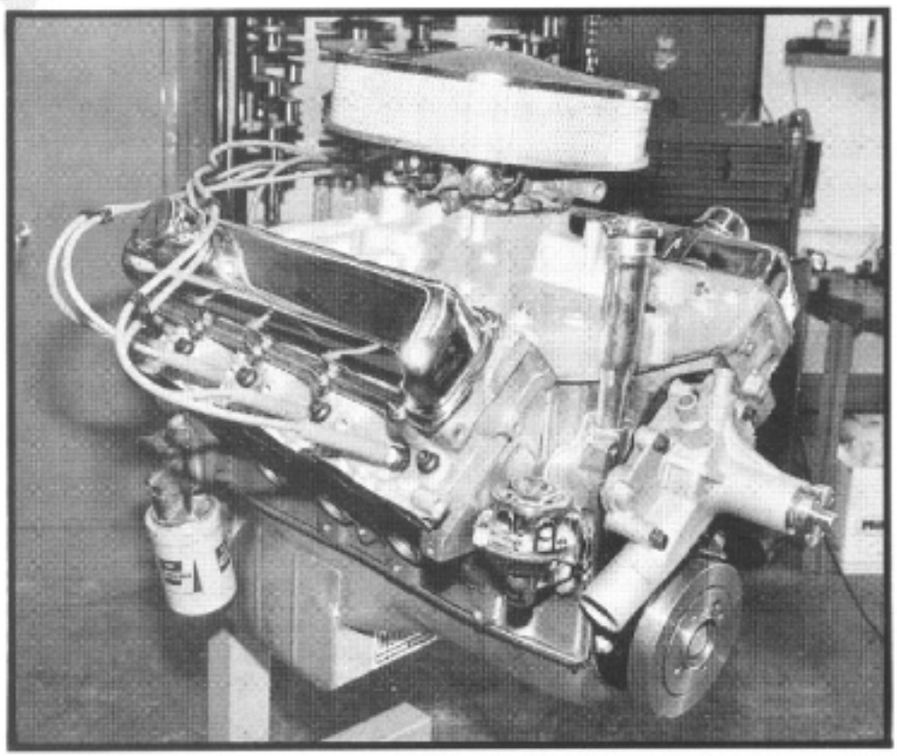
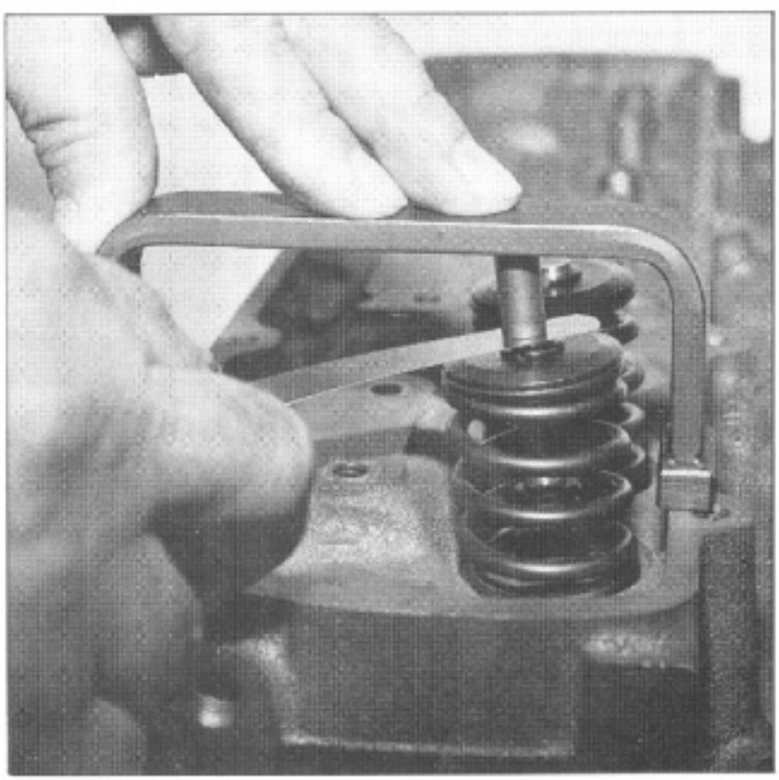
BULLETPROOF BIG BLOCKS

If Your 455 Olds Needs a Booster Shot, Then It's Time To Call The Doctor

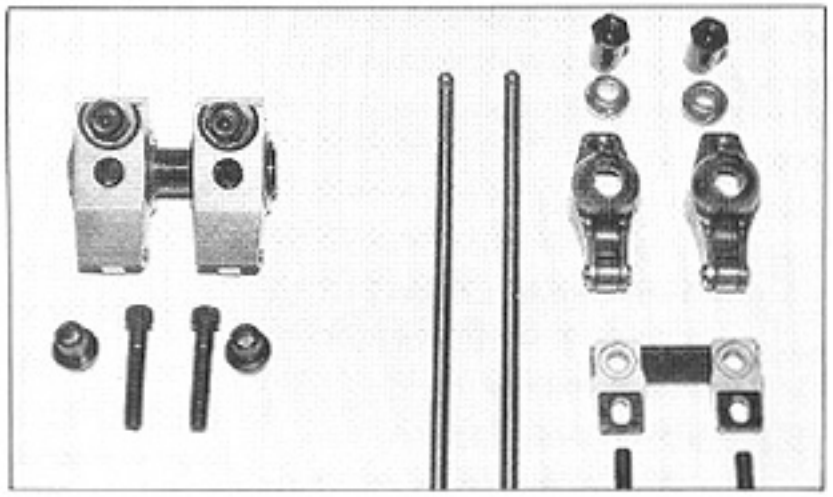


BY CHRIS HEMER

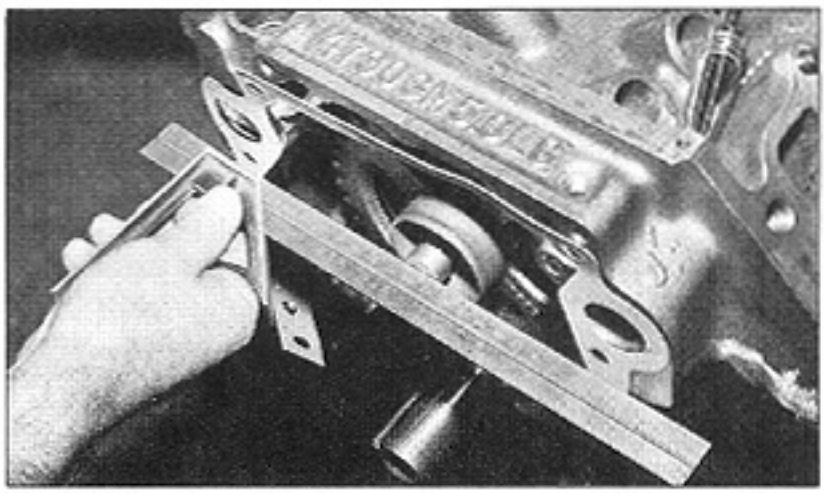
Although one of the unsung heroes from the General's battalion of big-block warriors, the 455 Oldsmobile has always been the performance alternative to those in the know. With a large displacement, big ports, light weight (compared to a big-block Chevy) and a relatively sturdy bottom end, the big Olds has found a home in everything from ski boats to race cars. But like every engine, the 455 has some inherent problems you should know about before attempting to modify one for the street or the track. With over 30 years experience designing, developing, building and racing Oldsmobile engines, we figured Joe Mondello would be just the right person to talk to—which is why we visited



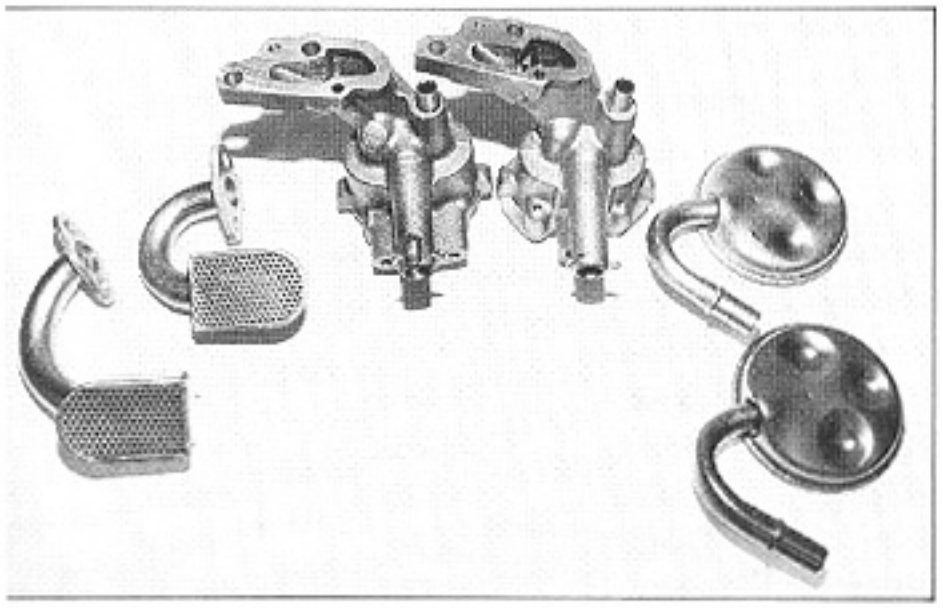
Valve stem height must be checked on all Oldsmobile heads once a valve job has been performed. This height can be checked through the use of a Mondello valve stem height gauge, #HG455. If you're running a camshaft with .500 lift or more, the guides must also be no longer than .690-inch from top guide to spring seat to avoid retainer to guide clearance problems.



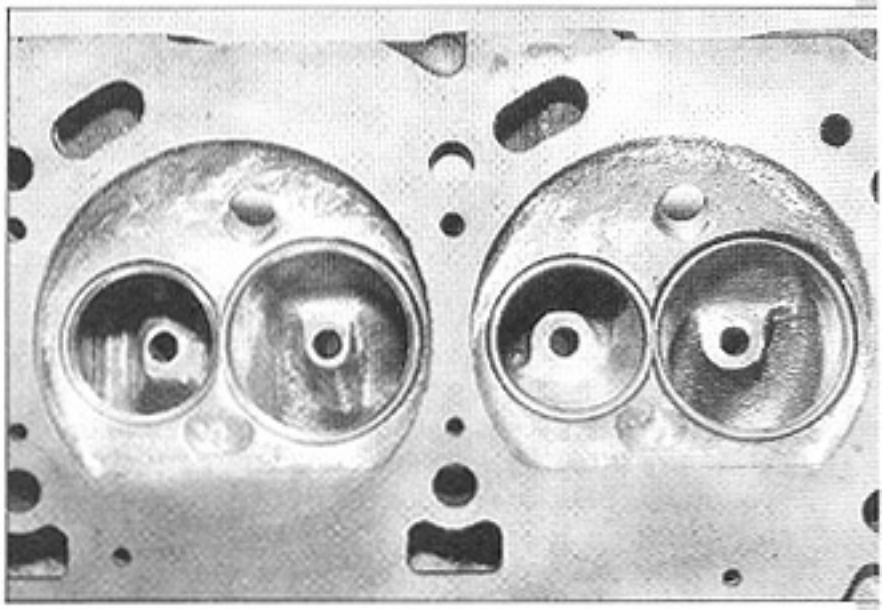
Whenever installing oversize valves in any Olds head, you must use an adjustable valvetrain, such as adjustable pushrods, (not shown) #7200 aluminum roller rockers, #SAR 455 steel roller tip rockers, or RA-280 stock-type rockers with #RP-295 adjustable rocker arm pivot kit. These pieces are also necessary to check proper lifter preload, which should be between .030 and .060-inch.



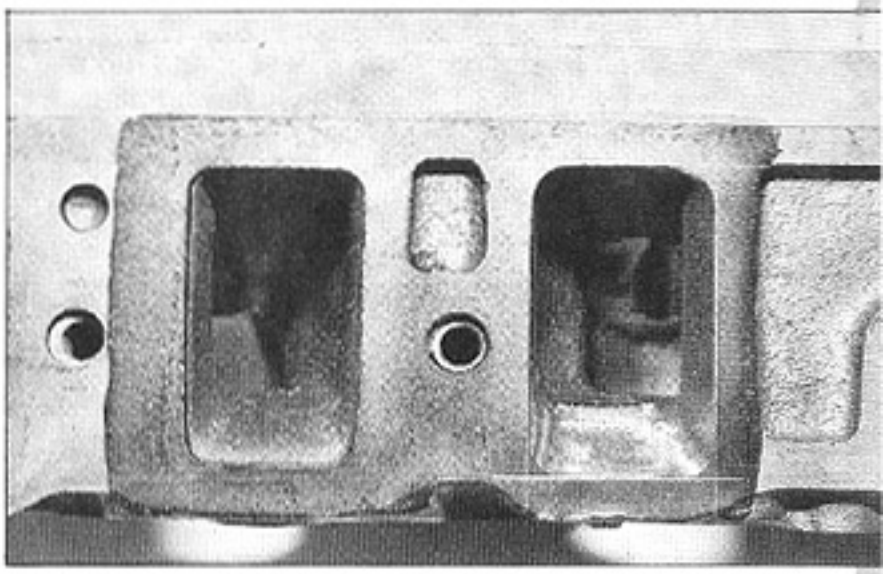
On all Olds engines, there is excessive movement of the cam, fore and aft. This creates excessive timing chain wear and incorrect ignition timing. The #CS-120 cam spacer and #TB-740 thrust bumper corrects this problem.



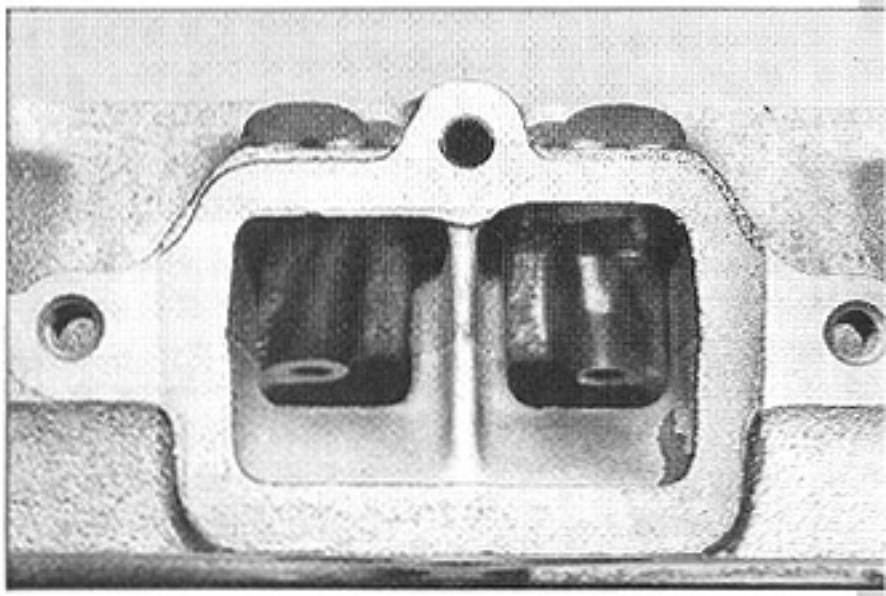
Mondello offers two pump and pickup systems. Left is the high-volume pump with pickups for the seven-quart street pan and eight-quart race pan; right is the street pump with pickups for stock pan and Toronado pan. Don't use the high-volume pump with the stock pan, because the pump will literally empty it at high rpm. Joe recommends the six-quart Toronado pan as an alternative to the more expensive seven-quart street pan, that is, if you can find it. Olds doesn't make it anymore, so you'll have to find yours at the salvage yard. Don't try using a diesel pan either; they only hold five quarts, not seven, which is a common misconception. The diesel engine has an engine oil cooler that holds two additional quarts, which is how the confusion started.



These two chambers have been prepared to show the difference between a street ported head, and a bracket ported head. The chamber on the left is for bracket racing, with extensive boul clean up, tear-dropped guide bosses, blended short side radiuses and chamber polishing. The street chamber features boul cleanup, and blended short side radiuses.



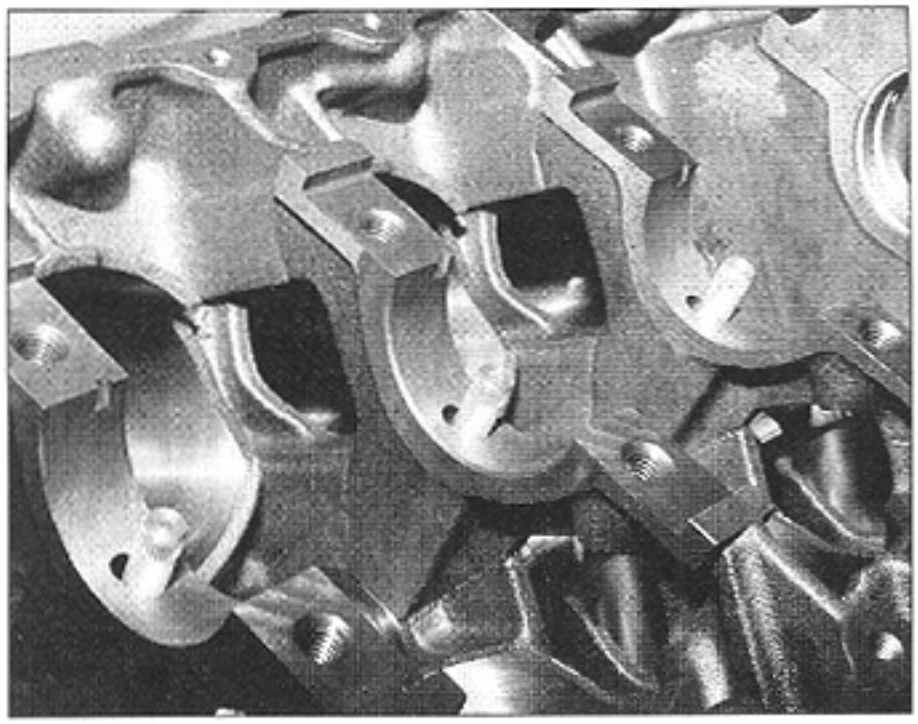
Joe recommends that the intake port roof on the bracket head be raised .150, match ported, and the pushrod side blended (right). Compare this port to the stocker.



The bracket exhaust port features a .175-inch raised roof, and porting that extends one inch into the port. The EGR bump has been removed, and the port itself has been widened .100-inch on each side. Make all the modifications inside the port, but do not widen the port at the flange, as you want as much gasket surface for the headers as possible. The best heads to use with these modifications are A,B,C,D and F, although all heads can benefit from these mods. All heads (except A) have 80-83cc chambers.

his shop in Van Nuys, California.

As you can imagine, Joe has built every Oldsmobile engine for every application, but the 455 is his specialty. If you're looking for a complete engine, he is confident in his claim that any one of the #396021F 455s, built in the years '68 to '76, will suffice for street or strip following his recommendations. Joe does have his favorites, however, which include block castings with the suffixes F, F0, F00, F1 and F2, and were built in the years '68-'70. These casting numbers can be found in the bellhousing area, below the rear cam bearing—so if you're searching for



All engines, street or strip, should use one of Mondello's oil restrictor kits, which fits into the stock main saddle oiling holes. This kit is shown on a 307 engine.

STREET ENGINE PARTS AND DESCRIPTIONS LIST

This engine can be run on pump gasoline, and has a compression ratio of 9.2:1. Using the following parts, it will make approximately 425 horsepower/500 foot-pounds of torque, will turn between 5500 and 6000rpm, and can be used with a stock converter and 3.42 gear.

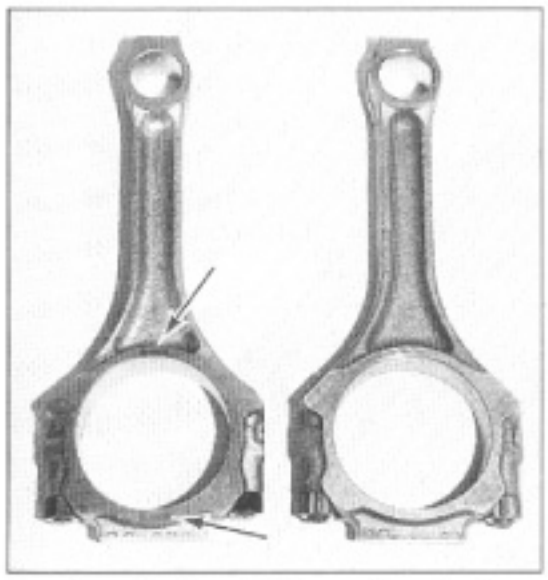
BLOCK: Any 455 Olds block, '68-'76 #396021F. Install #4040 Michigan 77 cam bearings and R-100 oil galley restrictors.
CRANK: Any nodular iron 455 crank, Magnafluxed, heat treated, shot-peened, oil holes chamfered.
MAIN CAPS: #ST 940 main studs and chrome-moly strap kit, recommended.
MAIN BEARINGS: #4030 Michigan 77, available in standard, .001, .010, .020 and .030 undersizes.
RODS: Any 455 rods, Magnafluxed, shotpeened, resized and fitted with # RB180 rod bolts.
ROD BEARINGS: #4010 Michigan 77, available in standard, .001, .002, .010, .020 and .030 undersizes.
OILING SYSTEM: OP 805 seven-quart street oil pan to be used with CT-850 full-length windage tray, WS-870 windage tray hardware kit, SP-756 oil pump and pickup. (This pan can only be used if running headers or rear exit manifolds.)
OIL PUMP DRIVE: #OD-260 chrome-moly oil pump driveshaft
GASKET SET: #OS 540, includes Neoprene rear main seal.
PISTONS: #2060, forged piston, rated at 9.25:1 with 81 cc head, .039 compressed Fel Pro gasket and .020 deck.
RINGS: #3070, Speed-Pro plasma moly rings.
CAM: #JM-20-22, hyd. .496 int./.512 exhaust lift, 266/274 degrees duration (gross) 226/230 (at .050) 110-degree lobe centers.
CAM SPACER: #CS 120, bronze cam spacer
CAM THRUST BUMPER: #TB740
LIFTERS: #HL 230, hydraulic
PUSHRODS: #PR 890, heavy-duty replacement pushrods
TIMING CHAIN & GEAR SET: #TR259 Cloyes True Roller, w/nine-position crank gear
HEADS: Unleaded: Casting numbers G,K,J. Leaded: B,C,D,E,F.
VALVES: OEM replacement, or street stainless, available in all sizes
SPRINGS: #SK-240-SSS, Complete spring kit for non-rotator heads; # SK-240-DSS Complete spring kit for heads with rotating retainers.
ROCKERS: #RA 280 stock-type rocker arms, shot peened and heat treated w/RP-295 adjustable rocker pivot kit, or #SAR 455 steel, roller-tip adjustable type
HEAD BOLTS: #HB-845, chrome-moly head bolts, complete w/ washers
VALLEY TRAY: #VT-580 (replaces bathtub)
INTAKE MANIFOLD: #2151, Edelbrock Performer
INTAKE MANIFOLD GASKET: IG-500 (replaces bathtub)
CARBURETOR: #QJ-800-2, 800cfm Quadrajet Carburetor
DISTRIBUTOR: #AD-455, blueprinted HEI distributor
BALANCER: #8080, new stock degreed harmonic balancer, factory balance*
FLEXPLATE: #8074-B, Billet steel inertia flexplate, factory balance*

BRACKET ENGINE PARTS AND DESCRIPTIONS LIST

This engine should be run on either straight racing fuel, or a mixture of pump and racing fuel, and has a compression ratio of 11:1. Using the following parts, it will make over 500 horsepower, 500 foot-pounds of torque, and will pull up to 6500rpm. This engine should be used with a 4.11 or lower gear, and a torque converter rated at 3000rpm of stall.

BLOCK: Any 455 Olds block, '68-'76 #396021F. Install #4040 Michigan 77 cam bearings and R-100 oil galley restrictors.
CRANK: Any nodular iron 455 crank, Magnafluxed, heat-treated, shot-peened, cross-drilled, oil holes chamfered.
MAIN CAPS: #ST 940 SOS main studs and chrome moly strap kit, required.
MAIN BEARINGS: #4035 Speed-Pro/Vandervell, available in standard, .010, and .020
RODS: Any 455 rods, Magnafluxed, beam-polished, side ground and notched, shotpeened, resized and fitted with #RB180 rod bolts.
ROD BEARINGS: #4015 Speed-Pro/Vandervell, available in standard, .010, and .020.
OILING SYSTEM: SS-820, complete eight-quart street oil pan to be used with high-volume oil pump, CT-850 full-length windage tray and WS-870 stand-off studs and hardware.
OIL PUMP DRIVE: #OD-260 chrome-moly oil pump driveshaft.
GASKET SET: #OS 540, includes Neoprene rear main seal.
PISTONS: #2260, Arias/Mondello forged flat-top pistons with valve notches, rated at 11:1 compression with 80cc head, 0.39 head gasket and .020 deck.
RINGS: #3070, Speed-Pro plasma moly rings.
CAM: JM-30 hyd., .560 int/.576 exhaust. 302/314 degrees of duration (gross) 252/263 degrees of duration at .050. 106-degree lobe centers.
CAM SPACER: #CS 120, bronze cam spacer.
CAM THRUST BUMPER: #TB740.
LIFTERS: #HL 230, hydraulic.
PUSHRODS: #PR-455-516 chrome-moly 5/16 oil-restricted pushrods.
TIMING CHAIN & GEAR SET: #TR259 Cloyes True Roller, w/nine position crank gear.
HEADS: Unleaded: Casting numbers G,K,J. Leaded: B,C,D,E,F.
VALVES: Stainless Post-Flow valves, 2.072 intake, 1.710 exhaust.
SPRINGS: #SK-240-SSS—complete spring kit for non-rotator heads; # SK-240-DSS—complete spring kit for heads with rotating retainers.
ROCKERS: #7200, aluminum roller tip rockers.
HEAD BOLTS: #HB-840 chrome-moly 12-point head bolts, complete w/washers.
VALLEY TRAY: #VT-580 (replaces bathtub).
INTAKE MANIFOLD: #2730 Edelbrock Torker.
INTAKE MANIFOLD GASKET: IG-500 (replaces bathtub).
CARBURETOR: #QJ-800-3, 800cfm Quadrajet, or 850cfm Holley Double Pump.
HEADERS: #3202 1⅞ primary tube inside-chassis Hooker Super Competition headers.
DISTRIBUTOR: #AD-455, blueprinted HEI distributor.
BALANCER: #8080, new stock degreed harmonic balancer, factory balance.*
FLEXPLATE: #8074-B, Billet steel inertia flexplate, factory balance.*

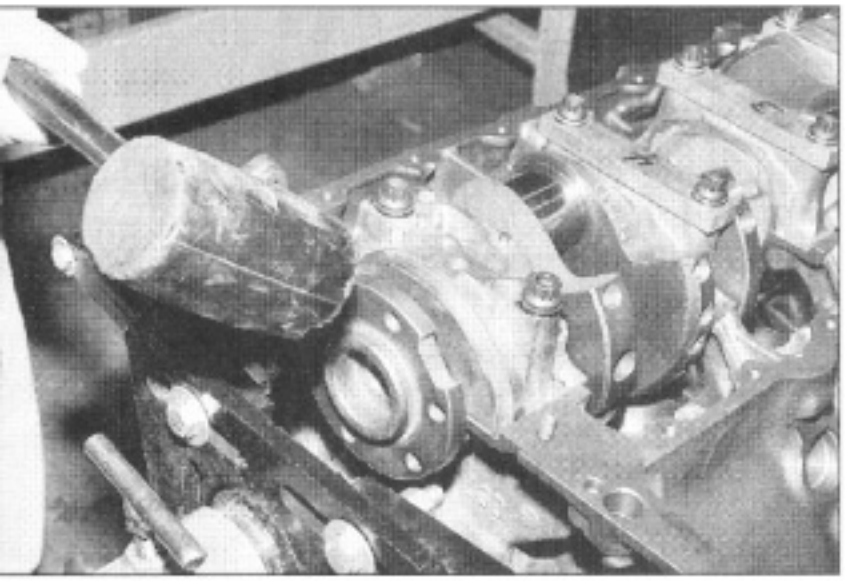
*Whenever changing any engine components away from stock, the entire reciprocating assembly must be rebalanced. When changing flexplate or balancer on previously balanced engine or factory engine, you must rebalance the balancer and/or flexplate to your old pieces. Mondello offers this service.



On a street engine, shotpeened, resized rods with #RB180 rod bolts (right) will be more than adequate. For bracket applications however, the rods should also be beam polished, side ground, and notched (arrow) for better side oiling of the rod.

one of these blocks at the junk yard, be prepared to drop a lot of transmissions out of a lot of Oldsmobiles before finding one. "They're not like small-block Chevys," says Joe. "You can't just read the number off the side of one and say, 'Oh good, this one has the four-bolt mains and the steel crank.' Oldsmobiles aren't that easy." Which is why he recommends you use whatever 455 you can get your hands on. What heads you run depends on your application. If you want to bolt on a set of heads and burn unleaded pump gas, then you should try to find a set of heads with the casting letters G, K or J. Castings A, B, C, D, E and F do not have the hardened seats necessary to run unleaded, but you may have hardened seats pressed into them if you can't find unleaded heads.

The following contains all the information you're going to need to build a bulletproof 455 for either a street or a bracket combination. In addition, you'll also find all the clearances for both, and torque specs so you can actually build an Olds 455 right out of this article! Neat, huh? PRR



Always tap the crankshaft front and rear with a large rubber hammer to center the thrust bearing. First, tighten the mains to 40 pounds, and tap them. Then 60; tap again, then 80; another tap, then final tighten. Note Mondello strap kit in place, on this 307 engine.

CLEARANCES:

PISTON-TO-WALL CLEARANCE: Arias/Mondello forged pistons—.008 to .009; TRW/Speed-Pro forged pistons—.003-.004
PISTON RING END GAP: .012 to .014 top, .010 to .012 second, .015 to .050 oil
CONNECTING ROD SIDE CLEARANCE: Street: .012-.016; Race: .018-.022
CONNECTING ROD BEARING: .0015-.0025
MAIN BEARING: .0015-.0025, Rear main—.003
CRANKSHAFT THRUST: .004-.010.

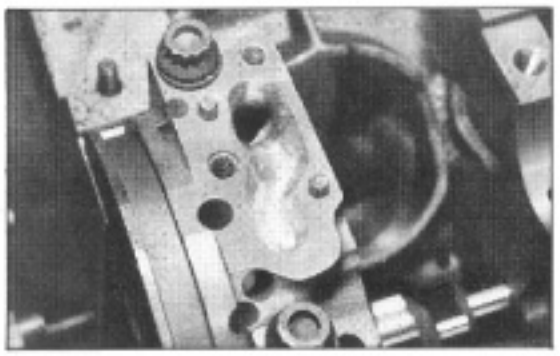
SPECIFICATIONS:

CONNECTING ROD LENGTH, CENTER-TO-CENTER: 6.735
STOCK BORE SIZE: 4.126
STOCK STROKE: 4.250
ROCKER ARM GEOMETRY: 1.6:1

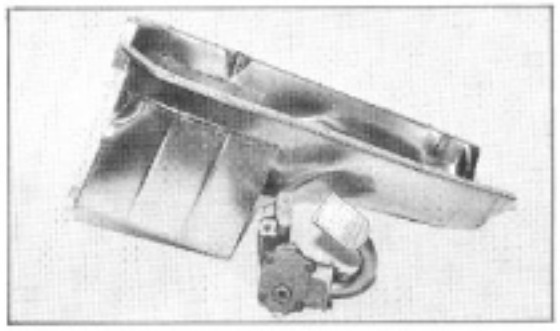
TORQUE VALUES:

Cylinder head bolts: 80-85 lbs., oiled
All rocker arm studs: 50 lbs., use Loctite
Main studs in block: 35 lbs., use Loctite
Intake manifold to head: 35-40 lbs., oiled
Exhaust manifold to head: 30 lbs.
Flywheel to crankshaft: 75-85 lbs., use Loctite
Main bearing cap bolts: 110-120 lbs.
Oil pump to block: 35 lbs., use Loctite
Oil filter adapter to block: 30 lbs.
Camshaft gear to camshaft: 65 lbs., use Loctite
Harmonic balancer bolt to crank: 180 lbs., use Loctite
Connecting rod bolts: 42 lbs., oiled
Valve rocker arm pivot bolt to head: 25 lbs.
All 7/16-inch studs, head and mains: 85 lbs.
All 1/2-inch studs, head and mains: 100 lbs.
All chrome-moly 3/8-inch rod bolts: 50 lbs., oiled

Mondello offers a variety of pistons for the 455, ranging from (left) the 11:1 race piston, (with 80cc chamber) 9.2:1 street piston, 9.5:1 street piston, 9:1 street piston, and 8.3:1 low compression piston.



The rear cap on both the street and bracket engines should be enlarged and polished like this one. It's a simple modification, but one that can help save some broken parts.



Mondello's race pan holds eight quarts, and is used with the high-volume pump and large pickup.