



*WHAT IS A SPECIAL—
AND WHAT IS THE OBJECT OF BUILDING ONE?*

IT would seem fit and proper, before embarking on this literary adventure of mine, to produce an exact and water-tight definition of a “special.” As every enthusiast will agree, this is almost as difficult as trying to define a sports car, a small matter, which has defeated experts since the term came into use. Nevertheless, since I can hardly write a book about the things, without at least attempting to define them, here goes.

A “special” is a car built for a specific purpose by an amateur, either entirely to his own design, or by combining the essential parts of a number of makes. The reason for building it is simply to produce a car with a better performance than anything the constructor could hope to afford to buy ready made. As this book deals with racing and sprint cars, the term “special” obviously does not refer to a trials machine. Henceforth, also, I think the quotes can be ignored; i.e., “special” now becomes, special.

A certain amount of mild astonishment may be felt that any amateur should consider himself competent to design a car which will be raced against machines dreamed up by professional designers, or to build with his own fair hands, a vehicle which will compete against the products of properly organized factories. It is often suggested that the best course open to the poor man is to abandon the tremendous task of constructing a special—and it *is* a tremendous task—and purchase for himself one racing car, obsolete, or obsolescent, with the idea of doing a spot of modernization, and, in general, hotting it up. In my opinion, nothing could be more fallacious.

The greatest mistake that anyone could make is to buy an aged and elaborate racing car with the idea of rebuilding it at home. The majority of such cars were originally produced as “works” racers, to be maintained by a large staff of experts in a separate racing department attached to the factory. It is next to impossible for the amateur to keep their complicated

machinery functioning, off his own bat. In addition, it is fairly certain that the designers allowed little or no safety factor in regard to super-tuning. In consequence, all the purchaser would be able to show for his money would be an out-of-date car, with out-of-date suspension and brakes, not to mention an out-of-date performance, and with spares unobtainable, or procurable only at astronomical cost. If the car has had the normal busy racing life of such machines, a lot of its vital parts are almost certainly fatigued.

The amateur can build his car with one eye on the maintenance side of a busy racing season, and the other on the particular type of event for which the machine has been designed. He can happily ignore some long-forgotten Grand Prix formula, and concentrate entirely on his own pet events. Admittedly it is most unlikely that the result of his labours will in any way stand comparison with modern "works" jobs, but some quire astonishing things *have* happened.

The question of design is very important, and I am often asked how well-known specialists normally set about it. Letting the imagination run riot, the reader can picture for himself the ideal set-up. The creator simply sits himself down at his drawing board, with a look of heavenly bliss on his face, and a monumental special just happens. It all sounds so wonderfully easy, but, of course, the real thing is entirely different.

The one factor which, more than any other, settles the whole layout of a proposed vehicle, is the amount of workshop equipment available. This varies in the case of individual specialists, ranging from the fortunate types who have access to an elaborate machine shop, to the splendid fellow who will have to do all the work in a tiny shed, with a few hand tools.

It may seem astonishing that a man could even consider building anything as complicated as a racing car, without a properly equipped workshop, but I know it can be done—I've done it myself. Also, the incredulous might be interested to learn that a friend of mine actually assembled a racing engine in his bedroom !

Naturally the specials that emerge from tiny sheds and bedrooms are built to a much simpler plan than those exalted creations which are born in delectable places, where the happy constructor can call upon lathes, milling machines, power

drills, electric welders and so on and so forth, and hang the expense.

Your true specialist is a pretty knowledgeable sort of chap, and has a very fair idea what the performance of his brain-child will be, before he drills the first hole, or tightens the first nut. This apparent "second sight" is not all that miraculous. Most enthusiasts have followed the Sport since their toddler days, and have acquired a pretty accurate "mental yardstick" in regard to performance. The most essential thing to know is what power-weight ratio is required to attain a given acceleration, for that is a vital quality for both sprints and races. The power developed, and weight, complete in racing trim, of most successful racing cars have been published. Consequently it is a simple matter to work out how closely one's proposed device will emulate their performance.

It is essential to be able to calculate with fair accuracy the total weight of a given agglomeration of components. I get myself weight-conscious, weighing every component as a matter of course. If you know the weight of all the usual sizes of wheels and tyres, various types of engines, gearboxes, radiators and fuel tanks, not forgetting the numerous forms of chassis and their accoutrements, you will be able to size up the weight of almost any motor-car, real or imaginary, and you will be quite near the mark.

In deciding how much power his engine is going to give, the specialist must eschew all wishful thinking. If he intends using an existing engine, power-curves are usually obtainable from the makers. On the other hand, should he desire to hot-up and considerably modify a power-plant, the temptation to overestimate the eventual result must be avoided. The possible gains from such modifications as increased compression ratio, supercharging, or different carburettor sizes, are readily calculable, and the prudent specialist will avail himself of all such information, and will certainly not be satisfied with the claim of, "Bags of power, old boy !"

If the type of event in which one will compete places any emphasis on maximum speed, the frontal area of the car will have to be known. In other words, "How big a hole does it make in the wind?" The little sums one has to do to work that out are perhaps the simplest of all motoring calculations, but the general idea is that if you have the same amount of

power as the other fellow, but your car's cross section is smaller than his, you ought to be able to rush along a bit faster than he can.

Having read the foregoing, one might come to the conclusion that the ideal racing car consists of the most powerful engine procurable, insinuated into the lightest and smallest car that will carry it. That, however, is only true up to a point. If the device fails to stay on the road, and refuses to go in the direction in which it is aimed, it has all been rather a waste of time, hasn't it?

Road-holding is a science concerning which most people hold very decided views, and we all pretend to know more about it than we do. Although it has been established that weight is not an essential, it has equally been proved that no car which lacks sufficient rigidity of construction to keep the wheels, steering, chassis and brakes in their designed relationship under the stresses of high speed can ever hold the road. Furthermore, the driver must be given sufficient room to allow of his putting forth his best work, and he must be sufficiently elevated to see what his front wheels are doing. This may have a most adverse effect on that low frontal area.

Another thing the amateur designer has to decide is how big his brakes are going to be, or, rather, what are the smallest brakes he can get away with. If the car is intended exclusively for the short stuff, quite small brakes can be made to do the work efficiently, thus saving a great deal of weight, which, on the majority of designs, is unsprung and therefore adversely effects road-holding. Big brakes suitable for road-racing are hard to find, and expensive, too! If the car is intended for long-distance road-racing, then let it have enormous brakes, for they are almost more important than the power-plant.

Braking is now an exact science, and the manufacturers of proprietary systems can tell you precisely what a given brake will, or will not, do. The racing-car designer puts his brakes well out in the open where the air can get at them to cool them. If he covered them up under the all-enveloping tinwork which the modern everyday road car wears, no brakes could stand up very long to racing conditions. It is instructive to calculate the kinetic energy in foot/tons possessed by your car at various speeds, for this is the energy that your brakes will have to dissipate in the form of heat. A case in point is the

fast Rheims circuit, where Grand Prix cars approach a corner past the grandstands, often at over 150 m.p.h.

It will thus be seen that, from the purely theoretical point of view, most of the details of the design practically settle themselves, once the main features have been decided. Let us now abandon the slide rule and the drawing board, and get down to brass tacks.

When I have lectured on special building, the three main questions launched at me are usually, "What equipment do you need?"; "What does it cost?"; and "How long does it take?"

I have already touched upon workshop facilities or the lack of them in connection with their effect on design, but perhaps it would be more useful to outline my own experiences in this direction.

Many years ago, when I built "Bloody Mary," I had no machine tools of any description available. I hadn't even a bench drill but had to make all the holes with a breast drill, known throughout the engineering world as a "gut buster." When my chest and tummy became too painful from constant pressure on the pad on the drill, I used to stick the work on the floor, and sit on top of the drill, twisting the handle by a clever piece of contortion work. I might add that I got sore that way, too!

The village blacksmith did some forging and bending, and the local garage came to my aid with some turning on its old lathe, but early on I learned that "putting work out" was an enormously expensive business. A lot of it would soon result in a special costing as much as a "real one." When you pay a firm to do a job for you, you're not only paying for the mechanics' time, but for all sorts of overheads, including rent, light, power, taxes, probably union subscriptions (plus political levy), not to mention your personal subscription towards the purchase price of the expensive lathe concerned with your job.

Let us say, then, that a good set of spanners, a selection of files, and a hacksaw are the irreducible minimum, but that a good drilling machine, a pistol-grip electric drill, and, above all, a fair-sized lathe, are luxuries for which one would sell one's soul. Welding tackle is, of course, jolly handy, but professional welding is really quite inexpensive, and one needn't have the same trepidations about putting out welding work, as compared with farming out a machining job.

As regards cost, this is the most difficult thing of all to estimate, because the situation varies so much for each individual, and some characters are in a better position to "fiddle" things than others. Nevertheless, an exact costing must be made as a preliminary, otherwise the would-be racer may find himself very much in the red, and with only half a car. A regrettable number of specialists have made this cardinal error, causing more disillusionment and the abandoning of more cherished plans, than any other contributory factor.

Your sensible specialist places himself (theoretically) in the position of a contractor who is putting up a tender for a job, and consequently quotes a competitive price. The specialist must be careful to avoid price-paring, leaving himself a sufficient margin to take care of snags which are almost certain to crop up. Wishful thinking has as little place here as it had when we were considering the design side of the thing.

When one is building a racing car, it has to be remembered that the completion of the vehicle doesn't end the drain on your financial resources. It is no good spending so much folding money on the construction of the device, that there is no spare cash left for racing it. If the design work has been well carried out, the costs of maintenance and repairs may be extremely moderate, but if preliminary trials reveal the need for modifications and alterations, large and unexpected expenditure may be incurred.

Even if the running costs are low, there are other incidental expenses which cannot be avoided. There is the cost of carting the vehicle around to the various events, either on tow, in a lorry, or on a trailer. Even if the special is sufficiently quiet and tractable to be able to be driven to race venues, nothing destroys the fine tune of a racing engine so quickly and completely as pottering. In any case, most specials run on fuel which is too precious to squander needlessly. Hotel bills will also have to be considered for the more distant shows, and the inevitable celebrations in the event of victory, or a general drowning of sorrows in the case of defeat, can be pretty expensive.

The time factor is even more difficult to estimate than the cost. It is fairly certain, however, that the construction of a special will severely restrict the builders' social life and other spare-time activities. All successful specialists pursue their

hobby with a fervency almost amounting to mania, and they certainly don't begrudge one iota of the work which monopolizes their so-called leisure hours.

When a specialist is a married man, his poor neglected wife has to suffer the complete obsession of her husband in his hobby. Possibly she fears secretly that he is engineering a juggernaut that must eventually bring about his downfall. Truly "motor-racing widows" have grounds for complaint, and special-building should be admitted as evidence in a divorce court.

Some builders have produced cars in a remarkably short space of time, and if the work entailed only means the insinuation of one sort of engine into another sort of chassis, there is no reason why this should not be so. When the car is more or less a radically new design, the job will necessarily take a longish time to complete. Even the most experienced and far-sighted constructors always find that they encounter a host of unexpected delays and snags. Most specials are started at the beginning of winter, with the idea of being ready for the following summer's events. They are, however, seldom completed, and it is only after the now familiar grind has been continued through yet another winter, that the resplendent creation finally emerges for a first public appearance.

Is it worth it? Is the hard labour, the almost monastic existence, and the financial stringency of the average special-builder justified by results? I can only say that the man who has entered in open competition, and beaten genuine racing cars at their own game with the product of his own brain and brawn, has enjoyed a thrill which no amount of money in the world can buy. For a little while, he can bask in the happiness that only real achievement brings, till his ambition spurs him on to further prodigious overwork after unattainable perfection.