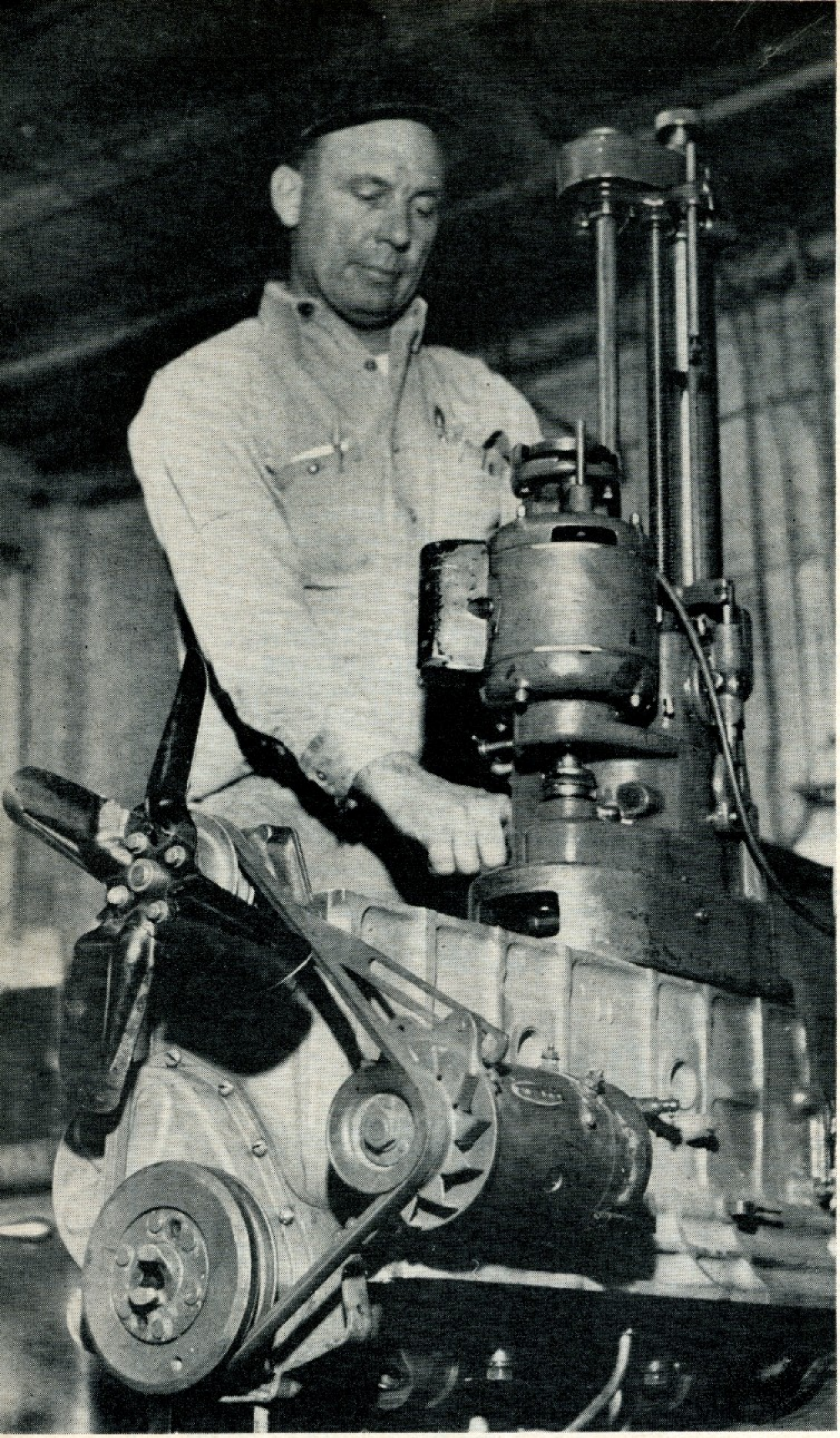


Guy Allen of McGurk speed emporium applies the boring bar to the "261" Chev engine.

SOUP THAT CHEV!

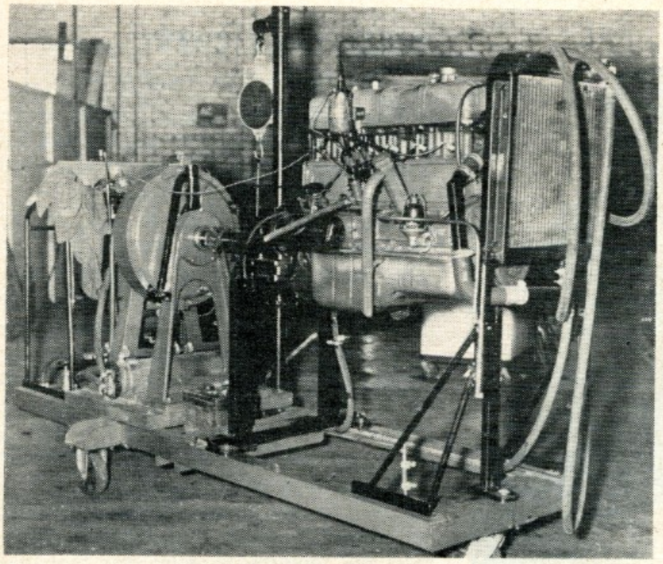
By Racer Brown

Little known "261" Chevrolet six truck engine proves to be a bomb—makes an easy replacement for standard passenger car mill

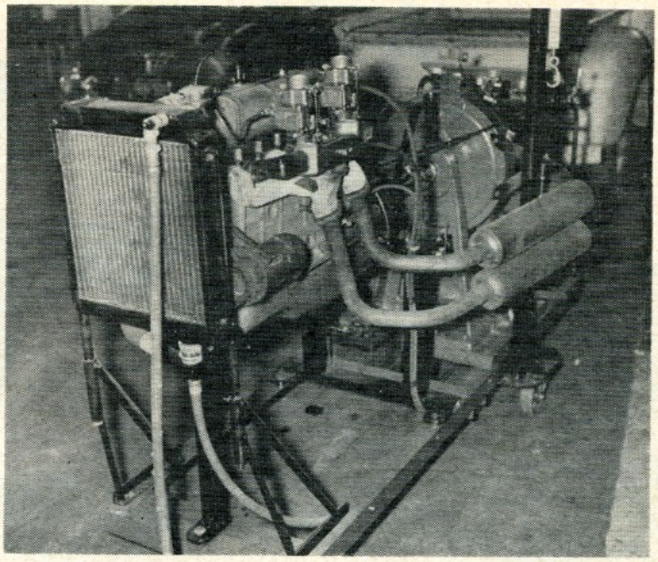
For months, loyal Chevrolet six fans have laid siege to our editorial offices demanding information on their favorite cars and engines. While we realize that the Chevs are very popular (the most, in fact), the big news was the late V8 engines, with emphasis being placed on a rival Dearborn, Michigan, product whose name is unmentionable in the same paragraph. But the Chevrolet sixes have not been forsaken by any means.

Possibly the best thing that has happened in years for the Chev six-in-a-row boys was the introduction of the "Jobmaster 261" truck engine in 1954. This engine retains many of the attributes of its illustrious predecessors, yet there are several features that cause it to stand out, head and shoulders—rather, block—above previous models. First of these is the matter of piston displacement; the figure 261 being an indication of the number of cubic inches contained therein. The bore and stroke are 3¾ inches and 3$^{15}/_{16}$ inches, respectively, which results in an increase of total displacement of over 10 per cent, as compared with current 235 cubic inch six cylinder passenger car engines and a 21 per cent displacement increase over the 216 cubic inch engines produced through 1952. Now that the modern practice of full pressure lubrication has, at long last, caught up with Chevrolet engineers, this little feature is also included at no extra charge. The third important fact is that interchangeability with existing Chevrolet six engines, plus most necessary accessories, places the "261" in a position of great versatility. Cost is always worthy of mention and the price of this engine is relatively modest, which is in keeping with the best of Chevrolet traditions.

The advertised brake horsepower output of the bare "261" engine is 135 at



Compact, portable dyno is self-contained except for water supply.



Dyno exhaust consisted of two Chev truck mufflers, no tailpipes.

4000 rpm, while with standard accessories, the advertised value is 123 at 3600 rpm. Advertised maximum torque of the bare engine is 220 pounds-feet at 2000 rpm and with standard accessories, this drops to 210 pounds-feet at 2000 rpm. The compression ratio is rated at 7.17 to 1.

Structurally, the "261" block is about as rigid and as rugged as any four main bearing block can be, comparing favorably with the larger GMC sixes in this respect. The material used is a close-grained alloy iron. The six throw crankshaft is a steel drop forging and is identical with '54 and '55 six cylinder passenger car and truck cranks. The four main bearing journal diameters become progressively larger from front to rear, being 2.684 inches, 2.715 inches, 2.750 inches and 2.777 inches, respectively. The crankpin diameter is equally generous, being 2.312 inches. Both the main and connecting rod bearings are of the steel-backed insert type with a thin coating of babbitt. A vibration damper, in combination with a crankshaft pulley, is located at the front of the crank to absorb any inherent torsional oscillations.

The connecting rods are very rugged steel drop forgings with a center-to-center length of 6¹³⁄₁₆ inches. Pistons are aluminum alloy permanent mold castings of double transverse slot design with integral steel struts. Two ³⁄₃₂ of an inch wide single torque cast iron compression rings are used, the top one being chrome plated. The single ³⁄₁₆ of inch wide oil ring is also cast iron and uses a light, spring steel expander. All rings are located above the piston pin. Following previous Chevrolet practice, the piston pins are a light thumb push fit in the pistons and are clamped in the rods by means of slotted pin bores and lockscrews. The piston pin bore is offset ⁵⁄₆₄ of an inch to the left, when viewing the engine from the front. Incidentally, the pistons are marked with a notch on the crowns, which signifies the "forward" position. The hardened chrome steel piston pins are .912 inch in diameter, somewhat (.046 of an inch) larger than those in 235 passenger car engines. A spur gear type oil pump delivers a pressure of 45 psi to all main, connecting rod and camshaft bearings and to the rocker arm assembly and is driven by a tang and slot arrangement that engages with the distributor shaft.

The camshaft is cast alloy iron and is supported by four bearing journals that are 2.154 inches, 2.091 inches, 2.029 inches and 1.966 inches in diameter from front to back, respectively. The cam is driven by an aluminum alloy timing gear that meshes with a steel crankshaft gear. The valve lifters are of the mechanical type made from hardenable iron castings.

The cast alloy iron cylinder head contains the familiar but nonetheless rather awkward Chevrolet combustion chamber. The three intake port openings measure 1⅜ inches in diameter and the pockets, directly below the valve heads, are 1⁷⁄₁₆ inches in diameter. The two end rectangular exhaust port openings are 1¼ by 1⁵⁄₁₆ inches, while the two center siamesed openings are 1¼ by 1¾ inches. The exhaust valve pockets are 1¼ inches in diameter. The intake valve head diameter is 1⅞ inches, compared to 1½ inches for the exhaust valve head. Single valve springs with a pressure of 182 pounds at the "valve open" position are used and are retained by conventional split keepers and retainer washers. Valve guides are removable cast iron. Valve timing figures are as follows: Intake opens 11½ degrees before top center, closes 52½ degrees after bottom center, duration 244 degrees, lift at valve .405 of an inch. Exhaust opens 51 degrees before bottom center, closes 13 degrees after top center, duration 244 degrees, lift at valve .414 of an inch. Pushrods are solid steel with upset ends and these transmit the motion of the valve lifters to malleable iron rocker arms that have a lift ratio of 1.477 to 1. The valve seat angle is 30 degrees on the intake and 45 degrees on the exhaust.

The intake and exhaust manifolds also follow previous Chev practice in that they are both cast iron and are bolted together at the junction of the intake manifold pre-heat chamber. The carburetor is a single throat downdraft Rochester model "B" with a venturi diameter of 1¹⁵⁄₃₂ inches and a manual choke.

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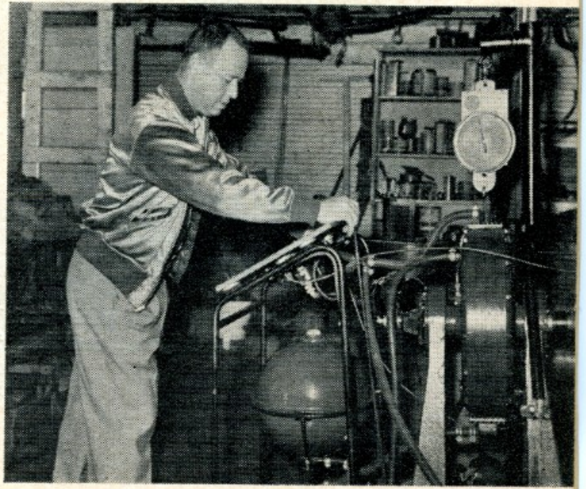
McGurk looks apprehensive as tach and scales climb to 190 lbs. No damage tho'.

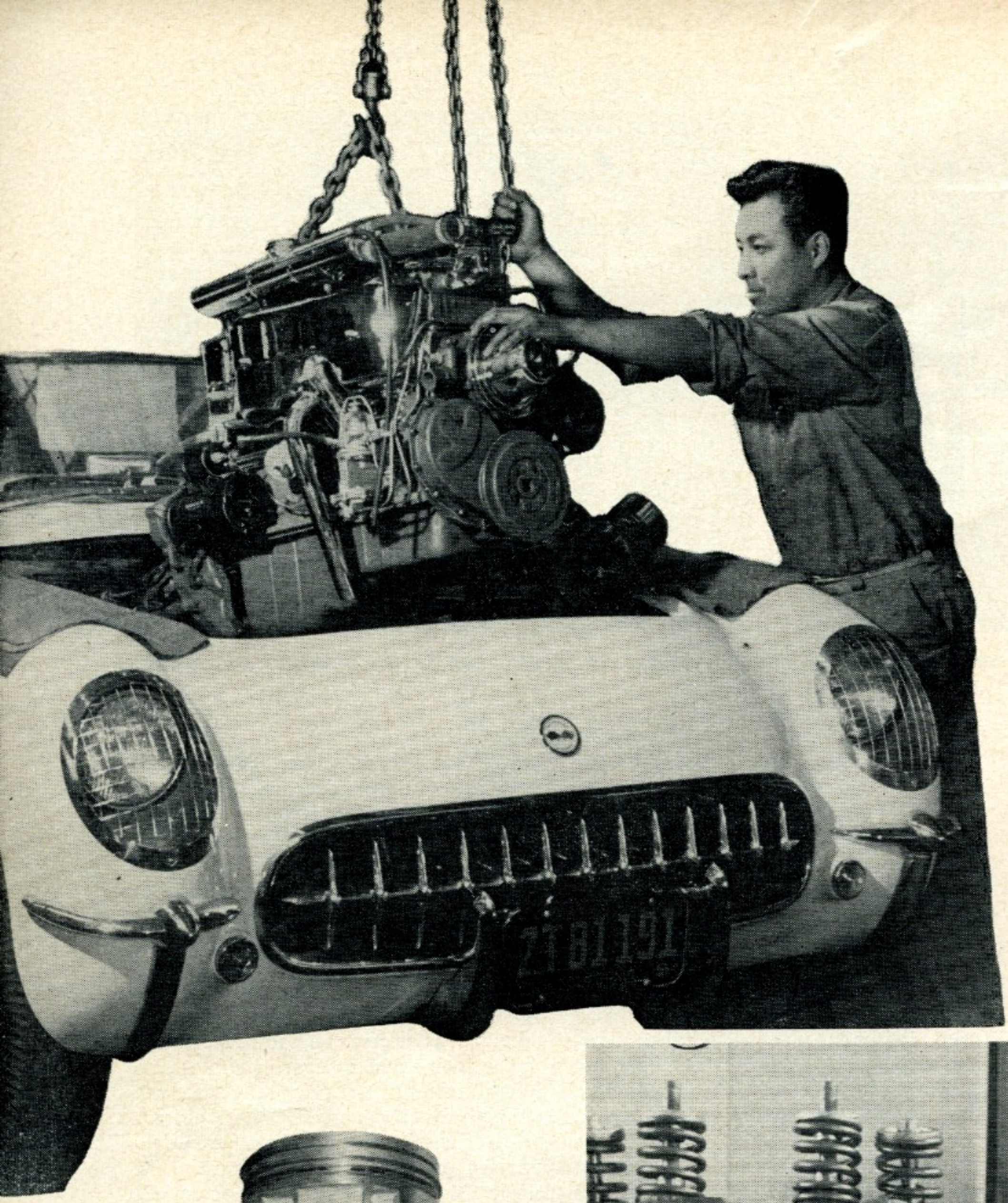


SOUP THAT CHEV! continued

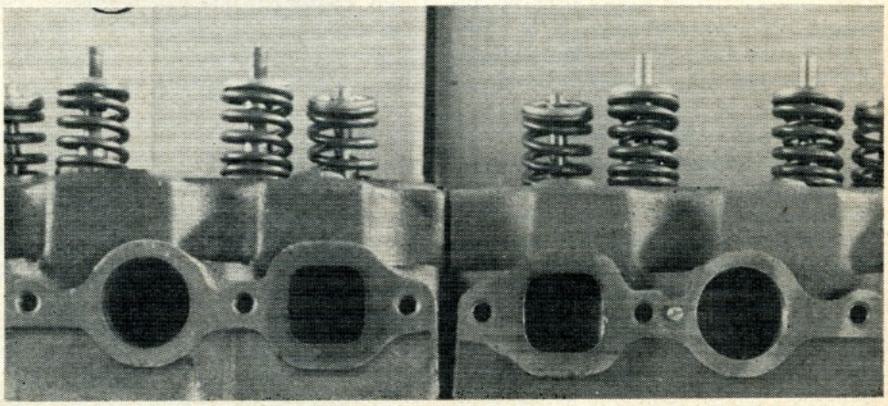
(Continued from preceding page)

Frank McGurk, long a familiar name in Chevrolet circles, had just finished his semi-portable engine dynamometer and just happened to have a brand new "261" engine. Frank was eager to learn of the potentialities the engine had in store, so the two of us cooked up a scheme of progressive dyno tests, starting with the stock engine. Before the first test, the engine was completely disassembled and corrections were made where necessary to bring the clearances to the values specified in the accompanying chart. The only exception was that the piston-to-cylinder wall clearance was increased from .001 of an inch to .006 of an inch by boring the cylinders .005 of an inch. During assembly, the compression ratio was measured and found to be 6.75 to 1 instead of the advertised 7.17 to 1, or a reduction of about 5½ per cent.

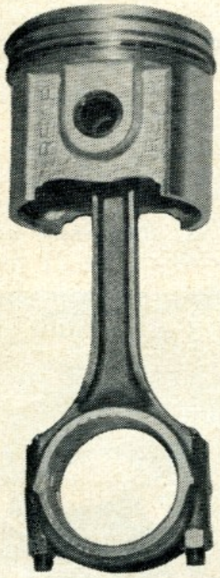
It should be pointed out that our specific intention in this series of tests was to show the various combinations possible with the "261" engine and the results obtained, making every effort to keep the engine in a "roadable" condition. Only during the last stages did any question



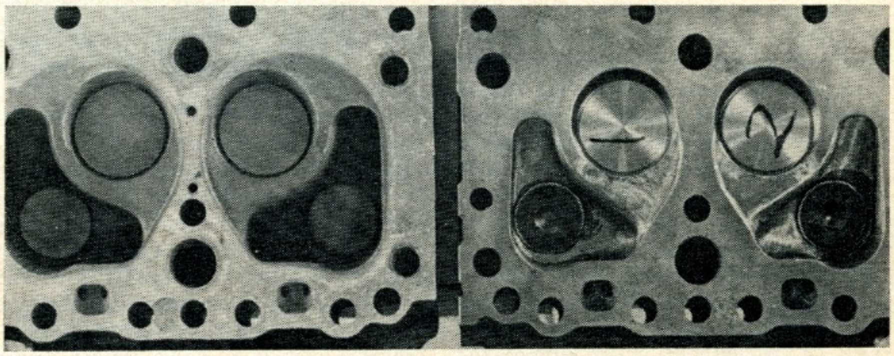
Sam Matsuda slips stock appearing "261" into "Corvette." This sneaky maneuver netted 11 mph gain in quarter-mile drags.



Modified "235" head, right, had intake ports enlarged ⅛ inch, exhausts "cleaned up."



McGurk "slipper" piston and husky "261" rod. Pistons are marked "front" and "rear."



Larger stock "261" chamber, left, compared to milled and polished "235" version.

arise regarding the "driveability" of the engine on the street. The results of the latter tests are shown for the benefit of those who prefer a rather "frantic" engine that falls between a conservative street engine and one built strictly for competition purposes.

On the dyno, the engine was operated under the following conditions at all times: The stock fuel pump was connected and operating, as was the water pump; the generator was rotated but no load was applied; engine water temperature was maintained at 180 degrees F; intake manifold heat was applied in all cases except the tests involving a "cold" manifold; stock Chevrolet straight-through pickup truck mufflers were used to ward off the minions of the law; engine oil was SAE 30; fuel was premium grade pump gasoline; no air cleaners were used; spark advance was manually adjusted to produce best power and torque but the centrifugal and vacuum advance mechanisms were operative; the ignition used for all tests was a stock Delco-Remy '54 Chev Powerglide with a centrifugal advance range of 29 crankshaft degrees, a Bosch "Big Brute" coil and condenser, AC-43 Commercial spark plugs gapped to .035 of an inch; a short, three-bladed fan was used to draw air through the dyno radiator.

The power absorption unit of McGurk's dyno was originally built by Harry Miller. This, together with the dyno scales, heat exchanger, instrument panel, fuel tank and engine supports, was placed on a frame of heavy steel channel, which had casters mounted to it for portability. Although relatively untried as a unit, the dyno proved to be quite sensitive and accurate. However, it should be pointed out again that horsepower and torque figures, as such, are valueless unless they are compared with other figures extracted from the same instrument. Here, although the actual power and torque figures are shown, the meat of the story lies in percentages, when the dyno was used strictly as a comparative instrument.

The first test was made with the engine completely stock, including a single stock Chev truck muffler, to check the outcome with the advertised power and torque values. The maximum brake horsepower output of the engine for this test was 114 at 3500 rpm, or 6.4 per cent below the advertised 123. Maximum torque was 201 pounds-feet at 2000 rpm, or 4.5 per cent below the advertised 210. At times, it is quite difficult to accurately diagnose the reasons why an engine fails to live up to its advertised values, but in this case, the lower-than-advertised compression ratio was undoubtedly a large contributing factor. Incidentally, all tests were started at 2000 rpm and were increased at 500 rpm increments until 5000 rpm was reached, which was past the power peak in all cases. At 2000 rpm, the brake horsepower of the stock engine was 77.

For the second test, the only change was the installation of a Chev "Corvette" exhaust manifold, header pipe and a second Chev pickup truck muffler. At 2000 rpm, the brake horsepower was now 80 and the maximum torque was 210 pounds-feet, or 3.9 per cent and 4.5 per cent, respectively, above the stock engine. At 3500, the power was 120, an increase of 5.3 per cent. The "Corvette" cast iron exhaust manifold will fit any 235 or 261

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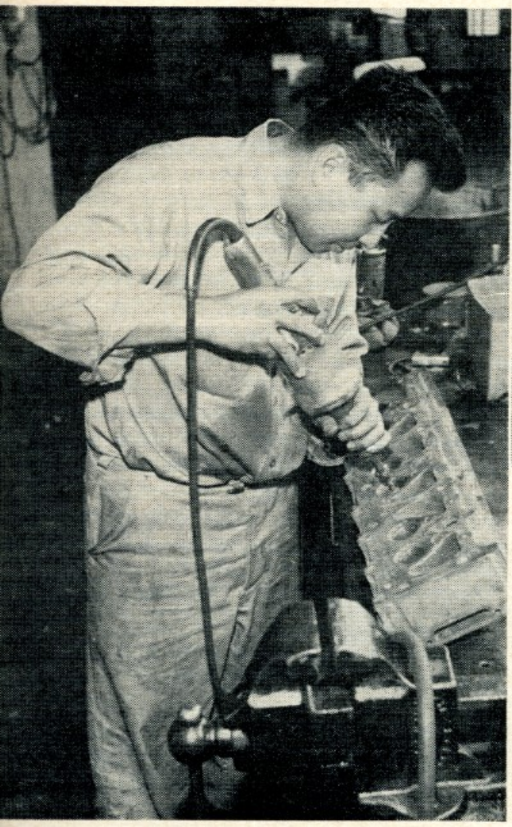
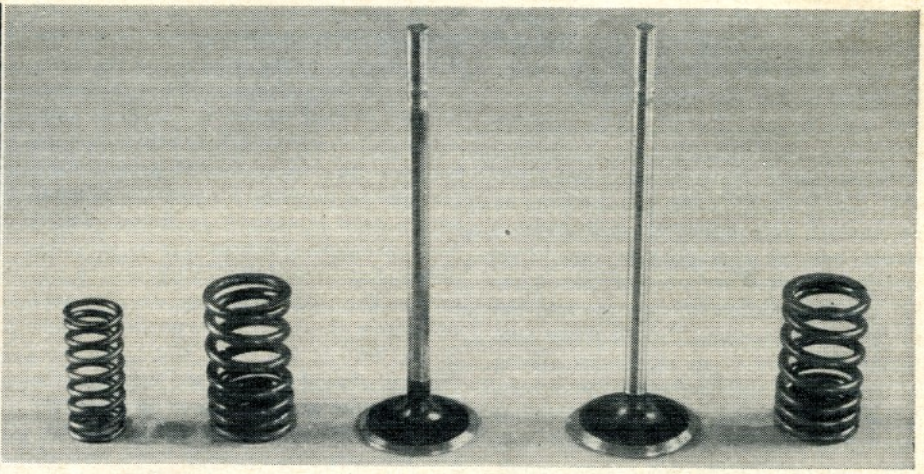
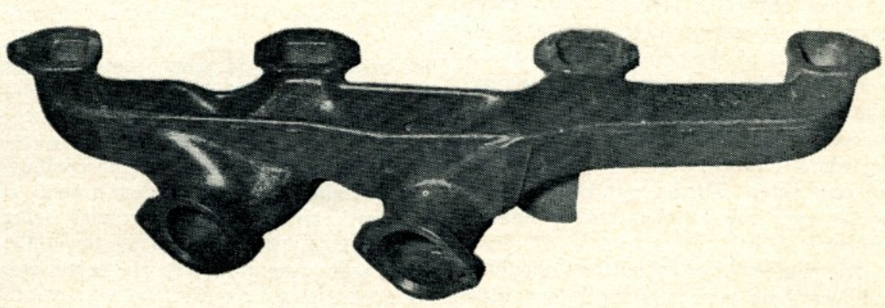


Sam works out the bumps in the "235" ports and combustion chambers with an electric grinder before seating the valves.





UPPER—Special springs and valve, left, compared to stock components. Combination of McGurk inner and outer springs raised pressure to 320 pounds with valve fully open. LOWER—Use of stock cast iron "Corvette" exhaust manifold improved power, torque.

		ENGINE RPM						
		2000	2500	3000	3500	4000	4500	5000
TEST NO. 1	B.H.P.	77	95	106	114	112	101	70
	TORQUE	201	199	186	170	144	118	73
TEST NO. 2	B.H.P.	80	98	112	120	119	110	84
	TORQUE	210	203	192	180	156	128	88
TEST NO. 3	B.H.P.	89.3	106	123	135	136	129	94
	TORQUE	223	220	215	202	177	151	99
TEST NO. 4	B.H.P.	91	110	131	145	147	145	110
	TORQUE	227	232	230	218	190	169	115
TEST NO. 5	B.H.P.	98	113	135	149	156	157	135
	TORQUE	238	237	236	223	204	182	142
TEST NO. 6	B.H.P.	89	109	130	148	164	168	160
	TORQUE	221	224	223	221	215	195	168
TEST NO. 7	B.H.P.	111	125	146	159	165	163	144
	TORQUE	265	262	255	238	216	190	151
TEST NO. 8	B.H.P.	114	121	148	168	178	177	169
	TORQUE	266	263	259	251	233	206	177
TEST NO. 9	B.H.P.	115	126	149	172	187	197	185
	TORQUE	268	264	261	257	245	229	194

(*Continued from preceding page*)
cubic inch Chev engine without alterations and costs but $18. The Chevrolet straight-through pickup truck mufflers (Chevrolet part number 3704250) cost $6.95 each.

For test number three, a McGurk dual intake manifold was installed, using two Stromberg BXOV-2 single-throat carburetors with 1 3/32 inch diameter venturis. This time, the brake horsepower was 89.3 at 2000 rpm and maximum torque was 223 pounds-feet at 2500 rpm. This represents a power increase of 16 per cent and a torque increase of 10.9 per cent over the stock engine. At 4000 rpm, the power was 136, or an 18.4 per cent increase over stock. Now the power curve assumed a flatter shape between 3000 and 4500 rpm. The main metering jets used in the carburetors were .058 of an inch, and the power jets were number 61's, both of which are stock. The Stromberg part number of the carburetors is 380269 and the price is $16.95 each. The McGurk dual intake manifold is an aluminum casting of the log type and has been quite successful in yielding power gains on all types of stock and modified Chev street engines. The two carburetors are approximately centered between the end and center ports. An exhaust pre-heat chamber is an integral part of the manifold and extends to the area directly below the carburetors. The connecting passage between the two carburetors is divided by a vertical baffle, which improves the flow of gases to the center port. The price of the manifold is $42 and includes the throttle linkage and fuel line kit.

Test number four called for a modified cylinder head and a compression ratio boost plus the foregoing additions. It was decided that the easiest method to obtain an increase in compression ratio would be to use the cylinder head from a 235 cubic inch Chev engine. A head from any 1953 or later 235 cubic inch engine is completely interchangeable with the "261" head and, when milled .030 of an inch, will yield the same compression ratio (7.85 to 1) as when the "261" head is milled .125 of an inch. Accordingly, the "235" head was milled and the ports were cleaned up and enlarged slightly. This latter operation was done on the intake ports by using a 1½ inch diameter shell reamer piloted in the valve guide bores and enlarging the valve pockets to the point where the ports change direction. Next, a 1 9/16 inch diameter piloted shell reamer was inserted halfway into the valve pockets and the ridges between the two reamed diameters were removed by blending the surfaces together with a hand grinder. A 70 degree piloted hand reamer was then used to increase the minor diameter of the valve seat to 1¾ inches. The 1½ inch reamer was also used to enlarge the port openings on the side of the head to the point where the ports changed direction. At the juncture, the hand grinder was again used to blend the surfaces together. The exhaust valve pockets were enlarged by using a 1⅜ inch diameter piloted shell reamer. The exhaust port openings were not enlarged appreciably, but were merely cleaned up with the grinder. The 70 degree hand reamer was used to enlarge the minor diameters of the exhaust seats to a consistent 1⅜ inches. Next, the "barnacles" were removed from the surfaces of the combustion chambers which were then ground to a smooth finish, the hand grinder being used for both operations. Finally, the intake valve seats were ground to 30 degrees and were narrowed from the top to a width of 1/16 of an inch by using a 10 degree valve seat grinding stone. Similarly, the exhaust valve seats were ground to an angle of 45 degrees and were also narrowed to a width of 1/16 of an inch.

When a Chevrolet six head is milled, it's necessary to recess the intake valve into the head an amount equal to that removed from the head to prevent interference between the valve and the piston. In this case, the head was milled .030 of an inch, so a like amount was removed from the top of the valve head which accomplished the same thing. Following this, each intake and exhaust valve was lapped to its individual seat, which left a visible guide for the next operation. In this, the maximum diameters of the valve heads were reduced on the valve refacer to just slightly more than that of the lapped surfaces, meaning 1.850 inches for the intakes and 1.470 for the exhausts. Then, each valve was undercut on a 15 degree angle from the lower edges of the lapped surfaces toward the stems and blended into the fillet radii beneath the heads. This work was also done on the valve refacer. Finally, the valve heads were polished with emery cloth and all sharp edges were removed. All of the head and valve work was done in McGurk's Inglewood, California, shop. The cost of porting the head and polishing the combustion chambers is $35, plus $12 for seating, lightening and assembling the valves and $9 for milling and recessing the valve seats.

Test number four was conducted with the reworked head and valves, the McGurk dual intake manifold and the "Corvette" exhaust manifold. Now, at 2000 rpm, the brake horsepower was up to 91, or 18.2 per cent over the stock engine. Maximum torque jumped to 232 pounds-feet at 2500 rpm, or 15.4 per cent over the stock engine. Maximum power was 147 at 4000 rpm, a gain of 29 per cent. Comparing these figures to those of test number three, it is evident that a gain in maximum power of 8.9 per cent and a gain of 4 per cent in maximum torque were obtained by a 16.3 per cent gain in compression ratio and by opening up the intake and exhaust ports, which permitted the engine to "breathe" more freely. While this latter factor undoubtedly contributed to the maximum power, the compression ratio increase was almost solely responsible for the gain in maximum torque, which is much more difficult to obtain without resorting to increases of piston displacement.

Test number five involves the use of a reground camshaft and a set of tubular pushrods. For anyone unfamiliar with the available types of the Chevrolet camshafts and valve lifters, it's very simple indeed to get badly loused up. The 1954 Chev Powerglide and all '55 models use cams made from cast alloy iron in conjunction with hardenable iron valve lifters. These materials are more-or-less compatible with one another and, as long as valve train loading is relatively light and lubrication of the lifter faces is satisfactory, wear of the cam lobes and lifter faces will not be too severe. This practice is fairly recent and is in direct contrast with earlier Chevs that used forged steel camshafts and chilled cast iron lifters. Worn cams and lifters were virtually unheard of before the introduction of cast iron cams and hardenable iron lifters. As a consequence, these latter materials, even when they are used together, are hardly suitable for modification. Worse yet, a hardenable iron lifter when used with a steel cam will usually last about five minutes before the lifter face is chewed beyond recognition. But the chilled iron lifter will work with either steel or iron cams.

SUGGESTED CLEARANCES FOR "261" CHEV ENGINE

MAIN BEARINGS	*.001 TO .003 OF AN INCH
CONNECTING ROD BEARINGS	*.001 TO .003 OF AN INCH
CAMSHAFT BEARINGS	.002 TO .004 OF AN INCH
PISTON SKIRT	**.0005 TO .0011 OF AN INCH
VALVE STEM-TO-GUIDE—INTAKE	.001 TO .0027 OF AN INCH
VALVE STEM-TO-GUIDE—EXHAUST	.003 TO .0047 OF AN INCH
VALVE LASH—HOT—STOCK CAM—INTAKE	***.006 OF AN INCH
VALVE LASH—HOT—STOCK CAM—EXHAUST	***.020 OF AN INCH

*ADJUSTED BY ADDITION OR REMOVAL OF SHIMS
**FOR STOCK PISTONS ONLY. FOR SPECIAL PISTONS INCREASE TO .006
***SET CLEARANCE AS SPECIFIED FOR REGROUND CAMS

While we are on the subject of cams and lifters, it is strongly advisable to replace hydraulic lifters with the "solid" or mechanical type, when a reground cam is used, for three good reasons. First, hydraulic lifters are quite a bit heavier than their mechanical counterparts and result in higher valve train loading, which necessitates stiffer valve springs to keep valve "float" at a reasonably high rpm. This is especially important to observe with the increased rates of valve acceleration found in most all reground cams. Second, Chev hydraulic lifters will usually "pump up" somewhat below 4000 rpm, which is responsible for short valve life because oil pressure within the lifters does not permit the valves to seat properly. Third, most cam regrinders include "clearance ramps" on each side of the cam lobe which gradually decrease and increase the valve "lash" or clearance before the valves actually start to open and after they are fully seated. Such ramps are neither necessary nor desirable when hydraulic lifters are used.

Therefore, for best results, a steel camshaft should always be used in conjunction with chilled iron mechanical lifters. For 1954-'55 passenger car Chev sixes, the part number for the steel cam is 3836489. The part number for the chilled iron mechanical lifters is 3660438 and these will fit "as is" in any 1941 through '55 Chev 235 and 261 cubic inch passenger car and truck engine. The part numbers for the steel camshafts of 1940 through '53 216 cubic inch engines vary because of timing and lift differences. The Chevrolet part number designating the chilled iron mechanical lifter for these 216 cubic inch engines is 839263. All Chev six chilled iron lifters may be identified at a glance by their plain lifter bodies, as compared to a single groove around the bodies of hardenable iron lifters. Also, cast iron and steel distributor shaft drive gears are available and must be compatible with the cam material. A steel distributor drive gear (Chevrolet part number 1865180) *must* be used with a steel cam. These can be identified by the plain shank on the gear. Conversely, a cast iron distributor drive gear *must* be used with a cast iron cam and can be identified by a single groove around the gear shank. The two types of gears and cams will not mix! These facts have been learned the hard way and to prevent others from following the same course, it is worth repeating that for best results, use a steel cam, chilled iron mechanical lifters and a steel distributor drive gear. The current prices for these parts are $13.50 for the cam, 96¢ each for the lifters and $1.57 for the gear.

Accordingly, the McGurk "261" was equipped with the correct lifters, distributor drive gear and a McGurk number 18 "¾" cam that was ground on a steel cam core. This cam is timed as follows: Intake opens 10 degrees before top center, closes 55 degrees after bottom center, duration 245 degrees, lift at valve .421 of an inch. Exhaust opens 72 degrees before bottom center, closes 32 degrees after top center, duration 284 degrees, lift at valve .410 of an inch. By experiments that took several years to complete, Frank has found that the exhaust timing of Chev sixes requires more duration than the intake. For this reason, all McGurk cams for Chevs are ground using separate intake and exhaust lobe configurations. The grinding charge for this cam is $35 exchange, or $45 outright. Additionally, a set of 12 McGurk tubular pushrods was installed. These are made from 5/16 of an inch O.D. chrome-moly steel tube with hardened steel ends and cost $12 per set. The valve clearances are .015 of an inch for the intakes and .016 of an inch for the exhausts and must be measured with a feeler gauge while the engine is hot and running.

RECOMMENDED TIGHTENING TORQUE VALUES FOR "261" CHEV ENGINE

MAIN BEARING CAP BOLTS	85 TO 90 LBS./FT.
CONNECTING ROD BEARING CAP BOLTS	35 TO 45 LBS./FT.
CYLINDER HEAD HOLD-DOWN BOLTS	90 TO 95 LBS./FT.
ROCKER ARM SUPPORT HOLD-DOWN CAPSCREWS	25 TO 30 LBS./FT.
TWO END INTAKE-EXHAUST MANIFOLD HOLD-DOWNS	25 TO 30 LBS./FT.
CENTER INTAKE-EXHAUST MANIFOLD HOLD-DOWNS	15 TO 20 LBS./FT.
SPARK PLUGS	20 TO 25 LBS./FT.

Test number five showed 98 brake horsepower at 2000 rpm, or 28.6 per cent over the stock engine and 157 at 4500 rpm, a gain of 36.8 per cent over stock. Maximum torque was now 238 pounds-feet at 2000 rpm, 18.3 per cent better than stock. Compared to test number four, the addition of the ¾ cam was responsible for a 6.1 per cent increase in maximum power and a 2.6 per cent gain in maximum torque, as well as boosting the peaking speed of the engine by 12.5 per cent.

Test number six was conducted for the specific purpose of proving a point to "Doubting Thomases." More times than not, an uninitiated amateur will purchase a reground camshaft that is much more frantic than necessary for his engine, figuring that if a "wild" cam is good, a "wilder" one is better and, too, the idea seems to be imbedded that he is getting more for his money. In either case, for a street engine nothing could be further from the truth. A McGurk number 92 "Super ¾" grind cam was installed for this test and was the only change. This cam is timed as follows: Intake opens 20 degrees before top center, closes 72 degrees after bottom center, duration 272

(*Continued on page 50*)

SOUP THAT CHEV!

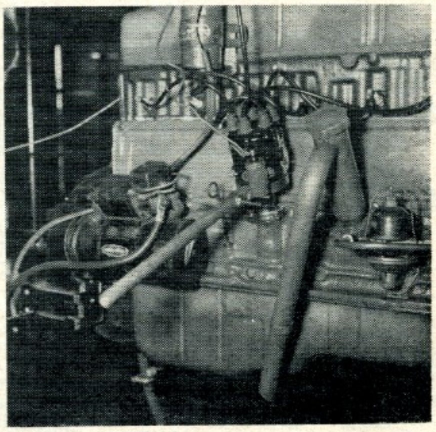
(Continued from page 19)

degrees, lift at valve .420 of an inch. Exhaust opens 74 degrees before bottom center, closes 36 degrees after top center, duration 290 degrees, lift at valve .429 of an inch. The specified "hot" valve clearances are .015 and .016 of an inch for the intakes and exhausts, respectively. The grinding charge for this cam is $40 exchange or $50 outright. At 2000 rpm, the brake horsepower was 89, a loss of 10.1 per cent, as compared to test number five. Maximum torque was 224 pounds-feet at 2500 rpm, a loss of 5.8 per cent. Maximum power was obtained at 4500 rpm and was 168, or a gain of 7.7 per cent. At every check point in the rpm scale below 4000, both power and torque were below test number five. From this, it's pretty obvious that the conservative number 18 "¾" cam offers better all-around performance, except at higher engine speeds, than the more radical grind. However, the degree of "wildness" of any cam is relative to the piston displacement of each cylinder and cannot be judged by the timing and lift figures by themselves, so for a larger engine the number 92 cam would cause a more favorable reaction.

The following three tests show that a really formidable Chev six street engine can be built with the aid of a boring bar. Any Chev six cylinder block, in which the water jacket cores are reasonably concentric with the cylinder bores, can stand ⅛ of an inch increase in bore diameter without fear of bore distortion or collapse in operation. The "261" engine is no exception. Accordingly, for test number seven, the engine was removed from the dyno and disassembled. All parts were closely examined for signs of excessive wear that could have occurred during the previous dyno runs, but there were none. The diameter of the cylinders was enlarged from 3¾ to 3⅞ inches, or ⅛ of an inch over the stock bore. McGurk "Powermaster" pistons were fitted to the new bore size with a skirt-to-cylinder wall clearance of .006 of an inch, measured at the bottom of the skirt at right angles to the piston pin axis. These pistons are three ring solid skirt cam ground slipper type that use the stock "261" piston pins, the bores of which are offset the same direction and amount as the stock pistons. The compression distance from the pin axis to the flat top is also the same as the stock "261." The two compression ring grooves are $\frac{3}{32}$ of an inch in width while the oil ring groove is $\frac{3}{16}$ of an inch in width. The top ring groove is deep, being machined for a "K-wall" ring. A balanced set of six pistons costs $60. The special Grant piston ring set costs $14.55.

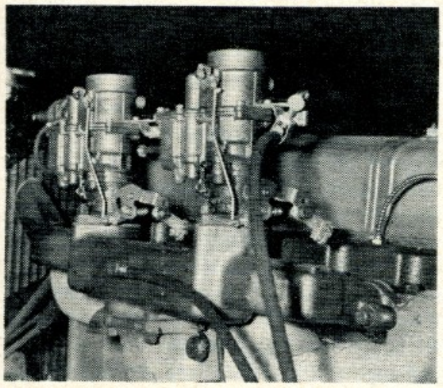
While the engine was in a state of disassembly, the balance of the crankshaft was checked and found to be acceptably close. With six cylinder inline engines, the crankshaft balance is checked independently of the connecting rod and piston assembly weights. However, the individual piston assemblies, including pistons, pins, rings and pin locks, should weigh exactly the same amount, within a one gram tolerance. Also, the crankpin ends of the connecting rods, which include the bearing halves, must be of equal weight and the same goes for the piston pin ends. When the connecting rod alignment was checked, the engine was buttoned up and reinstalled on the dyno.

With the 3⅞ inch bore and the $3\frac{15}{16}$ inch stroke, the piston displacement was up to 278 cubic inches, or a 6.5 per cent increase, which makes for a sizeable Chev six. The increase in bore size automatically boosted the compression ratio to 8.31 to 1, or 5.8 per cent. Test number seven was conducted after the engine had been "run in" for a couple of hours at about 2500 rpm in order to seat the new piston rings. The equipment for this test was the same as for test number five, with the exception of the displacement and compression ratio increases. This time, the brake horsepower was 111 at 2000 rpm and maximum torque was 265 pounds-feet at the same rpm. This represents gains of 44 per cent and 31.7 per cent in power and torque, respectively, when compared to the stock engine at the same speed. Comparing these figures to those of test number five, to see just how the displacement and compression ratio increases affected engine performance, we find that the power at 2000 rpm is up 13.3 per cent and maximum torque is up 11.3 per cent. An interesting point here is that the 6.5 per cent gain in displacement and the 5.8 per cent gain in compression ratio equals, when added together, 12.3 per cent, and the power and torque gains at 2000 rpm vary no more than one per cent either way from this figure, when the same equipment is used. Maximum power for this test was now 165 at 4000 rpm, or 44.7 per cent and 5.7 per cent above test numbers one and five, respectively.



Gas pipe "Johnson bar" clamped to ignition provided easy adjustment of advance.

The only change for test number eight was the installation of a McGurk number 82 "Competition" cam. After a short blast on the dyno, it was evident that there was a considerable amount of distress in the Chev valve train at engine speeds approaching 5000 rpm. This undesirable action necessitated changes in the valve springs and was brought about by the rather violent characteristics of the intake lobe which is timed as follows: Intake opens 22 degrees before top center, closes 62 degrees after bottom center, duration 264 degrees, lift at valve .429 of an inch. Although this cam has eight degrees less duration on the intake and only .009 of an inch more lift than the number 92 "Super ¾," the intake valve train is accelerated about 30 per cent faster, which



McGurk dual intake is exhaust-heated, uses two Stromberg BXOV-2 carburetors.

calls for some rather drastic valve spring pressures to eliminate valve "float." The exhaust timing is identical to the number 92 "Super ¾" cam used in test number six. The grinding charge for this cam is $45, or it may be purchased outright for $55. The specially made McGurk valve spring arrangement consists of an inner spring, a spring seat, located between the spring and the head for positioning the spring properly, special retainer washers and spacer washers. These parts come in kit form for six cylinders and may be used on any Chev and GMC six engine from 1937 through '55 and cost $13.50. In this case, a set of 12 specially made outer springs, which sell for $7, were used in conjunction with the inner spring kit to raise the valve spring pressures to 124 pounds with the valves seated and 320 pounds with the valves open, which is about 75 percent stiffer than the stock springs. *DO NOT* use these valve spring pressures on a cast iron cam! After the installation of the cam and springs, the valve clearance was set at .015 of an inch in the intakes and .016 of an inch on the exhausts with the engine hot and running.

While we are yakking about valve springs and pressures, it seems worth while to point out a very common error that is made during the assembly of a modified Chev, or, for that matter, any other engine. As previously mentioned, when a Chev six head is milled, it is necessary to recess the intake valves into the head an amount equal to that removed by milling to prevent interference between the valve and piston. For example, if the head were milled .100 of an inch, the intake valves must be seated .100 of an inch deeper into the head. This will raise the keeper grooves on the valve stems .100 of an inch further away from the valve spring seats. In order to compensate for this, it is absolutely essential that spacer washers be added between the valve spring seats and the head so that the valve springs will be the correct length when they are assembled in the head. The assembled length of all Chevrolet valve springs, both intake and exhaust, must be $1\frac{13}{16}$ inches. This dimension does not refer to the thickness of the keeper washers or valve spring seats, but only to the springs themselves. When McGurk special inner springs, seats and retainer washers are used, the assembled length of the inner springs must be ¼ of an inch less than the length of the outer springs, or $1\frac{9}{16}$ inches overall, due to a ⅛ of an inch step in both the spring seats and the retainer washers. Adhering to this rule will prevent valve "float" at medium-high engine speeds and will also prevent "coil binding" the springs due to an excessive number of spacer washers.

At 2000 rpm, test number eight showed 114 brake horsepower and the maximum of 266 pounds-feet of torque. Compared to test number one, this is a 48 per cent increase in power and a 32.3 per cent increase in maximum torque. When compared with test number seven, the more violent cam showed an increase of 2.7 per cent in power and a 0.38 per cent increase in torque at 2000 rpm, which hardly seems worth while in view of the sacrifice one must make at idle and at speeds below 2000 rpm. However, at 4000 rpm, the power was up to 178, or 56.2 per cent over the stock engine and 7.9 per cent over test number seven.

As pointed out earlier, there are those who enjoy driving a car with a more powerful engine, even at the expense of more ragged performance in the lower speed ranges. At this time, the McGurk "261" was definitely beginning to exhibit these tendencies and in test number nine, the last of this group, this point was even more strongly emphasized and the engine had, as far as we were concerned, reached the limit of "driveability" in a street machine at the conclusion of the last test.

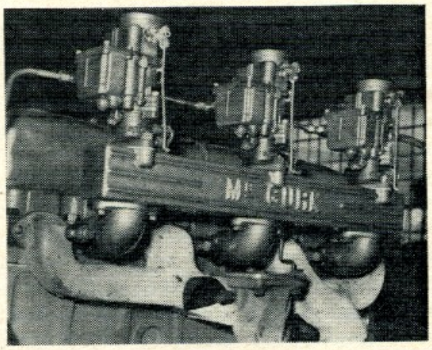
The only change for test number nine was the substitution of a McGurk three carburetor competition intake manifold for the previously used two carburetor installation. The two manifolds are similar only in that both are log type with a vertical baffle in the main passage between the carburetor mounting flanges. The three carburetor model is made to accept three equally spaced Stromberg BXOV-2's or similar downdraft carburetors with the same 1¼ inch SAE mounting flange. No provision is made in this manifold for exhaust heat to aid in keeping the mixture charge in a gaseous state. As a con-

(*Continued on next page*)

SOUP THAT CHEV!

(Continued from preceding page)

sequence and, as one might well expect with a "cold" manifold, engine performance and fuel economy are not of the highest order at the engine speeds usually encountered in city driving. However, this manifold does pay dividends at the other end of the rpm range where power gains are obtained due to increased volumetric efficiency, as we shall see. The price of the manifold is $43 and includes the necessary throttle linkage. Three



McGurk triple is similar to dual except it is "cold" type, no exhaust heat being used.

Stromberg BXOV-2's were used with .060 of an inch main metering jets and number 61 power jets.

At 2000 rpm, the brake horsepower and maximum torque were 115 and 268 pounds-feet, respectively. This represents a power gain of 49.5 per cent and a torque gain of 33.3 per cent over the stock engine. Compared to test number eight at the same engine speed, the gains are hardly worth calculating, but for the benefit of our exacting readers, an increase in power of 0.88 per cent and an increase of maximum torque of 0.78 per cent were realized. At 4500 rpm, the engine produced a solid 197 brake horsepower which, of course, puts a different slant on things. This figure is a whopping 73 per cent over the stock engine and 10.3 per cent over test number eight a sizeable amount for anyone's Chevrolet on gasoline. In fact, the engine produced at least 185 brake horsepower anywhere between 4000 and 5000 rpm, which shows a good degree of flexibility. The gain in power between this test and the previous one is due strictly to an increase in volumetric efficiency, as previously mentioned, and may be further defined as follows: About ⅓ the gain can be attributed to the improved "breathing" characteristics afforded by the addition of another carburetor. The remainder is due to the fact that no heat is applied to the mixture, which assures a denser charge reaching the combustion chamber and the maximum expansion ratio to the charge, once it enters the chamber and is ignited. It was our intention to use a stock "Corvette" three carburetor intake manifold during the dyno tests, but these manifolds and carburetors will not fit the later passenger cars without a considerable degree of butchery to the firewall supports, which seriously weakens the entire cowl structure, so this plan was abandoned. The "Corvette" manifold is an exhaust heated affair that utilizes three Carter side draft carburetors.

The "261" engine presents a degree of interchangeability with earlier Chevs that is almost too good to be true. For 1952 through '54 passenger cars, the front of the engine bolts to bosses that are integral with the "261" block. For passenger cars from 1937 through '51, the engine will accept the earlier front engine support plate (Chevrolet part number 3690511) once the clearance hole for the camshaft has been enlarged from 2¼ inches to 2⅜ inches in diameter. The back of the "261" block is identical with those from 1937 through '54 and the bell housings within this span will fit "as is." Any Chev passenger car flywheel from 1942 through '52 will fit the crankshaft flange without alterations and a flywheel of this type must be used in passenger car installations. It is recommended that a Rockford 4038G pressure plate and a Rockford 381742 clutch plate be used for passenger cars, which will fit any Chev standard transmission from 1937 through '54. For truck installations from 1937 through '55 the "261" flywheel, pressure plate and clutch plate may be used "as is," but for heavy duty installations, the pressure plate spring pressure should be increased by about 25 per cent, or a total of 1500 pounds. Additionally, a 1941 or later water pump, a 1937 or later generator and voltage regulator, a 1937 or later starter motor, a 1937 or later fuel pump and a 1940 or later crankshaft pulley will also fit the "261" without changes.

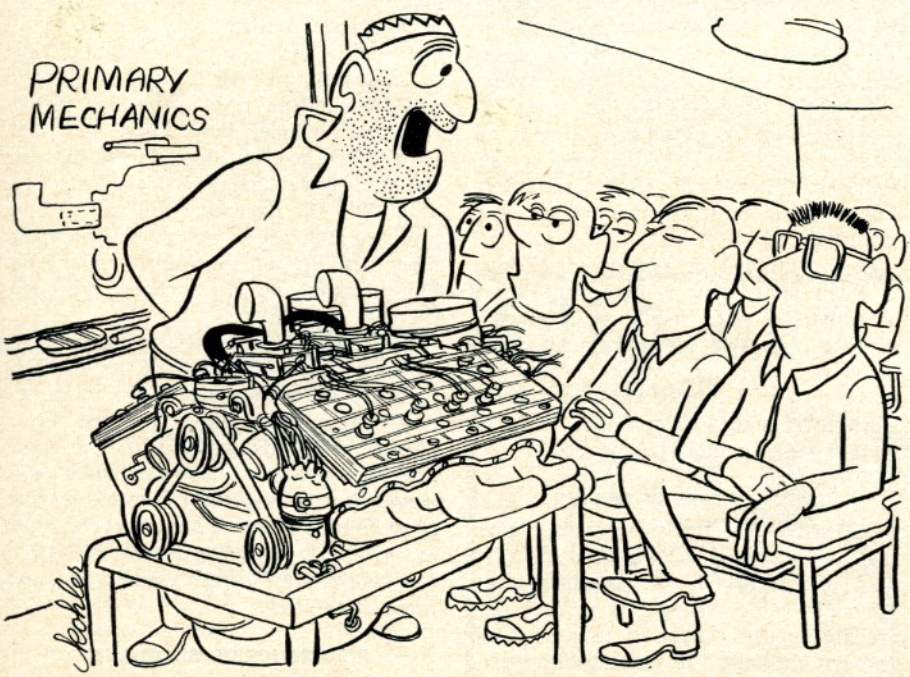
A '53 "Powerglide" or any '54 Chev oil pan will fit the "261" and will clear any 1937 through '54 passenger car or truck chassis components. A '53 "Powerglide" or any '54 Chev cylinder head will fit "as is." In line with this, it is recommended that a 1954 or later Chev rocker arm and shaft assembly be used. These rockers and shafts have been stiffened considerably and because of this, higher engine speeds are possible, in spite of the slight increase in rocker arm reciprocating weight. Also, the use of these parts results in a lot less valve gear racket. An ignition from any 1937 or later engine will fit the "261" but it is recommended that the automatic advance units be corrected to those of the 1954 "Powerglide," which are as follows: 0 crankshaft degrees advance at 600 rpm engine speed (distributor shaft speed of 300 rpm), 29 crankshaft degrees at 3500 rpm engine speed (14½ distributor degrees at a distributor shaft speed of 1750 rpm). The vacuum advance booster starts to operate at five inches of mercury and gives 17 additional crankshaft degrees at 10 inches of mercury. For those who are interested, a "261" engine may be purchased at Chevrolet parts dealers for the relatively low current price of $349.50, which includes all parts except the carburetor, fuel pump, starter motor, generator, ignition and fan. Incidentally, the "261" engine will completely interchange with a "Corvette" engine and will use all the "Corvette" accessories.

After the last test, the engine was removed from the dyno and installed in McGurk's '52 Chev ½ ton pickup truck. The purpose of this maneuver was to make a comparison between the engine dyno and McGurk's 300 horsepower Clayton chassis dyno. The truck was equipped with a standard transmission, 4.11 to 1 rear end gears and 700 x 15 rear tires. At 4500 rpm in second gear, the maximum road horsepower was 175, which showed a loss of only 12.5 per cent through the transmission and rear end, assuming that both dynos were of equal accuracy which, of course, is almost impossible to insure, but they were close enough to make this kind of comparison. Once on the road, the truck fairly well hauled, turning an average 0 to 60 mph time in about 7½ seconds. I say "about" because these runs were made in haste and with a slipping clutch. Unfortunately, time did not permit a complete series of acceleration runs nor the proposed drag strip trials. We did find time for a couple of standing start "bashes" beween McGurk's truck and my '54 Ford, which is no slouch in itself. Suffice it to say that McGurk's truck was the only Chev that pulled the Ford from a standstill, at least for the first few feet. There are no hard feelings, however; we still speak occasionally—but strictly in the line of duty.

Seriously, though, the performance of the modified "261" engine is exceptional by any standards, either on the dyno or in the chassis. In any one of the many combinations tried, the engine proved to be quite susceptible to modification, and with the typical ruggedness that characterizes Chevrolet products, it promises to deliver good performance and a long and trouble-free service life—provided, of course, that one recognizes and accepts its most serious limitation, which is, namely and to wit, that this engine will not turn a blue zillion rpm. This is due to the relatively heavy valve gear reciprocating weight, which applies to any Chev six engine. The overall length of both pushrods and rocker arms is quite high and, to obtain stiffness over these spans, there is no substitute for cross-sectional area, which means more iron has to be accelerated and decelerated each time a valve opens and closes. With stock valve springs and a mild cam, a top limit of 5000 rpm is advised. With the McGurk or other similar special valve springs, the engine should be kept below 5,500 rpm.

Actually, the modifications made to the "261" may be made to any Chev six engine from 1937 through '55. The results would be of a similar nature to those obtained with the "261," but proportionately lower due to the smaller potential piston displacement.

For the benefit of those who may harbor the fear that the new Chev V8's will outperform a well modified six, allow me to alleviate such frettings. McGurk has been fiddling for over a month with a new and completely stock '55 Chev V8 in an effort to raise the brake horsepower above 132. If this doesn't put the fire of enthusiasm back in the six-holer clan, nothing will. The old "Scatter Bolt Six" ain't dead yet—not by a long shot!



"This is an engine. See the pretty engine? It's an eight-cylinder engine. It's an eight-cylinder combustion engine . . ."