HONDA MOTORCYCLE CARBURETION

CONTENTS

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The function of the carburetor is to atomize fuel and mix it with air in proper proportions to suit engine operating conditions. In operation, the carburetor sprays gasoline into the air passing through it. The atomized gasoline (a mist of liquid fuel) is then vaporized by engine heat and heat of compression to provide a uniform and efficiently combustible air-fuel mixture.

The quantity of gasoline dispensed by the carburetor is controlled by metering circuits within the carburetor body, providing exactly the right air-fuel ratios. A throttle valve controls the amount of air-fuel mixture delivered to the engine, regulating the engine's power output.

AIR-FUEL RATIOS

The theoretically perfect air-fuel ratio is 15 parts of air to 1 part of gasoline, by *weight*. When there is a uniform air-fuel ratio of this proportion, the mixture burns completely without leaving an excess of either fuel or air.

The air-fuel mixture may still burn effectively when the ratio is as rich as 7:1 or as lean as 20:1. The actual limits of combustion will vary according to combustion chamber shape, pressures, temperatures, fuel characteristics, and mixture uniformity.

Extremely rich and extremely lean fuel mixtures both result in loss of power. An extremely rich fuel mixture burns slowly and incompletely, because there is not enough oxygen in the air to combine with the fuel. Incomplete fuel combustion causes spark plug fouling and carbon build-up in the combustion chamber. An extremely lean fuel mixture burns slowly and does not use all the oxygen in the air. If the lean fuel mixture is still burning when the exhaust valve opens, the valve head is exposed to prolonged high temperatures and oxygen, which may result in a burnt valve. Prolonged high cylinder temperatures may also lead to pre-ignition and may melt the piston crown.

Under actual operating conditions, fuel vaporization and combustion are less than perfect. Consequently, maximum power is usually developed with an air-fuel ratio of about 12:1 rather than the theoretical optimum of 15:1.

A very rich air-fuel mixture is required for cold starting because a cold engine reduces vaporization and causes fuel condensation on the intake ports and cylinder walls.

BASIC PRINCIPLES OF CARBURETOR OPERATION

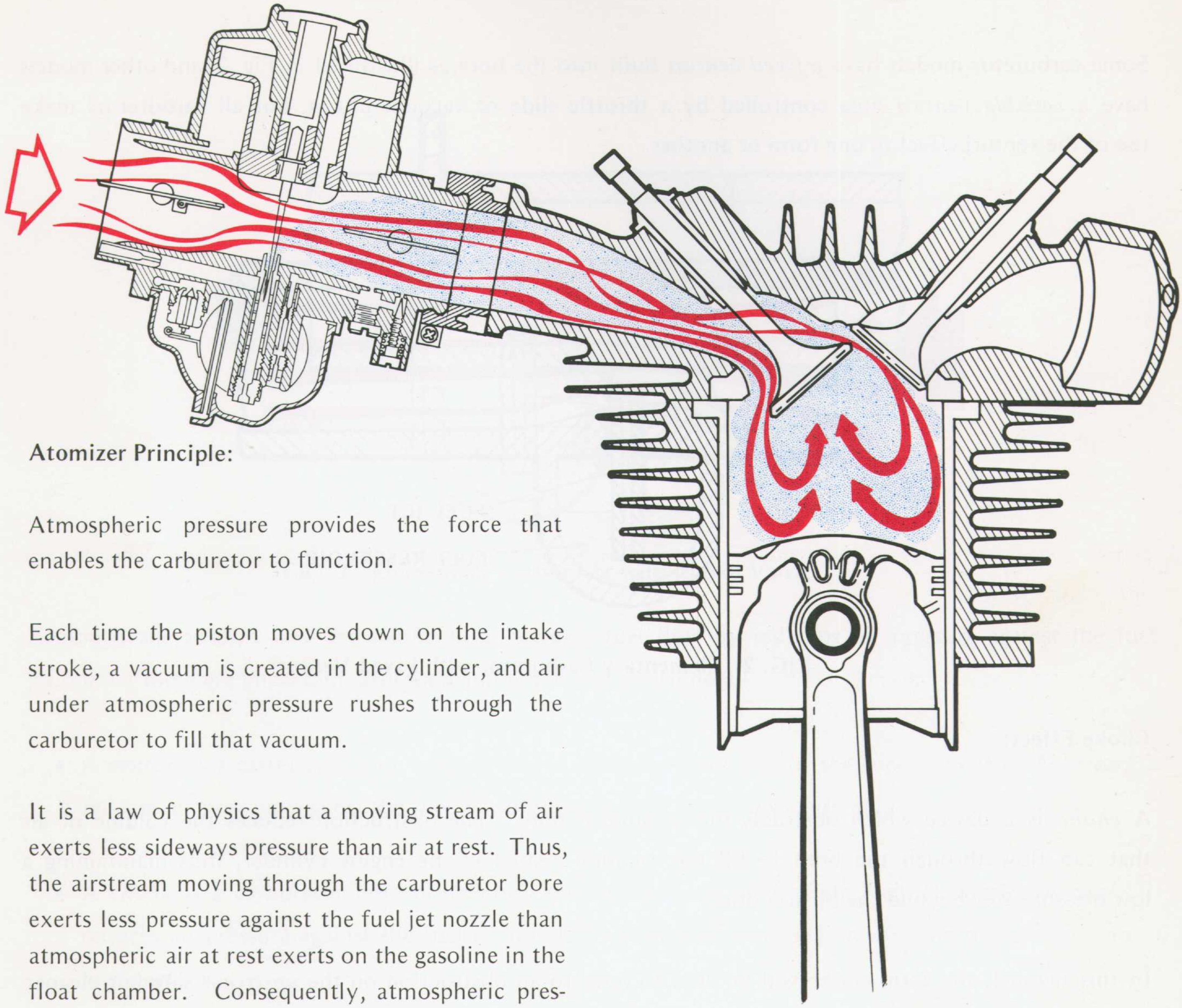

FIG. 1

Atomizer Principle:

Atmospheric pressure provides the force that enables the carburetor to function.

Each time the piston moves down on the intake stroke, a vacuum is created in the cylinder, and air under atmospheric pressure rushes through the carburetor to fill that vacuum.

It is a law of physics that a moving stream of air exerts less sideways pressure than air at rest. Thus, the airstream moving through the carburetor bore exerts less pressure against the fuel jet nozzle than atmospheric air at rest exerts on the gasoline in the float chamber. Consequently, atmospheric pressure forces gasoline up the jet, spraying it into the airstream in the carburetor bore.

A spray gun used in painting, and a perfume atomizer, operate on the same principle.

Venturi Effect:

A *venturi* is a constriction in the carburetor bore in the immediate area of the fuel jet nozzle. This constriction makes the atomizer principle work more effectively. Because the carburetor bore is narrower at the venturi, the volume of air passing through the bore must move faster at this point than at other areas. Increasing the speed of the airstream at the fuel jet nozzle decreases air pressure against the nozzle, causing atmospheric pressure in the fuel reservoir to force more fuel into the carburetor bore.

Some carburetor models have a *fixed venturi* built into the bore as illustrated in Fig. 2, and other models have a *variable venturi* area controlled by a throttle slide or vacuum piston, but all carburetors make use of the venturi effect in one form or another.

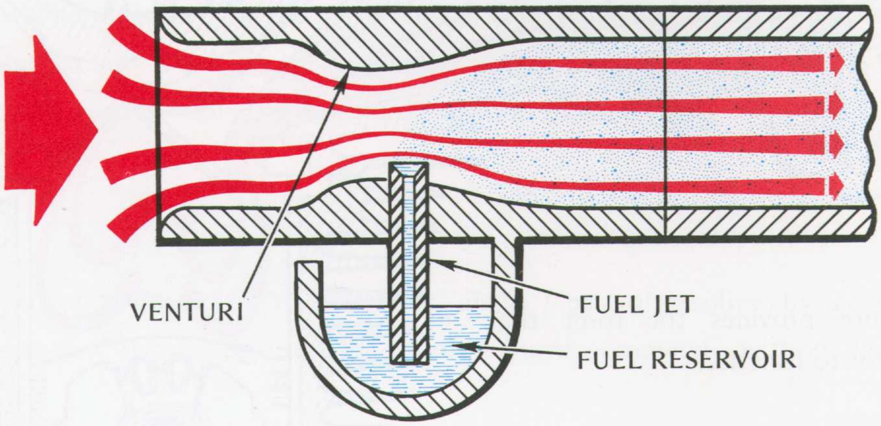

FIG. 2 Elementary Carburetor with Fixed Venturi

Choke Effect:

A *choke* is a device which obstructs the carburetor bore. The obstruction reduces the volume of air that can flow through the bore to fill the vacuum created in the engine cylinder, thus maintaining a low pressure area beyond the obstruction.

In this manual, the term *choke* will be used to refer to an obstruction on the *upstream* side (air cleaner side) of the fuel jet nozzle, as opposed to the term *throttle* which will refer to a *central* or *downstream* obstruction.

Because the choke is located on the upstream side of the fuel jet nozzle, the nozzle is within the low pressure area, causing atmospheric pressure in the fuel reservoir to force more fuel into the carburetor bore.

The most familiar application of a choke is the choke valve used to enrich the cold starting mixture, but the choke effect may also be utilized in other systems of the carburetor; for example, the upstream edge of a slide type throttle valve exerts a choking effect (see Throttle Valve Cutaway, page 17).

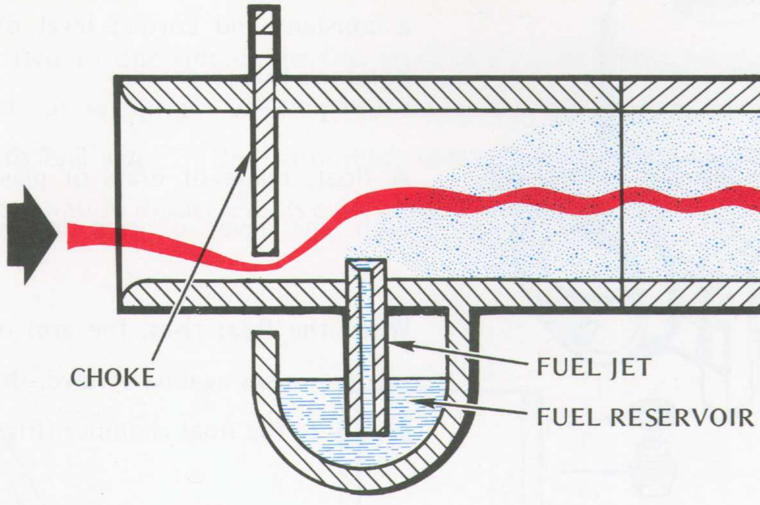

FIG. 3 Elementary Carburetor with Choke Valve

Although the *venturi* and the *choke* both increase fuel flow by reducing air pressure against the fuel jet nozzle, there are important structural and functional differences:

- A *venturi* is a carburetor bore *constriction* in the *immediate area* of the fuel jet nozzle. A *venturi* reduces air pressure against the fuel jet nozzle by locally *increasing airstream velocity*.

- A *choke* is a carburetor bore *obstruction* on the *upstream* side of the fuel jet nozzle. A *choke* reduces air pressure against the fuel jet nozzle by *preventing atmospheric air from filling induction port vacuum*.

The elementary carburetor illustrated in Fig. 2 would be capable of sustaining an engine at a constant high rpm, as long as the operator supplied fuel to the reservoir at the base of the jet. However, such a simplistic design lacks the features needed for control of engine rpm and flexible response to different operating conditions.

For practical operation, the carburetor must have a float system to control the fuel level at the base of the jets (or an alternative system such as the pressure pulse diaphragm), a throttle valve to regulate the volume of air-fuel mixture delivered to the engine, fuel metering systems to suit all operating conditions, and a choke valve or mixture enrichener to facilitate cold starting.