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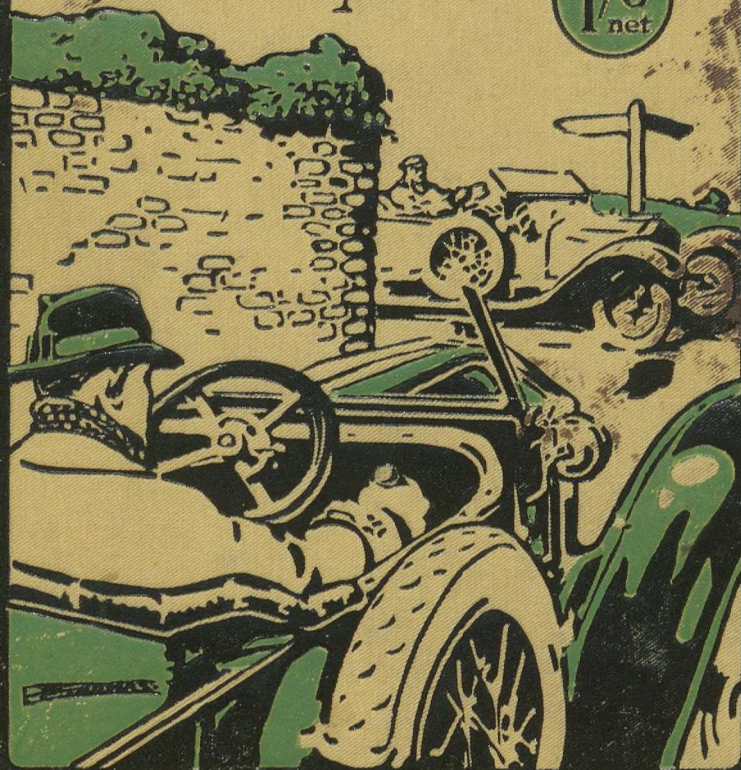
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SECOND
EDITION.

HOW *to* DRIVE a MOTORCAR

Written & Illustrated by
the Staff of The Motor

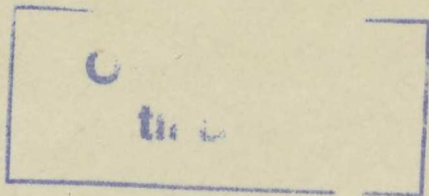
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HOW TO DRIVE A MOTORCAR

A KEY TO THE
SUBTLETIES OF
MOTORING

Written and illustrated
by the Staff of
"The Motor." ❀ ❀ ❀

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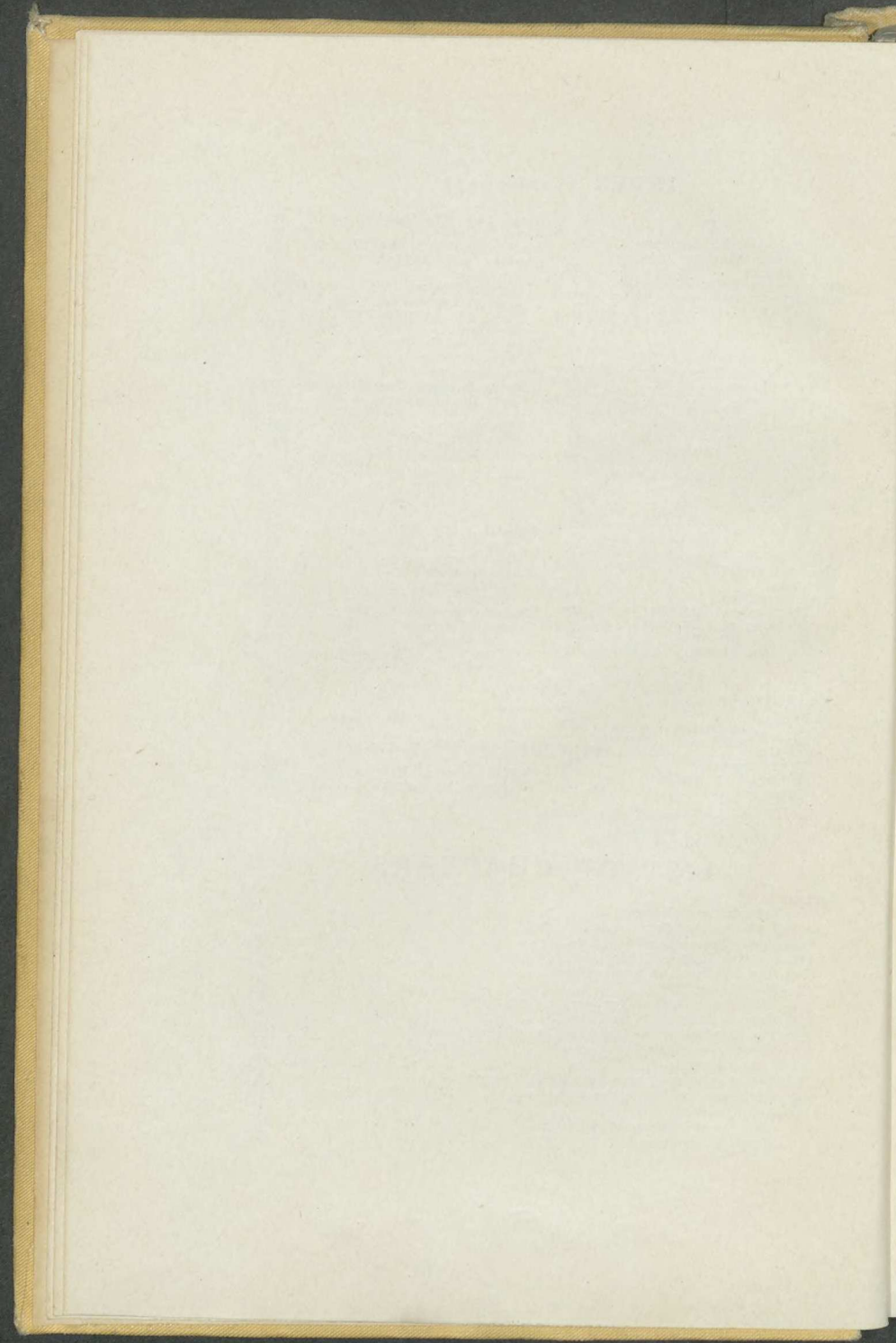
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PREFACE

This book is intended for every motorist. The result of a wide experience on the road and practice in the handling of many makes of cars has enabled the writer to become acquainted with many of the inside secrets of driving.

Undoubtedly a study of the subtleties of the art is a valuable acquisition to the motorist—particularly when a sudden emergency calls for some immediate exhibition of skill.

Everything worth knowing in connection with driving the car on the road is to be found in this book. For information on such matters as the principles and working of the engine and the construction of the car, the reader is referred to "The Motor Manual," price 1s. 6d. net, which deals exhaustively with these matters, and also with the question of breakdowns and temporary repairs.

INTRODUCTORY CHAPTER

MOST of us are aware of a common human failing which is to be traced in almost every walk of life, namely, that when a person attains to a mediocre efficiency in the execution of any given work or sport, he (or she) is inclined to think that the sum knowledge of the subject has been acquired. Most of us suffer from the same complaint in a greater or lesser degree, but somehow the motorist seems particularly susceptible to this human weakness.

It is, perhaps, a little unusual to start in the introduction to a book a tirade against one's readers, and really no such unwarrantable attack is intended. On the contrary, if we admit, for argument's sake, that some few people who imagine that they are expert drivers are not really such in all phases, then it is hoped that some of the information given may be really useful. It is also thought possible that some of the points may be instructive even to many experienced drivers, whilst a certain confidence is felt that the book will prove valuable to the bulk of motorists. It is not proposed to start with the literal A B C of driving a car, and the reader is assumed to have some average knowledge of the means of conducting a car, although here and there elementary matters may be referred to, so that even the absolute novice will not be at sea in reading the book. More particularly, however, it is desired *to lay down the ways and means to be adopted to enable the ordinary driver to become an expert*, both as regards the treatment of the mechanism which he controls and his conduct of the car when driving.

If these desiderata can be successfully attained, a good work will have been accomplished. In the first place, the correct care of the car and its appurtenances

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will show a direct saving in upkeep and running costs, whereas a sound knowledge of the expert way of driving a car will lead to a diminution both of accidents and accidental incidents. In proof of the former statement, it may be mentioned that whereas a driver who has purchased a Jones-Smith car finds that it costs him, say, 4d. a mile to run it for 5000 miles a year, another more capable and careful driver may do the same distance with a reduction of running costs of 25 per cent., or even 50 per cent. In proof of the latter field for improvement, one may cite the fact that the known expert driver is never, or, in the words of Gilbert, "hardly ever" concerned in an accident. Yet the expert driver frequently takes more risks than the average driver; but his greater knowledge and intuitive foresight enable him to guard against ordinary risks, and others which are largely unforeseeable, into which the less-experienced driver allows himself to drift. Conversation with most expert drivers will reveal the fact that they have been frequently in very tight corners, but by doing precisely the right thing at the right *fifth of a second*—not at the right second—an accident has been avoided and only been memorized as an incident. Such, then, is the objective with which we start our work.

CHAPTER I

Training the Eye[✓]

THE welfare of the public must always be the first consideration in the mind of the driver who is in charge of any vehicle which is inherently capable of causing damage to persons or property. It is perhaps a trifle obscured in the mind at times, as the habit of driving becomes so much a matter of routine that when one goes out day after day, and returns safe and sound again in the evening, the possibility of danger to other people is inclined to become a forgotten leading consideration.

Nevertheless, it should not be so. One must remember that even a small car of, say, 10 h.p., and weighing about 15 cwt., has in it, when running at even the legal limit of 20 miles an hour, a stored-up energy (which we term momentum) capable of inflicting serious bodily harm and causing considerable damage. Far be it from us to raise any undue ideas of danger. It is, however, the possession of a complete and thorough knowledge of the potential power for damage which a considerable weight, such as a car, possesses at a good speed, which enables one more accurately to guard against the possibility of losing control over that power, or failing accurately to direct it. There is undoubtedly a certain trust imposed upon the driver of a motor vehicle. He is the guardian primarily of the safety of other road users, and, secondarily, of his own well-being and that of his car. The statements are, perhaps, a little stale, but even an apparent truth is sometimes lost sight of through its very familiarity.

We have then the fact, which we trust the reader has now carefully absorbed, that the driver is in charge of a vehicle which is a potential means of causing damage, and that he is responsible for its safe conduct. How

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then is he to control it to the best possible means, and to secure the maximum safety all round, in conjunction with reasonable use?

On Training the Eyes

Well-trained eyes are an all-abounding fount of security. The statement is a strong one, but it is capable of substantial proof. Few drivers, it is to be feared, have made a point of training their eyes. The eye itself is a remarkably complex piece of the human anatomy, yet its powers of observation can undoubtedly be improved by scientific training. It conveys that which it perceives to the brain in a wonderfully short space of time, but the main thing to aim at is to encourage, by careful practice, the power of the eye to act—as one may so term it—on the offensive, rather than on the defensive.

That is to say, the eye should be assiduously trained specifically to seek obstructions to the car's progress rather than that the obstruction should be allowed to become apparent through its own magnitude.

For the sake of example, when touring along, say, the main road of any large town and approaching a cross-road—even if it be quite a by-road—the eye should intuitively pick out in the distance the presence of that by-road, and as one approaches it the mouth of the by-road should come under the active and positive vision of the eye whilst the main outlook is still straight ahead. One can gradually train the eye until such action, rather complex though it sounds, becomes neither more nor less than an instinctive habit.

The Value of a Second

It is hard to convey in plain black and white the extreme value which eyes so trained are to their owner. Say, for example, that one is going along the said main road at about 20 miles an hour and, quite hidden to anyone's vision, a butcher's cart is coming along quickly in the side road. Assume that, if neither alters speed, the two should meet at right angles. It

THE VALUE OF A SECOND

may be that the horse is a little out of control, or it may be that the driver is a careless one and going too quickly for safe travelling on a by-road. In either case the result is the same.

Now for the material advantage accruing to the well-trained eye. Suppose that 50 or 60 yds. away the presence of that hidden "dead" corner has been ferreted out by the eye, without for one fraction of a moment interfering with the main straight-ahead outlook; also suppose that as the car approaches the opening it is still held carefully and specifically in the field of vision. Now, as the horse finally dashes out, the trained eye picks out its presence the moment its head has protruded beyond the house, wall, or whatever it is which limits the line of vision. With the untrained eye such would undoubtedly not be the case, but probably most of the horse, with some people, even the whole horse and trap, would have to pass the edge of the wall before their presence was forced on the eye by their mere magnitude.

Now, if we assume that the difference in time gained between the trained eye and the untrained eye in this simple little case is one second, and then take pencil and paper, we find that the minute portion of time in question is the equivalent, at 20 miles an hour, of about 10 yds. It is quite patent that 10 yds. may more than easily mean the difference between sufficient time to have applied the brakes and sufficiently reduced the progress of the car, or to have allowed the cart to swing out with an accident as the result.

It is not sufficiently well grasped by the average driver what a huge difference a second, or even a fifth of a second, makes in any case of emergency. Quite frequently, however, a fifth of a second is the whole difference between an accident and an incident.

How to Cultivate Intuitive Sight

There are many kinds of intuition which should be found in the really expert driver. Some few people are gifted with such powers by nature, but unfortunately they are a very small minority. Everyone, however, can, if so minded, cultivate powers of

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intuition (the statement is verging on a Hibernicism, but the meaning can no doubt be gathered), and the eyes again are an important factor in this work. There are innumerable examples of differentiation between the eye trained to intuitive sight, so to speak, and the ordinary eye of the average driver.

For instance, one may be meeting a traction engine and a trailer, and the average eye will see therein a bulky piece of mechanism which has to be cleared, and so long as the road past is free of obstructions that single fact is the beginning and the end of what the untrained eye tells the brain of the driver of the car. On the other hand, the eye which is trained by experience to make use of instinctive sight will picture at the rear of the tractor the possible presence of either a small boy having a joy ride or a cyclist resting his legs at the expense of a little extra strain on his arms—in other words, being towed.

Now, the eye trained to this intuitive type of vision instinctively passes on that information to the mind, which is thereby automatically alert for possible eventualities. As one approaches the traction engine the possibility of a small boy running out from the back, or the cyclist swerving out, is a potent factor in the method of conducting the car, and instinctively the hand rests upon the button of the electric horn or the air-bulb, as the case may be, the foot is on the clutch pedal, and the other foot waiting to jam on the brake, if necessary.

In addition to this the steering is likewise adjusted to give more room for any possible traveller at the rear of the trailer; thus the whole situation is gauged instinctively, automatically, and without any trouble exactly to fit the possible circumstances of the case. Should, then, the cyclist swerve out, or should the small boy be chased away by one of the attendants and run across the road, the horn is blown instantaneously with the appearance of the very first portion of the person referred to, the car is steered further away, and, if necessary, the brake applied, all these things being done instantaneously.

TRAINING THE EYE

Now let us take the case of the other type of driver who has not trained his eye to picture these possibilities. He in turn goes merrily along, and if such a set of circumstances should arise he has first of all to grasp the situation in his mind, which takes a small portion of time, he has then to get his hand to the horn, to de-clutch, to steer out, and to apply the brake. The accomplishment of all these movements takes a certain amount of time, and in such circumstances where it would be no exaggeration to say an accident might be missed literally by inches it is not a second which counts but one-fifth or one-tenth of a second which makes all the difference.

On another occasion one may be overtaking a cyclist on a greasy road; in such a case the average driver thinks that, so long as he gives him sufficient room so as not in any way to inconvenience him, the whole of his duty is done. The eye trained, however, intuitively to picture possible circumstances as well as probable occurrences sees a mental vision of that cyclist sprawling on the road as the result of a skid. Consequently, if the circumstances are such as in the least way to make the possibility of such a skid approach the realms of probability, more room is allowed, and the mind is absolutely waiting to direct the muscles to make the necessary swerve at the very first indication of such an event portending.

That, then, is another example where an accident can be missed literally by inches if the eye is so trained, and the body synchronously harmonizing with every action; on the contrary, if such possibilities were not present to the eye, the circumstances, if occurring, would be such that with the best of intentions in the world an accident could not be avoided, although it may be only caused by the lack of a fifth of a second of valuable time.

Some Further Examples

Even at the risk of further examples appearing supererogatory, it may be well to quote some in order adequately to drive the point home and to show the lines on which the driver should train his eyes to

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picture not only probabilities but also possibilities. Take, then, as another example, the case of a pedestrian apparently wandering aimlessly in the centre of the road. Now, although it is done probably 99 times out of 100, and although one may advance sound arguments that it is excusable, nevertheless it should not, in point of fact, be argued by the driver that because he sounds his horn the said pedestrian will move to the side of the road.

The trained eye naturally assumes the very strong probability of such a thing happening, but it also has a glimmering vision as to the possibility of that person being deaf, hopelessly "in the moon," stupid, or even drunk. The writer has had experience with each classification, and many other people have also testified to such an extraordinary encounter. Admittedly—and luckily—such folk are but rarely met, but nevertheless the trained eye should visualize that remote possibility and be automatically on the alert to act as the circumstances dictate on its possible materialization.

An even more frequent and not by any means uncommon danger is the unattended horse, cow, pig, sheep, or other animal grazing on the country roadsides. It may easily happen that one's car is very quiet, and also that the animal in question will not hear it until one is so close that a safe passage is assured owing to the mere speed of the car and the relatively slow movements of the animal. It may chance, however, and not infrequently does happen, that for some reason best known to itself (possibly a delectable grass plot on the other side of the road) the animal selects the very moment of one's approach to cross from its present side of the road to the other.

Here again it may be that the circumstance suggested is not a probable occurrence, but nevertheless the trained eye should intuitively picture such happenings and be therefore prepared to act instantaneously at the slightest symptom of any such action on the part of the animal.

Above all, perhaps, children have to be given the

TRAINING THE EYE

fullest possible consideration by the eye trained to the intuitive visualization of possibilities. A child sitting with a doll at the side of the road may look, from a distance of 50 yds., as secure from any sudden desire to cross the road as a milestone. One may even know for certain that the child has actually been made aware of the presence of the approach of the car by means of the horn, so that one would feel justified in assuming that it will not suddenly dash across the road, but will await the passage of the car.

In most cases such assumptions are accurate, but, nevertheless, the trained eye should have constantly in front of it the possibility of a playmate's sudden call, making the child dash heedlessly in front of the car.

Never for one fraction of a second should the well-trained eye cease to have a specific knowledge of any movement of the child in question, although continuously keeping a keen look-out in front. The child should be a subservient part of the field of vision, but nevertheless a distinct entity therein, carefully under scrutiny until such moment as its power in any way to cause an accident is finally removed, owing to the inability of the child to get into the road before the car has actually passed the danger zone.

CHAPTER II

Traffic Precautions

THE necessity of carefully and systematically training the eye to cover a larger field of observation than that which is immediately in front of one has been alluded to at some length, and it is equally essential to train the eye to similar activity when driving in traffic. The possession of a well-trained eye, working in conjunction with what one might term an intuitive mind, is of the greatest possible use to the driver in guarding against the vagaries of various road-users in towns.

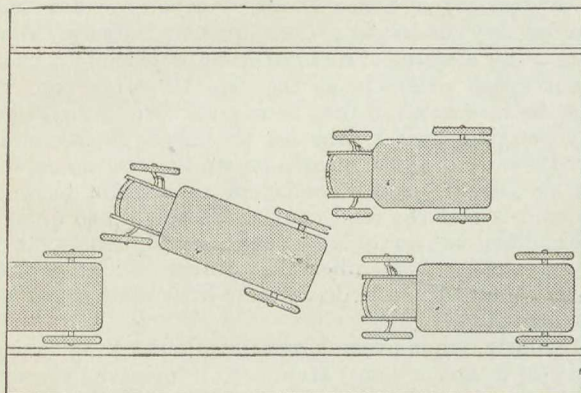
Corners and cross-roads should always be a subsidiary field of observation. The badly-driven, or too-quickly-driven, car coming round the corner should always be considered a possibility, and whilst it is, of course, chiefly advisable to have the main subsidiary outlook on the corner on the side of the road on which one is travelling, nevertheless practice will gradually enable the driver to have a pretty general observation of the corner on the right-hand side of the road as well. So many of the accidents which do happen occur at cross-roads that the importance of this factor cannot well be over-rated.

In all large towns, especially where commercial motors are much in evidence, the eye should also be trained to foresee the many vagaries in which these vehicles are in the habit of indulging. For instance, when overtaking a line of buses at the corner, it not infrequently happens that one of the middle ones will, without the slightest warning whatsoever, turn out into the road at full lock, and this at a comparatively good speed.

PASSING ON THE WRONG SIDE

Such a possibility, then, should be before the driver's mind when passing a line of buses waiting to take up passengers, and the eye should be trained to watch for the very earliest sign of a movement in this direction. When the roads are wet or greasy, these big vehicles frequently refuse point-blank to move from the middle of the road, so that it is often a very great temptation to cut inside and pass on the legally wrong side, although, of course, the bus has no right to obstruct the passage of the vehicle wishing to pass.

It must be admitted that where the road has much camber the driver does not care to be at the side, for



Danger of an omnibus suddenly drawing out of line.

a very sound reason, as these heavy vehicles have a strong tendency to sideslip when on a cambered road. It would not do to advocate passing on the wrong side in such cases, but if a driver elects to do so, then more than ever must the eye be keenly on the alert for emergencies. The driver of a bus which has absolutely refused to let a car pass by maintaining the right-hand portion of the left side of the road, will frequently not hesitate to declutch suddenly and make a dive for the left kerb the instant the bell is rung for a passenger to alight.

Consequently, if one does elect to pass a bus on the

HOW TO DRIVE A MOTORCAR

wrong side the greatest caution has to be exercised and the eye kept on the alert for signs of passengers wishing to get out, and the ear should listen keenly for the bell. It is preferable also, instead of making a rush past, to get at about the same speed as the bus till about the middle of the bus, and then, carefully watching the opportunity, sound the horn and accelerate in front of the bulky obstructor.

Another point which has to be carefully guarded against in traffic driving is the danger attendant upon following an electric tram. One should never forget that the "decelerating" efficiency (if one may coin an expression) of these trams is much greater than that of any motorcar. Consequently, always allow them a fair amount of room in front, especially if there is not space available at the side to swing out. It must be remembered that nearly all these trams have very powerful brakes, whether the motor-short-circuiting one is used or the electro-magnetic, and no vehicle relying purely on the coefficient of friction between the wheels and the road could hope to stop so quickly when going at an equal speed; consequently, it is always well to remember that trams can stop more quickly than cars, and drive some little distance in the rear accordingly.

Similarly, when overtaking a tram and trying to pass between it and a lamp standard, it must be remembered that its powers of acceleration are also very great, and that it is quite a common occurrence for the driver to select the moment when a car is trying to pass him as the time to exhibit the powers of acceleration possessed by his tram. With regard, then, to cutting between one tram and another, or a tram and a lamp standard, if there is a shadow of a doubt as to success remember Punch's famous advice in another direction and "don't."

With regard to children and pedestrians, the remarks which have been already written anent the training of the eye to guard against all possible contingencies of sudden movements are of double value in traffic.

DRIVING IN TRAFFIC

Speed in Traffic

It may, perhaps, be somewhat of a platitude to state that the main factor of safety in traffic driving is care, and the constant guarding against too great a speed. Taking a journey in London, for instance, say from the Bank to Marble Arch, it will be found, on a careful test, that the difference in time between absolutely careful driving, studiously avoiding sudden acceleration and sudden brake application, and then, on the other hand, using to the greatest possible extent the acceleration powers of the car and its braking abilities, is wholly negligible from the point of view of being any real saving.

With the proper method of driving one is courting safety, whilst with the other there is a distinct inclination towards encouraging accidents, to say nothing of the extra wear and tear of the car and one's own nerves and those presumably possessed by the public.

Another point which may be cited here is that of the proper way of driving in traffic, subject to direct control by the police, and when, subsequently, traffic blocks keep occurring.

It is all too prevalent a custom, when a traffic block can be seen ahead, say a hundred yards away, for the average driver to career along merrily without reducing speed until the last few yards, when the brakes have to be applied more or less harshly to arrest the car and stop at the rear of the vehicle in front. The proper way in such cases is to declutch a good distance away from the traffic block, so that the car's momentum takes it up to the vehicle behind which it is necessary to stop, and then only a very slight brake application is required finally to stop the car.

Obviously, no time is saved by the former and harsh method of driving, as in either case it is necessary to await the policeman's signal before the cars congregated in the traffic block can proceed again. It might be suggested against this dictum that if one does so drive, there is a possibility of some less mechanically-minded taxi driver, for instance, dashing in front of one and pulling up suddenly, and so securing a premier position. Even assuming such a thing to happen, it

HOW TO DRIVE A MOTORCAR

is really quite a negligible matter, as the difference in position is only a matter of, say, six yards.

Tyres, Road Conditions and Weight

There are other matters connected with traffic driving which have to be borne in mind. For instance, there is a distinct difference between driving a car with a steel-studded non-skid tyre on the back and one with rubber tyres only. Taken all round, the writer has gradually come to the conclusion that a metallic non-skid on one rear wheel is the preferable fitment for all-round use, at any rate in the winter, but whatever tyres are fitted, one has again to invoke the aid of the eye to study immediate surroundings.

For instance, if the day is dry and one is on wood pavement, a car in front with rubber tyres on the back, granted equal braking efficiency, will draw up more quickly in this case than one's own car. Therefore, when driving in traffic train the eye to take notice of the manner in which the car just in front of one is shod, so that in case of a sudden stoppage from any cause one does not run into the rear of the vehicle in front, because the braking efficiency of one's own car is not equal to the other one.

Then, again, if one is usually accustomed to driving with a full load of passengers it is necessary to remember that the braking efficiency of a car is distinctly less when driving alone, as, of course, the weight on the back axle is a large factor in assigning the coefficient of friction available for the braking effort between the road surface and the wheels of the car.

This weight factor has also to be taken into consideration as regards the skidding propensities of the car, but it is not proposed to deal with that side of the question of driving at the moment, as a special chapter is devoted to the subject later on.

Another set of changed circumstances which the eye should be trained automatically to observe without any specific effort are the varying conditions of the road surface met with in a large town. For instance, one may have been driving with rubber tyres on nice dry roads, where the braking efficiency was very good. and

DRIVING BY NIGHT

suddenly come upon a recently-watered road, where the braking efficiency will be notably less; consequently it is necessary to bear the fact in mind and make allowances for it. Conversely, of course, if one has a steel-studded non-skid and has been driving for a long time on wet roads and then suddenly strikes a part of the town where, perchance, the rain has not fallen, similar circumstances arise again.

How to Attain an Observant Eye

It must not be thought that all these various duties for the eye are being put down as a set of rules which the driver might have in front of him on the dash. No; they are formulated so that he may gradually train himself, little by little, to the accomplishment of all the various precautions set out, in an entirely automatic manner and without the slightest personal effort. As an analogy, one may point to the every-day bicycle, which in the early stages is a difficult machine accurately to balance and control, though when once the art has been acquired it is done entirely automatically and without the slightest conscious effort. In exactly the same manner, with judicious training, the driver can gradually train himself to accomplish all these various functions detailed to the eye and to do them quite automatically and without giving the matter any specified consideration. Obviously the suggestions put forward could be enlarged still further, as, for instance, when passing through wooded country in a storm or heavy wind, an outlook is invariably kept by the writer for the possibility of a tree being blown down across the road. Admittedly, that verges on super-refinement. In the foregoing matter, however, the chief desiderata have been enunciated, and only those matters alluded to which the motorist who wishes to be a good driver should gradually acquire. They really make all the difference between careless and safe driving.

Night Driving

The whole of the foregoing remarks are at least equally applicable to night driving, if not even more so, and although when driving in the day time on

HOW TO DRIVE A MOTORCAR

country roads one can frequently give a momentary glance at something not directly ahead with reasonable safety, at night such a practice should never be indulged in. In broad daylight one may, for instance, be on a road where there is no sign of a crossing or the possibility of any hidden thing in the neighbourhood of the road within, say, a couple of hundred yards, so that it may be reasonable to relax the set study of the road for a second or two. At night, however, conditions are different, and although one may see the road as a generality for a hundred yards or so with good headlights, nevertheless one cannot rely upon seeing anything at the side of the road, and consequently the outlook should be continuous and undivided.

✓ Meeting Powerful Headlights

One of the many difficulties encountered in night driving is the one experienced when meeting a car with powerful headlights. A cap has recently been brought out provided with a secondary brim of coloured material, which, when one deflects the head so as to interpose it between the lamp glare and the eyes, very considerably minimizes the glare and enables one to see fairly well.

If, however, one has not such a cap or similar device, then it is always desirable to use considerable caution when passing a car with powerful headlights. The chief danger, of course, lies in the fact that when just on the point of passing each other, the glare from the headlights is so great that it is practically impossible to see anything not itself illuminated just at the side of the road, even though possessed of powerful headlights on one's own car.

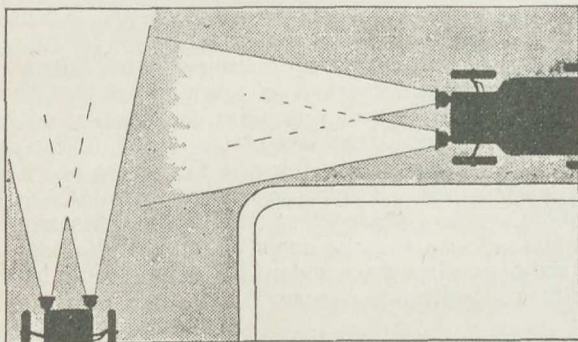
If one happens to be driving with only small headlamps, then it is preferable to slow down very considerably, as the risk of running into anything at the side of the road is considerably enhanced. In such cases it will be found that the right hand may be used as a shield between the eyes and the light of the approaching car, as if the direct glare is removed from the eyes the vision is considerably improved. Obviously, of course, the hand has to be moved to keep

MEETING CATTLE

pace with the progress of the approaching car, but very little practice enables one to do this without any trouble at all.

Cattle on the Road

Another point to be remembered is that the night time is frequently chosen by farmers for moving cattle from one part of the country to another, and sheep, for instance, with their "whitish" wool, are sometimes very difficult to detect on a white road at any distance. It is well, therefore, always to keep a weather eye open for cattle, more especially in agricultural parts of the country and on commons, in the New Forest, Dartmoor, and similar places.



Powerful headlights give warning of a car's approach to cross roads.

It is not infrequent in the latter places to find ponies sleeping on the road, and in the writer's experience it is a matter of no certainty that one will not also find in the alleged charge of the sleeping cattle a drover who is carrying more liquid fuel than is necessary for his accurate propulsion.

On the other side of the balance, however, there are several factors in night driving which render it in a way safer than daylight driving. In the first place, there is usually considerably less traffic about, and, in the second place, a powerful set of headlights give warning of one's approach a good distance away, and

HOW TO DRIVE A MOTORCAR

in the case of cross roads, etc., the strong beams of light projected by powerful headlamps can be seen on the road where perhaps the car, were it daylight, would be entirely obscured by hedges or houses. The main consideration, however, for night driving is care, and it must be remembered that eyes are given us for use, and that the driving of a motorcar at night is one of the occasions on which they should be continually employed in the work of directing the car.

One does not wish to be too dogmatic in laying down regulations, but personally the writer usually excuses himself as regards anything much in the way of conversation when driving a car at night-time, and really it is not advisable to enter into too animated a conversation, as the work in hand is usually sufficient to occupy one's whole attention.

At night, then, observation must be a little increased, and conversation on the part of the driver should be cut down to a minimum, and such minimum should never entail the use of the eyes! The passenger can always appreciate the fact when the position is explained. Taken the other way round, in the possible event of an accident, the reply that conversation caused one to take one's eyes from the road at the moment when the accident happened, could hardly stand as a legitimate excuse.

✓ Falling Asleep

This heading is rather a startling one, but it is a case of forewarned is forearmed, and therefore the subject may be briefly referred to. A long drive at night, by which is meant (varying with the constitution of the driver, of course) anything from 70 miles upwards, undoubtedly produces a somnolent effect upon a large number of people. To the writer's own knowledge quite a number of accidents, luckily in not one single case attended with any serious injury, have occurred through the driver absolutely falling asleep when at the wheel; in fact, it is the writer's belief that many of the accidents which occur at night are attributable to this cause.

It is usually considered a very bad thing to make

RISK OF FALLING ASLEEP

such an admission, but as a matter of simple fact such an idea is quite erroneous. Falling asleep at the wheel of a car when making a long night drive need not in the slightest shape or form have anything to do with having had this, that, or the other for dinner; this, that, or the other to drink; or with having a weak heart, a weak constitution, or any similar physical defect. No; it is some curious natural action which takes place to an extent on nearly all drivers, but in a pronounced manner on others.

A man who has never had anything to drink in his life and who has fed on the most innocuous of indigestion-producing food-stuff, may still on a long night drive find himself beginning to fall asleep, and may actually drop off to sleep at the wheel of the car so suddenly that he has no precise knowledge of the fact that he is doing so.

The writer has had experience of drivers falling asleep on more than one occasion, and once when on a long night journey, entirely given up to the charms of Morpheus in the rear seat, suddenly awoke to find himself with torn clothes and scratched face and hands, in the middle of a hedge. The explanation was that the driver, who was a thoroughly moderate man in every way, and healthier and stronger physically than ninety-nine men out of a hundred, had fallen asleep, the car had jumped the grass curb, and he awoke only in time to assist in stopping the car when its progress was mainly arrested by the hedge.

Several other instances have come under the writer's notice, and, as aforementioned, it is absolutely inaccurate to put down falling asleep at the wheel of a car on a long night journey as in any way due to tendencies towards inebriety or other physical defects.

If, then, on a long night run, a driver should at any time feel the slightest symptoms of drowsiness coming over him—on no account ever argue that because you are driving at 30 or 40 miles an hour you are bound to be all right and cannot fall asleep—stop the car at once. Do not think either that the fresh air will keep you awake, or that anything else will. It is better

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to draw up at once and have a few minutes on the road as a change, when it will be found that a run up the road for 100 yards and back again will put a fresh lease of life into the eyes.

It must not be thought that this matter has been touched on in any light spirit, as this is by no means the case. Several occasions on which a thoroughly sedate driver has been caught unawares by this peculiar propensity of night driving to produce drowsiness have come under the writer's notice. In some, as previously mentioned, accidents have occurred, and in others the taking of the kerb at the side of the road has suddenly awakened the driver to the knowledge of his extraordinary position, and he has had to thank his lucky stars for the escape from what might have proved a bad accident. The advice then, when contemplating a long night run—which, by-the-by, is thoroughly enjoyable on occasion—is always to have a wary eye for a weary eye.

CHAPTER III

Starting Up the Engine

LUCKILY a serious accident in starting up the engine is a very rare occurrence; but, on the other hand, there are quite a considerable number of minor accidents which occur from time to time, and even the most experienced motorists occasionally get "bitten" on a strange car. Cars, of course, vary tremendously in regard to the ease, or lack of ease, with which they can be started up, and it is requisite, therefore, to differentiate somewhat between the two classes. Then, again, there are large engines and small engines, engines of high, medium, or low compression, and likewise motors which are designed with a very high compression.

A Universal Error

In the first place, it is probably safe to state that the great majority of people do not even begin correctly when starting up the engine. As with everything else, there is a right way and a wrong way, even in so apparently small a matter as the grip of the starting handle itself.

Judging by the vast majority of people's methods, it is accurate to assume that the natural instinctive grip for a starting handle is the one in which the thumb is to the left of the starting handle and the fingers to the right of it, so that the grip is strengthened by the pressure which can be exerted between the thumb and the fingers. From the scientific point of view the grip is certainly the most powerful one which the construction of the hand enables one to exert, but, at the same time, it is quite wrong.

So long as it is feasible with just a little practice to obtain an amply good enough grip of the handle in

HOW TO DRIVE A MOTORCAR

another way, then, if that other way is an infinitely safer one, it should be given preference. Let all motorists, therefore, commence from now to practise the proper grip for the starting handle. The writer would exhort all his readers specifically to train themselves out of the ordinary bad habit, and see if they cannot very quickly acquire the correct method for gripping the starting handle.



Correct method of holding starting handle (left).

Wrong method of holding starting handle (right).



How to Grip a Starting Handle

Be it known then by these presents that the right way to grip the starting handle is as follows:—

Instead of surrounding the handle on the off side by the fingers, with the thumb on the left (the ordinary and instinctive grip), move the thumb over to the same side of the starting handle as the fingers. The grip is thus between the ball of the thumb and the fingers, the thumb itself not being of any specific value for the purpose of gripping the handle.

One has to admit that the grip, as described, is neither so natural nor so easy—at any rate, just at first; but, on the other hand, if one makes a point of

ACCIDENTS CAUSED BY BACKFIRES

studiously doing this for a short time, it will, like the other things already advocated, soon become an instinctive movement. Do not then be discouraged if, at the first effort or two, it is found very much harder. Persevere with it for some little time, and see if it cannot be successfully acquired; if it is impossible to acquire it after reasonable effort, then it is time to give it up as a bad job.

Backfire-caused Accidents

It is, of course, well known that the majority of accidents caused through backfires are those which occur when pushing down on the starting handle, as it is but rare that a backfire when pulling up has any serious effect, unless the engine swings backwards to such an extent that the starting handle comes round and strikes one on the back of the wrist.

We are dealing, therefore, for the moment with the accidents caused by a backfire on the downward motion of the starting stroke when "swinging" the engine. Now for the reason. It will simplify matters if the reader will take hold of a circular ruler, or anything which can be held as typical of a starting handle. Now grip this in the ordinary way, with the thumb one side of the ruler and the fingers the other side: hold it firmly, in the same manner that would be adopted if going to hit something (or somebody) with the ruler in question. Now look down on the hand and study the grip. Admittedly it is excellent.

Suppose, however, that some power—in the case under consideration a backfire—were, whilst one is pushing down on that handle, suddenly to put the boot on the other foot, so to speak, and jerk it up towards you. Obviously there is a great strain put on the sinews of the thumb and on the wrist, the result being that, in most cases, either the thumb or the wrist is strained—not infrequently both. The reason is fairly obvious, as, of course, the hand cannot be removed quickly enough against the reversed pressure to disengage it from the grip, nor can the thumb be removed from the region of danger.

Now, however, put the thumb round to the other side

HOW TO DRIVE A MOTORCAR

so that it is lying on the forefinger, and study the situation once more. Admittedly, the grip is not so good. On the other hand, however, imagine the same sequence of events, and presume that sudden reverse stress again to come into being, and then picture the result. The only damage which happens is that the fingers are forced to open, the starting handle shooting out from their containing grip, whilst the thumb is entirely out of the danger zone.

In other words, the possibility of damage from a backfire on the downward movement of the handle is even less with this grip than a backfire on the pull-up stroke with the ordinary grip. The reason is that the fingers with the grip advocated give way to the sudden reversed stress in the position indicated much more quickly than they do on the pull-up stroke where the thumb is on the other side of the handle.

Still again, in the odd few occasions when the engine takes it into its head to continue to fire backwards for a revolution or two—as it does sometimes when hot—the hand is thrown clear of the circle described by the starting handle, whereas in the pull-up stroke with the ordinary grip it is very frequently struck on the back.

With regard to backfires on the upward stroke, there is nothing to be gained by the principle advocated; but, as previously pointed out, in ninety-nine cases out of a hundred sprained wrists and thumbs caused by backfires are brought about by those which occur on the downward movement of the handle. As with everything else, practice makes perfect, and although this method of starting up will be found more difficult at first, the writer would ask the reader to persevere with it for a short time, and when a backfire on the downward stroke of the starting handle does occur, he will probably be able to congratulate himself on his escape from the encounter.

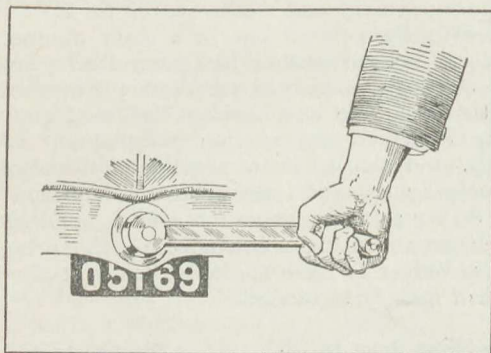
For Strong Wrists Only

There is another method of guarding against the risk of damage by backfires, at any rate, on small and

STARTING UP

medium-powered cars, which, however, is only being mentioned for the benefit of those people to whom it might prove of use. It must be distinctly understood by the reader that the mention of the principle in no way whatsoever signifies its advisability for the average motorist.

The idea referred to is what might be termed the strong-man or the strong-wrist principle, in which he who is gifted with a strong wrist may train himself to



Strong-wrist method of starting.

ignore such little details as a backfire, partially through his strength and largely through knack. For people in garages or testers, or for those who, like the writer, are continually in charge of different cars, the possibility of being able to ignore a backfire is worth recording.

Instead, therefore, on the downward movement, of having a bent wrist, one has to get a little more vertically over the starting handle, and keep the wrist absolutely firm until very near the bottom of the stroke, or, in other words, well past the point at which the backfire, if any, will occur.* If the wrist is held quite firm, and the fore-arm is braced to expect and to take a backfire, then a sudden though partly-anticipated

* It is, of course, assumed that the starting handle is properly set; even to-day some cars are so egregiously ill-conceived in this respect, that the top and bottom positions of the starting handle coincide with maximum compression!

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reverse strain can be taken from small and medium-powered engines by a strong arm and wrist.

The writer practised this for some time with a 75 mm. bore engine, with the spark advanced so that the engine backfired every time when it was turned slowly. In the early stages the compression cocks were partially opened so as to minimize the danger attached to the experiment, and these were gradually closed until it was found that the full shock of a backfire could be taken comfortably by the arm so long as one had practised the movement and was prepared for it.

As previously pointed out in a clear manner, this principle is not advocated for general adoption, but on the contrary is merely mentioned for what it is worth to those who have various types of engines to start up in which the ignition point is an unknown quantity, and also to show that the cultivation of a stiffly-poised wrist and forearm is an advantage in any case. So far as the average motorist is concerned, all that he learns from these few notes on this principle is that it is better to have the wrist fairly stiffly poised instead of loosely tensioned.

Variable Firing Point

Many cars in these days, especially the smaller ones, are not fitted with a variable firing point, as in practice the higher speed of the magneto is found to be, ipso facto, of such value that the resultant fiercer spark compensates in its greater rapidity of action in flame propagation for the lack of advance; in other words, it so chances that the higher speed of the magneto in itself constitutes an automatic advance spark.

In the case, however, of cars fitted with an advance and retard lever, one should invariably make a practice of glancing at the lever before starting up the engine. It is not sufficient, as many people do, to make a practice of bringing the lever back to the starting-up position when getting out of the car, as this does not overcome the possibility of someone moving it afterwards. Consequently, therefore, always make a point of casting a glance at the position of the spark lever to see that it is approximately right.

RISK OF STARTING IN GEAR

Now this does not mean that it should always be in its fully-retarded position, as a fair advance on the spark in most engines renders the starting up easier. It will, of course, be patent that in the case of cars with fixed magnetos the risk of a backfire is considerably minimized, but even in those cases, sometimes when the engine is hot, or if there is much carbon deposit on the pistons, a backfire may be encountered, so that the main instructions should not merely be glanced over by the motorist whose car has fixed ignition, but also taken to heart.

Starting Up in Gear

This is rather a pet subject with the writer, but he feels justified in drawing attention to it, although it is certainly—and unfortunately—not a common practice with most motorists adequately to guard against it. It is no doubt known to the reader that some few deaths have actually been caused through motorists starting up their cars when in gear. It hardly seems credible that so awful an accident could occur through such a thing, but nevertheless facts are incontrovertible, and unfortunately history possesses more than one case to prove the possibility.

It is not, however, in the light of viewing the likelihood of so terrible an accident occurring that it is desirable to deal with this matter, but, on the other hand, if the car is started up with a gear in, a considerable amount of damage may be done to the car in question, or to other property, in addition to the possibility of personal injury.

Every motorist should make an absolute unflinching practice of adopting either one of the two courses which will be propounded to guard against the possibility of the danger of starting up with a gear in mesh.

The first proposition is that of invariably making it an unflinching habit to look at the change-speed lever when one goes to start up the car after it has been out of sight for any period of time. It is not enough to argue as many people do that because it was a known fact that the car was out of gear when last the driver left the seat, therefore it must still be

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so positioned. No! There is the ubiquitous small boy to contend with, and there is the man of more mature age but with equal curiosity, either of whom may elect to move the change-speed lever.

At night, of course, the equivalent to this is moving the lever sideways so as to make sure that it is in the centre of the gate. This principle, if studiously practised, is a pretty safe guard against the possibility of damage through starting up the car with a gear in mesh.

"Feeling" the Handle

Another method, however, resorted to by the writer is that of "feeling" the starting handle. To those mechanically-minded this expression may be obvious, but for the sake of others it is as well to elucidate it.

Instead, then, of grasping the starting handle and so soon as it is in mesh swinging the engine, "feel" the rotary progress of the starting handle for an inch or two, so as to see if the engine is quite free from engagement with the gearbox. An inch of movement made quite slowly is sufficient to assure one that everything is well for starting up, and then the cranking motion can be completed quickly as usual.

It is very rare that an engine stops just in front of dead centre, and, as most motorists are aware, the firing point is usually some few degrees before the dead centre. If the engine stops near dead centre at all it is far more usual for it finally to remain stationary just after the firing point than in any other position.

It would serve no useful purpose for the moment to go into theoretical reasons for this, but observant motorists will probably have noticed the fact for themselves, though perhaps not bringing it down to so many words; in other words, it is usually found that there is an appreciable amount of movement before the firing stroke. Probably the pistons have stopped in mid-position, or else the engine is about on dead centre, and in the latter case the last piston, which would have fired had the switch been on, has just passed the point at which the spark would have occurred. Con-

FEELING THE STARTING HANDLE

sequently, this "feeling of the starting handle" is a very good safeguard against the possibility of personal injury or damage to property through starting up the car with a gear in mesh.

To the motorist who is not accustomed to taking either of the main precautions alluded to it may seem rather grandmotherly advice. Think not so, however; very little practice will soon make the observation, either by feel or by look, of the change-speed lever position a synchronous act with that of switching on or setting the throttle lever in position; in short, when once acquired, it becomes an instinctive habit and takes neither time nor trouble, whilst providing a fund of safety against the possibility of a nasty accident.

CHAPTER IV

How to Start and Stop a Car

THIS is another subject which superficially seems almost too childish to write about. Surely to goodness any motorist who knows anything at all about driving is aware of the proper way to start and stop a car. To save argument (if any were possible) we admit it; at the same time, however, if they do know it, few conscientiously practise it. For the sake, then, of those who may not know, and to try to convert those who do know and practise not, let us discourse even on so simple a subject.

How to Start the Car Itself

Having taken the seat, make a definite practice of inspecting the brake lever to see that it is really off. Obviously, an experienced motorist would not drive long against a tightly-applied brake. Not infrequently, however, when stopping on the level, one just puts the side brake on lightly, or yet again the ubiquitous small boy may do it for one, and it is quite possible under these conditions to drive for some little distance with a lightly-applied brake before beginning to wonder why "the engine is not pulling properly."

Now comes the question of engaging the gear. This, of course, varies with the car and with the number of gears which the car possesses. Let us take the case of the four-speed gearbox first. If the road is level, or the up-grade quite slight, in the majority of cases it is perfectly feasible to start on the second speed.

Many people with four-speed gearboxes, especially those who have not quite mastered the art of gear-changing, make a habit of starting on the third speed

HOW TO START

under these circumstances, so as only to have the straight movement in the gate to engage the direct drive. It is not good practice, however, as it puts an excessive stress on the clutch and the universal joint, or joints, between it and the gearbox, and then again on the universal joints on the tailshaft and the driving gear generally.

It must be remembered by those who are addicted to this bad habit that when starting away from rest, in addition to the pressure on the universal joints of the tailshaft, due to the actual power being conveyed through them, there is also the starting torque from the rear axle casing, which is, of course, at its maximum for a given power input, when moving the car from rest, and this tends to put a lifting thrust on the universal joints, although, of course, many cars have torque tubes or stays to minimize its effect.

Even with these fitments, however, it is still bad practice to start away on the third gear of a four-speed gearbox. Unless on a declivity, where the third or even the top gear may be put in straightaway, as the car gathers its initial motion by gravity, engage as a general rule the second gear.

Now, whilst engaging this second gear remember that there is a little point which is overlooked nine times out of ten, namely, that there is a distinct difference between theoretically and practically disengaging the clutch and the time when the clutch is actually disengaged from the mechanically practical point of view. To explain in further detail, one may depress the clutch pedal, which, in point of fact, actually itself disengages the clutch from the flywheel, but that movement does not in itself immediately stop the clutch member from revolving. It is necessary, therefore, not to make the movements of declutching and gear-engaging synchronous, but, on the other hand, to wait two or three seconds, as the case may be, until the clutch member has had time to stop revolving; still better, when it can be gauged accurately after a little practice, let the movement be made when the clutch member is just on the point of ceasing to revolve.

HOW TO DRIVE A MOTORCAR

It can, of course, be argued that engaging a gear whilst the clutch is revolving is only a small strain on the gear wheels, but nevertheless it is a strain; it makes a nasty noise, and tends to start a minute chipping-away action on the gears. In addition to all this there is the strain on the universal joints between the clutch and the gearbox in a reversed direction equivalent to stopping suddenly the rotating mass at the speed at which it may be revolving. These points are, it may be, but small items; nevertheless they should be given attention by the careful and good driver, even if only for the sake of eliminating the noise of engaging a gear with the clutch revolving at any speed.

Just occasionally it happens that when one goes to engage this second gear the lever is found to refuse to move, the reason, of course, being that the teeth of the wheel on the main shaft are in line with those on the layshaft. Do not in such circumstances thrust and jerk at the lever until the face contact gradually forces the free wheel out of alignment with the teeth on the held wheel—unfortunately one frequently sees drivers doing this—but just for a fraction of a second let the clutch in the least little bit so as to spin the clutch member round a trifle, when the gear will probably engage readily enough.

Gentleness With the Clutch

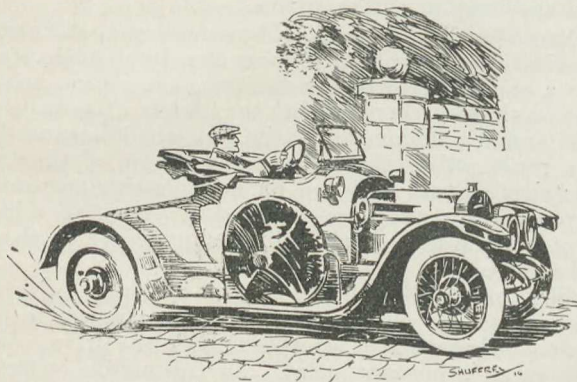
Now let the clutch in gently. It is, perhaps, to be feared that originality can hardly be claimed for this very sage piece of advice! Nevertheless, there is more in it than meets the eye. How many drivers, think you, manage to start their car each time without making one or other of the driving wheels spin round faster than the relative progress of the car?

Taking it all round, and especially where the roads are greasy or slippery, it is to be feared that by no means so many could claim this distinction as should be able so to do. Nevertheless, it is bad driving to let the clutch in, or to accelerate the engine, or the two in conjunction, in such a manner as to cause either or both of the driving wheels to spin round at a speed in excess of the progress of the car. In the first

NEED FOR A GENTLE START

place, such action is bad for the tyres, under some conditions, especially for that tyre which is slipping, and one such start will probably (quite at a guess) wear as much from the tyre as a dozen careful starts, in which no such skidding takes place.

Then again, there is a peculiar sequence of mechanical circumstances set up when one driving wheel is revolving faster than another, which causes an inward lateral thrust to come on to the slipping wheel, and an outward lateral thrust on the wheel which is not



Example of wheel slip owing to bad driving.

slipping. Here again it is not very great, but nevertheless it is bad, tending to wear the bearings of the wheels, which are not designed to take lateral thrusts as their primary duty.

Yet again, one brings the differential gear into play to an extent considerably beyond the purpose for which it is designed, and although it may be capable of successfully withstanding it for an almost indefinite period—short stretches at a time of course—nevertheless, it is not calculated to improve it. There is also the driving mechanism attaching the shafts to the road wheels, and the keys or serrations attaching the axle shafts to the differential gear. All these are again subjected to extra stresses which they need not be called upon to take, whilst at the final moment, when

HOW TO DRIVE A MOTORCAR

the slipping wheel suddenly strikes a piece of ground where the coefficient of friction is such as instantaneously to stop its slipping, the slight jerk felt by the driver at this moment has had to pass up through the portions of the mechanism referred to before getting to him or her; consequently, endeavour to start gently and with what may be termed an even acceleration. Do not "dab" the throttle right down so soon as the gear is engaged, but depress it gently and feel that the acceleration of the car is synchronizing with the acceleration of the engine.

Another point, though quite a small one, still worth consideration, is that of slipping the clutch when starting a car. To use a Hibernicism, the clutch should not be slipped when slipping the clutch. To translate this verbal paradox into plain English, it means that one must utilize the happy combination of the two. Clutches are not designed for an excessive amount of slip drive, but they are designed to permit of a little slipping, and it is only this little slipping which should take place.

First of all, then, let the clutch in gently, with the engine turning with only just sufficient power to prevent it being stopped when taking up the drive. Now this is an important point. As the clutch is finally let home, partially release the accelerator pedal—quite momentarily—at the same time, so that it would be a difficult matter to tell whether the engine was driving the car or the car the engine. Then commence again, from this point, gradually to accelerate. It sounds rather a lot in so many bald words, but it is only a matter of a fraction of time in actual use, and, like the other points advocated, when one has made a point of learning it the movement becomes intuitive and automatic. Now, of course, one passes on into the third speed, taking care to accelerate gently, and for the fraction of a second allowing the engine speed and that of the car to be the same, just as the clutch is finally let home, then gradually accelerating on again from that point: and so on, "repeating the dose," into the direct drive. The actual question of gear-changing is dealt with in a separate chapter, so

STARTING ON SECOND GEAR

that it is not necessary to go into this matter more fully here. With a three-speed gearbox on all approximately level roads, and on slight upgrades, it is quite feasible to start in the second gear, the methods adopted being quite similar to those for a four-speed box.

Reversing

It is rather extraordinary how few people are in any way adept at the art of reversing. One must admit that it is rather tricky work, and the reason why people usually do it so clumsily is traceable, no doubt, to the fact that ordinarily one obtains so little practice. The great thing to bear in mind is not to over-steer; also to correct just a little sooner than one is tempted to do. The average ability of motorcar drivers to reverse neatly and, as one might put it, "soberly," is so deplorably lacking in finish that it can be safely suggested that the reader (if not quite proficient) should spend half an hour one day when he has nothing much else to do on a quiet country road practising the art. He should also make a point of studying the full effect of changing the lock of the steering wheel when reversing. Words altogether fail to express the writer's consternation to see the awful muddle frequently made by drivers of motorcars when trying to get out of a garage or similar place where they are required to use anything different from ordinary straightforward progression. Sometimes it is really extraordinary, and so soon as the car begins to move backwards the driver seems to have lost every symptom of knowledge as to the manner in which to manœuvre his steering in order to get out of a close-fitting position. Of course it is not a very serious subject, but nevertheless on some occasion ability quickly to reverse out of a dangerous situation might prove very advantageous, to say nothing of the everyday value of such ability. Consequently the advice to practise reversing and study the effect of the varying front-wheel lock so as to become more adept in the not-frequently-seen art of reversing with accuracy is well worth consideration.

CHAPTER V

Starting on Hills

LEAVING a car at rest on a steep hill and starting away again are two factors in the art of driving which have to receive careful treatment. When speaking of steep hills in this connection, one means such hills, for instance, as those of about 1 in 8, and, of course, the steeper gradients up to the worst, such as the 1 in 4 that is occasionally met with in some portions of the country. If it is desired to leave a car on such a declivity care must be taken (when possible, of course) to be sure that, if the car is pointing up the hill, its position is such that the near side rear wheel is pointed at a slight incline into the kerb. If, therefore, for any reason the car should start to run backwards, it is impossible for it to do so for any great distance. Then, again, this makes the work of starting away from rest much easier, as the low gear can be engaged, the brakes put off, and the initial starting movement made under the most favourable conditions available in the existing circumstances.

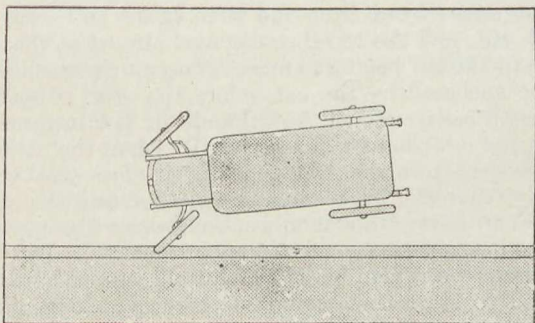
Leaving a Gear In

If for any reason it is quite an impossibility to leave the car with the wheels against a kerb or against some obstacle which will serve a similar purpose, then on a steep hill it is quite a good practice to engage the low gear (when facing down hill, the reverse) after stopping the engine and the car, as a precaution additional to that of the side brake lever. It may be that one's side brakes are in very good order and capable of holding the car on the declivity in question, but it must be remembered that the whole safety, so far as side brakes are concerned, depends on the little detent which

LEAVING A CAR ON A HILL

actuates in the teeth of the quadrant—even assuming that no small boy sees fit to meddle with it! Admittedly, it is but very rarely that the detent in question or the slide bar carrying it gives way under these circumstances, but such cases have been known, and it is well to bear the possibility in mind. In this connection, accidents have several times occurred through the instinctively evil-minded and ubiquitous small boy.

One must, of course, under these circumstances, remember that the gear is in mesh, but with the brake on, or if the hill is a steep one, it is very doubtful if one could move the starting handle sufficiently to start the engine. When starting away again on steep hills one must always bring into use the low gear. If there is only an accelerator pedal provided (and the car is not resting against the kerbstone), then it is best to hold the car with the side lever, and as one gradually releases this, to accelerate the engine, whilst at the



How to leave a car on a hill when front of car faces down hill.

same time gently engaging the clutch. If there is a hand control to the throttle, one may, if so minded, use the pedal brake for holding the car, and start away by means of the hand-control throttle and, of course, similar clutch manipulation.

If the car has to be left with the bonnet pointing down a steep hill, the operation should be similar, except, of course, that it is the front wheels which will

HOW TO DRIVE A MOTORCAR

then be left against the kerb, and it will be requisite in the first place for the driver to reverse, so as to get clear of the kerb before starting off forwards.

Starting the Engine by the Car's Momentum

When one stops a car and engine on a hill, down which one has to continue, the motor may be started up again by the momentum of the car. In such cases, instead of leaving the front wheels actually against the kerb, the car is held by the brake, with the front wheels pointing at a fairly sharp angle into the kerb, though some inches away. Consequently, in the possible case of the car moving from any cause whatsoever without the driver being in his seat, the wheel soon bumps up against the kerb without sufficient momentum to mount it, so that, beyond just a little bump to the tyre, little damage is done.

Then, when one takes the seat and the brake is released, as the car begins to move away from rest it can be steered out from the kerb again and with the clutch out, and the top gear engaged almost at the very moment the car begins to move. Too much speed must not be gathered by the car before the gear is brought in, as otherwise it will be difficult, if not impossible, to engage it without a severe jar. If, when the attempt is made to put the top gear in, it does not go in readily, then the brake must be applied and the speed of the car slowed down to a crawl, when the top gear will be in a position for easy engagement.

It must be remembered that in all cases where it is desired to start the engine in this way, it is always easier to do so on the direct drive than on one of the lower gears. It only takes a little consideration to show that if it is easier for the engine to drive the car on the low gear, it must be easier for the car to drive the engine on the high gear.

The hill may now be coasted with the top gear in engagement, and the clutch held out until such time as it is necessary to draw upon the power of the engine to propel the car, when the clutch should be let in gently so as to start the engine, when, of course, one continues to drive as in the ordinary course of events.

STARTING THE ENGINE

Starting the Engine by Running Backwards

Similarly if one has stopped on the way up a hill and is lazily disposed, the engine can likewise be started by means of the car, but in this case, naturally, it is necessary to engage the reverse gear. It is, of course, obvious that if the engine is revolving the right way for driving the car with one of the forward gears in mesh, then, when it is going backward, if one of these gears is engaged, the engine would be turned in the wrong direction.

This principle of starting the engine on the reverse cannot be so confidently recommended as sound practice, but at the same time if it is done carefully there is no particularly pronounced objection to it. When the engine is started, one has, of course, to stop the car again and engage the low gear, starting away as previously described.

An Exception to the Rule

It has been stated that in order to start the engine when the car is progressing forwards, the top gear should always be engaged. There are occasional exceptions to this.

The one most likely to occur is the case when one unwittingly stops the engine in traffic and the momentum of the car is reduced almost to vanishing point. In such cases it is probable that the said momentum would not be sufficient to start the engine if the top gear were engaged, or, to be more precise, it would perhaps be better to say that the remaining motion of the car would not revolve the engine sufficiently. In such cases one should quickly engage the second gear of either a three-speed or four-speed box (the motion must be quick and decided), and letting the clutch in will then have the effect of quickly arresting the progress of the car, but in so doing the engine will probably be turned at a speed which is sufficient to start it.

CHAPTER VI

Difficulty in Starting Up

ON occasion one goes to start up the car and finds her more contrarily dispositioned to perform her righteous and appointed work than any—well, any other “she’s” contrariness! The car’s conduct may appear equally unreasonable. It may be that the day before she was running perfectly, and yet now it is found that she absolutely refuses to start. Well, it is no use courting an apoplectic fit by continuing to grind the starting handle round and round.

No! Pause, and consider. The treatment to be followed when endeavouring to start up the car under these circumstances varies with the conditions obtaining. If one is in a hurry to get away, then the main consideration is to get the engine started up and leave the work of locating the precise fault to a future time.

Carburetter Faults

In such cases, having previously, of course, tried flooding the carburetter and made quite sure that the switch is in the proper position, open the petcocks and, closing the eyes to guard them against any particles of dirt being thrown up, blow down each petcock, with the lips just a little removed from actual contact. The object of this is that, so far as carburation is concerned, the failure of the engine to start up may be due either to a mixture which is much too rich or to one which is too weak. If the cylinders are charged with too rich a mixture, this action will thin it out: allow the petcocks to remain open for, say, half a minute or so.

By the end of this time it may be assumed that if the

TROUBLE WITH THE CARBURETTER

mixture were too strong it will now be quite weak, as the gas will rise up (it does not rise very high) sufficiently to leave a weakened mixture. Now put about six drops of petrol into each petcock and again allow them to remain open for a bare half-minute. Close them and have another swing. If the difficulty has been one of bad carburation the engine will probably start now, and when once running the trouble is not likely to be very manifest.

It is rather a difficult matter to lay down any didactic instructions as to tuning up or adjusting a carburetter which is out of adjustment, as there are so many of them, and they vary considerably, not only in their complaints but also in the method of adjustment. In fact, it would require a small book for this subject alone, if one were to give a full series of instructions in the art of adjustment and the work of tuning up the various standard carburetters on the market.

If the foregoing simple instructions have not proved successful in solving the problem, which seems to appertain to carburation, then one may be looking round for indications of trouble further afield. Just occasionally it may be that a continual flooding takes place, and if this is so it is probable that a slight leak has occurred in the float, so that some petrol has got inside it, and it does not rise quickly enough to actuate the little ball governors which shut off the needle valve.

Yet, again, it may be that the jet is choked with a minute particle of dirt, or partially choked, so that there is not a quick enough flow of petrol, in which case it is, of course, necessary to remove the jet and clean it. Sometimes the jet itself may be found to be quite clear, but the passage from the float chamber to the jet may, perchance, be blocked up: there is usually a little screwed plug which can be readily removed to make sure this is not the trouble. On the other hand, the filter may be choked up, and this is a trouble which can be simply remedied. Yet, again, even the petrol pipe itself from the tank may have got choked or the tap in some way have been turned off, either of which complaints can soon be detected.

HOW TO DRIVE A MOTORCAR

How Trouble may be Hidden

One of the most extraordinary cases of trouble in locating a shortage of petrol supply to the carburetter which has ever come under the writer's notice was due to some graphite which had found its way into the little air vent of the cap of the petrol tank, which, of course, was a gravity-fed one. This had hardened, and as the cap was provided with a good washer the tank had thus become air-tight, so that when a certain quantity of petrol had flowed out the partial vacuum in the tank arrested further flow. All the various defects previously alluded to had been carefully gone through by the driver, and he and his assistant were naturally sure of a ready flow of petrol when the copper pipe itself from the tank to the carburetter had been finally proved to be free. They were greatly astonished when, on turning on the petrol once again, it was found that the flow of spirit was still in some extraordinary way much too slow and insufficient for the needs of the engine.

As a final resource the then-unknown-to-be faulty cap of the tank was removed to make certain that the petrol, which was known to have been in the tank, had not been stolen. All was found to be well, and on trying once more the flow of petrol was suddenly found to be restored to its normal conditions. The coincidence set the driver and other folk thinking, and then the solution of the problem was quickly found. This fact is not mentioned as a matter in any way likely to crop up, but it serves its purpose in pointing out that, if one finds the flow of petrol is not free, it is not always sufficient merely to cleanse the filter.

[For ordinary starting-up purposes in those cars in which it is necessary to flood the carburetter, it is well to remember that slight flooding usually produces easier starting than excessive flooding; obviously, also, it is less wasteful, so that the point should be remembered. If it is found that the engine still refuses, then it is safe to assume that the trouble is due to ignition rather than to the question of carburation.]

TROUBLE WITH THE MAGNETO

Some Simple Ignition Difficulties

If, after the carburetter has been duly doctored, the car is still obstinate, as a first step remove the main earth wire from the magneto, and—have another swing. If this proves successful it is reasonable to assume that there is something faulty with the switch itself, or that there is a shortage in the switch wiring. If so desired, the car can now be run just as ordinarily, except that one has not got a switch in operation, so that the engine must either be stopped by means of the throttle or the wire replaced and the engine stopped through the medium of the switch.

It is perhaps well to rule out of court a common fallacy: absolutely no harm will accrue to the magneto by using it with the main "earth" wire (it should be actually "frame" or switch wire) detached.

It is just worth recording that if one finds the refusal to start up to be due to some part of the engine's electrical appurtenances, one should try the switch in the off position—in other words, in exactly the opposite position to that which is used ordinarily for starting up. It may just chance that there is some defect in the switch itself. Admittedly, it is not often that this is the case, but the writer well remembers the great consternation of a certain well-known motorist, who had spent a great time in trying to start up his engine, and after pooh-poohing the idea, reluctantly allowed a friend to swing it with the switch in the off position. At the first pull the engine started quite easily, but as the owner's only comment was far more expressive than useful it is not advisable to record it. However, the fact itself remains that just on an odd occasion the switch may so misbehave itself as to be "on" when it is in the off position and vice versa. If these simple little first-aid remedies are not effective then one must seek a little further afield for the trouble.

Further Electrical Adjustments

Any continued inability to start when once traced to some portion of the electrical appliances must then be sought for in other directions. First of all have a

HOW TO DRIVE A MOTORCAR

look round at all the wires to see that the terminals are right, the connections good, and the insulation not broken anywhere in a position in which a shortage could occur.

A plug may now be examined and, if found to be dirty, that is to say, internally, sooty or very oily, it is reasonable to assume that the others are in the same condition. Therefore, take them out and clean them, for which purpose a small quantity of petrol may be employed to rinse them in, although, of course, one must be careful as to its after-disposal.

En passant, it should be mentioned that one should never throw petrol down a water drain, and if it is necessary to throw the spirit away do not so dispose of it en masse, but sprinkle it about in small quantities over a good area, so that it will quickly evaporate. If by chance someone should throw a light down, it is only the few spots in question which will fire, and consequently no damage is done.

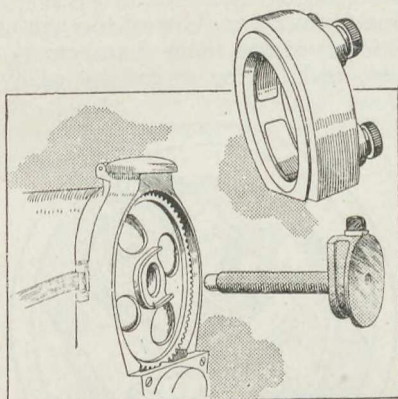
About the Plug Gap

There is usually too great a tendency to have a wide gap between the electrodes of the plugs; the best working distance between the points of a plug is .4 mm., or (very roughly) the thickness of a fairly stout visiting card. Either more or less is, generally speaking, conducive to bad running, and is also detrimental to the ignition system itself. Also note if the tips are clean, if not they may be cleaned by the use of a very fine file, if one has one, if not one can generally use the blade of a penknife and carefully push it through, which is usually a fairly satisfactory means of doing the work. If the width of the gap is found to be too great the prong of the electrode should be very gently tapped over with a good-sized key, or carefully bent, as may seem more easy to the person concerned in the adjustment. Many motorists are inclined to think that a wide gap in the plug means a big fat spark, and therefore a higher rate of flame propagation, and consequently more power. It must be remembered, however, that for other purposes it is necessary to provide a safety gap in

THE QUESTION OF SPARK GAP

the magneto itself, and if the width between the electrodes is too great, then, owing to the compression of the gas in the cylinder, the spark will refuse to jump the plug gap and select the one in the safety gap in the magneto itself, for preference.

Also remember, therefore, that because the spark jumps quite readily across the gap when the plug is laid on the top of the engine, it by no means follows that it will do so when screwed down in position, as the gaseous pressure is greatly increased, and the greater the pressure the greater the current requisite to jump



Distributor of magneto taken apart showing brush and contacts

a given distance between the electrodes. This fact may be more completely grasped when it is stated that the actual safety gap in the magneto itself, where there is no air compression, is usually set 12 or 13 times as wide as the width of a plug gap.

If the plug is really badly sooted up, so that ordinary rinsing in petrol does not appear to clean it, then the centre electrode of the plug itself may easily be removed so that both portions may be cleansed separately.

Cleaning the Distributor

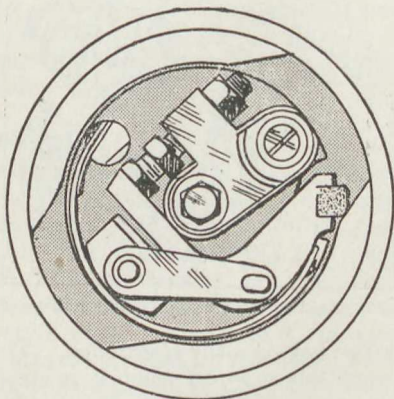
In the upper little cover-case at the end of the magneto is to be found the distributor, and if the

HOW TO DRIVE A MOTORCAR

aforementioned efforts have failed, then the covering disc should be taken off and the distributor brush inspected, and if necessary cleaned. Sometimes a little oil and carbon dust may have combined to make a "shorting film," which should be carefully wiped out with a piece of clean rag, and this may be just dipped in petrol if one takes care not to use too much petrol, and to give it time to evaporate before turning the engine again.

The Contact Breaker

If irregular firing should occur, it is practically certain that it is due to faulty working of the contact breaker. This is the lower of two little chambers at the end of the magneto, and the cover can be easily removed.



Contact breaker of a magneto—make and break must be kept properly adjusted

First of all see that the little centre screw is quite tight, and also that the steel segments are rigid; also note that the two platinum contacts are in good condition—not dirty and jagged.

Here, again, any oil or grease should be carefully removed, and if the contact points are uneven or dirty they must be carefully cleaned or adjusted. When the small bell crank lever is at its maximum depression,

WHEN TO CALL IN THE EXPERT

then the distance between the two points should be exactly .4 mm., as in the case of the sparking plug gap: roughly, the distance of a thick visiting card, if no better means of gauging the dimension is available

Do not Attempt too Much

If these first-aid instructions still fail to make the engine start up, then it is advisable for the average motorist to seek the aid of someone who specializes in motor work, unless by study, experience, or natural ability he feels competent to go into such questions as the correct setting of the magneto, etc. In any case, even to the fairly expert motorist, further dismantling of the magneto is not to be recommended: put more bluntly, though with more truth, it should, in fact, be avoided, as adjustments beyond the nature of those already alluded to require the return of the magneto to the manufacturers.

CHAPTER VII

How to Steer

THE question of steering a car is one which embraces a great number of small points, upon many of which it is by no means easy to give a definite pronouncement. In the first place, if one is buying a new car it should be a primary consideration that the driving position is a suitable one. The position assumed has to be a compromise between what one may term the most efficient one and the most comfortable one, and where there is any question of doubt precedence should be given to efficiency.

In an ordinary touring car one should neither have to lean forward nor should one loll in a too backward position, but the seat should be so arranged as regards height and slope that, whilst one has a good support for the back on the rear of the seat, the feet are in a "powerful" position to control the pedals. At the same time, the reach to the side brake lever must not be too great.

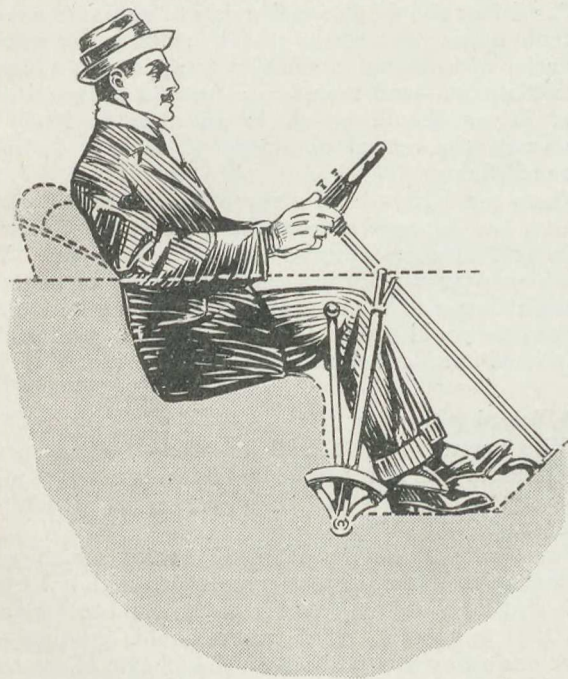
A choice of two methods of pedal-control movement may be offered, according to the available length in the driver's seat and the pressure necessary comfortably to operate the pedals. If the clutch pedal is stiff and the reach is fairly long, then the action comes more from the upper part of the leg, and suitable purchase is obtained with the small of the back in order to get sufficient pressure on the brake pedal, or to hold the clutch out for any length of time. If the pedal-control is easy and the leg-room is shorter, then the ankle and lower portions of the leg are the chief controlling factors.

POSITION OF THE DRIVER

Then, again, one should so sit that the line of vision is quite clear ahead, and

it is certainly preferable, if one has much traffic driving to do, to be able to see the tips of the wings, although the present fashion in coachwork often renders this difficult or impossible.

The steering wheel should also be in a handy posi-



Position of driver at wheel.

tion, and, whilst not too close to the body, should not be so far away as to make it necessary unduly to hang the hands out at a distance. Yet again, if one habitually drives by the accelerator pedal, as the majority of drivers do, and that movement is not

HOW TO DRIVE A MOTORCAR

thoroughly comfortable, the pedal should be altered, if necessary, so as to be in a position where the right foot is more or less at rest. If a long drive tends to give one cramp in the ball of the foot it shows that the requisite depression of the accelerator pedal is either too great or else at a wrong angle to the ankle, and a little longer pedal will probably be found an improvement.

The driver should also endeavour to cultivate a comfortable appearance at the wheel, which is not merely a matter of looks, as in addition to appearing at home with his work—and therefore calm and collected as a good driver should be—it is an attitude likely to encourage the actual obtaining of such a desirable state of affairs.

Many car drivers have a nervous appearance, which gives a bad impression from the mere point of view of looks and does not promise well for actual fact. The capable driver usually has the appearance of being as much at home at the seat of the car which he is driving as one would expect to find him when comfortably ensconced in an armchair by his own fireside.

With Regard to Steering

With regard to the actual question of steering, the best general rule that can be laid down is never to steer suddenly except when such action is absolutely necessary.

For example, having followed a cart which it is desired to overtake, do not come up to within 10 yds. of it and then suddenly swing out to the other side of the road to pass it. It is far preferable gradually to work one's way to a position on the off-side of the cart, starting, say, when 50 yds. from it. Not only is it safer, enabling a more complete view of the road in front of the cart to be obtained—and obtained in good time—but it is also distinctly better both for the steering gear, the tyres, and the car in general.

When the road is greasy this point is of even more importance for several reasons. In the first place, if one has not a metallic non-skid tyre on one of the front

HOW TO HOLD THE WHEEL

wheels, a greasy road may mean a front-wheel skid (this matter is dealt with more fully in a later chapter devoted to skidding), whilst even if this should not occur one of the more ordinary type of skids may be caused.

How to Hold the Wheel

This, again, is a subject in which there are many variations, and the personality of the driver must necessarily enter into the subject. For instance, when giving any hints on this subject, the size of the driver's hand and the strength of his fingers and wrist must all enter into consideration. A large number of motorists make a habit of driving a considerable proportion of their time with only one hand on the wheel, but really it is just as easy, when one is accustomed to it, to use both without any fatigue.

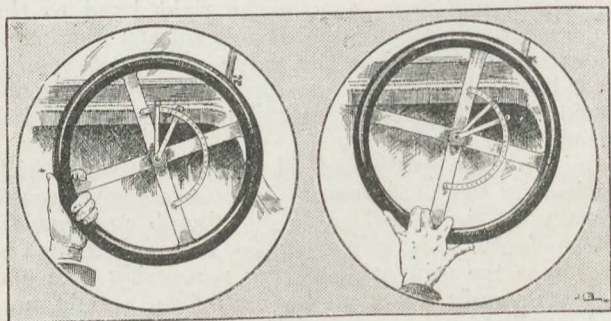
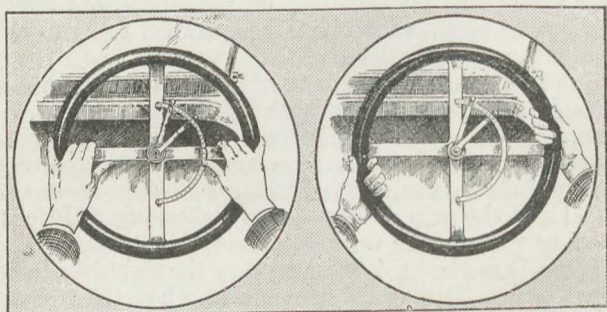
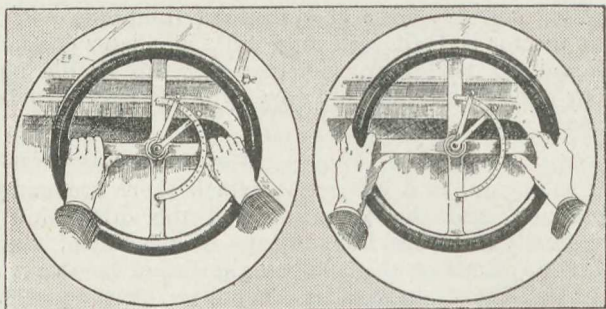
One is almost justified in stating that it is preferable to make a habit of using both hands for steering, as then, in case of emergency, the right hand is instantaneously ready and in a handy position to grasp the side brake, whilst the left hand is already on the wheel and the grip merely wants tightening a little in order to perform the work demanded from it.

If one is in the habit of using first the right hand and then the left, it may so chance that when the right is being used a sudden emergency case crops up, when it is necessary first of all to get the left hand to the steering wheel, and then remove the right hand to the brake lever. It may be that it only takes a fraction of a second so to do, but the value of a fraction of a second as frequently constituting the difference between having an accident and just missing one has already been shown.

Quite a good plan is to hold the steering wheel with the back of the hand upwards, the fingers going round the top of the wheel with the thumb underneath. Alternatively, this grip may be reversed, though in each case the grip, whilst being reasonably firm and instantaneously ready to be very firm, should not, under ordinary circumstances, be too tight.

The actual place on which the hand should rest on

HOW TO DRIVE A MOTORCAR



Some alternative methods of holding the steering wheel described in the text.

ALTERNATIVE GRIPS

the wheel is also of importance, and it should not be held on that portion of the wheel next to the driver's person. On the contrary, it should be more to the side of the wheel, as in this position the rotation of the wheel is caused by a direct push or pull from the arm, which is far more powerful, and quicker in action, than the lateral motion possible if the wheel is held at the bottom.

If Nature has provided one with a large hand and fingers, the grip in which one of the steering arms is always between the first and the second finger is a very powerful one, and is more quick in its ability to grip and control the steering wheel than the other type. Unless, however, one has got a big hand and fingers this grip may prove too fatiguing. It should, however, be tried, as it is undoubtedly an excellent grip when one can manage comfortably to span the steering arm.

Some Alternative Grips

Whatever position one takes with regard to holding the steering wheel, on a long journey one wants a change. What the writer terms the tension grip is quite sound as a change for open country work, and is also quite restful. It is not so suitable for town work or for very quick manoeuvring.

The grip in question is only properly permissible when it so chances, as frequently is the case, that, whilst the direction of the car is straightforward, the steering wheel has an arm each side of it at right angles to the direction of progression, or, say, parallel with the dash. In this case, one places the fingers of each hand over the steering arm on the respective sides of the wheel, the fingers gripping the wheel and a slight tension being put on the arms—what one might term just a hanging tension. As each arm is now in tension to check any irregular tendencies of the steering, the change arm is quite a distinct rest for the arm, as it is not called upon now to do any compressional work. If an obstruction to the right wheel tends to throw the steering to the left, then the fingers of the right hand resist that action in tension, whilst if the

HOW TO DRIVE A MOTORCAR

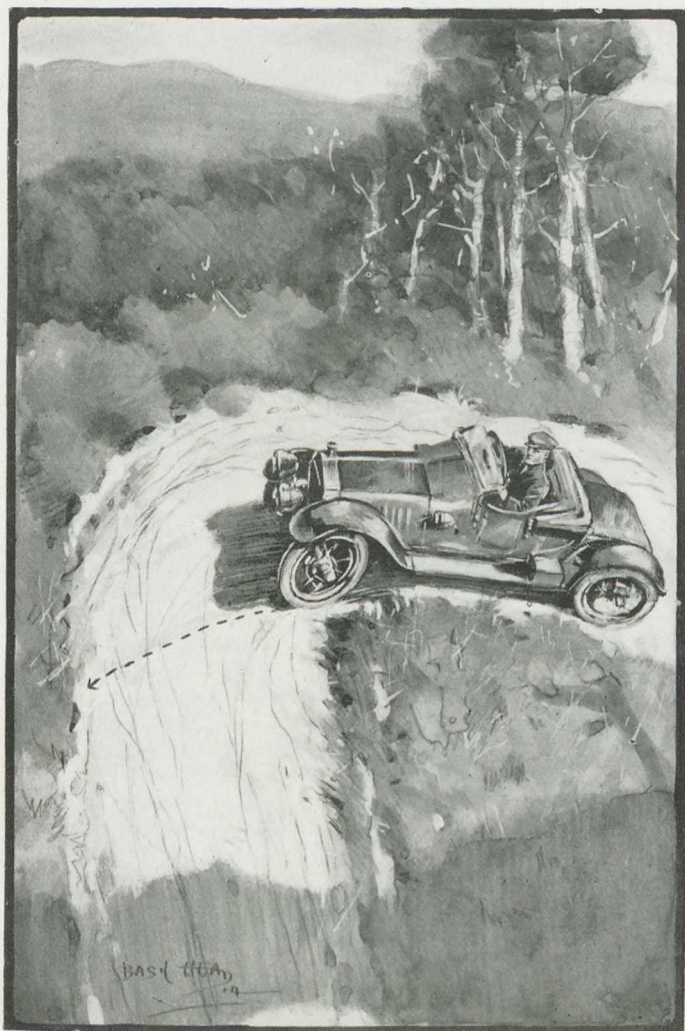
movement should be in the opposite direction then the left hand is called into play. The grip in this case is a little lighter than in the other types previously referred to.

With regard to the sudden tightening of the grip, if a bad road obstruction is met with and the steering wheel needs strong checking, then the increased tension is found to be quite automatic and instinctive, as the steering arm on the side in question is thrust more firmly against the fingers, which automatically in the act of restraining a forward movement also increase the grip.

Whilst bearing in mind that this grip is not advocated for traffic driving, it will be found a very restful change for ordinary touring work in the country.

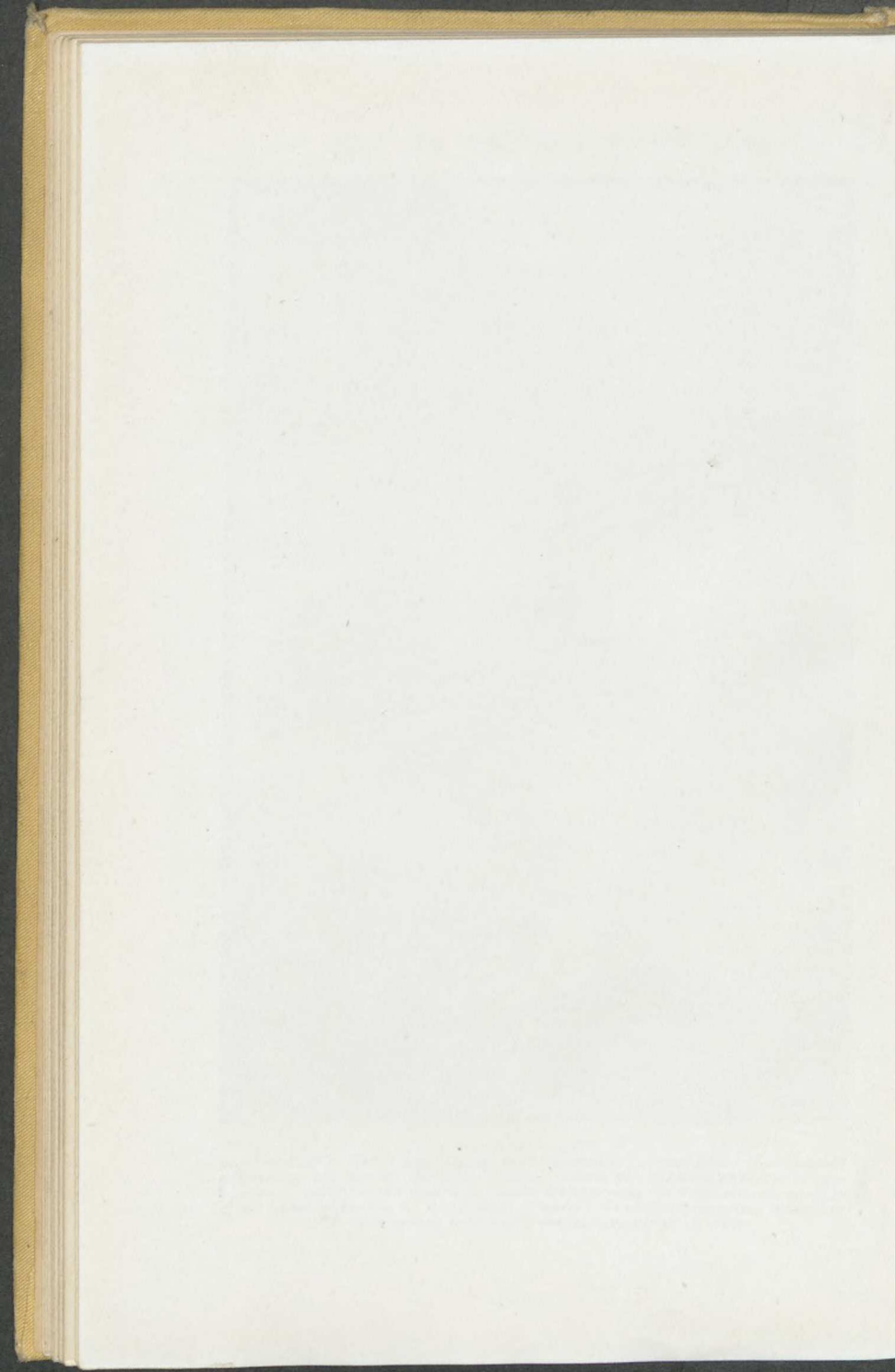
Yet a fourth method of holding the wheel, which can also be used as a change, is that in which the first finger and thumb grip the steering arm from above, whilst the rim of the wheel is between the first and second fingers. This grip again is similar to the last-described one, and is more what one may term a checking grip than an actual steering grip, and is not recommended for town use but only for country use, where the road is fairly open and no sudden maximum movement of the wheel is at all likely to be required. Both hands may be used simultaneously, or if the driver does not find that he can conveniently train himself habitually to use both hands for steering, then for open country work it may even be safe to use the one hand.

Perhaps, however, one ought to add even another qualification to this type of grip: it should not be used either for high-speed work or on rough roads. The reason why both these latter grips are only advocated for resting purposes, and for what the writer terms check steering, is that there is only direct power over a very small arc of the steering wheel's travel. Obviously, when one has made a little more than an eighth of a revolution of the wheel in either direction further movement has to a large extent to be caused by lateral pressure from the arm which is nothing like so powerful as the direct pull or push.



[To face page 54.]

Occasionally when touring in mountainous country one meets a hairpin bend which cannot be taken in one swing. In such cases do not hug the corner like this, as trouble may be encountered when reversing, necessitating a second reversing movement before the corner is negotiated. It should be taken fairly wide, as in the companion illustration facing page 56.



STEERING BETWEEN TWO OBSTACLES

On Passing Other Vehicles

As a general rule leave a fair amount of space between yourself and any other vehicle which you are passing. To be able, in case of necessity, successfully to pass some object with only an inch of clearance is a most excellent attribute to a driver's skill, but if such a proceeding is indulged in habitually then it is nothing more nor less than crass stupidity. There are all sorts of clever things which the really capable driver should be able to accomplish but which the really capable driver never does accomplish except in cases of necessity. Tight corners do occasionally occur, due either to one's own semi-recklessness or to the stupidity of some third party.

A Not Uncommon Tight Corner

When such a thing as a "close shave," as it is usually termed colloquially, has to be encountered with regard to steering, *do not endeavour to look at both sides at once*. This is a fatal mistake, yet it is one which the vast majority of drivers seem to make.

If, for the sake of example, you suddenly find yourself with what you doubt to be sufficient room to pass between the wheel of a steamroller on one side and a brick wall on the other, it can serve absolutely no useful purpose to try and look at both sides of the car when making the attempt.

It will serve no useful purpose to enumerate the many occasions when, from one cause or another, one is faced with an unpleasant proposition of this kind, so we will merely consider the example quoted as a criterion of other similar situations.

Assume, then, that the brakes have failed on a hill, or that for some reason or other we see in front a road bound on the one side by a brick wall and on the other side a steamroller. It is entirely out of the question to be able to stop in time, and the only chance of safety is to pass between the two obstructions. Is there room to pass? Primarily, so far as possible, keep quite cool. That advice is easy to give, but of course we all know that the ability successfully to keep one's

HOW TO DRIVE A MOTORCAR

nerve in a case of emergency varies with the person in question.

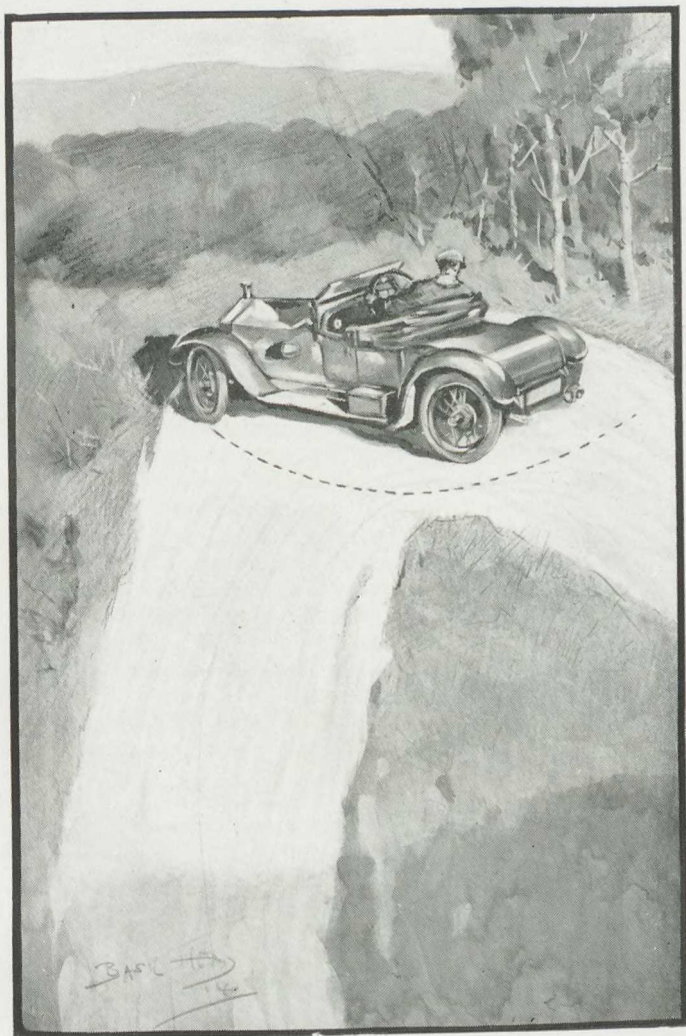
We are assuming that it is impossible to stop, therefore do not jam the brakes on too much, as this is sure to upset the steering, and anything in the nature of a skid may render a successful passage through the narrow imaginary spot an impossibility. Apply the brakes then only so much as they do not affect the steady direction of the car. If a pretty expert driver, they can be put on fiercely some distance away, the car straightened up again, and then the secondary application made of only such strength that it will not now affect the steering.

Do not look first at the brick wall and then at the steamroller and try and figure out whether it is possible or whether it is not. The assumed circumstances are such that one has either got to get through or have a smash-up. If there is to be a smash-up the more nearly you get to passing through the slighter the accident is likely to be.

Take, then, the right-hand object (we will assume it is the wheel of the steamroller) and steer just to miss it with your front wing and try and brace yourself to the knowledge that if the first few inches of the front wing successfully pass the wheel of the roller the rest of the car will do likewise. This fact is important, as in such cases there is always an idea which rushes to the mind that although the thing has just been missed at the beginning, one is steering into it, and therefore it is necessary to steer away from it.

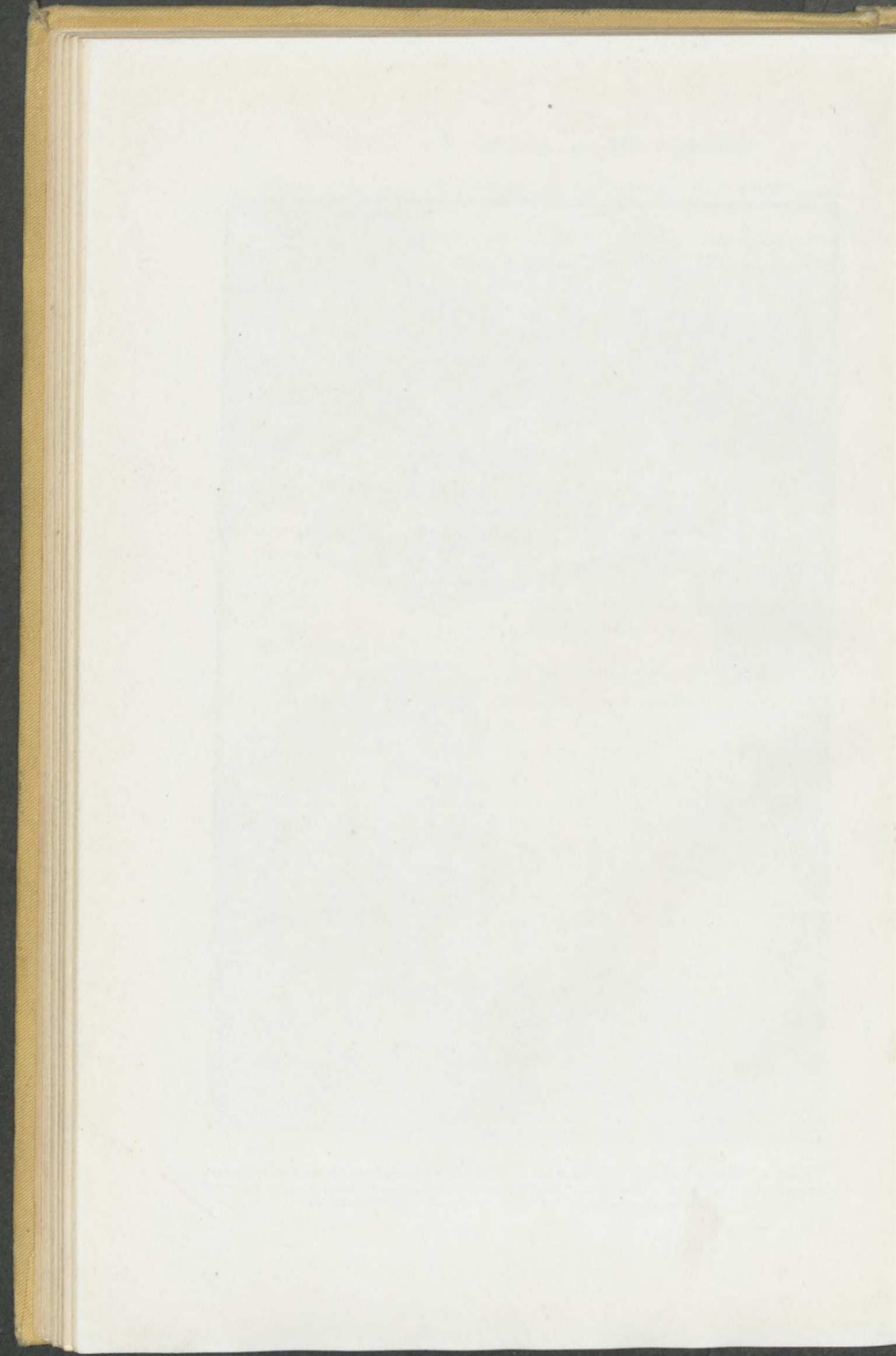
Do not, then, steer out through sudden alarm, because you imagine you are too close to it, but keep the eye firmly on that front wing and the steering quite steady until you are through. If there is room, then, by adopting this means you will get through. On the contrary, if, as so frequently is the case, one glances first to the right and then to the left the manœuvre is by no means so likely to prove successful.

If in point of actual mechanical fact there is not room for the car to pass, then an accident must, of course, ensue, but the fact that you are, so to speak, in the



[To face page 56.]

When a hairpin bend of this type is taken fairly wide, one reversing movement is sufficient to enable the driver to get round: the corner must not be hugged closely as one feels inclined to do on first thoughts.



TIGHT CORNERS

middle of the two objects is likely to minimize the accident rather than if you hit one of them fairly full and altogether cleared the other.

For example, a somewhat inexperienced driver, or one who lost his (or her) head, might clear the wall on the left by a foot, through the powers of vision not being so capable of precise judgment on this side of the car, only to catch the mudguard against the wheel of the steamroller and also perhaps the axle cap. This would, of course, swing the car round and probably dash it into the wall.

More than one case somewhat similar to this has come under the writer's notice, where the driver has absolutely ripped off mudguards and splintered the running boards both sides of the car yet come through without any further damage. It must always be remembered that if an accident is, through any set of circumstances, absolutely inevitable, it still remains the duty of the driver to face that accident and reduce its ill-effects to the minimum.

Remember, then, in all cases where it is a question of a "tight squeeze" not to glance first at one side of the car and then at the other, but go as close to the object on the right as you possibly can, and then, if there is in actual fact room to pass the other side will look after itself and you will get through successfully. If there is not room to pass no amount of looking from side to side could possibly help you: it only makes matters more difficult.

Steering Into an Obstruction—to Miss It

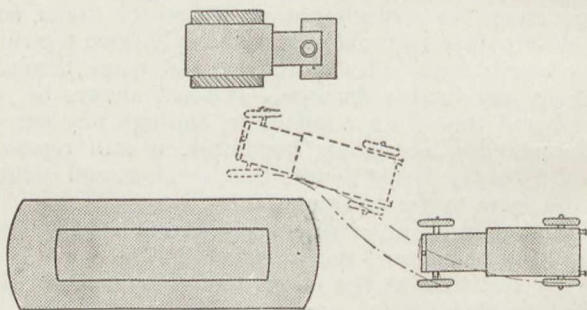
There is one other little point which really quite frequently proves useful to those drivers who know it, and that is the apparent paradox of steering into an obstruction in order to steer out of it. This again is a situation which only crops up in tight corners and is as a rule only serviceable in saving a minor accident.

Sometimes it happens that one has for some reason or other to make a sudden dive from behind the vehicle just in front to pass it on the right but finds that there is not so much room on the right as one wishes in

HOW TO DRIVE A MOTORCAR

order to enable a complete sweep-out to be made. Say, for instance, that one has to dash out in this way from the rear of a tramcar and that on the other side of the road there is our old and imaginary friend the steamroller. Now, the distance between the tramcar and the steamroller is, say, not very much more than the width of one's car. If the start of the steering manoeuvre referred to had been made in good time everything would be quite in good order and there would be ample room.

Suppose, however, that, contrary to instructions in previous chapters, the driver is hugging the tramcar in



Steering into an object—to miss it.

question and the driver of the tramcar for some conceivable reason has suddenly to apply all his brakes. The stoppage of that tramcar will be very much quicker than any ordinary motorcar could possibly hope to stop. Therefore, it is a sudden swerve at the last moment, and perhaps one's front wings only just skim the rear of the tramcar and one feels intuitively that the back of the car is going to strike the bigger vehicle.

Now, it is rather natural to assume that to steer out as far as possible towards that steamroller is one's only chance of making the best of the situation. In point of fact, however, such is not the case. When the car is about half-way past the dangerous "corner" of the

STEERING POINTS

tramcar the steering should be quickly reversed so as to make the direction of the car a dive for the front portion of the tramcar and give a sharp but decided "dab" to the pedal brake.

This will have the effect of bodily swinging the rear of the car out anything from a few inches to a couple of feet, or even a yard, according to road conditions and weight, or lack of weight, at the back of the car, the tyres in use, etc. The manœuvre sounds a difficult one, and admittedly it is not a novice's feat, but at the same time it is a perfectly sound piece of driving, not, of course, to be used for the benefit of amusing people, but to be resorted to in cases where circumstances, over which perhaps one has absolutely no control, have rendered the choice of such a manœuvre or an accident inevitable.

Steering Points in Epitome

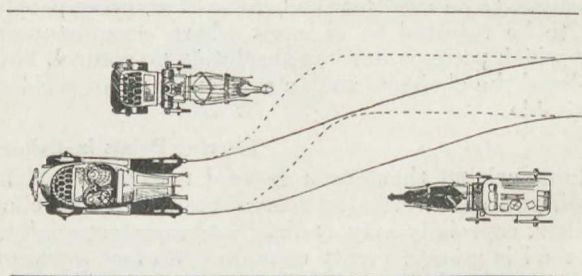
Summarizing then, as a general rule give vehicles which you are overtaking reasonable room, and allow cyclists, especially lady cyclists, and more especially if the road is greasy, plenty of room. So far as passing cars going in the opposite direction, reasonableness is here again the keynote of instructions. It is to be feared that many drivers are in the habit of hugging the middle of the road and leaving the other one to go into the gutter. This is bad driving, and the writer must confess that in such cases he does likewise, generally to the final disconcerting of the other driver, who usually makes somewhat of a wild swing away to his proper side of the road at the last moment.

Such, however, should not be the case, and both should take to the side of the road so far as may be necessary to leave, say, a yard between the two cars. It is ungentlemanly behaviour and bad driving to force the other man into the gutter, or to cut him too close.

Those who are tempted to adopt this bad type of driving (it is to be assumed that they have unknowingly got into the habit of it because respectable folk should always share the necessary "giving way") may find every now and then someone who is more at home with an inch to spare between the two cars than they are, and

HOW TO DRIVE A MOTORCAR

in such cases they may find themselves forced—as they think, in order to avoid an accident—to make a sudden swerve just as the two vehicles are meeting. The other driver, however, who is only endeavouring to teach them a lesson, is quite comfortable and knows that he is just missing the other car and is not at all worried. Let the motto then, when passing a vehicle going in the opposite direction, be that both give way a little, which is, of course, precisely as it should be.



Never steer in as shown by dotted line, except when compelled to do so in an emergency.

Remember always to steer gently and in good time, not leaving the movement to the last moment, when it is necessary to steer suddenly. In conclusion, on no account ever move the steering wheels through the medium of the steering wheel when the car is stationary. It is a very bad practice and imposes an excessive strain on the steering gear, which it is neither designed nor intended to take.

CHAPTER VIII

The Question of the Use and Care of the Brakes

ONE would be rather inclined to think that this subject was one on which it would be almost superfluous to write at any length. Most motorists ought to know how to use their brakes, and probably very many do, but at the same time those who do as they know they ought to, are, it is to be feared, rather in the minority. The lilt of the old proverb "Spare the rod and spoil the child" may safely be transposed into "Spare the brakes and save the car." Not only by so treating them will one save the actual mechanism of the car from excessive strain and wear and tear, but a great difference will be noticed in the mileage obtained from the tyres.

The case when it is really requisite severely to apply either one or both of the brakes should undoubtedly be the exception rather than the rule. In all cases where it is necessary to stop the car, the brakes should be used as little as possible compatible with the circumstances. For instance, when driving up to take one's place in a traffic block, do not run at a good speed until a few yards away, and then draw the car up "on its haunches," so to speak, by means of powerful brake application, but rather declutch in good time, and glide slowly up, so that the final arresting of progress actually necessary by a brake application is reduced to the practicable minimum.

Exactly the same method of procedure should be used when stopping at one's house, at a shop, or other place of call. Let the stopping manœuvre be started

HOW TO DRIVE A MOTORCAR

in good time, so that the car's momentum is nearly spent by the time it arrives at the spot upon which it is desired to arrest its progress. Even then it is preferable lightly to apply the brake for, say, ten yards than to apply the necessary amount of braking effort in, for example, the last five yards.

Use Both Brakes

Many motorists contract the habit of never using, or perhaps one might be safer in saying, but very rarely using, the side brake, the more convenient position of the pedal-applied brake being a sufficient temptation to cause an almost entire reliance upon its efficiency and good condition.

In most cars the pedal-applied brake is mounted on the gearshaft at the rear of the gearbox, acting therefore through the universal joints, the bevel gear, the differential gear, the driving keys or serrations, and so on to the road wheels. This brake drum is revolving at a considerably higher speed than the road wheels, which fact, of course, is one of the chief reasons for its efficiency being greater than the brakes usually operated by the side lever, which are mounted on the rear-wheel drums. Therefore, each time one uses this brake when the other one would serve equally well, extra wear and tear, all entirely unnecessary, are being thrown on the universal joints and the transmission gear, and it is these reverse stresses which tend quickly to destroy the pristine quietness of the universal joints and start them squeaking and rattling.

Try, then, to acquire the habit of using the side brake as well as the pedal-applied brake. In some few cars the principle of operation is reversed, and the pedal-applied brake acts on the road wheels, and the side lever on the differential brake. Obviously, in these cars the advice wants turning round to suit the circumstances.

Even with cars in which both the brakes operate on the rear wheels, so that all braking stresses are removed from the universal joints, etc., it is still advisable to make a habit of using them alternately. Not infrequently the one is of the internal-expanding

USE BOTH BRAKES

pattern, the other being of the contracting type, and usually the latter is a good deal more efficient than the former. If it is, then make a special point frequently to use the less efficient one, always remembering that the real value of high brake efficiency comes into being in case of emergency.

Another point to remember is that, when a brake is not used for some considerable period, oil may leak on to the drum, and then, if it should be wanted in some emergency, it may be found that its efficiency is reduced very considerably during the first part of the application until the oil has been squeezed or burnt out. Endeavour, then, to form the habit of always using the brakes alternately, in addition to using them as lightly as may be reasonable under the circumstances. It must also be remembered that, although a brake may be in perfectly good adjustment when it leaves the manufacturer's testing department, if it is never used and not attended to it is unreasonable to expect it to be still in perfect working order, say, after the car has been on the road for two or three months.

This dual use of the brakes advice may be extended and emphasized in the case of descending long hills. In such cases, if it is necessary to brake the car all the time, then change over from one brake to the other so as to prevent overheating, and by so doing reduce the inevitable wear and tear to a minimum. When changing over, do not release one brake first of all and then have to check the increased momentum of the car, as this means unnecessary strain, but rather as the one is released gradually apply the other so that the braking effort remains more or less equal throughout. Speaking in terms of generalization, it is preferable when descending long hills in ordinary country touring to use the brake acting directly on the road wheels rather than the other one, so that this should be the one used first, and then when it is judged requisite to make the change the differential brake may be employed, and if the hill is sufficiently long to make another change desirable then the brake which causes least wear and tear receives a second "dose."

HOW TO DRIVE A MOTORCAR

The foregoing matter may, perhaps, be subject to a qualification for traffic driving in big towns and cities, such as London, for instance, where brake application of a greater or lesser degree is required very frequently. In this case, the continual reaching for the side brake lever and the movement of it might prove a little fatiguing, and possibly a little less reliable.

A Useful Precaution

One small point relative to the question of the pedal brake is that of making sure that there is no possibility of the floorboard coming out of its proper position when not intended so to do, and thus making possible the jamming of both the brake and the clutch pedals. The writer experienced this once when travelling at quite a good speed, and a bad bump in the road made the floorboard jump up, and it contrived so to jam itself that neither could the clutch be released nor the pedal brake applied. Mats, matting, and other floor coverings should also be under scrutiny every now and then to see that there is no such possibility in regard to their thus misbehaving themselves. Occasionally a piece of rubber matting near the slot for the pedal becomes worn or loose, and any such uncontrolled piece of matting should promptly receive attention through the medium of a tin-tack.

Care of the Brakes

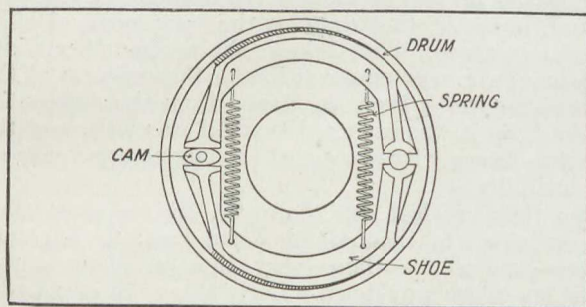
Both brakes should always be under the careful observation of the driver to see that not only do they act, but that they act properly. A slight adjustment, once a month, say, is very much to be preferred to making a big adjustment at the end of six months, when it becomes an absolute necessity.

The reason is quite a sound one. It is not usual—in fact it is hard to recall a single case—so to construct a brake on a motorcar that it is possessed of an accurate movement; that is to say, the actual movement of the brake shoe on to the drum is never concentric. The fulcrum pin for the brake shoe is usually so positioned that the brake serves its purpose better in practice than

WEAR OF THE BRAKES

it does in theory. Consequently, continued wear and tear on the brake, say over a period of six months, means that the surface of the actual brake block is not worn away evenly from the surface which it had when new.

Consequently, if a considerable adjustment is made, it means that the brake has again to bed itself, which in turn means considerably greater wear for an equal brake efficiency owing to the smaller area of the shoe actually in contact with the drum. This defect, which, as pointed out, is present in practically all cars,



Wear in brakes

is much minimized by making a small adjustment of the brakes frequently. The embedding process is thereby reduced to a minimum, and the available area for active braking effect is increased, so that the wear is proportionately reduced.

With regard to the whole question of the use of the brakes, perhaps the most important point of all is that of keeping the side-brake lever, which operates on the drums of the rear wheels, in thoroughly good order and in a serviceable condition. If, perchance, the actual control of the brakes is reversed and the pedal should apply this brake, whilst the differential brake is controlled by the side lever, as in the Daimler, Pipe, and some few other cars (the writer prefers this principle), then, of course, the advice applies to the pedal-applied brake.

HOW TO DRIVE A MOTORCAR

Luckily, it is but rare that serious positions are encountered owing to mechanical breakdowns. Perhaps the recital of an incident which occurred to the writer in the Isle of Wight may serve to show the absolute necessity of keeping the brakes which operate on the rear wheels in good order. It chanced, then, that in the course of a holiday in that island the excessive amount of hill work encountered had so worn the side brakes that the limit of adjustment had been reached, and in another day or two they were only what one might term "helpful" in arresting the speed of the car, but in no way serviceable by themselves. It was found, however, that even on the very worst of hills, as, for instance, about 1 in 5, the engine, if put into the low gear, was ample to brake the progress of the car with but the least assistance from the differential brake. So it was assumed that all was well, and the car was driven with the use of the engine as a brake on all bad hills.

On the very last day, however, the car was being driven down to the boat to come back to England, home—and office—when (very luckily) about three-quarters of the way down a fairly steep hill into Ryde, using the differential brake only, the car suddenly darted forward. As the pedal brake was found to be quite useless, the side brake was put on to its maximum, which, however, had practically no effect. Then the engine was raced so as to be able to engage the low gear, and the clutch then let in. To the writer's horror, even this made no difference, and the only choice left was boldly to charge into one of the shops at the side of the street—obviously a very dangerous proceeding, as there were many people about—or, on the other hand, to take "pot luck" (in the vernacular) with what chanced to lay in front at the bottom of the hill, and the corner which was well known to be there.

The former was ruled out of the question owing to the number of people about, and consequently the writer shouted at the top of his voice, "Klaxoned," and gesticulated violently with the one arm. Almost providentially it chanced that there was a policeman

MECHANICAL FAILURES ON HILLS

at the corner possessed of far more than ordinary commonsense, who, in the fraction of a moment, grasped the situation that the car was out of control, cleared the corner of people, and even managed to hustle out of the way a butcher's cart which was blocking the corner at the only angle by which one could hope to get round and avoid being upset and having a bad accident.

Thus, by a combination of good luck and skill (excuse the egoism), and a fairly well-judged angle for a high-speed turn on the corner, the immediate danger was successfully negotiated and the corner taken successfully. Luckily there was a free passage along the road until such time as the car took it into its head to stop. Then, of course, came the examination, and the moral—which is the point of value so far as the readers are concerned.

Well, the trouble—it was about the last car on which one would anticipate such a trouble—was that the universal joint had come adrift and bodily fallen out on the hill, so that neither the engine nor the differential brake were of the slightest possible use, the side brakes (which were out of order) being the only means of checking the progress of the car.

Now, luckily, this sort of thing happens but rarely, but it does happen on occasion, and not infrequently one hears either of differential gears or bevel gears breaking or of the shaft shearing, or some similar mechanical accident which absolutely brings the whole work of arresting the progress of the car on to the side brakes.

The one lesson was enough in the writer's case, and no car will he now drive unless satisfied as to the serviceable condition of the brakes, which act directly on to the road wheels.

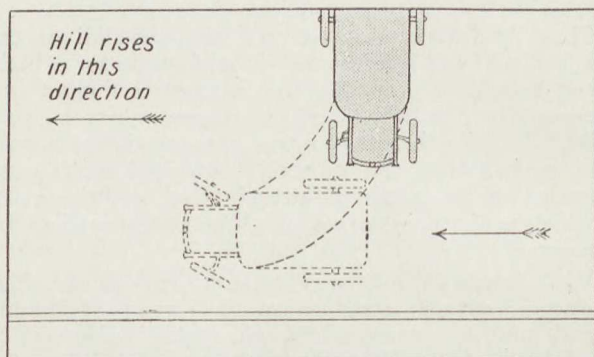
Mechanical Failures on Hills

So much then for the care of the side brakes, but there now remains for consideration the question of how to act if one does find oneself seated at the wheel of a car which is out of control. At the actual moment of writing no fewer than three specific cases are under

HOW TO DRIVE A MOTORCAR

the writer's notice in which this state of affairs has occurred.

In two cases the shaft on a worm wheel sheared, the cars being of different make, and very good make in each case, whilst on a third occasion the axle shaft, where it was attached to the differential gear, gave out on another make of car.



'Swinging across road

In all three cases the side brakes were by no means in the adjustment in which they should have been kept, but luckily in none of the cases in question was there anything in the shape of an accident, as they occurred in circumstances where the speed of the car soon arrested itself by the natural order of things; one was going up hill and the other two were on the level.

Now, suppose such a state of affairs occurs when one is climbing a steep hill. The very instant one fears that the brakes have not the power to control the car swing it immediately full lock across the road at right angles. If, of course, Fate should ordain that there is a nice grass bank at the one side of the road, obviously that is the spot to choose, and if the movement is done quickly enough it is highly improbable that any damage will occur either to the car or anything else.

If ever a car is showing signs of being unable to climb a hill the possible necessity of having to swing it

BRAKES FAILING TO HOLD

round at right angles, if the brakes will not hold, should be a potentially necessary scheme of action in the driver's mind. Always remember that if the brakes will not hold in the first few yards, when the car is beginning to gather momentum, there is less and less chance of them holding sufficiently to arrest progress, as the momentum increases.

Consequently, the instant the fact that the brakes will not hold is once a matter of absolute knowledge in the mind, select the better side of the road and promptly swing the car round into it. It may be that a wing is damaged, or it may even be that the bodywork at the back may be damaged. If so, it is bad luck. It must distinctly be remembered, however, that

any hill of length, with a bend or two in it, should not be thought of as possible of negotiation at speed backwards by the average driver.

As a matter of fact, to take a corner or severe bend backwards at good speed is a feat which would baffle the judgment and ability of even the most expert drivers, to say nothing of the possibility of meeting anything on the hill.

In the writer's attempts on various cars to climb the test hill at Brooklands not only has the engine failed to negotiate the climb on the 1 in 4 part, probably in about a dozen cases, but the brakes also failed to hold the car. In each case it was instantly swung round into the grass bank, striking it at a speed of only a mile or two an hour with the near side rear wheel, and then, of course, it was only a matter of waiting for one's friends, or other assistance, to pull the car to the top by means of a tow rope.

Of course, the circumstances there are favourable for such a manœuvre, but at the same time one must remember that it is rather more often than not that excessively steep and dangerous hills have to be tackled in country districts where there is often a grass bank, hedge, or something nice (under the circumstances) at the side of the road. Even if there is a pathway with a reasonable curb, if the manœuvre is done sufficiently

HOW TO DRIVE A MOTORCAR

quickly, it is highly improbable that any damage will result.

Brakes and the Skidding Question

Most drivers will probably have noticed that under certain conditions the quick application of the brake has a tendency to cause the car to skid. Now the choice of the brake applied can minimize this trouble. If one has a metallic non-skid on one rear wheel and a rubber tire on the other—whether the road be greasy or dry—a sudden application of the differential brake is likely to cause the car to skid.

In such cases it is preferable to employ the brake acting directly on the drums of the rear wheels, as if this is provided with a proper whiffle-tree or equivalent balance gear, then the slower speed application of the power being applied directly to each wheel is not so likely to cause a skid. To a considerable extent, when one wheel tends to slow down quicker than the other, the balance gear comes into play again, whereas with the differential-applied brake no differentiation can be made between the various wheels according to the different coefficients of friction which they possess relative to the road surface.

Not only so, but the grip is more sudden, and it is the suddenness that causes the side-slip. If one has metallic non-skids on both rear wheels, as many large cars have, then this advice does not necessarily hold good. Unless there is a distinct difference in the road condition under the one wheel compared with the other, or a noticeable difference in the weight upon the wheels under consideration, the differential brake will usually manage to proportion the application of power pretty evenly; in fact, in some cases better than the whiffle-tree balance gear can do.

Similarly, if both the wheels have rubber tyres of similar grip, here again there is not much to choose in the matter of which brake to employ. The main idea, however, in all such cases, is to remember that the greatest pressure on the pedal is by no means necessarily the greatest braking efficiency. When the wheel is stopped against rotating and is sliding along the road,

MODERATION IN BRAKING

the braking effect on the car is not so great as when it is revolving at the slowest speed possible in differential relation to the actual speed of the car's progress; in other words, if the wheel should be revolving, say, at 50 revolutions a minute, according to the actual speed of the car, the braking effect is greater if it is revolving only a few revolutions a minute than if it is actually held stationary by the brake.

Try Not to Over-brake

In nine cases out of ten, where sudden application of the brakes is employed, it is found—when the incident is reviewed afterwards—that the braking was greater than was necessary to save the situation. It is, of course, a question of a well-trained power of judgment to distinguish between the occasion when only the maximum brake power available will arrest the progress of the car under certain conditions, or when, say, 75 per cent. of the maximum brake power will suffice.

It would, perhaps, not be wise to propose to the average driver that he should not utilize all the brake power which he thinks requisite, but, on the other hand, careful study of different circumstances will, if he is observant, gradually lead him to a knowledge of the type of *apparently* critical situation which can comfortably be saved by 50 to 75 per cent. of the maximum brake application, when probably nine drivers out of ten would instantly employ the maximum brake power available, only to find it far too much.

The Necessary Care of the Brakes

In conclusion, then, on this subject, remember always that the lives of others, or their personal well-being, in addition to that of your own and possible damage to property or your car, are frequently, during the course of an average day's run, preserved from danger by the good condition and efficiency of the brakes. As they are so important, then, keep a close watch on their welfare.

Never contract the habit of relying on one brake alone, or if such habit has been contracted get rid of it

HOW TO DRIVE A MOTORCAR

at once, as sooner or later the occasion will arise when the brake in question will be found from one cause or another not to be sufficient adequately to meet the circumstances, and then, if the other brake is not in proper condition, something undesirable is likely to occur.

A Footnote About the Clutch Pedal

This chapter on the question of the brakes and their operation is perhaps as suitable an opportunity as any other for dealing with another little matter which is rather a pet hobby of the writer's, and which, so far as his observations have yet led him, does not seem to be a very common practice. Let us then incorporate this little foot-note on the idea.

It may be remembered that when the pedal accelerator was first cast forth for the consideration of the motoring world, there was quite a general outcry against it. The opinion freely expressed was that it was ridiculous to expect one to be able accurately to control the movement of such a pedal with the foot, and furthermore that very few miles of such driving—even if one assumed it feasible—would make the foot mighty tired and give one the cramp.

To be perfectly honest, the writer personally was one of the many who soliloquized thus. Yet to-day we see it as the most universally admitted practice on a car of any fitment about which there is a choice. Now, if it can so readily be done and the movement so well controlled, without undue fatigue by so many drivers, why not extend the idea of continual foot-control to the clutch pedal?

Many years ago the writer thought thus, and started to train the left leg and foot so as to become accustomed to spending something over 90 per cent. of the time when driving resting on the clutch pedal. Many admittedly expert drivers with whom the suggestion has been discussed have pooh-poohed it, but even so the writer still thinks that there is much to commend it. The reason, again, is our old friend previously alluded to, viz., the odd second, or even the fifth of a

THE CLUTCH PEDAL

second, which can make such a difference when traveling at speed between having an accident and just missing it. It is a fairly reasonable limit of time—after many careful tests—to state that when one has the left leg in a position of rest, some three or four-fifths of a second elapse from the time when the mind has become aware of the fact that it is necessary to de-clutch, before the foot is actually on the clutch pedal. Now, that minute portion of time is equivalent at 20 miles an hour to some 6 yds. or 7 yds., and the extra amount of momentum gathered in running that distance with the power of the engine still being passed on to the car compared with having declutched so many yards sooner is quite an important factor, when it is a case of missing an accident by a very narrow margin.

When one thinks how often an incident in driving is only prevented from being an accident by a matter of a foot or even inches, the intrinsic value of these odd fifths of a second is readily seen to be very much greater than their apparent or superficial value.

The idea is put forward, therefore—admittedly as no more than a suggestion—that the reader should endeavour to cultivate this method of training himself to be quite comfortable with the left foot resting directly on the clutch pedal for the greater part of his driving. When touring in the country a little rest or change is required (the spot of greatest safety can always be chosen), but for town work and villages, and where cross-roads are continually being negotiated, the writer invariably has his foot directly on the clutch pedal waiting there to make the necessary movement without the loss of those valuable odd fifths of a second, and never after the first month or two of training has he experienced the slightest trouble or fatigue in so doing.

To qualify this statement in order to make it precise in view of actual facts, it is, of course, necessary that the position of the clutch pedal and the seat relative to the driver's stature is more or less correct. If the seating room is very cramped, then, of course, it must prove tiring, but for those who habitually drive but one

HOW TO DRIVE A MOTORCAR

car, the writer—even in the face of the fact that he has failed to get much in the way of corroborative sympathy from certain expert drivers—nevertheless puts the idea forward as a scheme worth trying.

A Golden Rule

Finally, to conclude this chapter, on the general question of brakes, take to heart the following golden rule:—

Never, in any circumstances whatsoever, drive at a greater speed than that at which the car can be stopped with the use of one brake only, in the actual piece of clear road directly under observation.



An example of the above rule—the case of the humpbacked bridge.

If a bend in the road limits your vision of the road surface to 30 yds., your speed at no time under such conditions should be greater than that at which the car could be stopped with reasonable comfort in, say, 25 yds. If the reader will always make a practice of adhering to this rule he will not find himself suddenly encountered with a set of circumstances (which it may be ought not to exist) just round some bend, or just the other side of some humpbacked bridge, and he will go many and many a thousand miles without either a serious incident or an accident through travelling at too great a speed.

CHAPTER IX

Throttle and Ignition Control

MOST carburetters in these days are of what is termed the automatic type, and the question of the control of the amount of air used is not of such great importance as it was a few years ago. Frequently, however, one has a means of controlling the amount of air, or on the other hand one may wish to experiment with different-sized jets or needles. In either circumstance it is preferable to err on the too much air principle than it is on the too much petrol basis, as the former is not so likely to do any damage, whereas the latter may cause trouble; in fact, probably will.

Naturally, the more air that can be used with reasonably good results, the more miles per gallon will one attain, although it must be remembered that, if one is adjusting a mixture for the question of mileage, acceleration and power on the hills must not be expected to such an extent as if the mileage is not to be of primary importance. Bear in mind also that the quantity of air which can be used with a given petrol flow varies according to climatic conditions, and on a warm summer day a considerably greater quantity of air can be used with a given sized jet than, for instance, on a cold winter's day, or when the air is humid.

Too much air will, of course, make itself known by popping in the carburetter, and can also be judged by the length of time which it takes the engine properly to warm up to its work in the morning. This popping, however, is not likely to do any damage to the engine, although, if frequent, it is certainly not conducive to economical running.

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On the other hand, too rich a mixture is likely to soot up the plugs, leave a deposit on the piston heads and around the walls of the combustion chamber, and likewise on the valves, and thus in the course of time will adversely affect the running of the engine and tend to cause pre-ignition. Too rich a mixture can usually be detected by a pungent exhaust which has a sort of stupifying effect if inhaled much, whilst the exhaust gas is usually dark and smoky.

People occasionally find that a carburetter which, say, on a warm day in the winter, is quite satisfactory, is, a few days afterwards, when a very cold day comes along, nothing like so efficient. It must be remembered that there are two contributory causes for this. In the first place, there is a difference in the air itself, and in the second place the lower the temperature the less viscous the fuel, and as there always exists a definite relationship between the viscosity of the fluid and the skin friction engendered, so the flow in the jet varies. Consequently, if there is a spell of really cold weather and one's carburetter is of the automatic type it may be found necessary, in order to get good running, to put in a slightly larger jet.

The Use of the Throttle

It would be a fairly safe criticism to state that, in the majority of cases, the throttle is used too harshly.

Perhaps it is a matter where it is really not much use even advocating the invariable gentle treatment of the throttle, and, of course, through it the mechanism of the car. but at the same time one may safely plead for careful use of it, except where rapid acceleration is needed, for instance, in traffic. In other words, unless there is some specific reason for very sudden acceleration, depress the throttle pedal gradually, and let the car pick up its speed in an even manner, instead of in the quickest possible way.

It is fairly obvious, with but little consideration, that to open the throttle to its maximum from its nearly-closed position, involves a sudden strain not only on the engine, but upon all the various transmission units

CONTROL OF THROTTLE

in the chassis. It is very bad for the mechanism of the car suddenly to call into play the full available power of the engine, and it is certainly the reverse of economical. If the reader were to fix a graduated glass tube about a couple of feet in height on the dashboard, the markings being, say, in cubic centimetres, it would probably be something of an eye-opener to him to see the disproportion between the quantity of petrol used in sudden acceleration and the actual benefit accruing from it. Even beyond this many carburettors do not give the best actual acceleration by the quick and full depression of the pedal, but give better results by a fairly fast depression of the accelerator pedal at a constant speed in the early part of the movement, gradually speeding up the depression from about the one-third open position.

One may lay down another good honest rule with regard to the control of the throttle to the effect that one should never make a habit of driving for long periods with the throttle fully open. It is bad all round—it is wasteful—very wasteful—it is bad for the mechanism of the car, and it is unmechanical. On the contrary, one should do 80 or 90 per cent. of ordinary touring on approximately level roads with a good reserve of *throttle movement* in hand. If, again, the reader could take advantage of the diminutive glass petrol tank previously referred to, the difference in economy when running with the throttle full open and, say, from about half open to two-thirds of full depression, would be a considerable surprise.

Presume for the sake of argument that the maximum speed of the car assumed to be under consideration is 45 miles per hour. For such a machine the ordinary fast touring speed should not be more than from 33 to 37 miles per hour. Every car has some definite throttle opening at which it will "get along very well," and it may be that only, perhaps, six or seven miles per hour faster can be obtained with the maximum throttle opening.

Yet the difference in economy so far as petrol consumption is concerned between the unkind driving and

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the considerate treatment of the engine and chassis might quite probably work out at something approaching 20 per cent. In addition to this, at higher speeds tyre wear may be said to increase, roughly, as the cube of the speed, whilst the whole chassis suffers to some extent through the extra strain and jolting put upon it.

Then, again, the life-bearing productions of nature are not the only things which get tired. Metals have a knack of getting tired, and continual running under maximum power with considerable jolting is the best known means of producing the fatigue of the metals. From all points of view, then, more particularly that of economy, it is advisable always to make a practice of merely indulging in the full depression of the throttle for short stretches, or for hill-climbing purposes. It must be admitted that, every now and then, when a fine stretch of road presents itself, one has the right to enjoy the exhilaration of putting the car to its utmost speed, but this should be the joyous physical exception rather than the mechanically-murderous rule.

One may admit that it is usually advisable to accelerate up to a good speed by the full use of the throttle, but when that speed has been attained it is rather surprising, if careful notice is taken, how far throttle opening may be reduced without materially decreasing the speed of the car.

In Traffic

The remarks which have been made relative to the use of the throttle in general are particularly applicable in reference to traffic driving. Do not be tempted to overdo the "hang-on-the-top" idea, and when it is requisite to pick up with top gear engaged from a very slow speed take particular care not to open the throttle too quickly. Not only will the sudden jar on everything be detrimental to the chassis at large, but from slow engine speeds on touring cars the acceleration is not likely to be so good with a too-quickly-opened throttle as with a gently manœuvred one.

Frequently, when having come down to quite slow running, one can pick up again without any undue

ACCELERATION IN TRAFFIC

strain on the chassis by the very gentle treatment of the throttle, the very least possible depression being used at first, then carefully increasing, of course, with the quicker movement of the car.

With regard to acceleration in traffic as a means of getting past obstructions, nothing but practice can aid the reader in becoming thoroughly acquainted with what can be done with safety and what cannot. In any case of doubt, take friend "Punch's" advice, and "don't," although in many cases most drivers are inclined to think they cannot get through such-and-such a situation, whereas, in all probability, there would be plenty of room. This statement must not be taken in the nature of advice to become more venturesome in regard to traffic driving. No. It is only drawing attention to a characteristic fact, namely, that it is very hard to distinguish between the speed of which a good car is capable some few seconds after it has been accelerated, and the speed at which it was going the moment before the acceleration movement commenced. - In all cases, however, if there is any doubt, wait for a more suitable opportunity. Also remember that, when once you have made up your mind, hesitancy should cease. The writer was once being driven by a man who started to accelerate past a bus, and then rather late in the day changed his mind—and got his mudguard badly crumpled and burst a tyre! Had he gone on, he would have got through quite comfortably.

Ignition Control

There is really not much to say with regard to the question of ignition control. So far as the operation of the control lever is concerned, the great thing to remember is never to move it too rapidly. Never, having started up the engine with the ignition lever retarded, swing the control lever up to the maximum advance so soon as the top gear is engaged. Always at the first sign of knocking on a hill retard the spark until such symptoms cease: otherwise, as a general rule, keep the ignition well advanced and maintain the car pace required with as little throttle as needed.

CHAPTER X

Gear-changing

EVERYONE who drives a car is bound frequently, from one cause and another, to change gears. As there are so many cars in general use it is perfectly reasonable to argue that the majority of drivers are capable of doing this with more or less ease, otherwise there would be an outcry for further information, or simplification in the mechanism itself. Now, it is quite one thing to change gear, and another matter to change gear properly.

It is an art—the word “art” is used advisedly—which every driver should endeavour thoroughly to acquire; and this for many reasons. In the first place, a bad gear-change is very detrimental to the whole mechanism of the gearbox, and the gear control levers, striking rods, etc. A bad clash when gear-changing means that a distinct tendency is set up towards the chipping, or, in these days, perhaps, the scaling of the gear wheels themselves. Then, again, a fiendish noise is made, which is likely to give a very bad impression, both to the occupants of the car and those near at hand, whilst in the third place the bearings of the gearbox are subjected to an end thrust of considerable force owing to the big leverage provided, and consequently there is also a strain put upon the control mechanism which it is not intended to take.

Before going further one must admit that gear-changing is very considerably easier on some cars than on others, but so far as the broad principles of gear-changing are concerned the writer, with a large, diversified experience, covering practically every car at all well known to the world of automobilism, has not

THEORY OF GEAR-CHANGING

yet found one on which ordinary gear changes could not be made properly with a little practice and reasonable knowledge of the car in question. This qualification is meant to apply only to the gear changes as such, and when it comes to what one may term super-refinement in the art of gear-lever manipulation there are some cars which absolutely refuse to do that which one is endeavouring to accomplish. More of this anon, however.

We have therefore the fact that it is entirely unnecessary for any noise whatsoever to occur when gear-changing, whether the step be made from neutral to a forward or the reverse gear, or whether it be from a low gear to a higher one, or, on the contrary, a step downwards. Let us, then, as the matter is one of prime importance, go into it carefully and see if we cannot all learn to become expert in the art of changing gears.

At the present time quite a large number of drivers, although able to make a gear change, do not care to do so at a high car and engine speed, and consequently do not come down from the top gear on a hill until the severity of the hill in question forces them so to do, although it may be perfectly apparent, even at the start, that a change is bound to be required before the summit is reached. This is not as it should be, and every driver, so soon as he comes to that portion of the hill where his engine tells him intuitively that it is about time to make a change in order to keep the engine running at its best efficiency, should proceed to do so without any hesitation, or worry as to the possibility of making a bad change.

Some Theoretical Considerations

As we have agreed to go into this matter rather fully, it will be well in the first place to endeavour reasonably well to appreciate the actual nature of the operation effected from the theoretical standpoint, so as the more readily to grasp the *raison d'être* for the practical side of the question advocated. Not only is it desirable to have some cognizance of the actual movement of parts inside the gearbox, but it is as well to be able to appreciate them relatively to their mechanical significance,

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and the momentary and after effect which such movements produce.

To start with, then, in the vast majority of gearboxes the work of changing gear consists in withdrawing one toothed pinion from mesh with another and making another pair of pinions engage. Now, in the writer's opinion, the man who first put such a contrivance on to a motorcar, more especially with the metals at that date available, was worthy of the mechanical engineer's equivalent of the Victoria Cross! It was a bold conception, and could it have been put to most of the engineers of the present day without the light of the practical proof of its possibilities, it would, in all probability, have been decried as a mechanical abomination.

The writer would go even further still and say that it is one, but the marvellous state of efficiency and success to which it has been brought in the motor industry is so good an excuse for its existence as almost to give the lie direct to the criticism. Be that as it may, however, it is only *en passant*.

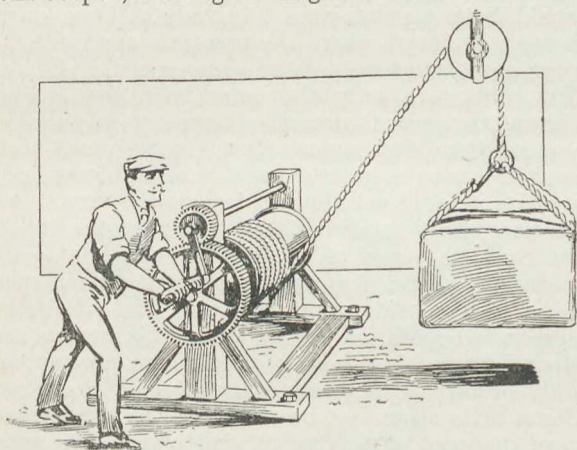
This movement which we have to get is obtained by the simple work of pushing forward, or bringing back, the change-speed lever. It is now necessary to consider the question of speed ratios and their bearing upon the subject, as that is all that a gearbox is. We have an engine which is capable of a certain torque, or power output, and a car of a good weight to be driven along roads of varying surface and gradient, and with different wind resistances, etc. Now, suppose that engine gives off the maximum power it is capable of producing at 1000 r.p.m. Again, suppose that with the final gear axle ratio, size of wheels, etc., the speed would then be 30 miles an hour on a level road. For the moment let us carry that imaginary engine and car in our minds and take a homely simile to further us on our course of understanding fully the value of gear ratios.

Suppose we have a large block of rock which it is desirable to move. We find on trying that it is quite impossible to move it with the hands, and we

THEORY OF GEARING

consequently bring into use a crowbar. Having got the crowbar under the rock and placed a stone or similar fulcrum on which to exert the leverage which we are going to put into the crowbar, it is still found impossible to move the rock which we are anxious to get rid of. Obviously, the next step is either more power in the shape of an assistant on the "business end" of the crowbar, or, if an assistant is not forthcoming, then a longer crowbar.

It will be found that the power which the person in the imaginary case is capable of exerting at his maximum output, although failing to remove the rock with



A simple example of the value of leverage obtained by a small pinion working into a large one.

a small crowbar, is still, by bringing into use a longer one, capable of easily accomplishing the work. That is to say, that with a given capacity of power output he is able to accomplish work with big leverage which he cannot do with small leverage. Bringing the simile nearer the subject matter under consideration, the ratio of gearing is such a thing that when increased the engine is able to do that which could not be accomplished otherwise.

Now, let the engine trying to drive the car up a steep

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hill be the equivalent of the man trying to move the rock. Neither can accomplish the work in hand. The man, however, with the greater leverage is able to accomplish that which he could not perform before, and similarly, therefore, the engine, if we can provide it with a bigger ratio of leverage, can make the car climb the hill.

It is for neither more nor less than the giving of this different leverage that the gearbox is installed upon a car. Now, in the case of the long crowbar, assuming the man still to exert his given power and to do so at a given speed, the rock will be moved more slowly than it would if the crowbar were, say, only half the length, and the movement where the power is applied to the shorter one carried out at the same speed.

Now, this is exactly the same with the gearbox. Assuming the power to remain the same and the speed the same from the engine, then the resultant power output, if it is to be great enough to take the car up the hill which it could not climb before on the direct drive, must necessarily be slower. We get then the cardinal point that the speed of the gear wheels has to vary considerably with the engine running at a given speed. Now, a little consideration will show that, if the gear change is to be effected quietly and neatly, means must be found for making those gear wheels run at approximately equal periphery speed at the point of contact.

Some little space has been devoted to this explanation of the need of gear ratios and to make the reason for their necessity easily understood. The full knowledge of this phase of the gearbox is essential to a good gear change.

The Four-speed Gearbox

Let us now go through a typical four-speed gearbox and carefully follow the theory of the operations, using the illustration as an aid to the study. First of all we have the wheels (a and b), which constitute what are usually termed the constant-mesh pinions, that is to say, wherever the gear lever is put, at neutral or otherwise, these two pinions are always in mesh and revolving, on the assumption, of course, in the latter case,

CONSTRUCTION OF THE GEARBOX

that the engine itself is working and the clutch not withdrawn. Now, in the first illustration we see these two constant-mesh pinions in their position for revolving together, but as none of the three gear wheels on the layshaft (l) are in engagement with the wheels on the main shaft (m) no motion is conveyed to the back axle.

At this point, for the benefit of the novice, it may be pointed out that the primary shaft is divided and that the three gear wheels (c, d and e), are in no way connected with the gear wheel (a), the end of the shaft on which the said three gear wheels (c, d and e) are mounted having a bearing inside the gear wheel (a), the bearing in question (s) being commonly known as the spigot bearing. Now, by means of the change-speed lever, we are able to move through the medium of the striking lever (f) the two gear wheels (c and d), whilst by means of the other striking rod (g) we can move the wheel (e) forwards or backwards from its position in the first illustration.

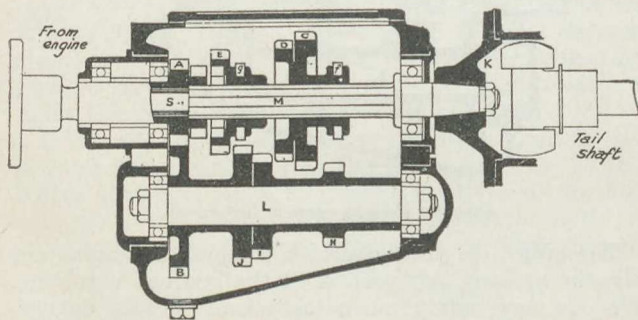


Diagram showing gears in neutral position.

Now, just for the sake of argument, we will assume that the wheel (a) has 20 teeth and the wheel (b) 40 teeth, so that when (a) is revolving at 1000 r.p.m. the wheel (b) and with it the layshaft and the other three wheels (h, i and j) (these are fixed solidly on the shaft with b) are revolving at 500 r.p.m. Now, it is obvious that the slower the universal joint attachment (k) revolves in relation to the speed of the engine the

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greater is the leverage applied to that said universal joint; therefore, we look on the layshaft (l) for the smallest wheel and on the primary shaft (m) for the biggest wheel, so that the reduction from the layshaft to the primary shaft may be as big as possible for the low gear.

It is easily seen that it is necessary for us to obtain this low gear to move the wheel (c) into engagement with the wheel (h), remembering, of course, that the wheels on the layshaft never change their position; but the engine is running and therefore the layshaft is likewise running because of the constant-mesh pinions, so that if we try to bring c into engagement with h under these circumstances trouble will ensue.

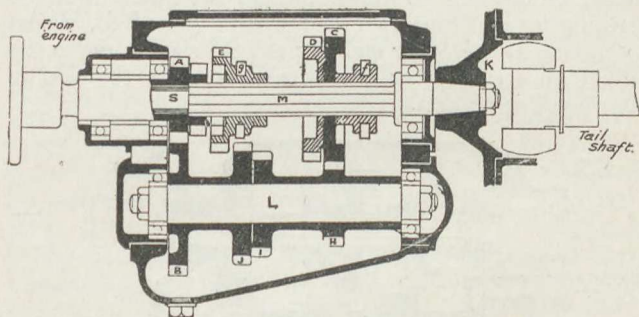


Diagram showing gears in first speed.

Therefore, we must declutch so that the engine can revolve without any portion of the gearbox revolving. We can now safely move the wheel (c) into engagement with the wheel (h), as both are stationary. A second or two must be allowed from the time when the declutching movement is made to permit the constant-mesh pinions to cease revolving, as there is a certain amount of momentum stored in the clutch member and these wheels which has to spend itself before they come to rest.

Having moved the gear lever into the first speed position, and thus getting these two gear wheels into mesh, we can now let the clutch in gently, the result

GETTING INTO SECOND GEAR

being that the engine begins to drive round the wheel (a), which in turn makes b revolve at half the speed, and then the wheel (h) drives the wheel (c), once again reducing the speed as compared with the engine. If, for the sake of argument, the small wheel (h) has only 10 teeth and the big wheel (c) has 50 teeth, obviously the wheel (c) will only revolve once for every five revolutions of the wheel (h); in other words, great leverage is provided.

In addition to this, however, we have assumed that the constant-mesh gears already make a gear reduction of 2 to 1, so that if the engine is going 1000 revs. the wheel (b) is only making 500, and h likewise goes at 500, the wheel (c) only goes at 100 r.p.m. This double reduction constitutes the great leverage previously referred to.

It is soon found, however, that the road conditions warrant a change into a higher ratio, and we have naturally to look for the second gear. This will be made up naturally by the next smallest wheel on the layshaft, and the next largest one on the primary shaft, remembering, of course, that the constant-mesh pinions never change. Therefore it is necessary to make the wheel (d) engage with the wheel (i).

Obviously, however, these two wheels could not engage at the same time as the low gear ones, so that before they are made to engage we have to declutch and move the wheel (c) out of engagement with the wheel (h). Therefore, we again take our change-speed lever and bring it from where we put it before into neutral position, which has the effect of pushing wheel (c) forward towards the engine so that it is out of engagement with wheel (h), by which time the wheel (d) is getting quite close to wheel (i). We must remember now that when we were travelling along a few moments ago on the first gear the layshaft (l) was revolving at 500 r.p.m., whilst the primary shaft (m) was only revolving at 100 r.p.m., that is to say, the layshaft was doing five times the speed of the primary shaft. ☺

If, now, the second-speed gear wheels (i and d) have

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respectively 25 and 35 teeth, it is evident that if those teeth are to be made to engage whilst both are revolving the periphery speed (not the actual number of r.p.m.) must be approximately the same. Going back for a moment to our first speed, the gears in mesh meant relative speeds to the shaft of 500 r.p.m. for the little one and of 100 r.p.m. for the big one, and if these speeds were maintained exactly the wheels could be taken out of mesh and brought into mesh again with consummate ease.

Now to get into the second gear. We have assumed 25 teeth for the wheel (i) and 35 teeth for the wheel (d), in other words, a proportion of 5 to 7. Now, it is necessary to remember that when we declutch to go

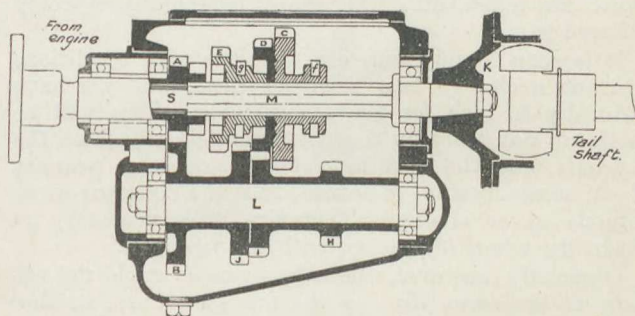


Diagram showing gears in second speed.

out of the first gear the car still goes along, and through the tailshaft forces the primary shaft (m), with its gear wheels, to continue revolving, although naturally they will slow down a little bit by the time the actual change is made.

If we assume that the car speed falls down to the equivalent of 90 r.p.m. for the primary shaft instead of 100, then for the wheel (d) quietly to mesh with the wheel (i) it is necessary for the layshaft to run at $\frac{7}{5} \times 90$ r.p.m., in other words 126 r.p.m., so as to bring the actual speed of the teeth equal. But when the engine was running we knew that the layshaft and therefore the wheel (i) were doing 500 r.p.m. To effect the

GETTING INTO THIRD GEAR

change we declutched, and naturally the engine is slowed down at the same time, and the slight pause in the neutral which is made allows the layshaft (l) to slow down from its 500 r.p.m. to about 126 r.p.m., so that this change up can be made more or less automatically and easily. In other words, the actual order of events is such that the natural procedure in practice fits in beautifully with the theoretical requirements.

Therefore we find ourselves in the second gear with the constant-mesh gears still in mesh and wheel (i) driving wheel (d) and the clutch is let in and the engine again accelerated up to 1000 r.p.m. The result is, therefore, that, whilst a is still doing its 1000 r.p.m., b is doing 500 r.p.m., and i the same number of r.p.m. as b, but i only having five-sevenths the number of teeth of the pinion d, it (d) only does five-sevenths of 500 r.p.m., or about 355 r.p.m. Therefore we find the tailshaft is being driven faster than it was before, and consequently the leverage from the engine to the tailshaft reduced, but the speed of the car increased.

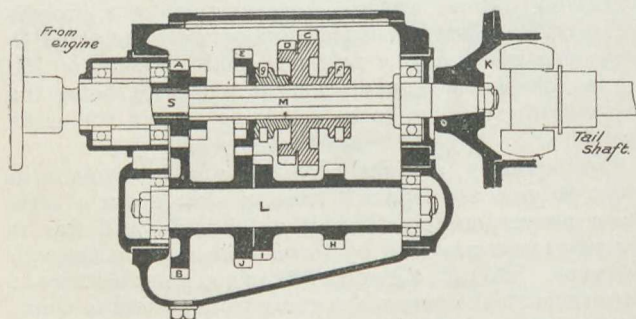


Diagram showing gears in third speed.

We now want to get into the third speed. From our previous arguments we look for the next largest gear wheel on the layshaft, which is j, and the next smallest one on the primary shaft (e). It is therefore necessary first of all to move d out of engagement and to bring e into engagement. Consequently it is necessary to operate first the shifting lever (f) and then the other

HOW TO DRIVE A MOTORCAR

shifting lever (g). In operating the first and second gears, however, we have already been moving the lever (f), so that coming back from second to neutral we disengage d from i and leave the wheels (c and h) likewise out of engagement.

We now have to pick up wheel (e) and bring it into engagement with wheel (j), and to do so it is necessary to pick up the striking bar (g), which, of course, means coming through the gate. We do so. Now we will assume that wheels (j and e) have 30 teeth and 30 teeth respectively. Therefore the two wheels want to be revolving this time at just the same number of r.p.m. in order to make a perfect change.

The procedure is very similar, with this difference. When we were in second we found the primary shaft, and therefore the wheel (e), revolving at 355 r.p.m., whilst the layshaft (l) was doing 500 r.p.m. But it will be remembered that when we declutched, the car, through the medium of the tailshaft, still continues to drive the primary shaft and with it, of course the wheel (e). If we assume this slowing down process which takes place when the clutch is disconnected to bring the speed of the primary shaft down to 150 r.p.m., then it is requisite for the wheel (j), being the same diameter as e, to be revolving at just the same speed.

Consequently, a slightly longer pause is requisite in order to give the layshaft time to slow down a little more proportionately than it did before, and this is happily again provided by the action of going through the gate. Do not, therefore, be in too great a hurry to pass through the gate when going from second to third. On letting the clutch in again to pick up the drive on the third speed, we find wheel (a) once more doing 1000 r.p.m., wheel (b) doing 500 r.p.m., and (j), being fixed to the same shaft, likewise doing the same number, j and e being respectively 30 and 30 teeth, we get the same result of 500 r.p.m. for the wheel (e). ♡

We now want to go into top gear, which is commonly known as the direct drive. Just at the back of the wheel (a) are seen what are termed dog clutches, and

TOP GEAR

there are slots on the inside of the wheel (e) to correspond to these, so that if e is pushed forward to engage those dogs, e and a are locked together and the primary shaft then travels the same speed as the engine.

We have, however, to remember here that a, just before the moment of declutching, was doing 1000 r.p.m., whilst e was only doing 500. Now when we declutch the speed of e will drop to, say, 450, and therefore, before the slots in it can be engaged with the projections on the wheel (a) the speeds of the two wheels must be approximately equal; in other words, the speed of the engine must drop down to about 450 before the engagement can be made with silence and without jar. Therefore, an appreciable little pause after coming out of third is requisite before engaging the top gear.

We have now been right through the whole theory of

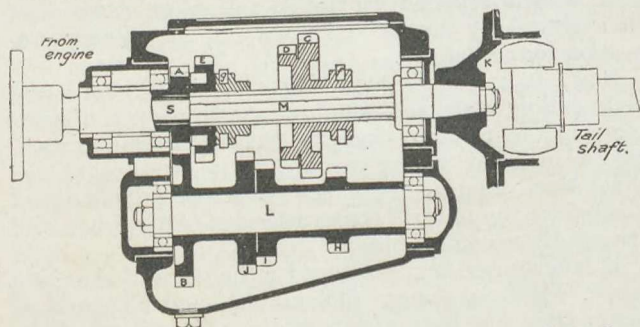


Diagram showing direct drive on top gear: when the inside teeth of E are moved into engagement with the smaller teeth on gearwheel A, the direct drive is obtained.

the why and the wherefore of quiet gear changes in an up direction, and, epitomizing the theory, in practice we get the following effects:—(1) To come through neutral into first, having declutched, wait a moment for the constant-mesh pinions to come to rest so that the low gear wheels may be engaged. When one is in too great a hurry to get into low gear and a little noise results, it is because the layshaft has not stopped revolving and one tries to bring into engagement with the

HOW TO DRIVE A MOTORCAR

revolving pinion on the layshaft the stationary first-speed wheel on the primary shaft, which is in direct engagement with the tailshaft of the stationary car.

To get into second a slight pause is requisite to allow the layshaft to slow down, which is usually provided sufficiently by the practical movement of changing the gear and the passage through the neutral position.

To get into the third speed again a little pause is requisite—provided kindly by the natural order of affairs—in this case by having to pass through the gate.

To come into the top speed, still another pause is requisite, which should be made in this case by allowing the change-speed lever to rest for a second, or it may be two seconds, in the neutral before putting it into the top gear notch. The amount of time for resting between the changes depends largely on the type and efficiency of the clutch stop fitted. The ratios of the gear wheels selected are taken rather on account of their simplicity than as exemplary of an ordinary proportion for actual use.

Now, this has all been fairly straightforward and plain-sailing work, as beyond the mere question of waiting a moment before engaging the first gear and waiting a moment before engaging the top gear, the theoretical requirements are automatically accomplished by the natural construction of the gearbox and the conditions which obtain.

It is now necessary to consider the work of changing down, which is a more difficult art, and although so much time has been spent on the explanation of the comparatively simple changes, nevertheless the knowledge gained will help us greatly in coming to a complete understanding of the more difficult operation of effecting a perfect change from a higher to a lower gear.

CHAPTER XI

Gear-changing Downwards and Trick Changes

IN viewing the aspect of the case of gear-changing when going to a higher ratio, we have seen that it is the easier part of the work, the chief desideratum being a pause before making the change, which in most cases is provided automatically by the nature of the movement to be made, so that very much skill is not needed in effecting these changes in a reasonably good manner.

A four-speed gearbox has been dealt with, as it is easier to argue from the four to the three than vice versa. The only difference worth recording is that with a four-speed gearbox the pauses to be made are less than with a three-speed gearbox, as the difference between the ratios is naturally smaller. There is another small point, which may be mentioned to complete the substance of the main variations, and that is the necessity of taking into consideration the diameter and weight of the revolving portions of the clutch mechanism. If they are heavy, then a longer pause will be necessary. If they are light the momentum stored in them is not so great, and they will come to rest more quickly, and consequently a shorter pause is requisite.

Finally, there is the question of the clutch stop which has to be considered. It is provided to minimize the pause which is requisite, and there, of course, the same line of argument carries weight. If the clutch stop is efficient, the pause will be small; if not, slightly longer. In some few cars, within the realm of the writer's practical experience, the clutch stop is so efficiently

HOW TO DRIVE A MOTORCAR

arranged that a deliberate pause is quite unnecessary and the movement can be made almost as quickly as one cares to make it. This question of pausing must not, of course, be overdone, as, if it is, it is often a more difficult matter than it is when going too quickly. Occasionally one does do this, and finds difficulty in making the change up, and under these circumstances the only thing to do is to leave the change speed in the neutral for a moment and slightly accelerate the engine and have another go.

As to the precise moment in which to make the change gear upwards, it is rather difficult to lay down a definite law. The writer makes a practice of changing up on what may be termed a "rising note." That is to say, observe if the "hum" is on a rising scale, and the change should be made shortly before this becomes a fixed tone. If the car is kept on the low gear until such time as the fixed tone is brought into being, the gear change will always prove a difficult one, and one that necessitates a fairly considerable pause. Briefly, this means that on the level the low gears are not left in engagement for very long, and, excepting on a very steep hill, it generally means changing up again before the actual summit is reached.

In conclusion, always remember that, under any circumstances, if the time of changing gear is not successful and a grinding noise is the result, do not force the gear in, but try again gently. If the cause is through too long a pause it is better to go back into the gear which one is endeavouring to get away from, and make an attempt to change into the next one over again. Never force the gear lever.

Trick Changing

As a general rule it is safe to say that the clutch should always be partially or wholly disengaged for gear-changing. As a matter of fact, however, gear-changing can be effected without disengaging the clutch, although the writer would certainly be the last to advocate a general adoption of such a manoeuvre. For the sake of example, however, one can, whilst the

THE SLIPPING CLUTCH CHANGE

car is accelerating well, suddenly close the throttle, which causes a very momentary over-running of the engine by the car, and this considerably reduces the pressure between the teeth of the wheels in the gearbox which are transmitting the drive, and so enables the lever to move them out of engagement without undue force. The movement, if properly executed, will on some cars really make a thoroughly good change.

However, this sort of gear-changing should not be attempted by the novice or even an ordinarily good driver, and experts would be better advised if they left it alone as it must inevitably put more strain on the change-speed mechanism than when it is moved with the clutch disengaged.

Changing Down

It is in the changing down that the majority of drivers find their greatest difficulty. We will deal again with a four-speed gearbox, as the advice in connection therewith may, when taken with minor modifications, be held to refer to a three-speed gearbox also. The state of affairs is now entirely opposite to what it is when changing up, and, instead of making a pause, it is necessary, in order to make a good change, to accelerate the layshaft. Now, there are several ways of doing this, but the whole of the writer's experience has tended to confirm his original belief that the double declutch method is better, and more universally reliable than any other, consequently the advice will be mainly restricted to this movement. Therefore, in the vernacular, we will "tick off" the method of layshaft acceleration, which will not be recommended for general use, quite briefly.

The Slipping Clutch Change

Instead of wholly disengaging the top gear to go into the third, the clutch is slipped, and the gear lever can then bring the gears out of engagement against this slipping drive. When the two gear wheels are quite disengaged the layshaft is automatically speeded up by the engine running faster, and the next gear can be engaged. In many cases this works quite well, but in a good many more it does not, and it must always

HOW TO DRIVE A MOTORCAR

entail a certain amount of wear on the clutch which cannot benefit it, and also a certain amount of strain on the gear change mechanism, which is likewise sure to be the reverse of beneficial.

The throttle is, of course, left pretty well open, but the movement, even in the hands of an expert, is not always so successful as expected. Some people argue that this is the quickest way of changing in a scientific manner, but the writer, while giving due deference to the other opinions, does not altogether agree. Admittedly, the movement is simpler than that which is going to be primarily advocated, but it is necessary to make the declutching movement with a certain amount of deliberation and care, and also to make the depression movement slowly: thus time is taken up. So much, then, for the slipping method of changing down.

How to Double Declutch

It must be admitted, before starting to describe this, that it will sound a little complicated on paper, but when once mastered the action is almost instantaneous, and the writer, without wishing to appear in any way to vaunt his prowess, has accustomed himself so to do it that the several movements are accomplished so quickly that occupants of the car are frequently difficult to convince that the series of movements have actually been accomplished. As stated, this is not meant in a boastful manner, but more to encourage the novice to study the movement and practice it, and not to be frightened by it.

Assuming, then, that we are running along at a good speed on top gear and encounter a hill. It is obvious, even at the bottom, that, before we can surmount it, it will be necessary to change to at least the 'third gear. Well, instead of waiting until the last ounce of the engine's power has been expended on the top gear, and then making the change when it is comparatively easy, we are going to show how it can be made at any car speed and any engine speed with perfect precision and silence.

PRACTICE IN DOUBLE DECLUTCHING

The movements may be enumerated thuswise:—

- (1) Declutch and allow the accelerator pedal to come up to the ordinary slow running position.
- (2) Gear lever to neutral.
- (3) Let the clutch in and accelerate the engine by depressing the pedal for, say, a full second.
- (4) Clutch out, and gear lever into the third speed.
- (5) Let the clutch in again and accelerate in the ordinary manner.

One must admit that, written out in full, it is in appearance rather complicated. The whole series of movements, however, can, when one is really au fait with them, be accomplished well under two seconds, which, if one is to make a scientific and silent change at any required engine or car speed, is not an excessive time in which the car is to lose momentum. The neutral position has to be regarded as if it were another gear between the top and the third, though in practice, of course, it is nothing more than a mechanical movement utilized to serve a scientific purpose.

Let us now come to our diagrams again and find out the why and wherefore of the movement in theory. In top gear we have the wheel (e) in engagement with the dogs on the wheel (a), the only connection with the layshaft (l) being through the medium of the constantly meshing pinions (a and b). We remember, however, that the wheel (a), if revolving at 1000 r.p.m., means a speed to the wheel (b) and the layshaft of only 500 r.p.m. Now, to come from this top gear into the third, it is necessary to engage the two wheels (j and e). We remember, however, that j has 30 teeth and e 30 teeth, so that, in order for a change to be effected silently, the speed of the layshaft (l) must be in a proportion of 30 to 30, or, in other words, must be just the same speed as the primary shaft, which is, of course, 1000 r.p.m. Assume, then, that we are going along with the wheel (a) (and therefore on top gear on the wheel e) doing 1000 r.p.m., and it is desired to change into the third gear. Then, if we assume that the loss in momentum is such as to bring the speed of the wheel (e), which, of course, is connected all the

HOW TO DRIVE A MOTORCAR

time to the tailshaft, down to 850 r.p.m., then in order for j to mesh with it quietly it must be going at just this speed, in other words about 850 r.p.m. We remember, however, that when the engine is doing 1000 r.p.m. the layshaft is only doing 500 r.p.m. We see that for a good change to be made, it is absolutely necessary that the layshaft should do about 850 r.p.m., in other words to go faster. Herein lies

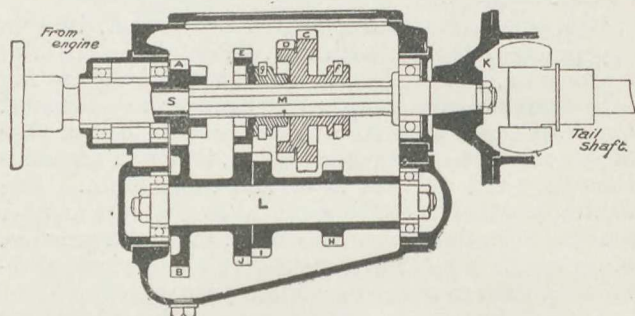


Diagram showing gears in third speed.

the whole secret of the movement, and whilst the gear-box is in the neutral position the clutch is let in and the engine accelerated, so that the layshaft is speeded up to the requisite amount to allow the change to be made scientifically and silently.

In any gear change made within reasonable limits this method will always be found effective. In fact, one may almost say that it is so without any qualification, as to change into the third speed when the engine was doing its utmost on the level would be quite an unnecessary procedure, and also a foolish one. Even under these adverse circumstances it can be done, unless the car is actually on the down grade, because the engine will always run faster when disengaged than when driving the car.

As we have so fully gone into the necessity of having this balance of speed between the wheels mounted respectively on the primary and secondary shafts when

PRACTICE IN DOUBLE DECLUTCHING

we were studying changing up, it is unnecessary to go through the other gear changes downwards.

Exactly the same line of procedure is to be followed. In each case the layshaft wants speeding up in order to enable a silent change to be effected. On a four-speed gearbox the amount of speeding up requisite is naturally less than on a three-speed gearbox, and in some three-speed gearboxes, where the drop from top to second is a very big one, quite a large amount of speeding up is requisite to make a silent change at speed.

How to Learn It

This art of double declutching is the one question above all others which the writer would ask those of his readers who are not already quite masters of it carefully to study and successfully to learn. Superficially, it seems a little difficult; but when one masters it it is the acme of simplicity, and one's feet and hand operate in perfect sympathy and without a shadow of thought from start to finish of the manoeuvre. First of all try it quite slowly, sitting in the seat of the car without the engine running at all. Merely practise the proper series of events and practise them until they can be accomplished in the proper order without anything in the nature of a stop from one movement to the other. When this has been learnt, essay first of all to make the attempt on an easy gradient, whereon a change from the top gear is not even necessary. Do not do it at great speed. Try for sake of example first of all at 15 miles per hour. When fairly practised in the movement under these conditions, then try it on ordinary hills where a change is requisite, and when finally proficient it will be found that a change from top gear to third can be made just as easily and accurately at 30 miles per hour on a steep hill as at 15 miles per hour on a gentle grade—and always quietly to boot.

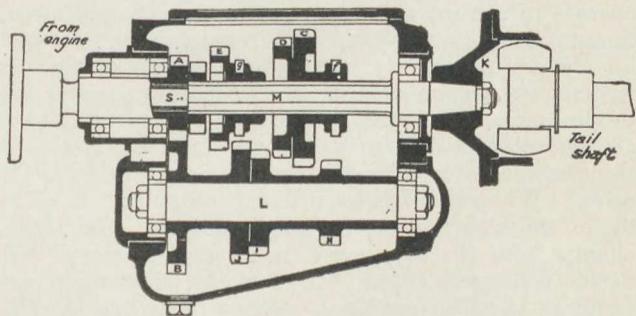
Coasting

Coasting is not really a portion of the work of gear-changing, but the question of how to coast may suitably be considered here, relatively to a long down grade

HOW TO DRIVE A MOTORCAR

under average touring conditions where one does not wish to "blind all out," with the engine accelerated to its utmost. People frequently declutch and let the engine thereby run at its ordinary slow-running speed. However, the mere fact of holding the clutch out for a long period on end is always fatiguing in a greater or lesser degree, whilst it is likewise putting unnecessary strain on the clutch withdrawal mechanism and its usually unfortunate ball bearings (how many people think regularly to lubricate these bearings?).

Both these defects can be overcome when coasting by declutching in the first case, and putting the change-speed lever into the neutral. So far this is the acme of simplicity, and on a nice road of fancy we will continue the coasting until we arrive safe and sound at the bottom of the hill, when the road conditions are such that it is necessary to call upon the engine to take up



Neutral position for coasting long inclines.

the drive again. We are faced with a little problem. How are we going to get a gear in again and which one?

Coming back to theory, if we study the illustration in the neutral position we see that the primary shaft (m) is being driven by the tailshaft, and no gears are in engagement, except the constantly-meshing pinions. Now, the tailshaft may be revolving at, say, 800 r.p.m., which we will assume to be the equivalent of about 20

RE-ENGAGING GEARS AFTER COASTING

miles per hour. As the engine is only "ticking round," the gear wheel (a) is probably only turning at about 200 r.p.m. Obviously, then, if we endeavour to engage the wheel (e) with the dogs on the wheel (a) under these circumstances we are in for trouble. One obvious solution to the difficulty is to wait until the wheel (e) has slowed down to 200 revolutions, which of course would be silly, as it would mean waiting until the car is only crawling. Why not accelerate the wheel (a) up to 800 r.p.m., which can be done quite easily by depressing the accelerator pedal?

The latter course is the one to be adopted, and practice alone can train the driver to know by the "feel" through his body, or the sound of his engine, the approximate speed at which it is running, but it is really not so difficult in practice as it would seem in theory.

It is generally easier to over accelerate a little and then wait the necessary moment or two whilst listening to the sounds which tell of the reducing speed of the engine, and then with the clutch disengaged gently move the change-speed lever into the top-speed gear notch. To learn this, again try at slow speeds on the level. For instance, amble along gently at, say, about 15 miles per hour on the top gear. Declutch and put the change-speed lever into the neutral. Coast for about 20 yds., accelerate a little until it is thought that the speed of the engine is above what it would be if it were driving the car on the top gear, declutch, wait a moment, and gently re-engage the top gear.

Practice alone can make perfect in this manœuvre, but when one knows the car well perfectly quiet changes can be made from neutral into the top gear, or into the third if under extreme circumstances it should be requisite (naturally by greater acceleration), at pretty well any speed desired. The idea is certainly one to be noted, as it is economical both from the petrol consumption point of view and from that of wear and tear of the clutch mechanism, and the ability to do these little manœuvres on a car certainly adds to the pleasure of driving it.

HOW TO DRIVE A MOTORCAR

A Little Secret

Some little time ago the writer, in studying the various phases of gear-changing, hit upon an idea which he had never heard of before, and put it, not without a certain amount of misgiving, to the test of practical experience. With very little practice it really works admirably. Nevertheless, it may be as well, perhaps, not specifically to advocate it as a general rule, but it may be tried by those who care to make the experiment, and if they find they can do it successfully it is certainly easier than the method of engaging the top gear from neutral previously described.

It is termed a little secret, as, having once proved it satisfactory in practice, the writer questioned a number of well-known drivers to find out if any of them had ever made use of the idea, and none of them had. However, whether the idea is or is not original does not affect its utility. Briefly, then, it is the bold step when wanting to engage the top gear again after coasting, of doing so without any consideration whatsoever for the clutch. The operation, of course, is precisely the same. That is to say, the engine must be accelerated up to what one considers will be the speed of the primary shaft and then at the precise moment, when the revolutions of the engine are considered to be substantially equal to the speed of the primary shaft, the gear lever is gently moved into the top speed notch without using the clutch in any shape or form. Obviously the movement must be carried out in an accurate manner, but when the manœuvre is executed successfully the top gear can be engaged without troubling in any way about the clutch, and this without the slightest noise and without the slightest jar. Having done so, of course, the accelerator is brought into use again and the car driven on as usual.

Gear-changing for Braking Purposes

There is one other aspect of gear-changing which may be alluded to, namely, when it is desired to use the engine as a brake in descending a very steep hill. If one is on an unknown road and travelling at a fairly

GEAR-CHANGING FOR BRAKING

good speed, and suddenly encounters what looks as if it is going to be a very steep and treacherous hill, it is quite a good thing to use the engine as a braking medium. The worse the hill, the lower the gear which should be engaged. If it is thought that the third speed will be sufficient check to the momentum of the car, then the engine should be quickly accelerated with the gear lever in the neutral and the third speed engaged. If the hill is a very bad one and it is deemed necessary to engage the second then greater acceleration is necessary in the neutral position in order to do so. Similarly with the low gear, though none but an expert driver should try to engage the low gear from the top without slowing down considerably. On the vast majority of cars the low gear will act as a sufficient brake for practically any hill encountered in ordinary touring work. The throttle is, of course, left closed if one wishes to save petrol, and the spark may be switched off if desired so as to cool the engine.

On the other hand, if the rings are not a very good fit, then driving the engine by the momentum of the car down a hill with the throttle closed may have the effect of drawing oil past the rings on to the top of the piston owing to the partial vacuum, if the switch is turned off for the descent. Care must be taken when switching on again so as not to jar the driving mechanism; in fact, it is preferable just to declutch as one makes the electrical contact. There are pros and cons to the question of using the engine as a brake, but from an all-round standpoint the writer would advocate its adoption in any case where there is a bad hill to be encountered and where there is the faintest shadow of doubt as to the brakes; otherwise the practice would only receive sanction.

CHAPTER XII

Skidding: Its Dangers and Safety

THE majority of motorists, in the course of their experience, happen upon the day in which they have a big surprise owing to the occurrence of a bad skid or sideslip. Many drivers habitually take such liberties with their well-mannered car that it is frequently on the point of breaking away from its good behaviour into misbehaviour, being no longer able to withstand the treatment to which it is subjected. On such an occasion, if the driver experiences a bad skid, he is generally lucky if he gets out of it without harm to himself or his car.

Unfortunately, nomenclature in motoring matters is of an uncertain type, and "skidding" is generally looked upon as the correct phraseology for either a skid or a sideslip. As a matter of fact, they are quite different, but for the purpose of this article, beyond recording the inaccuracy, we will go but little further, treating the matter in the broadly-accepted meaning of the word.

Before going into the subject further, however, it may be well just to point out that skidding really means the rotation of one or both of the rear wheels in a forward or backward direction, minus the corresponding movement in the car's progress. Slithering to the side of the road through any cause whatever is a sideslip, and should not be confused with a skid. However, it may be accepted as a fact that a skid in itself is a *prima facie* cause of sideslip, and it is with the latter phase of driving that we wish to deal.

Now, in a sideslip, which in future we will call "skidding," there is on occasion both a distinct element of danger and a distinct element of safety. In

FRONT-WHEEL SKIDS

the case of a bad skid in the hands of an inexperienced driver admittedly great danger lurks. The expert, however, often employs a skid to save the situation.

Now, to those without experience, a warning may be issued that no ordinary tyre can be effective in all circumstances against the possibility of bad skidding. In fact, it is both unreasonable and unmechanical even to think that it could. Given certain conditions which are frequently met with and often practised by inexperienced drivers, a car will and must skid—so long as the laws of mechanics remain what they are.

Two Types of Skids

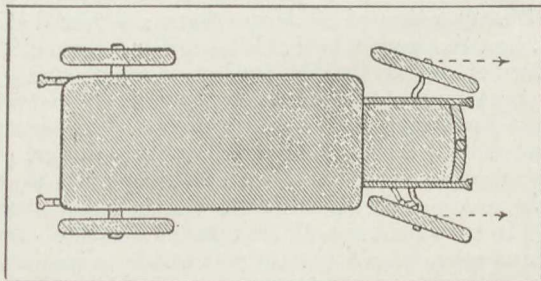
In this question of skidding there are two distinct types, i.e., the front-wheel skid and the rear-wheel skid. The former one is luckily far less common than the latter type, and also much more difficult to deal with. In most cases drastic methods are needed successfully to cope with a front-wheel skid, and any driver, even the most experienced in the world, may quite reasonably be involved in an accident due to a front-wheel skid. It is often very difficult to foresee the danger spot, and some pieces of road which look quite dangerous are often found to be perfectly safe, and others, which hardly even enter into consideration from the danger point of view, are found to be veritable hotbeds of front-wheel skids.

A front-wheel skid on a dry road at an ordinary driving speed, with any type of tyre, may almost be ruled out of the area of practical politics. It is, however, in the case of greasy roads where the great danger lies. Even with a non-skid tyre on one of the front wheels, the writer has experienced on more than one occasion a pronounced front-wheel skid, which is all the more disconcerting as one is naturally not anticipating such a thing. The writer's memory does not recall a case of such a skid with both front wheels fitted with non-skid tyres, but then few cars are so equipped, and consequently one does not have much opportunity of coming across such an occurrence. A front-wheel skid, even under such circumstances, is conceivable.

HOW TO DRIVE A MOTORCAR

The Front-wheel Skid

It may be that some readers are not fully aware of the insidiousness of a front-wheel skid, so that it may be well to make the point clear. Suppose, then, that one is following a bus, or other vehicle, at, say, 15 miles per hour on a wide road in town, and that for some reason or other the bus applies its brake so suddenly that one would have to swerve out in order to avoid running into it. Naturally one steers fairly quickly to the right, but if—to one's utter consternation—the car goes along in a perfectly straight line, taking no notice whatsoever of the steering gear, that



A front-wheel skid—car refuses to answer to the helm.

is a front-wheel skid. Such occurrences usually happen on a well-cambered road with a greasy surface, more especially if one has not got a non-skid tyre on one of the front wheels. In such an eventuality it is hard to lay down a definite rule; in fact, it is not over easy to give any advice. Obviously, if there is time to stop by a violent application of the brake (which one would not have indulged in otherwise), by all means stop. Failing this, endeavour to remember (if conscious of the fact that the amount which the steering wheel has been turned would be sufficient to clear the vehicle in front under normal conditions) not to increase the lock, as this will in some cases make matters worse.

As already stated, it is not a subject upon which it is easy to give advice. The writer, however, has frequently experimented on greasy roads with imaginary

FRONT-WHEEL SKIDS

obstacles and put certain theories to practical test, and has often been rewarded with success. The following three propositions are given in the order in which the writer would try them if faced in practice with a front-wheel skid under the circumstances which have been alluded to.

In the first place try a fairly smart "dab" with the brake, which has the effect of momentarily increasing the adhesion of the front wheels, by piling up the weight of the car on them, which may give them sufficient adhesion to commence the desired direction. A more complex method of treatment is similar in its effect to the suggestion just offered and is on the following lines.

First of all, declutch; then race the engine and slam the clutch in for a second with a jerk, and then take it out again. The effect caused here is a lifting effort on the back of the car, thus increasing the weight on the front wheels, whilst additionally one has the slight extra advantage of the gyroscopic torque couple set up. This will probably cause the rear wheels of the car to skid a little to the left and so bring them more or less in a parallel line with the front wheels, and then on driving under power the direction may be picked up with less likelihood of the skid continuing.

The final resort is one which the writer was forced to employ quite recently, and luckily the manœuvre was attended with complete success. Lock the front wheels full over to the right, leave the clutch in and give the brake a fierce bang, but holding it down for a sufficient length of time to cause the car to turn completely round. Just when the back of the car is beginning to face where the front was when the manœuvre was started, let the brake off and also declutch and slow down gradually with the brake, when the control of the direction of the car has been regained.

It must be distinctly understood that these suggestions are not put forward as part and parcel of ordinary routine driving, but they should be carried at the back of the mind and held in readiness for any occasion

HOW TO DRIVE A MOTORCAR

where the driver is suddenly confronted with an almost impossible situation, when the car refuses to acknowledge control through the steering gear. Prevention is, therefore, better than cure, and one steel-studded non-skid tyre on the off front wheel, maintained in a reasonable state of efficiency so far as the studs are concerned, is enough to guard against the trouble in the large majority of circumstances.

When taking a right-angle turn on a greasy (greasy—not merely wet) road, always exercise a certain amount of care in case a front-wheel skid should develop when part of the turn is made, and, speaking in general terms, learn to have a regard for the steering gear when on greasy roads, more especially if both the front tyres are of the plain rubber type.

Another point which should be remembered is not to adopt that common phase of bad driving, overtaking a vehicle at a good speed in a direct line behind it, and only starting to steer out at the last moment. Start to get to the offside of the vehicle which it is desired to overtake in good time, and then, even if a front-wheel skid should occur, there is plenty of time to correct it.

Rear-wheel Skids

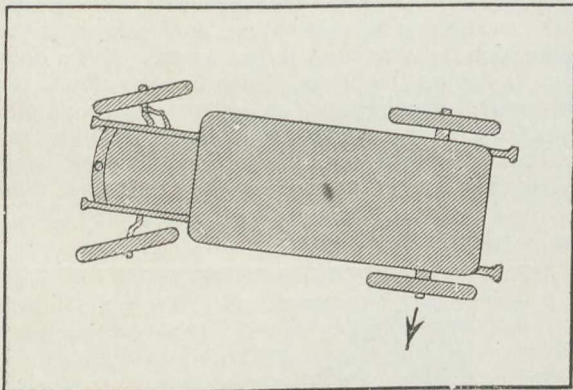
As already indicated, this type of skid is far more frequent, and luckily it is also far more easily corrected. So long as both rear wheels are driving equally (we are referring to skids caused by progression) all goes well. If, however, from any cause whatsoever, such as sudden acceleration or a difference in the road surface, one wheel suddenly starts to revolve at a speed considerably in excess of the rate of progression of the car, then certain circumstances are set up which render the vehicle susceptible to rear-wheel skidding.

On consideration, it is seen that, with the wheel spinning round faster than the car's progress, the adhesion between the wheel in question and the road surface is less than it is at normal times, and consequently the car is more susceptible to a lateral thrust, or, more likely to slide down a camber of the road.

Opinions rather differ as to the precise cause of this

REAR-WHEEL SKIDS

type of rear-wheel skid, many people holding that it is due to a lateral thrust at the back of the car caused through engine acceleration, others thinking that it is due to a slight touch of the brake or some variation in the steering, or, yet again, some combination of the three. The slightest suspicion of lateral thrust at the back of the car, no matter how generated, is sufficient, if one of the wheels is revolving faster than the relative progress of the car, to render the vehicle susceptible to rear-wheel skidding.



Rear-wheel skid.

For instance, the mere fact of letting in the clutch suddenly has some small effect upon the steering gear, and the after effects of this are especially noticeable if the road has a decided camber. If it should be the near side road wheel which is revolving at a greater speed than the relative progress of the car, or if the tyre should be under inflated, then the conditions are still further aggravated.

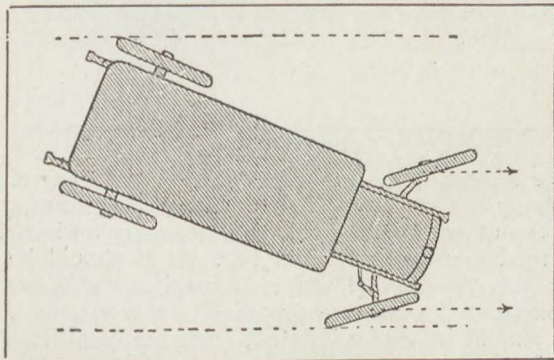
It must also be remembered, in this connection, that a considerable camber on the road may have the effect of altering the adjustment of the cables controlling the rear-wheel brakes, so that a slight brake application may be brought into being quite apart from the intention of the driver.

Still other causes which are helpful to rear-wheel

HOW TO DRIVE A MOTORCAR

skids are such things as the distribution of the weight of the people and load carried. For instance, if the greater portion of the weight is not in the central axis of the car; or, yet again, if both wheels are revolving too fast on a slippery surface, and the surface under one wheel is more slippery than under the other.

If from any of these various causes or from any other cause, when one is driving along and the car begins to skid at the back to the driver's left, then he *must* do exactly what he probably feels inclined *not* to do, that is to say, steer to the left: in other words, in exactly the same direction as he is skidding, and towards the spot from which he is anxious to get away. As he does so he must dab on the brake, which has the effect, in the first place, of piling up an extra proportion of the weight of the car on to the front wheels, and so increasing their adhesion, and then through their angular setting they convey a counterbalancing thrust, tending to thrust the rear of the car back again from the direction in which it was going.



Car proceeding crab fashion. Note that in this case the car occupies much greater space than it would normally.

Sometimes, on very greasy roads with much camber, one finds it practically impossible to maintain a straight line of progress for the car, and it is only possible to get along in a crab-wise manner. On such occasions one must steer a little bit to the left, and if even this is not

INTENTIONAL SKIDDING

sufficient to keep the car going in the direction in which it is intended to take, the brake must be "dabbed" frequently, though gently, even against the power of the engine. Quite gentle brake application is enough, but of course even this should not be used against the engine unless it is impossible to get along otherwise.

These notes may be said to cover rear-wheel skids caused simply by circumstances connected with the car's progression, and there remains for consideration the question of controlling a skid which one causes by applying the brake rather more suddenly than anticipated.

Other Types of Skids

The writer, many years ago, took out an old chassis on to a lonely country road and experimented assiduously, and, selecting a nice greasy part, spent a considerable time in studying skids of various types and learning how to control them. It must be remembered, in all seriousness, that, whereas the skidding of a car in the hands of a novice or an insufficiently-experienced driver is a source of danger to himself, his car, and other folk, the knowledge how to skid a car wilfully and how to control its skidding is, in the hands of an expert, very valuable knowledge; in fact, on some occasions, it is the one and only available means of safety.

Consequently, therefore, although in plain black and white the information to be imparted may look a trifle extravagant, the writer would nevertheless suggest that those who are not au fait with the subject should seek an opportunity of learning by practical experiment. It is perfectly easy to imagine an obstacle exists and to put on the brake on a greasy patch very suddenly (in the first case, of course, one would only travel at quite normal speeds, say, 12 or 15 miles per hour) and notice the effect. Now try the same manoeuvre over again, but at the same time that the brake is put on suddenly steer in the direction of the skid, and it will be noticed, if the manoeuvre is executed properly, that the resultant skid is largely minimized, if not entirely corrected.

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Sometimes when travelling at a good speed where one imagines everything to be clear, and it is suddenly found necessary to put on the brake very much quicker than it is ever anticipated (either on a greasy road or dry road), a good driver will perhaps have as many as half a dozen of these corrected skids, taking off and replacing the brake in exactly the right order in each one, carefully preventing the car from getting out of control beyond a swing of perhaps a yard or so.

It must be remembered in this connection that the highest braking efficiency of a car is never obtained by having locked wheels, and unless the driver is thoroughly experienced and collected in his control of the car in a case of emergency he is inclined to think that he has done everything possible by putting the brake on to its full extent. Such an assumption, however, is quite erroneous. A series of dabs, each one tending to cause a skid which is corrected by steering against it, then straight again for the fraction of a second, another dab of the brake and another skid and so on, is very much more efficient as the quickest means of reducing the speed of the car.

A thoroughly capable driver—on a car which he knows—will, in cases of emergency in traffic driving, frequently execute such a manoeuvre and skid his car within a few inches of the traffic at his side, and yet what looks like a lucky escape from a collision is neither more nor less than a perfectly-executed scientific movement.

There are also some occasions when racing the engine and letting the clutch in suddenly may be brought to the aid of the aforementioned movement actually to cause a skid, but that is getting rather beyond the limits of any except the most expert drivers, and consequently it will be as well perhaps not to pursue the subject further.

Once again, it is well to point out that the information given is not intended to be used as an ordinary driving proposition, but at the same time it is seriously suggested to the reader that a knowledge of the manner of controlling a skid of the rear wheels is an item of

SKIDDING FOR SAFETY

information with which he ought to be acquainted. Even with a careful driver, every now and then occasions crop up where a sudden brake application is necessitated through the unanticipated action of a third party, and then a skid of the rear wheels is a very likely sequence. It is, therefore, well to know how to control such a skid, and to take full advantage of the possibilities which it carries with it. A lack of knowledge may mean dashing one's wheel against the kerbstone and perhaps breaking it, or at any rate putting it out of truth, damaging the wheel against the side of some other vehicle, or even running into some person, and in the face of all, greater braking effect can be obtained by controlling this skidding, whilst probably avoiding the hypothetical damage mentioned.

The Art of Skidding for Safety

It is only after some little deliberation that it is deemed advisable to deal with this subject, as in the eyes of some readers it might appear in an exactly opposite sense to that in which it is intended to be taken. The last thing the writer wishes to do is to lead any driver to start taking right-angle corners or sharp bends by skidding round them, or, on the other hand, to turn round in the road ready to go back in the direction from which he has come by means of "waltzing" his car round. Such manoeuvres should never be carried out or attempted except in a case of emergency where no other conceivable means can secure safety.

Unfortunately, even yet, there are so many inexperienced drivers on the road that the most experienced and careful motorists are frequently thrust into positions of great danger through no fault whatsoever of their own.

The knowledge of how to produce and utilize a violent skid has on many occasions been the means of preventing the writer from being the partner in an accident, and it can honestly be stated that in only one case did he feel that the imminence to danger was his own fault in any shape or form. However, giving the circumstance the fullest consideration afterwards, the

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conclusion was come to that, on whomsoever lay the fault, an accident could in no conceivable way have been avoided except by the employment of a complete skid. For the sake of an example, we will pick out the case where the fault could be said to rest more or less equally with the writer and the other driver.

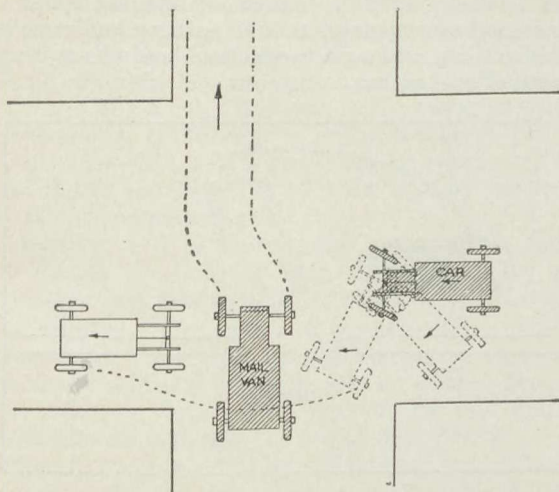
One night, then, returning very late from the office and in a hurry to get home, and anticipating no cross-traffic, a corner was being taken at a speed which was perhaps rather in excess of what one should do, even at an hour when practically no traffic was about. When well up to this corner, a huge mail van appeared, apparently acting under similar ideas, though as it was coming from a side street and crossing the writer's car, which was on the main road—well, the question of blame is not material to the situation.

The fact remains that it was a situation in which it would have been absolutely impossible to avoid a collision in any other way than that adopted. Neither car could have stopped sufficiently to have allowed the other to pass, and the only possible solution was to turn the car completely round in the hope that the time so taken up before continuing in the same direction, *though backwards*, would be sufficient to enable the mail van to cross out of the way. Luckily the driver of the van did the only thing which he could do, and swerved as far as was possible to the left. The writer put the front wheels sharp to full lock, jammed on the foot brake with the clutch in, the car becoming stationary for a moment whilst the back swung round and faced in the opposite direction, and then, of course, continued on its way, being steered to the near side of the road away from the van. By a combination of luck and skill no damage whatsoever occurred to either car, and all that remained was to turn round again and to continue, giving a little more regard, however, for cross traffic—however improbable—at the other cross-roads.

The manœuvre executed may be gathered from the illustration given. In some cross-road encounters of this nature it is possible to swerve behind the other

SKIDDING ROUND CORNERS

vehicle, or sometimes to swerve out in front of it, and take the other side of the road, but it is a matter of the merest fraction of a second which is allowable to make up one's mind whether such a course is possible or impossible. In some cases, it is absolutely impossible, and neither by braking and steering to the rear of the other vehicle, nor by accelerating in front of it, can a



Example of skidding car round. Car and mail van meet at a corner. There being neither time to stop nor room to get round, car is skidded round eventually drawing up facing in opposite direction.

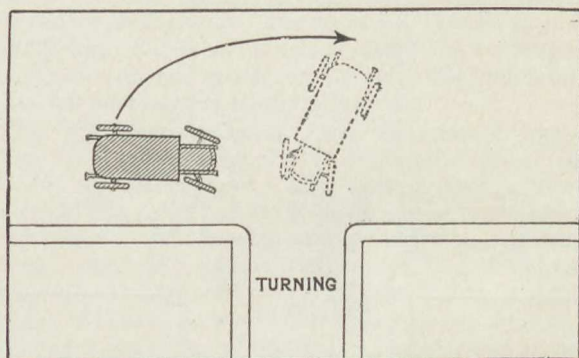
collision be avoided. In such cases, the one and only hope for safety lies in taking advantage of the fraction of time gained by making the car turn round on its own axis as it were, that moment of time allowing the other vehicle to proceed out of the danger zone.

Corner Work

Another part of the art of skidding which may be considered is one which with good driving should not really need mention, and that is the situation where one is confronted with a right-hand turn or a sharp bend

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when travelling at a speed too great to take it by ordinary steering methods without a distinct risk of either overturning the car or slithering into the bank. A large number of accidents, however, have been caused through this bad driving, generally at night where the road suddenly appears to end abruptly, and a sharp corner or quick bend is encountered. As before stated, such a situation should never be encountered unwittingly, as it is nothing but rank bad driving so to do, and such turns should only be met with intentionally in racing.



Skidding round a corner.

However, if such a situation does confront one, and it is seen that to take the corner merely by steering round it is going to overturn the car or slither it into the near side of the road, then, instead of taking the corner by steering round it, one can do it with perfect success by skidding it in the following manner:

In the first place, there will, of course, even in the most flagrant case of bad driving, be a second or two to spare between the time when the driver is suddenly aware of the fact that he has to negotiate a corner at greater speed than he is able, and the time when he has actually to do so. This time should be employed in brake application and with deceleration of the engine,

SKIDDING TO AVOID AN ACCIDENT

but not declutching. The brake must not be applied to such an extent as to lose control over the precise direction of the car. Head the car directly at the near-side corner, and just as the front wheels arrive there set the steering wheels to steer round the corner, firmly dab on the brake (which will cause the back of the car to swing round), and the instant the back wheels are approximately parallel with the front wheels accelerate to the utmost. Sometimes it is necessary to make a dive for the offside of the road into which one has thus turned, waiting until the last moment to correct this direction into a straight line up the road. The latter part of the manoeuvre is, of course, to counterbalance the after effects of the skid, and a corner can be taken at greater speed if this movement is adopted than by the former part of the manoeuvre only.

Similarly, if it is a bend, the procedure is akin to that already mentioned. It is impossible to lay down a hard-and-fast rule for a sharp bend, as the procedure to be adopted varies according to the bend in question. However, the main idea remains the same, namely, to rely on the skid and to check that by sudden acceleration, and then by steering against the skid and the acceleration to maintain the stability of the car.

There is another situation which has likewise caused a number of accidents, that is, where the driver is foolishly driving at too high a speed for the distance of clear road actually under his observation, and is then encountered with something which directly blocks up the road, as, for instance, a tree blown down or a broken-down traction engine, or some other obstruction. In such cases, if it is impossible to stop by brake application in the ordinary way, safety may be ensured by turning the car round completely in the road and advancing backwards as before described, and then turning it round again from backwards to forwards, and continuing in the ordinary way. The side slithering of the tyres in these two manoeuvres has a very great braking effect. Here, again, nothing but rank bad driving or inordinate stupidity by some third party should bring into being the necessity for such an action. To some

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readers it may even sound a little fantastic, but some very bad accidents could have been avoided if the drivers had known how to do it.

It is certainly preferable for all to go on the assumption that prevention is better than cure; in other words, always drive carefully and, so far as it is humanly possible, avoid the necessity for such drastic action.

However, on occasion, drastic action is the only means of safety, and if all drivers were really au fait with the art of skidding and skidding control there would undoubtedly be a big reduction of minor accidents and a diminution of serious ones. The proof of this is to be found in the fact that many really expert drivers take far more risk in driving than the average driver, and yet one never, or very, very rarely, hears of them being involved in an accident. The whole solution to this state of affairs lies in the fact that they do the right thing, and do it in the right fifth or tenth of a second, instead of only making the superficially obvious attempt to avoid an accident.

With regard to the question of skids in general, many people consider that the higher the speed of the car the quicker the tendency to sideslip. They may be correct in this opinion, but the writer does not personally agree with it to the full. For a sudden brake application he is inclined to think that the rear wheels slip more readily at moderately slow speeds than at high speeds, though conversely there is no doubt that the front wheels will skid more easily at high speeds than at slow speeds. In conclusion, it must once again be pointed out most distinctly that

these manœuvres are mentioned solely to provide the knowledge of how to act in such cases, and are not in the slightest shape or form intended to constitute a part of the daily curriculum of the average driver.

No. The knowledge is useful, and an old car and a quiet greasy road, with a little practical experimenting, will teach a great deal with regard to skidding. The information is well worth having.

CHAPTER XIII

Lady Drivers

IN starting this chapter the author has a full knowledge of the fact that he is on treacherous ground. So long as human nature is what it is, it will be impossible in ninety-nine cases out of a hundred to get ladies to view *in lumine sicco* any subject about which there may be a difference of opinion from the mere sex point of view. In these "suffragette" days one hesitates even to offer any advice to ladies, but as the whole of the writer's experience with lady drivers has tended to lead to one set conclusion, it is deemed advisable briefly to touch on the subject. It is in no-wise intended to decry the practice of ladies driving their own cars; the writer is honoured with the friendship and acquaintance of many who really drive very well. In fact, on the credit side of the balance, as regards the different sexes for motorcar driving purposes, it may be mentioned that the most apt pupil the writer has ever instructed was a lady.

Nevertheless, there are certain situations in which one finds it impossible to concede that the average lady driver is the equal of the average male. The whole of the conditions referred to may be summed up in the one word "emergencies." Many ladies are really excellent drivers, thoroughly capable in every way, accurate in their gear-changing, considerate for their cars, and with a due appreciation of the implied trust which they bear when driving. The writer has been driven round Brooklands track by lady drivers at speeds several hundreds per cent. in excess of the legal limit, and felt perfectly content and quite safe, so far as the actual driving was concerned.

It is, however, on the odd occasion of the emergency that the lady driver is not so likely to act with precision and, above all, absolutely instantaneously.

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Really this charge, whether admitted or denied, should not be looked upon as anything derogatory to the fair sex; it is purely a matter of Nature's ordinances, and with these we have no quibble. It may be granted that many ladies are as courageous and as capable as men, and, even further, the writer is inclined to think that when once a lady has thoroughly mastered a car she is a more considerate driver, from the car's point of view, than a man.

Still further on the credit side of the fair sex, the writer will readily confess that some lady drivers whom he has met were considerably above the average male driver, not only in regard to the question of considering other road users, but also in their ability to drive. However, in cases when an emergency does arise, whether the emergency in question be a small one or a serious one, the whole of the writer's experience in the past 15 years, and also information gleaned from other reliable sources, tend to prove that *action has not been so instantaneous* as it would have been with an equally capable male driver.

Naturally, constitution has a good deal to do with it, and in the case of the fair sex a driver is either born for the work or not, in a more marked degree than in the case of a man.

It would be futile to endeavour to analyse the why and wherefore of the statement, or even to produce arguments to substantiate it, and thus endeavour to prove it a fact. There is a something in the construction of human beings which varies with the sex, allowing the mere male to act more quickly in any surprise engendered by an emergency than one of the gentler sex. It may be that the knowledge possessed by the lady under consideration in some supposed emergency is greater than that possessed by a similarly imagined man; it may also be that she will be braver and face the situation more boldly; it is even conceivable that she may *see* what ought to be done more quickly than one of the other sex, but even granting all this, the writer still maintains that she is not so likely *actually to do it* in so short a space of time as a man.

EXPERT DRIVERS

Consequently the whole purport of these remarks is bound up in the one piece of advice to be more careful at any point, such as cross roads, corners, places where there are children at the side of the road, and so on, and thus guard against danger so far as may be humanly possible.

Any lady drivers, or prospective lady drivers, who may chance to read this chapter are earnestly begged by the author seriously to bear the points raised in mind. It is no serious charge, but, on the contrary, it is purely drawing a line of differentiation between the sexes from a physiological point of view, which is the work of Nature.

Driving Capabilities

If there is any one thing in which it is impossible to make a person change his or her opinion, the writer would say it is in regard to the degree of expertness of the person in question relative to his or her ability properly to drive a motorcar. In all probability 99 motorists out of 100 of both sexes consider themselves expert drivers. However, in the writer's opinion, there is no greater self-deceit in the world than this belief. One may be a good all-round driver, capable at the wheel, neat and precise with gear changing, and even able accurately to control such road conditions as skids, etc. Nevertheless, the real expert driver is he or she who, in the emergency which must come every now and then (assuming, of course, that reasonably long distances are covered), is able to, and in practice does, act in precisely the right manner at precisely the right fraction of a second. It is the person thus gifted—one has to be born to it, as this degree of perfection can never be obtained by practice—who is really the expert driver. In the writer's opinion (the word opinion is used advisedly, as it is impossible to be didactic on the subject), the total "hes" and "shes" falling under this classification are a very, very long way from running into four figures.

It is sincerely to be hoped, then, that those lady drivers who read this chapter will take to heart the advice given. Epitomized, it is only a plea to them

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to exercise particular care in places where there is any likelihood of an emergency. It is nothing to do really with a comparison between the sexes as to their respective credentials. Numerous cases can be recited from historic occurrences, where women have proved themselves to be more courageous than men; where they have proved themselves more capable of surmounting a difficulty; where they have proved themselves possessed of extraordinary presence of mind.

It is, however, that extraordinary and undeniable characteristic presented to us in a smaller or greater degree by Nature—presence of mind—which is quicker in coming into action with men than with women. Pray you, then, lady readers, do not take these remarks amiss, and do not construe them as merely intended to decry the ability of the lady driver.

CHAPTER XIV

The Use and Misuse of the Horn

IT seems almost to verge on the superfluous to devote words to so apparently simple a matter as that of blowing the horn. Nevertheless, it is a subject for which the writer will proffer no further apology. The use of a horn need only be referred to from the point of view of considering the possibility of situations arising, when it is safer not to give a warning signal, both in one's own interest and in that of the other parties to the situation. It would be unwise to endeavour in any way to lay down definite situations, when the well-being and safety of all concerned is better guarded by not using the horn than by employing it. Nothing but experience can teach this. It may be taken, however, as an undeniable fact that in many cases such action is in point of fact the correct procedure.

One frequently sees the magistrate's court query in the case of an accident, "Did he blow his horn?" The value of evidence to this effect depends wholly and entirely upon the circumstances obtaining.

In many situations it is no exaggeration to say that an accident may absolutely be caused through no other action whatsoever on the part of the driver than that of blowing his horn.

Really experienced drivers will quite appreciate the situations which do occasionally occur when this state of affairs is neither more nor less than the absolute truth.

We will try to give one example for the benefit of those who may not of their own account be able to

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picture such circumstances. Assume, then, that one is driving along a road at 20 miles an hour; a child or perhaps two children suddenly run out from the path to cross in front of the car, not being aware of its presence. Now, the really capable driver will instantly make up his mind in regard to the relative speed at which the children are running, and at which his car is travelling, as to whether or no they will have advanced sufficiently on their journey by the time he gets up to them to enable him to pass behind them. If they are so advanced, or *intent* on their crossing, that their safe return on hearing a motorcar horn is not reasonably certain, then

it would be rank bad judgment to sound the warning device,

as this is just as likely, with children, to have the opposite effect to the one intended. One might imagine that blowing the horn would cause them to accelerate their speed, but in all probability the effect produced would be to cause them to look round and thus, even unwillingly, hesitate in their progress or even to become uncertain as to whether to run back or proceed. Consequently—and please always remember it—the mere sounding of a horn in such a situation, may be the one and only cause of an accident. The writer has witnessed one such, and if the idiotic driver had not sounded his horn he could easily have cleared the child by a couple of yards.

If one is certain that the children under consideration can in point of fact be safely missed at the moment when it is actually necessary to clear them, even if it only be by a very small margin, then such action as that indicated is the one to be adopted, even although the passage of the car may cause a considerable shock to the children.

It is far preferable that they should be subjected to a momentary shock by a narrow or comparatively narrow escape from an accident, than that they should be placed for a moment in real danger of being involved in one.

WHEN NOT TO USE THE HORN

The writer had a funny experience once in this connection, when an elderly woman suddenly ran out into the road to catch a child who was up to mischief of some sort on the other side of the road. It was just such an instance as that put forward as an example. Sufficiently gentle brake application was applied so as not to make enough noise to attract the old lady's attention and the car was just swung round the back of her, giving her undoubtedly a nasty start. Now for the sequence. Just as the writer was congratulating himself on his judgment, a violent tirade of abuse came from the passenger in the back of the car, as to why this, that, and the other the horn had not been blown! It was disgracefully bad driving, and everything that was wrong—and so forth.

It is a thousand to one, however, that if the horn had been blown both of us would have been involved in a nasty accident. It was quite impossible to have swung out sufficiently to the right on account of the road being occupied by a big two-horse dray, and any hesitation or slackening of speed on her part would have rendered a passage to the left of her impossible. Other folk were on the path to the left, so even if one should have successfully negotiated the kerbstone to get on the path an accident would have occurred there.

Yet again, a violent brake application in endeavouring to stop would have made enough noise owing to the skidding of the wheels to attract her attention and cause her to hesitate, so that again an accident would have occurred, though naturally at a less destructive speed.

No! the course adopted was absolutely the proper one for the circumstances existing, and although one was naturally very sorry to cause the old lady such a shock, nevertheless it was more than enough consolation to know that one's judgment had saved her from being involved in a nasty accident.

Remember, then, that it is not always the safest thing to do to blow the horn, any more than it is always the safest thing to put on the brake in a case of emergency. In exactly the same way as acceleration is

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often the means of securing safety, so refraining from blowing the horn in a case of emergency may be the best possible means of avoiding a potential accident.

The Misuse of the Horn

There is no doubt that many drivers abuse a powerful horn, and every now and then one sees correspondence or suggestions in papers to the effect that the legislature should prohibit the use of powerful warning devices on motorcars.

Such a totally prohibitive proposition is a stupendous error, and shows in a most thorough manner that the proposers have but a very small knowledge of the subject upon which they write and in all probability less practical road experience.

Unless, however, motorists as a body will on their own accord set to work to weed out those who blatantly misuse such warning devices, it is not beyond the bounds of possibility that legislation will be enacted to limit the use of such devices.

In the writer's opinion there is no greater safeguard for the driver of a car, and also for the other road users concerned in most cases of emergency, than a 12-volt Klaxon or similarly powerful warning device.

The supreme value in cases of emergency of a fifth of a second has already been fully dealt with, and, one ventures to hope, cogently explained. Therefore, an instrument to participate in the safeguarding of life or property in such cases of emergency must be instantaneous in action and of a fairly high tone, so as to convey its warning at the maximum speed possible and to the greatest distance.

Times out of number situations crop up where children are concerned, or where a driver of a covered van makes a sudden turn to the wrong side of the road (without dreaming of any such simple precaution as indicating his intention), and in numerous other emergencies, where the warning note of a powerful horn instantly saves the situation and paves the way to

MISUSE OF POWERFUL HORNS

safety, a potential accident being converted to a mere incident.

Then, again, in country touring when overtaking drivers of heavy vehicles of the traction engine type, or drivers of horse-drawn vehicles who are asleep, the services of a good horn are most valuable.

All these facts, however, do not constitute an excuse for the misuse of such a horn in ordinary town traffic, neither should the valuable properties of such an instrument be called into play for taking cross-roads at excessive speeds when driving late at night—or of course at other times. At the best one cannot assign musical honours to such an instrument, its main value being the safety it provides, and its utility.

Do not, therefore, make a habit of using such a horn indiscriminately for ordinary town driving. It is bad taste to do so and argues a lack of consideration for other road users. Some of the younger folk in the motor world seem imbued with the idea that the possession of such a warning instrument is an item upon which they can justly pride themselves, and consequently they like to exhibit its abilities on the least provocation. This, of course, is a misconception of the real state of affairs, and an ordinary gentle-toned horn should be used for all cases where one merely asks for permission to pass.

The situation, where in the interest of the person concerned and oneself the message to be conveyed is "stand still," is in quite a different category, and then an ear-piercing warning is not only justifiable, but is in the best interests of all concerned. Where such an intimation is not, in point of fact, absolutely necessary for one's own safety or for others, a mere gentle warning should invariably be used.

Mesmeric Influence

As this is not a book on psychology, anything relative to the subject of mesmerism would appear to be out of place, but there is just one point however which may be mentioned, and that is the situation in which a person who is crossing the road suddenly becomes aware of the presence of a car which is apparently going to come

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into collision with him or her, and hesitates as to what to do. In such cases some drivers have found that what one may term a "commanding eye" is effective in controlling the action of such a person.

It is rather hard definitely to define what one does under these circumstances, and it is not proposed to do much more than merely mention the fact.

It will, however, be found that if one can convey by a set look and a composed appearance, the feeling of security in the situation possessed by the driver, the other party will be imbued with it and remain stationary, allowing the driver to look after the rest. In nine cases out of ten, where accidents occur under these circumstances, if only the pedestrian would in the first case remain quite still the driver of the car would probably negotiate the situation without damage to anyone.

The chief thing is, of course, to be cool and, by having a composed appearance, to convey to the other party the impression that there is no danger in the situation. If, however, the driver himself looks flustered and lacking in determination as to what he is going to do, the situation is rendered worse and the hesitancy of the other party is only increased and the danger of an accident made more imminent. Try then, under such circumstances, to appear perfectly confident of the procedure to be adopted, and it will be found that a fixed and determined air, not infrequently, aids in conveying this knowledge to the other party. In most cases it is far easier for the driver of the car to manipulate it so as to avoid an accident than it is for the pedestrian to escape a serious situation.

CHAPTER XV

Notes in Epitome

THE first requisite for all motorists is that of coolness, and coupled with this should invariably run a strong undercurrent of gentlemanly behaviour. Luckily the road hog is in a distinct minority in the various classes of motoring, but nevertheless there are still a number of people who are not quite so considerate in their driving principles and manners as one would wish to see them; some from selfishness and some from ignorance.

It is almost impossible to define any series of specific instances to make the point more lucid, but the whole gist of nice road manners turns on the pivot of considerateness. This word should have an all-embracing width of meaning, not only to other road users as such and to humanity, but even to mere animal life of the small order, which one meets ever and anon in the course of one's travels.

For instance, it ought not to be too much to ask a driver of a car to give due consideration to the safety of so insignificant a thing as a frog, for instance, which may be finding its way across the road from one pool to another. Similarly with hens, chickens and dogs. In all such cases a motorist should take all reasonable precautions not to endanger their lives or limbs.

There are odd occasions which occur when it would be wrong for a motorist to pay attention to such things if it was a case where his own safety and that of the occupants of the car, or other people's safety on the road would really be endangered.

For instance, when one is travelling at a good speed on a greasy road or in a confined space and a dog or

HOW TO DRIVE A MOTORCAR

other animal suddenly runs in front of the car and nothing but a violent application of the brake could avoid hitting it, and it is a foregone conclusion that such brake application must carry in its wake a bad or dangerous skid, then one is reluctantly compelled to let the animal in question take care of itself as best it can. However, these circumstances are certainly rather the exception than the rule, and in all other cases due consideration should be given to all animal life, even of the lower order, such as sparrows and frogs.

Another failing to which we are all more or less likely to fall victims is the one of assuming that because the horn has been blown, the person for which the warning has been given is aware of the fact that it has been blown. It may be, perchance, that a man is leading a heavy dray, and that his hearing is not of the best, or that he may even be deaf. If, therefore, he does not move quite so fast as one would wish, do not for that reason "cut him" or otherwise abuse him, as it is no crime to be deaf, and the law does not as yet place any restriction on the clatter which a horse-drawn vehicle may make.

No. The driver of a car should always carry with him, as his stock in trade, a large fund of philosophy, and draw on it copiously for each such instance which he encounters.

It must be remembered that the balance in ordinary humanity between perfection and imperfection is largely in favour of the latter quality, and many people will always be ignorant, or even stupid in their behaviour on the road. It will be found far more enjoyable, and considerably more beneficial in all such cases where one may even have a just cause for annoyance, to draw on one's fund of philosophy and recognize that such things must be, treating the incident in question with good humour or a smile of indulgence, as one may feel inclined.

Mud Splashing

When driving on wet roads, one should always keep an eye on the possibilities of splashing foot passengers

MUD SPLASHING

when passing them. A car driven over a large puddle at a good speed will splash mud and water out sideways for a very considerable distance; in fact, to a far greater extent than most people imagine.

A considerate driver when out under such road conditions always keeps a wary eye for large puddles in his path, so that, if reasonably possible, he will miss them with his nearside wheels and thus avoid the possibility of splashing people on the path.

Similarly in the opposite case, if the roads are very dusty and one is touring at a good speed in the country, and raising a cloud of dust, one should invariably, on meeting other folk—driving, riding, or walking—slow down to a reasonable speed of, say, 20 miles per hour, and not pass them at high speed, leaving them half choked in a huge cloud of dust.

All said and done, it is a very small matter just to slow down a little under these circumstances, and the people for whom such consideration is shown are sure to appreciate it. Similarly, when two cars meet on a dusty road, it is to the advantage of each driver if speed is slackened, so that each one does not present the other with an unappreciated gift of a cloud of dust. Some silly folk accelerate under such conditions, to see which can make the larger cloud of dust!

The Freemasonry of the Road

It is rather to be feared that the one-time generally-existing freemasonry of the road is not so popular amongst us in the motor world nowadays.

Whenever one chances to meet a fellow-motorist who is in difficulties on the roadside, it is certainly a most commendable proceeding to slow down and ask if one can be of any assistance. It may be the smallest little thing imaginable which is holding him up, and that one can with but very little inconvenience to oneself assist the fellow-motorist in distress.

For instance, one may run out of petrol, and a gallon of this at any time valuable spirit may be of exceptionally great value to a stranded motorist who is in a hurry to get on. It may be the stranded one wants a

HOW TO DRIVE A MOTORCAR

plug, or the loan of a tyre pump, or a valve for a tube, or some other insignificant detail which one could supply (and, of course, if of any value accept payment for) with but very little inconvenience. Then again, it may be that the stranded motorist is held up for some very simple little trouble which a few words of advice from a more experienced driver may quickly rectify.

The writer invariably makes a point of slowing down and asking if assistance is required whenever he meets a fellow-motorist—of any classification whatsoever—in a state of distress at the roadside. There might, of course, be odd occasions when one could not possibly spare the time, but these are rare exceptions which would only emphasize the value of the general rule.

Not so very long ago, the writer was stranded through lack of petrol, the spare tin which was thought to be in the car not being there. It was broad daylight and five successive cars which were signalled to with requests to stop took absolutely no notice whatsoever, not even to the extent of shouting out "Sorry, but I'm in a hurry." Now, it is neither more nor less than a bare absolute fact that such behaviour is entirely foreign to the character of a gentleman.

It is to be hoped, then, that this spirit of free-masonry may revive, and those motorists not disposed to help others in such cases should remember that on some occasion they may be similarly stranded, when time is a matter of considerably more than the average importance, and that then they would certainly be the first to think they were illtreated if they could not obtain some simple little roadside courteous assistance from passing fellow-motorists.

Some Common Mistakes

Both petrol and benzole being of a highly inflammable character, one should always guard against smoking when filling a tank or even in the garage itself. Smoking, per se, is in the writer's opinion so far removed from the possibility of causing an accident that it can be discounted from the realms of practical politics, but, nevertheless, the advice should be

CARE WITH PETROL

adhered to strictly on account of the ever-present possibility of striking a match to light a fresh cigarette or cigar, which is entirely a different proposition.

A friend of the writer's once made a 1000 successive attempts with brightly-burning cigarettes to ignite some best quality petrol, and in no single instance did the spirit act other than water would. It is not the glow of the cigarette, cigar, or pipe which is dangerous, but if there is any vapour about or any of the spirit spilt anywhere, then the situation may be entirely changed into one of great danger by striking a match to light up again.

Another point to remember is that when filling up with spirit on an odd occasion a garage hand (occasionally one is guilty of the negligence oneself) may overfill the tank and cause a considerable quantity of the spirit to be spilt. If the tank is in the dashboard a large proportion of this may find its way under the bonnet and under the floorboards into the precincts of the engine. If the tank is in the rear, a good deal may be in the neighbourhood of the exhaust pipe. In either case the engine should not be started up, more especially in an enclosed space, until such time as that spirit is entirely evaporated.

With the dashboard tank, a little of the spirit getting into the distributor of the magneto may be ignited by a spark or there may be a short circuit somewhere. In the other case a backfire or a pop back in the carburetter may cause a flame at the end of the exhaust pipe. In such an event, therefore, there is a distinct danger of causing a fire, and it should invariably be guarded against by mopping up the petrol with a piece of rag and waiting until the spirit has evaporated.

In this connection, it is quite sound advice to suggest that one should always keep an eye on all petrol connections; see that the unions on the pipes have not developed a leak. Similarly that the carburetter has not contracted a habit of flooding, or that the tank itself has not sprung a leak. All these conditions present a distinct element of danger, and should be rectified at the earliest possible moment.

HOW TO DRIVE A MOTORCAR

Some General Advice

Never allow yourself to become addicted to the bad practice of showing off. For instance, there is nothing particularly clever in causing the rear wheels to spin round at a great speed and so cause a shower of sparks from the steel-studded non-skid tyre when starting up. Neither is there anything particularly clever in driving up to a traffic block or other necessary stoppage at a high speed and then jamming on the brakes so as to effect a spectacular stop. Any credit there is rests with the machine and its maker and not with the driver. Similarly, there is no credit whatsoever in turning round in the road in a half circle at such a speed as nearly to force the front tyre off its rim. Such practices to the expert driver or mechanically-minded person are amongst the heinous sins of the mechanical world.

Make a habit of always giving due meed of importance to cross-roads, even though they may be of an insignificant character. Similarly try to cultivate a calm philosophy when finding another car faster than your own, and do not let the fact that a car passes, which one happens to know is about the same power as one's own machine, prove upsetting. Anything in the nature of racing on the road is to be deprecated, as it tends to kill that most desirable characteristic, sangfroid, and excitement will perhaps lead one or both of the parties concerned into taking undue risks with their own cars, or with the safety of other users or potential users of the highway.

When meeting other traffic at night, if the car being met has very powerful headlights, invariably slow down and go slowly immediately after passing the other car, until such time as a clear outlook on the road is again attained. The light is frequently so dazzling as partially to cause one to lose the ability of seeing such things as cyclists or small vans which may be a short distance in front on the left-hand side of the road; one should always be careful in passing a car under these conditions.

Never use powerful headlights excepting when you need them, more especially, of course, if a car is fitted

USING HEADLIGHTS IN TOWN

with an electric-lighting outfit. It is ludicrous, of course, to use electric headlamps in such a place as London, and it is a considerable annoyance to other people, and does one but little good. With suitable qualification, such procedure might be reasonably prohibited. A very occasional exception in which the writer indulges in the use of his headlights in town is in going through certain streets which are known for their extraordinary danger, through the multitude of children living and playing therein, and in such cases headlights are undoubtedly a safety medium, being an additional warning to any children who are in the habit of rushing from the path into the road. In all ordinary circumstances, however, refrain from using the headlights for town work.

In summer, when passing a car which is making a great cloud of dust, one should also slow down, as this may be sufficient to impede one's outlook for some few yards. Remember, also, that if inclined to indulge in speed work one should always make a point of choosing the right spot for so doing. Never go fast down a steep hill, or for that matter down any hill; the extra braking effort necessary to stop the car in case of emergency is enormous, and is rarely understood, whilst the fact of an engine turning at its highest possible revolutions when running downhill is anathema to a mechanical mind. The real charm of power is speed work up a gradient when the engine is really working and not merely turning at high speed.

A common fault met with is that of overtaking a car on an ordinary road where there is only comfortable room for two vehicles abreast, and which is curved. Under the circumstances, if a car suddenly appears coming from the opposite direction when one is in the act of overtaking the other car, a position fraught with much danger is at once brought into being.

Never under any condition overtake another car on a bending road, until such time as ample clear road is actually visible ahead in which to pass the other car and get to the proper side again.

Similarly, when overtaking another car do not cut

HOW TO DRIVE A MOTORCAR

across to the left too suddenly, as although you may be going a good deal quicker than the car you are overtaking, nevertheless when you take a diagonal course whilst he continues in a straight line, the relative speeds are more in his favour.

Never take corners at too great a speed. Remember that it is against the laws of mechanics, and that one corner taken at an excessive speed will put more strain on the front-wheel bearings and steering gear, than a very considerable length of straightforward running.

Always endeavour to use the brakes as little as possible. The better the driver the less frequently does he require violent braking effect.

In traffic, do not follow too closely in the wake of a tram, bus, or other mechanically-propelled vehicle, as there is nothing particularly clever in running, as so many taxi drivers do, with the mudguard or lamps only a foot from the rear of the preceding vehicle, and it only brings into play a considerable amount of excessive braking. Some people are wont to express the opinion that, because so-and-so drives like this, he is a good driver and possessed of sound judgment. Such an opinion is entirely erroneous, and such driving is nothing more or less than rank bad driving. In the case of necessity, it is well to be able to judge things by a small margin, but when there is no necessity it is only foolish.

In the case of an accident, whether one is concerned in it or not, humanity demands that the driver should proffer assistance.

Do not make too great a use of the horn, especially if it is of the loud-toned variety. It is bad taste, and one should remember that everyone has an equal right to the proper use of the roads.

If the steering seems suddenly to pull to one side, it is usually an indication that one of the tyres is becoming deflated. If the pull is a continual one to the left, it is probably the nearside front tyre, if to the right the off-side. If it has a tendency to pull first one way and then the other, it will probably be found to be one of the rear tyres.

MINOR HINTS

If landed with a punctured tyre and no means for repairing it, and there is a garage, say, some few miles along the road, the car can be driven very gently and as slow as it can run on the top gear (not exceeding five miles an hour), and it is possible to get to such garage without seriously damaging either the tube or the cover: the writer has done it many a time and oft. If it is the nearside front tyre which is causing such trouble, get the front passenger into the back on the right-hand side of the car. If a rear tyre and there are passengers in the back, get them so far as possible to sit on the opposite side of the car.

If an unaccustomed noise develops, it should be investigated at once. A squeak which cannot be easily traced is often due to one of the universal joints. Do not forget that front wheels occasionally require some lubricant, and if ever a car appears to run stiffly, an examination should at once be undertaken to find, first of all, whether there is anything wrong with the engine and if that is all right then examine the bearings of the wheels, etc.

Occasionally have a look in the radiator, and replenish it; do not fill it to the top, but only to within about an inch of the overflow pipe. It must be remembered that the water has to expand, and if by any chance the overflow pipe should have become partially blocked with dirt or through other means, and the heating of the water in the radiator is accomplished at a great speed, sufficient pressure may be generated by its expansion to cause a leak in the radiator.

Spare petrol and lubricating oil should always be carried, and with regard to the question of lubrication always remember that a little oil supplied frequently is very much better than waiting until a portion of the machinery makes it manifest that it wants some more lubrication, and then giving it a good dose.

All Stauffer boxes and similar grease pots should be screwed down about every 200 miles.

So far as the engine is concerned, always keep an eye on it from the lubrication point of view, acting according to the instructions of the makers. A good

HOW TO DRIVE A MOTORCAR

engine of about 12 or 15 h.p. should do something in the neighbourhood of 750 to 1000 miles to a gallon of oil: some cars do a good deal more. If touring in a very hilly country where many hills have to be encountered on low gears, it is a good plan to put in a little fresh oil, whether it is time for it or not. Similarly, if one is doing 250 miles per week, it is preferable to put in a quart of oil each week than a gallon at the end of the month. Every 1000 to 2000 miles or so (according to the maker's instructions) some fresh lubricant should be added to the gearbox, and similarly the lubricant in the rear axle casing should be brought up to its proper level on such occasions.

In conclusion, never under any conditions whatsoever drive at a speed in excess of that at which a sufficient distance of clear road can be actually seen ahead in which comfortably to stop by the application of one brake. A whole book could be written on the subject of dangerous situations, but to the writer's mind it really seems not worth while. A hundred examples might be given, and it would be the hundred-and-first which the reader might come against. If this one golden rule is invariably adhered to the occasion when one will be involved in an accident through one's own fault is a very remote possibility. To instance one special case where this advice is important, the well-known hump-backed bridge may be quoted, and one should declutch when sufficiently near the top of this to know that the momentum of the car will carry it over the brow, and it should only be surmounted at such a speed that, if necessary, one can stop in a few yards. Of all rules for careful driving, the one italicized above is the corner stone and mainspring. If it is honestly adhered to one need not really say anything much beyond that, so far as the question of speed is concerned. It is an automatic governor for the safety and well being of oneself, one's car, and all other road users.

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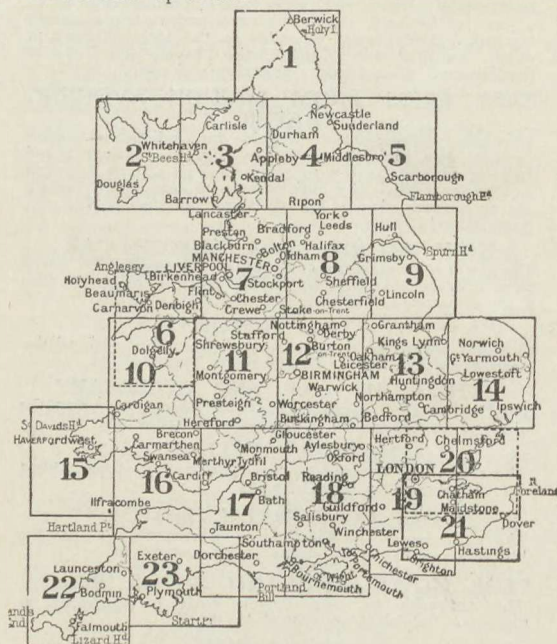
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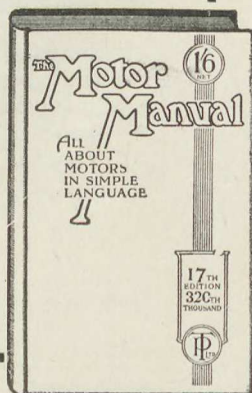
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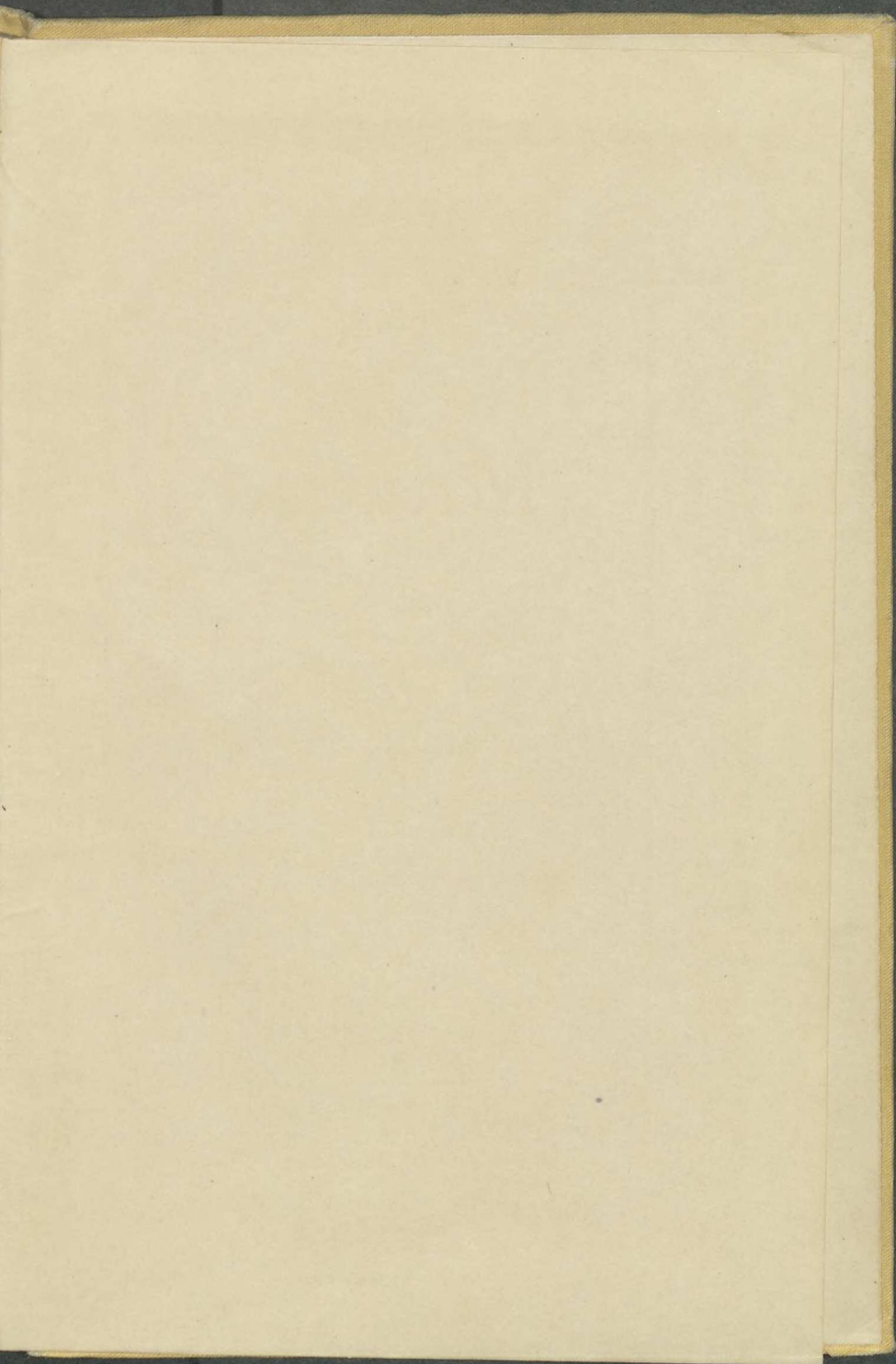
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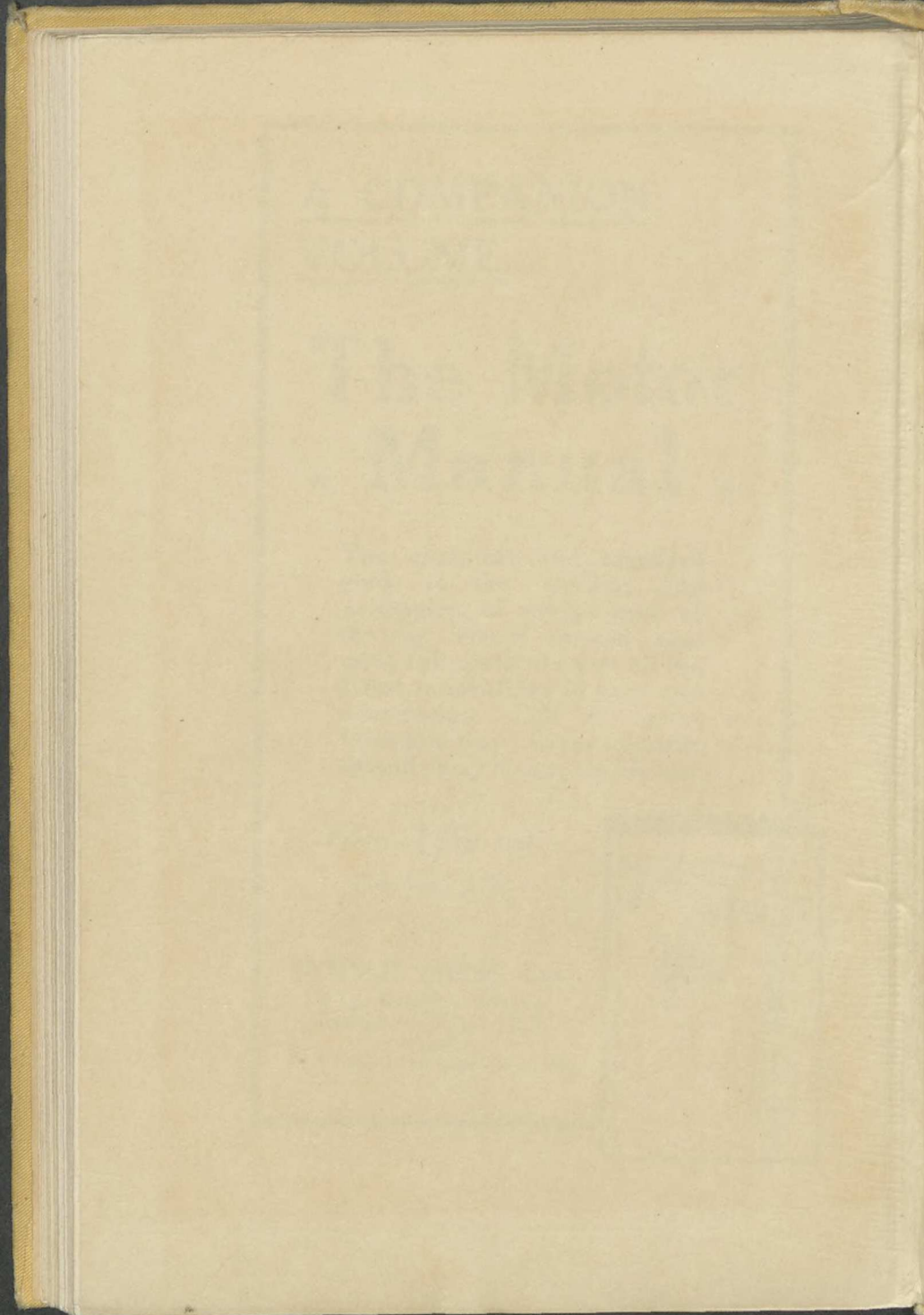
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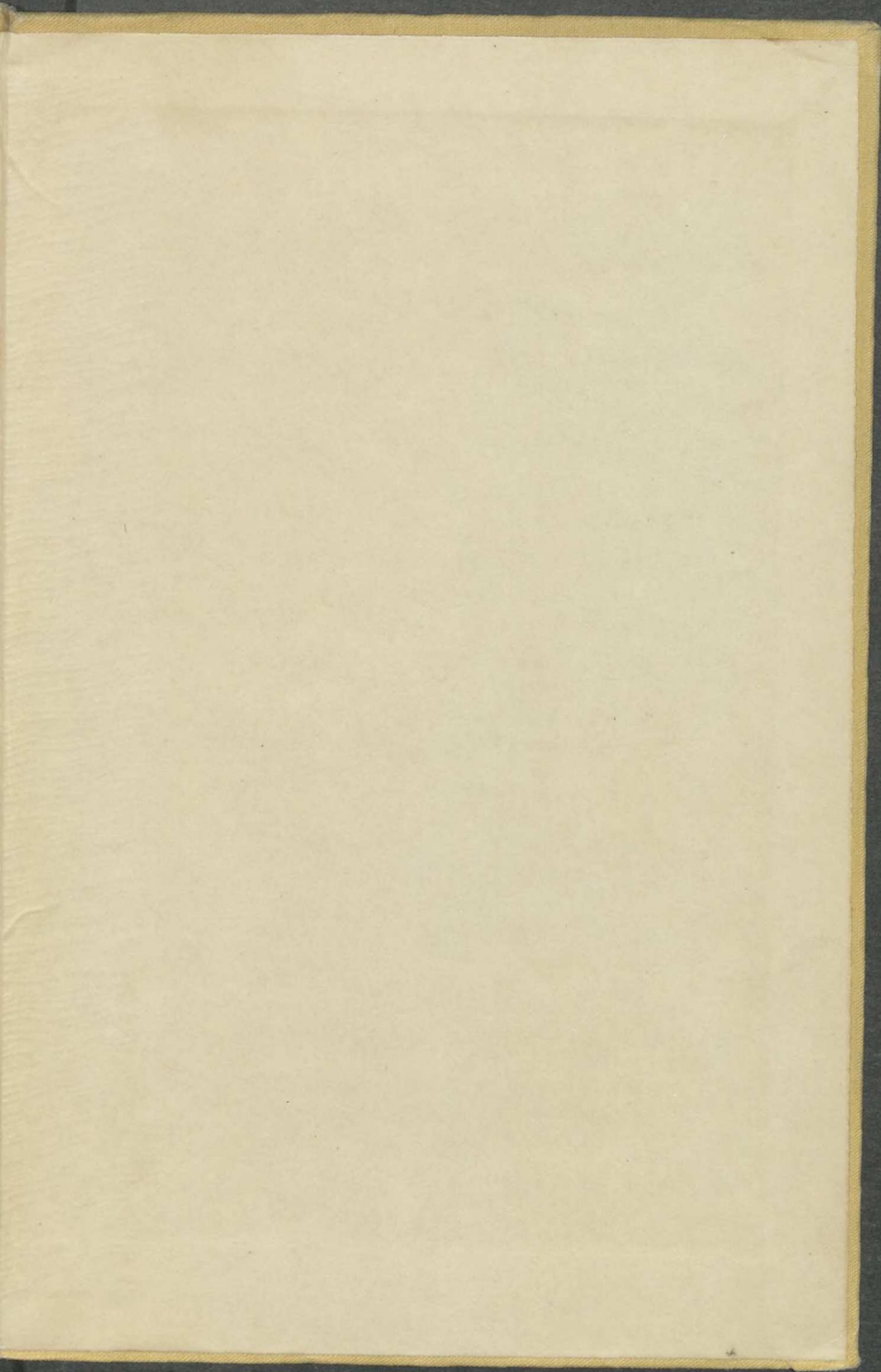
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