

The difference between a winning and losing car may be just poor planning. Here's a what and why checklist that should be consulted before commencing actual work.

WHETHER you build an engine for the street or for a hot A/Altered, there are many points to keep in mind, details that can change the engine from a loser into a winner. Here is a list of important trophy-winning items you *should* consider.

PLAN the engine as a unit. Decide ahead of time whether you want to bore, stroke, use a blower or a special cam. It will save a great deal of back tracking. Why order high high compression pistons when you may use a blower later? Engine purpose and the rpm range in which it will operate determine the choice of cam and carburetion.

KEEP NOTES on all modifications, no matter how small. If you run at a strip, note such items as weather, strip condition, traction, jetting and timing settings. The hotter the competition, the more important these details become. Notes save needless repeat runs.

BUILD TO LAST! You can win only if you cross the finish line. It may sound like a daring challenge to bore your block bigger than the next guy's. But if the cylinder walls

are too thin and buckle when the blower puts out pressure, you'll lose power. Some of the hottest Chryslers running in the dragster classes are *not* bored.

KEEP IT CLEAN . . . dirt will chew up bearings and cause needless engine failures. Pull out the Welch plugs at the ends of oil galleries and replace them with threaded plugs. When the engine is disassembled, rod out and clean all oil feed passages. After honing, wash out the cylinder walls with soap and water, then cover them with oil.

BORING, within the limits of the engine, will increase displacement. A cylinder must be honed after it's bored. Pistons should be on hand before boring is started, so that you can fit them selectively. Always break the edge at the top of the block after boring so that rings will go in without damage.

STROKING can bring a substantial increase in displacement and a reasonable cost. It is less touchy than using a blower, and will not push your engine into as high a class. Torque will increase fairly evenly

YOUR BASIC

throughout the operating range, as with boring. When installing a stroker crank and pistons, always allow extra room for running clearances.

CHECK THE FLATNESS of both the head and the block. Raised areas at the bolt holes in the block or a warped head can cause endless gasket failures.

LARGER CLEARANCES will cut down on friction horsepower used up in turning the engine. However, the larger the clearance, the less reserve "life" you have before rings and bearings give out. Many builders assemble an engine and break it in via actual highway use to loosen it up, then run trouble-free the rest of the season.

HIGHER COMPRESSION RATIOS increase combustion efficiency, but call for higher octane fuels. An engine should be tuned for the particular fuel you'll be using to utilize its maximum potential. Always equalize combustion chamber volumes of the cylinders. This takes into account the differences in piston-to-deck heights due to stack-up of tolerances in rod length, crank and piston dimensions. High compression pistons are a better method of raising compression than shaving the cylinder head. To avoid pre-ignition, remove all sharp edges from the combustion chamber.

BIGGER VALVES will help improve breathing. However, breathing improvement must take place all along the path from carburetion to the ports, or bigger valves will not help. For blower installations, go to larger exhaust valves. Normally-aspirated engines will benefit more from big intakes.

UNSHROUDING, or unpocketing, the valves calls for removing breathing obstructions caused by the

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cylinder heads or cylinder walls being too close to the valves. Alterations to the combustion chamber to relieve the gas flow will affect the compression ratio, since you will be increasing the volume of the chamber. Excessive reduction of squish area can make the engine perform worse, rather than better. It sometimes helps to relieve the cylinder, as long as the relief does not encroach on ring travel.

PORTING is an art. Carving out too much, or in the wrong places, can often decrease performance. You should match the ports at the junction of the head and intake and exhaust manifolds. Much improvement can be attained by matching the port sizes to each other. Check the effect of manifold changes on fuel distribution with an exhaust analyzer.

THE CAMSHAFT determines the timing of your engine. If your engine is designed for maximum torque and low rpm, the most desirable cam is one with moderate timing, high lift and rapid opening and closing. This gives the largest effective valve opening. High rpm's call for wilder timing, so that the valve is open to a greater extent by the time the piston starts on its intake or exhaust stroke. Later closing is needed to take advantage of the ram effect of gases in intake or exhaust passages. Blowers require cams with longer exhaust durations. Cam performance is designed for a particular engine rpm range. Peak horsepower at maximum revs is not necessarily the answer for a street engine. A cam must be matched to your driving needs.

MANIFOLDING AND CARBURETION are determined on the basis of the engine's air requirements. Consider the engine as a pump pulling air through the carburetors, or past the air metering system of a fuel

injection unit. If the displacement is large, volumetric efficiency good, and the intended rpm high, you can stand more carburetion. On the other hand, excess carburetion will cause a loss of low rpm torque, which will make the engine untractable for street use.

HOTTER IGNITION SYSTEMS are a must for maximum performance. A hot ignition system, by itself, will not increase power. It will only insure that each air-fuel mixture charge will be ignited. Magnetos offer an advantage for high rpm, but result in hard start difficulties unless coupled with battery-starting circuits. For the all-out machine a mag eliminates the need for a battery and generator. Numerous high quality optional systems are available.

MAGNAFLUXING of all major moving parts is good insurance against premature failure. It will reveal the small faults and cracks that initiate the complete break. Critical areas are at crankshaft fillets, connecting rod webs, piston skirts and main bearing webs.

BALANCING reduces engine-induced vibrations and helps prevent failures. Imbalance results in high stresses on the crank and main bearing webs. The higher the rpm at which you intend to operate, the more important good balance becomes. Always balance the clutch and flywheel with the engine.

USE LARGE PULLEYS on the generator and water pump if you expect very high rpm. Centrifugal force can throw out generator windings when a unit is overspeeded. Using a larger pulley cuts down on generator speed. Excessive speeds make the water pump cavitate shrply, reducing its efficiency. You can cut down on pump rpm and modify the impeller by cutting down on alternate blades, or bypassing some of the coolant

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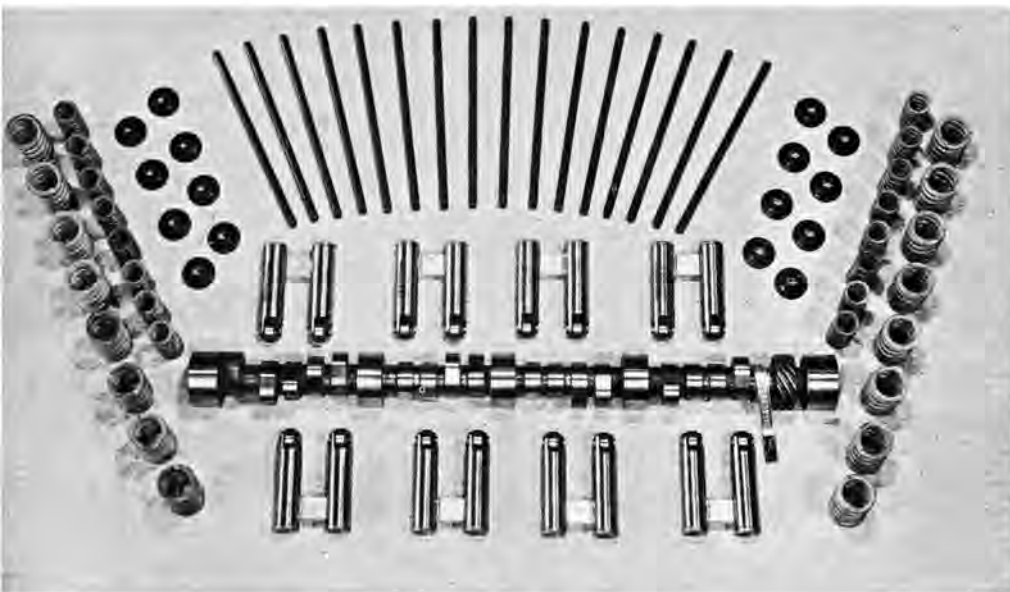
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A DYNAMOMETER is a major help in setting up an engine and checking performance of individual modifications. Dynamometer work is useless if you do not keep notes on the effect of each modification. Setting up advance curves and jetting the carburetor is best carried out on the dyno. Road testing is a good check.

BLOWERS do provide a massive power increase through most of the torque range. For best effect, a blower installation should be planned as part of an engine build-up rather than as an afterthought. You can then add low compression pistons or retain the stock pistons and unpocket the valves more generously. Manifolding, carburetion and ignition timing will be different. You should install a cam designed for blower operation or retain a milder stock cam. With a blower the exhaust valve, rather than the intake valve, should be enlarged. Yes, you *can* install a blower as a bolt-on item, but that does not uncork all of its possibilities.

FOLLOWING are the addresses of the two largest auto specialty houses in the country, which cater to the needs of enthusiasts and handle just about every name brand and quality make of souping equipment. Both offer merchandise catalogs either free or at a very nominal fee.

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