to close the air inlet. Thus the working fit may be sufficiently free to provide an easy movement of the parts without liability of unseating the disk from its lower seat in ordinary service.

The movement of the cut-off disk in its "kick-over" is very slight and my invention entirely avoids the possibility of the disk being suspended between its two seats which would leave the vacuum connection and the air inlet open at the same time, destroy the vacuum, or partial vacuum, in the receiving chamber and stop the inflow of liquid thereinto, and as the vacuum connection would suck air freely from the air inlet direct to the manifold the predetermined carburetor mixture would be destroyed and the operation of the engine would be reduced in efficiency. I have
found it desirable to make the air inlet in the lower seat for the disk the same size as the suction opening in the upper seat for the disk.

3. It will be noted that while the invention is sensitive in operation its parts are not correspondingly delicate but on the contrary they are strong and substantial and will withstand any amount of rough usage and wear to which they are likely to be subjected. This is important to motorists because automobiles and trucks equipped with vacuum tanks are wholly dependent on the proper operation of the vacuum system for maintaining the cars and trucks in service, and if the vacuum system gets out of order and does not operate properly, it is extremely difficult to maintain the car temporarily in service until a place can be reached where repairs may be made.

The suction cup also has the further function of a safety device not only by providing a quick “kick-over” but also in preventing the possibility of the liquid fuel being sucked through the vacuum connection to the manifold. If by chance the disk should not shift from the lower seat to the upper seat to open the air inlet and close the suction connection until the level of the liquid reaches the opening 18, then the liquid flowing into the suction cup will change the vacuum, or partial vacuum therein, to pressure which will lift the disk from its lower seat and result in closing the vacuum connection.

I have found in commercial use of the invention that the float will revolve on the guide more or less irregularly. This revolving action of the float correspondingly revolves the cut-off disk which keeps the disk clean and in effect continually “grinds” the seats to keep them clean and in perfect seating condition. My invention entirely overcomes the tendency of the systems now in general use to fail on long or steep grades because it provides for constantly maintaining a sufficient supply of fuel in the vacuum chamber for all engine requirements.

I have illustrated and described herein an embodiment of the invention, and a slight modification thereof, which I have found in actual practice to be very efficient and satisfactory but I reserve the right to make all such changes in the form, proportion and arrangement of parts as fairly fall within the scope of the appending claims.

I claim:

1. In a vacuum feed system, a tank having a liquid fuel receiving chamber and a feed chamber, a valved communication between said chambers, a vacuum producing connection to said receiving chamber, a cut-off disk adapted to close said connection, and a vacuum cup operatively disposed with relation to said disk to retard its movement to cut off the vacuum producing connection.

2. In a vacuum feed system, a tank having a liquid fuel receiving chamber and a feed chamber, a valved communication between said chambers, a vacuum producing connection to said receiving chamber, a cut-off disk adapted to close said connection, and a vacuum cup adapted to temporarily retard the movement of said disk, a partial vacuum being formed in said cup by the suction from said vacuum producing connection.

3. In a vacuum feed system, a tank having a liquid fuel receiving chamber and a feed chamber, a valved communication between said chambers, a movable cut-off disk, a vacuum producing connection opening at one side of said disk, and a vacuum cup opening at the opposite side of said disk to retard the movement of the disk for closing said vacuum producing connection.

4. In a vacuum feed system, a tank having a liquid fuel receiving chamber and a feed chamber, a valved communication between said chambers, a vacuum producing connection to said receiving chamber, a vacuum cup, a cut-off disk operatively disposed between the open ends of said vacuum producing connection and said vacuum cup, said disk being arranged to engage the open end of the vacuum cup when the vacuum producing connection is open so that a partial vacuum will be formed in said cup by the suction from said vacuum producing connection to temporarily retard the movement of the disk for closing said vacuum producing connection.

5. In a vacuum feed system, a tank having a liquid fuel receiving chamber and a feed chamber, a valved communication between said chambers, a float in the receiving chamber, a cut-off disk carried by said float, a vacuum producing connection opening opposite one side of said disk, a vacuum cup opening opposite the other side of said disk, said vacuum cup having a comparatively large opening adjacent the disk and a comparatively small opening to the receiving chamber so that a partial vacuum created in said cup by the suction from said vacuum producing connection will hold the disk temporarily against the buoyant action of the liquid in the receiving chamber.

6. In a vacuum feed system, a tank having a liquid fuel receiving chamber and a feed chamber, a valved communication between said chambers, a vacuum producing connection to said receiving chamber, a float operated cut-off disk adapted to close said connection, and vacuum means operating upon said disk to temporarily restrain the movement thereof against the buoyant action of the liquid in the receiving chamber.
whereby a quick "kick-over" of the disk is provided when said means is released.

7. In a vacuum feed system, a tank having a liquid fuel receiving chamber and a feed chamber, a valved communication between said chambers, a vacuum producing connection to said receiving chamber, a float operated cut-off disk to close said connection, and vacuum means operating upon said disk to temporarily restrain it against the buoyant action of the liquid in the receiving chamber so that when said vacuum means is released the disk will have a quick "kick-over" to close said connection.

8. In a vacuum feed system, a tank having a liquid fuel receiving chamber and a feed chamber, a valved communication between said chambers, a head for the receiving chamber having oppositely disposed seats therein, a cut-off disk operating between said seats, a vacuum producing connection opening through one of said seats, an air vent opening through the other seat, and vacuum means operating upon the disk for retarding its movement in one direction.

9. In a vacuum feed system, a tank having a liquid fuel receiving chamber and a feed chamber, a valved communication between said chambers, a head for the receiving chamber having oppositely disposed seats therein, a cut-off disk operating between said seats, a vacuum producing connection opening through one of said seats, an air vent opening through the other seat, and means operating upon the disk through the seat through which the air vent opens to temporarily restrain the disk from movement from said seat.

10. In a vacuum feed system, a tank having a liquid fuel receiving chamber and a feed chamber, a valved communication between said chambers, a head for the receiving chamber having an extension into said chamber, said extension having an opening disposed centrally of the chamber and a horizontal slot, the walls of said slot forming seats, a float in the receiving chamber, a sleeve movable with the float and projecting into said opening, a cut-off disk carried by said sleeve and operating in the slot between said seats, a vacuum producing connection opening through one of said seats, and an air vent opening through the other seat.

11. In a vacuum feed system, a tank having a liquid fuel receiving chamber and a feed chamber, a valved communication between said chambers, a head for the receiving chamber having upper and lower elongated seats therein, a float in the receiving chamber, a disk operatively disposed between said seats and operated by said float, said disk engaging one or the other of said seats substantially throughout the length of the seat, a vacuum producing connection opening through one of said seats, and an air vent opening through the other seat.

12. In a vacuum feed system, a tank having a liquid fuel receiving chamber and a feed chamber, a vacuum producing connection to said receiving chamber, a head for the receiving chamber having a slot and oppositely disposed seats therein, a cut-off disk revoluble in said slot and operatively movable between said seats, and vacuum means operating upon the disk for retarding its movement in one direction.

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