MOTOR NOTES FOR MEDICAL MEN.

By H. MASSAC BUIST.

EVE OF THE MOTOR SHOWS.

THE yearly International Paris Automobile Salon opens in the Grand Palais, off the Avenue Champs Elysées, on Thursday next, October 2nd. Apart from members of the French industry, there will be an aggregate of thirty foreign exhibitors, of whom four only are of British origin—namely, Austin, Morgan, Morris, and Rolls-Royce, the actual Morgan exhibited being a machine built abroad under licence from the British originators.

The eighteenth Annual International Motor Car Show promoted by the Society of Motor Manufacturers and Traders at Olympia will open under the patronage of the King on October 17th. The public will have access to it daily, Sunday excluded, until the 25th. By contrast with the Paris Exhibition, the London one will retain the distinction of being beyond challenge the most thoroughly representative of the world's motor car manufacturing industry, nothing approximating to such an absolutely representative international character being organized elsewhere. Thus there will be no fewer than 128 exhibitors of cars, 25 exhibitors of tyres, and 284 exhibitors of accessories and components, apart from which no fewer than 57 carriage builders have been allotted space in the enlarged building. By reason of our Free Trade policy, which is singular among the nations possessing motor car building industries, this country is the motor mart of the world, America, with her high tariff wall, having aimed always at keeping out foreign products. In effect, the best examples of motor car design and manufacture in the world are on our market and will be represented at Olympia, together with several examples of the undesirable. Therefore, no medical man need consider it necessary for him to journey to Paris next week in order to inform himself concerning the new style motor cars introduced for the 1925 season.

NOTABLE DEVELOPMENTS OF THE YEAR.

While it is still possible to add accessory to accessory in the equipment of a car, there is no gainsaying that some standardized machines have become overloaded, though under this head the owner will necessarily follow his own inclination. It is impossible to offer any useful expert advice beyond suggesting that every user should put to himself the question: "Is it essential that I should have this gadget, or that; and, if I must have one, or both, what, if any, power will they absorb in the way of current from the batteries, and so forth?" Electric screen wipers, cigar lighters, signal-horns, and so forth are very convenient; but how many owners are aware that a signal-horn, for example, uses more current in ordinary car service than is absorbed from the battery when starting the engine? Perchance under this head the average medical practitioner's use would be different from that of the ordinary member of the public in that, generally, the family doctor has to make short journeys, on commencing each of which he has to start his engine by mechanical means. But in adding an electrical accessory to a car one should always have in mind the current it will necessarily use and especially the need for inspecting the wiring at frequent intervals in that the slightest leak may lead to a costly bill on account of repairing or replacing the battery.

Much experiment has been devoted this year to continuing the investigation of four notable problems—the application of brakes to front wheels; the furtherance of fabric bodies of light weight; the standardization of low pressure, large section pneumatic tyres; and the possibilities of forced induction, generally called supercharging, with a view to obtaining more power from an engine, primarily for aircraft service, to enable the "ceiling" to be raised. The last-named development does not concern the medical man at the moment beyond his noting that, in the case of the first British engineering house to give attention to the use of supercharging mechanism experimentally, a very important stage of progress has been arrived at which may render it possible presently for the supercharger to be of

service to the user of a standard car. Briefly, last year foreigners used supercharging for the French series of Grand Prix races, and other first-class tests of the kind, employing gear that is not only complicated, expensive, and extremely unreliable, but which is also required to run in some cases at 20,000 revolutions a minute. In short, this is scarcely commercial practice.

LAST SATURDAY'S SUPERCHARGING DEMONSTRATION.

But in engaging in this year's Grand Prix race Sunbeam has experimented with a supercharger wherein a Rootes type of blower is used which is run no faster than crankshaft speed. The results obtained not only enabled this manufacturer to achieve the fastest circuit, but also the fastest speed over the measured course, each by two different Sunbeam machines, in the course of the first International 500 miles Grand Prix of Europe road race. The accessory, besides, adds 33 per cent. to the power output of the engine when it is running at high crankshaft revolutions, and it adds no less than 50 per cent. at lower crankshaft revolutions. Moreover, no trouble was experienced by the firm with this sort of supercharger in that race; nor when Mr. Louis Coatalen, the chief engineer, applied it to the small 1,500 c.cm. 4-cylinder engined Darracqs run in the Junior Car Club's 200 miles race on the track at Weybridge on Saturday last, wherein that make broke world's records, the three machines covering the distances at over 102 miles an hour mean speed, each with power plant that would be rated at 10 to 12 horse-power for Treasury taxation purposes. In this connexion it is interesting to note that the weight of the blower used on these engines was 35 lb. only. Thus we have arrived at the point at which it is possible to apply a supercharger to an engine (1) of a weight that is commercially practicable; (2) which functions at a normal speed because it does not turn any faster than the crankshaft of an engine; (3) which can be designed to increase the horse-power developed by an engine to a greater extent when the crankshaft is running slowly than when it is running fast; and (4) the cost of which is practicable commercially. Being interpreted, this means that a given power plant so equipped is able to get a car away, either from a stand or from a traffic slow-down, with unprecedented efficiency. If we are to deal with the long-standing problem of the gearbox, and to enjoy a chance of eliminating it, plainly we must increase enormously the flexibility of the engine. In particular, it must be possible for it to develop very much more power when the crankshaft is turning slowly. This is what this form of supercharger renders possible. At the moment, however, the matter is to be regarded as still in the experimental stages merely. We must not expect the gearbox to be eliminated right away by this means, though there will be early and immature attempts in this direction almost assuredly in face of the Sunbeam and Darracq successes. An automobile engineering house of such repute, however, would not proceed in this direction until it had years of further experience of the problem.

BALLOON TYRES IN SERVICE.

The fabric-covered body is a development which was described in these columns in detail last year. It has been taken up since by a large number of manufacturers here as on the Continent, and some American car builders are also standardizing the scheme, though none of these particular examples is likely to be placed on the British market this year. In any case, the only point to mention in this connexion on the present occasion is that a large number of chassis builders will be showing such bodies manufactured under licence, and designed specially for their particular vehicles, at the forthcoming Olympia show.

There, too, it will be found that a number of car builders in this country, as on the Continent and in America, are standardizing what are variously styled "low pressure," "balloon," or "comfort" tyres. Necessarily the medical man is interested in this matter, since anything that makes for enhanced comfort of riding is of importance to him as saving fatigue, and, notably, giving his hands the best opportunity for being in a sensitive, as distinct from a numbed, condition, in which latter state they are apt to get

as a result of driving cars that are coarse. It would be correct to state that millions of words have been written and printed for and against so-called "balloon" tyres. Practically all that has appeared is concerned with what the various writers believe to be the theory of the proposition. In point of fact the medical man need not bother about such theories because balloon tyres exist to-day as practical appliances, in defiance of many theories on which the pneumatic tyre industry has been working for thirty years past. Alike manufacturers and users of balloon tyres are at the present moment divided into two schools at least, each advocating a different principle of construction. Many of the things which, we are told by theorists, concern the conduct of chassis so equipped do not in fact occur in practice, or, if they do, it is found that the given characteristics are manifest to a degree that is negligible. At the moment one has to record the mere fact that, while a number of car models are standardized with low pressure tyres of large section, nevertheless the automobile engineers of the world accept the proposition with many reserves.

Characteristics for the Road.

As to the practical application of the principle as concerns European manufacturers to date, it is observable that builders of small cars have standardized comfort tyres for 1925, notably Morris, Rover, Citroën, Renault, and such like, with a number of others. The comfort tyre is by no means so much in evidence, however, in connexion with middle-size and large cars, though there are exceptions. One of the most popular engine sizes for 1925 cars is 3 litres, or 183 cubic inches, which in the best European practice is really a big car class now, whereas in American practice it still represents merely the middle-size car because transatlantic engines do not develop as much power as European ones. But the weights of the vehicles are much about the same, and this class of chassis generally represents a full scale four- to five-seat car. I have made a point of driving both a British car of world-wide repute and the very latest American six-cylinder car coming within this category, both equipped with comfort tyres—the English one of the wired-on type and the American one of the straight-sided sort. With the English car, which has absolutely true pivotal steering, a remarkably good suspension system, and so forth, the tyre pressure was about 45 lb. to the square inch; whereas for this type of machine with its speed capabilities the rear wheels would be pumped to at least 70 lb., and the front ones to 65 lb., with ordinary tyres. With the comfort tyre I found the steering so light as to be absolutely unaffected. But there is no gainsaying that, in taking corners or bends at speeds well within the compass of the car, it lurched to a degree that was inconvenient to the passengers. As far as the American car was concerned it was quite as heavy a vehicle; yet the manufacturers of the straight-sided tyre recommended 28 lb. pressure only for the front wheels and 32 lb. for the back wheels. Of course, the American springing system was not equal to that of the British machine because the American car is a type of vehicle designed for service all over the world, therefore it has to be capable of withstanding more severe shocks. In the matter of steering, sometimes it answered easily and at other times it wanted the use of both hands to make a right-angle turn. One had to employ a deal of physical effort on a gradient which describes a half-circle, and which I use for discovering how the gear ratios of different cars work out in practice; therefore I never approach it on any machine as fast as twenty miles an hour. In this particular case I approached at eighteen miles an hour and found that the American engine and gear ratio enabled this machine to continue easily up the rise, accelerating on top gear, although I did not over let the car exceed twenty-seven miles an hour.

Dragging on Curves and Corners.

But in negotiating the given curve with the engine behaving so easily I not only needed great physical effort to steer the car round, I also alarmed the company's mechanic because the back wheels dragged loudly. Afterwards we examined them and found that during the nego-

tiation of the curve in question we must have been riding on the upper half of the tyres—that is, on the side, as distinct from the tread proper. Apparently the tyres on the front wheels were not deflected to a like degree. Yet throughout the speed was well within the compass of similar motoring with ordinary tyres. With them on such a chassis one could have taken that hill with safety at thirty-five miles an hour. In the case of all the big cars that I have tried this year—and I have tested most of the leading designs—I have found that luxurious suspension is obtained without the use of comfort tyres. But most of the small cars I have tried during the twelvemonth could be made to ride better.

In this connexion the use of the low pressure tyre is certainly interesting and is to be recommended as a cheap solution if the problem is understood properly. For one thing, most medical men will appreciate that when the first of the post-war series of small cars was put on the market, whenever a manufacturer or agent wanted to demonstrate he arrived with the ordinary tyres then fitted inflated to low pressures only; of course, this enabled his machine to ride better and therefore to give a more favourable impression. But, as was pointed out in these columns at the time, the practice is fundamentally wrong, is unsafe, and is uneconomical of tyres. By contrast the properly designed low pressure tyre is intended to be run at the pressures

FIG. 1.—Illustrating (left) ordinary tyre, and (right) "balloon" tyre.

indicated by the tyre maker for the given weight, and is not being used under the wrong conditions at those relatively low pressures which, however, would be entirely wrong if applied to an ordinary tyre. For one thing, the low pressure tyre must have a wheel rim designed especially for it, because low pressure tyres cannot be effectively fitted to ordinary tyre rims. That would upset entirely the gear ratios and, even if one succeeded in fitting such a tyre in such a fashion, one would find it constantly tending to peel off the rim, which is a source of danger. Therefore all systems of low pressure tyres at present on the market are designed to require a width of wheel rim proportionate to their air-retaining section. In other words, balloon tyres are not oversized tyres placed on ordinary rims: neither are they pneumatic tyres made out of proportion. On the contrary, they are designed and made to be entirely in proportion; therefore, for a given car the circumference of a balloon tyre that should be fitted is exactly the same as the circumference of an ordinary section tyre; but in the case of the comfort tyre a wheel rim is required proportionately smaller in diameter but of greater width than the rim needed for an ordinary tyre (see Fig. 1).

Contact Area and Speed.

A very considerable amount of quite unnecessary confusion is being occasioned in the minds of inquiring car users by the implication that the comfort tyre must take a good deal off the speed of a car and must interfere with the steering because it must be flat by reason of the low pressure. In point of fact the alleged flatness is not

discernible to the eye in practice in the case of a comfort tyre inflated as it should be; despite the fact that users of comfort tyres are to be seen driving about the country with these proportionately gigantic pneumatics looking flabby and presenting quite a flat contact on the road. That, however, is a condition for which the user is alone responsible; it has nothing to do with the right application of the principle as such, nor do the tyre makers recommend it. Sundry examples of the right way to use comfort tyres are available all over the country to-day, merely by observing how small cars of the types mentioned above are presented on the road. In these proportionately much larger tyres on such little cars one does not notice that there is any "flatness" where the tyre makes contact with the road. Of course, a much better road grip is obtained by the use of a comfort tyre, whether of the beaded-edge, the wired-on, or of the straight-sided types, than with ordinary size pneumatics, this being one of the great claims advanced on behalf of the new type. Properly to appreciate the matter, however, it should be noted that there is not great *length* of contact with the road on the part of the comfort tyre by comparison with an ordinary one; rather is it a case of a

FIG. 2.—Illustrating relative areas of tyre tread contact with the road in the case of a given car fitted with ordinary size pneumatic tyres (the smaller area) and with a low pressure tyre (the larger area). The depth of section represents the direction of travel and the width of section represents the width of grip on the road.

greater proportionate area of road grip being obtained (see Fig. 2). That makes for safety and efficiency as regards enabling a car to hold the road in circumstances in which, otherwise, it might tend to slip sideways, forwards, or backwards; while the lower pressure gives the suspension system less work to do, so that the car can ride over obstructions, such as stones or bricks, without bouncing off them into the air. In other words, with the comfort tyre it is possible, for a given system of suspension, weight, and car speed, to maintain continuous contact with the road in a vast variety of circumstances in which an ordinary car would lose contact with the surface, and therefore lose driving efficiency, waste petrol, and sustain scraped tyre surface each time the driven wheel came back on to the ground. But the larger area of contact achieved by the use of the comfort tyre, being particularly appreciable in regard to the width of the road grip (see Fig. 2), dictates

FIG. 3.—Illustrating (left) true centre point steering, and (right) non-pivotal steering.

that the steering must be designed on true centre-point principles unless the driver is to exercise much effort, which is undesirable not only as far as he is concerned, but also because it means that the tyre tread is being scraped whenever the course of the car is being deflected: that makes for wear (Fig. 3).

"Bogie" Points Banished by Practice.

Some imagine that the use of comfort tyres must necessarily take something off the speed of the car. They would have a very strong argument if medical men had to drive

their cars at speeds at which experimental machines are designed to run for records (such as the Darracq performance which set up a fresh standard last week) by which to judge car engine efficiency. But at the speeds at which the medical man requires to drive his car the difference between the use of comfort and of the ordinary section pneumatic tyre is negligible. It is not easy to define the matter more closely than that, for this reason among others: road surfaces differ all over the country. If you drive on those of the billiard-table variety, under the heading of mere maximum speed attainable you would achieve better results with an ordinary tyre inflated to its higher pressure than you would with a comfort tyre, which should be inflated to a lower pressure. But if you chance to go over a road of bad surface, then at such speeds as an ordinary car is capable of you would rather stand to gain than to lose by using a "comfort" tyre, because the "balloon" tyre would itself absorb by its air cushioning action a vast number of the bumps which are occasioned by passing over the irregularities of the road surface. Therefore the diving wheels would maintain practically continuous contact with the road surface, and the horse-power developed by the engine would not be wasted, as it is the moment a harder inflated, smaller section, ordinary pneumatic tyre receives a jar from an irregularity of the road surface, or from a loose stone, and therefore starts to bump off the road surface into the air, where the power of the engine is spun away instead of being harnessed to useful driving effort.

In regard to acceleration, as when starting a car on its journey, the momentary casting of an additional load on the back wheels would have no adverse effect by making a low-pressure tyre present a larger area of surface in contact with the road than does a higher pressure, smaller section tyre. We should be mindful not to be governed by theory, but rather by practice, for (as has been observed above) the low-pressure tyre is a practical proposition to the extent achieved to-day solely and wholly in defiance of principles on which the pneumatic tyre industry has been working all these years.

In the matter of cost, there is no reason why bills should be heavier with the use of low-pressure than with high-pressure tyres. It is too early to determine whether, in the hands of the ordinary motorist, one actually saves money on the tyre bill by using low-pressure tyres. There is one reason that offers a material prospect of gain by using balloon tyres. The whole fabric, being under lower pressure, is stressed to a vastly less extent, which is very important as regards the strain on the cover, which has to be kept inflated not merely when the car is in use during actual travelling along the road, but also all the time it stands in the garage, year in, year out. There is, besides, one certain economy of wear and tear to be achieved by the use of "comfort" tyres fitted properly and maintained at the correct pressures in the case of cars possessed of true centre-point steering: the shackle bolts of the springs, and the springs themselves, are saved wear to a quite extraordinary degree because they are protected by the low-pressure, large section pneumatic from a much greater proportion of jars received when traversing irregularities of road surfaces; and those received are cushioned to a remarkable extent.

Some Car Builders' Criticisms.

The fact that a large number of motor car manufacturers believe in the use of balloon tyres does not mean necessarily that, in the present stage of development, that type has definitely superseded the ordinary section pneumatic. On the contrary, of the builders who have standardized "balloon" tyres, a goodly proportion provide relatively defective springing and use the "comfort" tyre to disguise that. Formerly small car manufacturers, in particular, were wont to demonstrate their machines with ordinary section tyres inflated at pressures below those recommended by the tyre manufacturers.

The difficulties experienced in connexion with the use of "balloon" tyres of various sorts include (a) the failure of the side walls, which, however, constitutes a problem that has been largely solved through the proportionately

wide rim base required by all makers who have standardized this type of tyre for the current year, as indicated above; (b) side roll occasioned by the use of such tyres, which, as I have shown, has not been overcome yet in the case of larger constructions; (c) harder steering, to which the same remark applies; and (d) greater noise. As to the last point, one is aware to-day that, where motorists use steel-studded, non-skid ordinary section tyres, the passage of a car creates much greater noise than when the all-rubber treaded tyre of good gripping, anti-skid section is used. I have, however, often observed that the use of the balloon type of tyre on middle size and on large cars does create noise to a degree that is noticeable when taking corners, or curves, in circumstances in which, with ordinary section tyres on the same types of cars, the passage of the tyre would be quite undetected by the human ear.

In general, at this stage one's advice to medical men is that, if a manufacturer standardizes his car in any of the smaller categories with "balloon" tyres, it is advisable to run such a vehicle in that condition once one is satisfied that lightness of steering is not prejudiced. As regards fitting cars already owned with balloon tyres, one must have in mind the cost involved in fitting different wheels from those standardized for the use of tyres of normal section. Therefore, in most cases, it is scarcely worth doing.

There remains the case of the medical man who, because he is a specialist, or has a country practice covering a very large area, needs a really efficient middle size, or an actual big, car because he requires to put it to good speed performance on occasion. At the moment, one would suggest that it were better to allow manufacturers to go ahead gaining experience with the use of balloon tyres for these constructions than that the medical man should himself make the experiment. For one thing, these more powerful, larger scale cars are usually designed with very excellent springing systems; therefore, with the use of ordinary tyres of ordinary section and ordinary pressures, there arises no question of rough riding. Unquestionably, much experience will be obtained with balloon tyres during the next twelve months, alike by the tyre industry, by motor car manufacturers, and by the public. Doubtless the average medical man will conclude that the first two can more usefully conduct this work than himself.

Dunlop's Distinctive Policy.

Such a firm as the Dunlop Rubber Company holds that the whole proposition of the "balloon" tyre has been rushed in America. Be that as may be, in the issue it has decided to employ a different rim and tube section from those favoured by most manufacturers. With its thirty years' experience of both beaded-edge and wired-on types of tyres, its technical staff were of quite an open mind and discussed with manufacturers their technical requirements, the final decision being that a tyre designed to be run at relatively low pressures should be independent of the inflation pressure for its retention on the rim. This theory was tested exhaustively, and it proved completely sound in practice; hence the Dunlop balloon tyre is a wired-on type, and, unlike beaded-edge tyres, which are essentially inflation held, it is retained on the rim by its inextensible wire edges being smaller in circumference than the lips of the given rim. In this respect this Dunlop type tyre is identical with the straight-sided type of tyre, the adoption of which in this country has been delayed chiefly because of its higher initial cost, albeit the straight-sided type is widely favoured in America. In balloon tyre practice this difficulty of initial cost can be obviated, and a tyre constructed on straight-sided principles and offered for the first time at a price no higher than that of the beaded-edge tyre of the same nominal size and capacity. Incidentally, the Dunlop balloon tyre is used in conjunction with a rim made in a single piece in which the necessary strength can be provided by a relatively much lighter construction; this achieves a simple means of fitting and detaching the tyre, and allows the valve to come through the side of the rim. Of balloon tyres in general it should be observed that the use of the corded type of cover construction, being by far

the stronger, is general, and, of course, is to be recommended. Satisfactory service can be looked for only by maintaining balloon tyres at the pressures the manufacturers recommend for the given size pneumatic.

FRONT WHEEL BRAKES.

Of front wheel brakes it may be recorded that there is a vast increase in the number of manufacturers who will be standardizing this accessory, particularly in regard to middle-sized cars—for instance, Austin, Rover, and Star. No one system of construction is accepted universally. Front wheel brakes have been evolved to the practical point, but are still merely in the earlier stages of development. There is as much difference between the merits of systems used as there is between the power developed by the engines of the different cars on the market. I regret that I can form no other opinion than that the majority of front wheel braking schemes are being supplied to-day solely to meet pleadings of the salesmen who realize that the public has been educated to demand such accessories. Thoroughly sound and safe front wheel braking schemes are employed in the minority of cases only. When a really safe system is fitted an absolutely new standard of motoring safety is achieved by the introduction of front wheel brakes. But when a braking system is not satisfactory, at least to the extent to which it is possible to make one in the light of knowledge acquired to date, then it is safer not to have front wheel brakes. If any reader doubts this, let him have in mind the fact that in America insurance rates on cars fitted with front wheel brakes have been put up.

Apart from one's instinctive objection to doing so in connexion with a development which is really only in the initial stages, it must be said that the whole problem is vastly too intricate at the moment to lay down any hard and fast rules. Suffice it for illustration's sake that the front wheel braking system of the expanding shoe type, wherein six sets of brakes are applicable to a given car, as in Sunbeam practice, provides an absolutely new standard of safety in regard to motoring; whereas in regard to certain other cars that shall be nameless, front wheel brakes are designed of smaller diameter than the rear wheel sets, are fitted at lower shoe pressure where shoes are used—say, 7½ lb. front to 30 or 40 lb. behind—and the front wheel brakes come into operation at an appreciable interval of time after the brakes on the rear wheels. By these and other signs they may be recognized as brakes made by firms who realize just enough to be aware of the fact that they do not understand the subject, therefore they wish to take no chances. Of course, so little power could be absorbed by a front wheel brake built on the scheme just mentioned that practically no embarrassment would be caused to the freedom of the steering, or what not, if anything did go wrong with the system; in short, this school of motor constructors simply mesmerizes the car owner into the belief that he has an effective front wheel brake.

Some Helpful Points.

Again, there are systems of brakes by contracting bands, instead of by expanding shoes, which when operating successfully furnish to the given car more efficient brakes than those particular vehicle types have had hitherto; albeit the degree of efficiency in question is, at the most, no more than the efficiency achieved in a car with ordinarily efficient expanding shoe back wheel brakes and none on the front wheels at all. When it is wet, the unprotected exterior band type of front wheel brake is undesirable because dirt, grit, and so forth can get into it and, sometimes, the lining becomes saturated. Thus when one applies such brakes in rain one discovers that one slides a hundred yards, or more, while yellow grease is being squeezed out of the linings, and that after that they "bite" suddenly. In the circumstances it is difficult to lay down hard and fast rules; but serviceable points to have in mind include the following:

(a) If a manufacturer offers front wheel brakes at option, buy his car without such brakes; evidently he himself has not sufficient faith in them to put his whole reputation behind them.

(b) Where a car builder fits front wheel brakes observe whether he has redesigned his front axle to take the twisting strain involved by their application, for, whereas the I-section front axle is the best possible for achieving lightness in combination with sufficient strength for one that has to deal solely with a rolling wheel, nevertheless it is about the worst section possible to resist the twisting strain of brake application; hence such constructors as Fiat, Sunbeam, Lanchester, Daimler, Rover, and so forth use either solid circular or tubular section front axles, the only point that is material in this connexion being that such sections should be available from the spring pads outwards to the wheels, in that it does not matter what section the axle takes between the two springs.

(c) Test whether the steering is affected in any way by the use of front wheel brakes: uphill, downhill, on the flat, on the camber, at fast speeds, legal limit, and traffic crawls.

(d) Do not be bluffed into the belief that, merely because a car has brakes to all four wheels, it is necessarily more efficient in that connexion than one that has them to the two rear wheels only, because the former may have small diameter, or low pressure, or narrow section, or otherwise inefficient brakes on all four wheels; whereas the latter may have wide, deep diameter really effective brakes to the back wheels only and be, in fact, much more efficiently braked.

(e) Remember that the fitting of front wheel brakes adds to the weight and complication of the car's mechanism.

No Universally Adopted System Yet.

My own opinion is that front wheel brakes will be universal practice in a few years. But it is nineteen years since I had my first experience of front wheel brakes, and I realized then, by exciting "incidents" experienced on greasy surfaces, how much one has to learn before a front wheel brake can be fitted which will prove safe in all circumstances of use. That is the problem. It is doubtful if the average owner could adjust satisfactorily most front wheel brake schemes. That is not so easy as it looks even though the wing nuts be accessible—as, in some cases, beside the very wheel hubs themselves. One adjustment for all four brakes is, of course, the best, as in Lanchester, Rover, and Sunbeam practice. Schemes vary vastly in merit, as do methods of control. The entirely mechanically controlled Lanchester method is a splendidly sound arrangement. Again, the compensating scheme adopted by Vauxhall is as excellently effective as it is simple. Servo mechanism, which some firms do not fit, is nevertheless a great gain in regard to assisting lightness of control and ensuring safety. Some firms, such as Sunbeam and Rover, use Servo control for the front wheel brakes only and not for the rear set, which, incidentally, is one means by which they conform with the now twenty-year-old law that requires that a car should be capable of being held on either of two independent sets of brakes operating on the rear wheels when the vehicle is at a stand on a hill. Where Servo mechanism is applied to all four wheels, when the car comes to a stand that system of brakes will not hold it. Hence the application of Servo mechanism to the front wheel brakes only by certain manufacturers and designers.

ROVER'S NEW PROGRAMME FOR MEDICAL MEN.

Than the Rover Company, no British enterprise has succeeded in providing lower-priced, more durable, refined, economical running cars that have proved uncommonly dependable and satisfactory over a period of years. In one district in the provinces no fewer than eighty-five medical men own the 12-h.p. type of machine who cannot be induced to buy anything of later design because they are so satisfied with the performance. The Rover Company, however, is making a radical change in its programme of car design and production for the 1925 season which, tests convince me, will be successful in causing the at present contented medical man who can afford it to become dissatisfied with what Rover he has and acquire one of these new style models. Briefly, the firm will supersede the well known 12-h.p.—lately re-rated at 14-h.p.—side-valve engined three-speed car by a four-cylinder overhead valve four-speed nominal 14/45-h.p. car of approximately the same engine capacity (2,132 c.cm.), but of extraordinarily different performance, the whole power plant and chassis being the design of Mr. P. A. Poppe, who has been working on it with the Rover Company since Christmas last. But he had actually this type of chassis in mind from the time of

the armistice. He designed and built the original power plant and gear sets for Morris-Oxford cars, and is a remarkable mathematician. The present aim is to produce a Rover car which itself should be, if anything, ahead of its time. This machine, which will be introduced to the public at Olympia on October 17th, will be listed at little more than the price of this year's 14-h.p. side-valve engined car, and will scarcely scale more than one hundred-weight extra, including the weight of the balloon tyres standardized. It is a very much more ambitious car, alike as to performance and accommodation, than the type it supersedes, the tax being nevertheless only £14 a year. Though the overhead valves are on opposite sides of the cylinders, only one overhead camshaft is employed. Moreover, it is set on one side of the engine, being driven by a vertical shaft from the crankshaft. A truly hemispherical combustion chamber is achieved, and the sparking plugs are set vertically in the top of each cylinder, in the dead centre—the most efficient position. Pressure lubrication is furnished to every engine bearing. The lubrication design marks an innovation in, among other things, the quantity of oil carried in the sump—about three gallons—which is schemed specially to cool it. The lubricant is circulated by a gear pump at the foot of the vertical shaft which drives the overhead camshaft. The oil is forced (a) up the vertical shaft into the inlet rocker chamber, across the head into the exhaust rocker chamber, thence back into the sump by way of the steering box; and (b) along passages in the crankshaft and crankcase to each big end bearing, to each of the three mainshaft bearings, and, from the big ends, upwards through the hollow connecting rods to the gudgeon pin bearings, whence a spray is directed on to the inner side of the piston crown. The clutch and gearbox also receive their supply of lubricant from the engine sump, a constant level being maintained in the gearbox. Any overflow finds its way into the clutch chamber, where it is picked up by the flywheel and discharged through passages back into the crankcase. Should water get into the lubrication system by any chance it is rejected by special filters, and falls to a trap below. It will be observed that the steering box, which in ordinary cars is generally neglected, is in this case lubricated positively and automatically. Four speeds are provided, and an extraordinary degree of quiet running is achieved by the introduction of gearwheels with tooth profiles of a form unlike any I know, a consequence being that one does not hesitate to change speed, so quiet is the running on the indirect drives. It is possible for a driver familiar with this car to change gear without withdrawing the clutch—a point mentioned to show the extraordinary ease with which the gears can be changed by one who can judge his engine speed accurately.

Notable Points of Original Practice.

The unit construction of engine and gearbox has been achieved without the disadvantage of inaccessibility ordinarily involved. A more accessible chassis I have not seen yet. The controls are on the right hand. An uncommon feature is that the gear lever itself is adjustable for position, while the hand brake lever design breaks fresh ground. The strength of the frame, without involving heaviness, is quite beyond the common. Four wheel brakes of no less than 13 in. shoe diameter, enclosed completely, are furnished on the Perrot patent principle as regards the control of the front sets. Exceptional features of Mr. Poppe's design of the braking installation include the means of lubricating the cross-shafts; and the manner of allowing for the difference of axle and spring position when the front wheel brakes are in active operation, equal braking efficiency being transmitted to each of the four wheel brakes during that period only. Again, the hand-controlled brakes operate on all four wheels in synchronism, as do the foot-controlled brakes. Yet both sets are entirely separate, and each set is so designed that, if the front wheel brakes were to fail, the back ones would hold. In effect, there are four completely efficient sets of brakes, so that three sets could fail and still the driver would have efficient braking on two wheels of the chassis. This interesting device will be one of the notable new things to be studied at the Show. The steering gear is adjustable in every direction. The steering joint, and the front wheel

brakes control gear joints, are mud- and grit-proof without leather covers. The propeller shaft is enclosed, the drive being taken by a clutch consisting of a bronze disc between two steel plates, through the gearbox to a propeller shaft enclosed in a torque tube that has a bearing for the shaft about midway—thus eliminating drumming, which would occur through shaft whip when this length is unsupported—to the back axle driven by silent spiral bevel gear. The car does a petrol consumption of about twenty-five miles per gallon at touring speeds; has a wheelbase of 10 feet; a track of 4 feet 6 inches; a ground clearance of 8 inches; and a speed of over a mile a minute, the engine being an uncommonly efficient one, designed for a mean effective pressure of no less than 105 lb. per square inch at 2,000 crankshaft revolutions a minute, and capable of acceleration up to 4,000 crankshaft revolutions a minute. Therefore, though rated at 14/45 h.p., this power plant gives very much more power than the higher figure. Yet it can be run for the cost of the now superseded 14-h.p. Rover car. It will be available alike with Weymann and with coach-built bodies.

For the medical man the Rover Company will also introduce at Olympia the new 9/20-h.p. 1,074 c.cm. overhead valve water-cooled four-cylinder engined £9 tax type, which is available with two-seat body and with four-seat "chummy" body, also with a three-door body in a *de luxe* edition, all with Dunlop balloon tyres, the petrol consumption varying between forty and fifty miles per gallon. The speed possibilities are in excess of fifty miles an hour—I obtained fifty-three miles an hour in test—and the equipment includes an all-weather hood, and so forth, this being a machine that will be marketed at less than £200 in the ordinary version, and at very little more in the *de luxe* version, which latter has 5 inches longer wheelbase. Rover is one of the notable 1925 recruits to the overhead valve system. These two chassis types, together with the continuation of the 8-h.p. air-cooled two-cylinder engined machine that sells at £160, complete the firm's manufacturing programme for the 1924-25 season.

GLASGOW MEMORIAL TO LORD LISTER.

UNVEILING CEREMONY.

So far back as February, 1912, an influential committee was appointed in Glasgow to promote the establishment of a memorial to the immortal memory of Lord Lister. Owing to the war the activities of this committee were for a time suspended. Later, following various suggestions as to the most suitable form such a memorial might take, it was resolved to erect a statue in bronze to be placed in the Kelvingrove Park. A suitable site was obtained near the statue of Lord Kelvin, his illustrious contemporary and colleague in the Senate of Glasgow University. To Mr. G. H. Paulin, A.R.S.A., was entrusted the preparation of the statue, which is a striking figure in bronze and is mounted on a granite base. Lister is represented seated, with head uncovered, and wearing his academic robes. The sculptor has depicted him in a strikingly alert attitude and as he was while still in the full vigour of his professional career.

The unveiling ceremony took place on September 17th, in the presence of a large and distinguished company. The Lord Provost, Mr. Matthew W. Montgomery, presided and called upon Sir Hector C. Cameron, a former dresser, house-surgeon, and assistant of Lord Lister, to unveil the statue. Sir Hector, before unveiling the statue, delivered an oration which we give *in extenso*.

Sir Hector Cameron's Address.

I esteem it a very high honour indeed to have been invited to unveil the statue commemorative of Lord Lister, beside which we are now assembled. I am well aware that I owe this honour to the fact—the accidental fact—that I am the sole survivor of those who served under him as house-surgeons in Glasgow and one of the very few still alive who listened to his lectures and witnessed his work in the old College and the old Royal Infirmary in the High Street. I formed a still closer connexion with him after my house-surgeonship was completed, when he invited me to be his assistant in private practice.

Above all, it was "he for whose applause I strove; I had such reverence for his blame," and he honoured me with an affectionate friendship to the end of his long life. Such considerations make me feel that, however much I could have wished that some eminent man of science had been invited to occupy the place in which I now find myself, I may console myself with the reflection that I shall at least fulfil, however imperfectly, what I may well regard as a pious duty.

Mr. Joseph Lister became a candidate for the chair of surgery in the University of Glasgow on the death of Professor Lawrie in November, 1859, and his appointment was announced on January 28th, 1860. He was then in his thirty-third year. He had been resident in Edinburgh for some years previously, where, latterly, he had held the post of assistant surgeon to the Royal Infirmary and was an extra-mural lecturer on surgery.

The appointment to the chair in Glasgow did not at that time carry with it the succession to hospital wards, and for the first fifteen months of his professorship he had no opportunity of illustrating by his practice the theoretical teaching which he communicated to his students in his university classroom. He was, however, appointed a surgeon to the Royal Infirmary in August, 1861, and began his work there when the winter session opened.

From the time he began his professorial duties he commanded the enthusiastic admiration of his students. At the end of his first winter session they adopted the very unusual course of presenting him with an address in which they expressed their high appreciation of the lectures to which they had listened and the valuable instruction which had been communicated to them. It is interesting to recall that the member of the class chosen by his fellows to read and present this address to the professor was J. B. Russell, afterwards the first whole-time medical officer of health of Glasgow, a most able public servant of the city, and a pioneer of world-wide reputation in the then nascent science of preventive medicine.

The enthusiasm thus excited in the students of his first class was fully maintained in succeeding years. I became a member of the class in 1862. One of my fellow students was Friedrich Trendelenburg, a son of a professor of the University of Berlin, who had been a friend of Professor Allen Thomson of Glasgow University from their youthful days. Young Trendelenburg had in consequence been sent for two years' study to Glasgow under Professors Allen Thomson, Lister, and William Thomson, afterwards Lord Kelvin. In later years he made for himself a great reputation as professor of surgery in the University of Leipzig, and introduced valuable improvements in the practice of certain departments of the surgical art. With these improvements his name will always be associated. Some years ago, in a letter which I received from him, he observed that, while we all regarded Professor Lister with great respect and admiration, none of us could foresee that he would one day "change surgery from the very bottom." This was a just remark. All of us, indeed, felt conscious that we were listening to new and valuable lessons not yet in print, but little realized how great their value was or what unspeakable blessings were to flow from their development in the near future. It was not, however, until 1865 that Lister began to develop his antiseptic system of wound treatment.

It is not possible on such an occasion as this to explain the details of Lister's method of wound treatment, but in the words of a celebrated French surgeon now deceased, writing in 1902, "it produced in the evolution of our science such a revolution that we ought to judge it as though centuries had passed." "Have we not seen," he asks, "in twenty-five years such a progress as centuries never made?"

And the progress thus made has now largely extended. The principles he taught as the foundation of his system are now universally received and acknowledged by surgeons the whole world over, although in many ways the mode of applying them has become modified. He wedded surgery and science in a manner unattempted before, with the effect, as has been well said, that surgery, and especially operative surgery, has been so changed as to become "a safe and soundly based science" instead of being, as it was formerly, "a hazardous lottery." The result has been the saving of human lives in number beyond all calculation.

Those achievements, you will believe, were not accomplished without indomitable perseverance, and a marvellous patience in the face of great opposition from the majority of the leaders of his profession, especially in his own country. From the very first he was under no illusion in regard to the inevitable and hostile criticism which his doctrines must evoke, especially from those who were prejudiced by a life-long familiarity with the older teaching and the former methods of practice.

In an interesting letter which I some years ago received from Dr. Collins Warren of Boston, a distinguished surgeon of America, he told me of a visit which he had paid to Lister's wards in the Royal Infirmary of Glasgow in the summer of