THE MASTER TECHNICIAN'S

SERVICE REFERENCE BOOK

SESSION NO.

63-7

CARBURETION AND PERFORMANCE DIAGNOSIS

MASTER TECHNICIANS SERVICE CONFERENCE
PREPARED BY CHRYSLER CORPORATION
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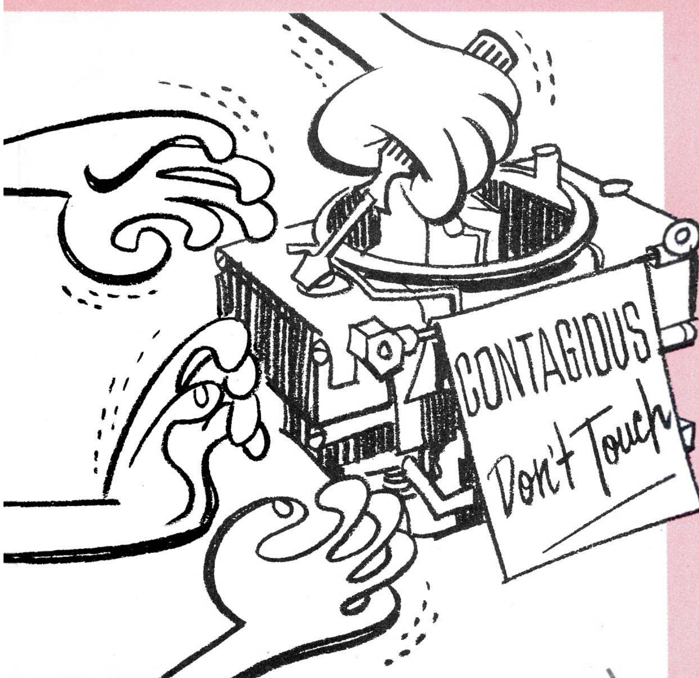
Tech comments on carburetoritis!

It seems to me that more starting and performance troubles are blamed on the carburetor than on any other part of the engine. Maybe that's because the carburetor, or at least the carburetor air cleaner, is the first thing an owner sees when he looks under the hood of his car. Whatever the reason, far too many owners, and a few mechanics, seem to get "CARBURETORITIS" every time an engine acts up. Since carburetors can't talk, we'll probably never know how many have been unjustly subjected to the ordeal of major repair or replaced without benefit of intelligent diagnosis!



Now I'll admit that locating the cause of some starting and engine performance troubles isn't the easiest job in the world. Many engine-starting and performance complaints are downright tricky to track down. That's because some ignition troubles have the nasty habit of acting like carburetion problems and some carburetion problems very much like ignition troubles. To complicate things, some purely mechanical conditions in the engine itself cause performance symptoms which are easily mistaken for carburetion or ignition.

This reference book is mostly about carburetion but it also has a lot of common-sense ideas that should help all of you do a better job of telling when to suspect the carburetor and when to keep "HANDS OFF". This isn't a nuts-and-bolts book full of carburetor repair details . . . you'll find that information in the Service Manual. It *is* a think-about-it book and thinking is the secret of sound diagnosis!

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INTRODUCTION

Diagnosis is basically a process of locating the cause of trouble by a process of elimination. Unfortunately, this doesn't mean the same thing to all people.

THE PARTS CHANGER

For instance, there is the *parts changer* approach . . . simply replace parts until the trouble is corrected. In a sense, this is a process of elimination but it isn't very scientific and is apt to be mighty costly and unsatisfactory to the customer.

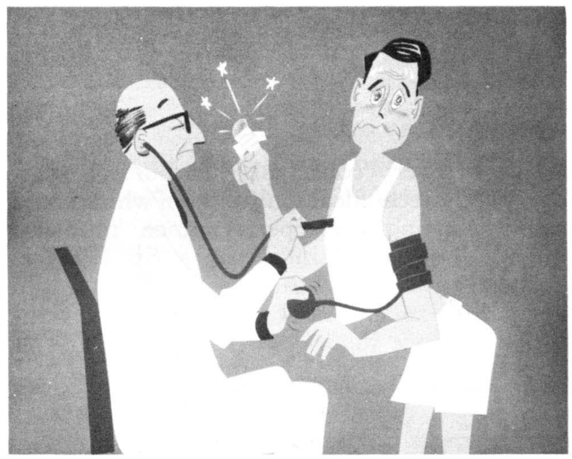
To make matters worse, parts replacement doesn't always eliminate all of the basic causes of trouble. For example, it is sometimes easy to improve performance by changing parts without actually correcting all the contributing causes. This is an open invitation to a comeback.

THE CASE FOR TESTING

Tests and inspections are a mighty important part of diagnosis. Tests will often turn up marginal conditions contributing to performance problems as well as major conditions. A thorough job of testing and inspection is good insurance against comebacks because you have a better chance of finding *all* of the out-of-line conditions . . . not just the most obvious ones.

THE UNTHINKING TESTER

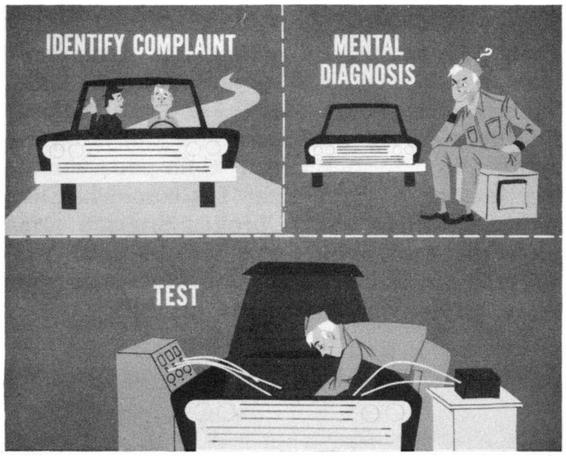
Tests are mighty important but they don't take the place of *thinking* and *common sense*. Testing everything under the hood . . . without first defining the complaint and analyzing the symptoms is more scientific than parts changing but not very practical. It's somewhat like giving a patient with a broken finger a complete physical before you set the bone and apply the splint. He may not appreciate your thoroughness when he gets his bill!



ROAD-TEST—THINK—TEST

Figuring out what to test first is one of the most important steps in troubleshooting. On a performance complaint, a road test is usually the first and often the most valuable test of all. You'd be surprised how much time and trouble you can save yourself by identifying the complaint and then checking out the most likely causes in a logical order.

Be sure and identify the condition the owner is complaining about. If possible, take him with you when you road-test. Next, use some mental diagnosis to figure out what could cause that specific kind of trouble. Then, test or check out *all* possible causes in logical order. Of course, you can save yourself a lot of time and trouble by testing and checking the easiest things first. Generally, that means checking out the things that can be inspected or tested without time-consuming disassembly . . . eliminating potential trouble spots that are right under your nose.



ELIMINATION BY MENTAL DIAGNOSIS

A list of every conceivable carburetor, electrical and mechanical malfunction which could cause starting and performance problems might fill several printed pages. So, it is important to identify the complaint and pin down the exact kind of operating conditions which produce the complaint.

In trying to pin down the operating conditions producing a specific complaint, take into consideration weather and temperature, engine temperature, engine speed, engine load and throttle opening. Now that sounds like a pretty big order, but don't let it throw you. A little mental diagnosis will usually help you decide which conditions produce or aggravate the condition the owner is complaining about. Ask yourself questions like these:

Is it a hot- or cold-weather problem?

Is it mostly a damp-weather problem?

Is it a cold- or a warm-engine problem?

Is the problem confined to one speed range?

Is the problem related to the load on the engine?

Is the problem related to throttle opening?

If the answers to only one or two of the above questions is "YES", you will have greatly reduced the *possible* causes of trouble.

The remaining sections of this book are arranged according to general types of starting and performance problems that are most apt to occur under certain operating conditions. After you have done some preliminary testing and a little mental diagnosis, you shouldn't have any trouble deciding which section of the book to refer to for further diagnosis and service help.

COLD-START AND WARM-UP PROBLEMS

COLD-ENGINE STARTING TROUBLES

Suppose an owner's *only* complaint is hard starting or failure to start when the engine is cold. By the time the car is brought into the service department, most of the clues are apt to be gone.

If you have a chance to talk to the owner or can find out from the man on the service truck about the conditions under which the car wouldn't start, your job won't be quite so hard. On the other hand, a Repair Order that simply says, "Won't Start", isn't much help. In a case like this, the best you can do is start looking for clues to the cause of trouble in the most likely places.

IT COULD BE ELECTRICAL TROUBLE

Slow cranking and reduced ignition voltage is probably one of the most common causes of hard starting, particularly in cold weather. So, test the battery and cranking voltage. If the battery is low, there's no point in disturbing the carburetor until the battery condition is corrected. If cranking voltage is low, it is probably electrical or ignition trouble rather than carburetion.

ENGINE OIL VISCOSITY

Just a word of caution: don't overlook the importance of engine oil viscosity in very cold weather. This was covered in detail in Session No. 63-5 so we won't cover details of oil viscosity here. However, one of the best ways to reduce cold-weather starting problems is to recommend oil viscosity based on the LOWEST TEMPERATURE ANTICIPATED, rather than the average or highest temperature expected.

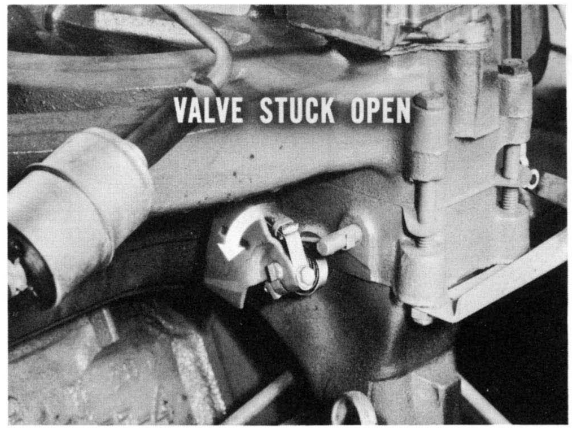
Of course, if cranking voltage, cranking speed and ignition are okay, the hard-starting problem is probably in the choke. But remember, these choke problems are apt to cause cold-engine performance problems, as well as starting troubles.

COLD-ENGINE PERFORMANCE PROBLEMS

Sluggish, cold-engine performance, and perhaps frequent stalling until the engine is completely warmed up, is most apt to be caused by fast-idle and choke system trouble. It isn't very likely that the trouble is electrical if performance smooths out as soon as the engine warms up. A possible exception is a case where the starting and cold-engine performance problems occur *only* in damp weather. This, of course, indicates ignition trouble caused by condensation in critical areas of the ignition system.

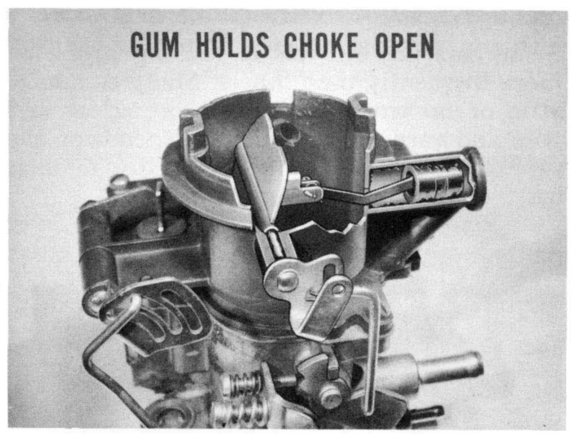
IT COULD BE MANIFOLD HEAT CONTROL VALVE

Before you jump to the conclusion that sluggish, cold-engine performance is in the choke and fast-idle system, take a minute to check the manifold heat control valve. If it's stuck in the open, cold-engine performance will be unsatisfactory and the tendency for carburetor icing and stalling will be greatly increased.



COMMON CAUSES OF CHOKE TROUBLE

When a hot engine is shut off, fuel vapors from the fuel bowl find their way into the choke piston cylinder and choke shaft bearing areas. These vapors deposit gum and varnish on the choke piston, in the cylinder and in the choke shaft bearings. Accumulations of these deposits hold the choke open even though the choke rod is trying to close the choke valve.

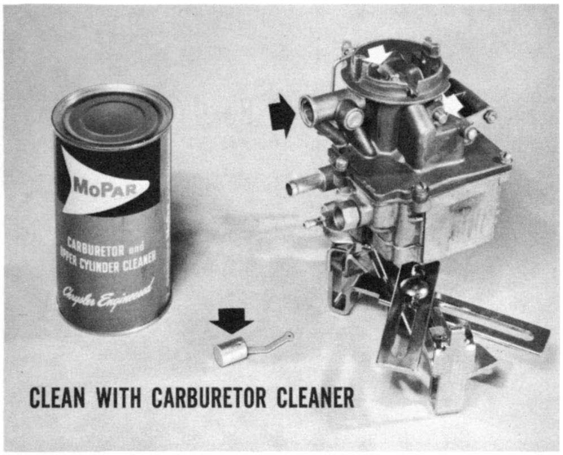


HOT GUM AND VARNISH ARE TRICKY

Don't be fooled by a choke piston that doesn't stick when the carburetor is warm. The gum and varnish deposits are not very sticky when they are warm, but they stick like glue when they are cold and stiff.

CLEAN THE PISTON, CYLINDER AND SHAFT BEARINGS

On every carburetor job, remove the choke



CLEAN WITH CARBURETOR CLEANER

piston and clean both the piston and the cylinder with carburetor cleaner. Also soak the air horn in carburetor cleaner to loosen and remove deposits from the choke shaft bearing areas. The importance of cleaning deposits from the choke shaft bearings is frequently overlooked. Current production carburetors have been modified to reduce the shaft bearing area and minimize choke shaft sticking.

PREVENTIVE SERVICE HELPS CHOKE OPERATION

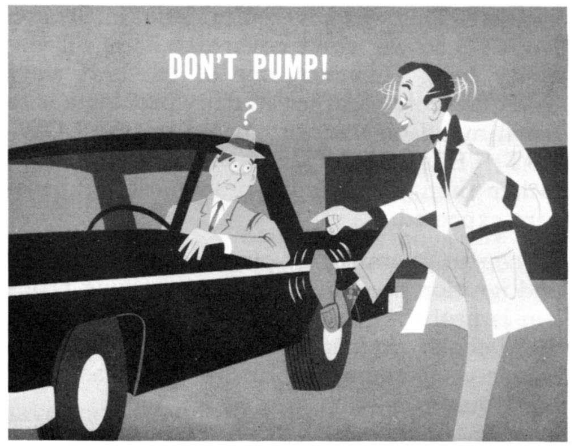
Some cars get into choke-sticking problems more frequently than others. Many cars have little or no trouble on this score. How fast gum and varnish accumulates depends on the type of fuel used, the type of driving and weather and temperature conditions.

FREQUENT PREVENTIVE SERVICE WILL PREVENT DEPOSITS

A treatment of carburetor cleaner at least every six months will greatly retard the accumulation of deposits. In some cases, it's a good idea to administer this preventive service every two months . . . when the engine oil is changed. You don't have to disassemble the carburetor . . . just use a small squirt can to get cleaner into the critical areas.

FIX THE OWNER, TOO

When an owner starts to have choke-sticking troubles, he is apt to get into the habit of pumping the accelerator to get his car started. If, after having the choke fixed, he continues this practice, he'll frequently wind up with a flooded engine and starting problems.

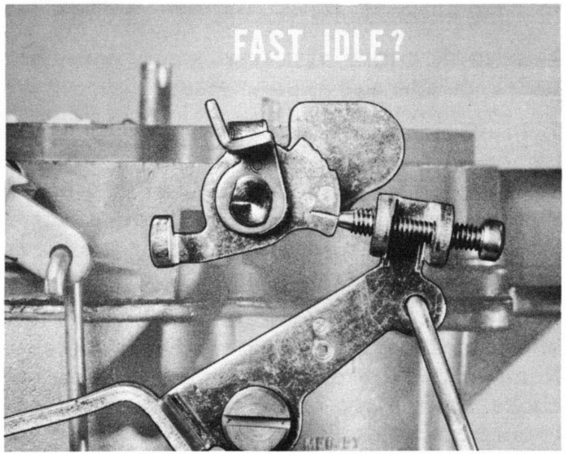


It is a good idea to tell owners who have had choke problems not to pump the accelerator. It's also a good idea to make sure owners understand how to floorboard the accelerator to unload a flooded engine. Very often, on starting complaints, the owner's habits need overhauling!

FAST-IDLE IS ALSO IMPORTANT

In connection with cold-engine starting and performance complaints, don't overlook the importance of making sure the fast-idle is properly adjusted and the linkage is free. If the fast-idle is slower than specified, frequent stalling in cold weather is quite likely.

Since the choke and the fast-idle cam action are inter-related, make sure that all of the linkages controlling them are working freely. If in doubt, disconnect the choke rod from the choke valve shaft and test choke and fast-idle linkages separately. Binding in the fast-idle



linkage will affect choke operation and vice versa.

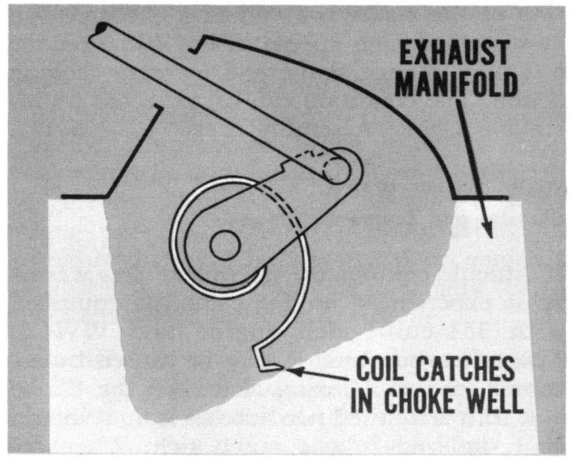
CHOKE COIL STICKING—Plymouth-Dodge "Six"

Some cases of difficult cold-engine starting have been found to be caused by interference at the choke coil. If hard starting, stumbling and repeated stalling after starting is experienced on models equipped with the Stromberg WA 3 carburetor, it may be due to interference between the choke coil and the wall of the choke well. The interference is caused by the end of the coil catching on the lower surface of the choke well.

TEST FOR CHOKE STICKING

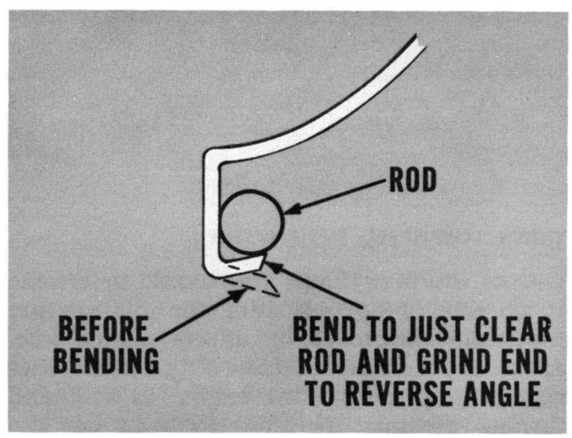
To check for this condition, allow the engine to cool down for about two hours. This waiting time can be reduced by allowing the engine to cool down for about 30 minutes, then blowing compressed air against the choke well to cool it down to 90° or lower. Open the throttle. If the valve closes even part way, the coil is not sticking. However, if the valve stays open, but can be moved easily by hand, the choke coil is probably catching in the choke well. A further indication of this condition is a "twanging" noise when the choke housing attaching screws are loosened.

Choke units displaying this difficulty should be replaced with new units, Part No. 2463271. The trouble described will not occur on units identified by the number "53" and a yellow dot of paint or later chokes identified by the number "57".



EMERGENCY CHOKE FIX

In an emergency, a sticking choke coil can be modified. Note the index mark on the disc. File it deeper, if necessary to make it more visible. Next, loosen the coil-adjusting locknut and rotate the coil so the free end hangs down. Bend the hooked end of the coil inward as far as possible without having the bent end contact the choke rod. Grind the tip to provide a chamfer in the opposite direction. Finally, turn the index disc until the notch is opposite the "2" notch-rich mark and tighten the locknut.



RICH MIXTURE DURING WARM-UP—Dodge and Plymouth Models

Some cases of extreme fuel mixture richness during engine warm-up have been reported on models equipped with BBD, 2-barrel carburetors. This difficulty is caused by distortion of the choke coil. When a car is driven at sustained high speeds in hot climates, the coil may change shape and *increase* choking action. The condition can be corrected by installing Choke Assembly, Part No. 2463159.

SLOW ENGINE WARM-UP— Chrysler and Dodge 880 Models

If difficult, cold-engine starting or slow warm-up is experienced on these models equipped with 361-cubic-inch engine and WWC3, 2-barrel carburetors, it may be caused by incorrect choke indexing. Remove the choke unit. If it is indexed *two* notches lean, it should be re-indexed to *one* notch rich. When re-installing the choke, make sure the rod does not interfere with the hole in the choke housing when the choke is opened and closed. If interference is encountered, reposition the housing in the choke well.

BINDING IN CHOKE ASSEMBLY— Dodge, Chrysler and Imperial Models

If insufficient choking action, excessive choking or slow engine warm-up is encountered on these models equipped with AFB, 4-barrel carburetors, it may be due to binding caused by an improperly formed angle at the lower end of the choke connector rod.

To check for this condition, the engine must be warmed up. Disconnect the choke rod clip. Remove the choke rod from the arm on the choke shaft. Any binding or resistance encountered indicates improper rod alignment. To correct, bend the lower end of the rod to *exactly* 90 degrees. Reassemble the choke and make sure all parts move freely.

DO NOT LUBRICATE.

IDLE- AND LOW-SPEED PERFORMANCE

The first thing you usually think of in connection with rough idle and poor light-throttle low-speed performance is the carburetor low-speed system. If the trouble is confined to these operating ranges, it's logical to question carburetion. However, there are several ignition and mechanical conditions that are just as apt to cause the same kind of performance problems. Don't overlook them . . . particularly the ones which are easy to check.

QUICK LOW-SPEED SYSTEM TEST

One of the first things you should determine is whether or not adjusting the idle mixture materially improves or affects engine idle. If turning the mixture screw out a bit increases richness and causes the engine to roll, and turning the mixture screw in leans out the mixture until the idle is even rougher, the low-speed system *isn't restricted*. If this is the case, there are some other things to check before getting deeper into the carburetor.

CRANKCASE VENT VALVE

The carburetors on all models equipped with closed-crankcase ventilation are calibrated to match the controlled vacuum bleed provided by the crankcase vent valve. If the crankcase vent valve is stuck closed and the orifice in the valve is plugged, the idle mixture will be too rich and cause rough engine idle. If the vent valve is stuck in the open position, the idle mixture will be too lean for smooth idle and good low-speed performance. Check these possibilities on rough engine idle complaints.

IGNITION TIMING AND SPARK PLUGS

Ignition timing has an important bearing on engine-idle performance. It pays to make sure timing is right, since this operation takes only a few minutes. Just make sure you disconnect and plug the vacuum advance line before you take your readings. If the vacuum line isn't disconnected, you may get some vacuum advance at idle speeds and a false timing indication. If you fail to plug the disconnected vacuum line, engine idle will be extremely rough . . . on some models the engine may not even run at idle speeds.

Don't overlook the effect of narrow spark plug gaps on engine idle. Narrow gaps may not noticeably affect performance at road speeds but they will seriously affect idle and low-speed performance. What's more, they are subject to fouling and can contribute to reduced fuel economy.

TEST COMPRESSION

If you don't find any clues to the cause of rough idle in the ignition system or idle mixture adjustment, it's a good idea to test the compression of all cylinders. This is particularly logical if you have pulled the spark plugs to check their condition and gaps. Since low compression on one or more cylinders affects engine smoothness a lot more at idle speed than it does at road speeds, rough engine idle may be a clue to valve or other compression troubles. For example, incorrect tappet adjustment can cause rough engine idle.

IDLE MIXTURE AND IDLE SPEED

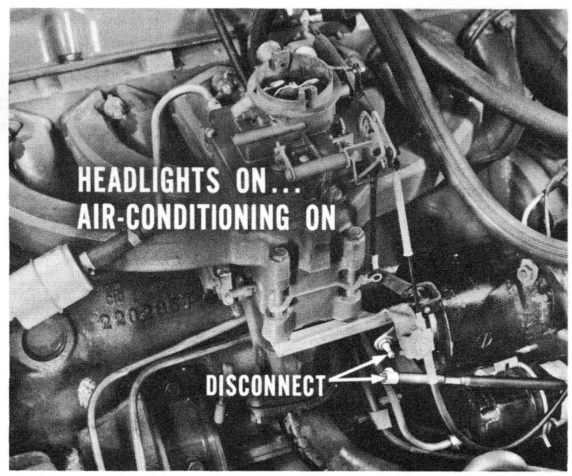
Care in adjusting idle to specified speed and care in adjusting the idle mixture is most important to smooth engine idle and good light-throttle performance. More than one tune-up or carburetor job has bounced because the technician didn't take time to do the job right. Many technicians have their own pet ways of going about adjusting idle speed and mixture. If you have one that is 100% foolproof, keep up the good work.

If not, maybe the following suggestions will help you do the best possible job in the shortest possible time.

IDLE MIXTURE AND SPEED ADJUSTMENT PREPARATION

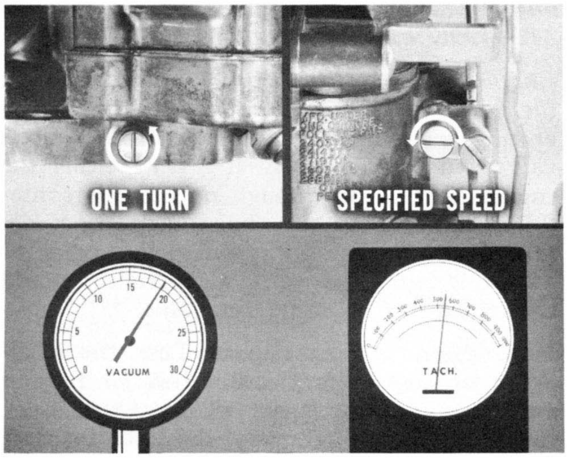
Engine fully warmed up: Make certain that the engine is fully warmed up to normal operating temperature. When it is, the choke valve will be wide open. If it isn't, either the engine isn't warm enough or there is something wrong with the choke. Adjusting idle mixture on a partially warmed up engine or adjusting mixture with a partially closed choke is a sure shortcut to trouble.

Normal load on the engine: Turn the headlights on high beam and if the car has air conditioning, turn it on full blast and open the car windows. You want the full alternator and compressor load on the engine when you adjust idle speed and mixture. On TorqueFlite jobs, disconnect the throttle linkage to eliminate interference with the transmission throttle valve linkage.

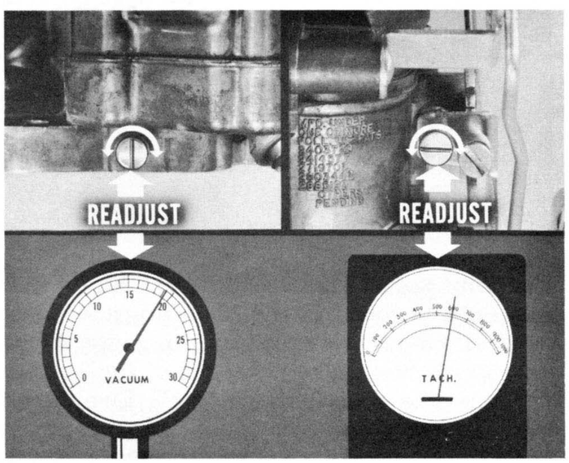


Vacuum gauge and tachometer: Since high manifold vacuum is the best indication of a good idle mixture, use a vacuum gauge. Don't trust your ears to tell you when the exhaust "sounds like the right mixture". Don't trust your eyes or your sense of touch to accurately detect engine smoothness. The correct idle mixture at specified idle speed is most important. Don't guess at idle speed . . . use a reliable tachometer.

Establish a starting point: Back out the idle mixture screw about one full turn. Adjust the idle-speed screw to obtain specified engine idle speed.



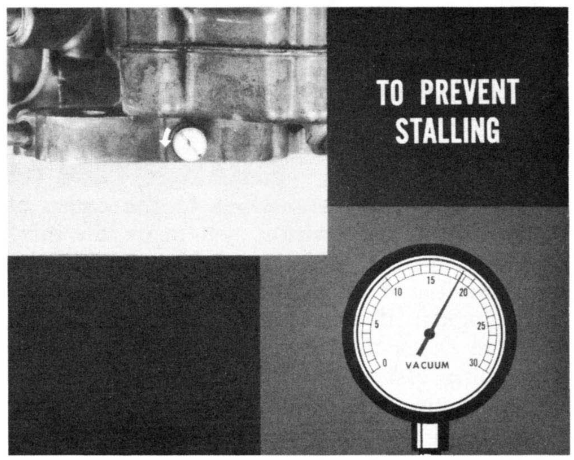
Balance mixture and speed: Adjust the idle mixture screw slowly in or out to get the highest possible *steady* vacuum reading. Normally, this will improve the idle mixture and increase the engine idle speed. So, readjust idle to the specified speed. This will move the throttle valve into the correct relationship with respect to the idle and vacuum advance ports. This step is very important because the calibration of the engine low-speed system is dependent upon throttle valve location with respect to these ports.



Readjust mixture and speed: Very carefully readjust mixture until you again get the highest, steady vacuum reading. If idle speed increases again, readjust it.

Too-lean idle mixture: The highest steady vacuum reading indicates a relatively lean mixture. However, there is no way of telling exactly how lean the mixture is unless you have an exhaust analyzer. If the mixture happens to be right on the borderline of "too lean," the engine may stall now and then, and low speed light-throttle performance may be adversely affected. Here's how to avoid this.

Right for the road: Carefully back out the mixture screw a fraction of a turn. Keep a sharp eye on the vacuum gauge. When the vacuum drops *slightly,* the mixture will be just rich enough to prevent stalling and will also insure good light-throttle performance. If you do this step carefully, you will not have materially reduced the air-fuel mixture ratio; you will simply avoid turning out a tune-up job with a too-lean idle mixture.



IDLE-MIXTURE AND SPEED ADJUSTMENTS— TWO- AND FOUR-BARREL CARBURETORS

The single-barrel carburetor adjustment instructions and precautions apply to two- and four-barrel carburetors. The engine must be fully warmed up and choke open. Use a tachometer and a vacuum gauge. The use of a vacuum gauge is, if possible, even more important on multi-barrel carburetors. Open both mixture screws one full turn and adjust idle to specified speed.

Balance both mixture screws and speed: On two- and four-barrel carburetors, adjust first one and then the other mixture screw. In other words, alternately adjust the mixture screws a fraction of a turn at a time until you obtain the highest steady vacuum reading. Readjust idle to specified speed if adjusting

mixture changes the speed. Always go back and readjust the idle mixture after readjusting idle speed to see if you can get a still higher, steady vacuum reading.

Important adjustment tip: If you have to open or close one mixture screw a lot more than the other to get the best vacuum reading, something's wrong in the low-speed system. Remove the idle-mixture screws and examine them to make sure they are not ridged or otherwise damaged. If you have to open one or both screws an abnormal amount, one of the idle ports or passages may be restricted.

Final idle-mixture adjustment: Turn both idle-mixture screws out a bit and the same amount. As in the case of the single-barrel carburetor, this will increase the richness of the mixture slightly to improve light-throttle performance and prevent stalling. Keep your eye on the vacuum gauge. A very slight drop in vacuum tells you the mixture is just right.

CARBURETOR THROTTLE CONTROL ALIGNMENT

Occasionally, an otherwise good carburetor job is ruined because of damage to the throttle valves. Earlier we pointed out how important it is that throttle valves be positioned exactly right with respect to vacuum and idle ports. Always put the carburetor throttle body on a repair stand to avoid damaging the valves.

CHECK THROTTLE VALVE ALIGNMENT

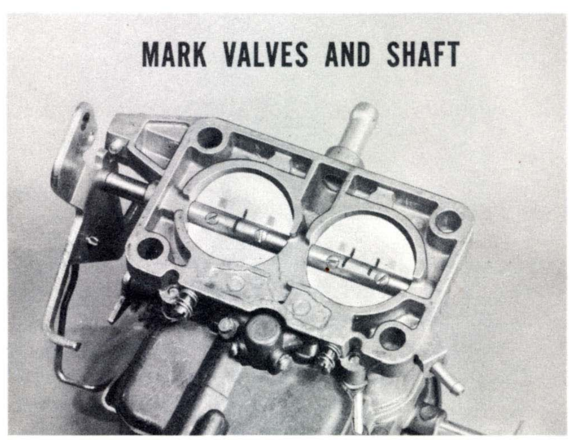
On every carburetor job that requires carburetor removal, check throttle valve alignment. If you have an unexplained low-speed, light-throttle performance problem or have trouble obtaining smooth engine idle, check throttle valve condition and alignment.

Throttle valve alignment inspection: Back off the idle-speed screw so that you can hold the throttle valve in a completely closed position. Hold the carburetor up to the light. The clearance between the carburetor bore and the edge of the throttle valve should be uniform. If appreciably more light shows past one side of the valve than the other, or if no light shows at one side and there is a wide band of light on the other, the valve is misaligned. Also, check this possibility: make sure that carbon deposits in the bore, particularly at the idle ports, aren't interfering with the fuel flow from the idle ports.

To realign a throttle valve: Loosen the throttle valve attaching screws. Be very careful not to break the screws off in the throttle shaft. Hold the valve closed with your fingers and tap it slightly to center it in the bore. Hold the valve in position and tighten the screws.

TWO- AND FOUR-BARREL CARBURETOR THROTTLE VALVES

If you have to remove throttle valves or a throttle valve shaft, mark the valve to show its position on the shaft. This is important on all carburetors but most important on two- and four-barrel carburetors. That's because it's easy to get the valves in the wrong bores on these multi-barrel carburetors. If you install the valves in the wrong bore, upside-down or reversed 180°, you'll upset the calibration of the low-speed system.

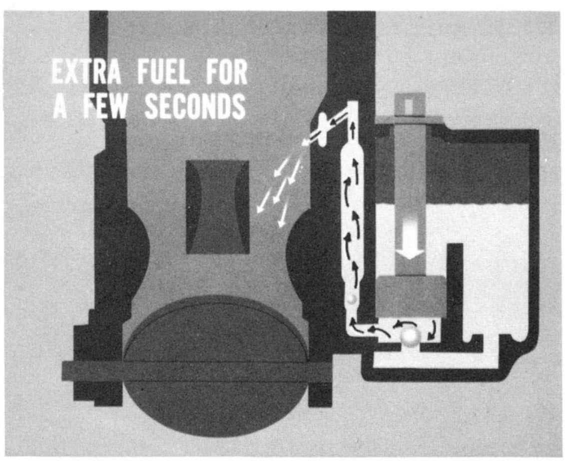


FOUR-BARREL SECONDARY VALVES

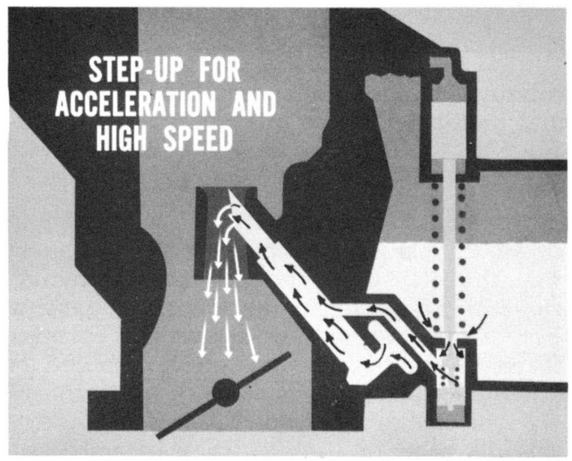
On four-barrel carburetors it's important to inspect the secondary throttle valves, too. If the secondary valves are misaligned or improperly adjusted, excessive air flow past these valves will lean out the mixture and cause rough engine idle. The engine may stall or not run at all at specified idle speed. Excessive air-bleed will also affect light throttle adversely.

ACCELERATION AND POWER PERFORMANCE

It is important to understand the difference between the purpose of the accelerator pump system and the purpose of the step-up system when troubleshooting an acceleration stumble. The only purpose of the accelerator pump system is to feed the engine extra fuel for a few seconds when the driver steps on the gas. This is a mechanically controlled, one-shot richening of the mixture. The step-up system, on the other hand, is controlled by engine vacuum. It supplies extra fuel through the main metering system for good acceleration and high-speed performance. It increases the richness of the mixture for extra power when manifold vacuum is low.



Momentary stumble: If you get a momentary stumble on acceleration from any speed when you step on the gas, the trouble is probably in the accelerator pump. If the engine picks up the load and accelerates normally after that first momentary hesitation, the step-up system is probably okay.



Sustained stumble or hesitation: If you get full power when you step on the gas but performance fizzles out as soon as the engine has used up the extra shot of fuel from the accelerator pump, the trouble is probably in the step-up system. Don't confuse this trouble with inadequate fuel supply which is covered a bit later.

Quick accelerator pump test: Remove the air cleaner and open the throttle quickly by hand. A solid, continuous stream of fuel will be discharged into the air horn if everything is okay. On a two- or four-barrel carburetor, be sure to check for equal discharge in both barrels.

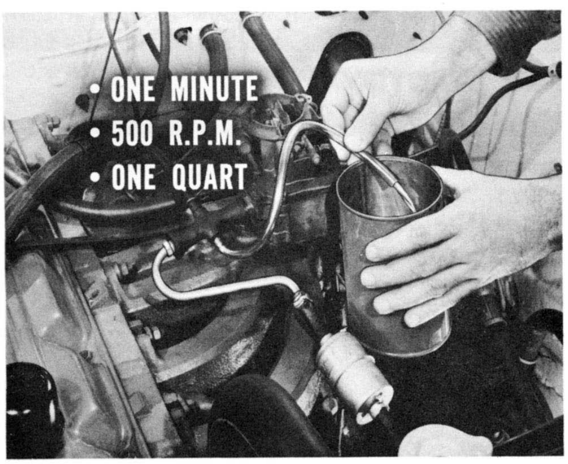
Slow-throttle opening stumble: Details on servicing the accelerator pump system are covered for each model carburetor in the appropriate Service Manual. However, here is a tip that may come in handy. If there is no noticeable stumble when the accelerator is depressed rapidly, but some hesitation when the throttle is opened somewhat slower, check the accelerator pump plunger. Even though the plunger leather may appear to be in excellent condition, it may leak on slow-throttle opening because the plunger lip does not seat firmly and seal against fuel leakage. Flaring the leather cup to increase lip pressure against the accelerator pump cylinder wall will usually correct this condition. Keep this in mind when installing a new pump plunger.

FUEL SUPPLY PROBLEMS

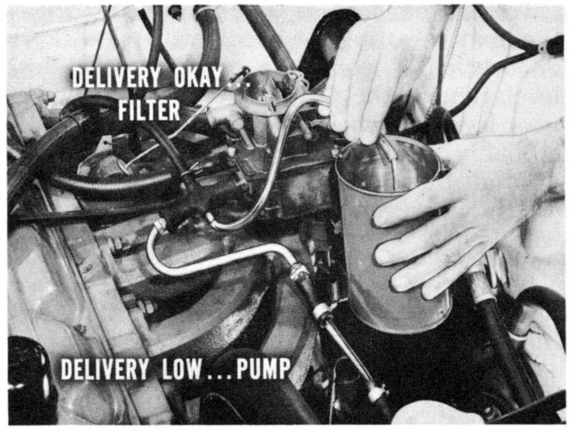
If the car acts like it is running out of gas at full throttle and at higher speeds, the *carburetor* may be running out of fuel. More than one carburetor has been overhauled unnecessarily when the trouble was in the fuel filter or the fuel pump. You probably know how to check out a fuel pump . . . the details are in the Service Manual. However, it is important to check both the pump and the filter. Here's the best way we know to kill two birds with one stone.

FUEL PUMP AND FILTER TESTS

Measure the amount of fuel delivered through the filter in one minute while the engine is idling at 500 r.p.m. The pump should deliver one quart.



If fuel delivery through the filter is less than one quart in one minute, repeat the test without the filter in the line. If fuel delivery is okay, the trouble was in the filter. If fuel delivery is still low, the fuel pump, the fuel lines or possibly a restriction at the tank inlet is causing the trouble. The fuel pump pressure



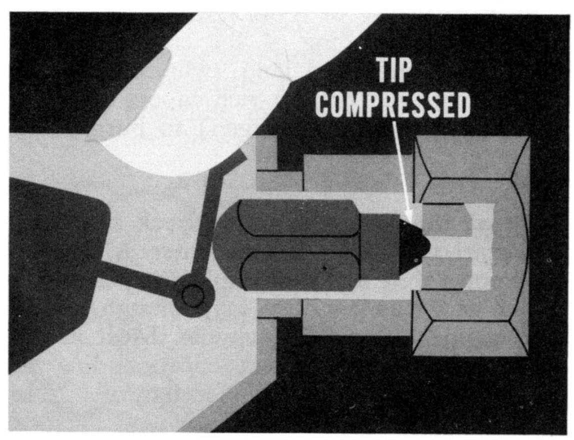
and vacuum tests described in the Service Manual will help you determine the exact location and nature of the trouble.

LOW FLOAT LEVEL

A low float level is a common cause of stumble on acceleration and can contribute to other performance problems. The following tips on float adjustment will help you correct float problems as well as help you avoid building in trouble when you overhaul a carburetor.

FLOAT-LEVEL ADJUSTMENT

The synthetic tip of the float needle is easily compressed. That's one reason why this type needle is far less prone to leaking or premature wear. However, if you compress the tip of the float needle when checking or adjusting the float, you'll get a false float-level setting. When the tip regains its normal shape, the fuel level will be *too low*.



Invert the air horn so that only the weight of the float is seating the needle when you check float level. If you have to adjust the float level, remove the float. If you try to bend the float level tab when the float is in place, you'll probably compress the needle tip. After the job's all buttoned up and ready for delivery, the tip will regain its shape and the float level will be low.

OTHER CAUSES OF POOR ACCELERATION AND POOR FULL-THROTTLE PERFORMANCE

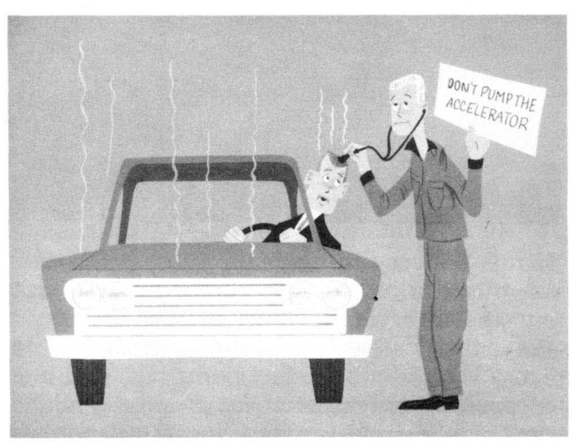
As was pointed out earlier, trying to list all of the factors or combination of factors that might cause performance problems would be quite an undertaking. Since this book deals primarily with carburetion troubles . . . their diagnosis and correction . . . we won't attempt to cover all of the possible causes of poor performance. The best we can do is bring to your attention some of the more common ones related to carburetion.

Ignition problems: High-speed performance problems caused by ignition troubles are sometimes particularly difficult to locate and correct. Perhaps the most important thing to remember when trying to locate the cause of high-speed ignition problems, is the extremely short period of time available to develop high secondary voltage. The ignition points are closed for only an instant. In this brief interval the ignition-coil field must build up, collapse and distribute the secondary voltage to the spark plugs. Wide ignition point spacing, low point tension, resistance in the ignition primary circuit, incorrect ignition timing, sticking or incorrect vacuum or centrifugal advance, wide spark plug gaps, or high resistance in the secondary circuit are all possible causes of high-speed performance troubles.

Mechanical troubles: One easily overlooked mechanical-type trouble is closely related to carburetion. If the manifold heat control valve is stuck in the closed position, it directs too much heat to the carburetor and intake manifold. This can seriously affect the air-fuel ratio and cause serious performance problems . . . particularly in warm or hot weather. This seems fairly obvious, but it is something that is all too frequently overlooked. Also, in the mechanical category, sticking valves, weak valve springs and even poor coolant circulation, resulting in overheating, are possibilities.

DELAYED HOT-ENGINE STARTING

The basic cause of most hot-engine starting problems is flooding of the engine. Specifically, the manifold and cylinders become loaded with fuel or over-rich vapors that don't contain enough air (oxygen) to burn.



MAKE SURE IT'S NOT THE OWNER

One of the first things to check into on a hot-start complaint is the owner. Make sure he knows that he should hold the accelerator down as far as it will go long enough to clear the engine of over-rich vapors. Most important, make sure he isn't compounding the problem by pumping the accelerator . . . intentionally or otherwise.

BOWL VENT AND ACCELERATOR PUMP STROKE

Make sure the external bowl vent is working and properly adjusted. While you are at it, check to make certain someone hasn't set the accelerator pump for its longest stroke. On some carburetors, the pump stroke and bowl vent adjustments are made at the same time. On other carburetors these two adjustments must be made separately. Be sure and check the manual for adjustment details on the carburetor you're working on.

CHECK THAT FLOAT LEVEL!

A float level that is too high will seriously aggravate hot-start problems. And of course, a high-float level doesn't help fuel economy either! To minimize hot-starting problems, you can reduce the float level $\frac{1}{32}$-inch below specifications.Don't lower the float any more than that or you'll bring on engine stumble and acceleration problems.

THE FLOAT VALVE NEEDLE, TOO!

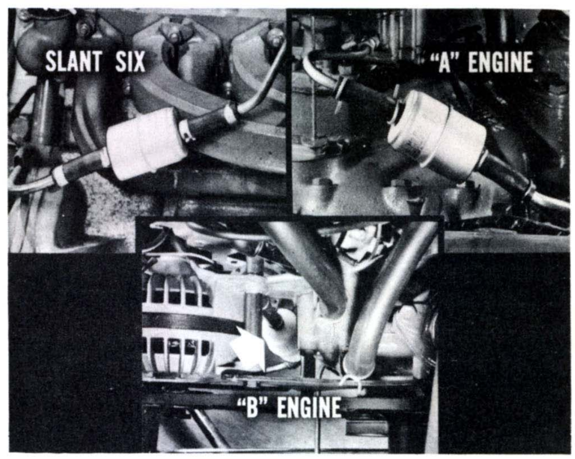
A damaged or leaking float valve needle is just as bad as a high float level . . . usually a lot worse. It will cause the fuel level in the float bowl to be excessively high most of the time and cause rich-mixture problems like poor fuel economy, sluggish performance and a rough rolling idle as well as hot-start problems. Inspect both the needle and the seat to make sure they aren't damaged, worn or leaking.

RELOCATE THE FUEL FILTER

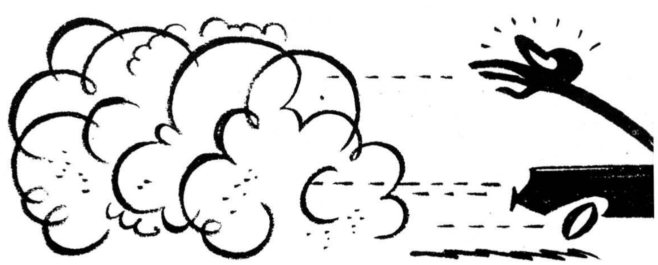
The fuel filters have been relocated on present production cars to get them away from engine hot-spots. In addition, they have been repositioned so that they are tipped at a 45-degree angle or positioned upright. Here's the reason for repositioning the filters.

If it is extremely hot, *if* the engine has been driven hard so it is very hot, and *if* the engine is stopped, heat will cause fuel in the filter and lines to heat up abnormally and expand. If the filter is in a horizontal position, fuel expansion and vaporization in the filter and lines may push a solid stream of fuel past the float and into the carburetor and intake manifold.

The present upright or 45-degree-angle position of the fuel filter provides a vapor spacer at the outlet side of the filter. Expanding fuel pushes vapor instead of solid fuel into the carburetor and most of it escapes without flooding the manifold.



If you want to know where to put the filter on an early-production or past-model car, just take a look at a late-production job having the same engine and equipment. Get out your flaring tool and tube-bending set and you can make a new line in less time than it takes some owners to start a flooded engine.



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