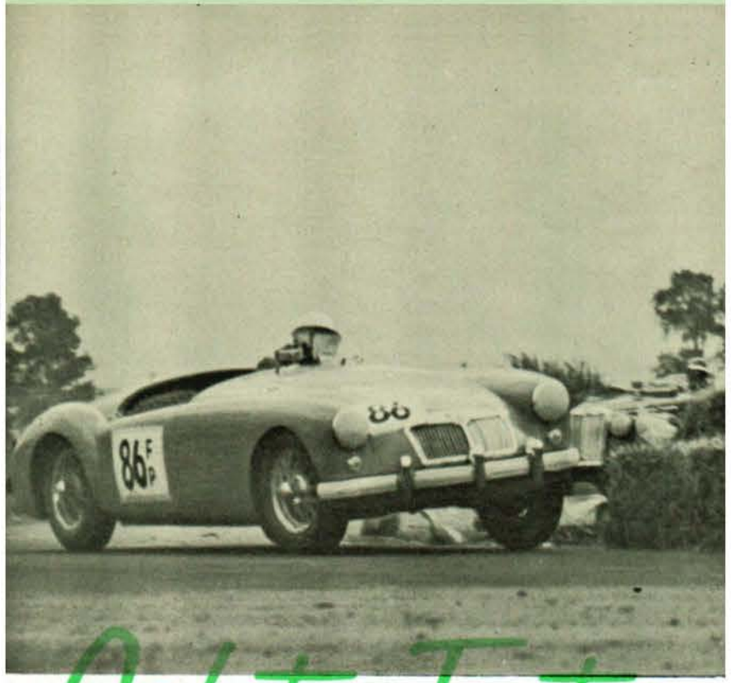


Safety Faster

by John Christy & Dennis May

DURING THE COURSE of the production run of the T series MG Midgets the men of Abingdon faced up to the fact that wherever MGs are run there'll be those who want more. They'll want MGs, to be sure, but what they want is *more* MG than the dealer is prepared to handle as a matter of course. Something else that was realized was that such people aren't always filled to the brim with bravado when it comes to experimentation — they'd rather bite off a small piece, savor it, then — maybe — come back for more. Thus the stage-by-stage form of soup-cooking that invariably is the form followed by Abingdon's sages.

Now — and at long last — the MG racing department, largely in the person of Mr. Sidney Enever, has counterparted the instructions that came with the late lamented XPAG and XPEG engines powering the T series. These formulae for fun have been released exclusively to SCI in advance of publication date of the factory book. The directions that follow omit nothing the factory included and indeed add some touches not in the book. One section, in fact, does *not* hold benefit of official blessing but more about that later. In the following, wherever special parts are needed they are listed by number as well as description.

One other point of note is that these directions apply to any BMC B-Type engine no matter what the application. The only proviso being that these directions begin with the engine in late series MGA tune — the others must be brought to that stage first insofar as equipment goes, with exception of course of the special parts. These can be purchased directly and substituted for the original items without concern for the MGA stage of tune.

The basic material is a rugged piece of work indeed and the bare block has, in the latest record car, held together while poking out just a tad less than 290 hairy-legged horses with a supercharger boost of 30 psi. Consequently what follows is not likely to shorten the life of the engine if properly done and properly stoked when installed. However, in their always-cautious way the makers have pointed out that super-tuning of this nature is grounds to void the new-car guarantee.

The major difference between the MGA and previous models is that the entire souping process can be accomplished with parts which can be ordered directly out of the MG parts catalogue by any dealer or distributor. As with earlier models the operation can be conducted in easy stages, four in number with two sub-options for special circumstances. Each of these has been thoroughly tested by the MG racing department under the personal direction of Sidney Enever. Each option was built, run on the dynamometer, torn down and then rebuilt and re-tested. Mr. Enever is not one for half-measures where his customers are concerned.

Before getting to the actual stages, for the benefit of those who would prefer to stay within the SCCA and CSCC specifications for production racing, let's cover just what can be done legitimately to get the best out of the engine. Since this engine is a mass production item, it is to be expected that variations in output will occur in the over-the-counter item. About the only thing that the racing clubs will allow is the smoothing off of these inequalities but you'll be surprised at the amount of difference such smoothing will make. The first point to tackle is the breathing. It should be, but often isn't, understood that intake and exhaust manifolds are seldom accurately matched to the ports involved. Either they are offset slightly or, due to casting tolerances, different in size between manifold and port. Competition rules specifically state that these may be matched up — just take care that the matching doesn't require a quarter-inch of "alignment" grinding. This, however, is only the first step. Tolerances in mass production also allow for variances in several other departments to points far different from those the design engineers intended.

Take valve springs for example. There are two per valve on late models. The outer spring should have an installed pressure of 50 lbs. and a compressed pressure of 105 lbs. The inner coils should have an installed rating of 30 lbs. and a compressed reading of 60. On newly run-in engines variances have been found running all the way down to compressed readings of 80 for outer units and 45 for the inner springs. Since the designed valve-bounce point is 6000 rpm with the full pressure operating it can readily be seen what such lowered pressures can do to top engine speed and valve life.

If you are competition bent and the production category is your *forte*, it would be best when having a 5000 mile valve-lap done to have the springs checked as well. If any are found wanting as to length and pressure it would be advisable to hie oneself down to the nearest MG parts emporium and check out a handful of springs, selecting carefully only those that produce top pressure. This procedure has been known to allow engine speeds higher even than the recommended 6000 rpm with no sign of valve float. Carrying this business one step further you can also grab a fistful of pushrods and find a set in which each piece is the same weight as the other seven. With the cast cams now being used variations in timing aren't as frequent as they once were but if you're really serious about this production competition it might pay to check and if necessary give the stick a touch or two to bring it dead on. Each of these little things helps — not much individually, true, but in the aggregate they can amount to the difference between also-ran and prize-taking.

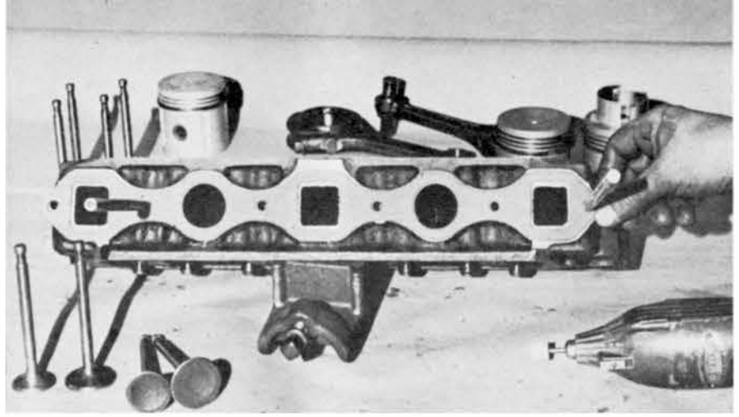
The one thing not pointed out above but vital in the foregoing and an absolute must in what is to follow if the last penny's worth is to be extracted from each operation, is static and dynamic balancing of crank, rods, pistons and the flywheel-clutch assembly. A four-barrel engine is not the smoothest mechanism in the world and anything that can be done to make it smoother will pay off both in power and in service life with a plus factor in increased useable rpm. If you cannot have this done in your area or the size of the working budget won't allow it, you can do without and the engine won't come unsoldered but the man who *has* had it done will, all other factors being equal, do you when the chips are down in competition.

Now let's get down to the business at hand — that of extracting more horses than originally intended for this particular stable.

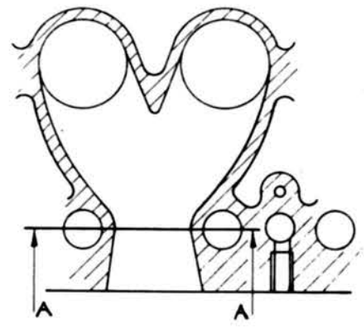
STAGE 1

This operation is the mildest form of hop-up but is basic to all the steps that follow. Some of it has been done on late engines from #17152 at least as far as general dimensions are concerned but even these can stand a touch up with the polishing stone to take care of production tolerances. It is designed to take partial care of the prime gripe of every knowledgeable speedcrafter who has ever taken a good long look at this engine — the complaint that the intake ports are not only siamesed but that each port is smaller in area than just one of the two intake valves it serves.

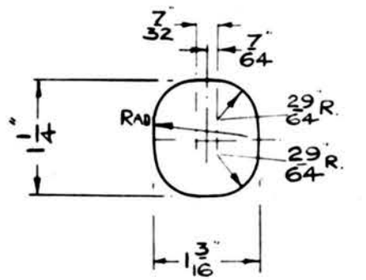
Inspection of the ports of the MGA head will show that they are tapered inward for a distance of about one inch at which point they widen out into a large chamber feeding two intake valves. The point at which the port is narrowest is the point of attack. This narrow throat can be enlarged to 1-3/16 inches in width and 1¼ inches in height. You can probably increase each dimension by 1/32 if you are braver than Dick Tracy but take care! The reason for the narrowing is that two water passages run vertically alongside each intake port — you're not drilling wells, so be conservative with the grinder. Radii of the corners of this passage are also large, being 29/64 of an inch at each corner. The factory suggests that a metal template be cut to those dimensions and attached to a long bolt. In this way the port can be ground to a point just allowing this template to pass through.



Misalignment is present in any production engine. Exhaust ports may be cut out to align with gasket. Intake ports are ground as shown in diagram (below).



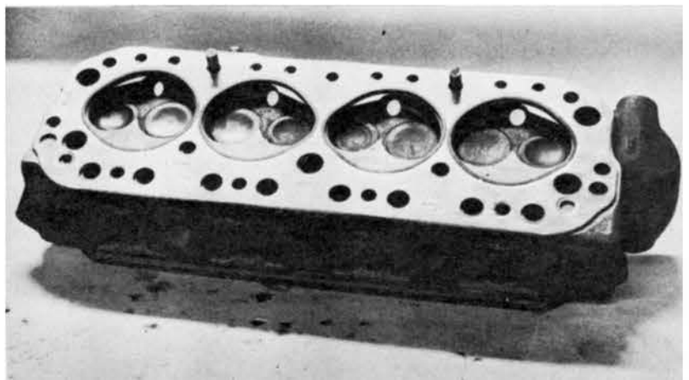
A template should be made to the above diagram to indicate proper port size.

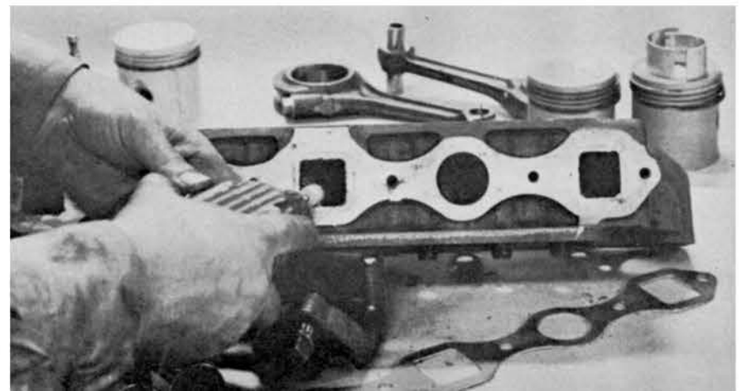


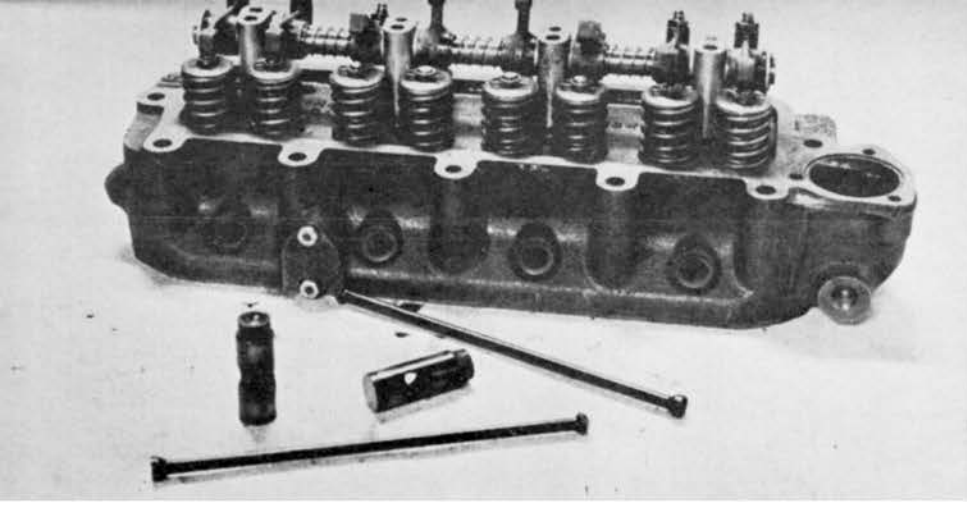
SECTION THROUGH INLET PORT ON 'A-A'

The dimensions given for the template apply to the area at line AA. Care is essential here since water passages are placed very close to narrow portion.

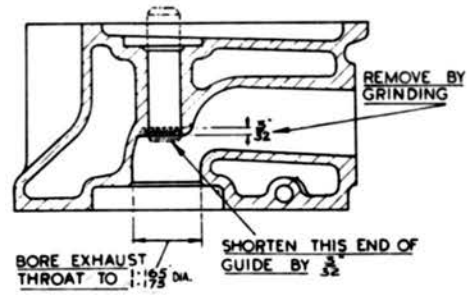
MGA head with gasket shows why combustion chambers should not be carved. Any reshaping would affect gasket sealing. At right, diagram shows the point at which radius must be ground to avoid hot spot and to allow fitting of special pistons.







B-Type BMC head is a sturdy, solid item and quite free of tendency to warp. Valve gear is equally rugged and unbreakable although valve springs are short.



Exhaust throat and valve guide should be altered on early engines as shown.

Lightly grind and polish the entire manifold and port system or all that you can reach but be careful not to alter the shape of the passages other than described above. Do not change the shape of the valve throats except on engines prior to #4045 in which the exhaust throat should be bored to 1.175 of an inch and the valve guide shortened 3/32 of an inch. Later engines already have this modification.

The heart shaped combustion chamber is the final point of attack in this stage insofar as chopping metal goes except for a final matching of ports to manifolds. You will note that the combustion chamber peaks between the valves and in many engines this may come to a sharp point while in others it will be somewhat rounded. If this is as far as you intend to go with the engine grind this to a 1/8 of an inch radius. If you intend to go further or there is a possibility you might succumb later to power-hunger, grind it to a 3/16-inch radius — this last to make room for a piece of equipment about which we will talk later. The chambers are already pretty well finished by the factory but they can stand a careful polishing, being careful not to grind metal away since all you can do is lose compression thereby. Any enlargement around the walls might also impair the gas seal.

Finally, if you live sufficiently close to sea level you can try the slightly richer SU carburetor needles marked C.C. The net result will give 75 bhp at 5750 rpm and if all the balancing and selective fitting of valve gear described earlier is done you might just pick up a bit more. The factory says 75, though, and they own the dyno.

STAGE 2

This one is strictly for low and mid range rpm charge, and in fact does less than nothing at the top end except for cutting back peak speed. The idea is to gain two or three bhp at the middle range (around 3000 rpm) and it might be useful for dragging, gymkhanas and stump-pulling contests. The effect is achieved by a switch to a cam with some of the characteristics of a tractor layout, at least on paper, coupled with the procedures as outlined in Stage 1 and a new ignition.

The cam is listed as part #1.H. 603 (which is *not* a competition part number) and its characteristics are as follows: Intake opens 5° BTDC and closes 45° ABDC, exhaust opens 40° BBDC and closes 10° ATDC. Valve lift is .322 of an inch and tappet setting is .015 of an inch.

The ignition recommended by the factory for this dragster is part #1.H. 1036. The standard igniter can be used if finances prohibit but the replacement item has an advance curve tailored to go with the 603 cam and the valve characteristics it produces. Setting on this ignition is four degrees before top dead center.

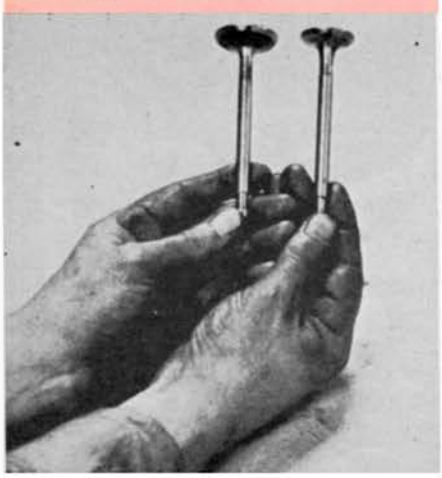
For additional urge this stage has a sub-option guaranteed to make other MGA owners extremely envious at least until you hit about 4500 rpm. You will note that unlike the recommendations for the XPAG and XPEG engines no head milling has been mentioned. The reason is simple — it's not necessary. The stock MGA pistons come with concave heads with a depression cavity of 4.85 cc. The factory has very obligingly built a set of pistons without this cavity and installation of these will raise the compression ratio from the stock 8.3 to 1 up to a respectable 9 to 1. These are listed as part #1.H. 1078 and come complete with rings and wristpins.

This stage if carried through to the compression boost should give about the same top end as the stock product and at the same time give a healthy boot in the back at normal cruising speeds — ideal for the stop-light grand prix. It will also make things very tough for tech inspectors at production races, particularly those held on tight courses.

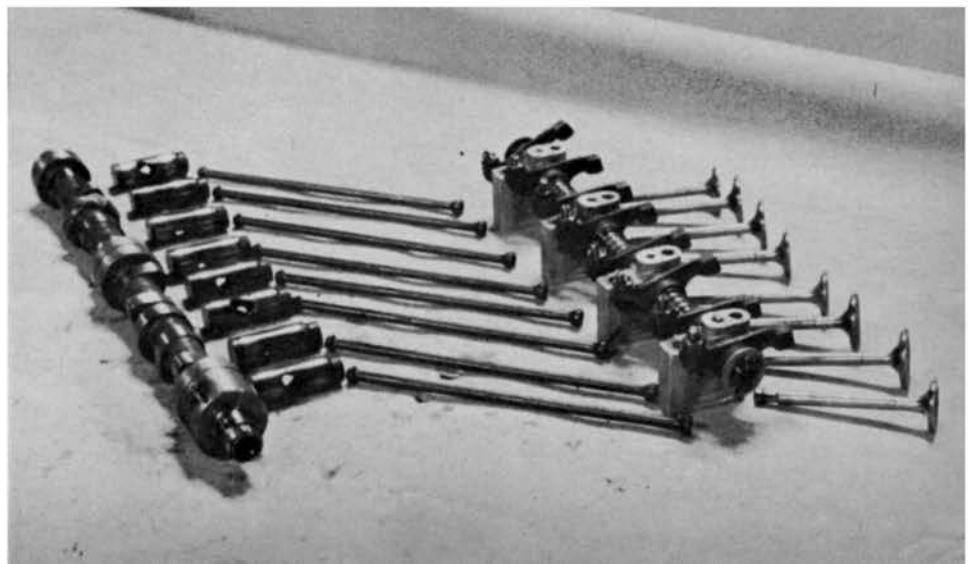
STAGE 3

This one is so simple that it barely needs mentioning, aiming only to produce more

MGA valves are meaty items that can take a good amount of cutting down.



Here is where care pays off. Select all valve gear so that each component matches its counterpart in weight, using the lightest pieces as criteria.



power at the top end and make for a general improvement over the whole range. First, carry out the Stage 1 directions as described. Then install the flat-top 1.H. 1078 pistons as described in the latter part of Stage 2. This requires premium fuel and a switch to Champion N-5 plugs for street use and N-3 plugs for racing or for continuous high speed driving. Use the standard igniter and keep the setting at four degrees BTDC. The C.C. carburetor needles are prescribed in place of the stock G.S. needles. According to how well the Stage 1 directions and the selective fitting have been carried out the engine should now deliver between 78 and 80 bhp at 6000 rpm with something extra in hand if the valves don't float.

STAGE 4

This with its sub-option is the big step — as close as the factory will allow to full race, at least officially.

The start is as always with the Stage 1 operation and the rest of the rites that should precede it. Then make sure your corner gas station has super-premium 100-plus octane fuel because you're going to need it if the engine isn't to sound like a handful of dry peas in a coffee can.

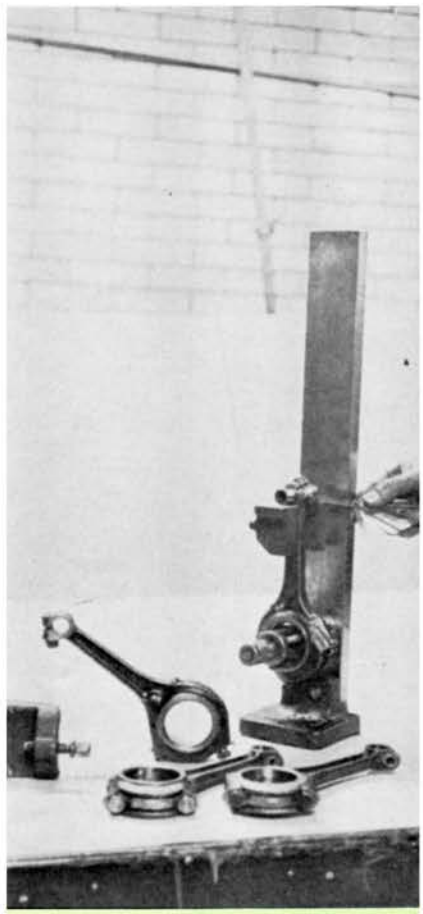
After solving the above, order a set of pistons, part #1.H. 1108 which will give the engine a compression ratio of 10 to 1. These have raised domes and necessitate the chamfering of the combusition space divider as described in Stage 1 to a radius of 3/16 of an inch. These pistons have floating wristpins so a special set of connecting rods will also have to be purchased. These come in matched sets, one set numbered AEH 431 for cylinders two and four and the other set numbered AEH 433 for cylinders one and three. *Do not mix them up!* The pistons are shaped to fit the combustion space and will only fit with the sloping face *toward* the spark plug. With the pistons installed, put a small roll of plasticine or putty on each piston and install the head temporarily; then turn the engine over by hand for one complete revolution. Remove the head and measure the clearance between the piston and the combustion space divider as indicated by the clay on the piston. If the clearance is 1/16 of an inch you're in good shape, otherwise grind enough more off the divider to make up the clearance.

Before installing the pistons it might be well to observe a point of caution. A compression ratio of 10 to 1 on this block is quite a squeeze and it's best to be sure things are going to hold. To really be sure, remove all the studs and smear lapping compound on the head or the block and then work the head over the block to mate-lap the surfaces to a perfect fit. Ordinary silver (aluminum) paint makes the best gasket sealer. After final assembly be sure to follow the MG company's directions for torquing down the head. This is one operation where you must beg, borrow or otherwise acquire one very necessary tool — a torque wrench. No one can guess an accurate torque setting with a power-bar and Mr. Enever and company are very specific. Their prescription is 50 lb-ft, no more and *no less.*

As of this point you should have 86 bhp on tap at 6000 rpm but if the purse can stand it, this isn't the end, although it is about as far as one would want to go if the car is to be used essentially on the public thoroughfares.

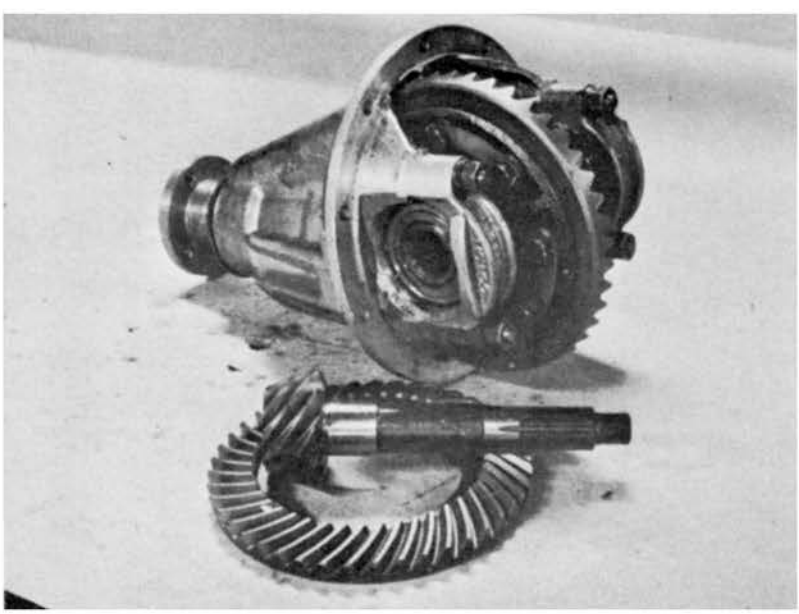
Still within the area of Stage 4 is one more shot. By this time more carburetion is indicated and here we go to 1¾ inch SU carburetors. The part number for these is AUC 780 and they demand a special manifold which for the MGA *is* in the catalogue, numbered AEH 200. This last is still a production item and needs the polishing treatment described in Stage 1. The AUC carburetors are fitted with .100

(Continued on page 54)



Any and all connecting rods, whether new, used or otherwise should be carefully aligned before use and after a balance job if the engine is to stay in one piece under added racing stress.

Gears can be set up as semi-quick-change units by pre-assembling the set in the carrier. This allows the gear swapping to be done in unit merely by dropping drive shaft and half-pulling the axle shafts to allow removal.



Stock pistons have concave crowns as shown at right. Flat top pistons are intermediate at 9 to 1. A second set not shown, raises compression to 10/1.

MGA

(Continued from page 25)

jets and K.W. needles. If richer needles are indicated use R.F. and if leaner operation is wanted K.W. 1 needles will do the job.

The big jugs should be mounted with neoprene gaskets and double-coil spring washers under the nuts, which should be safety wired. The gasket is also a catalogue issue piece bearing the designation AHH 5791. No air cleaners are supplied with these and it's unlikely they'll be wanted but if they are send the carb number to any large U.S. speed shop and they will probably be able to supply the cleaners. This final operation in the Abingdon stable is worth 88 bhp at 6000 rpm.

STAGE 5

The MG people do not list this stage but from certain catalogued parts, a bit of experience and items available from some of the better knotfarms in the U.S. it appears that there are still more horses that can be fitted under the MGA hood. This last series is only for the strong of heart and experiment-minded. It has not, repeat, NOT, been checked out on the Abingdon dyno and has no official blessings from Mr. Enever. Let's explore the possibilities anyway.

First let's take a close look at the catalogue. There we find part number 1H 1025 which is described as a hard-face Bright Ray exhaust valve. H-m-m-m. A little farther down the list are part numbers 1H 1111 and 1H 1112. These are heavy-duty valve springs, inners and outers respectively. Getting interested? There's more — an oil cooler kit listed as part number ARH 0088. Abingdon says that the special valve springs will raise the point of valve bounce to 6400 rpm but the company won't admit to more power — just sustained power. The other items are interesting chiefly from the point of view of keeping the thing together at continued high speeds.

This being the case maybe we can rifle the till just a little further. Let's look at that cam for a bit. The hottest cam available from the parts bin is the one which comes stock with the car. This has a .357-inch lift and a 252 degree duration on both intake and exhaust. While we know that not much more lift can be tolerated, we also know that American cam grinders don't consider anything under 270 degrees much in the way of duration unless valve acceleration is very rapid which it isn't in this case. Several of the better cam grinders have MGA grinds worked out and others will work out and tailor a cam to your needs. Among the former is Ed Iskenderian and among the latter are Ed Winfield and Racer Brown.

There is probably a very good series of reasons why MG didn't make a hotter cam available, most of which center around the awful exhaust layout and a time element since they've been busy with other things. We'll sympathize over the time problem and go on to the exhaust.

The problem here is that the center two exhaust valves feed into a siamesed chamber and port. However the outlet is pretty robust and we might even be able to cheat about 1/16 of an inch in size. This way we can treat that port the same as we used to do with the center two on the earlier block, running that into a balance box at a point just under the fire wall. The outer two are run together and thence to the balance box. True, the results won't be quite as good as the same ideas applied to a four-port but it'll be one big improvement over the stock manifolding. Any good header system would.

Alright — the factory says 6400 rmp can be had with the special valve springs and stock valves. That fact has been tested. We also know that any lightening of the valve train will pay off in a raised float point. That too has been proven for years. As a starting point take the pushrods. When you select your balanced set use the lightest one as a standard. Next, take your valves to a *good* machine shop, preferably one that specializes in speed work and have the man undercut the valves. But *carefully* — if you remove much the service life will be shortened and the strong springs may tend to tulip them. If you are patient and dexterous, the final piece of work can be polished (not ground down) rockers. The minute amount of metal ground off in the polishing will not make too much difference but in a way such things are satisfying. In any event the lightest pushrods obtainable and the undercut valves should allow engine speeds above 6500, possibly even within an ace of 7000 rpm depending on the cam selected.

With such a range of engine speeds cam selection becomes a matter of "what do you want to use it for?" Limits of good sense should apply with an upper limit or peak speed for a full-race conversion coming in about 6500 rpm tops, leaving any extra bonus for inevitable over-revving during those times when the chips are down in the final laps of a race. With the cam and exhaust modifications listed, added to the full Stage 4 layout it would be advisable to run richer needles than the standard K.W., the R.F. pins being about the right starting point. Since there are no factory test figures available here it would be best to use a mixture analyzer to check the effects of the better scavenging afforded by cam and headers and if any error is to be made let it be on the rich side.

Regarding this last part — our own Stage 5 — the authors wish to point out that this is meant only to point a direction and individual advice should be sought from *competent* professionals in your area or among the special parts makers regarding individual problems. Further, unless you are really gone on racing, serious racing that is, it would be best to stick with the proven factory modifications since these as we've said, have been tested not once but often.

As with the full house XPEG, the all-gone MGA has a lot more urge than the stock machine and as a result there is considerable added strain on the driveline. The anonymous oracle at Abingdon has foreseen these difficulties and has as usual

come up with the answer in a choice of new clutch springs or a complete new clutch assembly. The springs are standard after engine number 16225 and have a pressure range of 180/190 lbs. Their part designation is 1H 1024. For the full treatment, though, there is part number AHH 5457, a special competition clutch which is a pretty fierce item but one that will take everything you can put through it with the hopped-up B-type engine.

GEARING TIPS

At long last the factory will publicly admit that they can sell the close ratio gearboxes used in the EX182 LeMans cars. A few of these gearsets have come to this country but they seem to have been held pretty close to the vests of the distributors and dealer-sponsored cars. Now they're a catalogue item. The specs on this box read:

Third gear: 1.27 to 1, Second: 1.62 to 1, First 2.45 to 1. The following parts are needed to rebuild your gearbox to these ratios:

1H 3297 Clutch shaft
1H 3298 Countershaft drive gear
1H 3299 2nd speed mainshaft gear
1H 3300 3rd speed mainshaft gear

In addition to these, there is a range of six rear end ratios giving ratios of 5.12, 4.88, 4.55, 4.30, 4.11, and 3.9 to 1. The last two are newly available. As with all the B-type BMC rear end set-ups the rear end gears are housed with the ring, pinion and attendant bearings in unit in a readily removable housing. Assuming you have enough money to make things really easy, you can pre-assemble gear sets and have what amounts to a semi-quick change rear end. It's a pretty expensive way to do things but it works.

The foregoing operations, at least after Stage 3, add up to a bit more than their counterparts applied to the earlier engines in dollars but MG has made it easier by cataloguing a number of parts that had to be made up for the early engines. The additional cash involved is made up for by the ease of purchase and the bolt-on quality of most of the operations. Also a mite more GO is on tap for the later engines when things are carried through far enough – more power is available for a reasonably tractable street machine than was available in the full race conversion of the XPEG although the earlier engine could be twisted somewhat tighter, 7000 rpm and more being available when desired.

As the man said: "You pays you money and you takes you choice."

John Christy & Dennis May

NEXT MONTH

SEBRING — PRE-RACE

speculation by
STEPHEN F. WILDER
SCI TECH EDITOR