TM 9-1826 C

WAR DEPARTMENT TECHNICAL MANUAL

ORDNANCE MAINTENANCE

CARBURETORS

(ZENITH)

WAR DEPARTMENT *15 MAY 1944*

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TM 9-1826C, Ordnance Maintenance, Carburetors (Zenith), is published for the information and guidance of all concerned.

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(For explanation of symbols, see FM 21-6.)

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ORDNANCE MAINTENANCE—CARBURETORS (ZENITH)

CHAPTER 1

INTRODUCTION

1. SCOPE.

a. The instructions contained in this manual are for the information and guidance of personnel charged with the maintenance and repair of Zenith carburetors. These instructions are supplementary to field and technical manuals prepared for the using arms. This manual does not contain information which is intended primarily for the using arms, since such information is available to ordnance maintenance personnel in 100-series TM's or FM's.

b. This manual contains a description of, and procedure for, disassembly, inspection, repair, and assembly of the following series of Zenith carburetors: 28, 29, 30, 63, 450, IN167SJ, and 1510MV.

c. For carburetor adjustment and replacement, refer to the pertinent operators' manual.

2. MWO AND MAJOR UNIT ASSEMBLY REPLACEMENT RECORD.

a. Description. Every vehicle is supplied with a copy of W.D., A.G.O. Form No. 478, which provides a means of keeping a record of each MWO completed or major unit assembly replaced. This form includes spaces for the vehicle name and U.S.A. registration number, instructions for use, and information pertinent to the work accomplished. It is very important that the form be used as directed, and that it remain with the vehicle until the vehicle is removed from service.

b. Instructions for Use. Personnel performing modifications or major unit assembly replacements must record clearly on the form a description of the work completed, and must initial the form in the columns provided. When each modification is completed, record the date, hours and/or mileage, and MWO number. When major unit assemblies, such as engines, transmissions, transfer cases, are replaced, record the date, hours and/or mileage, and nomenclature of the unit assembly. Minor repairs and minor parts and accessory replacements need not be recorded.

c. Early Modifications. Upon receipt by a third or fourth echelon repair facility of a vehicle for modification or repair, maintenance personnel will record the MWO numbers of modifications applied prior to the date of W.D., A.G.O. Form No. 478.

CHAPTER 2

BASIC PRINCIPLES OF CARBURETION

3. A SCIENTIFIC INSTRUMENT.

a. A carburetor is a scientific instrument designed to mix gasoline and air in proper proportions and to furnish this proportionate mixture to the engine under varying operating conditions. It is essential to recognize clearly that the function of the carburetor cannot extend beyond the proportionate mixing of fuel and air. This knowledge will avoid many false leads in diagnosing so-called "carburetor troubles." Bear in mind that the carburetor only delivers the proper mixture into the manifold.

4. PERFORMANCE EXPECTED OF A CARBURETOR.

a. Varied Fuel-air Mixtures Required. Engines have been highly developed so they will run smoothly at 200 revolutions per minute, run faster than 4,000 revolutions per minute, pull load at 300 revolutions per minute, accelerate strongly and quickly from any speed up to maximum, and do it all with low fuel consumption. Each operating speed requires a fuel-air mixture of different strength.

b. Carburetor Depends on Suction. The carburetor depends entirely on the suction of the engine. Except for idling, the richest mixture is needed when suction is the lowest, and the leanest mixture needed when suction is the highest. These opposing values must be reconciled in the carburetor design.

c. Rich Mixtures for Power. Acceleration, running at maximum speed, and lugging up hills or through sand or mud, requires a relatively rich mixture which must be supplied by the carburetor. Running over level roads with throttle partly open under ordinary conditions, does not require full power, and a lean mixture may be used. Most driving is done under these conditions; if ideal operation is to be obtained, the carburetor must automatically reduce the amount of fuel fed to the engine under this favorable running condition.

d. Air Cleaners. Even though an air cleaner is used, necessarily restricting the amount of air supplied, the carburetor must keep the fuel-air mixture near the proper strength, to avoid dilution of crankcase oil or reduced economy.

e. Angle Operation. The engine must operate not only on the level but on hills and sides of crowned roads. The carburetor must therefore function normally when tipped in various directions and varying distances from horizontal.

5. METERING CHARACTERISTICS (fig. 1).

a. Explanation of Graph. A graphical picture of carburetor mixture requirements is shown in figure 1. Mixture ratios are given in percentage of fuel to air by weight. That is, a 6 percent mixture

denotes 6 parts of fuel to 100 parts of air. The higher the percentage, the richer the mixture.

b. Ideal Mixtures. The mixture ratio is plotted against engine speed. Referring to the graph, it is seen that with wide-open throttle and full load the mixture ratio is about 7 percent, this being almost the leanest mixture that will produce full power. A mixture ratio up to about 8½ percent will produce full power, but will, of course, use considerably more fuel. This ratio holds fairly constant for all speeds except extremely low speed. Imagine a vehicle running at maximum speed on the level with throttle wide open as at the extreme right-hand end of the solid line. It comes to a long hill and with the throttle

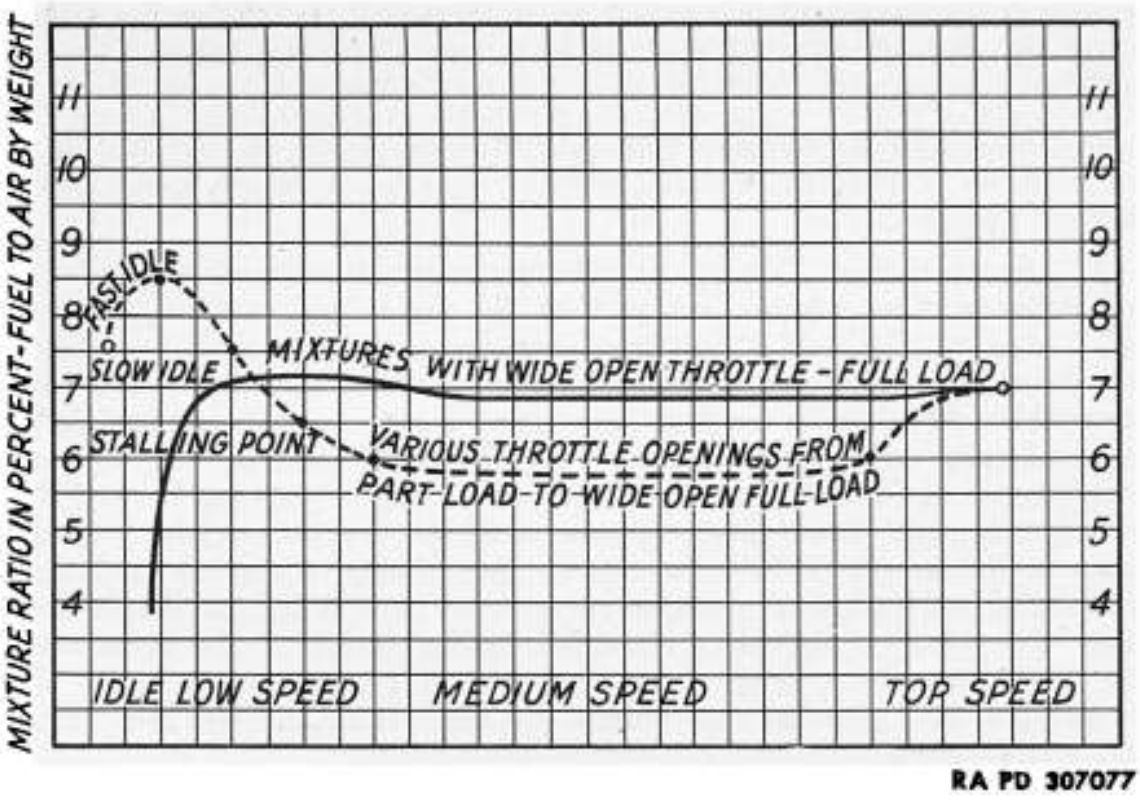

Figure 1—Ideal Metering Characteristics

held wide open the grade resistance pulls down the car speed more and more until it reaches extreme low speed at the left end of the curve where it suddenly drops down to a very lean mixture of less than 5 percent. When it reaches about the 6 percent mixture the engine will stall unless the driver shifts gears. The reason for this is that the suction with low engine speed and wide open throttle drops so low that the slowed-up flow of air will no longer atomize and lift enough fuel to maintain the necessary richness of mixture for power development.

c. Idle Mixture. For idling, the mixture ratio runs from 7½ percent at low idle to 9½ percent at fast idle. Distribution in the manifold is usually poor at idle speeds, so the mixture has to be rich to ensure cylinder getting a rich enough mixture: As the throttle is

slightly opened to a fast idle, the mixture is made richer to "strengthen" the transfer from the idle to the main discharge jet. This avoids a "flat spot" (or a lean, weak condition) at this critical point of operation.

d. Part-throttle Mixture. Now follow the broken line from "fast idle" down to the right and to where it rises and joins the solid line. Imagine a vehicle on a level road idling at about 10 miles per hour, and then slowly open the throttle. The vehicle speed will accelerate to 20, 30, 40 miles per hour, etc. At about 50 the throttle is nearly open and there is nearly a full load on the engine. From about 20 miles per hour, up to 50, the engine was running on a mixture considerably leaner than when it was running with wide-open throttle. At about 30 miles per hour the fuel-air ratio is down to 6 percent, and holds about this value to about 50 miles per hour. These are usual road speeds and with this lean mixture the "miles per gallon" is considerably increased.

e. Full-load Mixture. From 50 miles per hour up the full load requires the 7 percent mixture, without which maximum speed could not be obtained.

f. Acceleration. One of the principal requirements of present-day carburetors is to provide fuel so that the engine will accelerate surely and rapidly. This is a full-load requirement because the engine's accelerative ability is measured by the power it has in reserve over and above that being used to drive it at a given speed. Accordingly, the mixture must be that shown by the solid line, i.e., a full-load mixture of at least 7 percent fuel to air. Imagine driving the vehicle at 20 miles per hour. The mixture is about 6 percent, which is too lean to accelerate. When throttle is opened the mixture must automatically attain the 7 percent value from any point on the broken line. Therefore, a means is provided in the design of the carburetor to automatically change from the lean 6 percent mixture to the richer one of 7 percent the instant the carburetor throttle is opened; otherwise, the engine will not respond instantly.

6. SUMMARY.

a. In summarizing, the fact is that the carburetor has a real job to perform properly, and often under quite difficult conditions.

(1) It must measure proper mixtures and amounts for maximum power with wide-open throttle, as in the case of high speed on level roads, low speed pulling up hill, etc., or acceleration from low or medium speeds. It must supply a richer mixture for slow idle, and a leaner mixture for part-throttle operation.

(2) It must operate on the level or on hills.

(3) It must ensure easy starting and good operation when cold.

(4) It must operate properly when hot.

(5) It must overcome air cleaner restrictions.

(6) It must stay put under vibration and jars of rough road travel.