At the idle and low speeds, the velocity of the air flowing through the carburetor is reduced and the vacuum created in the venturi will not be strong enough to operate the main metering system. Because of the restriction of the air flow through the carburetor due to the nearly closed throttle plate, intake manifold vacuum will be high. This high manifold vacuum provides a pressure differential which is used to operate the idle system.

At the idle, fuel flows through the main jet into the bottom of the main well. The high manifold vacuum acting on this fuel through the idle system passages draws the fuel from the main well through a short horizontal passage into the idle well. A calibrated restriction in the lower portion of the idle well meters the flow of fuel entering the idle system. The fuel passes out the top of the idle well and into the idle system passages in the main body. A metered flow of air from the idle air bleed is admitted to the fuel as it enters the idle passage in the main body. The idle air bleed also serves to vent the idle system to prevent any siphoning effect at higher speeds or when the engine is stopped. This mixture of fuel and air continues down, flowing through the idle restriction, and, passing the two idle transfer holes in the throttle body, is discharged through the idle discharge hole into the strong manifold vacuum existing below the throttle plate. The two idle transfer holes act as additional air bleeds at the idle. An idle adjusting needle, which seats in the idle discharge hole, controls the discharge of fuel at the idle and provides a means for adjusting the idle mixture of the engine. Turning the idle adjusting needle in moves the pointed tip of the needle closer to its seat, restricting the fuel flow out of the idle discharge hole. This results in a leaner idle mixture. Conversely, turning the needle out allows more fuel to flow out the idle discharge hole to provide a richer idle mixture.

During off-idle operation, which occurs when the throttle plate is moved open slightly past the two idle transfer holes, each hole begins discharging fuel as it is exposed to manifold vacuum. As the throttle plate is opened still wider and engine speed increases, the velocity of the air flow through the carburetor is also increased. This creates a vacuum in the venturi strong enough to bring the main metering system into operation. The fuel from the idle system tapers off as the main metering system begins discharging fuel. The two systems are engineered to provide a smooth, even transition from idle to cruising speeds.

5. POWER ENRICHMENT SYSTEM

When high power output is required, a richer mixture must be provided than the mixture required for normal cruising when no great load is placed on the engine. The carburetor provides the added fuel for high power operation by means of the power enrichment system, sometimes called the economizer system.

The power enrichment system is actuated by manifold vacuum. Manifold vacuum, which is strongest at the idle, when there is no load on the engine, is reduced in proportion to the increase in engine load. This is due to the fact that, as the load on the engine increases, the throttle plate must be opened wider to maintain a given speed. Manifold vacuum will be reduced because the restriction offered to the air flow entering the intake manifold by the throttle plate will be lessened as the plate is opened. The strength of the manifold vacuum is thus an accurate indicator of the power demands placed on the engine.

Manifold vacuum acting on the economizer diaphragm actuates the power enrichment system. This vacuum from the lower portion of the throttle bore below the throttle plate is transmitted through the vacuum passage to the vacuum chamber on top of the economizer diaphragm. At idle and normal cruising speeds, the vacuum acting on the economizer diaphragm is strong enough to hold the diaphragm up against the tension of the diaphragm spring. This raises the economizer diaphragm stem clear of the power valve and the power valve will be held in the closed position by the tension of its spring. The power enrichment system will thus be inoperative in conditions of high manifold vacuum.

When high power demands place a greater load on the engine, manifold vacuum is reduced. When the vacuum is reduced below a predetermined point, the diaphragm can no longer overcome the tension of the diaphragm spring and the stem will be forced down. This depresses the pin in the center of the power valve, opening the valve. Fuel from the float chamber will flow into the valve and, passing through a horizontal passage, enter the main well. There it is added to the fuel flow of the main metering system, enriching the mixture for full power. The drilled plug in the passage between the power valve and the main well is a calibrated restriction which meters the flow of fuel through the power enrichment system.