MOTOR CARS FOR MEDICAL MEN.

By H. MASSAC BUIST.

LESSONS OF THE TOURIST TROPHY RACE.

WHILE watching the very careful practice and the actual race of two days for the Royal Automobile Club's Tourist Trophy in the Isle of Man last week, I think perhaps the most vivid impression made on my mind as to the utility of the business was conveyed by the performance of the standard D.F.P. machine, which is not a racing car; it is a fraction under two-thirds the maximum engine size allowed, and was handicapped by having axles taken off a larger standard model, so that it should conform with regulations as to track width; it was driven by Mr. Walter Bentley, who had never been in a road race before. It was one of only half a dozen machines that finished among the twenty-two starters on the 600 miles race, which it accomplished, nevertheless, at the mean speed of 48.38 miles an hour. When it is borne in mind that the last tourist trophy race was won at only fifty and a fraction miles an hour by a racing machine of nearly three times the engine volume, it will be realized that we are now arriving at the period when the small motor can be relied on not only to give the medical man regular service, but also to perform in such a manner that, though using a small engine, he is nevertheless not compelled to crawl about the country. In the course of his preparations Mr. Bentley, who had not the advantage of a factory behind him to build racing engines, tried on his own initiative to fit racing style pistons. But they broke, and therefore the standard sort, which in this case are proportionately light, were employed when making the performance to which I have referred. It was further notable for the fact that there was only one pause when driving from the dépôt to the starting line to replenish supplies at the outset of the second day's racing, so that no machine in the whole series engaged revealed such absolutely reliable running as this little touring car, the mean speed of which came within nine miles an hour of that of the winner.

FURTHER PROGRESS OF THE SMALL ENGINE.

This performance confirms my contention of a year ago that the Tourist Trophy Race, as well as this year's race in France for the *Coupe de l'Auto*, should have been for machines of 2,000 c.cm. (122 cub. in.) engine volume, because for years past very considerable attention has been given to the 3,000 c.cm. (183 cub. in.) engine size to the great improvement of what may be called the 12-16 h.p. size of car. Between these two sizes there is a sufficiently wide difference to represent a distinct class of car and public to be catered for. Hitherto nothing has been done to encourage the production of the 2,000 c.cm. four-cylinder car as a special type. Yet the whole demand is for this style of engine for a class of vehicle between a 21-25 cwt. motor car and the light car not exceeding 12½ cwt. or so. As it is, the *Coupe de l'Auto* regulations this year are for machines of 2,500 c.cm., the announcement being deliberately made that this step is a gradual come down to a 2,000 c.cm. race for 1915. Such a move is illogical, because if a race is to be of any use it should encourage the production of a fresh style of vehicle, which would mean that the offer is developing 2,500 c.cm. engines for one year only, and that all that work must be set aside the next year. Moreover, commercially, a 2,500 c.cm. engine is neither, fish, flesh, nor fowl. Such a car would probably only spoil the market for 3,000 c.cm. engine vehicles. The fact seems to be that those who organize motor competitions are not sufficiently in touch either with the demands of the public or with what it is possible for the motor engineer to accomplish, with the result that they have not had enough faith this year to realize what can be done by the 2,000 c.cm. engines. Mr. Bentley's performance in Manxland last week on the D.F.P., however, may be said to have educated those concerned in the course of the very first day's running, so that it may be taken for granted that next year we shall employ our races to encourage a new and distinct size of motor car proper (not a light car as such) by having a tourist trophy efficiency and reliability trial for 2,000 c.cm. engines. The country doctor needs cars of this size.

POINTS ABOUT MOTORS AND CHASSIS.

Let us now consider those machines which were built up to the Royal Automobile Club's engine volume of 3,310 c.cm. (201.90 cub. in.). Few of these engines were developing less than 70 h.p.; some were capable of developing over 90 h.p. Yet what are they in size? Only 10 per cent. larger than the £4 4s. tax 12-16 h.p. standard Sunbeam car, and 40 per cent. smaller than the 16-20 h.p. standard Sunbeam car. Nevertheless they were far too speedy for the full power to be used all round the course. It is a fact that the winner's speed up the most difficult climb of the circuit, from Ramsey to the Bungalow, was only two and a half miles an hour less than the mean speed at which the Sunbeam won the whole race. If we put it in another way, we find that if we were to take the average middle-sized touring car with four-seater body, rated by the maker at not more than 20 maximum h.p., and its complement of passengers, it would be possible to travel a greater distance round the course on the top gear than the drivers did in the race. This was because they could not use their full power for more than very brief spells—a minute at most—on the more level ways. Consequently it was purely a race of brakes and acceleration. That was why so much of the driving was done on the indirect speeds or lower gears. Where the ordinary tourist would pass easily round a fluent curve on the top speed, the racing driver would have to apply the brakes violently on approaching the curve, which at his speed would become a sharp turning. Just before negotiating it he would slip in the third speed so as to accelerate again as quickly as possible on getting round the bend. It is here that the chief value of the race for the medical man comes in, as a test of chassis strains and stability. True, gears are not as troublesome as they were wont to be, but even now the mechanism can be submitted to very severe strain when changing at 20 or fewer miles an hour. Imagine, then, the strain of changing speed with the engine turning at 3,000 or more revolutions a minute, and developing its maximum power, which is let in with a jerk, for the clutches had to be fierce, because the sheer brute force of the drive is often employed to steady a car when it has started skidding and bouncing after taking a corner. Gears have to be made much easier of manipulation, and vastly more durable, and a car frame has to be made so stiff that there shall be a minimum of distortion under the extraordinary variety of strains to which it is submitted.

THE QUESTION OF BRAKES.

The brakes are of such wide diameter as to look like small wheels. Perhaps the most valuable lesson of this race will be to cause European manufacturers to standardize brakes of much larger diameter and more ample contact area. Europe has lagged behind the best class of American motor car production very appreciably in the matter of amplitude of brake area, probably because we have not had to use the majority of our cars in regions like the Rocky Mountains, where the most intelligent automobile engineers of the United States have learnt this part of their business. But the Isle of Man race has taught alike those engaged in it and those members of the industry who shunned the ordeal, not only the necessity for larger brakes, but also the refinement and proportional saving of wear that can be gained for the touring car by using them. The way to get a quiet brake and one that does all the work at present done by the ordinary touring type with a vastly greater amount of ease and less wear is to build it large, so that a much lighter contact achieves the same result, and in much more refined fashion, therefore, to the saving of tyres. In addition, of course, in emergency you can use your larger and much more powerful brake until the contact is quite as fierce as is possible to achieve with the ordinary touring type to-day; in other words, by the employment of these larger brakes you have also a much larger margin of safety.

As for engines, the race has gone to a racing type not yet adaptable to touring car service by reason of its inherent inaccessibility, and the damage to the car that would result if a valve broke. But inasmuch as the Sunbeam Company proved in 1912 and again last year what it could do with the ordinary poppet valve type of engine when submitted to the ordeal of racing, this latest success with the overhead form of poppet valve is a

remarkable revelation alike of versatility and correctness of design, and of accuracy of workmanship, for I saw the machines being produced at the factory at Wolverhampton early this year in the same shops and with the same tools employed for manufacturing the standard cars of the make.

THE DEVELOPMENT OF THE LIGHT CAR MOVEMENT.

While the chief lessons of the Tourist Trophy Race for the medical man are the facts that the 12-20 h.p. size of car has now been demonstrated capable of greater feats of reliability, endurance, and efficiency than was possible to accomplish by machines of five times the volume only three or four years ago, and that for the reasons set forth the motor competition organizing bodies have no option but to encourage the development of a size of motor of only two-thirds the volume, yet if we study what is going on behind the scenes in the matter of light car production at the moment, there is revealed something of very material interest to the medical man. One firm, which I am not at liberty to name at the moment, but which has achieved most remarkable successes in light car trials this year with two-cylinder machines, has a four-cylinder model ready to put on the market next year. I have seen three specimens touring about. From the exterior very few people guessed there were more than the ordinary two cylinders under the bonnet, though nearly everybody expressed amazement at the way they climbed the hills. This is the advantage which comes from the engine that develops its power more smoothly by reason of the greater number of cylinders, and which has more power, though from the manufacturing point of view it will not be necessary to charge many pounds extra for the product. This and other activities in other directions go to indicate that any time from next autumn onwards it will come to be generally recognized that light cars, as distinct from cycle cars, will be nearly all four-cylinder, water-cooled machines, no matter what their price.

FOUR-CYLINDERS AND HARDIER MOTORS.

The competition regulations, too, whereby makers are now allowed by Royal Automobile Club rules to construct their light car engines up to 1,400 c.c.m. is proving very useful to the industry. Already not a few constructors are finding that their light cars with engines of about 1,100 c.c.m. are giving a certain amount of trouble in the hands more particularly of the more sporting section of the public. This is not because they lack efficiency, but for the very reason that they possess it. We must have in mind that a great number of motor cyclists are taking to using light cars, and the pursuit of their old sport has led them to hunt their engines tremendously, which they can afford to do when they have a belt form of drive that can hide a multitude of sins by slipping. But when these folk start hunting four-cylinder engines fitted to machines with gear-boxes and live axles, and revel in the high efficiency they manifest, they forget to give those little motors any relief. The medical man can afford to smile at this sort of thing, because the trouble such abuse occasions is in the end all to his gain, in that as fast as the public learns to destroy the product, so quickly must the manufacturer learn to make it one degree harder so as to be ahead of the user. The great problem of the moment, therefore, is for the light car engine builder to make a motor which the user of too sporting a turn of mind cannot hunt to destruction. He finds the solution of the problem in the regulation whereby he may build for competition purposes up to 1,400 c.c.m. This gives him the opportunity of supplying a notch or two more power in relation to chassis weight, which will please the public purchasing in 1915, and at the same time he can afford actually to lower the efficiency of the engine by reason of its appreciably increased size, so that even should it be hunted it will not be submitted to proportionately the same strain as the proportionately more efficient and smaller 1,100 c.c.m. motors. Of course, one of the penalties of merit in motor construction is that the more efficient the product is made the nearer necessarily must it be working to the point at which breakdown must occur. Happily, improvements in steels and in design year by year enable that point to be moved further and further away, as is proved by the fact that toy scale motors are now giving better service than cumbrous ones only a few years ago.

THE DEVELOPED DE DION DOCTOR'S MODEL.

It is only a few years since the one-cylinder De Dion cars, with their characteristically shrill note when the engine was accelerated to about 1,800 revolutions a minute, were doing yeoman service in providing the medical man with reliable, low-powered, long-wearing and comparatively cheap cars. Such is the progress of motor construction, however, that to-day for practically the same price the firm markets a four-cylinder, water-cooled nominal 8-10-h.p. machine, which is sold as a chassis with tyres, pump, jack, and tool kit, for £221, and which can be provided with various types of coachwork according to requirements, working out at a total price of £275 upwards. I have been driving one of these cars for about 400 miles, over hilly country, with a four-seater body, and was not accompanied by any one who knew anything at all about the machine. The aim was to let trouble occur if it was likely to do so, and in any case to find out for one's self precisely what amount of attention the vehicle needed. We went at a good average speed, for the work was mainly made up of two journeys, each of 160 miles, both of which were non-stop, save for the fact that we called a halt for fuel. The petrol consumption worked out at approximately 30 miles to the gallon—up hill and down dale—and in the long runs the car was not allowed to crawl and a good deal of the roadway was of the cross-country sort.

The method of control is not that which generally obtains. On the contrary, it is almost directly the opposite, for instead of having a means of accelerating, the foot-brake pedal is used to decelerate. This means that the throttle lever is set at the maximum required, and practically the car is driven on the foot-brake all the time. This, combined with the absence of a gate form of quadrant for the change-speed lever to work in—there is, instead, a straight-through quadrant—was a little strange at first, but it is interesting to note that we had not gone one hundred miles before all the movements were made as automatically as though one had never driven any other type of car. If it is possible for one to change one's habits in so brief a time, the conclusion appears to be that for one coming fresh to motoring, and not knowing any other system of control, this must be a very easy one. It is rendered the simpler by reason of the disc form of clutch used, with which it is practically impossible to make a really bad engagement.

A MACHINE NEEDING A MINIMUM OF ATTENTION.

The great point about the car's conduct in use is its sturdiness. Throughout my trial of it nothing came loose, despite the fact that it was rattled over some really indifferent roads. It must also be very light on tyres, as well as fuel. In the matter of oiling, there is nothing to look after save in the morning to lift out, by a single turn of the hand, a tell-tale measure like a sort of skewer. This ordinarily projects into the base-chamber. At the bottom end there is marked an oil gauge. It is as well on first lifting this out to wipe it clean, then plunge it back before taking the reading. There ought to be between 1 and 1½ litres in the base-chamber for splash lubrication, so all that has to be done is to pour in however much lubricant the tell-tale may show to be necessary. Further, this chassis is not replete with a great number of greasers for the springs and so forth. Though I did not turn a greaser of any sort during the whole of my use of the car, it did not appear to need anything either during my work with it or on handing it over at the finish. In small car construction this absence of parts that need constant lubrication by manual attention, and the absence of the development of looseness, are points of the utmost value.

As for the powers of performance of the machine, apart from the economical aspect, its qualities of acceleration are the first feature that will appeal to the medical man. It can slow up in traffic until it comes almost to a standstill, then, without slipping the clutch or causing the engine to pre-ignite, the raising of the brake pedal is sufficient to give it as much throttle as has been set, and the car will accelerate again. In the open country it will bowl along merrily by the hour at thirty miles an hour. It can, of course, be accelerated beyond that, though that may be taken as its best speed on clear country roads, and it works economically at that rate of travel.

LITTLE NEED TO CHANGE GEAR.

The car is quite distinctive when it comes to hill climbing. I know of no make of machine which provides more surprises in the way of revealing its ability to keep on the direct drive on an up-gradient. At the points where, in the ordinary way with the average car of any good make, it would be necessary to drop into a lower gear, with the De Dion it would be quite wrong to do so, because for this machine that is really too early a stage to make such a change. The consequence is that for the first day the driver is encountering nothing but surprises at the number of hills he surmounts on the through drive without change of speed at all. That is a matter of some moment to the medical man. It means that he saves himself fatigue in driving. A small car that calls for a great deal of gear changing is a very tiring machine to handle, the amount of effort scarcely being realized until the end of the day. Besides, the more often gear is changed the more often are tyres and chassis jarred, because, be the driver never so careful when on an up-grade, he must be fairly prompt about the business, or he will bring the car practically to a standstill. The most memorable feature of the De Dion is its habit of losing engine revolutions on a hill climb to a certain pitch, beyond which most gradients seem powerless to bring it, and it will take the full throttle at these slow revolutions without any pre-ignition or developing pronounced vibration.

In fine, this pioneer firm has produced in the four-cylinder 8 to 10-h.p. model a car preserving all the characteristics and hardiness which have made its repute world-wide since pioneer days, with the desirable latter-day features in the form of four cylinders cast on the block principle and giving the necessary flexibility and power in very small compass, so that though the chassis is a handy size, it affords more than the ordinary proportion of space for the accommodation of coachwork.

THE TEACHING OF PATHOLOGY.

AN EDINBURGH PLAN.

THE recent appointments of Dr. Lorrain Smith as Professor of Pathology, of Dr. James Ritchie as Professor of Bacteriology, and of Dr. Theodore Shennan as University Lecturer on Morbid Anatomy, have made it possible to introduce novelties in the modes of teaching pathology in the University of Edinburgh. Our correspondent has been favoured by a demonstration and explanation by Professor Lorrain Smith of the changes which have been wrought in the portion of the subject which is specially under his care.

To understand the *rationale* of the new method it is necessary to remember that in Edinburgh pathology is, as it were, one of the middle subjects in the medical curriculum, lying, along with *materia medica*, between physics, botany, zoology, chemistry, anatomy and physiology on the one hand, and medicine, surgery, midwifery, the specialties legal medicine and public health on the other hand. Hitherto it has been customary to teach pathology rather on the plan of the former than of the latter group of subjects. Different morbid processes have been described in order as they affect various organs and tissues, or the separate systems have been taken up and the pathological changes peculiar to them set forth and illustrated. The methods of teaching, both in the practical class and in the theoretical lectures, have evidently been dominated by memories of chemistry, anatomy, histology, and physiology; and the result has been that, when the student has come to try to apply his knowledge of pathology to medicine and surgery and the other final subjects, he has had to rearrange much of his mental equipment, looking at pathology from a new viewpoint, and suffering in some measure from the confusion associated with such a change. Especially at the bedside he has found his acquaintance with pathology and morbid anatomy singularly unhelpful. Much time has thus been lost before the student's store of accumulated knowledge of pathology has been made available and useful for the understanding of the cases which have come to him in the hospital and dispensary.

Professor Lorrain Smith now teaches pathology with his eye, so to say, upon the clinical case of the future—upon the hospital patient of the immediate future and upon the private patient of the student's more distant future. He draws the clinical method back to the study of pathology and morbid anatomy, and deals not with isolated organs and tissues, not with incidents in great dramas of disease, but with individual cases as examples of the relationship existing between the morbid anatomy of one organ and that of another, and of all the others, with clinico-pathological ensembles, with whole dramas from the first stirring of the elements of the plot to the fall of the curtain upon death or recovery. If death be the result, every lesion can be shown, its age-relationship to every other lesion can with some degree of accuracy be settled, and unexpected side-effects, sequelae, and complications demonstrated and explained. He teaches the student to look at the "altogether" of the case from its pathological aspect, and then he makes him correlate the pathological findings with the clinical history and development of the symptomatology as revealed in the patient's record. It is pathology with fresh interest put into it; the dead organs live again in order to tell how they died and what killed them. It is theoretically admirable, it may be said, but is it practicable? Will it work? Professor Lorrain Smith believes it is practicable and says it has worked, and he is able to furnish proof.

Here, for instance, are a series of specimen jars, each containing one or more organs or parts of organs; in them are all the parts which are of pathological importance in the setting forth and understanding of a chronic case of heart disease. All the organs involved are here, and they are all together; it is the *ensemble* of a case of mitral stenosis from the beginning in endocarditis to the termination long afterwards in death; it is the journey to the grave with the lesions in the organs taking the place of the inscriptions on the milestones; it is rather gruesome, it is realistic, it is almost horrible, but, above all, it is interesting, and it is the interested student who learns and who learns both surely and quickly. In the first jar is the portion of the heart showing the constricted mitral, in the same jar is the thrombosed left auricle; in it, too, are emboli in various organs and old and recent infarcts; in the lowest part of the vessel is the heel of the patient with a patch of necrosis on it—a most significant incident in the drama. In another jar are preparations showing thrombi in the iliac and femoral vessels, and in the muscles of the leg; in another are infarctions in the lungs, and in yet another are various parts of the brain showing recent infarctions there. All the organs show chronic venous congestion. Another set of jars contain the pathological stages of a case of malignant disease of the stomach and its extensions; another set shows tuberculosis in its ensemble, with amyloid complications, in a case of phthisis. The very arrangement and order in which the organs are grouped in the jars is an easily remembered lesson in causation and progress, in etiology and prognosis.

It may be asked, however, how the student or the class of students is brought into the teaching scheme. The answer is satisfactory. The clinical history of the case from which the specimens have come is first stated briefly, and in more or less simple language such as the patient himself would employ; in this way the student is not overburdened with medical details, and need not even be acquainted with the special terminology of the subject. A perfectly fair criticism may be advanced here; it may be said that the student taking out pathology has as yet very little knowledge of medicine, and can hardly profit fully from the clinical history. This is true, but it is an objection which already has less force in Edinburgh than it had a year ago, for now (see the JOURNAL for May 9th, p. 1041) medicine, pathology, and morbid anatomy are taught in the same *Annus medicus* (the third), and by the time the student has got well into the study of pathology he already knows a good deal of medicine.

Having mastered the elementary facts of the clinical history, the student is next led to the specimens, and is supplied with the notes of the *post-mortem* examination. Each organ is described, and the changes in it explained, and he verifies the statements on the organs and tissues. He is then taught to summarize the clinical and pathological facts, he is shown how the morbid anatomy supplies the clue to the understanding of the clinical incidents