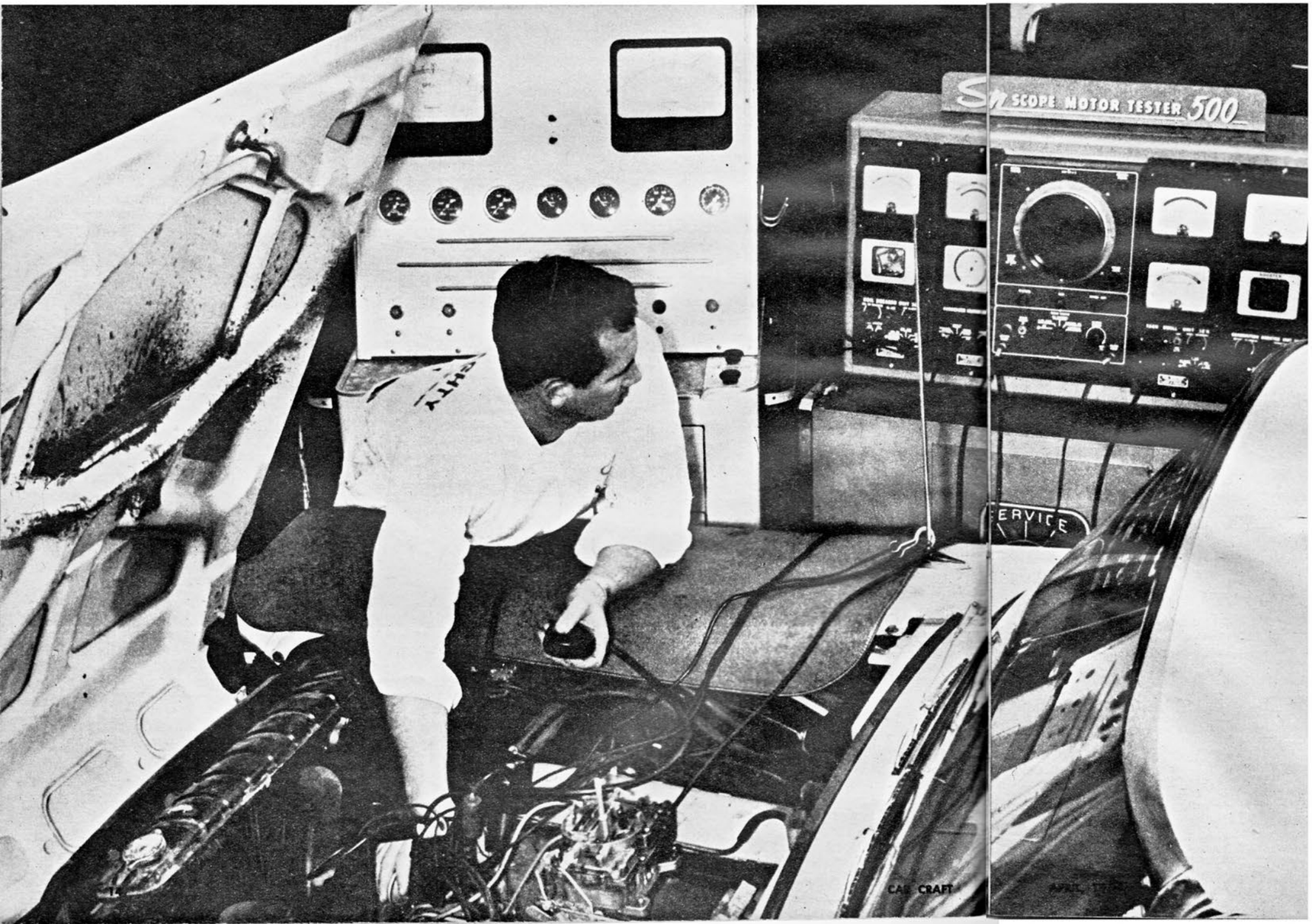
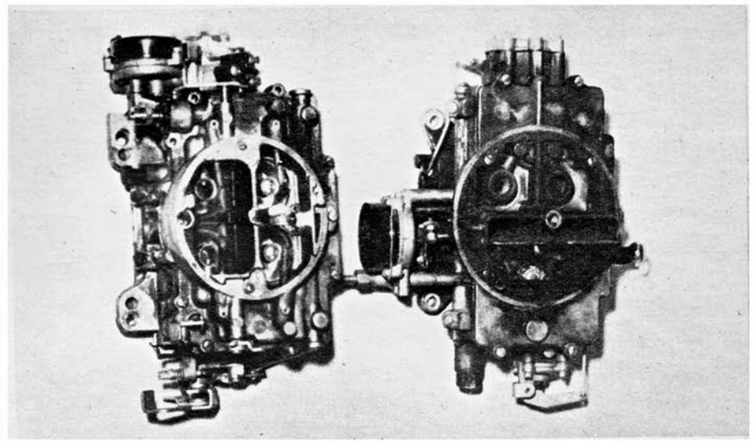
SUPER-TUNING

the FORD-MERC-EDSEL-LINCOLN

BY JOHN GERAGHTY

Photos by Colin Creitz





Optional standard equipment on Ford products is the desirable Carter AFB four-barrel carburetor shown at right. The Carter was used in place of Ford and Holley units because of the flexible operation possible throughout the entire HP range.

DURING DETROIT'S HORSEPOWER race of the past five years an ever increasing breed of new car buyers, referred to as performance minded enthusiasts, has originated. Along with growth of this type of consumer a demand for individual operational perfection has caused unfair comparison between many of the leading automobiles. Due to mass production and demands of other types of drivers an intermediate point has been reached that will produce high rates of economy, allowing a low operational cost and still maintain a suitable performance factor. Many cars such as Chevrolet produce engines to cover each of these individual demands where Ford, Mercury, Edsel and Lincoln have fell into the intermediate operational class. Many changes can be made during normal tune-up procedure that will enhance either the rate of economy or high performance factor considerably. We shall direct this article to the latter of these.

Ford's popular 352 cu. in. engine is the particular unit we shall use as our subject mainly because of the high horsepower increase possible due to the factory's lack of interest in high performance operation. A 1959 Ford sedan equipped with a standard transmission and 4:10 rear end ratio belonging to Dave Shoemaker, a drag racing enthusiast from California, was selected as our feature car. All modifications found to be advantageous for the 352 cu. in. engine apply to the 332-383 and 430 cu. in. engines also unless otherwise stipulated.

H.P. COMPARISON CHART

R.P.M.	#1	#2	#3	#4	#5	#6	#7
2500	95	102	103	108	126	127	127
3000	120	126	126	130	142	144	145
3500	130	137	142	150	155	159	160
4000	140	152	157	160	164	169	173
4500	120	130	145	148	160	162	182

'59 Ford was placed on the Clayton chassis dynamometer, various pieces of testing equipment were connected for commencing high performance tune-up. Chart lists different tune-up steps across top, RPM's at left, respectable HP gains are noted.

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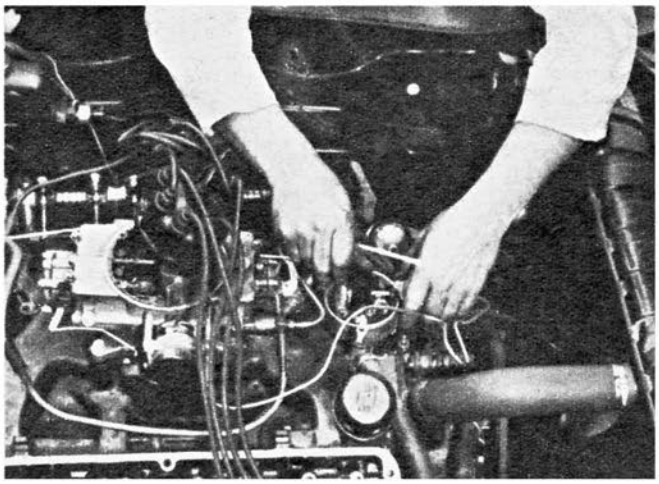
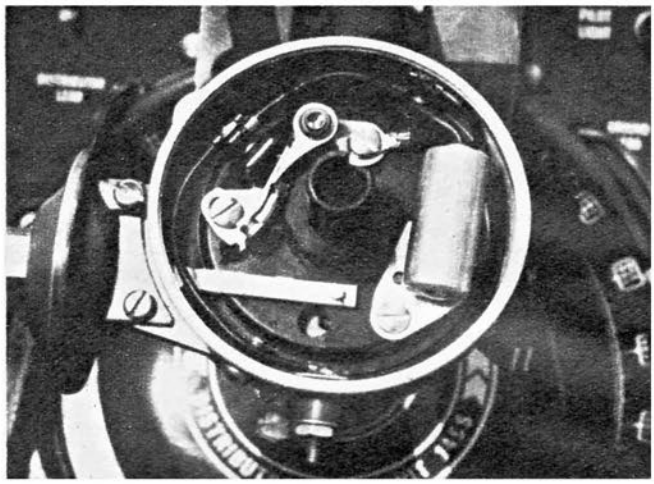
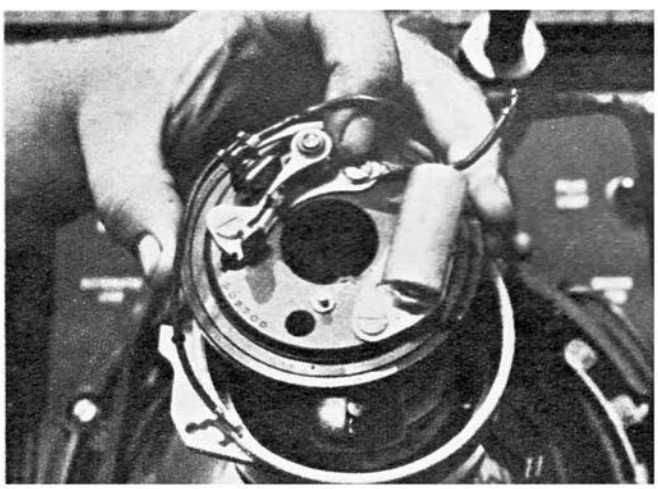


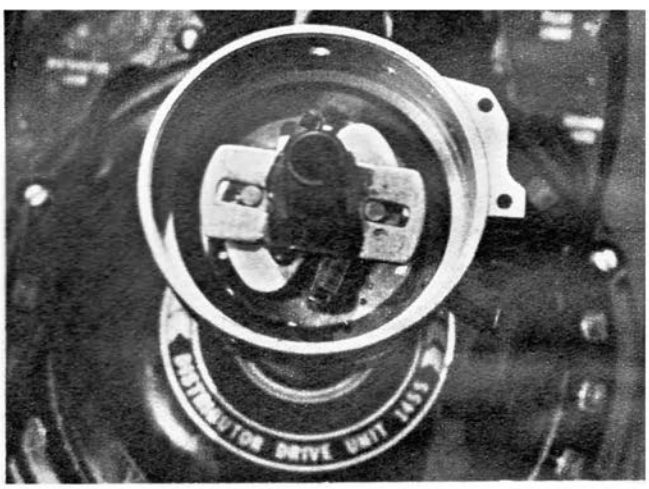
Removing distributor cap, clamp, vacuum line, note position of rotor to assure proper assembly, now remove distributor.



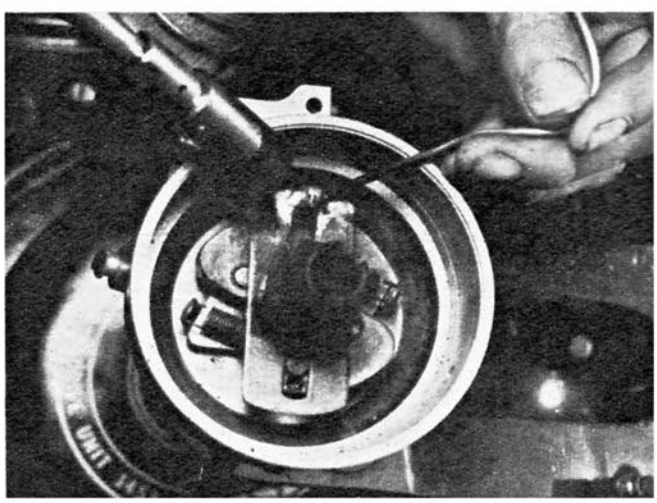
Before any modifications are made to the distributor, all parts; bushings, plates, etc., should be checked thoroughly.



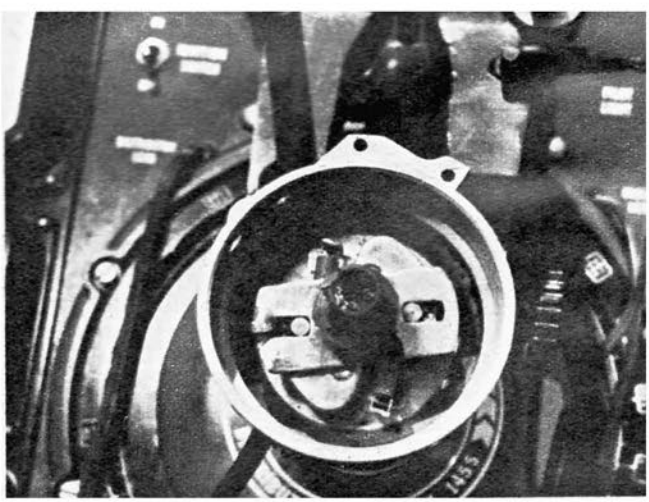
The vacuum advance diaphram, primary distributor leads and distributor plate are removed to expose centrifugal weights.



Automatic advance is controlled by spring loaded weights. Weight's movement must be halted at ⅔rds travel by stops.



Properly tinning the distributor control plate and new stop bracket, small amount of flux center solder will hold stop.



Curved end of stop bracket should hang down into control slot allowing only ⅔rds of normal mech. advance travel.

After placing Dave's car on our Clayton chassis dynamometer and attaching various pieces of testing equipment we were ready for the super tuning procedure which would release those hidden horses necessary to increase maximum performance. Complete records were kept during the precision tune-up with each test showing comparative H.P. over various engine RPM. Each of these tests will be referred to as test 1, 2, 3, etc., and may be followed on the H.P. graph contained in this article.

Test # 1

Although low end performance was comparatively good, the overall horsepower curve was very poor. The most prominent problem was in the secondary side of the ignition system. The spark plugs were breaking down due to an excessive lean condition and high engine temperature. The 180% thermostat was removed and a flat plate shaped to the size of the thermostat gasket, made from .062 flat sheet material, was installed. A ½" hole was drilled in the center of the plate to allow the necessary restriction of water, this allowed a lower engine temperature to be maintained. A new set of factory recommended Champion spark plugs were gapped to .030 and installed. The carburetor was left alone enabling a check of each operation individually.

Test #2

Although high RPM horsepower improved considerably the oscilloscope screen showed a definite secondary ignition break down to be evident under any maximum load condition. It was quite clear that the factory TVRS secondary wiring, designed as a resistor and equipped with a carbon center, would not carry the necessary secondary coil voltage to the spark plugs. After replacing all spark plug wires with Packard 440 copper center cable and installing a new coil to distributor cap connector we were now prepared for test run #3.

Test #3

The overall increase in horsepower and RPM was quite pleasing and our attention could not be directed to the carburetor system. The air-fuel ratio meter in test #2 indicated 15 parts of air to 1 part of gasoline under maximum load conditions. The desired air-fuel ratio for maximum horsepower is approximately 12 parts of air to 1 part gasoline so it was quite evident that the mixture would have to be richened considerably, and the secondary throttle valves would have to open earlier. The primary jets were enlarged approximately .001 and the secondaries .004.

Test #4

Test #4 showed a sufficient increase throughout the completed horsepower curve. The fine tuning could now begin. An exact distributor curve was plotted and matched to the stock distributor. This was accomplished by locking the distributor into a position that would eliminate both the automatic and vacuum advance. The tuning marks located on the crank pulley are extended to 40 degrees before top dead center. The engine is then put under maximum load at a particular RPM and the distributor is advanced and retarded until the point is found which produces maximum horsepower. This is repeated throughout the complete RPM range and accurate records kept to show the degree of advance required by the engine to produce maximum HP. This curve is then installed into the distributor by the use of different weights, springs, and stops. Desiring high RPM HP the distributor points were installed with great care and a setting of 30 degrees of dwell found to be best. It was also discovered to prevent point vibration over 4500 RPM a small soft piece of rubber had to be installed behind the point arm. (Directions and complete specifications on all ignition modifications can be found in the special ignition section accompanying this article.)

Test #5

Test #5 showed excellent low end horsepower increase. Inspection of the HP graph will show the advantage of a proper distributor curve.

Having perfected the ignition we now directed our attention to trimming the edges off the carburetor system. The Ford and Holly carburetors used in many cases with 332, 352 and 383 engines are limited in control of secondary throttle operation. Therefore the Carter, which is also stock equipment, is recommended. If the Ford or Holly carburetors are used, a decrease in accelerator pump action tends to clean up the low in performance considerably. The lever arm located on the pump shaft is drilled in progressive steps increasing and decreasing in movement of the pump diaphragm. The shorter of these holes is the one to use. The Carter carburetor allows the removal of the weighted secondary throttle shaft and butterflies. This allows an earlier throttle opening under rapid acceleration.

Test #6

Test #6 shows an increase in HP with a Carter carburetor. The same maximum horsepower will be developed with either type of carburetor although the mid range will be a slight bit flatter.

Preparation for Test #7

An exact valve setting was tried to help raise maximum engine RPM. The hydraulic lifters were set with the engine running. Each adjustment was backed off until lifter noise was evident, then the adjustment was tightened slowly until the lifter noise stopped. Approximately ⅛ turn more was taken and this proved to be best. The mechanical lifter engines were more versatile. If a higher gear ratio is used a valve setting of .026 intake and .026 exhaust is best, otherwise a setting of .022 and .022 works better by raising the maximum horsepower RPM and allowing a wider overall curve.

Test #7

A higher RPM was reached after the previous valve adjustment and a horsepower increase now capable of pleasing the most demanding Ford, Merc, Edsel or Lincoln owner. Two articles due to appear in near future issues of CAR CRAFT will deal with the installation of the factory interceptor cam equipped with solid lifters and available from your local Ford agency and the installation of a large 4 barrel carburetor. Either of these installations will prove extremely advantageous to further increased performance.

MODIFICATION OF THE STOCK DISTRIBUTOR SYSTEM FOR TOP PERFORMANCE

We suggest a local tune-up shop be kept in mind to calibrate the final touches of this ignition system modification and distributor synchronizer.

We will begin with the removal of the distributor. The distributor cap is removed first and a note taken on the position of the rotor. This determines the position of the distributor and must be replaced in the same location. A hold down clamp and bolt located at the base of the dis-

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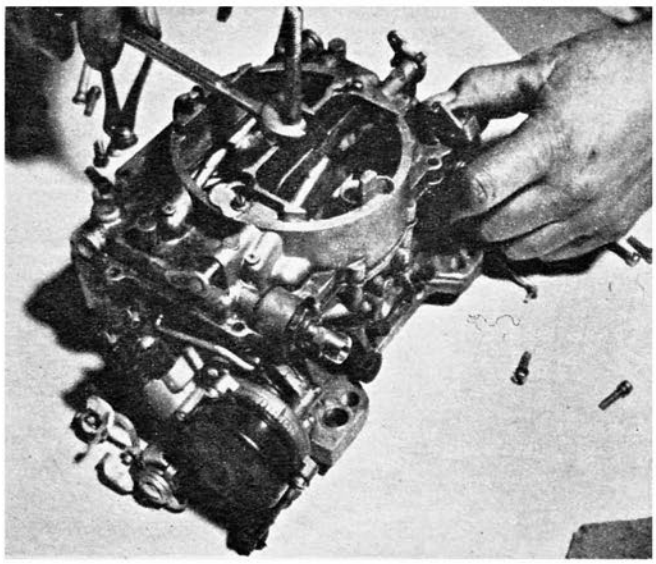
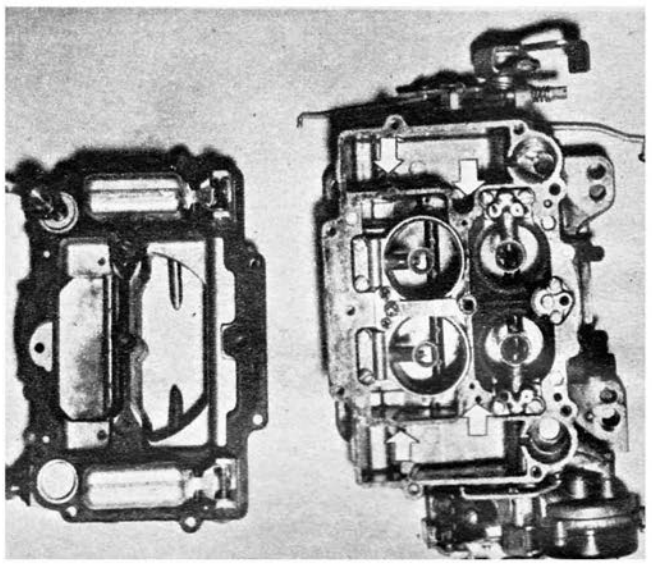
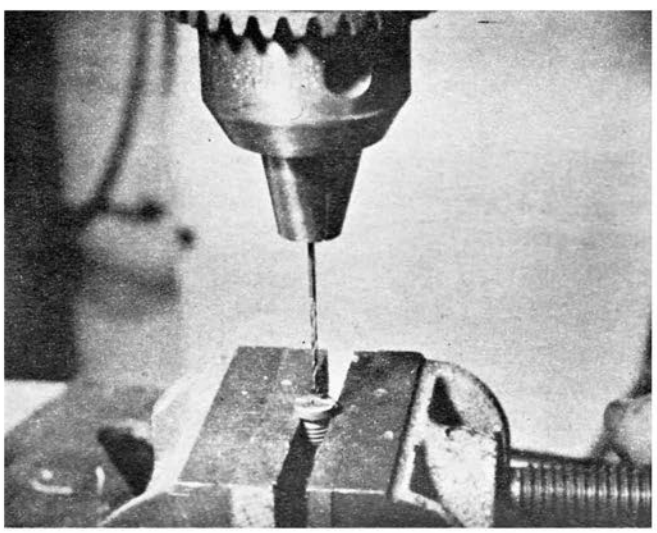
The Carters primary and secondary main jets are made accessible by removing bolt and carburetor air horn assembly.



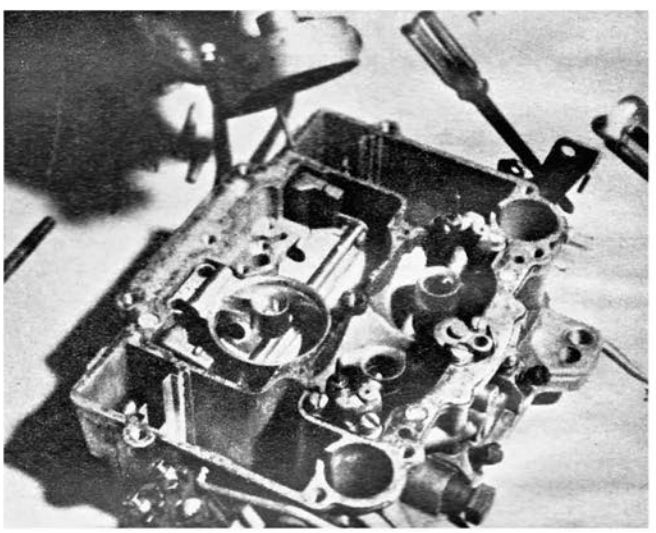
The main jets are located in the lower float bowl body. Use a medium screwdriver, with extreme care, to remove them.



A bench vise and drill press should be used, when drilling the main jets out to larger diameter, to insure proper size.



Secondary throttle governor assembly can be lifted out by first removing left, right venturi clusters. Note positions.



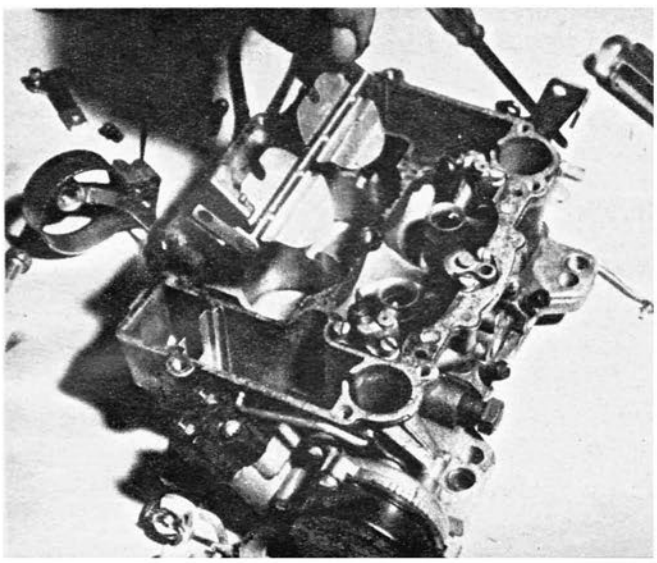
tributor is removed along with the vacuum line and lifted as a unit.

Before the modification begins we must determine the condition of the distributor. The shaft bushings are checked for any excessive clearance by moving the shaft sideways. This is important. Bad bushings will cause the points to vary during opening and closing. The distributor plate is also checked for excessive looseness by trying to move the plate up and down by holding the condensor or any outer edges of the plate. If there is any movement up or down the plate should be replaced as it will cause excessive point vibration and not allow high RPM.

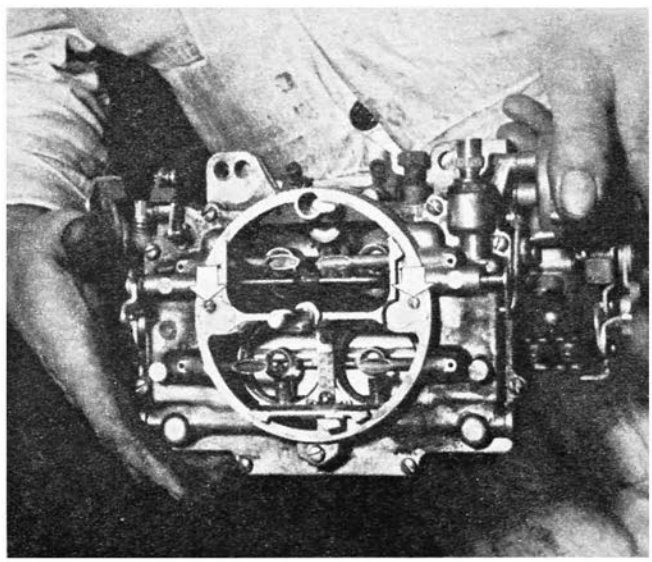
If a distributor synchronizer is available it is recommended procedure to run the distributor from 0 to approximately 4000 RPM keeping track of the stock ignition curve and observing the condition of the distributor cam by the firing location of each cylinder. A variation of 1 degree maximum is allowed for maximum performance. If the synchronizer is not available the advance curve is listed by distributor number and is available in most auto repair manuals. The cam wear can be detected by using micrometers across the highest part of the lobes and comparing figures.

The distributor is now ready for modification. The major change deals with the curve. For those who don't have a chassis dyno in their immediate locale, a good curve for the 332-352-383 and 430 engines is to leave 12 degrees mechanical advance in the distributor unless a low rear end ratio has been installed. If this is the case 8 degrees mechanical advance should be retained in the distributor. The examination of the distributor curve shows that the distributor curve increases gradually from approximately 400-4000 RPM. When the point of 8 or 12 degrees is reached, whichever the case might be, movement of the advance mechanism should be stopped. This is the

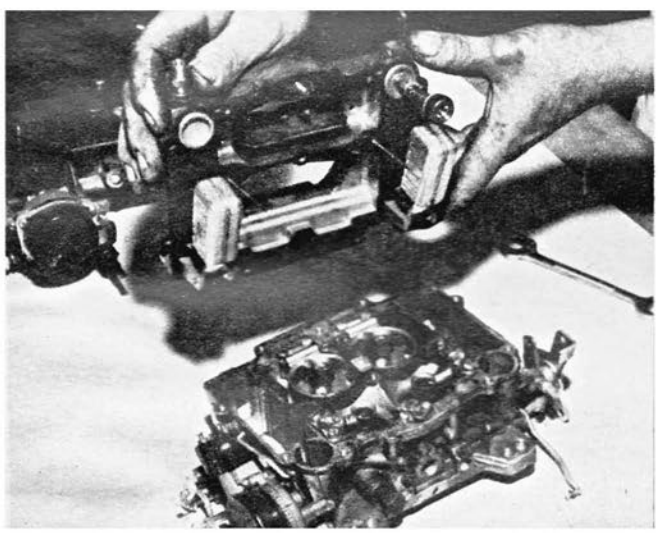
The secondary governor assembly can now be removed by lifting the complete unit gently in a partially opened position.



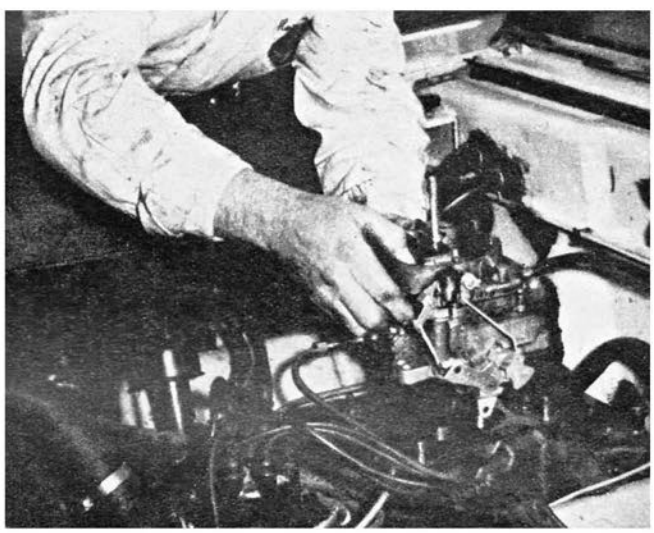
Arrows designate vacuum operated metering rod cover plates. Rods to be removed from air horn before assembly.



After removal of the metering rods, air horn may be installed on the carb body, taking care not to misalign float units.



After bench modifications, install the Carter AFB 4-barrel replacement carb on car. Carter carburetor is all-aluminum.



RPM that maximum lead can be used by the engine. It is noticed at this point that by stopping the distributor advance the amount of maximum advance would be less if the original tuning marks would be used. Therefore a relative position must be determined. A maximum total amount of advance must be 38 degrees crankshaft. The crankshaft speed being twice the distributor, all advance in the distributor must be doubled to figure crankshaft degrees. In other words the 8 degrees distributor curve is equivalent to 16 degrees crankshaft and the 12 degrees distributor advance is equal to 24 crankshaft degrees. These figures are subtracted from the total desired amount of advance which is 38 and your new initial tuning mark is the subtracted factor.

The proper procedure for stopping the advance mechanism in the distributor can be found in the complete picture caption story.

Original equipment points and condensors are recommended for installations of this type along with proper care in examining all leads to reduce any chance of a primary ignition ground connection. Alignment of the point faces is as important as the proper point gap settings. 29-30 degrees dwell is recommended. Without these two factors a high RPM ignition is impossible. After a complete double check the distributor is ready to be installed in the same manner as it was removed, keeping in mind the original rotor position and using the new initial tuning mark. With the close examination of the coil, distributor cap resistor and rotor, the modified distributor unit is ready to supply the necessary fire for your high performance stock engine.

The precision tune up not only produced a much more responsive, smoother street machine but proved itself by capturing its class trophy first time out. The car increased its ¼ mile speed from 84.52 to 92.27 and cut elapsed time from 15.97 to 15 flat.