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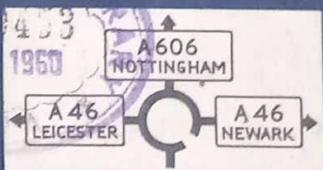


ROAD CRAFT

A manual of driving instruction for students of the Motor Car Wings at the Metropolitan Police Driving School

LONDON
HER MAJESTY'S STATIONERY OFFICE
1958

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METROPOLITAN POLICE
DRIVING SCHOOL

Roadcraft

A MANUAL OF DRIVING
INSTRUCTION FOR STUDENTS
OF THE MOTOR CAR
WINGS



LONDON.
PUBLISHED FOR THE COMMISSIONER OF POLICE
OF THE METROPOLIS
BY HER MAJESTY'S STATIONERY OFFICE

1958

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THIS MANUAL is used for the instruction of Police Drivers at the Metropolitan Police Driving School, Hendon.

The contents are substantially the same as those of *Attention All Drivers* or *The Hendon Technique of Driving* published by the Order of the Road in January, 1954, but since withdrawn from publication. The present book has been delayed pending the publication of the new Highway Code which was issued in March, 1955. References to this Code are included in this book.

In making this Manual available for public sale the purpose is to spread knowledge of the art of good driving and to make the road safer for all road users.

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SECTION I

*The Physical and Mental Requirements
of a Motor Vehicle Driver*

1. The object of this Section is to help the driver to realise the need for a high degree of physical and mental fitness in order to drive a motor vehicle according to the highest standards of skill, safety and consideration for other users of the road.
2. The law's requirements in this matter are not exacting, for the driving licence applicant who is not suffering from a disease (mental or physical) or disability likely to cause his driving to be a source of danger and who is not deficient in limb need only declare ability to read a car number plate in good daylight at a distance of 25 yards (with glasses, if worn). He is not required to have any particular standard of hearing.
3. Nevertheless, the average driver will find that he becomes aware of many contingencies through his ability to hear and recognise various sounds when driving a motor vehicle. Good vision, good hearing, and a good standard of health all have an essential bearing on the power of concentration so necessary in present day driving.
4. **CONCENTRATION.** The reactions to happenings seen and heard take place in the brain, which is the centre of control of all thought and action. To perfect control in any human activity, the ability to concentrate is necessary.
5. Concentration may be defined as the full application of mind and body to a particular endeavour, to the complete exclusion of everything not relevant to that endeavour.
6. The power to concentrate exists in everyone; but few can concentrate sufficiently to drive a motor car with complete mastery in all circumstances.
7. A high standard of concentration may be achieved by any driver by his own enthusiastic effort, and by self discipline. Self discipline involves self criticism, followed by an earnest endeavour to improve one's control of thoughts and actions.
8. With the aid of **VISION, HEARING, GENERAL FITNESS and CONCENTRATION** a driver will be able to exercise good

JUDGMENT, which is the ability to distinguish between right and wrong, good and bad, and safe and unsafe.

9. Moreover, he must be able to formulate a safe driving plan for every circumstance on the road, and then carry that plan into effect with DELIBERATION.

10. To do this his muscular system must be in good condition, for when driving, the movements of the limbs exercising control of the vehicle must be sure and accurate.

DRIVER REACTION TIME

11. Driver reaction time may be defined as the time that passes between the moment a driver observes the need for action, and the moment he takes that action.

12. The action may be to change the course of the car by steering, to make it go faster by acceleration or slower by braking. There may also be the need for a combination of steering and acceleration or braking.

13. Reaction time is of major importance when applied to braking. For example, a driver should be capable of reacting to an emergency stop by braking in two-thirds of a second. In that period, i.e. the period elapsing from his seeing the need to stop to the time he applies his foot-brake hard, the car, if travelling at 30 miles an hour, will have covered approximately 30 feet without losing any appreciable speed. This distance is called the THINKING DISTANCE and is referred to as such in the Highway Code.

14. The Thinking Distance will vary in three ways; (a) with the speed of the car; (b) with the physical and mental condition of the driver; and (c) with the degree of concentration he is giving to driving.

15. The ability to react quickly can deteriorate in several ways. Undue worry, fatigue, illness and the effects of alcohol and certain drugs, are well-known causes of lack of mental and physical well-being.

16. To improve his mental and physical condition, the average driver should live a normal and regular life and be moderate in all things; he need do nothing more.

17. To shorten an abnormally long reaction time, especially in the case of the slower type of driver, some simple exercise should

be taken, such as skipping for 15 minutes each day. This will help to co-ordinate the limbs and eyes.

SECTION 2

The Location and Manipulation of Controls

OBJECT OF SECTION

1. The object of this Section is to assist a driver to locate the various controls on a motor car by a systematic survey; then to consider some fundamental principles in manipulating the controls to the best advantage. The subject must be treated somewhat broadly here since the details of all makes of cars cannot be covered.

SURVEY OF INSTRUMENTS AND DRIVING CONTROLS FROM THE DRIVING SEAT

2. GAUGES TO BE SEEN AND CHECKED BY THE DRIVER AT INTERVALS

- (a) Oil pressure gauge (or warning device).
- (b) Water temperature gauge.
- (c) Speedometer.
- (d) Engine revolution counter.
- (e) Ammeter.
- (f) Fuel gauge.
- (g) Ignition warning light.
- (h) Warning device for direction indicators (if fitted).

3. CONTROLS OPERATED BY HAND

- (a) Carburettor mixture control or cold-starting device
- (b) Hand throttle.
- (c) Ignition switch.
- (d) Starter switch.
- (e) Windscreen wiper.
- (f) Light switches.
- (g) Direction indicators.
- (h) Gear lever.
- (i) Hand-brake lever.
- (j) Steering wheel.
- (k) Horn button or ring.
- (l) Variable ignition control.
- (m) Anti-dazzle device switch (if hand operated).

4. CONTROLS OPERATED BY THE FEET

- (a) Clutch pedal.
- (b) Brake pedal.
- (c) Accelerator pedal.
- (d) Anti-dazzle device switch (if foot operated).

5. The list of controls given in paragraphs 2, 3 and 4 is not exhaustive as many cars have additional refinements, such as shock absorber controls, radio sets, air conditioning equipment and heaters. A driver must make himself familiar not only with the functions of the various controls and gauges, but also their positions, which vary on different makes of cars.

DAILY INSPECTION

6. Before driving a car for the first time on any day, the driver must ensure that it is in a roadworthy condition. He must check that:

- (1) RADIATOR is full.
 - (2) OIL LEVEL in sump is correct.
 - (3) FAN BELT is not slack.
 - (4) TYRE pressures and treads are correct.
 - (5) WHEEL NUTS are tight.
 - (6) FIRE EXTINGUISHER is fully charged.
 - (7) PETROL TANK is sufficiently filled.
 - (8) STEERING is in good order (check the connections and test for backlash).
 - (9) LIGHTS
 - (10) HORN
 - (11) DIRECTION INDICATORS
 - (12) WINDSCREEN WIPERS
 - (13) TOOLS are complete (check with log book).
 - (14) FIRST AID KIT is sealed.
- } are working properly.

DEPARTMENT AT THE WHEEL

7. From his position at the wheel of the car, the driver must be able to:

- (a) obtain the maximum view possible all round the car;
- (b) manipulate properly the steering, brakes and clutch.

8. He must, therefore, be seated in an upright and alert position; not taut or strained, yet not relaxed or seated primarily for comfort.

The driver's seat is adjustable, and on some cars the steering wheel may be raised or lowered.

9. The driver should not rely on the seat back rest for supporting the entire length of his back; but firm support is essential at the base of the back, so that the body does not roll to one side on a corner or bend, impairing his control of the steering.

ADJUSTMENT OF REAR VIEW MIRRORS

10. From the driving position previously described, view to the rear must be obtained by using the driving mirrors. The use of two mirrors is recommended, one to give a centre view through the rear of the car, and one to give a rearward view of the offside.

11. These mirrors should be adjusted so that the best view may be obtained merely by swivelling the eyes from the straight view ahead, without the need to turn or lower the head. The driver should be able to see following and overtaking traffic on a straight and level road.

SECURITY OF DOORS AND SUNSHINE ROOF

12. A check is needed on doors and sunshine roof panel to ensure that they are securely fastened. Accidents occur sometimes through doors opening or sunshine roof panels blowing off whilst cars are in motion.

SOME BASIC PRINCIPLES FOR DRIVING SMOOTHLY AND SAFELY

13. Learning to drive a car is similar to learning to swim or ride a bicycle; it is a skill which will develop with practice. The driver will have difficulties, especially during the earlier stages. He should be critical of his own efforts and learn from his mistakes.

14. The driver must be confident of his ability to drive the vehicle with safety for himself and others.

PHYSICAL EFFORT—**APPLICATION, AMOUNT, DIRECTION AND TIMING**

15. Effort in this sense may be defined as the exertion of strength. A common example of effort with which most drivers will be familiar is riding a bicycle. Having learned to balance himself on the machine, the rider finds that he is able to ride it by the application of strength on the pedals, first with one foot and then the

other, in a certain direction at an appropriate moment, until he acquires the rhythm of pushing and turning. If the rider applies too much strength in the wrong direction or at the wrong moment, the rhythm and his balance are upset and the machine gets out of control.

16. When driving a motor car, a similar rhythm and application of effort are required at times, although not continuously as in cycling. A car will respond satisfactorily to the correct movement of a certain control, in the same way that a bicycle does. For example, to apply too much pressure on the accelerator pedal will produce too many revolutions of the engine, making the car go too fast and possibly get out of control. To apply too much pressure on the foot-brake will cause the brakes to work too forcibly and this again may throw the car partially out of control.

17. The driver may well ask: 'How can I tell when I have pushed or pulled sufficiently on a particular control?' He will find the answer in the result of his effort. Let us examine the result. If the control, when operated, has no effect, the fault may be not enough effort, wrong direction of application or wrong timing of the effort. On the other hand, if use of the control achieves the desired result, then the effort, direction and timing must have been reasonably accurate.

18. For example, if the driver wants a car to go slower on a level road, he may reduce engine power by lessening pressure on the accelerator pedal, resulting in gradual loss of speed. Think in terms of speed, not distance of accelerator pedal movement. Imagine the car is still going too fast; obviously the brakes must be applied; what is the result? The brake pedal moves, resistance is felt at the pedal after some movement, and the car loses speed to a greater degree. Again the driver should estimate the success of his effort by the result, which is the loss of speed of the car.

19. Take another example as an illustration of effort being applied, maintained and then gradually relaxed. The left foot and leg are used to operate the clutch pedal. A fair amount of deliberate effort is required to push the pedal forward to the full extent of its travel. The sensation of the pedal moving and stopping is readily felt. Sometimes the clutch must be held disengaged for short periods; to do this, pressure must be maintained on the clutch pedal and this sensation is felt in the same limbs.

20. Then it will be necessary to let the clutch re-engage. The effort to hold the pedal forward must now be relaxed in such a way that the pedal will move backwards steadily, and, at the latter part of its travel, quite slowly to ensure smooth engagement of the clutch.

21. The application of effort to steering a car is extremely important. Many learner drivers find difficulty in steering a normal straight course on the nearside of the road. The car seems to have a tendency to 'wander' first to one side and then to the other. This trouble may often be traced to:

- (a) too much effort on the wheel;
- (b) the correcting effort maintained for too long;
- (c) not enough effort.

22. The car manufacturer designs a car to keep a straight course on a level road with little or no effort from the driver. Since the normal road is not level but has a camber, the car tends to run down the camber towards the nearside. To overcome this tendency, only just enough effort need be applied to the steering wheel to keep the car on a straight course. The effort amounts to nothing more than a light restraining movement on the steering wheel, made by a light grip, with the hands placed on the wheel in a position approximating to ten minutes to two on the face of a clock.

23. To be successful the driver must be able to manipulate every control when necessary without taking his eyes off the road, and to do this he must:

- (a) know the position of each control;
- (b) locate it with hand or foot as the case may be;
- (c) apply the right amount of effort—in the right direction—at the right moment.

APPENDIX TO SECTION 2

PRECIS FOR DRIVER

PHASE 1. INITIAL DUTIES

Carry out daily inspection (as in para. 6).

Enter driving seat to recognise and feel controls

- | | |
|----------------|---|
| (a) Hand-brake | Check movement of lever and operation of pawl and ratchet setting device. |
|----------------|---|

- (b) Foot-brake With hand-brake off, check movement of pedal. Then re-apply hand-brake.
- (c) Instrument panel Check and recognise each instrument with ignition switch 'off' and 'on'.
- (d) Clutch Check movement of pedal.
- (e) Accelerator Feel spring tension to operate pedal. (Do not agitate pedal with pump-type carburettor.)
- (f) Gear lever Check each gear position.
- (g) Steering wheel Check 'back-lash'. Do not apply force when car is stationary.
- (h) Other controls Check operation.

PHASE 2. STARTING ENGINE

The following notes give a general procedure for starting an engine from cold, and when warm. The method may differ slightly for various makes of car; the maker's handbook should also be consulted on this subject.

Starting a very cold engine

When a car has been standing in the open in wintry conditions for some time, the oil will be cold and will have drained into the oil sump; and the engine will offer much greater resistance to being rotated than if it were warm. Therefore the following procedure should be observed:

- (1) Hand-brake Set to 'on' position.
- (2) Gear lever Put in neutral position.
- (3) Fuel supply Open main supply cock (if fitted).
- (4) Fuel pump On cars fitted with a mechanically operated fuel pump, a few strokes on the hand primer will ensure the correct level of fuel in the carburettor float chamber. This is unnecessary on electrically operated pumps.
- (5) Mixture control Set by hand operation or automatically. (See maker's instructions.)
- (6) Throttle control Set hand control or automatic 'fast idle' device. (See maker's instructions.)
- (7) Starting handle Rotate engine a few times with starting handle (if fitted).

LOCATION AND MANIPULATION OF CONTROLS 15

- | | |
|-----------------------|--|
| (8) Ignition control | Set hand-operated ignition control (if fitted) to 'retard' position. |
| (9) Ignition switch | Set to 'on' position. |
| (10) Starting handle | Rotate engine by pulling the handle up from lowest position. |
| (11) Mixture control | When the engine starts, adjust hand-operated controls (if fitted) to normal running positions as soon as possible. |
| (12) Ignition control | |

It is harmful to the engine to allow it to idle when cold. If it is intended to warm up the engine before driving the car, it should be allowed to run at 'fast idle' speed, approximately 800 to 1,000 r.p.m. The car may be driven immediately, however, without causing undue wear, provided a moderate speed is not exceeded until the correct working temperature is reached. In any case the aim is to attain the correct working temperature as quickly as possible.

Starting a warm engine

- (1) Hand-brake Set to 'on' position.
- (2) Gear lever Put in neutral position.
- (3) Fuel supply Open main supply cock (if fitted).
- (4) Accelerator Set for warm engine. (Follow maker's instructions.)
- (5) Ignition control Set hand-operated ignition control (if fitted) to 'retard' position.
- (6) Ignition switch Set to 'on' position.
- (7) Starter motor control Press button or pull knob and release it when engine starts.
- (8) Ignition control Set hand-operated control (if fitted) to normal running position.

PHASE 3. MOVING CAR FROM A STATIONARY POSITION

- (1) Driver's seat Adjust if necessary.
- (2) Driving mirrors Adjust if necessary.
- (3) Doors and Sunshine roof Check for security.
- (4) Engine Start up. (See instructions in Phase 2.)
- (5) Mirrors Use for rear view.
- (6) Signal Make the proper signal before moving.

- (7) Clutch Fully depress pedal and wait for 3 seconds.
 (8) Gear Select first gear.
 (9) Hand-brake Grip lever, releasing pawl and ratchet, but retain brake in 'on' position.
 (10) Accelerator Increase engine speed and maintain suitable power.
 (11) Clutch Allow pedal to rise until engine speed decreases slightly under load. **KEEP FEET IN THESE POSITIONS ON CLUTCH AND ACCELERATOR PEDALS.**
 (12) Hand-brake Move to 'off' position. *Car moves.*
 (13) Mirrors Use for rear view, and glance over shoulder.
 (14) Clutch and Accelerator Let clutch pedal rise carefully for the remainder of its travel, at the same time applying further pressure on the accelerator pedal as necessary.
 (15) Accelerator Regulate road speed of car by control of accelerator.

PHASE 4. STOPPING CAR UNDER NORMAL CONDITIONS

- (1) Mirrors Use for rear view.
 (2) Signal Make the proper signal.
 (3) Accelerator Remove foot.
 (4) Foot-brake Apply foot-brake and maintain pressure as necessary.
 (5) Clutch Fully depress pedal as car is coming to rest and maintain that pressure.
 (6) Hand-brake Set to 'on' position.
 (7) Gear lever Place in neutral position.
 (8) Foot-brake and clutch Remove both feet from pedals.

The driver should practise Phases 3 and 4, first on level roads, and when proficient, on 'up' gradients.

PHASE 5. GEAR CHANGING

In all gear changes, whether up to a higher gear or down to a lower gear, the double de-clutching method will be employed.

- (a) *Changing 'up'*
- (1) Prepare to change
 - (2) Clutch, Gear lever and Accelerator
 - (3) Clutch
 - (4) Clutch and Gear lever
 - (5) Clutch and Accelerator
 - (6) Clutch
 - (7) Accelerator
- Place foot on clutch pedal without pressure, and grip the gear lever at the same time.
 Fully depress clutch pedal, move gear lever to neutral and release pressure on accelerator. Three movements made simultaneously. Do not remove hands or feet from these controls.
 Let clutch in fully, whilst keeping gear in neutral and engine idling.
 Fully depress clutch pedal and move gear lever to desired gear position. Two movements made simultaneously.
 Let clutch in deliberately, but gently at end of pedal movement, and depress accelerator pedal slightly to match engine speed to the car's road speed.
 Remove foot from clutch pedal.
 Regulate road speed of car by control of accelerator pedal.
- (b) *Changing 'down'*
- (1) Prepare to change
 - (2) Clutch, Gear lever and Accelerator
 - (3) Clutch and Accelerator
 - (4) Clutch and Gear lever
- Place foot on clutch pedal without pressure, and grip the gear lever at the same time.
 Fully depress clutch pedal, move gear lever to neutral and release pressure on accelerator. Three movements made simultaneously. Do not remove hands or feet from these controls.
 Let clutch pedal rise fully, depress accelerator pedal, then release pressure on the latter. Two movements made simultaneously whilst gear lever remains in neutral.
 Fully depress clutch pedal and move gear lever to desired gear position. Two movements made simultaneously.

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- (5) Clutch and Accelerator Let clutch in deliberately, but gently at end of pedal movement, and depress accelerator.
- (6) Clutch Remove foot from clutch pedal.
- (7) Accelerator Regulate road speed of car by control of accelerator pedal.

PHASE 6. STEERING

During the driver's progress in mastering Phases 3, 4 and 5, he will have gained some experience of steering the car, but some of the elementary requirements are given below. The subject is dealt with more fully in Section 7 (page 74).

To steer a straight course

- (a) Normal position of hands on the wheel should approximate to ten minutes to two on a clock face.
- (b) Hold the wheel lightly. Aim the front of the car generally to the desired course. Do not try to sight a fixed point on the car (e.g. radiator cap) on a particular landmark ahead.
- (c) Use the minimum of effort to correct the car's natural tendency to 'wander'.
- (d) On suitable occasions practise keeping to a straight course with one hand controlling the wheel.

Minor deviations to either side on a suitable quiet road at slow speeds

- (a) Before commencing any deviation, use the mirrors and, if necessary, give appropriate hand signals.
- (b) To bear left, pull wheel down with left hand. Pause in this position and note result.
- (c) To straighten course again, pull wheel back with right hand until the car straightens course.
- (d) Repeat procedure for deviation to the right and straighten again.
- (e) Note the small effort and movement of wheel required to do this.

Turn to either side into converging quiet roads at slow speeds

- (a) Before commencing turn, use the mirrors and give the appropriate signal.
- (b) Adopt the same methods as for the minor deviations above.

THE HIGHWAY CODE

- (c) Note that greater steering wheel movement is required and consequently more effort (see Section 7, paras. 54-58).
- (d) Having turned the steering wheel sufficiently, keep it in that position until the car is entering the side road, the wheel being then gradually turned to its original position.

SECTION 3

The Highway Code

(In this Section, references to paragraphs in the Code are printed in italics. A copy of the Code is included at the back of this Manual.)

OBJECT OF SECTION

1. Every applicant for a driving licence is asked on the application form whether he has studied the Highway Code. The importance of a sound knowledge of the Code cannot be too strongly emphasised, for a driver may at any moment encounter a situation needing prompt application of any one or more of the Code's principles. Accordingly this Section is designed to assist him to learn and understand those principles. It does not, of course, supersede the Code, and must be read in conjunction with it.

ORIGIN AND PURPOSE OF THE CODE

2. Prior to 1930 there was no official publication available to road users in booklet form from which they could obtain advice and guidance on their behaviour whilst using the roads. There did exist, however, certain Acts of Parliament and Regulations which regulated and controlled vehicular traffic. Through the years drivers, especially professional drivers, have built up an unwritten standard of behaviour, based on their own experience and respect for one another's rights as road users. Road sense was something acquired by spending years on the road on some form of transport, either horse-drawn or mechanically propelled.

3. The development of the motor vehicle was quite rapid. Improvements in road layout and construction did not keep pace with this development.

4. In 1930 Parliament passed the Road Traffic Act, a far-reaching Act making provision for the regulation of traffic on roads with

special reference to motor vehicles, and requiring the Minister of Transport to prepare a 'Highway Code' containing directions for the guidance of all road users.

5. The present Highway Code, which followed three earlier editions, was prepared by the Minister in consultation with the Committee on Road Safety, the members of which represent various Government Departments, the Police, local government and road users' associations, the Royal Society for the Prevention of Accidents and other organisations.

6. The Code is the basis for all road safety propaganda, which aims to secure universal recognition of the value of the Code as a standard of road conduct for all drivers, cyclists and pedestrians.

7. The Highway Code is not of itself law, and failure to comply with any of its provisions will not of itself render a road user liable to prosecution. It must be remembered however that when, for example, a motorist drives so negligently as to offend against the Code, he may at the same time render himself liable to civil or criminal proceedings. Section 45(4) of the Road Traffic Act, 1930, provides that: 'A failure on the part of any person to observe any provision of the highway code shall not of itself render that person liable to criminal proceedings of any kind, but any such failure may in any proceedings (whether civil or criminal, and including proceedings for an offence under this Act) be relied upon by any party to the proceedings as tending to establish, or to negative any liability which is in question in those proceedings.' This subsection, which appears on page 3 of the Code, clearly shows that the Code is not intended simply to give good advice, but also to set a standard of behaviour; and it follows that a road user's conduct may be examined in a Court of Law in relation to those provisions.

8. There is a Foreword to the Code by the Minister of Transport and Civil Aviation. The driver should read it and appreciate that it not only introduces the Code to all road users, but is an appeal by the Minister to all road users to 'play the game' and to teach others to do likewise.

STUDY OF THE CODE

9. The method the driver adopts to learn the Code is really a matter for himself. Whatever the method he should be able to answer any question put to him either in problem form, whereby

his knowledge and reasoning power will be tested, or in question form asking what the Code advises on a certain subject.

10. To memorise the Code, it is suggested that the driver should first get a broad mind-picture of its general layout. For this purpose the chart below may be of assistance. He can then apply himself to learning the paragraphs under each sub-heading.

GENERAL SURVEY OF HIGHWAY CODE

PART 1

THE ROAD USER ON FOOT

Paragraph Numbers	To whom addressed	Sub-headings under each Section
1-15	Pedestrians	Walking along. Crossing the road. Getting on or off public vehicles.

PART 2

THE ROAD USER ON WHEELS

16-46	All drivers and riders	Driving along. The safety of pedestrians. Signals. Overtaking. Road junctions. Railway level crossings. Turning corners. Stopping. Extra rules.
47-52	Pedal cyclists	Extra rules: Traffic behind you. Driving along. Night driving. Direction indicators. Reversing. Parking and stopping.
53-66	Motor drivers Motor cyclists Riders of motor-assisted pedal cycles	

PART 3

THE ROAD USER AND ANIMALS

Paragraph Numbers	To whom addressed	Sub-headings under each Section
67-71	(In general, paras. 16-46 also apply to persons in charge of horses.)	

Pages	APPENDIX TO CODE
14-19	Drivers and riders Signals to be given to indicate their own intentions.
20-21	Road users generally Signals given by Constables regulating traffic.
22-25	Traffic signs.
26	Traffic light signals.
27-32	THE LAW'S DEMANDS

11. Inexperienced drivers may not fully appreciate the meaning and intention of some of the advice given in the Code. It is not proposed to discuss every paragraph, but it is hoped in the remainder of this Section to assist by drawing attention to some of the more important matters.

12. Paras. 16, 53 and 54 in combination advise drivers, when about to move off, reverse, change course, overtake, turn or stop, to make sure that their movements will not endanger or inconvenience other road users. To that end, the driver should look to the rear when about to move from a stationary position (or even if opening his door) or look in his mirror if his vehicle is in motion. These precautions are essential BEFORE the intended movement is made and BEFORE the appropriate signal is given.

13. Para. 17 advises drivers to keep well to the left unless about to overtake or turn right. This advice must be interpreted according to prevailing circumstances. The distance a driver keeps between the nearside of his vehicle and the nearside kerb (or grass verge) must vary according to several factors, such as:

- (a) The number of pedestrians using the nearside footway, and the likelihood of their stepping into the roadway without warning.
- (b) The class of vehicle being driven.
- (c) The camber of the road.
- (d) The width of the road and the amount of traffic using it.

- (e) The speed of the vehicle being driven.
- (f) The presence of vehicles parked on the nearside and the space between them.
- (g) The possibility of pedestrians stepping out from behind any stationary vehicle.

The driver should always keep a sensible safety margin on his nearside, and at the same time avoid causing obstruction to overtaking or other traffic.

14. Paras. 22 and 23 and the relevant item on pages 30 and 31 of the Code deal with the driver's responsibilities at pedestrian crossings. As to the pedestrian's right and obligations, see pages 5 and 28 of the Code.

15. Uncontrolled crossings, which are those not controlled by Police or by light signals, are marked by black and white stripes, studs, and beacons with internally flashing lights. At these crossings, pedestrians have the right of way unless a police officer is controlling traffic there temporarily. At a crossing controlled by Police or by light signals, drivers must conform to the signal given and should also give way to pedestrians already on the crossing when the signal to move is given.

A double line of studs indicates the limit of the no-waiting area on the approach side of a crossing. Unless to give precedence to pedestrians, to prevent an accident, or in circumstances beyond their control, drivers must not allow their vehicles to remain stationary between these studs and the crossing.

16. Para. 24 draws attention to the danger arising from the thoughtless action of pedestrians who come suddenly into a driver's view from beyond stationary vehicles, buses in particular. The good driver anticipates such actions and is always on the alert for them.

17. Para. 26 tells the driver to be prepared to meet pedestrians and led animals coming towards him on his side of the road. He should slow down and give them plenty of room. The pedestrian or the person in charge of the animal is in fact complying with para. 3 of the Code (see also para. 70 in this connection).

18. The advice given in para. 27 about giving signals is concise and needs to be borne in mind constantly. Failure to give a proper signal in GOOD TIME misleads other road users and is so often the

source of accidents and 'near-misses'. Signals are dealt with fully in Section 5 of this Manual.

19. *Paras. 28-33* deal with 'overtaking'. When badly carried out, overtaking is likely to cause an accident. Safe overtaking is so much a part of good driving that some stress is laid on the subject here. Overtaking is a manoeuvre needing planning, for the right place and moment must be chosen; if there is any doubt, don't attempt to overtake (see *para. 28*). Usually overtake on the right, but there are exceptions (see *para. 30*). Overtaking in roundabouts is not recommended. Attempting to overtake at the wrong place is a common fault (see *para. 29* which lays down when not to overtake and ends with the best possible advice—'IF IN DOUBT —HOLD BACK').

20. Special attention to the advice on 'Turning corners' (*paras. 41-45*) is needed at places where driving is made more difficult by the physical features of the road. Over 12,000 personal injury accidents occur every year at road junctions in the Metropolitan Police District. A system of approach as described in Section 4 of this Manual puts into practice the advice in these paragraphs and ensures freedom from accidents.

21. *Para. 56* advises drivers not to drive nose to tail when on the open road. The question of distance between vehicles proceeding in a line of traffic is indeed important at all times. The tendency of the average driver is to keep too close to the vehicle in front. The safe distance varies with the circumstances, e.g. speed, condition of road surface, efficiency of brakes, and the reaction time-lag of the drivers. See Section 7 of this Manual where the subject is dealt with at greater length.

22. The sub-heading 'Night Driving' embraces *paras. 59-61*, and should be read in conjunction with *paras. 18 and 19*. In really well-lighted areas it is easy to drive without recourse to the use of headlamps. The greatest difficulty occurs when the street lighting is poor and pools of shadow obscure other road users. In such circumstances headlights should be used, full on if that will not cause danger to other traffic, or otherwise, dipped. If full headlights cannot be used, speed must be reduced. In short, the interpretation of *paras. 59-61* is—use whatever lighting is adequate for you to see well ahead, but in so doing, do not inconvenience other road users.

WARNING SIGNS
SURMOUNTED BY
RED TRIANGLE

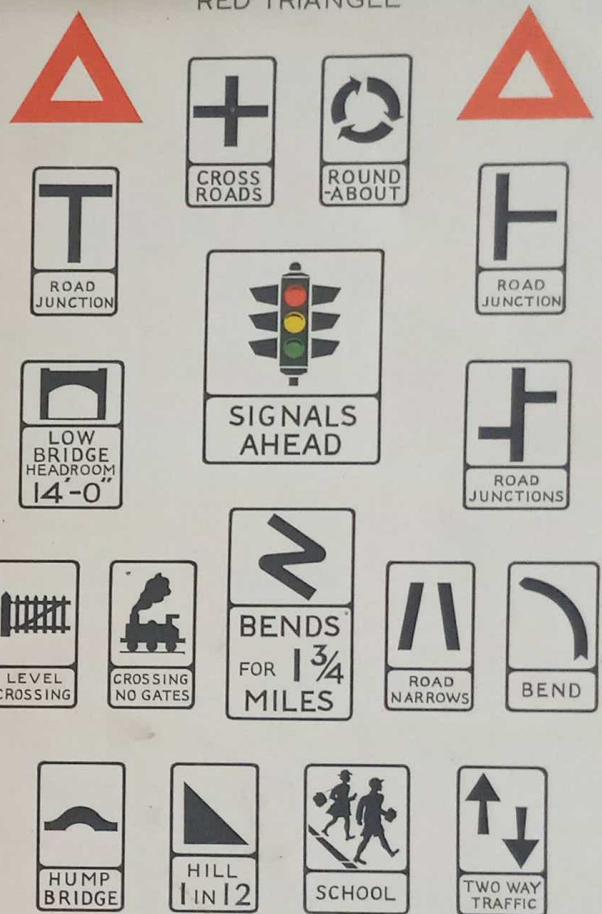


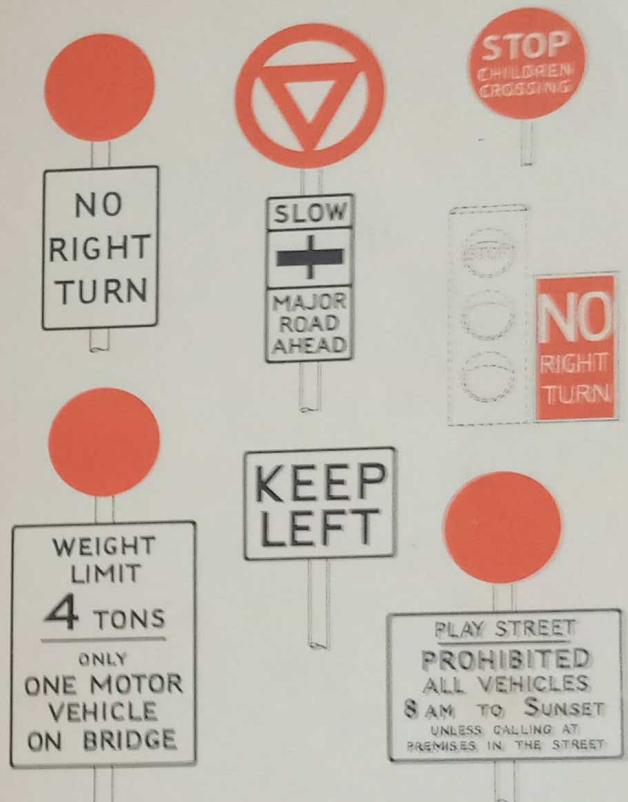
PLATE 2

SIGNS WHICH MUST BE OBSERVED

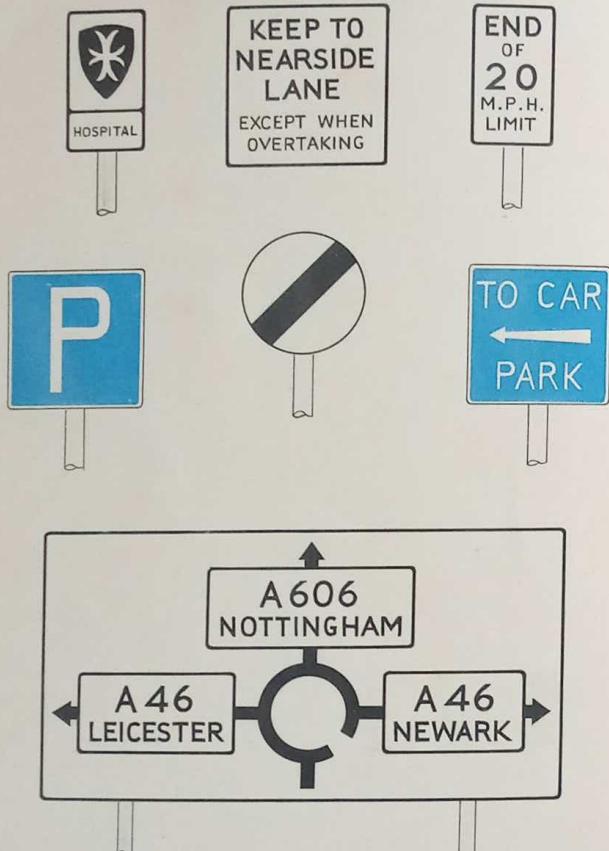


PLATE 3

SIGNS WHICH MUST BE OBSERVED



INFORMATIVE SIGNS



THE HIGHWAY CODE

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23. Note that the advice in para. 60, advising drivers to dip headlights when meeting other vehicles and cyclists whenever road and traffic conditions allow this to be done, should always be followed when driving round a left-hand bend.

24. Reversing is dealt with in paras. 63 and 64. Far too many accidents occur during reversing, some with fatal results to pedestrians. Moving a vehicle into position by reversing, especially in a confined space, is a difficult manoeuvre and special care is required. Make sure there are no children in the 'blind area' behind the vehicle (para. 53). Although the advice in para. 64 to get help when reversing is addressed to the drivers of large vehicles, it should also be borne in mind by car drivers. It should indeed always be followed when reversing in a yard or other confined space.

25. The advice in para. 65 ('Parking and Stopping') must be universally respected by drivers. It is up to every driver, when parking his vehicle, to choose a position where it is neither dangerous nor obstructive to other road users.

26. The Appendix to the Code includes illustrations of '1. Drivers and Riders Signals' (dealt with later in this Manual—Section 5), '2. Police Signals' (which are self-explanatory), '3. Traffic Signs' and '4. Traffic Light Signals'.

27. Road signs provided by Highway Authorities to guide, assist and direct traffic have been erected on a uniform system, following recommendations of two Departmental Committees (1933 and 1944), which included representatives from various road users' organisations, as well as from the Police. The system has been built up in accordance with standard principles laid down in Regulations and Directions of the Minister of Transport and Civil Aviation. These specify the size (including dimensions of the lettering, symbols, etc.) colour, design, positions (including height), and other requirements.

28. A selection of illustrations of signs in more general use will be found between pages 24-25. Drivers should be thoroughly conversant with their form and meaning, although it is a general principle that the significance of any sign must be clear at a glance.

29. Road signs can be divided into groups as follows:

- (a) Warning signs
(Plate 1)

These are recognised by the red triangle surmounting the sign, with its apex uppermost.

- (b) Signs which must be observed (Plates 2 and 3) These incorporate a red disc or red circle.
- (c) Informative signs (Plate 4) These do not bear either triangle or circle, and the colour red is rarely, if ever, used.
- (d) Pedestrian crossing signs Yellow beacons, with internally flashing lights and the carriageway marked with studs and black and white stripes.
- (e) Automatic traffic signals Permanent installations displaying lights operating through a sequence of red—red amber—green—amber—red; and temporary installations in which the amber is omitted.
- (f) Carriageway markings Yellow or white lines. Studs (with or without reflectors). The words 'Slow', 'Look right' or 'Look left', etc.

30. Warning signs and carriageway markings are placed at the approaches to places where more than ordinary care is called for. A failure to heed them, while not specifically an offence, may render a driver liable to prosecution for careless or even dangerous driving. On the other hand, there is a legal obligation to comply with the signs shown in Plates 2 and 3 and with automatic traffic signals, and to heed the markings which indicate a pedestrian crossing in view of a driver's duty to give way to pedestrians using it.

31. The 'Halt—Major Road Ahead' and 'Slow—Major Road Ahead' signs, which are included in Plates 2 and 3 respectively, need special mention. They are in fact in two categories for they warn of the existence of danger points beyond them and, at the same time, they are signs which, as mentioned in the Code, must be observed. It will be seen that they are surmounted by a red circle and a red triangle, the latter usually having its apex downwards.

32. Informative signs, as the name implies, give information for the guidance of road users, and since many of them relate to road

junctions or cross-roads, they quite often serve as a warning of approach to a hazard.

33. The significance of white or yellow lines is worth some explanation. The continuous line is laid down at places where potential danger exists, or to aid traffic to follow a particular course; in short, to segregate opposing lines of traffic. The continuous line should not be crossed, unless the driver can see the road well ahead and knows that it is clear.

34. On wide arterial-type roads the broken line is used to divide the road into three, and sometimes four, lanes. A sign advises road users to keep to the left or nearside lane except when overtaking. Great care should be exercised when using the centre lane on three-lane roads, especially on approaching slight up-gradients when the view ahead may be reduced. Many drivers tend to use the centre lane automatically for overtaking, without first making sure that approaching traffic is not doing the same thing.

35. Pages 27 to 32 of the Code are devoted to a brief statement of the law's requirements affecting drivers of vehicles as well as cyclists and pedestrians. They should be studied by every driver, for a knowledge of what the law requires him to do is just as important as a knowledge of what he should do without compulsion to ensure that his driving is above criticism.

36. The Code is addressed to all classes of road user, and the car driver, who will at times be a pedestrian, a cyclist, or a person in charge of an animal, should not ignore the parts of the Code which affect those classes.

37. It is clearly the duty of all road users to recognise and respect the Highway Code. If they do so, not only will the roads be safer for everyone, but freedom of movement about the roads will improve. Obstruction, delays and traffic jams are made worse by the thoughtless behaviour of many road users, resulting in bad tempers and frayed nerves, with the consequent loss of respect of road users for the rights of one another.

SECTION 4

The System of Car Control

1. The System of Car Control is the basis upon which the whole technique of good driving will be built. It must have a solid foundation, and any weakness in its structure, either theoretical or practical, will be evident in a driver's performance.

2. The object of this Section is to assist the driver to acquire the best possible KNOWLEDGE of the System: he must remember and understand its principles, and this is a matter for mental application.

3. The proper application of the System requires skill which can only be acquired by practice.

4. The System of Car Control may be defined as:

A SYSTEM OR DRILL, EACH FEATURE OF WHICH IS TO BE CONSIDERED, IN SEQUENCE, BY THE DRIVER AT THE APPROACH TO ANY HAZARD.

5. A HAZARD may be any physical feature, such as a cross-road, roundabout system, road junction, bend or hill-crest, or any potentially dangerous traffic situation developing ahead.

6. The definition requires a driver to CONSIDER EACH FEATURE IN SEQUENCE at the APPROACH to a hazard. These features, which are shown in correct order in the table below, necessitate sound appreciation of the road conditions and correct manipulation of the controls to ensure the safe passage of the vehicle.

TABLE SHOWING NAME AND OBJECT OF EACH FEATURE OF THE SYSTEM OF CAR CONTROL

Name	Object
(1) COURSE SELECTED. First use the mirrors and, if necessary, give the appropriate signal	To put the car into its correct position for negotiating the hazard.
(2) MIRRORS AND BRAKES. Before braking, again use the mirrors and if necessary, give slow-down signal.	To ensure safe speed of approach to, and at, the hazard.

THE SYSTEM OF CAR CONTROL

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Name

Object

(3) GEAR To select the correct gear for the speed decided upon at the second feature above.

(4) MIRRORS AND SIGNALS. Again use the mirrors and, if necessary, give a directional signal.

(5) HORN* To warn others of your presence. (They may be within your view but unaware of your presence; or they may be out of your view.)

(6†) NORMAL ACCELERATION AT POINT A.1 OR A.2 IF SAFE (See FIGURE 1) To leave the hazard safely having regard to road surface and traffic conditions.

7. By the correct application of this System, the car will at all times be:

- (a) in the right place on the road;
- (b) travelling at the right speed; and
- (c) with the right gear engaged.

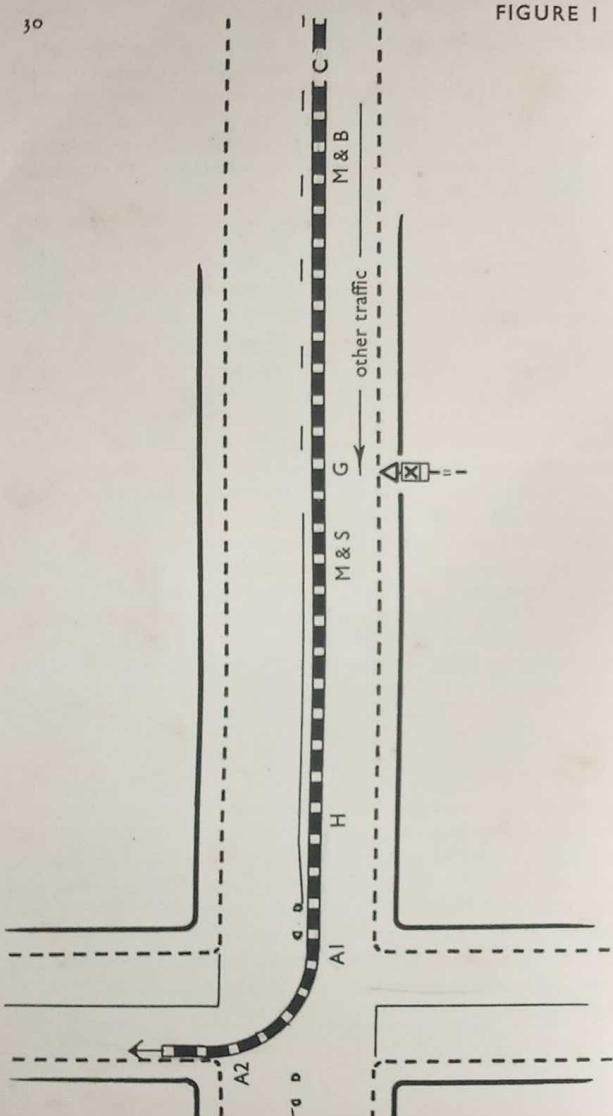
8. The application of the System can be illustrated with a diagram depicting any kind of hazard; but a cross-road is used in this case (see FIGURE 1) because it obviously presents the greatest potential danger. The most difficult manoeuvre at a cross-road is the right-hand turn, since an encounter with other traffic coming from any direction is possible. The driver should therefore study FIGURE 1 (which is not drawn to scale), and imagine he is driving from the right of the figure and turning right at the cross-road. The district is a built up area, so speed of approach will not exceed 30 m.p.h. All six features of the System are shown on the figure and each one is explained in the following paragraphs.

9. Feature 1. This is shown with a line commencing at the point marked 'C' and extending forward and round the corner to the driver's right. 'C' stands for 'Course Selected'. The distance of this point from the junction is purely diagrammatic; it cannot be laid down in so many feet or yards as it must vary, mainly according to the speed of approach. The line shows the course to be

* Use of the horn in built up areas at night (11.30 p.m. to 7 a.m.) is prohibited by Regulation.

† This feature applies only to hazards at which the vehicle alters course.

FIGURE I



THE SYSTEM OF CAR CONTROL

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taken by the driver for this right-hand turn (see Highway Code, para. 41); it is up to, but not over, the crown of the road. Such a course will allow following traffic to overtake on the nearside (see Highway Code, para. 30), and also give drivers of approaching traffic an indication, apart from hand signals, of the intention to turn right. In this feature the term 'COURSE SELECTED' should be understood to mean:

- see and note the position of the road into which you intend to turn;
- use the mirrors;
- give turn right signal if necessary and if safe to alter course;
- steer on to the course selected.

10. Feature 2. This deals with the speed of approach to the hazard. It commences at the point marked 'M and B' (*i.e.*, Mirrors and Brakes), the position of which is again purely diagrammatic. The driver considers his speed, basing his judgment of a suitable speed for the hazard on (a) the degree of turn he will have to make at the junction, (b) the probable or obvious condition of the road surface at the junction, and (c) his view of other road users likely to be encountered there. If he considers his speed too fast, he will reduce it by the application of this second feature, the term 'MIRRORS AND BRAKES' being understood to mean:

- use the mirrors;
- give slow down signals for following or approaching traffic;
- apply foot-brake as necessary.

11. In the application of this feature the driver should aim to carry out all his normal braking for the hazard whilst the vehicle is on a straight course; any subsequent braking should only be necessary because of some unforeseen change in traffic conditions.

12. Feature 3 is shown at the point marked 'G' where the driver selects the gear which is appropriate to the road speed he deemed to be suitable at 'M and B'. Here again, the position of 'G' on the figure is approximate, but a learner driver should make the gear change about 90 feet from the hazard, or when his vehicle is level with the road sign giving warning of approach to the hazard.

13. Having engaged the lower gear, the driver will regulate the speed by correct manipulation of the accelerator pedal. Further speed may be lost if necessary; but it is rarely necessary to increase

speed (this is, in fact, a common error, often creating the need for further application of brakes).

14. The driver's attention is drawn to the situation as it now stands—the car is in the right position, travelling at the right speed, with the right gear engaged.

15. Feature 4 is shown in FIGURE 1 at 'M and S' (i.e. Mirrors and Signals). Note the position of this term in relation to 'G'; it follows *immediately* after. The absence of an interval between the two guards against the common fault of giving late signals. The term 'M and S' here means:

- (a) use the mirrors;
- (b) give turn right signals (hand and traffic indicator).

16. Feature 5 is shown at the point marked 'H'. At this point, the driver must consider whether to sound the horn. No hard and fast rule is laid down that it should, or should not, be sounded. The driver should be guided entirely by the circumstances, keeping in mind that use of the horn in no way relieves him of the responsibility of taking every other safety precaution.

17. Feature 6. This applies only to hazards which cause the vehicle to pass through a curved path. Note that there are two positions on the curve, 'A.1' at the beginning and 'A.2' at the end. When the driver gets near enough to the junction, he should recognise the condition of the road surface and consider how his tyres will adhere to it. If the surface is good, *and if it is safe to proceed* (see Highway Code, para 36), he may apply a normal amount of acceleration from the 'A.1' position, so accelerating safely round the curve and out of the hazard.

18. If, however, the road surface is bad for tyre adhesion, *and again, if it is safe to proceed*, he will let the car travel from 'A.1' to 'A.2' under the influence of the engine just pulling the weight of the vehicle, not increasing road speed appreciably; and on reaching 'A.2', when the rear wheels are again following the front ones in a straight path, the normal amount of acceleration may be applied to increase speed.

19. In his early efforts to apply the System of Car Control, the driver will find that a decided effort of concentration is required to get his brain to work in conjunction with, and as fast as, the speed of the vehicle; therefore, initial practice should be done at quite slow speeds.

20. A perfect mind picture of all the six features of the System must be acquired as early as possible in the training period, so that, as each feature is considered and dealt with the next will readily come to mind. Any hesitation or delay caused by wondering which feature comes next will be detrimental to driving technique, because every second of delay represents ground covered by the car. It is wrong to dwell too long on any one feature, otherwise the remaining features cannot have proper consideration.

21. Let us take two examples (FIGURES 2 and 3) showing how speed of approach and the braking distance can influence the timing of the whole System:

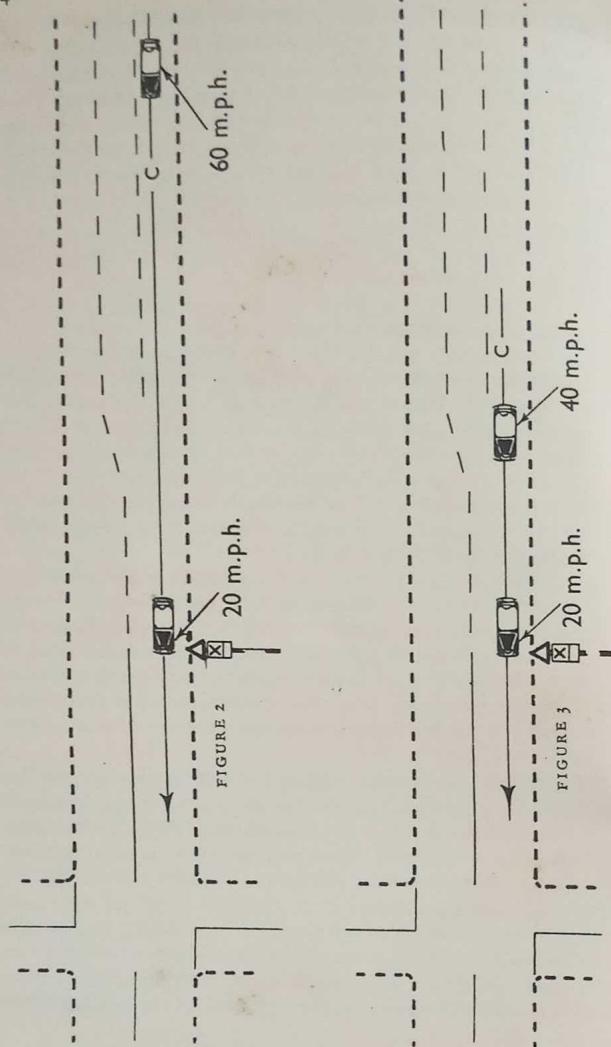
First Example. The driver of a car approaching a cross-road at 60 m.p.h. must see the hazard in good time. It is obvious to him at this stage that he cannot negotiate the cross-road at this speed, and he should assess what speed is suitable. He quickly decides upon the course he intends to follow and applies Feature 2 ('Mirrors and Brakes') deliberately. Braking, being a hazardous operation at this speed, must be spread over a long distance of road to reduce speed to, say, 20 m.p.h., and so we find that the application of the whole System of Car Control will cover a considerable length of road, owing entirely to the braking distance. (See FIGURE 2.)

Second Example. The same driver approaches the same cross-road at 40 m.p.h. As before, he must see the hazard in good time, but he can select his course when nearer to it, because of his lower speed. For the same reason, he commences to brake at a point nearer to the hazard than if he had been travelling at 60 m.p.h., but he will arrive at a speed of 20 m.p.h. at the same distance from the hazard as in the previous example. (See FIGURE 3.)

22. It will be seen from FIGURES 2 and 3 that speed of approach and braking distance must decide the point at which the System is commenced. The result is the same in both cases, for the gear change point is exactly the same and there are time and distance for the remaining features of the System to follow accordingly.

23. Road conditions do not always demand alteration of course, speed or gear; even so, every feature is individually considered. For example, a driver approaches a minor cross-road as he travels at 40 m.p.h. on a main trunk road in flat open country. He observes the cross-road well ahead, and the main road and both converging

FIGURES 2 and 3



THE SYSTEM OF CAR CONTROL

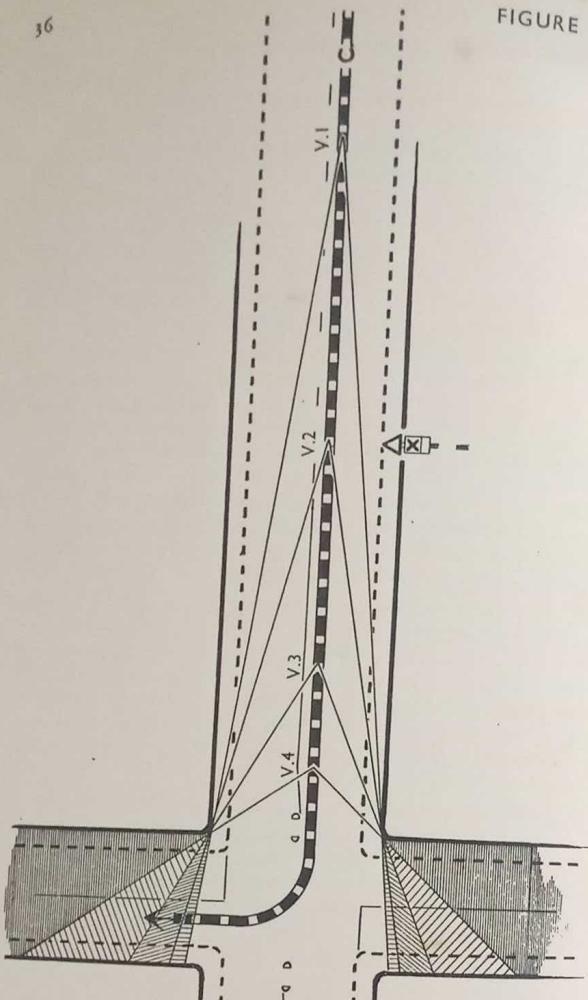
roads are absolutely clear. He considers his existing course satisfactory. His speed (40 m.p.h.) is quite safe, there is no following traffic and there is no need to brake. Still the roads remain quite clear of other traffic and the gear ('top') is quite suitable for the speed and prevailing conditions. He uses the mirrors again; there is still no following traffic and there is no need for any signals as his intention is to go straight on. The converging roads remain quite clear with perfect visibility, and there is thus no need to sound the horn. He passes over the cross-road at 40 m.p.h. with perfect safety. In this example the driver has considered every feature of the System, and, being satisfied with the conditions ahead of him at each stage, he makes no change.

24. Road observation by the driver is dealt with in Section 6 of this Manual, but it must be mentioned at this point because it is so closely allied to the System of Car Control. Only by perfect observation will the driver become acquainted with the traffic conditions prevailing as he approaches a hazard and when he reaches it. Refer to FIGURE 4, which shows four points, V.1, 2, 3 and 4, spaced along the road from the beginning of the System up to the hazard. Straight lines drawn from each point to the built up corners, and then extending across the converging roads, show how the driver's view into the converging roads develops.

25. At V.1, when he selects his course (which is to turn to the right), his view is negligible. From V.1 to V.3 the view improves very little, which shows how necessary it is to approach the hazard with special care. From V.4 to the actual cross-road the view round the corner begins to open up and rapidly improves; and as this is happening the driver should make his decision to increase speed, slow down or stop, according to the position and behaviour of other road users.

26. Once the driver has learned to apply the System of Car Control on the approach to each hazard, he should persevere and practice it continually. He will find that it will become almost instinctive, and that it is in conformity with Highway Code advice. Furthermore, it will be the foundation upon which the finer points of driving can be built.

FIGURE 4



SECTION 5

Drivers' Signals

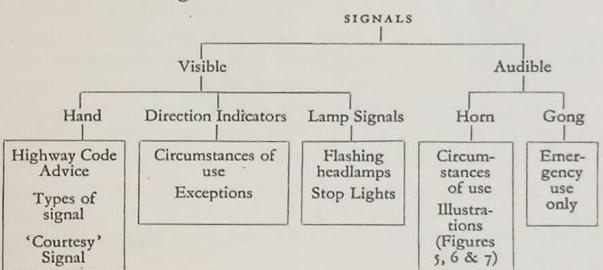
OBJECT OF SECTION

1. Some reference has already been made to the subject of signals in the earlier Sections of this Manual. The object of this Section is to improve the driver's knowledge of the signals to be given by himself and by other classes of road users.

2. 'Signs and signals are the language of the road. To ensure the safety of yourself and others, master this language.' The Highway Code, from which this quotation is taken, impresses on drivers the importance of giving correct signals clearly and in GOOD TIME.

3. If every road user, in a spirit of consideration for others, made a consistent effort to perfect his signalling technique as set out in the Highway Code, many accidents would be avoided. Every driver can do a great deal to educate other road users by giving signals which are properly timed and which cannot fail to be understood and appreciated.

4. The 'family tree' below shows how the subject is divided under certain main headings:



HAND SIGNALS BY DRIVERS

5. Drivers' signals as illustrated on pages 14-19 of the Code are INFORMATIVE. They merely convey notice of an intention to carry out a manoeuvre for which the driver giving the signal must take full responsibility.

6. Four kinds of signal are illustrated:

- (a) 'I am going to move out or turn to my right.' The palm of the hand faces the front, fingers extended and close together (the arm remaining outside the car for not less than three seconds).
- (b) 'I am going to turn to my left.' The arm is slowly rotated in an anti-clockwise direction with a flexed elbow, the palm of the hand facing the front.
- (c) 'I am ready to be overtaken.' The extended arm is lowered, palm facing the front, and then moved forward and backward.
- (d) 'I am going to slow down or stop.' The palm of the hand, with fingers extended and close together, faces the ground. The arm is slowly lowered and raised several times.

7. In each case, the arm should be extended as far as possible, so that drivers and others for whose information the signal is intended will get a clear indication of what course the driver is proposing to take. The signal must be given in good time and must continue long enough for other persons to realise its meaning and to react accordingly, for otherwise it is useless and may indeed result in danger to them as well as to the driver himself. Having signalled, it is still necessary, before carrying out the intended manœuvre, to make sure that it is safe to do so.

8. A driver must make habitual use of his mirrors as a complementary action to his use of signals. This is emphasised in the System of Car Control dealt with in Section 4. In that system, signals have to be considered on three occasions for three distinct changes in running conditions, i.e., 'Course selected', 'Mirrors and Brakes' and 'Mirrors and Signals'.

9. General advice as to circumstances demanding the use of signals by car drivers will be found in paras. 16, 22, 27, 41, 42, 45, 46, and 54 of the Highway Code. Of these, three need special mention, i.e.:

Para. 27 is the basis of all advice on this subject.

Para. 22 read in conjunction with advice on page 16 of the Code, advises the use of the 'Slow down or Stop' signal when giving way to pedestrians at a zebra-marked crossing. It is an indication not only to drivers behind but also to those approaching the crossing from the opposite direction.

Para. 45 reads 'Let the police officer controlling traffic know clearly by your signal which way you want to go'. Signals for this purpose are shown on page 18 of the Code, the first indicating an intention to go straight on, the second to turn left, and the third to turn right, the latter being the orthodox right-turn signal. Occasions for using them as information to traffic pointsmen may not be frequent, since correct positioning of a vehicle and normal signals by hand or by direction indicator will usually suffice to show a driver's intention. Nevertheless, the hand signals on page 18 of the Code should be borne in mind and used as necessary.

10. It is appropriate here to include mention of the 'Courtesy Signal' to be given by a driver as an acknowledgment of a courteous action towards him by another road user. The signal need only be the raising of the left hand towards the forehead; it should not be overdone, nor should it be neglected, for its general use can do much to promote good road manners.

11. 'Do not rely on signals to go ahead given by unauthorised persons' is the advice in *para. 38* of the Code. Statutory power to regulate traffic is vested only in police officers. Signals by uniformed officials of the motoring organisations should, however, be observed. Don't accept a signal to proceed by any other person without satisfying yourself that it is safe to go on; but a signal to stop should be treated with due respect in the interests of safety, as for instance when such a signal is given by someone in charge of animals (*para. 26* of the Code).

12. The expert driver will not only give exemplary hand signals himself, but will also know the signals to be given by other road users (see illustrations on pages 14-19 of the Code).

DIRECTION INDICATORS

13. Both the semaphore and flashing types of indicator are authorised. These devices have a more restricted use than hand signals for they can only be used to indicate a driver's intention to turn or deviate to left or right. For such purposes, they can be used in place of hand signals. Nevertheless, police drivers will normally use them to supplement, and not as substitutes for, hand signals.

14. Variations will be necessary in the following situations:

- (1) when negotiating a roundabout;

- (2) on reaching a major road, the approach to which is marked by a 'Halt' sign;
- (3) at a red traffic signal, when the car will have to remain stationary for an appreciable time before turning left or right.

15. For the purpose of the first of these variations, liken a roundabout to a clock face, and let the point of entry be at 6 o'clock and the point of departure 12 noon or 3 o'clock. In either case, half or more of the roundabout must be traversed, during which the hands are needed to control the steering (see FIGURE 5). The System of Car Control will be applied at the approach to the roundabout. At the point 'M and S', hand and direction indicator signals will be omitted, if conditions are normal. The roundabout will be entered and the correct position adopted (see figure). In each instance, when the car reaches the point marked 'S(t)', the nearside direction indicator will be used, which means that it will be visible during the last 90 degrees of the car's passage in the actual roundabout. This procedure does not apply when taking the first road on the left out of a roundabout, in which case the procedure is exactly the same as when making an ordinary left turn at any road junction.

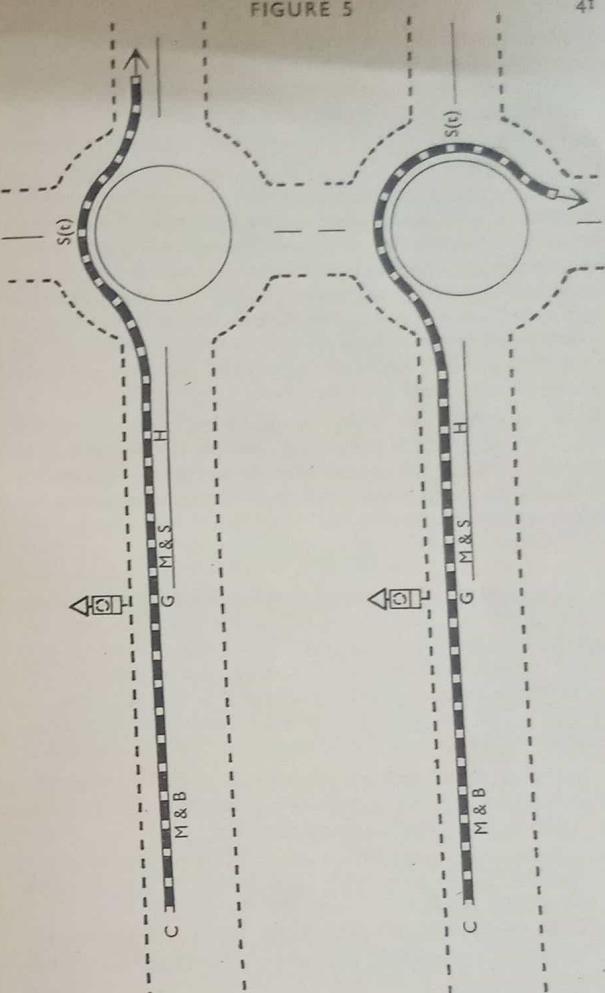
16. The second and third variations relate to an approach to a road junction where a definite stop must be made to comply with a 'Halt' sign or a red traffic signal. The method of the approach will be quite normal until the 'M and S' feature of the System is considered; here signals showing an intention to deviate to left or right will be omitted, but, as the car is brought to rest at the normal stopping place, the appropriate direction indicator will be used.

17. A common fault is that of leaving indicators in operation long after the turning movement has been completed. This is misleading to others and the Code (para. 62) emphasises that drivers should make sure that the signal is cancelled immediately after use.

LAMP SIGNALS

18. The third form of visible signalling is that of switching the headlamps on and off during the hours of darkness. This is an excellent means of giving warning of approach at a road junction or to a driver ahead before overtaking him. To use this form

FIGURE 5



of signalling effectively, the driver must be able to locate the head-lamp and dipper switches without fumbling. The headlamps must be flashed on and off in good time before reaching the junction or the vehicle to be overtaken. Do not flash excessively or in the face of oncoming traffic, in case dazzle or reflection causes danger to other road users.

19. The stop light fitted at the rear of a vehicle and operating in conjunction with the foot-brake pedal, is a useful form of lamp signal, provided vehicles are not travelling so close that it is out of the view of the driver behind. It is not a substitute for the hand signal indicating an intention to slow down or stop. Unlike the hand signal, it does not give immediate indication of the intention to slow down or stop because the light switch is not actuated until some pressure has been applied to the foot-brake pedal, by which time some deceleration has taken place.

20. Before leaving this subject of signals the driver will be well advised to link together in his mind 'Mirrors and Signals'. Make this a habit and it will ensure that the proximity of following traffic will always be known and that the necessary signals will always be properly given.

AUDIBLE SIGNALS

21. The second broad category of signals embraces those which are audible. These are given by sounding the horn and can conveniently be termed 'warning notes'. The gong, which may only be used on police vehicles, ambulances and fire brigade vehicles, is an emergency warning device, and as such is only to be used on occasions of real emergency; even then its use must not be relied on entirely to prevent collisions at cross-roads and similar hazards.

22. The horn* should only be sounded when it is really necessary. No hard-and-fast rule can be laid down, but there are certain occasions when the use of the horn is justified, thus:

- (a) to attract the attention of another road user who is obviously vulnerable, despite all safety precautions reasonably taken by the car driver;
- (b) when approaching a hazard where view is extremely poor, or prior to overtaking after every other safety precaution has been taken.

* Use of the horn (a) in built up areas at night (11.30 p.m. to 7 a.m.) and (b) on a stationary vehicle is prohibited by Regulation.

23. In cases under (a) the horn note is necessary to draw the attention of road users to impending danger, and to get them to co-operate with the car driver to avoid the possibility of an accident (pedestrians, children and cyclists are usually involved).

24. The circumstances in (b) are not quite so obvious; indeed opinions differ a great deal. What, after all, is the reason for sounding the horn after every reasonable safety precaution has been taken? Surely it is to warn of your presence another road user who is not within your view or who, even though visible to you, may be unaware of your approach, so that, if he has not already done so, he may take the necessary safety precautions himself.

25. A driver is likely to encounter other road users in these circumstances at every road junction, cross-road, or factory or farm entrance, or whenever he overtakes another vehicle, but it is not suggested that use of the horn is necessary on every such occasion.

26. The driver must realise that experience, intuition, the need for a warning, and the possibility of adopting an alternative driving plan to avoid collision with a thoughtless road user, must be the considerations upon which he must decide to sound, or not to sound, the horn.

27. He will find that, in heavy traffic, occasions for using the horn are rare, primarily because speeds are moderate and other precautions can be taken quickly. In light or medium traffic in built up areas, the need for warning notes will become more frequent, and good judgment coupled with restraint will be necessary to avoid excessive use of the horn. On journeys on unrestricted main roads, where average speeds will be much higher, warning of approach at road junctions will be recognised more easily as a necessity. A similar judgment should prevail on minor country roads at the approaches to blind bends, farm entrances, etc.

28. As a general rule the horn button fitted centrally on the steering wheel should be operated with the left hand. Where twin-note horns are fitted, the soft note should be used for town driving and the loud for country driving. As a safety precaution when travelling at speed, the hand should not be taken off the steering wheel to operate the horn button, but should slide along a convenient spoke of the wheel, using the thumb to operate the button.

ROADCRAFT: SECTION 5

29. Horns should not be sounded in an aggressive or demanding manner, but always courteously, giving plenty of time for other road users to react. For example, the driver who gets very close to a vehicle he is about to overtake at speed, and then sounds his horn several times gives the overtaken driver a shock and possibly the impression that the overtaking driver is thrusting and aggressive. Such behaviour is detrimental to the spirit of good fellowship on the road.

30. The horn note should be confined, as far as possible, to one note, either short or long, according to the traffic conditions and the type of road user for whom it is sounded.

31. FIGURE 6 shows some common occasions for the use of the short note. The driver should imagine he is driving from the left of the figure on the course shown; each cross adjacent to the line represents a short horn note given to warn the road user being overtaken and passed.

32. FIGURE 7 shows two occasions for the use of the long horn note. The driver should imagine he is driving from the left of the figure on an unrestricted road at a fairly high speed, and ahead he can see a heavy lorry proceeding steadily on the nearside. Having satisfied himself that it is safe to do so, he will prepare to overtake the lorry and when about three car lengths from the rear of it, he will give a long note of warning, shown on the figure by a line marked 'Correct'. This note is correct for three reasons: (a) there will be little doubt that it will be heard by the lorry driver, (b) he will have time to react, and (c) it will assist him to judge the overtaking vehicle's speed and position. Early and late shorter notes are also illustrated; they are obviously ineffective.

33. Warnings to drivers of vehicles about to be overtaken should not be given automatically, but the following points should be taken into account on such occasions:

- Can the overtaken driver be given plenty of room in case he should deviate slightly?
- Will unexpected overtaking at speed be likely to disturb him?
- Is there any possibility of his deviating without warning, e.g., changing course to enter a garage or other premises?

34. FIGURE 7 also illustrates the long note sounded at the approach to a minor cross-road when view into the converging

FIGURES 6 and 7

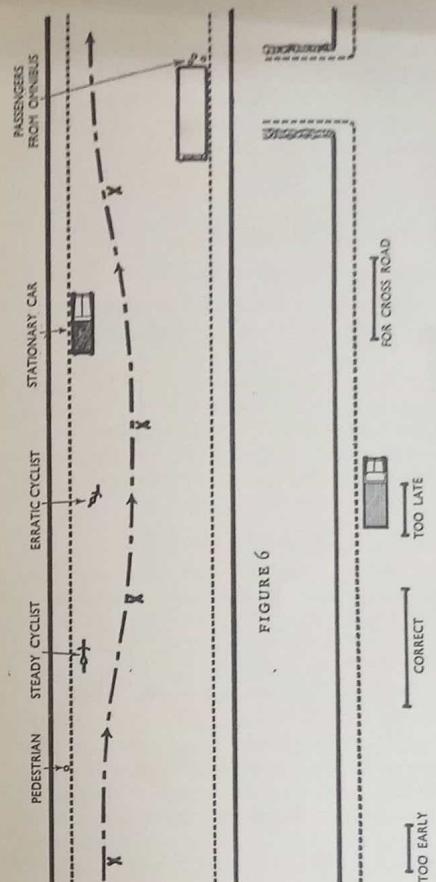


FIGURE 6

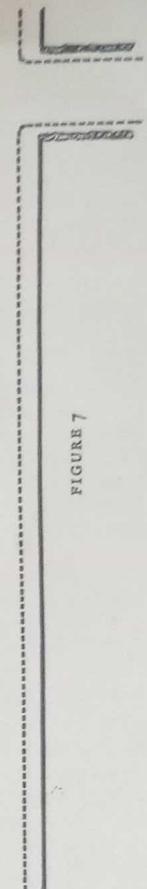


FIGURE 7

roads is obscured by hedges. Assuming that the System of Car Control has been correctly applied, the fifth feature here illustrated must be a long note sounded in good time since it must carry a considerable distance. It is a good plan to listen for an answering note, which, when heard, will call for extra precautions.

SECTION 6

Road Observation

OBJECT OF SECTION

1. The object of this Section is to assist the driver to improve his standard of road observation by considering individual aspects of the subject.
2. The powers of CONCENTRATION and of ROAD OBSERVATION are very closely related, for without the former, success in the latter cannot possibly be achieved. The good driver realises that it is not enough merely to see every detail in a road scene; he must ASSESS THE VALUE of what he sees, and upon that value formulate his driving plans.

THE VIEW FROM THE VEHICLE

3. The view a driver obtains from his position at the steering wheel must cover the area to front and sides through an arc of approximately 180 degrees. He must also have the best possible view to the rear through his driving mirrors. It is, therefore, very important that he should follow closely the directions given in Section 2 under the headings 'Department at the Wheel' and 'Adjustment of Rear View Mirrors'.
4. The windscreen and all windows must be as clean as possible inside and out; misting of the glass can be prevented by ensuring proper ventilation of the interior of the car. The windscreen wipers must work efficiently immediately they are required. These elementary precautions will do much to prevent the unnecessary handicap of trying to see through glass covered with particles of dust, mud or water.
5. Some obstruction of the driver's view is caused by the coachwork of some saloon cars. Windscreen support pillars and rear

quarter panels cause blind areas at certain distances from the vehicle. In some cases the blind areas to the front can be large enough to mask a pedestrian or pedal cyclist or a road sign. This disadvantage can be most noticeable when side views are required into bends and road junctions. The driver should not make 'heavy going' of these difficulties; he should merely be conscious of the dangers created and adapt himself to the conditions by moving his head to gain the views he requires in all circumstances. When reversing, the driver's view of a pedestrian to the rear can be obscured by a rear quarter panel, and extra precautions are therefore essential before beginning the reversing movement (see para. 24 of Section 3).

HOW VISION IS AFFECTED BY SPEED

6. Crowds of pedestrians can move about on the pavements of a busy shopping thoroughfare without colliding with one another, not so much because they are all the time looking out for obstructions, but mainly because their speed of movement is so slow that they can change their pace and direction in time to avoid collision. The length and breadth of their view may be short when they move slowly. If, however, one of them wishes to get along quickly he begins to look further ahead, to pick out the places where the crowd is thinnest and to direct his course and increase his speed accordingly. He then finds that his view of other pedestrians at close quarters deteriorates, so that quite often, if one of them comes into his path suddenly, he narrowly avoids collision.
7. The driver of a motor vehicle adjusts the length and breadth of his view in a similar way, but of course over greater distances because his speed is a good deal more than that of the pedestrian. When driving at 60 m.p.h. the focal point is a considerable distance ahead and stationary objects there appear clear and well-defined, whereas the foreground becomes blurred. At this speed a distinct effort is required to pick out foreground details, and if more than occasional glances are directed at them there will be a natural tendency for the driver to decrease his road speed.
8. When road speed must be kept low owing to traffic conditions, the focal point naturally shortens and the driver observes details. These often indicate that a danger situation is developing, and he then has time, owing to his low speed, to take the precautions which will prevent him from becoming involved.

9. From this natural tendency of the eyes to focus according to speed, it is clearly dangerous to drive fast in the wrong places. If traffic is medium to heavy, foreground details must be seen, and to enable the eyes to do this and the brain to function as a result of the stimulus received, speed must be kept within reasonable limits.
10. Fatigue brought about by continuous driving over long periods is first felt as eye strain and lack of concentration, and although special efforts may be made by the driver to maintain his normal standard of observation, he will find the task becomes increasingly difficult; his speed will slacken and his recognition and assessment of danger situations become late and inaccurate.

WEATHER CONDITIONS

11. Weather conditions such as fog, mist, heavy rain or snow, the fading daylight at dusk and the dazzling brilliance of the setting sun, reduce visibility considerably. To meet these conditions speed must be reduced so that objects in the immediate foreground may be seen in time to take evasive action if necessary.

12. When driving in fog, switch on side and rear lights and, when necessary, the fog lamp. A clearer view may be obtained by opening the windscreen if this is possible. If the windscreen is a fixed type, it may be helpful to use windscreen wipers. Proceed at a slow steady pace, and let the nearside kerb or grass verge be your main guide for position. The presence of a continuous white line will give warning of approach to a road junction or corner, and at such places the white line may be a valuable landmark. Be prepared for sudden stoppages of traffic ahead and do not follow too closely. Traffic should only be overtaken when it is really necessary, and then with great care; remember you may lose visual contact with the kerb.

ROAD SURFACES

13. The average motorist is not so well acquainted with the appearance of road surface types and conditions as he should be. It is useless to complain about a slippery surface after a skid has occurred. The good driver is the one who looks well ahead, recognises any changes of road surface conditions, and then applies correct values of braking, acceleration and steering so that maximum road holding is always achieved.

14. When clean and dry, the surfaces of most properly made up roads are good or fairly good for road holding. During inclement weather or when the road is soiled, the non-skid value of any surface will deteriorate. Tyres cannot grip a road surface properly if it is wet, or soiled by slippery substances such as snow, ice, frost, oil, moist muddy pastes or wet leaves; or if it is composed of dry loose dust or gravel.
15. The types of soiling mentioned in para. 14 are all recognisable; they have their own distinctive appearances, which can be seen by the driver as he approaches them. Unfortunately these conditions are frequently found at the approach to, or at, HAZARDS. The driver already knows that at the approach to HAZARDS running conditions such as steering, braking and acceleration may need alteration, and tyre adhesion to the road surface then becomes of paramount importance.
16. The modern tendency in road construction is for roads to be covered with a non-skid mat which provides a good surface for tyres to bite on. Surface dressings usually consist of stones or chips, or quite fine granules, which are held in position by various tar or bituminous compounds.
17. These surfaces have a dull, coarse, open texture appearance; some, because of the larger chips used, have a more coarse appearance than others. As these surfaces get older they take on a polished appearance owing to wear caused by the passage of traffic. The driver may consider these surfaces as coming in the class known as macadams, the comparative non-skid standard of which is quite high.
18. Concrete road surfaces usually have a distinctive appearance through being light in colour, and have a good non-skid value. Some, however, have a roughened formation of lateral ribs and are apt to hold surface water which freezes in cold weather, creating a slippery surface not easily recognised.
19. Wood blocks, stone setts and smooth asphalt surfaces are frequently encountered in towns and cities. Their appearance and low non-skid value are well known to the average driver, and great care must be taken when driving on roads of these types to avoid skidding, which will occur from the slightest cause.
20. During wintry weather, road surfaces become frost and ice covered, but not always uniformly; isolated patches and certain

gradients remain iced up when other parts have thawed out. The good driver will observe these areas, not only from their appearance but from the behaviour of other vehicles and will take due precautions in good time to avoid skidding.

21. Wear and tear to the vehicle should be reduced so far as practicable by keeping a good look out for pot-holes, projecting man-hole covers, sunken gullies and any material likely to damage tyres, such as broken glass. To avoid running over such surface conditions, alter course slightly if this can be done without detriment to other road users. If they cannot be avoided, speed must be reduced so that rough ground is traversed slowly, thus reducing to a minimum the shock to the vehicle.

ROAD SIGNS AND MARKINGS

22. The driver's attention has already been directed to the many types of road signs and markings (see Section 3). It is of the utmost importance that the information or directions they give shall be understood by the driver; and it follows that every sign or road marking must be seen in such good time that the driver will be able to comply with it, or profit by the information given.

23. Having seen the sign and understood its meaning, the driver should direct his observation beyond it to the road layout or condition it refers to; he will then have plenty of time to take the special care needed.

24. It is disturbing but true that the average road user does not see and understand the majority of the signs provided for his guidance, unless he makes a special effort or is in search of specific guidance. Every driver should cultivate a special interest in and respect for all signs and markings; by so doing he will improve his road observation and general standard of road behaviour.

DRIVING PLANS

25. A really good driver will formulate his driving plans on the correct assessment of the ever changing scene ahead and to the rear of his vehicle. He should have a deliberate and calculating temperament, able to make driving decisions without hesitation in a methodical manner at any moment. All decisions must be based on the principle of safety for others as well as himself.

26. He must realise that these driving plans and decisions are made on a combination of:

- (a) What he can see,
- (b) What he cannot see,
- (c) The possible circumstances which may reasonably be expected to develop.

27. Motoring conditions in the British Isles are such that a driver can rarely base his decisions solely on (a) above, because there are many stretches of road where the layout and traffic conditions do not permit an unobstructed view. The greatest difficulties arise from conditions in areas into which the driver cannot see, such as round bends and corners, behind trees and buildings, at places where roads converge, or where other traffic obstructs the view of the road beyond.

ZONES OF VISIBILITY AND INVISIBILITY

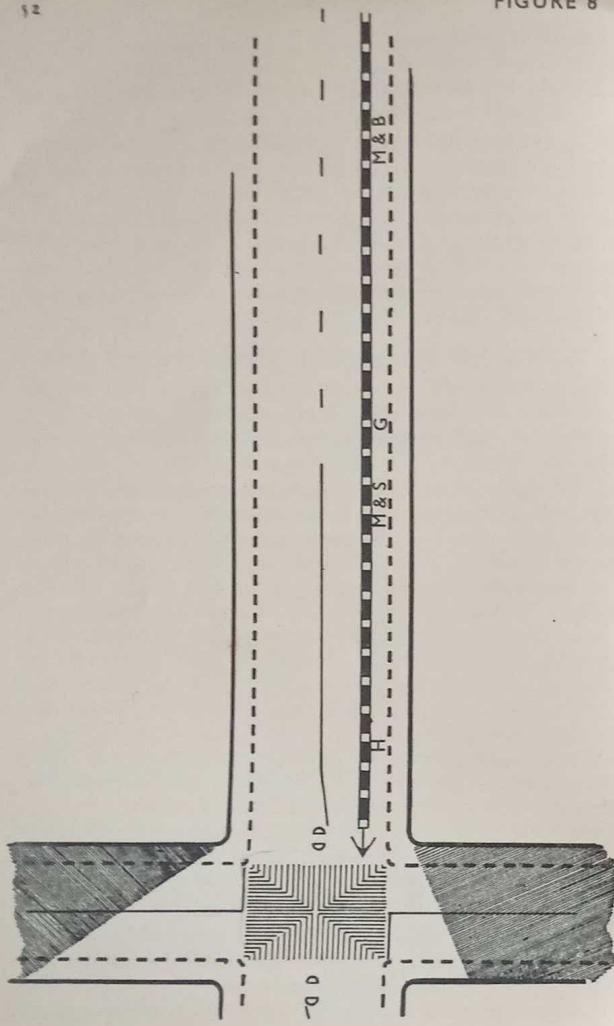
28. To assist the driver to study the theory of this problem, and to improve his driving method, it is possible to divide the road scene into zones or areas, which may be termed zones of visibility and invisibility.

29. FIGURE 8 illustrates a cross-road in a suburban area. A driver approaching the cross-road from the right of the figure and intending to go straight over, will become aware of its presence by seeing the refuge and the continuous white line leading up to it; these two outstanding features, if seen in good time, will be sufficient warning of approach to a HAZARD. He will then have time to prepare himself for any eventuality by applying the System of Car Control. The darker shaded areas in the converging roads are zones of invisibility, and at the point 'H' they have receded to a minimum and the zone of visibility is now reaching maximum size. The lighter shaded area may be termed a zone of danger, for it is the intersection of the cross-road where an accident may occur. When the driver gets close to it his position, speed and gear must be such that he is able to take one of two alternatives:

- (i) Slow down or stop to allow free passage to other road users.
- (ii) Accelerate across and out of the zone of danger if satisfied that no other road user will be endangered or inconvenienced.

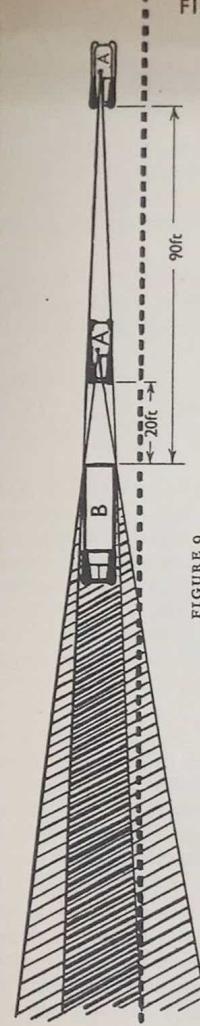
30. The size and position of zones of invisibility created by larger vehicles moving ahead are shown in FIGURES 9 and 10. They show the importance of distance and position in relation to a slow

FIGURE 8



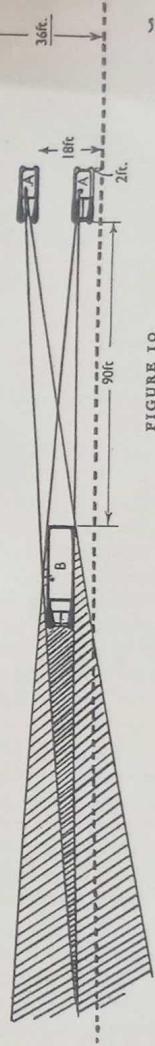
FIGURES 9 and 10

FIGURE 9



53

FIGURE 10



moving vehicle ahead which, if conditions permit, is to be overtaken. A good view beyond the slow moving vehicle—both to the near- and offside of it—is essential before a decision can be made.

31. FIGURE 9 shows a car 'A' in two positions behind a lorry 'B'. The first position is 90 feet behind the lorry and the car driver can see the nearside kerb up to a point some 100 feet beyond the lorry; he also commands a good view along the offside of it. Such a position therefore secures a good view and assists the decision to overtake.

32. The driver of car 'A' in the second position, 20 feet behind the lorry, loses sight of the nearside kerb just in front of the lorry; he also loses the view of the offside of the road at a point some 170 feet beyond the rear of the lorry.

33. A comparison of the two positions of the car 'A' in FIGURE 9 shows that the good driver, before overtaking, will get an early view beyond the lorry when his position in relation to the lorry is most favourable, that is, as in para. 31.

34. FIGURE 10 shows that position in relation to the width of the road and distance from the back of the lorry can affect the zones of invisibility not only in relation to their size but also in relation to their position. In this figure the car 'A' is shown in two positions. The first position is about 2 feet from the nearside kerb, which gives an unobstructed view of the kerb along the nearside and ahead of the lorry but an inferior view along the offside. The second position is 18 feet from the nearside kerb, which gives a good view along the offside of the lorry, but a poor view along the nearside.

35. The zone of invisibility in the latter case has not only been kept small by hanging back from the lorry, but has also been moved; in the first position it is almost directly ahead of the lorry, and in the second position it is to the nearside of it. The net result of the two views obtained is almost complete knowledge of the conditions prevailing in front of the lorry, and this is exactly what is wanted for forming a decision to overtake.

36. The observant driver will take full advantage of views across open spaces and through breaks in low positions in hedges, fences or walls, to get that valuable, if brief, view into converging roads which to some drivers appear totally obscured. He will also observe the configuration of the countryside generally, and will

often be able to judge the severity of any bend or gradient by the position, etc., of trees, hedges or telegraph poles. FIGURE 11 illustrates the zones of invisibility at the approach to a cross-road. The zone on the driver's right is broken up by gaps in the wall which runs alongside the road. View into the nearside converging road is at first quite poor, but the set-back of the hedge at the actual junction provides a superior view at a later stage to that on the offside, which becomes poor again owing to the presence of the wall.

FIGURE 12 shows how the telegraph poles give an idea of the severity of the bend in the distance.

37. The length of view a driver obtains at bends and curves on a road which is bordered by hedges, trees or other obstructions, can to a certain extent be increased or decreased by the position of the car as it approaches such places. FIGURE 13 shows right and left-hand bends which are badly obscured by high hedges. A car is shown in alternative positions at the approach to a right-hand bend, and in alternative positions at the approach to a left-hand bend. A comparison of the sight lines (marked on the FIGURE) shows that the driver in each case, from position 'A', secures an earlier and longer view round the bend than he does from position 'B'. From this it follows that earlier views into right-hand bends may be obtained by keeping well to the left, and into left-hand bends by keeping slightly over to the right when approaching the bend. Lining up in this way must only be resorted to when it is perfectly safe to do so, and in any case there must be no encroachment on to the offside of the road.

ROAD OBSERVATION IN TOWN DRIVING

38. One of the most important aids to successful town driving is local knowledge. To know the situation of main road junctions, one-way streets and roundabout systems, and the type of conditions prevailing there, is undoubtedly of great assistance to a driver because he then has some idea of what to look for.

39. Town driving demands great power of concentration, road observation, the ability to react quickly to changing situations, and considerable driving skill. Views ahead are frequently restricted owing to the density of traffic. It is not wise to focus all one's attention on the vehicle immediately in front and a sensible distance should be maintained behind it, so that a view of traffic

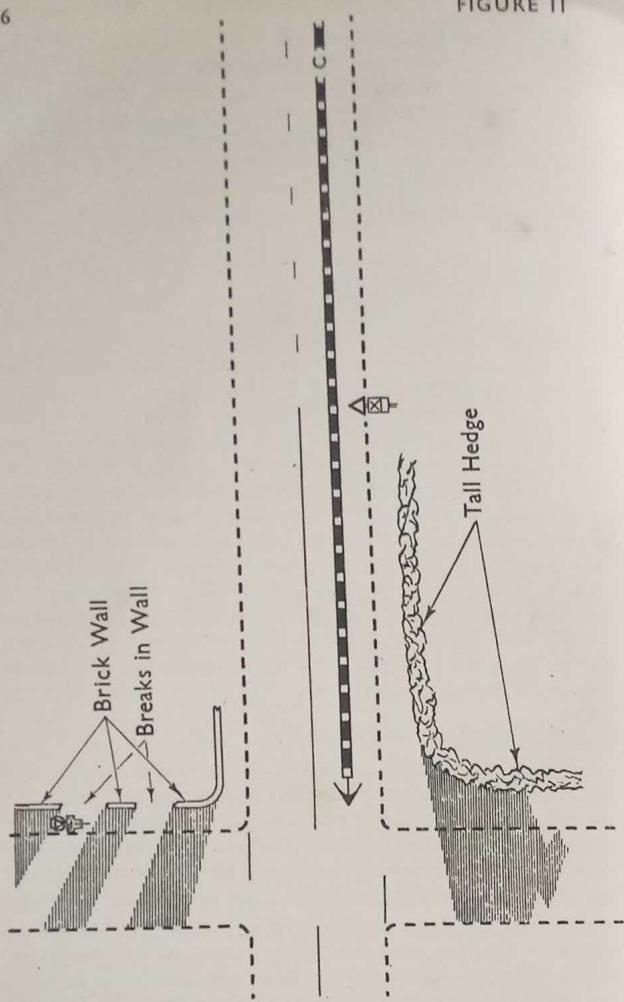


FIGURE 12

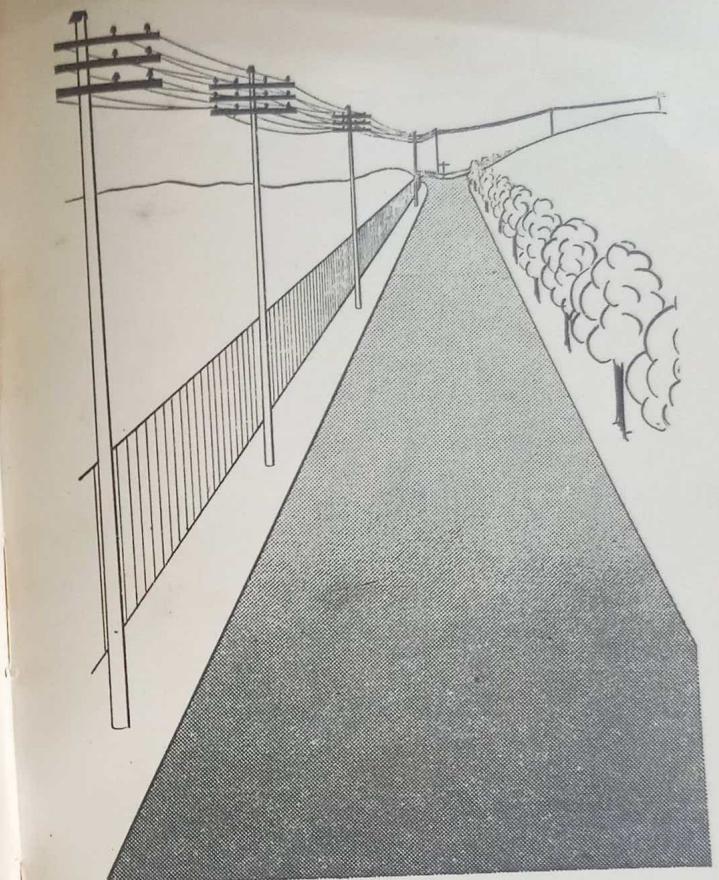
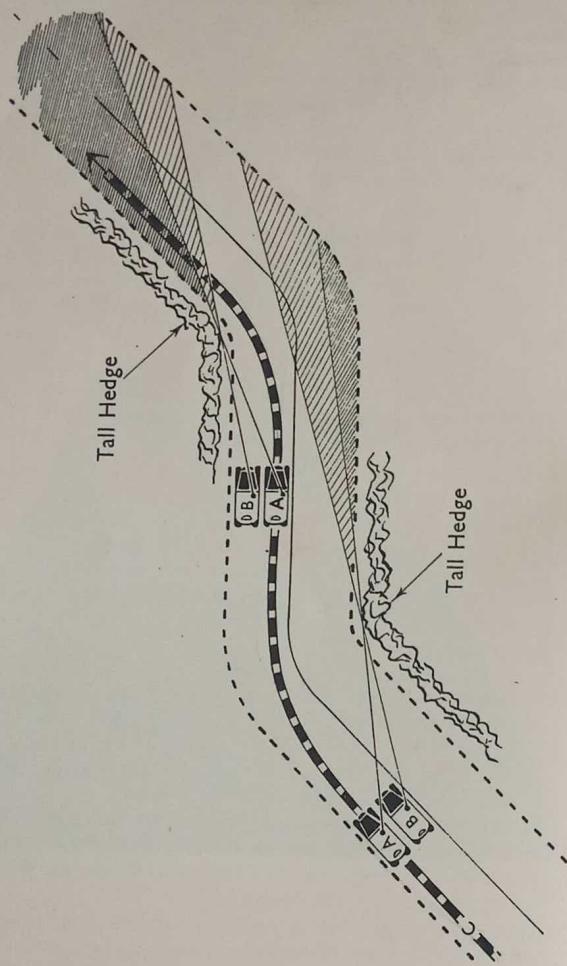


FIGURE 13



ROAD OBSERVATION

movement two, three or more vehicles ahead may be obtained from time to time.

40. In places where traffic is really heavy and slow, driving is nothing more than a series of stops and starts. Length of view is short and passage along the road becomes a matter of 'follow my leader'. If however there are two or three lines of traffic moving in the same direction, it is important to be in the correct line, especially if a turn to left or right is to be made at the next junction.

41. Correct position at the approach to a busy junction can only be achieved by seeing the junction from a distance unless the driver has local knowledge. The good driver notes the type of control (*i.e.*, traffic lights or traffic policeman), sees the formation of the lines of traffic and then gets into his correct line in good time.

42. Quick decisions must often be made when driving in traffic. An accurate forecast of traffic movement can sometimes be made by observing quite small details. A complete list of these cannot be given, but the driver will find the following examples of use:

- (a) Passengers congregating on the platform of a bus prior to alighting, coupled with the view of a bus stopping place further ahead. From this it may be deduced that the bus is about to stop, so hold back and plan to overtake it on the offside.
- (b) A considerable amount of traffic crossing and turning some distance ahead gives early information of approach to a road junction.
- (c) A pedestrian hails a cab from the rank you are passing. Watch for the first cab to move off, possibly across your path, or for the pedestrian to run out to meet it.
- (d) A lorry three or four vehicles ahead of the one you are following may be seen to pull up suddenly; a sudden stoppage of all traffic may result, so be prepared.
- (e) A row of stationary cars on the nearside. Watch those with drivers at the wheel; any may move off suddenly. Watch for front wheel movement and exhaust smoke as well as hand signals and direction indicators.
- (f) When passing a row of stationary vehicles, there is always the possibility of a pedestrian stepping out from between them. The view in between these vehicles is always very

limited, but it can be improved, if traffic conditions permit, by giving them a wide berth and so providing a safety margin as well as a better view. (See FIGURE 14.)

- (g) When stationary behind another vehicle, particularly on an up gradient, watch the behaviour of the driver, especially as he starts off, and be prepared for him to run back before moving forward. Make allowance for this by not drawing up too close.
- (h) Keep a good lookout for sudden movements of pedestrians and pedal cyclists; they can change course very quickly, but quite often some small action may be observed which will indicate their next move. The cyclist, before swerving right, takes a quick glance over his right shoulder but may neglect to give a hand signal. The bus pulling up at, or just moving away from, a stopping place can be the clue to the intention of the pedestrian running on the opposite footway to cross the road to board it.

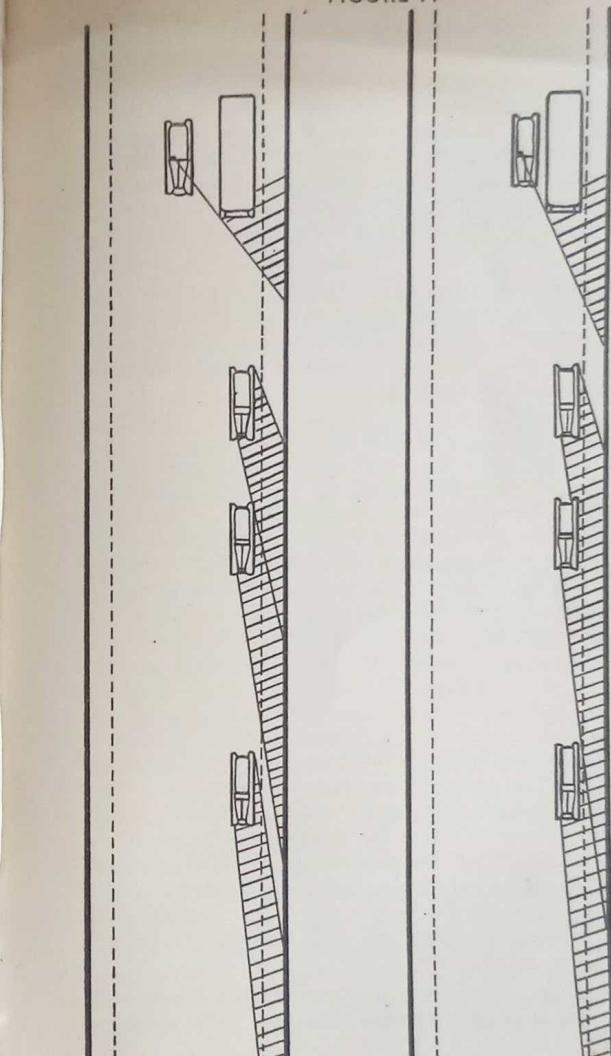
NIGHT DRIVING

43. For good road observation in night driving, certain basic factors which have already been mentioned become important. The windscreen must be as clean as possible at all times, and in wet weather the screen wipers must be used, because particles of dirt and water on the screen obstruct the view. This is made much worse by the lights of approaching vehicles. Any reflections on the inside of the screen caused by light from behind the driver will have a bad effect on his vision; therefore any light used by passengers should be reduced to a minimum, and should not be used at all under fast driving conditions unless it can be screened from the driver entirely. The instrument panel should only be illuminated when necessary unless it is properly screened or dimmed, as any bright light at that distance from the driver's eyes will have a distracting effect on his view of the road ahead.

44. It is of the greatest importance that the lighting equipment of the car should be in efficient working order, and it should be checked periodically and adjusted if necessary by a competent electrician. He will use scientific apparatus for the job, and the driver will then get from his lamps maximum illumination of the road without dazzle to other road users.

FIGURE 14

61



45. Attention having been given to the foregoing matters, the driver must now give his mind to the problems of observation in hours of darkness. When driving on unlighted roads with no other traffic, he will find he has good visibility from his own lights, and all he has to do is to keep his speed within the range of that visibility. When driving on roads provided with the best modern street lighting, where the arrangement of the lamps provides a uniform flood of light with no shadows or pools of darkness, he will find he has really good visibility without any need for his own headlamps.

46. The favourable conditions mentioned in the previous paragraph are quite rare, however, and more usually the night driver finds he is at times harassed by the glare or dazzle of approaching vehicle headlamps and the frequent pools of darkness or shadow caused by inferior street lighting.

DAZZLE

47. Not infrequently a driver will be dazzled by a glare of light from an approaching vehicle particularly if its headlamps, though dipped, are badly adjusted. The greatest difficulty is experienced immediately after the glaring lights have passed, because the eyes take a little time to adjust themselves to the sudden reduction of light which follows. On such occasions the driver is advised to keep his temper and to control his natural impulse to retaliate by switching his headlights full on. He should avoid looking straight at the approaching headlamps and should direct his eyes to the nearside of the road ahead, keeping a particular lookout for pedestrians and vehicles; he will then get some benefit from the illumination of the road by the approaching lights. He will, of course, use his own anti-dazzle device, but will not black himself out by running on side lamps only. He should slow down or stop (see Highway Code, para. 19), and as soon as the offending driver has passed he may switch on full headlamps to overcome the ensuing blackness. Finally, the driver should bear in mind that this evil of dazzle, whilst bad at times, is by no means continuous. He will find that, if he makes a practice of using his own anti-dazzle device as he approaches oncoming traffic, the same courtesy will, as a rule, be extended to him.

48. One of the most difficult problems which beset the night driver is found in built up areas where the street lighting is

inferior. Frequently he finds that his view consists alternately of pools of light from street lamps, and of darkness where the street lighting fails to penetrate owing to lack of power or to obstruction by overhanging trees. He is advised to illuminate these pools of darkness by using his headlamps whenever he can do so without danger to other road users. Frequently, of course, this will be impossible owing to approaching traffic, and in this event he should drive on his dipped headlamps or pass-lamp at a speed suited to the conditions. It is dangerous to black out completely by driving on side lamps only.

49. The driver will find that, whilst his own lights illuminate many objects on the road, he will see a great deal from the lights of other vehicles, particularly those approaching. The glare of the headlights of traffic approaching round bends or coming along converging roads gives ample warning of approach and also a guide to the severity of bends and corners. Objects on the road ahead often appear as silhouettes in the approaching lights.

50. Night driving is always a severe test of endurance. A driver should prepare himself by taking sufficient rest beforehand. Fatigue will first be felt as eyestrain, for continuous looking along a beam of light is most tiring. If drowsiness overtakes him, he should not try to overcome it whilst still driving; he should stop, 'have a stretch', rest his eyes for a little while, and have a drink of hot tea or coffee. Any change from driving will restore the failing power of concentration and observation.

SECTION 7

Acceleration-Braking-Steering

OBJECT OF SECTION

1. This Section opens a field of study in greater detail for both the novice and the more advanced driver. Much of the material has been dealt with in a broad sense in the earlier Sections of this Manual, but it is hoped that the driver will realise that it is attention to the finer points of driving that will fit him to be classed as an expert.

2. The moment a driver puts a motor vehicle into motion, he accepts a great responsibility. He can cause the vehicle, a mass weighing a ton or more, to move forward or backward at varying speeds, turn to either side sharply or gradually, and stop suddenly or smoothly, just when he wishes, provided he manipulates the controls accurately (in this his physical and mental condition will play no small part—see Section 1).

3. The System of Car Control, with which the driver should now be familiar, was explained in Section 4, but of necessity in such a broad manner that no attention was given to the details of acceleration, braking and steering. These details and the manner in which they affect the car will be discussed in the following paragraphs.

ACCELERATION

4. Let the driver first get a clear impression in his mind of what is meant by 'Acceleration' as applied to driving a motor vehicle. It is the increase in road speed of a moving car brought about by the control exercised by the driver with his right foot and the accelerator pedal. (We are not here considering acceleration developed by a car in such unusual circumstances as running away and coasting down a hill with increasing speed because the brakes have failed.)

5. The acceleration capabilities of different cars vary considerably according to the efficiency of the engine and power weight ratio. A high maximum speed on any given journey is not very useful if it takes a considerable time and a lengthy stretch of suitable road to attain it.

6. High average speeds under ordinary road conditions are usually achieved by the modern car not because of its high maximum road speed, but more by its excellent power to accelerate, when suitable gears are used, from quite slow speeds.

7. How is acceleration produced? As the pressure of the driver's foot depresses the accelerator pedal, it enlarges the carburettor throttle valve opening and an increased amount of combustible mixture is admitted to the cylinders of the engine. This increase of mixture will produce, if the power available is equal to the driving conditions, an increase of revolutions per minute of the engine which will be transmitted to the driving wheels and the car will accelerate.

8. The accelerator pedal is spring loaded to its closed position and the driver must acquire the 'feel' of this spring loading in order to open the throttle valve at all times smoothly. The accelerator pedal and linkage, right through to the carburettor, must be in perfect working order; it will be extremely difficult to control speed with the accuracy which is necessary, if this linkage is fouled by floor boards or mats or has any slackness to be taken up by the initial movement of the pedal.

9. To describe the length of movement of the accelerator pedal in various circumstances will not be of much assistance to the driver, but an attempt to describe how that movement is to be effected may be helpful.

10. First, he is advised to wear light footwear, preferably shoes; this is really important because the sensation of pedal movement and accurate 'feel' of the operation of foot pedals cannot effectively be transmitted to the brain through thick-soled heavy boots or shoes.

11. The right foot operates the accelerator and foot-brake pedals, but for most of the time it is on the accelerator pedal. Therefore the right heel should rest on the floorboard approximately midway between, and to the rear of, these two pedals; it will support the weight of the right leg. The ball of the foot should fall naturally forward and downward on the accelerator pedal. The ankle must be flexible to allow the foot to rise or fall at will from the pivot created by the heel. At this stage the driver should understand that although the heel acts as a pivot for accelerator pedal movement, it will not serve the same purpose when pressure is applied on the foot-brake pedal.

12. An engine will only respond to an increase of pressure on the accelerator pedal if it can develop the power to do the work demanded of it. All references now made to acceleration will be on the assumption that the correct gear is engaged and that road and running conditions are such that an increase of road speed is desirable and possible with safety.

13. Effective acceleration is only possible when a useful and, it may be stressed, economical increase of the engine revolutions per minute is obtainable, and to this end the use of the gear box must be considered. For instance, a driver wishing to get high speed as quickly as possible from a car fitted with a four-speed

gear box would be unwise to use more than 50 per cent of maximum r.p.m. in second gear, or more than 75 per cent of maximum r.p.m. in third gear. Any rate of r.p.m. above these approximate figures for the average car would be unproductive of the acceleration wanted, and uneconomical in fuel consumption. For normal driving the percentages above are on the high side.

14. Generally, when the accelerator pedal is depressed with a rough, sudden, jerky movement, the car will jump forward, suddenly increasing road speed; but if the pedal is depressed steadily and progressively, the same increase of road speed will be obtained but without the sudden jump and jerk. Obviously the latter manner of depression will cause less wear and tear and will produce smoothness of movement.

THE BEHAVIOUR OF A CAR UNDER THE INFLUENCE OF ACCELERATION

15. Acceleration has a considerable effect upon the behaviour of a car as it proceeds along the road. FIGURE 15 shows that, when under the influence of acceleration, a car tends to settle down on to the road, particularly at the rear end, with the result that the weight is more evenly distributed on each of the four road wheels, tending to improve the grip of the tyres on the road surface, thus achieving a condition of maximum stability.

16. This favourable behaviour of the car under acceleration is more forcibly realised when it is compared with the behaviour of a car under the influence of braking (see para. 33 below). The driver should also realise that this condition of good stability prevails not only under acceleration, but also when the weight of

ACCELERATION

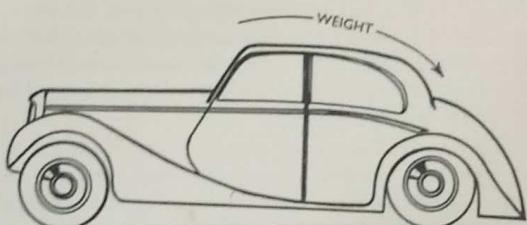


FIGURE 15

the vehicle is being propelled by a pulling engine with no increase of road speed.

ACCELERATION SENSE

17. Acceleration sense is a skill found only in really good drivers, but it is latent in many, and may be developed by improved judgment of speed and distance, and practice. It may be defined as the ability to vary the speed of the car according to the existing road and traffic conditions when braking is not demanded. A driver who possesses acceleration sense recognises the speed both of the vehicles he is following and of those which are approaching. He also takes into account any variation of speed that may occur owing to changing conditions which develop ahead. He decides upon a safe distance to keep between his vehicle and the one in front, by acceleration, deceleration or constant road speed. In the light of these considerations he will adjust his speed by suitable variations of pressure on the accelerator pedal, avoiding braking unless it is absolutely necessary, so that he keeps progressive station in the general flow of traffic. He may overtake certain slow moving vehicles with a suitable burst of acceleration when it is safe to do so, and will at the same time be prepared to reduce his speed by timely deceleration if an inconsiderate driver overtakes and then cuts in.

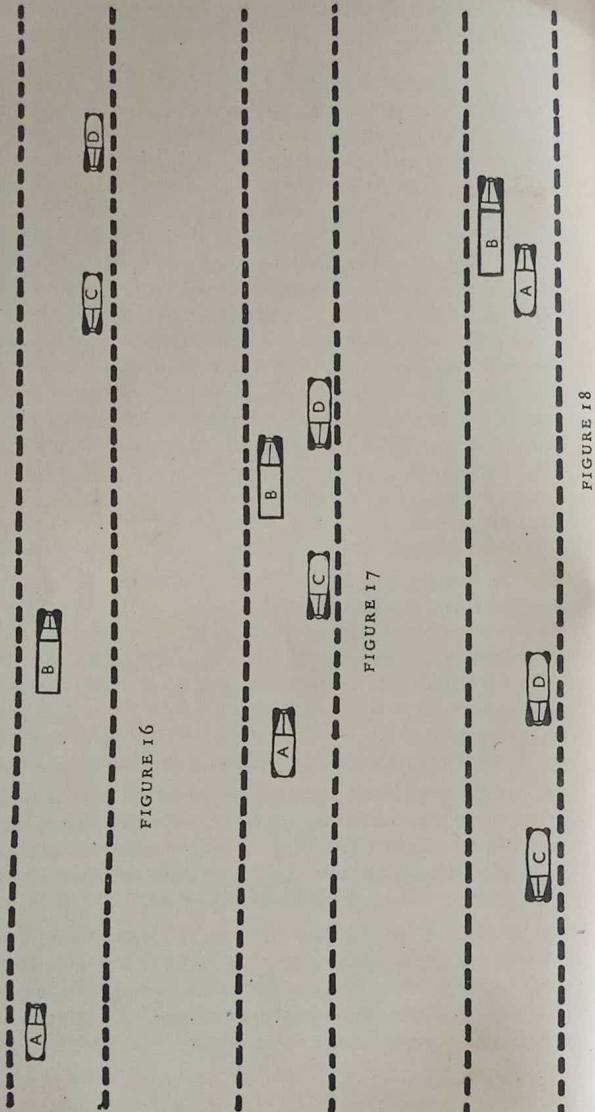
18. The distance a driver decides to maintain between the front of his vehicle and the rear of the one ahead, when there is no intention to overtake, is dependent upon the speed of both vehicles, the condition of the road surface, his reaction and his driving ability.

As a guide to this distance it is suggested that at speeds up to 30 m.p.h. not less than one foot per mile an hour is suitable. At speeds over 30 m.p.h. the distance should of course be increased, and not less than one yard per mile an hour should be allowed.

19. Acceleration sense is one of the important skills which, allied to others, makes overtaking on fast roads a well timed, brisk and safe manoeuvre. FIGURES 16, 17 and 18 illustrate a skilful driver's judgment and use of acceleration as he leads up to the act of overtaking a slow moving vehicle on a fast road.

20. In FIGURE 16 the driver of car 'A' is travelling quite fast towards a lorry 'B', which he plans to overtake. The situation is complicated for him by the presence of the approaching cars 'C' and 'D'. He recognises the situation in good time and, from their speed and distance, realises that the cars 'C' and 'D' have the

FIGURES 16, 17 and 18



right of way and that he must not be sandwiched between two lines of moving vehicles. He therefore eases his speed by early deceleration.

21. FIGURE 17 shows the relative positions of the vehicles a fraction of a second later. The important vehicles are now the lorry 'B' and the car 'D', which are now opposite one another. The driver of car 'A' now accelerates, not fiercely but steadily, to close up the gap between himself and 'B'.

22. FIGURE 18 shows the final phase when the driver of car 'A' is accelerating firmly along the offside of the lorry 'B'.

23. The technique of the experienced driver who drives fast but considerately is well worth close study, and it will be found that he makes full use of the power of acceleration of his car at every opportunity in a safe yet deliberate manner.

24. First of all he knows the capabilities of his car; he will not drive fast until he is familiar with its behaviour, and he will never demand more of it than he knows he can get.

25. The changing conditions of the road surface will never escape his attention, and he will drive his car in such a way that he makes full use of acceleration where the surface is in good condition and eases his speed in the bad places.

26. His approach to bends and corners will be perfect demonstrations of every feature of the System of Car Control, and his technique of acceleration will reveal a perfect timing of the application of the correct degree of acceleration as his car commences, traverses and leaves its curved path. The car will enter the curve at a safe speed, the engine pulling the load, and as the view of the road out of the hazard opens up and the steering is straightened, he increases acceleration. So the car has entered the hazard at a slow or moderate speed according to the severity of the bend, and has left it by firm and safe acceleration. The driver's continued aim has been to maintain tyre adhesion to the road surface under the adverse conditions of a bend, coupled with brisk movement of the car by a careful balance of acceleration and steering.

27. Finally, the driver will realise that acceleration properly used can be a contributing factor to his safety in certain accident situations. For it is possible to accelerate out of danger, as well as to brake. Braking sometimes results in stopping right in the path of approaching danger.

BRAKING

28. There are two normal methods by which the speed of a motor vehicle may be reduced—(a) by the deceleration of the engine as the pressure on the accelerator pedal is relaxed, and (b) by the application of the brakes.

29. It will be appreciated that the previous discussion on acceleration did, to some extent, deal with the loss of road speed brought about by normal deceleration. When pressure on the accelerator pedal is relaxed the engine will slow down due to the compression in the cylinders, and this slowing down will be transmitted to the driving wheels. Thus the engine is acting as a brake on the speed of the car.

30. This method of reducing speed will be smooth and gradual; it will have little detrimental effect on the grip of the tyres on the road, and unnecessary wear and heating of the brakes will be avoided. The loss of road speed by engine deceleration will be more pronounced when a low gear is engaged. This will be valuable when driving on slippery roads where normal braking would be likely to lock the road wheels and cause skidding, or when making long descents in hilly country, when heavy continuous brake application would cause overheating of the brake shoes and drums.

31. Generally, however, deceleration by using the engine is a lengthy process, and although effective use is made of it in the initial stage of every reduction of road speed, the ordinary road wheel brakes must be brought into action quite frequently.

32. The elimination of unwanted road speed by the application of road wheel brakes can be one of the most difficult and hazardous controlling operations carried out by a driver. This is especially so when the brakes are applied at speed.

33. Braking is hazardous because of the effect it has on the car. FIGURE 19 shows, to an exaggerated extent, the behaviour of a moving car under the influence of braking. The rear tends to lift, weight is thrown forward and downward on to the front wheels, and the resulting unequal distribution of weight makes the steering heavier and reduces the general stability of the car, especially at the rear wheels.

34. The driver will readily observe that the conditions prevailing when the car is under the influence of braking are a complete

BRAKING

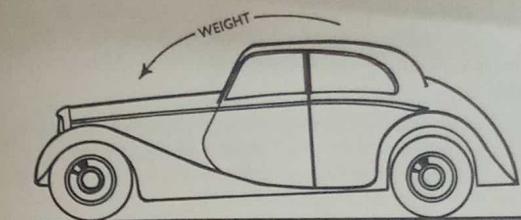


FIGURE 19

reversal of the favourable conditions found when the car was under the influence of acceleration.

35. In order to reduce as far as possible the difficulties and disadvantages previously described, the driver must learn to apply intelligently the following three rules for all normal braking:

(1) *Brake only when travelling straight, that is, not in a bend or when skidding. This means you must brake in plenty of time for whatever hazard you are approaching.*

(2) *Let your brake pressure vary with the condition of the road surface. Choose a coarse, firm and dry section of road for firm braking, and ease off the pedal pressure for a loose or slippery road surface. This calls for continual observation of road surface conditions.*

(3) *When descending a steep winding hill, maintain firm braking on the straight stretches, and brake as lightly as possible in bends or corners. Remember the value of engaging a lower gear at an early stage in the descent.*

36. When braking, every effort should be made to reduce speed as safely and smoothly as possible, thereby minimising the wear and tear to the car generally and the generation of heat at the brake drums.

37. The foot-brake pedal is operated with the ball of the right foot, and the heel cannot act as a pivot for the foot in the same way as it did when controlling the accelerator pedal.

38. The initial effort required to move the brake pedal will be greater than that required to move the accelerator. The first part of the pedal movement will merely take up the free movement of the braking system; this movement may be anything up to two or

three inches. Then the brake shoes will make contact with the brake drums which are revolving with the road wheels. Normally this contact should be made as lightly as possible and once established, it should be made harder, as necessary, by increased pressure on the pedal.

39. The pressure on the brake pedal should be eased off gradually as the unwanted road speed is lost, so that as the car comes to rest it glides to a stop on an even keel, entirely without jerk or settling down suddenly at the rear end.

40. Progressive brake application is superior to sudden hard application; all late heavy braking should be confined to the rare occasions when an emergency stop is needed. The good driver should estimate the distance he requires to stop, or slow down appreciably, from all road speeds, and will commence his braking in time to reduce speed with safety and smoothness. Again the driver is advised to judge the effect of his effort on the brake pedal by the variation in the speed of the vehicle.

THE BRAKE TEST UNDER RUNNING CONDITIONS

41. The driver's attention is first drawn to Phase 1 in the Appendix to Section 2, under the heading 'Enter car to recognise and feel controls', wherein he is instructed to check the operation of the hand- and foot-brake controls.

42. Assuming these tests prove satisfactory, the driver should, as soon as possible after getting the car moving on the road, test the brakes under running conditions. This test is to show him the manner in which the vehicle responds to normal braking; it is a test of firm progressive braking, but not a crash stop to lock the road wheels.

43. The method of testing is as follows. If possible, choose a level stretch of road with a good surface; then, whilst travelling at 30 m.p.h. in top gear, apply the brakes with medium initial firmness and then progressively harder, so that the vehicle loses road speed rapidly without locking any road wheels. Since it is a test of the brakes only, the clutch should be disengaged as the brakes are applied. During the test, due regard must be given to the safety and convenience of other road users.

44. The result of the test should show that the vehicle can be pulled up on a straight course, without swerving or lurching to either side. There should be no tendency for any wheel to lock; the best braking is obtained when the wheels are just revolving.

45. The information given in the foregoing paragraphs on reducing road speed may be consolidated in the driver's mind by the following example. Imagine driving at speed along a fast main road with a good view ahead, and approaching a road junction where a 90 degrees left-hand turn will be made.

(a) The driver must OBSERVE the following features as early as possible:

- (1) The road junction layout, which is a hazard.
- (2) The condition of the road surface as it opens up ahead.
- (3) The other traffic ahead and to the rear; and possible changes in traffic conditions during the approach.

(b) The driver must DECIDE:

- (1) To select the best course, bearing in mind that he will be braking very firmly.
- (2) The approximate speed at which he will turn the corner.
- (3) Where he will commence braking to bring his existing speed down to that which he estimated would be suitable for turning the corner.

(c) The driver will comply with the following requirements in his MANIPULATION OF CONTROLS:

- (1) The car must be travelling as straight as possible during braking.
- (2) The initial brake application will be as light as possible.
- (3) Brake pressure will then be increased as necessary.
- (4) During the period of firm braking, considerable heat may be generated at the brake drums, and it will be beneficial from time to time to relax the pedal pressure momentarily, reapplying it delicately. This method will be profitable especially if the road tends to be slippery. (In this connection, it should be borne in mind that, if the car has been driven through pools of water, the operation of the brakes may have been impaired through water seeping on to the brake drums and linings.)

(5) The speed will be reduced to that decided at (b) (2), when braking will cease in time for the remaining features of the

System of Car Control to be considered before the turn is made.

This example is similar to but more detailed in the matter of braking than those given in Section 4, para. 21, where the System of Car Control was discussed.

STEERING

46. One of the main requirements in the proper control of a motor car is to ensure that it is always in the right place on the road, whatever the circumstances. Obviously this is done by the driver's ability to steer accurately and safely. In order that he may do this, the steering and suspension must be in good condition and, in addition, the tyre treads and air pressures must be correct.

47. The driver should realise that different makes of cars have steering characteristics which are peculiar to themselves. Hence, drivers are heard to remark that a car's steering is heavy or light, or that it is high- or low-gearied. In any case these characteristics have their advantages and disadvantages in certain circumstances, and it is the driver's duty to recognise them and adapt himself accordingly.

48. Good road observation is necessary so that the driver may see road traffic conditions all round the vehicle; then he may place his car in the best position available to him, subject to the advice in the Highway Code and this Manual.

49. A modern car in good order will keep to a straight course on a straight and level road with little or no steering control by the driver. Since, however, modern roads are not level but have a camber, a car being driven on the nearside of the road tends to run down the camber towards the nearside, or towards the offside if being driven on the offside of the road. This tendency can be overcome easily by the minimum of steering control.

50. The driver will find that a motor vehicle moving on a straight course will be travelling under the most favourable conditions so far as directional control is concerned. As soon as it is moved into a curved path, the stability of the vehicle deteriorates and control becomes more difficult. The driver should therefore aim to make all deviations from the straight course as gradually and smoothly as possible, avoiding any steering movement of a sudden or jerky

nature which will be detrimental to the grip of the tyres on the road.

51. Steering success or failure originates in the driver's deportment in the driving seat, and his attention is again drawn to the advice given in Section 2, paras. 7-9. The seating position there advised will be found advantageous when the car is skidding or cornering, for in these circumstances the body is apt to roll with the alteration of weight distribution, and the steering wheel may be moved unintentionally. Some additional support may be obtained by bracing the left leg from a firm position taken with the left foot on the floorboards.

52. As previously stated in Section 2, the normal basic position of the hands on the wheel on a straight road should approximate to the hands on a clock at the time of ten minutes to two. It will enable him to effect any emergency movement of the wheel which may be demanded, and his arms and elbows will have freedom for all necessary arm movements.

53. Movements of the arms to control the steering wheel will originate where the upper arm joins the shoulder, the wrists and elbow joints acting as shock absorbers. The grip of the hands on the wheel rim should normally be light, with a readiness at all times to tighten if necessary. A tight grip continuously maintained can make for rough movements of the wheel, which are seldom necessary. The fingers should fold round the rim in a natural manner; such mannerisms as the palm of the hand holding the wheel with fingers outstretched or the fidgetting of the hands on the wheel should be avoided. Remember also that the wheel is provided for the driver to steer with and not as a support for his arms. The driver is advised that the movements of his hands often reflect his state of mind; they can indicate his confidence, or lack of it, to the critic.

54. On the average private car all normal deviations from the straight course can be made by following the under-mentioned guiding principles:

- (1) The hand on that side of the wheel corresponding to the turn to be made should pull down on the wheel from a high position.
- (2) The other hand should allow the wheel rim to slide through it, or, if the turn is severe, it may drop to a low position ready to push upwards if necessary.

55. Such hand and arm movements alternately pulling down and pushing up may have to be repeated if the turn to be made is of a sharp 'hairpin' nature, or if the car has particularly low-gear steering.

56. Having turned the car sufficiently, it must be straightened again or it will continue in a circular path. Accordingly, the steering wheel should be fed back by hand movements similar to those in para. 54, but in the reverse direction. The steering on most cars has an automatic self-straightening action; on some, this may be quite powerful and restraint will have to be exercised on the wheel to prevent the car straightening up too soon.

57. By the methods in paras. 54-56, steering into a turn and out again will be accomplished either slowly or quickly according to the road speed but in any case smoothly and progressively.

58. The driver should note, from the description of the position of the hands and their movements on the steering wheel, that each hand keeps to its own side of the wheel. Never, when the car is being driven forward, should either hand pass the 12 o'clock position.

STEERING WHEN REVERSING

59. When reversing, the driver must turn his head to look over his right or left shoulder, and the basic hand-hold on the wheel must be at the top of the wheel near the 12 o'clock position. When he looks over his right shoulder his left hand should take this position, and when he looks over his left shoulder his right hand should be so placed. The steering wheel may then be turned either to left or right. During this procedure the free hand may adopt a low position approximating to four or eight o'clock as the case may be, either with a loose hold allowing the wheel to slide through it, or to hold the wheel in position whilst a new grip is taken at the top.

FIVE RULES FOR STEERING, AND STEERING FAULTS

60. (1) Your right elbow must not rest on the top of the offside door or window frame. This attitude restricts the use of the arm.

(2) Your hands must be placed on the wheel so that you are able to exert maximum leverage, if necessary.

(3) On a straight road your hands should settle in the effective position (ten to two), not gripping tightly but being ready to do so.

(4) Normally you should tighten the grip when cornering and braking, both hands holding the wheel during these operations.

(5) Do not tighten the grip when on a greasy or slippery road; it may tend to roughen your movements of the wheel, so inducing skidding.

61. The following common steering faults should be avoided:

- (a) Allowing the hands to drop down to a position in the lower half of the steering wheel.
- (b) Allowing the hands to fidget, or move unnecessarily on the wheel.
- (c) Removing either hand from the wheel for unnecessarily long periods when gear changing.
- (d) Removing both hands from the wheel.
- (e) Gripping the wheel too tightly.
- (f) Turning in a given direction too much, or maintaining a given turn for too long. This often results, especially with a novice driver, in the car describing a 'weaving', erratic course.
- (g) Trying to fix the position of the car on the road, by continuously sighting one point, such as the radiator cap, on a special feature in the road layout. *NOTE:* This is a useful procedure when moving the car very slowly in a confined space, e.g., in a garage.
- (h) Making sharp deviations out of, or into, a straight course (*i.e.*, cutting out or cutting in when overtaking stationary or slow moving vehicles or other obstructions).
- (i) Failing to allow sufficient safety margin on the nearside when overtaking other vehicles or obstructions. *NOTE:* Six feet of clearance has been found to be a good margin of safety if such space is available. This distance is given only as a guide, as frequently a driver will have to decide on a suitable margin of safety in the light of prevailing conditions.

62. The driver should bear in mind that other driving faults will produce conditions which will make steering difficult. The most important of these are:

- (a) Poor road observation.
 (b) Entering bends and corners too fast.
 (c) Braking in bends and corners.
63. The importance of a driver's ability to concentrate and react quickly to emergencies and changing road conditions cannot be overstressed, especially with regard to steering. One of the evasive actions often demanded to avoid an accident situation is an alteration of direction at short notice.
64. The main features of this Section are illustrated in FIGURE 20, which shows a sharp bend, normally cambered; there is no obstruction of view or other traffic, but the road surface conditions present the greatest difficulty because they are wet, dry, greasy and dry again. The figure is self-explanatory, and the driver should note the course as the car approaches and leaves the bend, and the braking and acceleration values on the different conditions of road surface.

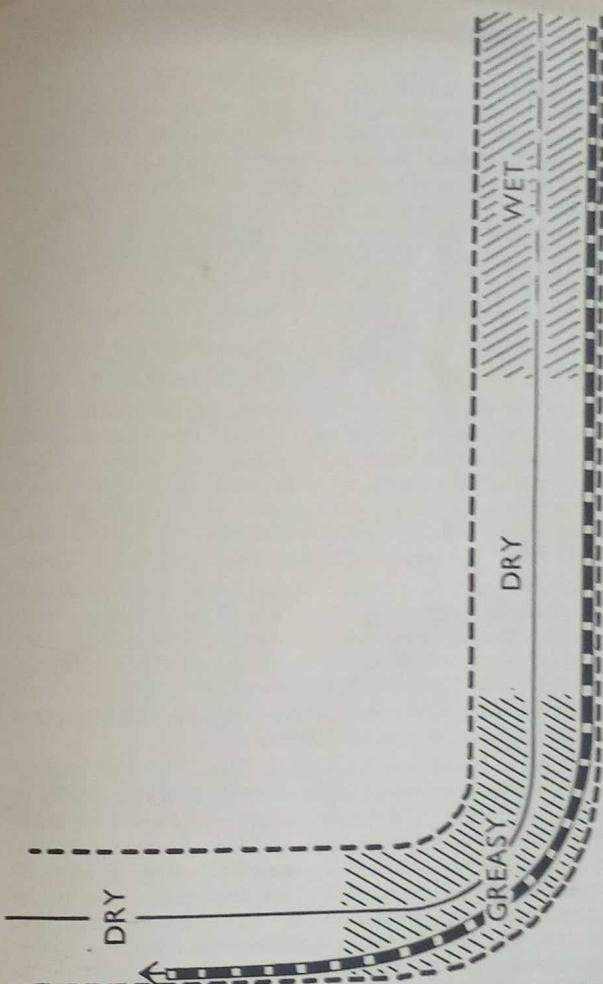
SECTION 8

Cornering—Skidding—Gear Changing

OBJECT OF SECTION

1. The object of this Section is to make the driver conversant with the theory of cornering, skidding and gear changing. A good understanding of the theory will help him, but practice alone will enable him to reach the desired standard of car control.
2. When a car is travelling on a curved path, for example, when negotiating a corner or bend, it is subjected to forces which tend to prevent it following the course directed by the driver. In these circumstances its road holding qualities are put to the test and it earns the reputation in the opinion of its driver of being a good, bad or indifferent road holder.
3. The road holding qualities of a car are largely in the hands of the designers and manufacturers. They construct vehicles of different types to give various performances, and it is dangerous and quite unfair for a driver to expect from a vehicle a standard of performance for which it was never designed. The driver is therefore advised to take an interest in vehicle design and performance

FIGURE 20



so that his driving methods will reflect a sympathetic understanding of the characteristics of the vehicle he is driving.

VEHICLE ROADWORTHINESS

4. Before discussing the action of driving round a corner or bend, the roadworthiness of the vehicle must be recognised as a matter of great importance. The condition of the steering, suspension, shock absorbers, tyres and tyre pressures, and the loading of the vehicle, will each have a far-reaching effect on its behaviour on corners and bends. The driver's main responsibility is in relation to tyre maintenance. He can exercise some control over tyre conditions and pressures and on the loading of the vehicle, but the other matters are usually in the care of garage workshop staffs.

SOME CONSIDERATIONS ON THE BEHAVIOUR OF A CAR WHEN CORNERING

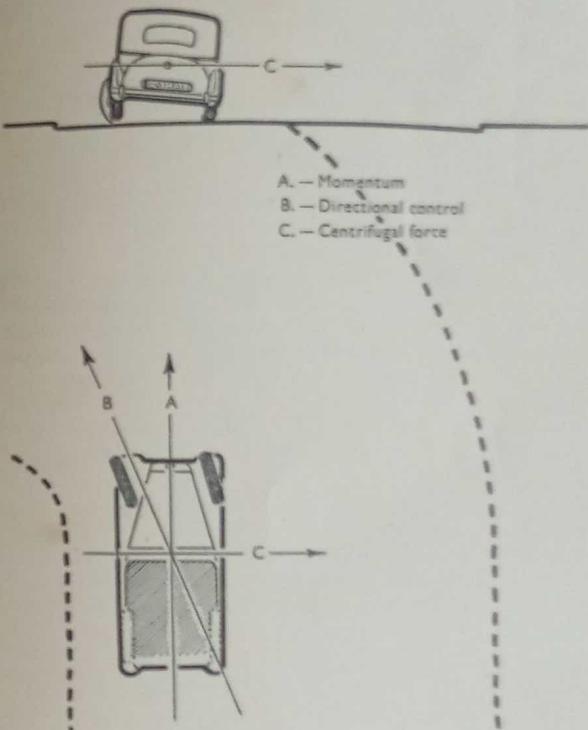
5. The problem of driving a car through a curved path is mainly solved by the method of approach. The car cannot negotiate the curve with safety and on the course directed by the driver, unless the tyres retain an efficient grip on the road. The whole time a car is in motion under proper control, a portion of the tyre tread is in direct contact with the road, and, in theory, there should be no movement of that portion of the tyre relative to the road surface.

6. When a car is driven round a corner certain forces are set up, the amount of which is controlled by the driver, and these tend to overcome the grip of the tyres on the road. The driver will appreciate the significance of these forces by referring to FIGURE 21, which is in two parts, the lower showing the plan view of a car turning a left-hand corner, and the upper showing a rear end elevation of the car in the same situation.

7. The plan view shows three arrows, lettered 'A', 'B' and 'C' which represent powers acting through the centre of gravity of the car. The arrow 'A' represents the momentum of the car, which is proportional to the car's weight and speed. The amount of the momentum will therefore be created by the driver through his control of the car's speed. The direction of momentum will be opposed to the turn to be made. In order to turn the corner the driver turns the steering wheel and directs the front of the car to the left; this directional control is shown on the figure by the arrow 'B'. The combination of the forces of 'A' and 'B' directs

FIGURE 21

CORNERING FORCES.



the course of the car into a circular path, which by the mass weight of the car creates an outward pull which is known as centrifugal force, shown on the figure by the arrow 'C'.

8. The grip of the tyres on the road must be capable of exercising the necessary inward pull on the car to prevent it slipping outwards under the effect of centrifugal force. If the grip does this the car will follow the curved path directed by the driver; if not, it will slide outwards across the road.

9. To summarise these conditions:

- (1) The driver controls the amount of momentum by his speed of approach to the corner.
- (2) He turns the car into a circular path by his directional control.
- (3) Centrifugal force is thus created, which will pull the car outwards into a skid if the tyres are unable to exert the necessary inward and opposing pull.

10. The upper part of FIGURE 21, giving the rear end elevation, shows the behaviour of the car through the vertical axis when it is turning left. As the car turns, the weight tends to build up on the outside wheels, causing the car to heel over. Soft sprung cars, or those with a high centre of gravity, will tend to heel over more than others. In any case, the tyre pressures will be important, for, under pressure, tyre walls become excessively flexed, resulting in tyre distortion, which will accentuate the heeling over effect and reduce the power of the tyres to resist centrifugal force.

11. Whilst considering the behaviour of the car about its vertical axis during cornering, it is well to consider what happens if brakes are applied in the corner. As stated above, when the car turns, the weight distribution builds up on the outside wheels. When brakes are applied it is found that weight is thrown forward. It therefore follows that, when brakes are applied in a corner, the outside front wheel will be bearing a considerable weight, with the car tending to pivot on it. Obviously a car under such stresses will be more difficult to handle.

THE ROAD CAMBER OR CROSSFALL

12. The camber or crossfall of the road will also have a bearing on the effect of centrifugal force. A normal camber dropping from the crown of the road to the kerb will prove favourable on left-hand bends and unfavourable on right-hand bends, for the

obvious reason that a car slides more easily down hill. Some corners and bends however are super-elevated, that is, the whole width of the road is constructed with a banking in such a way that the crossfall will be favourable to the passage of a car round the bend in either direction.

THE SYSTEM OF CAR CONTROL FOR CORNERS AND BENDS

13. In order to put to good use the information on cornering contained in the foregoing paragraphs, it is essential that the driver's observation on every corner he has to negotiate shall be of the highest order. His judgment (which will improve with experience) will lead him to apply correct values in his controlling actions on the car. He must recognise every corner as a hazard and consider each feature of the System of Car Control at the approach to it.

14. All corners or bends demand the application of the following principles:

- (i) Correct positioning of the car on the approach side. (Course selected.)
- (ii) Right choice of speed. (Mirrors and Brakes.)
- (iii) Correct gear for the speed. (Gear.)
- (iv) Car to take the corner under the influence of progressive acceleration whenever possible—not rolling round while decelerating, nor being wrenching round with the brakes on.

By the application of these principles, the following safety factors will be apparent as the car is about to leave the bend or corner:

- (a) It will be on the nearside of the road.
- (b) It will be able to remain there.
- (c) It will be able to stop in the distance the driver can see to be clear of other traffic.

SKIDDING

15. In the first part of this Section cornering was discussed, and the grip of the tyres on the road was found to be essential if a car is to negotiate corners and bends with safety. It is now proposed to investigate what happens if, unfortunately, the grip of the tyres fails and a skid occurs.

16. Every driver of a motor vehicle on the public highway should aim to drive and control his machine in such a way that skidding never occurs. This is not always possible when the roads are covered with ice or frozen snow, or during bad weather, but it is safe to affirm that many accidents which are alleged to have been due to skidding in ordinary wet weather would never have occurred if the drivers had had a better understanding of the causes of skidding and a better control over their vehicles when in a skid.

17. Preventing, causing and controlling skidding are practical elements in the driving of a motor car, and an hour's practice on a skid pan or on a slippery private road will be more valuable than many hours of talking or reading on the subject. It is possible however to give some advice on the theory of the subject which will help the practical effort.

18. Skidding may be defined as follows:

Involuntary movement of the car due to the grip of the tyres on the road becoming less than a force or forces acting on the car. In other words a car skids when one or more wheels slide instead of having a pure rolling action.

The driver should examine this definition and consider the kind of forces which might act on the car, and more important, how they may be created.

19. Any driver who has experienced a skid will realise that he was changing either his speed or his direction, immediately before the skid developed. From this it appears that skidding is usually caused by accelerating, braking or changing direction so suddenly or forcibly as to create forces more powerful than the grip between the tyres and the road.

20. FIGURE 22 shows the plan view of a car. The four arrows lettered Y₁, Y₂, Y₃ and Y₄ illustrate the various forces and their approximate direction of operation which can be controlled by the driver. Y₁ and Y₂ are the sideways forces, caused by turning to the left or right. Y₃ is a retarding force caused by braking and locking the road wheels. Y₄ is the acceleration force causing wheel spin. Obviously a driver can create a combination of these forces by braking or accelerating whilst the car is describing a curved path.

21. All these forces will be operating on the car from time to time whilst it is in motion. The important thing to remember is that the driver must not allow them to become so powerful as to overcome

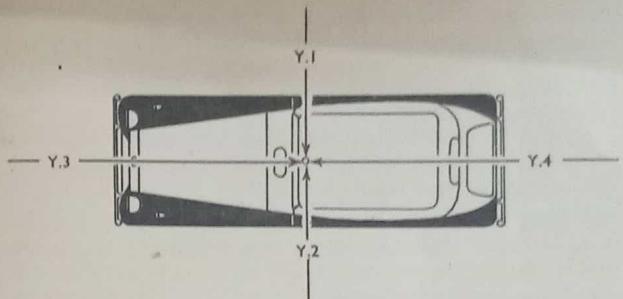


FIGURE 22

the grip of his tyres on the road. The Road Research Laboratory conduct experiments on the grip value of different types of road surface. For this purpose they use special apparatus which records in graph form a value which they call the Sideway Force Coefficient. From the driver's point of view (which is more practical than scientific) the most important fact revealed by these experiments is that the grip of a tyre on a road surface is relative to the speed of the vehicle along that surface. Almost every kind of surface has a good grip value when speed is kept low, in the region of 5 m.p.h., but as speed increases (and the maximum test speed is 30 m.p.h.) the grip value falls rapidly on some surfaces, notably wood blocks and smooth asphalt. Macadam and concrete surfaces however show up very well as speed increases.

TO MINIMISE THE RISK OF SKIDDING

22. The importance of good tyre treads and correct tyre pressures has already been stressed. Any neglect of these will increase the risk of skidding when driving on slippery roads.

23. Every driver should keep a good look out for sections of road surface which are soiled. To realise that the surface is slippery only when the vehicle is running over it is too late. Every driver should be able to recognise ahead of his vehicle the following road surface conditions (the list is not exhaustive):

- (a) Patches of oil or grease at cab ranks and public service vehicle stopping places.

- (b) Sections of road presenting smooth surfaces caused by wear and impregnation with rubber, dust and oil, at the approach to cross-roads, corners and bends.
- (c) Unfavourable cambers at corners and bends.
- (d) Loose dust or gravel.
- (e) Patches of frost, ice, or hard packed frozen snow, especially on gradients and bends in suburban and country districts.
- (f) Sunken gullies, man-holes, etc.

24. When such conditions are encountered, speed must be reduced. The smoothest control over speed in these conditions will be obtained through the accelerator pedal, which will regulate the speed of the engine and, of course, that of the road wheels through the transmission. Braking, if used, and any alterations to the steering, must be effected with such smoothness and delicacy that tyre adhesion to the road is not impaired.

SKID PAN

25. The ideal type of skid pan is one comprising an area laid with different types of road surface. It should be capable of being marked out into various straight sections, and should include several corners.

CAUSES OF SKIDDING

26. To learn to control a skid, the driver must learn how skidding is caused. It may be caused by the following:

- (a) Excessive speed, which is a basic cause.
- (b) Coarse steering in relation to a speed which in itself is not excessive.
- (c) Rough acceleration, a parent of excessive speed.
- (d) Excessive or sudden braking, demanded by excessive speed.

CORRECTING A SKID

27. The first requirement for correcting a skid is to know its type and to recognise the sensations transmitted to the driver by the behaviour of the car in the early stages of the skid's development. These sensations should be linked with the manner of control prevailing at the moment of skidding.

SENSATIONS ASSOCIATED WITH SKIDDING

28. *Rear Wheel Skid*.—A rear wheel skid caused by combinations of (a), (b) and (c) in para. 26 gives a sensation of unbalance to the

human body produced by the car endeavouring to turn about its vertical axis. The normal feel of the steering is replaced by one of extreme lightness, the car tends to turn broadside and, if unchecked, will tend to turn completely round. A rear wheel skid caused by (d) in para. 26 produces similar sensations, but with the addition that the desired loss of road speed does not take place.

29. *Front Wheel Skid*.—When this occurs, usually on a corner or bend, the sensation is that of complete loss of steering control, the vehicle going straight ahead instead of following the course of the deflected front wheels. The cause undoubtedly arises from excessive speed.

30. *Four Wheel Skid*.—A four wheel skid caused by (d) in para. 26 will produce a sensation of increased speed rather than of the desired loss of it, and the car will tend to slide forward.

31. *Guiding Principles for Correcting Skidding*.—Immediately the sensation of skidding is felt, it is imperative that the driver exercises a controlling influence over the vehicle, or the skid will develop to alarming proportions. The following notes are given as guiding principles, but practice in the art is essential.

32. (1) *Rear Wheel Skid* caused by (a), (b) or (c) in para. 26. Eliminate the cause by removing pressure on the accelerator pedal. At the same moment, turn the front wheels INTO the skid—or in other words, if the rear of the car swings to the right, turn the steering wheel to the right until stabilisation is achieved; similarly, if the rear of the car swings to the left, steer in that direction. Then steer into the desired course and apply gentle acceleration. Excessive or prolonged steering correction should be avoided, or another skid may be induced in the opposite direction.

(2) *Front Wheel Skid* caused by (a) in para. 26. Eliminate the cause by removing the pressure on the accelerator pedal and at the same moment straighten the front wheels. Another method is to cease acceleration as above, and if the hand-brake operates on the rear wheels only, apply it on and off, being careful to render the hand-brake setting device inoperative. This latter method may cause a helpful rear wheel skid, but in any case it will tend to reduce road speed.

(3) *Four Wheel Skid* caused by (d) in para. 26. Eliminate the cause immediately by stopping braking momentarily, to allow the road wheels to rotate. Then re-apply brakes with a delicate initial

pressure which may be increased gradually, so as to avoid locking the wheels again.

CONCLUSIONS ON SKIDDING

33. Every experienced driver knows, and every learner driver will find by experience, that concentration and quick reaction play a highly important part in driving on slippery roads without skidding. If a skid does occur, these same human qualities will be indispensable in the correction and control of the car. It has been previously mentioned, and is here stressed again, that the best control over the speed of a car on a slippery road is through the accelerator pedal. This is only possible through the clutch and a suitable gear ratio. So the driver is advised that, when controlling a skid on an average private car, it is generally best to leave the clutch engaged. If speed is excessive, normal braking is not advised, but if a lower gear is within road speed range a quick change down may be effected to reduce road speed. In this case, when the lower gear is engaged, great care must be taken to ensure smooth transmission of engine power through the clutch to the road wheels.

GEAR CHANGING

34. One of the most admirable qualities to be found in the good driver is ability to make the best use of the gear ratios of the car he is driving. Gear changing in itself is not a difficult operation. On most modern cars easy gear change devices automatically smooth out the difficulties which were experienced by drivers of the earlier cars which were fitted with plain 'crash' gear-boxes.

35. Notwithstanding the modern gear change devices, it is still considered essential that the driver should use the double de-clutching method of changing gear, a method which has been described in detail in Section 2.

36. The following paragraphs aim to improve the driver's knowledge and judgment of the correct use of the gears available to him on the average 20 to 30 h.p. car fitted with a four-speed gear-box. To this end he must have a good knowledge of the main components of the gear-box and their function when the accelerator, clutch or gear lever is moved.

37. It is through the gear-box that the power of the engine is transmitted to the road wheels. The power available is limited and

is proportional to the r.p.m. of the engine. Therefore different gears are used to make it possible for the engine to maintain r.p.m. and perform the work necessary to move the car from stationary, accelerate, decelerate and travel along the road, up and down hill, at any safe speed up to the car's maximum.

MOVING FROM STATIONARY AND CHANGING UP

38. A car may be put into motion smoothly and its speed increased progressively without undue stress on the engine or transmission, if the gear-box is properly used. The following procedure should therefore be followed:

- (1) Get the car rolling in first gear to overcome its inertia, then change up to second gear.
- (2) Accelerate in second gear, then change into third gear.
- (3) Accelerate in third gear, then change into top gear.

By this method the speed of the car will be increased smoothly, and briskly if necessary, and maximum road speed may be achieved as quickly as possible if this is desired. Care must be taken not to 'over-rev.' in an intermediate gear.

CHANGING DOWN

39. From the previous paragraph it is obvious that as speed increases to a certain limit in each gear so a change up is effected. On the other hand, when a car's speed is reduced, by the severity of a gradient or because it must slow down on account of traffic conditions, a lower gear must be selected to supply the power required either to climb the hill or to effect the smooth-turning effort which is necessary for slow progress in traffic.

40. Ability in judging when to change down to a lower gear is a very practical part of the training of a driver.

41. At the approach to a hazard the learner is advised to change down about 90 feet from the hazard. Other occasions for a change to a lower gear may be recognised in the following signs and symptoms:

- (a) A loss of road speed coupled with a reduction of engine r.p.m. and loss of reserve of power.
- (b) The increasing difficulty of road conditions observed ahead, such as the severity of a gradient, the slow movement of traffic proceeding ahead, or the approach to a hazard.

42. The selection of a suitable lower gear at the correct time will provide the advantages which are desirable in the following road circumstances:

- (a) On an up gradient, to maintain the power to climb the hill without undue loss of speed or engine r.p.m.
- (b) At the approach to a hazard, to enable the driver to accelerate out of the hazard if this is safe, or to stop more readily if necessary.
- (c) When travelling at low road speeds or when in doubt about traffic conditions ahead, to provide the reserve of power and flexibility to accelerate or decelerate by control through the accelerator pedal.
- (d) On a slippery road, when the use of engine compression to lose speed is safer than braking, since the latter would be liable to cause skidding.
- (e) On a steep down gradient, to control speed with engine compression thereby avoiding long periods of hard braking.

43. No matter how well a driver may handle a car, his ability to use the gear-box properly will do much to make or mar his driving. The first class driver should aim always:

- (a) To be in the correct gear for every road speed and traffic condition.
- (b) To make all gear changes quietly.
- (c) After selecting the gear, to connect the engine power to the transmission without jerk or jar to the machine.
- (d) To be capable of engaging a particular gear without first using an intermediate gear.
- (e) To know the approximate maximum road speed of the car he is driving in the intermediate gears.
- (f) To avoid changing gear when alongside a vehicle he is overtaking (both hands should remain on the steering wheel).

44. To satisfy these requirements the driver should endeavour to improve his ability to judge road speed without reference to the speedometer, and to judge engine r.p.m. by sound in each gear at various speeds. He should pay great attention to the details of the precise manipulation of the accelerator, clutch and gear lever (see Section 2). If at first he is not as successful as he expects to be, he should take frequent spells of practice, concentrating on gear changing alone.

CONCLUSIONS ON GEAR CHANGING

45. Car sympathy is a quality to be admired in any driver. It is shown in many ways, not the least of which is the manipulation of the gear changing controls and the r.p.m. used in any gear.

46. The handling of the average car engine can be heard and felt, and the knowledge gained by the combined use of these senses should enable the driver to drive his car with that delicacy and smoothness, sometimes called 'polish', which is so much admired amongst keen motorists.

47. Some common faults when changing gear, and in its kindred operations, are set out below:

- (1) Failure to appreciate the basic working principles of the main components of the gear-box, i.e. main-shaft and lay-shaft, and their behaviour under various running conditions.
- (2) Inability to recognise the sound of engine speed, and the correct relationship between it and the road speed of the car.
- (3) Failure to assess road speed correctly before selecting a particular gear. The commonest error is that of trying to engage second gear at too high a speed.
- (4) Failing to take a proper grip on the gear lever when moving it from one position to another. This is the root of many gear changing difficulties.
- (5) Lack of precise co-ordination between foot and hand movements to effect a clean, smooth, gear change.
- (6) Late gear changing, or entire failure to change down, at the approach to a hazard when the road speed and conditions demand a lower gear.
- (7) Failing to recognise the sound of the engine when 'over-revving' in a low gear. This fault is often associated with the act of overtaking.
- (8) Timidity and reluctance to attempt necessary changes down to low gears, after previous unsuccessful attempts.

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