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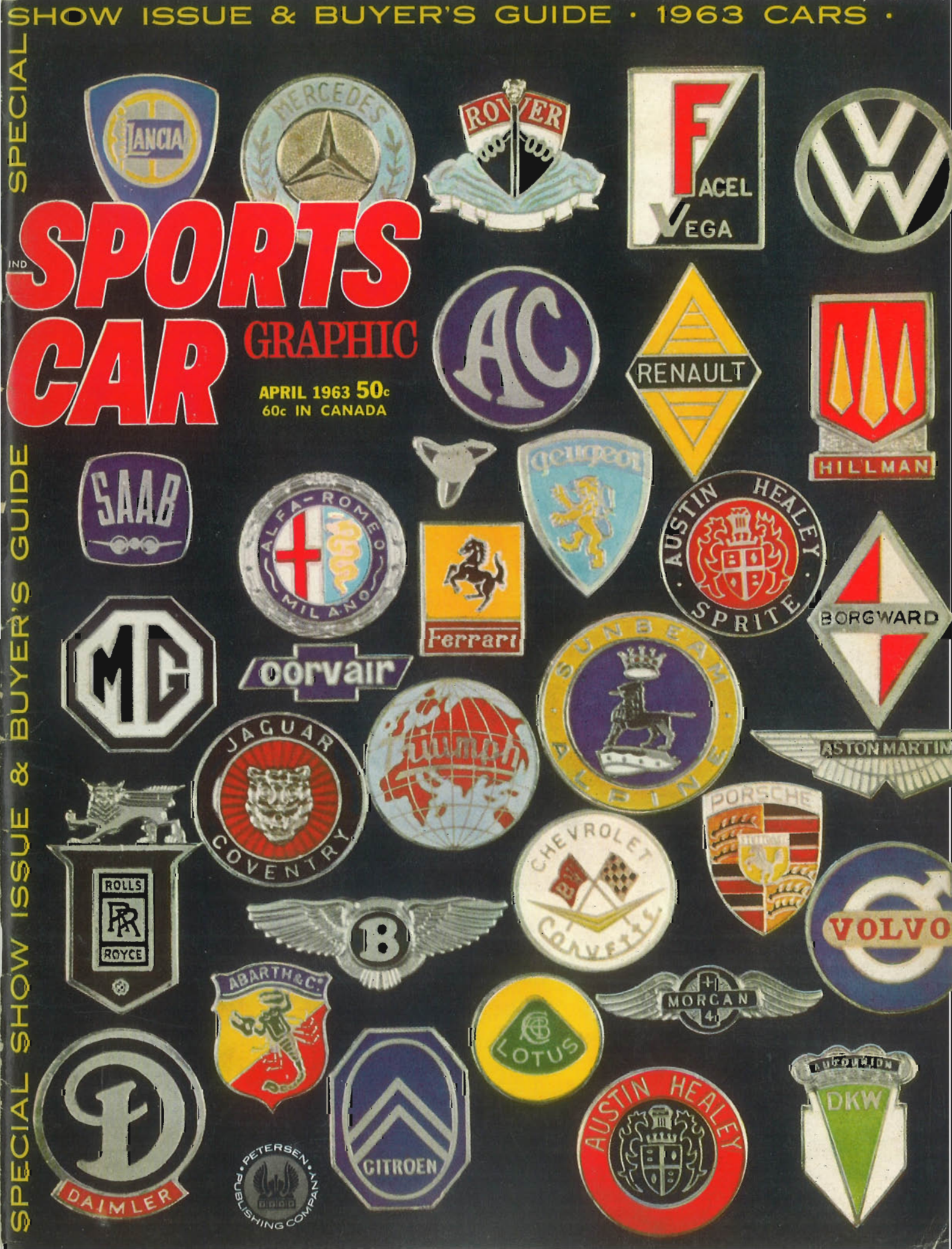

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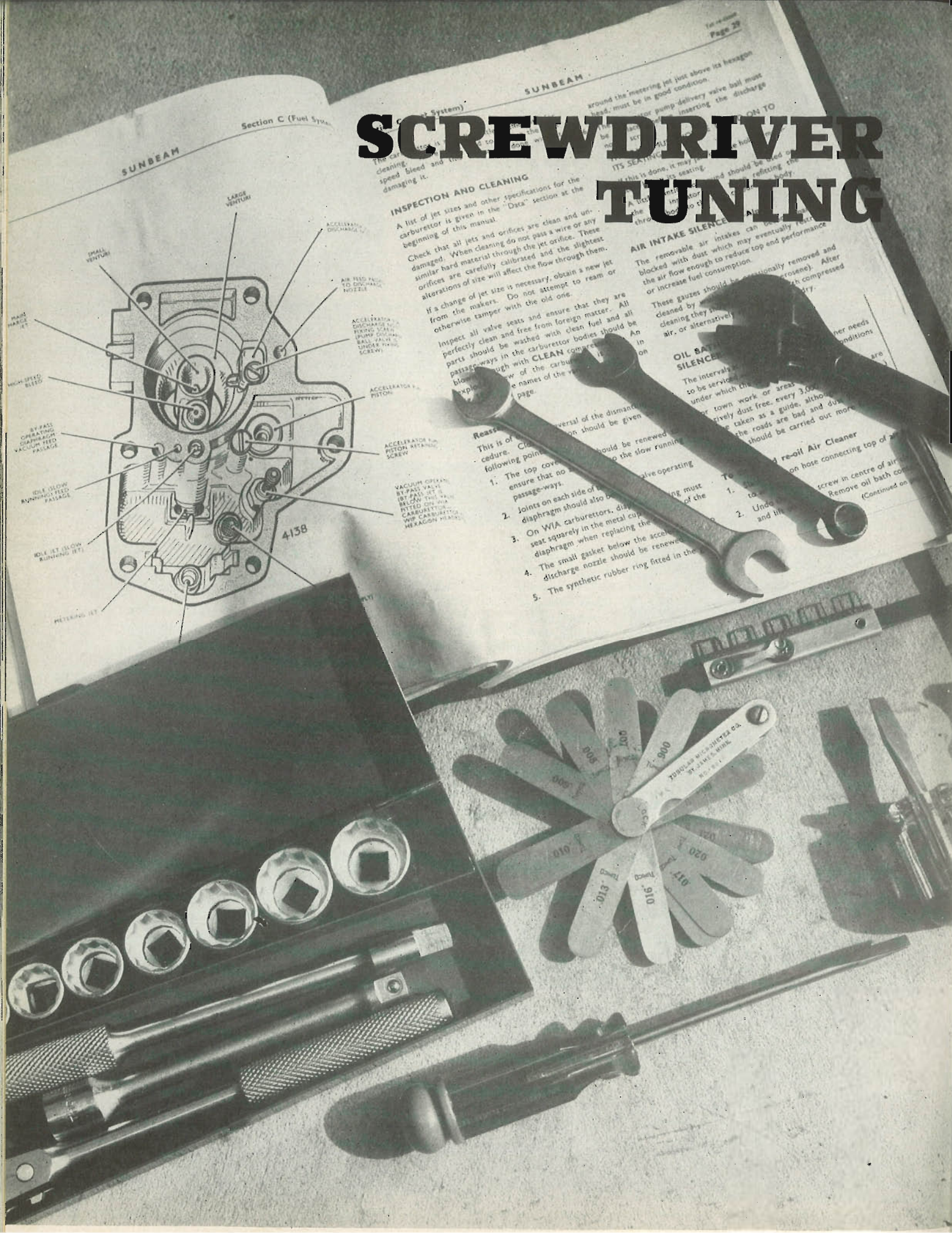
SCREWDRIVER TUNING



With a few simple tools, and a few minutes time, you may be able to radically improve your car's performance!

A well known sports car service center operator in New York once made the statement that his business would decline by 50 percent if the average owner realized there was a screwdriver in the tool kit that came with his car. This may be an exaggeration for the sake of accenting a truth, but it is safe to say that not one car in a hundred performs as well as it might, or costs as little to operate as it might, if the driver would spend a few minutes occasionally with a packet of hand tools and his owner's manual. To encourage that enjoyable aspect of motoring, SCG herewith presents a roundup of simple tuning and maintenance hints, as related to sports and imported car engines, gleaned from a number of experienced people who daily come in contact with the small problems of maintenance or performance. They include: Bill Corey, owner of Bill Corey's Service Center in Pasadena, Calif., and author of ENGINE TUNE UP GUIDE; Roger Bursch, owner of Scientific Automotive, also in Pasadena; Bill Stucker of Hollywood Sport Cars, Hollywood; OCee Ritch, technical writer and author of many owner's handbooks, including the CHEVROLET PERFORMANCE HANDBOOK, soon-to-be published by Petersen Publications; and SCG's Technical Editor, Jerry Titus. Don't look for anything revolutionary, but be assured that, short of modifying the engine, these hints lead to maximum performance and trouble free operation for everyday driving – John Christy.

BY OCEE RITCH

PHOTOS: JACK BRADY & GORDON CHITTENDEN

BEFORE DISCUSSING INDIVIDUAL AUTOMOBILES, it is probably well to review the basic attributes of the two types of carburetors found on most sports and imported cars. These are (a) the fixed-jet type as represented by Solex, Zenith, Weber, Carter, Rochester and Stromberg; (b) the variable venturi type, as represented by SU, In moving from one type to the other the owner may contribute to poor performance by using the wrong tuning technique. For example: it is normal practice to adjust the idling mixture on the Solex or Zenith for best engine rpm at a given throttle setting. However, if this is carried out on the older SU, the cruise and high-speed mixture will be too lean. The idle mixture strength has relatively little to do with performance through the rest of the range as far as the fixed-jet carburetor is concerned, but it is all important to the SU. The idling circuit in a fixed-jet carburetor is part of the transition circuit and affects performance up to 2500 or 3000 rpm in many cases, but it cannot wholly control the mixture strength as does the relative position of the jet and needle in the SU arrangement.

In the fixed-jet carburetor, mixture strength (and this is the primary factor in engine performance) is controlled by drilled passages in the carburetor body. Portions of the passages are in the form of small, brass, removable plugs drilled to appropriate sizes and called jets. They control the volume of fuel and, in instances, air, which is permitted to pass into the venturi. The one adjustable 'jet' is a tapered needle which screws into the carburetor body to enlarge or diminish the size of the fuel passage dedicated to supplying the engine at idling speed. Because of the low velocity of air passing through the carburetor at low engine rpm, insufficient fuel to provide the extra-rich mixture needed for slow speed running is drawn from the cruise jet, and a supplemental amount is routed through the passage which opens below the throttle butterfly. The amount is directly controlled by the *idle mixture screw* . . . not to be confused with the *idle speed screw*, which adjusts the position of the throttle butterfly.

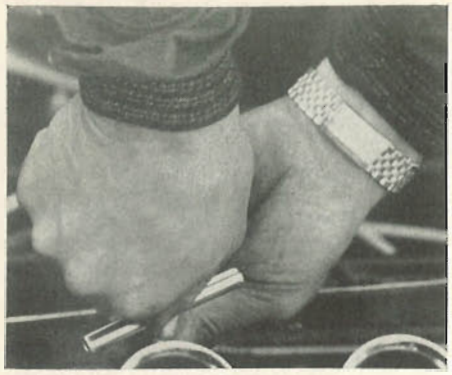
The *modus operandi* in tinkering with idle setting is as follows, (with the engine at normal operating temperature and choke off):

For a single carburetor – Screw the idle speed adjustment in until a fast idle results . . . say 900 to 1,000 rpm . . . then, turn the idle mixture screw in until the engine slows down perceptibly and back it out until it speeds up to a maximum. You will pass the point at which the optimum setting occurs, naturally, and some engines are more sensitive than others, but a little backing and forthing will soon reveal the best position. This is a simple adjustment, even without a tachometer, since the ear is capable of detecting minor changes in rpm. If the screw can be bottomed without the engine's faltering, remove the screw completely and examine the tapered tip. It will probably be blunted or damaged, and must be replaced. After the maximum rpm at this idle speed setting is determined, back the idle speed screw out until the curb idle recommended by the manufacturer is attained.

As a check on this mixture strength, rev the engine up gradually to about 3,000 rpm and release the throttle suddenly. If it returns to idle speed smoothly, fine. If it stumbles or dies, the idle mixture is too rich. Lean it by turning the screw *in* a fraction of a turn at a time until it will perform acceptably.

For two (or more) carburetors – Disconnect the throttle linkage between the carburetors and set a fast idle (see also specific recommendations under car headings) by either of two methods: (1) Run the curb idle speed adjustment up against a .003-inch feeler gauge interposed between the tip of the screw and the throttle tang, just tight enough for a slip fit, on each carburetor. Then adjust the screws in, part of a turn at a time, carefully duplicated from one carburetor to the other until the desired fast idle results. At this point the carburetors will be roughly synchronized and, if you will take care to duplicate each adjustment, final synchronization will not be too difficult. (2) Without a feeler gauge: turn each idle speed screw in a little at a time, working from carburetor to carburetor and attempting to equalize the adjustment as you go, balancing by listening carefully at each venturi for the tell-tale hiss or suction sound. (The traditional short length of tubing, a Unisyn or the Mesa Electronic Synchronizer are valuable assists.) At the fast idle, run the mixture strength needle of one carburetor in until it seats *lightly*, then back it out a predetermined number of turns, say 1½. Repeat exactly on the second carburetor (and the third, etc.) With this starting point you can seek the optimum speed by turning the screw in and out on one carburetor, (keeping track of the number of turns is helpful) then moving to the second carburetor and repeating the process.

At this juncture it will be necessary to reduce the idling speed to normal curb idle, which you can accomplish by backing off the adjustment on each carburetor a portion of a turn at a time. Check the synchronization once again, re-connect the linkage, rev the engine up slowly to 3,000 and release the throttle suddenly, as explained above, to verify the setting.



SCREWDRIVER TUNING *continued*

Synchronization is important to engine smoothness and throttle response on most dual carburetor sets-ups, but is really vital with multiple throat arrangements, such as the dual Zeniths on the Porsche, where there is one venturi per cylinder. If synchronized at idle, the carburetors keep in step all the way to full throttle, if the linkage is in good condition. As a check, make sure the throttle butterflies are all fully open at full throttle.

The SU is another kettle of fish entirely. Fuel is metered through a single jet penetrated by a tapered needle. As the throttle is opened, and a greater volume of air flows through the venturi, the needle is lifted in the jet, which creates a larger opening. Mixture strength at various speeds is controlled by the shape, or taper, of the needle. At idle, the needle is at the bottom of its travel and the jet is *lowered* by means of an adjusting nut at the bottom of the carburetor to permit fuel to flow. Thus, with the engine at operating temperature, the proper starting point is with everything shut off – the adjusting nuts run up firmly, throttle stop and fast idle screws backed away from their stops, choke and interconnecting linkage disconnected. If you have a .003-inch feeler gauge (a business card will do in a pinch) run the throttle stop screws in until they will just grip the feeler gauge, then screw them in an additional two turns apiece. Turn the jet adjusting nuts on each carburetor down two or three turns . . . the number of turns is not important at this point, but to keep the adjustment equal is. Now, the engine should run, after a fashion, at least.

Use the throttle stop screws to attain factory recommended idle speed, (generally 600 rpm) turning each one an equal amount. Check synchronization by ear or through the use of hose, stethescope, Unisyn, Mesa, etc. (If the engine refuses to idle at this speed with this jet adjustment, richen each carburetor until it will run.)

Slowly raise the piston in one carburetor as high as it will go. This has the effect of taking that carburetor out of the circuit. If the engine dies, lower the adjusting nuts on both carburetors ½ turn. Repeat the piston-lifting bit. If it runs, but poorly, this is fine. If it stumbles, richen the mixture until it will run. Then go through the same process with the second carburetor. The object is to get the engine to run on either carburetor alone in the same fashion. When it does, the mixture is equalized . . . but not yet correct. Turn the adjusting nuts, equally, up a flat at a time, until the best speed for this throttle stop setting is attained.

Here is where most home tuners and some mechanics leave the adjustment, but dynamometer tests and air/fuel ratio checks indicate that it is best to richen the mixture until the engine slows perceptibly. This will be about three flats on each adjusting nut, in most cases.

If your tool kit goes beyond the screwdriver-and-pair-of-pliers stage, a new tool called the WS SU Tool can be of immense help in adjusting SUs if, for no other reason than it makes it unnecessary to remove the air cleaners!

With the tool (actually three rods and three needles in a plastic case) you can check free movement of the piston and jet-needle centering in a matter of seconds. The tests rods are also in different diameters equivalent to the float level setting requirements of various SUs (the bar fits between the fork and the float chamber lid) which keeps fuel level 1/16-inch to ¼-inch below the jet. By inserting the test rods in the damper chamber, and fitting them with the needles, it is possible to visualize the relative positions of the pistons and synchronize them by adjusting the throttle stop screws. They can be synchronized at any rpm, and if one is consistently erratic over the speed range it is an instant indication that the wrong needle or a damaged needle is in use. An inexpensive item, the tool looks like a real help to the enthusiast who is short on experience or time.

SUs provide for mixture strength control during acceleration through the use of a damper which retards violent action of the piston. This chamber should be kept topped up with 30 wt. engine oil. The suction chamber and piston should be thoroughly cleaned in solvent at least every 10,000 miles. Jet needle wear is fatal to good performance and any evidence that the needle has been striking the jet, such as a shiny spot, is reason enough to discard it, taking care to check needle-to-jet centering in all cases.

In any carburetor tuning remember this: It may not be the carburetor adjustment which is at fault. Poor compression on one or more cylinders, incorrect valve lash, manifold air leaks, incorrect timing, worn points or plugs, or even worn or dirty carburetor parts can be responsible for erratic running despite correct mixture strength. Too, each car seems to have its pet ailments that conspire to baffle the amateur tuner, so we will consider them herewith. Naturally, it is impossible to consider all imports in this space, so we will touch only on those about which SCG has received the most queries indicating wide ownership and interest.

ALPINE

	Series I	Series II
Main Jet	130	142
Plug Gap	.025	.025
Plug Type	CH N5	CH N5
Point Gap	.016	.016
Static Timing	7° BT	7° BT
Exhaust Clear.	.014 H	.014 H
Intake Clear.	.012 H	.012 H

The Alpine fuel tank is untreated and prone to formation of rust, so always use top grade gasoline from a busy *major* service station to avoid excess water in fuel. Use Kleen Treet or equivalent occasionally to purge the system. Check for rust which may have passed the filter into the carburetor bowl, in case of flooding or poor performance. An in-line fuel filter is a good investment for this car. The Zenith carburetors on the Alpine are sometimes tough to keep in synch because the jam nut on the interconnecting linkage occasionally works loose. Check it often. The cam and roller in the accelerator pump linkage are subject to wear, causing the throttle to stick partly open or reduce the pumpstroke. The cam can be re-ground by hand filing, if worn, but the arm must be re-adjusted to compensate for the amount removed. Dab a bit of Lubriplate on the cam and roller during tune up to help prevent wear. This carburetor is also subject to throttle shaft-bore wear because of linkage tension. The air leak so created will affect performance mysteriously, and the only solution is a new carburetor body. Ignition point-gap setting is critical because the points have a tendency to close up. Use standard gap and timing advance. If plugs are a problem try one of the "hot-tip" type.

AUSTIN HEALEY

	100-6	3000 Mk I & II
Needle	CV	CV
Plug Gap	.025	.024
Plug Type	Ch N5	Ch N5
Point Gap	.014-.016	.014-.016
Static Timing	6°BTDC	5°BTDC
Exh. Clear.	.012 H	.012 H
Intake Clear.	.012 H	.012 H

Ninety percent of the poor running complaints about the Healey center on improper point and plug gap, or incorrect heat range plugs, plus small difficulties with SU carburetors, generally. having the wrong float level. If most driving is in the city, a hotter plug than the specified N5 should be used; N8 or equivalent, or a broader heat range type such as Bosch or Lodge installed. Gap at .025. Timing is also critical, following the manufacturer's recommendations. Valve lash seems to hold pretty well. The 3000, with three carburetors, suffers from blown intake manifold gaskets. The production gaskets are paper, service replacement gaskets (under warranty, if blown) are metal and infinitely superior. Three different float levels have been specified for carburetors used on Healeys, and the owner's manual tells you which you have, but in case it isn't at hand: the old type is set at 7/16-inch, the recessed type at 5/16-inch and the plastic float at 3/8-inch. Check the rubber equalizer tube for leaks, which will cause erratic running. If you suspect leaking manifold gasket, fill a Coke bottle with water and pour it over the manifold with the engine running. If it stumbles or dies, you've got it. Use premium ethyl fuel always. If you use a fuel with a Boron addative, and the engine backfires a few times, it will be necessary to clean soot out of the dash pots on the carburetors. If you dissassemble the carbs, be sure to match up the pistons and domes as found.

AUSTIN HEALEY SPRITE

	Mk I	Mk II
Needle	V3	V3
Plug Gap	.024-.026	.024-.026
Plug Type	Ch N5	Ch N5
Point Gap	.014-.016	.014-.016
Static Timing	5°BTDC	4°BTDC
Exh. Clear.	.012C	.012C

The Sprite also suffers from tank rust and extremely fine particles can foul the jet, so keep the fuel as free from water as possible and install an in-line filter. The usual SU problems are to be watched for (see introduction) plus the fact that on many cars the overflow tubes on the float bowls are tied to the engine block, which sets up a fearsome vibration with consequent flooding over, etc. Cut the tubes off even with the bottom of the bowl. Be sure the distributor plate screws are tight and that the centrifugal weight moves freely. There is a tendency for them to stick at full advance, causing poor performance and baffled owners. Be sure to set the distributor points with the timing mark at the five-degree advance pointer, not at TDC, which can be done accidentally if you have been checking TDC. Most owners have a tendency to play with the micrometer adjustment on the distributor. For premium fuel it is best centered and left alone.

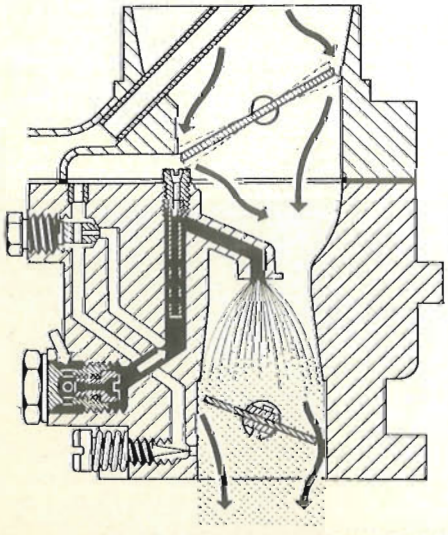
CORVAIR

	Turbo Air	Monza
Main Jet	.052	.053
Plug Gap	.035	.035
Plug Type	AC 46 FF	AC 44 FF
Point Gap	.019 new) .016 used)	same
Static Timing	13°BTDC	13°BTDC
Valve Lash	3/4 turn to center lifter	

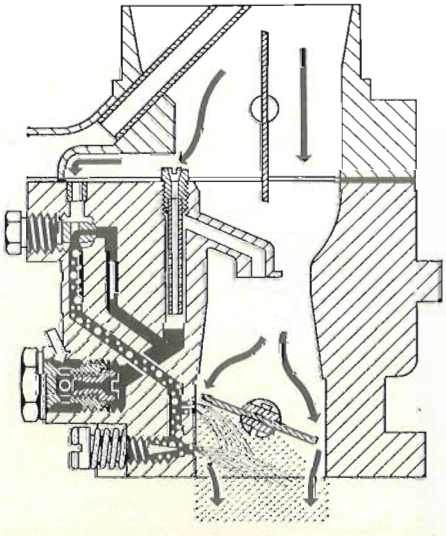
Bill Corey, who probably does more Corvair work than any independent garage in the country, says he has never had a Corvair in his shop which runs perfectly, no matter how recently it has been in a dealer's hands. This is attributable to the one factor which should encourage Corvair owners to pay more attention to their vehicles: Each Corvair is an individual. Dynamometer power-timing reveals the widest range of advance settings in any automobile. Corvairs power-time out anywhere from 13° to 21° BTC. From this improper synchronization of carburetors, uneven valve lash and improper head bolt torque, come nearly one-hundred percent of Corvair troubles. Properly set up, the Corvair is transformed. First, with the engine at normal temperature (run it 30 minutes if in doubt), torque the head bolts down to 35 lb. ft. Following the shop manual sequence (and if you don't have a shop manual there is a good Owner's Handbook advertised in this

(text continued on page 68)

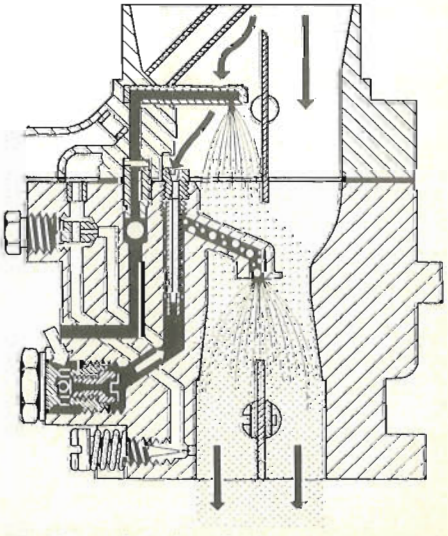
FIXED-JET CARBURETORS:



Choke circuit, in operation above, pulls gas from main dump tube by creating negative pressure in the venturi area.



Idle circuit in effect here, with choke off. Fuel is picked up, drawn through a low-speed jet, fed in below the throttle.



Both acceleration & hi-speed systems in operation. Note aeration in main tube via air-correction jet, open butterflies.