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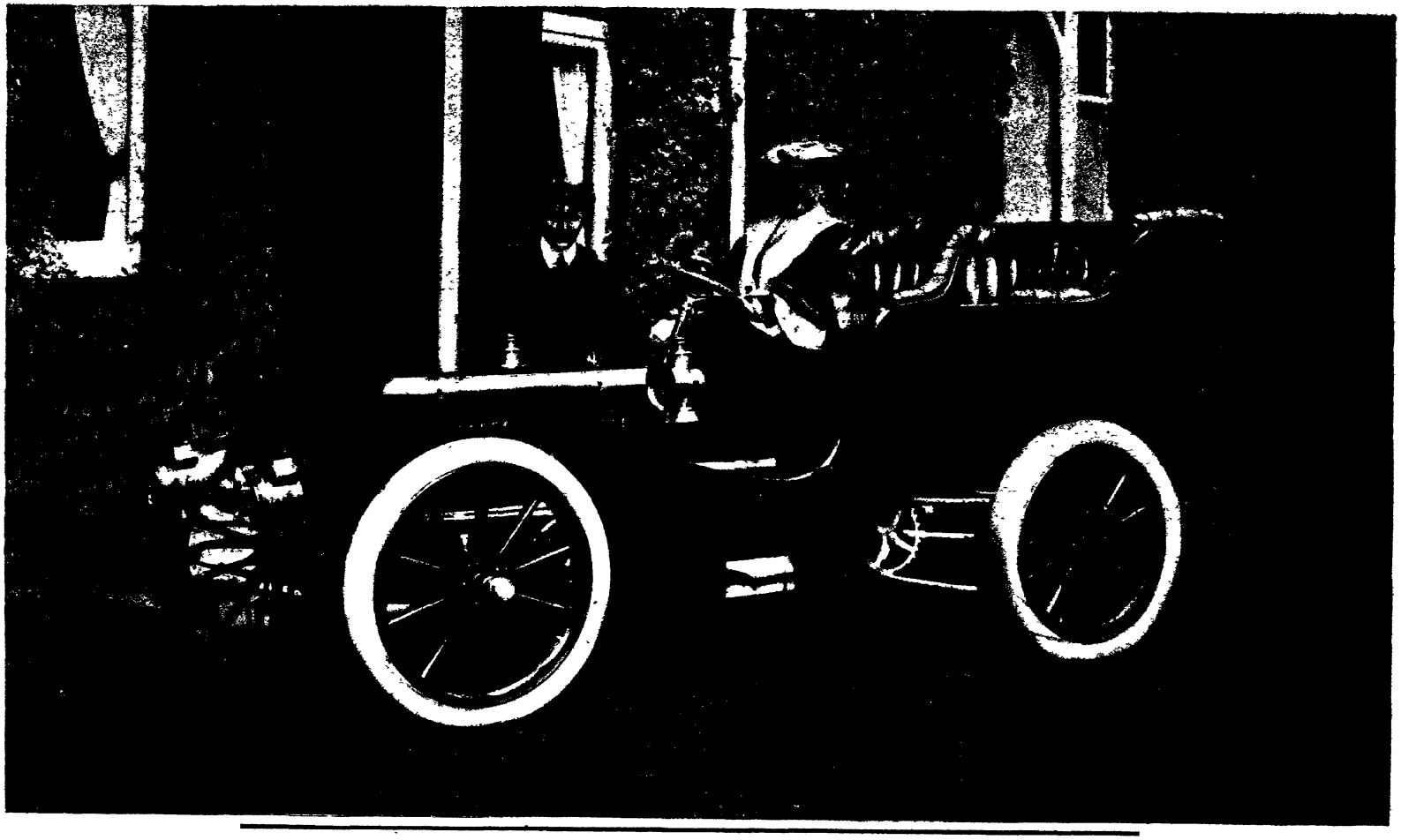

MR. AND MRS. CHARLES JARROTT AND THEIR 35 H.P. DE DIÉTRICH.

THE CAR LIBRARY.

CARS AND HOW TO DRIVE THEM.—Part II.

THE CAR LIBRARY.

Cars and How to Drive Them.

PART II

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CONTENTS.

INTRODUCTORY.

THE gratifying success which has attended the first and second editions of Volume I. of *Cars and How to Drive Them* has induced me to issue a second volume dealing with cars other than those treated of in the first volume. I have again adopted the principle of getting well-known drivers of the vehicles to give hints about the driving and management of their cars; but I have further elaborated the idea by including lettered and numbered diagrams of the mechanism of various cars. These will aid the beginner in more readily locating the several parts and understanding their functions.

I regret that considerations of space, and the great difficulty of obtaining satisfactory photographs in every case, have made it impracticable to fully illustrate the mechanism of each car; but the most salient points of the principal systems will be found illustrated, and these should prove of general interest. As many of the cars are really very similar in their main details, there would be a good deal of tiresome repetition had I attempted to illustrate the complete mechanism in every case.

It is obviously impossible to treat at full length mechanical details in an unpretentious work of this description, but sufficient information will be found to give a novice much useful instruction in the care and management of his car, and the experienced automobilist can also learn of other systems, and possibly further instruct himself in a knowledge of his favourite machine. Again, those wishing to compare one kind of automobile with another will be able to do so.

Of course, no amount of book learning will make a skilful motorist either from a mechanical or purely from a driver's point of view.

Daily experience in the shed and on the road is the only way to thoroughly understand a motor-car; but a book which gives initial hints and deals with peculiarities of special systems is sure to be useful.

I hope that the several writers who have assisted me in the compilation of this volume will accept my best thanks, and that my readers will duly profit from these pages.

J. S. M., *Editor.*

THE DE DIÉTRICH.

By Charles Jarrott.

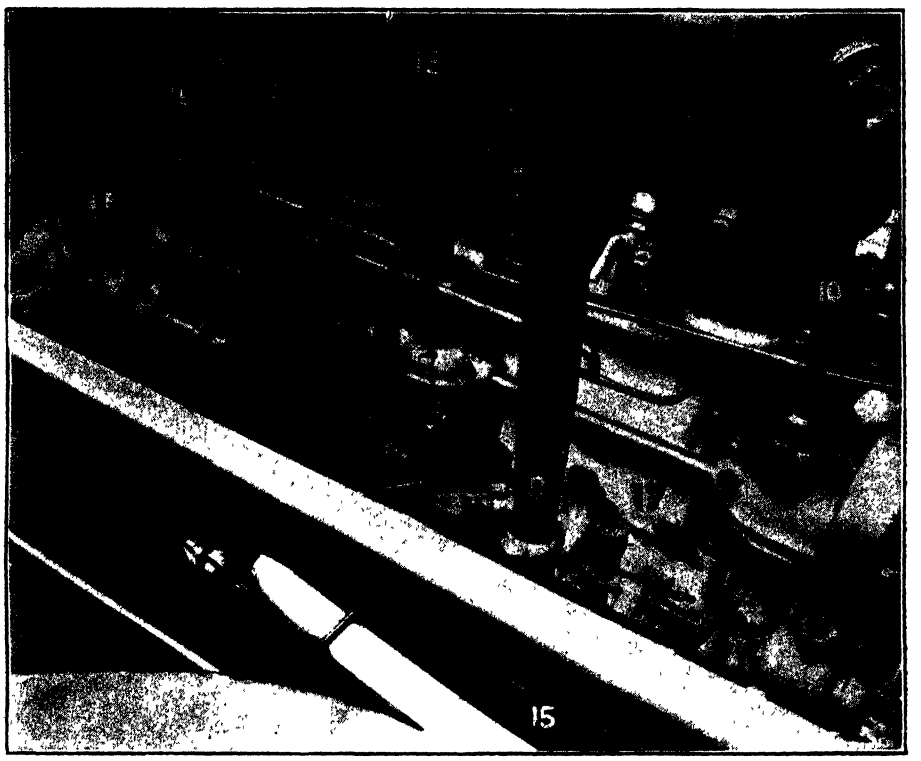
IN dealing with the famous De Diétrich one has to go back to the days when machines of the Amédée Bollée type were the construction on which the renowned Luneville firm had pinned their hopes and ambitions. The requirements of the later motoring generation, however, demanded more up-to-date practice and the requisites of a really modern type. Calling in the aid of the well-known engineering firm of Turcat-Méry, of Marseilles, Messrs. De Diétrich in 1902 took a licence under their patents for the manufacture of their model and started a new lease of life in the automobile world. Determination to establish a reputation as manufacturers of the best was well backed up by the works, and a careful examination of one of the De Diétrich cars is convincing beyond measure that neither time nor money have been spared to turn out everything in the very finest and most workmanlike manner. As a result of this the De Diétrich has become famous as a car, sound in design, strong in construction, and reliable in its running—in short, as a fine specimen of what a really up-to-date high-grade automobile should be.

Having thus, with the enthusiasm engendered by successful and enjoyable use, lauded the "marque" up to the skies, perhaps it would be better if I confined the rest of my remarks to the construction and manipulation of the cars, and—keeping myself strictly up to date—will for the purposes of this article deal with their latest models. I may mention that four models are made—12 h.p., giving about 15 b.h.p.; 16 h.p., giving approximately 22 b.h.p.; 24 h.p., giving about 30 b.h.p.; and the 35 h.p., giving approximately 40 b.h.p. As all these models are identical in construction—the only difference being in the motor—my remarks apply to all types equally.

The Motor.—The motor carries among its chief points most of the features which are now considered as up to date. The four cylinders are cast in pairs and are without water or gas joints on the cylinder heads, so that the difficulties experienced on many motors from leaky cylinder heads are not possible on the De Diétrich. The crank shaft is carried on three bearings, and is turned up out of the solid. Looking towards the motor from the front of the car both inlet and exhaust valves will be found on the right-hand side, and both are actuated from the same cam shaft. The exhaust valves are lifted in the ordinary way, and the inlet valves—which are placed on top of the exhaust valves—are actuated by rocking levers lifted by rods operated by the said cam shaft. An exceedingly neat method of taking the inlet valves out complete by the slackening of two nuts is not the least important feature in this connection. On the same side one finds the carburetter and throttle for the mixture. Controlled by a lever on a ratchet on the steering wheel the little piston throttle can be set to any point at the will of

the driver, and the speed governed accordingly. It will be observed that the carburetter is placed well up, and that the length of the induction pipe to the motor is consequently very short. On the left side of the motor is arranged another cam shaft, which is utilised for ignition purposes. (The ignition, I might mention, is by magneto of the Simms-Bosch type.) Rods are carried up which operate rocking levers, and these in turn act upon the ignition tappets situated close to the inlet valves on the right-hand side of the motor.

The Pump.—The pump, which is gear-driven, is also to be found on the left side of the motor, and its construction is worth studying. It is as near perfection



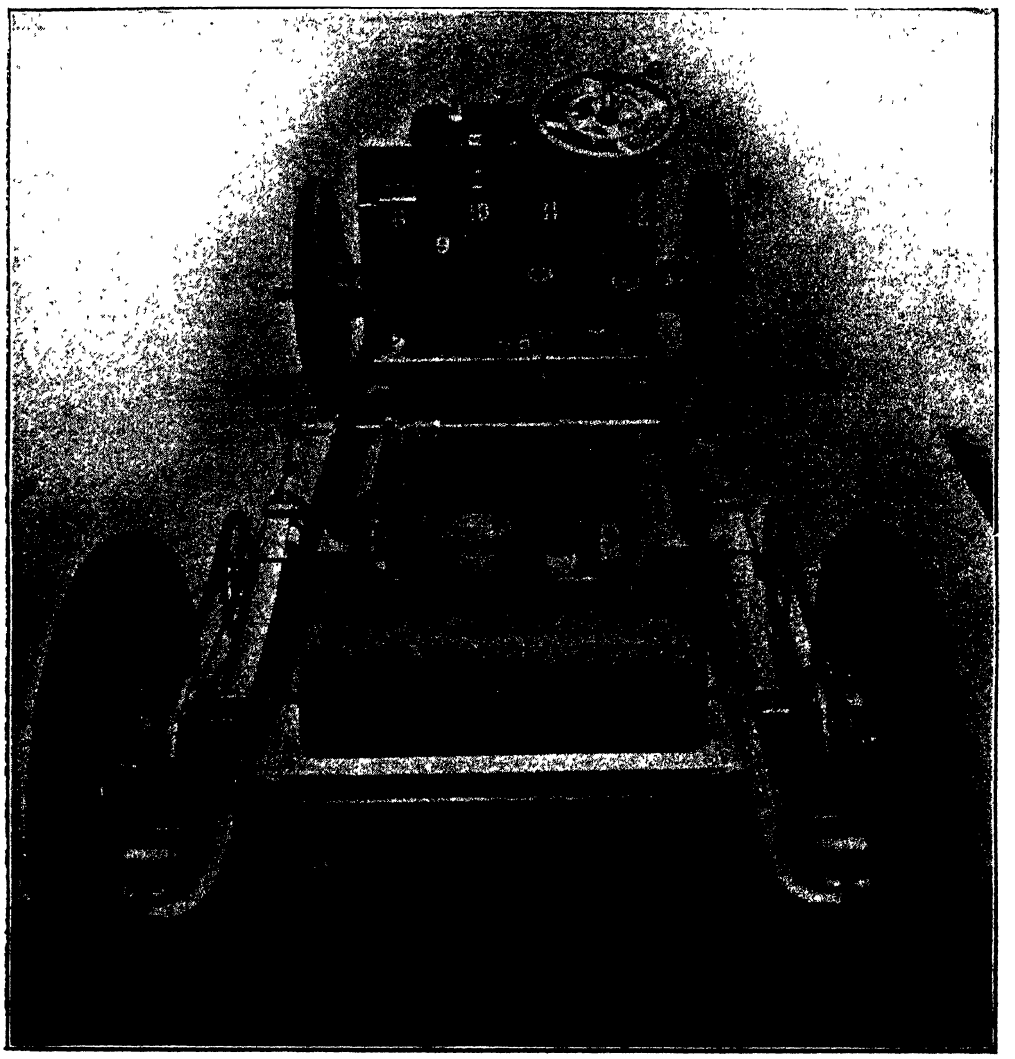
THE ENGINE, SHOWING MAGNETO IGNITION, ETC.

1. *Magneto.* 2. *Commutator.* 3. *Flexible coupling.* 4. *Pulley driving oil pump.* 5. *Water cock.* 6. *Magneto cam shaft.* 7. *Lubricating pipes.* 8. *Pump.* 9. *Pump outlet.* 10. *Tappet rod.* 11. *Flexible pump coupling.* 12. *Grease lubricator from dashboard.* 13. *Magneto wire (to plugs).* 14. *Vent.* 15. *Drain cock on pump.* 16. *Flywheel.* 17. *Inspection door.*

in its results as it is possible for a pump to be, and I may say that I have never known a De Diétrich pump get out of order or give the slighest trouble. A gauge on the dashboard shows you that the pump is working, but apart from that you might not have a pump at all for all the trouble it gives you. The magneto is also gear-driven and is on the left side of the motor, easy to get at, keep clean, and lubricate. On the little shaft driving the magneto can be fitted the commutator if it is wished to fit high tension ignition in addition to the magneto, and in this

connection I might mention that special plugs are fitted into the cylinder heads, which can be removed and sparking plugs substituted if desired.

Lubrication.—Every part of the motor—internal and external—is lubricated with oil of the usual fairly thin consistency, with the exception of the pump, which is, of course, lubricated with thick grease. The pistons are lubricated by a



THE CHASSIS VIEWED FROM THE REAR.

1. *Petrol tank.* 2. *Gear-box.* 3. *Foot brake drum.* 4. *Clutch pedal.* 5. *Brake pedal (on drum).* 6. *Throttle and advance spark.* 7. *Radiator.* 8. *Petrol reservoir.* 9. *Petrol filling pipe.* 10. *Grease pot, lubricating sprocket bearings and pump.* 11. *Lubricator to engine.* 12. *Pump (water) gauge.* 13. *Gear-changing lever.* 14. *Hand brake lever.* 15. *Silencer.* 15A. *Exhaust outlet.* 16. *Clutch.*

Dubrulle lubricator which feeds automatically when the engine is at work, and the pump attached to it supplies the crank chamber. Provided the engine has the right amount in the crank chamber at the start of the journey, the full lubricator

should be set so as to last approximately about one hundred miles. On this point I may mention that over lubrication does not seem to have any bad effect or to cause misfiring—although the engine may be smoking furiously—a point worthy of notice. A glass reservoir with pump for paraffin to clean piston rings is fitted to the dashboard.

With the exception of the engine, however, and the bearings of the shafts in the gear-box—which are kept lubricated by the oil in the gear-box itself—lubrication is secured by proper grease cups, and on the dashboard a special Stauffer grease cylinder is fixed, which has three pipes—two leading to the end and outside bearings on the sprocket shaft, and the other forward to the pump. Each of these pipes is provided with a small tap, which renders it possible to force the grease to any one of the three bearings—or to all three—as it may be desired. A large screw operates the grease plunger.

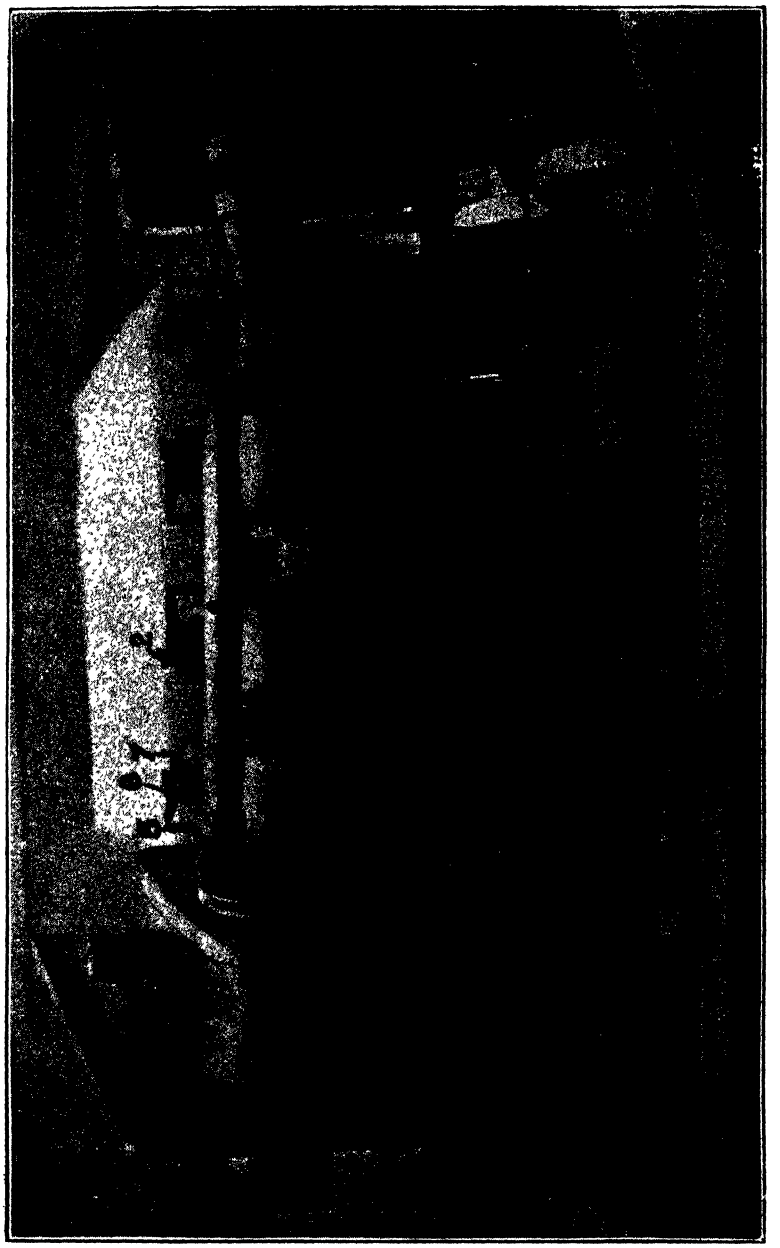
Always remember that plenty of oil and plenty of grease—in the right place—secure smooth and satisfactory running and minimise wear and tear, whereas carelessness in this direction will ruin the finest car ever made. Therefore lubricate, and lubricate, and lubricate again, especially if you are making much use of your car. When taking a long run the grease cups should be filled up and screwed home, and ought to be refilled every 300 miles at most, and the oil in the gear-box should always be kept to its proper level.

The Gear.—Designed with the idea of keeping the gear-box as flat as possible, the two shafts are arranged side by side instead of being one above the other, consequently, either shaft and the gear wheels on it can be easily and quickly inspected by removing the lid of the gear-box, which is detached without difficulty. Four speeds and the reverse gear are all actuated by a single lever placed on the right-hand side of the driver, and the gears slide in and out quietly and without noise on the Panhard principle. Here again, as on every part of the engine, all the nuts are castellated to prevent any possibility of their working loose. The thrust on the cross-shaft is taken up by ball bearings. It should always be seen that plenty of oil is kept in the gear-box and it must come almost up to the level of the shafts. Oil of a greater thickness should be used, and Stauffer grease ought not to be put into the gear-box itself, except a small quantity for thickening the ordinary thin lubricating oil—if it is utilised.

The Clutch.—This is so arranged as to make it possible to slide it back on the shaft in a few seconds, either to clean or make any special adjustment, or even to fit a new clutch leather—a very rare necessity—without having to take down all the gear-box. As the clutch shaft is fitted with a universal joint, it will be found that the cone is bound to go in dead true with the flywheel, and, at the same time, perfect alignment of the clutch shaft bearings is secured. Here, again, the thrust on the clutch is taken up by ball bearings. The clutch spring is arranged close to the dashboard, in a horizontal position, and so accessible as to make it possible to tighten it, even while the car is in motion, by raising the floor board.

Brakes.—The brakes are all metal to metal. The brakes operating on the two road wheels are both expanding, and are fitted into drums on the inside of the wheels. They are also enclosed to keep out mud, dirt, dust, and oil, but the casing is so arranged as to make it possible for the shoes of the brakes to be quite accessible for replacement. The two brakes are operated by a hand lever

on the right-hand side of the driver, which, however, has to be pulled *towards* the driver instead of pushed away from him, when it is wished to apply these brakes. Care in application is necessary, as they are very powerful. The foot brake is, as



THE ENGINE, WITH TANK AND RADIATORS.

1. *Cylinders.* 2. *Compression taps.* 3. *Water tank.* 4. *Oil pump wheel.* 5. *Inlet valve actuating rod.* 6. *Pivoted beam.* 7. *Valve stem.* 8. *Water outlet from jackets.* 9. *Commutator.* 10. *Magneto.* 11. *Radiator inlet pipe.* 12. *Water tank outlet.* 13. *Tappet actuating rods.* 14. *Water cocks.* 15. *Pump.* 16. *Oil pipes to cylinders.* 17. *Tappet beams.* 18. *Radiator outlet.*

usual, operated by the right-hand pedal and acts on the countershaft. This also is external expanding, and is enclosed in the same way as the side brakes, but is quite accessible and easily got at. Adjustment is obtained by a long nut with a right

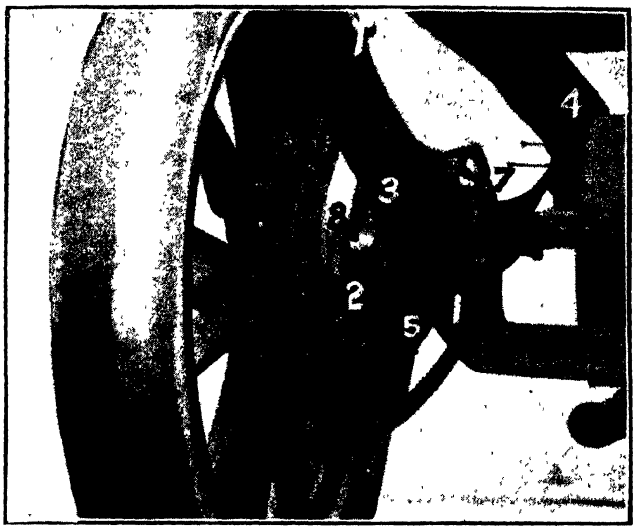
and left hand thread attached to the actuating rod, which can be shortened or lengthened at will.

Tanks.—The water tank on the De Diétrich is arranged inside the bonnet and at such a level as always to secure the cylinder heads being kept full of water irrespective of the action of the pump. Owing to the splendid cooling obtained by the De Diétrich system, it will be found that practically no water is used, and that the tank seldom requires replenishing, although this is a point which should be carefully looked to in case of accident. It is possible to run off the water in frosty weather from the tank and also from the motor and radiator by means of the special taps provided for the purpose. The main petrol tank is situated in the frame between the gear-box and the tool box, which is arranged in the rear of the frame. Pressure feed to the carburetter is secured by a small pipe fixed to one of the exhaust pipes. A small safety pressure gauge is fitted in order to keep the pressure constant. I would like to point out one special feature in the De Diétrich in this direction. The nuisance of having to use a hand pump to obtain the initial pressure to start the engine is obviated.

Instead of the petrol being forced direct to the carburetter, it is first conveyed into a small copper tank (a few inches square) on the dashboard. Proper air taps are fitted to this tank, and the petrol is forced in at the *top* of this small reservoir and flows out at the *bottom* to the carburetter, so that when the engine is stopped and there is no pressure in the main tank to force the fluid to the carburetter, the small tank on the dashboard—which is fitted higher than the carburetter—being full of petrol, feeds the carburetter by gravity. Directly the engine starts, the pressure from the exhaust forces up petrol from the main tank to keep the small auxiliary tank full. The whole feed is quite automatic and entirely does away with the necessity of a hand pump. A large copper pipe fitted on the front of the dashboard leads to the main petrol tank for filling purposes, and the reservoirs can be filled up at any moment without inconveniencing the passengers in the car in the slightest degree, a matter particularly to be appreciated in very bad and wet weather.

Driving and Manipulation.—It will be observed that a single lever working on a ratchet is fitted on the steering wheel, and if the action of movement of this lever is carefully followed out, it will be found that it serves a dual purpose. Firstly, it holds open the throttle or rather the plunger in the carburetter allowing more or less gas to the cylinders, and a continuation of the movement of the lever, after fully opening the throttle, advances the magneto ignition. The latter is accomplished by varying the timing of the cam shaft, on which the cams are fixed which operate the levers, in their turn operating the firing tappets. It will thus be seen that any possibility of advancing the sparking while the engine is running very slowly with the throttle partially closed is avoided, and hammering of the piston ends prevented. The damage caused to motors through careless variation of the timing of the ignition has never been truly appreciated, and the covering of this point by Messrs. De Diétrich is, to my mind, important in rendering their cars more "fool proof," whilst it saves the driver no small amount of trouble.

Having thus appreciated the functions of this small lever we will proceed further. The throttle is opened without the ignition being too far advanced, the petrol is turned on—two or three vigorous turns of the starting handle—and

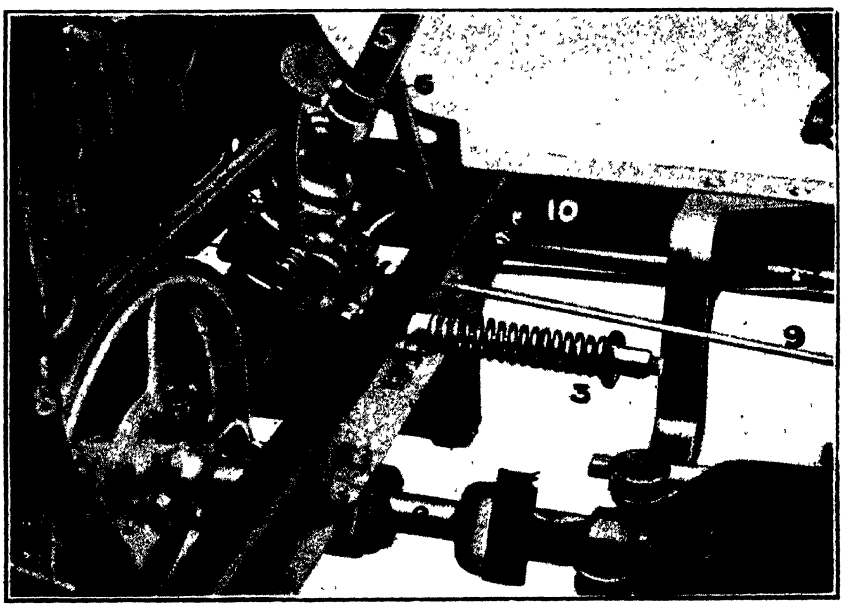


REAR AXLE AND BRAKE.

1. *Axle.* 2. *Dust proof cover.* 3. *Spring.* 4. *Frame.* 5. *Radius rod.* 6. *Chain rack.* 7. *Spring clip.* 8. *Arm of expanding brake.*

the motor has started. You immediately bring back the throttle — while the car is standing—in order to keep the engine running on a small amount of gas, and quietly.

I would now like to explain the functions of the left-hand foot pedal. I have already previously explained that the right hand pedal operates the foot brake. The left pedal has as its primary object the operation of the clutch. It also does something else. Imagine a situation of your driving along a country road. The throttle lever is wide open and you are swinging along in great style. Suddenly, without a moment's warning, a carriage and pair dashes out of a side road and you have to act in a second. Out with the clutch—foot brake on—and to save the situation the hand brake has to be hurriedly applied. Your left hand is clinging on to the steering wheel. What is the result—with the throttle lever wide open—by your not having had time to get your hand on the wheel to close it—immediately you take your clutch out the engine races off



THE CLUTCH, ETC.

1. *Clutch.* 2. *Clutch shaft and universal joint.* 3. *Clutch spring.* 4. *Clutch pedal.* 5. *Steering Column.* 6. *Brake pedal.* 7. *Gear box.* 8. *Petrol filling pipe.* 9. *Brake rod.* 10. *Frame.* 11. *Ball thrust block.* 12. *Flywheel.*

at a great speed, creating additional consternation to the possibly already affrighted horses. In the De Diétrich, however, all this trouble is done away with. To the left of the clutch pedal is attached a lever which is in turn also connected up to the throttle plunger in the carburetter, and the mere act of pressing the foot on the left pedal first closes the throttle and brings the engine down to a low speed, and then, if pressed farther forward, forces out the clutch.

Immediately the pedal is released the throttle is opened to the point to which it has previously been set by the lever on the steering wheel. It will thus be seen that whenever the clutch is withdrawn—no matter for what purpose—whether it be in order to slow down speed, or whether it be to change the gear, the engine is throttled down immediately the power is not being utilised in driving the car—thus securing economy and silent running otherwise impossible. The speed of the car may be checked at any moment—even without withdrawing the clutch—merely by lightly pressing forward the clutch pedal, which, as I have pointed out, first operates on the throttle. Strain on the gear and strain on the frame and clutch is also entirely obviated and a general flexibility of control secured, which is necessary to be tried to be fully appreciated.

With the engine running at a high speed the control lever can be still farther advanced—thus advancing the ignition—and a still further increased speed secured. It will be readily understood that the car with this system of control can be driven even on its highest gears at a very low speed in the thickest traffic. I do not think it is necessary in this article for me to go through the elementary instructions necessary to drive a De Diétrich car. The De Diétrich is on this point identical with other cars of the same type. No one would think of changing gear without first taking out the clutch, and it is not necessary for me to say that when the car slows down when going uphill on its *third* speed, that the *second* speed is the gear to change to and not the *fourth*.

Before starting out on your journey, however, see that your grease cups and lubricator are full. Observe that the oil to the cylinders is running regularly through the sight feed in the Dubrulle lubricator, and set it so that by the use of the oil pump and the automatic action the lubricator has to be replenished about every one hundred miles. See that your chains are oiled and the bolts in them properly secured. A little oil on the working joints of the springs makes a marvellous difference in the easy swing of the car. Give a hand occasionally to screw down the plunger in the grease cylinder on the dashboard. When stopping for the night pump through a little paraffin to the piston rings from the glass pump fitted for that purpose on the dashboard.

Some Hints and Tips.—If the engine should happen to be misfiring, first see that all the cut-out devices fitted for each cylinder are free and then by their aid test each cylinder separately. It may be that oil has worked on to one of the tappets. This may work off after a few moments running—it usually does so—but if not take out the tappet and clean it. In course of time and after considerable running the plugs in the tappets may wear and require turning. If so, turn and fit new copper washers and screw in again so that the round of the plug is secured for the point of contact. In doing this care should be exercised and the tappet pieces themselves which make contact with the plug must be filed up. It is very necessary to see, however, that any adjustments to the tappets should be very carefully made to all four in order to secure accuracy of timing of the ignition.

The adjustment of the throttle in the carburetter should be carefully attended to, as the correct setting of this makes the difference between the motor running quietly—or otherwise—when standing. I should like to explain that in the construction of the De Diétrich throttle a special auxiliary air slide is arranged, which opens as the throttle opens and the speed of the engine is increased, and closes automatically as the throttle is closed and the speed of the engine decreased, thus securing a consistent mixture at all engine speeds. Thin oil can be used to lubricate the slide of the throttle, which, if kept lubricated, will assist to secure the smooth running of the engine.

The arrangement of the clutch pedal in the manner I have mentioned may at first puzzle the driver when wishing to start the car up a steep hill, the foot brake not taking out the clutch, and thus allowing him to release the left pedal in order to race the motor to secure the necessary start. The side brake, however, *does* take out the clutch without affecting the throttle. Therefore, to start up a steep hill, hold the car with the foot brake and let in the clutch by the side brake lever, having first opened the throttle wide, and take the left foot entirely away from the left pedal.

And now to conclude. Speaking candidly and from my own experience, I know of no point on the De Diétrich cars regarding which I can say trouble may be expected. I have driven many thousands of miles on various types of cars, and I cannot recall more than four or five stoppages from any cause whatever. I have broken on two separate occasions the little spring on one of the ignition tappets—replaced on each occasion in a few seconds. I have once had to tighten a clutch spring, and I have twice stopped through stoppage in petrol pipe—all trivial.

THE FIAT.

By Victor Miller.

BEFORE dealing with the Fiat car itself, I want to explain the meaning of the word F.I.A.T. It is derived by taking the first letter of each word which forms the title of the firm, Fabbrica Italiana di Automobili Torino. This company only started some five years ago, but they have made such enormous strides that, at the present moment, they have one of the best equipped works in the world. In dealing with the description of the Fiat cars, I shall confine my remarks chiefly to the 24 h.p. Fiat, but they refer equally well to the 16 h p. type. All the Fiat cars have four cylinders, which are cast in pairs; mechanically operated valves are fitted, and, in my experience, I have found that these are far superior to the automatic induction valves; you certainly get more power, and I find that the engine runs much smoother. The 24 h.p. engine has cylinders of 125 bore by 125 stroke; the 16 h.p. has 110 by 110.

Ignition.—All the Fiats are fitted with the Simms-Bosch magneto electric ignition. After having tested this for many thousands of miles I have found it absolutely reliable. It has the advantage of doing away with batteries, coils, etc. The magneto is placed on the right-hand side of the engine and is driven by silent red fibre gear wheels.

Radiator.—The Fiat is fitted with a genuine honeycomb radiator, under licence from the Mercédès Company. It is hardly necessary for me to give a detailed account of this, as its principles and method of action are now known by all motorists. It is, in my opinion, a great improvement on the old type, besides giving the car a much neater appearance. I am referring, of course, to the genuine article, and not to the many bad imitations which are on the market at the present moment. This radiator carries about 1½ gallons of water, which is circulated round the cylinders by a centrifugal pump driven off the half-time exhaust shaft. The flywheel, which is made very large, is fitted with arms shaped like fan blades, and these arms, in revolving, suck cool air through the radiator.

Clutch.—This is of the coil type, and is really an English patent (Lindsey's). It was first made for motor-cars about four years ago by the Mercédès Company, and slightly altered in detail. It was tried on a large English racing car, but was given up, and it has been left to the Mercédès and F.I.A.T. manufacturers to perfect it. This clutch is placed in the boss of the flywheel, and consists of a flat spiral spring about 7 in. in diameter, one end of which is made fast to the boss of the flywheel, while the other end is free, and there is a bell crank lever attached, with a small roller at the end. A cam slides on the main shaft, which engages the small roller

MR. VICTOR MILLER AND HIS 24 H.P. FIAT.

on the lever. This lever is moved by the roller running up the cam, and this motion tends to tighten one end of the clutch spring, which grips a hollow cylinder mounted on the main shaft. It will thus be seen that a very slight pressure is required, as one has but to slide the cam on the shaft, which is held by a very light spring. The lubrication of this clutch is effected in various ways; the Mercédès gets its oil from the engine bearing, the Fiat gets its oil put in through a filling plug in the outside case of the clutch. This should be filled up every day.

Gear.—The gear of the new Fiat cars has been entirely remodelled, and the second motion shaft now lies to the left of the first motion shaft. The gear-box has a very large inspection cover, and its sliding members are arranged on the Mercédès lines, the sliding wheels being mounted on two independent sleeves. The reverse intermediate gear wheel is carried by a rocking arm. The change-speed lever moves forwards and backwards in either of two alternate slots for the four forward speeds, and has a safety catch, which, when withdrawn, allows it to pass to a third slot for the reverse speed.

Ball Bearings.—The gear, countershafts, and axles are all fitted with ball bearings, and I find that if properly lubricated they will stand more wear and tear than the plain bearings, but they must be exceptionally well made and finished and very highly polished.

Frame.—The main frame is constructed of pressed steel, and it has no under-frame, either for the engine or gear-box. It is narrowed opposite the engine in order to give an increased lock to the steering wheels. There are two lengths for each type, viz. :—

16 h.p., 7 ft. 7 in. and 9 ft. 6 in.
24 h.p., 8 ft. 10 in. and 9 ft. 9 in.

The longer one is specially made to allow a side entrance to be fitted to the body.

Brakes and Springs.—Two brakes are fitted to the Fiat, actuated by the usual pedal and lever. They are both metal to metal, and very powerful. The side brakes are of the internal expanding type, and are compensated by springs. The foot brake is connected with the clutch in such a way that this is withdrawn when the brake is applied. The semi-elliptic side springs are made very long, the side spring horns in front forming a part of the pressed steel frame.

Lubrication.—I have seen more breakdowns, and sometimes cars absolutely ruined, through bad lubrication than from any other cause; and thus I quite understand why the Fiat Company prize their patent lubricator so highly. Too much lubrication is nearly as bad as too little. The Fiat lubricator being an automatic one, there is no danger of this. It is mounted on the dash, and is driven by a round belt fitted on the rear end of the cam shaft. The accompanying illustrations show the action of the mechanism. It consists of a large cast aluminium tank, having two flap lids of considerable size. One of these lids gives access to the oil reservoir, which holds a very large quantity of lubricating oil, and the other provides inspection convenience for the secondary or distributing tank. Beyond this the actual device may be said to comprise two distinct mechanisms—the elevators and the distributers. Fig. 1 shows the elevator, sectioned to show its components. There are the two tanks, T and S, having the bell-mouthed tubes F fixed in the partition between them. T, the lower tank, is simply and solely a

reservoir for lubricating oil; S is the distributing vessel into which the oil from T has to be carried and kept at a constant level. The action is as follows:—The shaft B is driven from the engine by means of a pulley and belt, and drives the worm A gearing with the worm wheel D. This worm wheel is carried on a shaft running the whole length of the tank S, and upon it the chain wheel C is also mounted, this wheel lying centrally in either direction between the mouths of the tubes F. Over this chain wheel C, and a similar chain wheel G in the reservoir, and running through the tubes as shown, is the ball chain E, the balls being an approximate fit in the bore of the tubes. On the chain wheel being revolved from the worm wheel shaft the balls are, of course, caused to pass up through the tubes, over the chain wheel C (where any oil there may have been carried up runs off into the tank), and down again into the tank T, where they pick up more oil and carry

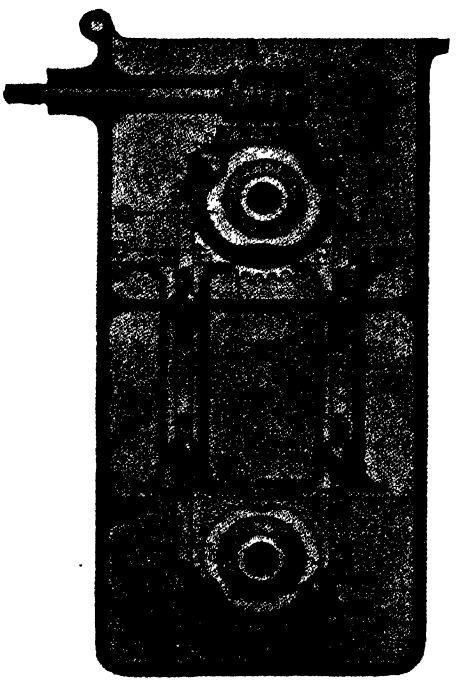


FIG. 1.—THE OIL ELEVATOR.

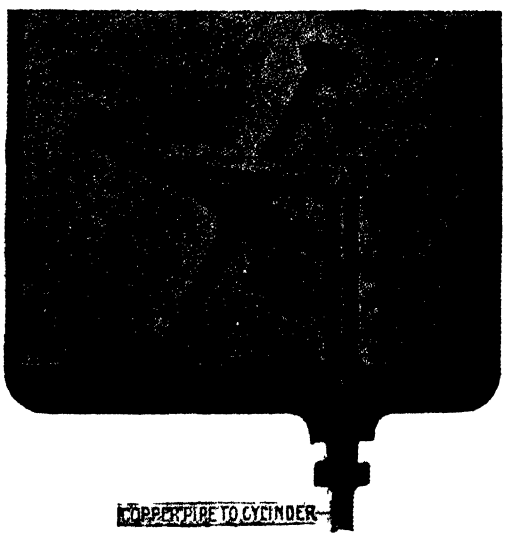


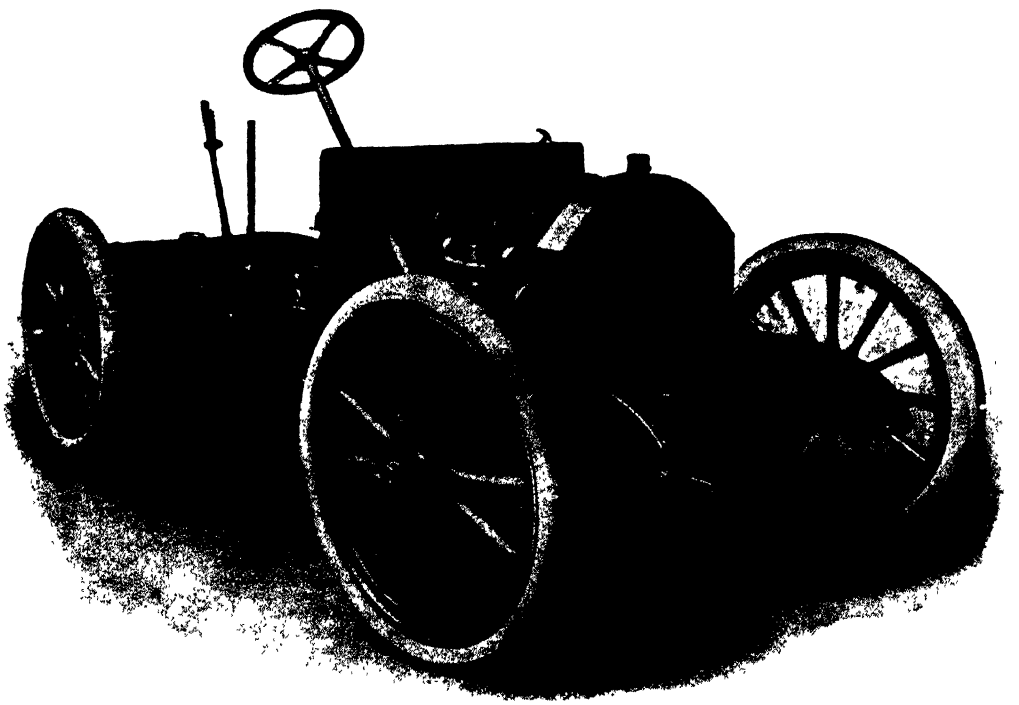
FIG. 2.—THE OIL DISTRIBUTER.

A, *worm on actuating shaft.* B, *actuating shaft.* C, *chain wheel.* D, *worm wheel.* E, *balls on the chain.* G, *free chain wheel.* S *and* T, *oil tanks.*

it up to tank S. Should more oil than is necessary to keep the level constant at the top of the tubes F be carried up, the downward passage of the ball chain in the return tube simply takes it back to the lower reservoir. Thus we have a constant level of lubricating oil in the tank S. The distributing device is shown in Fig. 2. The worm-wheel shaft driving the chain wheel is continued, and at its other end a small four-armed spindle is mounted. At the extremity of each arm a little oil bucket is mounted, and as the spindle revolves these buckets in turn dip beneath the surface of the oil in the tank and so become filled. As each bucket passes its highest point it discharges its oil, which falls into the oil dish, whence it is conducted to the cylinder by a small copper pipe. In the actual lubrication there are two such distributers—one for either pair of cylinders. The advantages

of the lubricator are obvious—absolute proportioning of feed to the speed of the engine, cessation of lubrication when the engine stops, and perfect certainty and simplicity of action.

Carburetter.—The Fiat carburetter automatically ensures a constant quality of mixture by having the throttle valve connected with the auxiliary air admission valve. These valves are connected, through the hollow exhaust cam shaft, with the governor on its forward end. The speed of the engine can be regulated by a small lever placed above the steering wheel, or by a small foot pedal placed between the clutch and brake pedal. I find this a great advantage, especially when driving in traffic, as it does away with all taps and handles on the steering wheel,



THE CHASSIS OF THE FIAT.

and leaves the hands free to steer. The float feed is of the usual type, and gets its petrol forced up from the tank by the exhaust pressure.

Starting the Motor.—The first thing to do is to pump up the pressure in the petrol tank by the small hand air pump, which is fitted to the dashboard, and tap the float in the carburetter to ensure your having a good mixture. Then give the starting handle a few smart turns, and the motor will start. After the motor has run a little while, and got a little heated, half a turn of the handle is sufficient. The lubricator starts working, automatically feeding the engine with oil in proper proportions, without any adjustment, and the petrol is forced by the exhaust to the carburetter.

Changing Speed.—Before putting the lever in the first speed slot, see that the clutch is well out, by pressing the left pedal well home, then let the clutch in care-

fully, and at the same time open the throttle a little by advancing the small lever placed on the steering wheel, and the car will start. To change from first to second press the clutch pedal down and pull the lever towards you. After a little practice these two motions can be done simultaneously. To go from the second to the third speed first bring the lever to the neutral position, then bring it sharply inwards or towards you and then push it forward. To get into the fourth, pull the lever backwards as far as it will come. All this sounds very complicated, but it is only needed to explain the course the lever takes in changing into the various speeds. As a matter of fact, with a little practice, it is done in one motion, and, when mastered, it is without doubt the best form of change speed, as it is practically impossible to make a mistake.

Petrol Consumption.—The consumption of petrol on the old types was rather high, especially so on the 24 h.p. car, but with the new carburetter the consumption compares, I think, favourably with other cars, and of the general efficiency of the Fiat there can be no question.

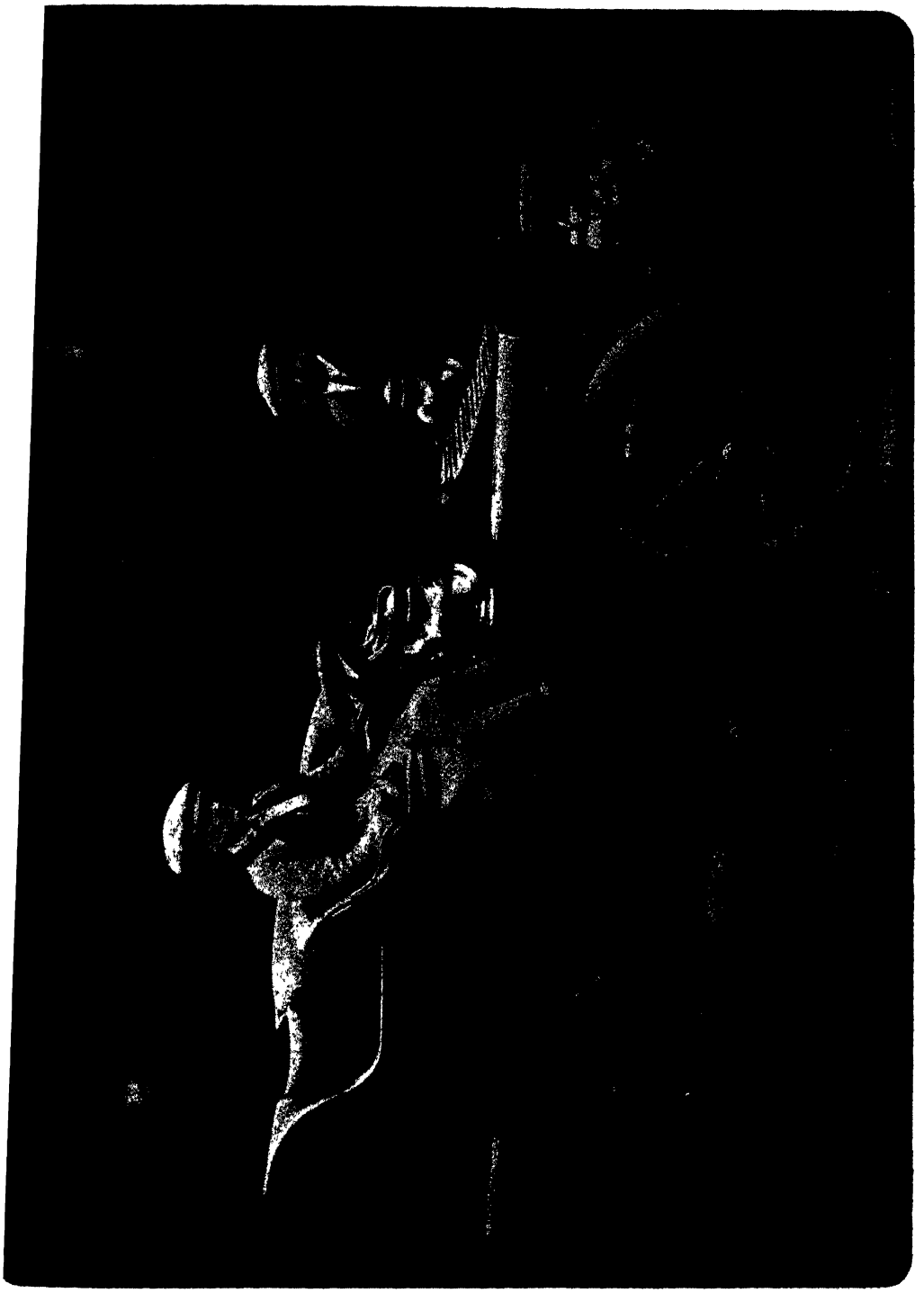
THE SUNBEAM.

By the Hon. Maurice Gifford.

HAVING seen that two of the Sunbeam cars went through the Glasgow to London non-stop run with full marks, I communicated with the makers, Messrs. John Marston, Ld., and they sent a car over from Wolverhampton for a trial run, which proved very satisfactory. I was much impressed with the running of the car, simplicity of management, and good

A PRETTY GROUP.

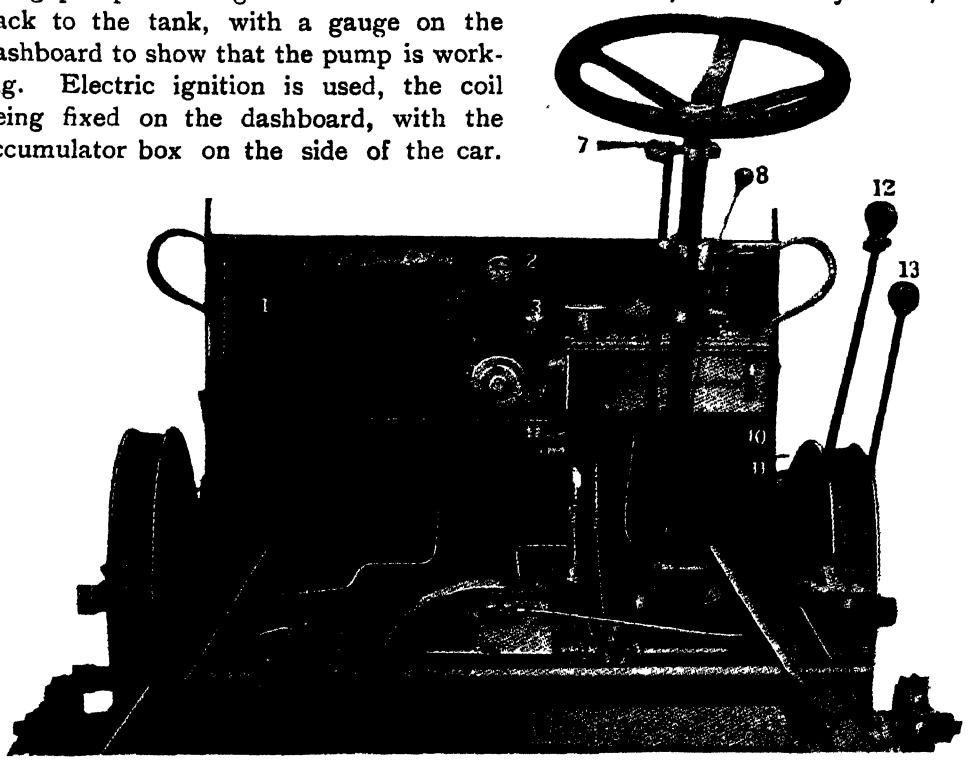
workmanship throughout, and I decided to order one, which was delivered on the date promised. I am unable to drive the car myself, having lost an arm in the Matabele Rebellion, 1896, but I have not found it necessary to engage a mechanic.



THE HON. MAURICE GIFFORD AND MRS. GIFFORD WITH THEIR 12 H.P. SUNBEAM CAR.

After a few lessons in driving, my wife was soon able to handle the car, and having studied the details I look after the mechanism, with the assistance of a man to clean it.

General Description of Motor.—Now, as to technical details. The motor is a 12 h.p., with four vertical cylinders, without any water joints, and is automatically governed on the inlet. The connecting rods are forged steel with bronze bearings. The cam shaft operating the valves is enclosed in the crank chamber, and is, therefore, perfectly lubricated by the oil splash. By unscrewing one plug on the top of each cylinder the valves can be removed. The engine is cooled by water being pumped through the radiator in front of the car, round the cylinders, and back to the tank, with a gauge on the dashboard to show that the pump is working. Electric ignition is used, the coil being fixed on the dashboard, with the accumulator box on the side of the car.

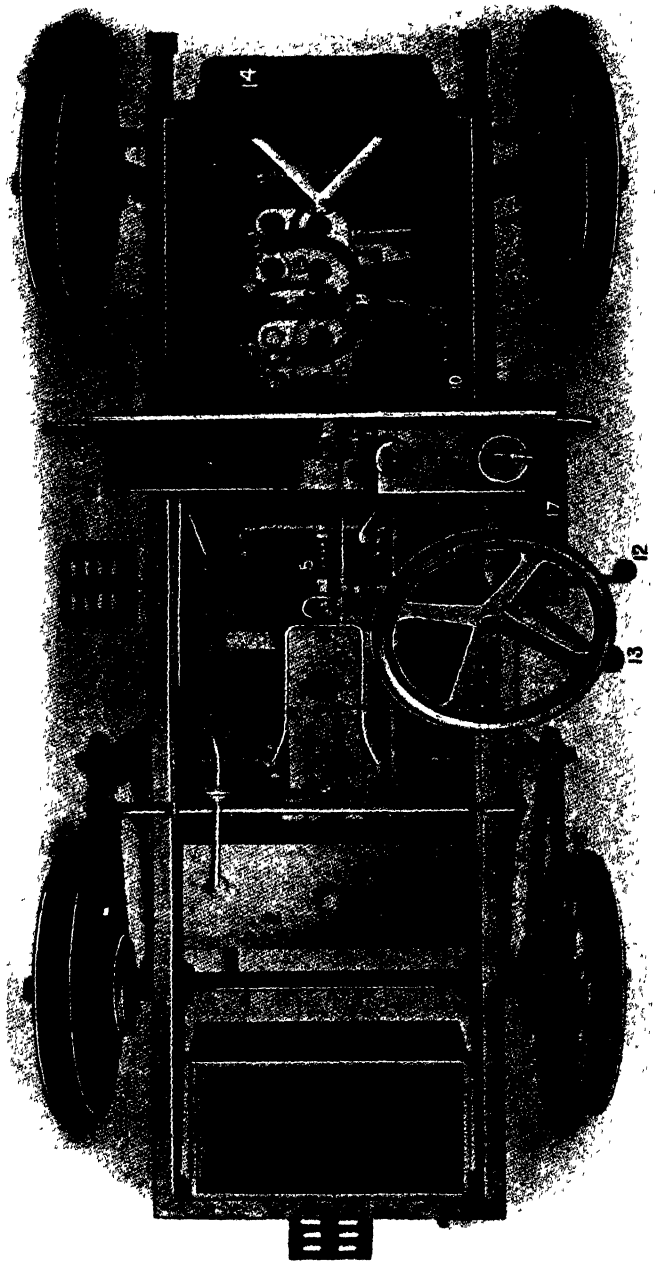


THE 12 H.P. SUNBEAM.

1. *Coil box.* 2. *Water gauge.* 3. *Air tap to carburetter.* 4. *Switch.* 5. *Commutator.* 6. *Forced-feed lubricator for engine and gear-box.* 7. *Ignition or sparking lever.* 8. *Lever to set speed of engine.* 9. *Clutch pedal.* 10. *Pedal of foot brake.* 11. *Accelerator pedal.* 12. *Hand brake.* 13. *Change-speed lever.* 14. *Gear-box.* 15. *Drum of foot brake.*

A point worth noting here is the careful manner in which all the electric wires are insulated by wood casing and vulcanite tubing, thus preventing the possibility of short circuits. The gear-box is particularly neat and well designed, while the gear wheels are machine cut from special steel and carefully hardened. The steering is non-reversible, with all the joints capped with leather to keep dust and dirt away, thus considerably reducing the wear. A foot brake (metal to metal) acts on the cross shaft, which also cuts out the engine when applied. There is also a powerful hand brake fitted, acting on drums attached

to the road-wheels. All the brakes are well designed, substantially made, and hold both forward and backward. The axles have plain parallel bearings with oil bath lubricator, and the hubs are steel with phosphor bronze bushings. The



CHASSIS OF THE 12 H.P. SUNBEAM.

1. *Tool box.* 2. *Water tank.* 3. *Gear-box.* 4. *Foot brake drum.* 5. *Clutch spring.* 6. *Clutch pedal.* 7. *Coil.* 8. *Commutator.* 9. *Forced-feed lubricator.* 10. *Carburetter.* 11. *Inlet pipe to engine.* 12. *Change-speed lever.* 13. *Hand brake.* 14. *Radiator.* 15. *Engine.* 16. *Grease cup for outside bearings of gear-box.* 17. *Accumulator box.*

artillery wheels are all equal sized (32 in.), which permits the tyres to be changed from the back to the front if desired. An important feature in the latest pattern Sunbeam is the fitting of the firm's oil-bath gear cases to the chains, and in the various reliability trials held during the past few years the Sunbeam cars had these

cases on, and they proved an absolute success in every way. This can be better appreciated when it is explained that the chains always run in a bath of oil, are perfectly protected from dirt, and will consequently wear more than double the length of time of an ordinary exposed chain; in fact, I am told that after the trials the chains showed no signs of wear, besides running noiselessly. All the other details of the car are worked out in a very careful manner, and the workmanship leaves nothing to be desired.

Hints as to Driving.—Before starting the engine be careful to see that the change-speed lever is in the neutral position, retard the sparking by bringing the small lever towards you when sitting in the driver's seat, and open the throttle valve by bringing over the other lever on the steering column also towards you. Then turn on the switch and petrol, give a turn to the handle in front of the car, and the engine will start. Release the clutch by pressing down the pedal on the left of the steering column, and move change-speed lever into the forward slot nearest the car (the safety catch for reversing, of course, being in position), let in the clutch gently, and the car will move forward on the first speed. Now repeat the clutch movement and bring the speed lever into the backward slot nearest the car; again let in the clutch, and the car will be running on the second speed, and it will be found advisable to continue on this speed for a while until you have mastered the steering. To put in the third speed you repeat the clutch movement and bring the speed lever into the forward outer slot; the fourth speed is the outer backward slot. I may mention here that the change-speed on this car is a particularly easy one, as you can tell at a glance from the forward or backward position of the lever what speed you are in, and the novice is not so apt to miss his changes. You have only to push the lever backwards or forwards, which can be done mechanically without looking, and this is a great advantage, particularly at night.

Further Hints.—When starting on a journey see that the grease cups and oilers are filled.

Always fill the water tank with soft water whenever possible.

Always carry a spare accumulator.

It is advisable to unscrew the valve tops and put in a tablespoonful of paraffin frequently to clean the piston rings.

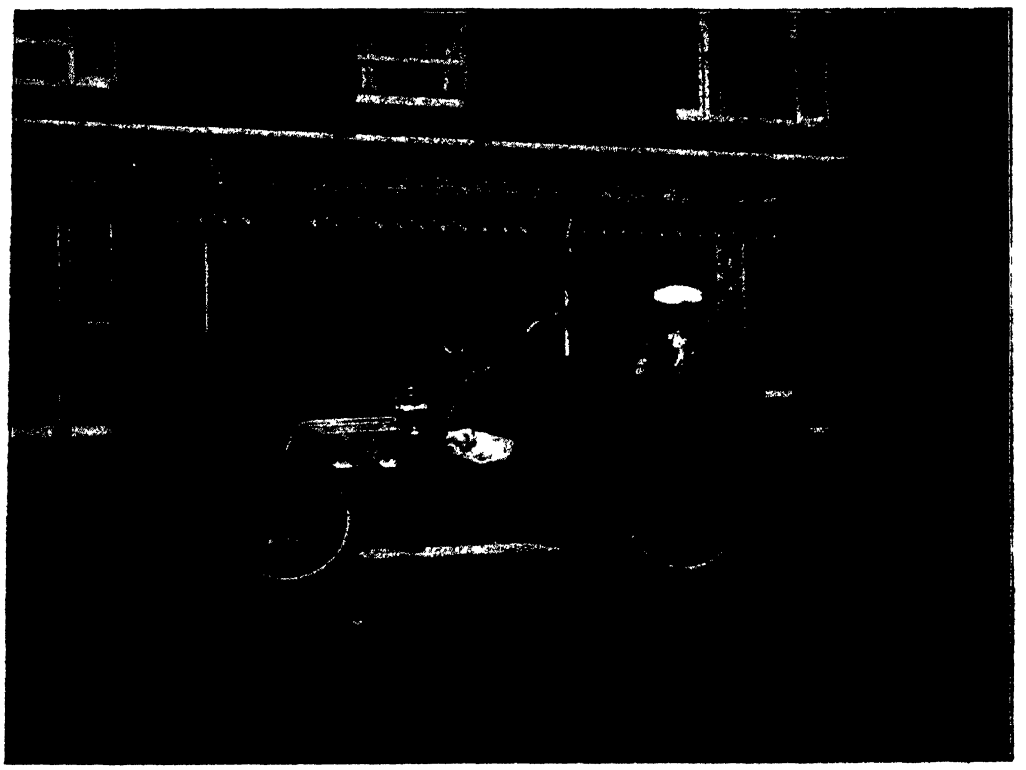
Always use a strainer when filling both the petrol tank and the water tank to prevent any dirt getting in.

In conclusion, I may add that I have found that this car will climb almost any hill on the second speed with a full load, and in towns, by throttling down by means of the steering column accelerator, you can run on the fourth speed at eight miles an hour very silently, which is a great advantage, and leaves your feet free for the brake and clutch. In fact, I have found the car very easy to manage in every respect.

THE 15 h.p. ARIEL.

By A. Butler-Harris, M.A., M.B., Oxon.

IN the selection of a high class car it is necessary to clearly formulate beforehand to one's self exactly what purposes it has to serve, and whatever can best and most economically fulfil one's conditions. It goes without saying that initial price is an important consideration. Having in my practice



MRS. BUTLER-HARRIS AT THE HELM OF DR. BUTLER-HARRIS'S 15 H.P. ARIEL.

driven for the past three years various single and two cylinder cars, I came to the absolute conclusion that the following factors were necessary in my choice of a new car.

1. Power.
2. Silence.
3. Absence from vibration.

4. Lightness, compatible with 1 and 3, in order to save tyres.
5. Elasticity of engine, which means ease of driving.
6. Simplicity of design and get-at-ableness.
7. Perfection in fitting and material, and hence reliability.
8. Moderation in price consistent with 7.
9. Economy in petrol and oil consumption.

To this end I visited showrooms and shows, and had many drives in many cars. My choice eventually fell upon a 15 h.p. Ariel, which was fitted for me with a particularly well built light tonneau body. This I have now driven 1,000 miles under all sorts and conditions of weather, on all kinds of roads, hills, lanes, and traffic, without a stop, and without an adjustment being necessary.

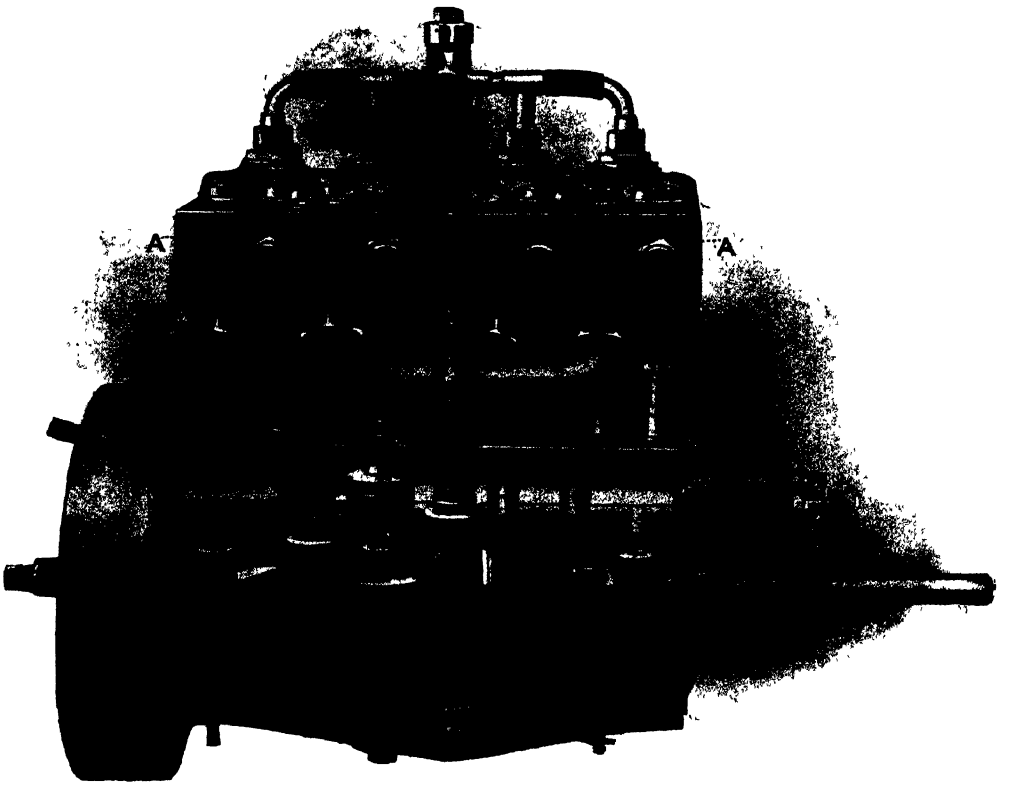
The car has gone out and come in at all hours of the day and night, and after its early morning toilet of washing and replenishing has always been ready to begin the day again. A careful examination reveals no sign of wear, and the tyres are barely scratched. The car is fast, silent, smooth, easily handled, climbs hills well, and consumes a moderate amount of petrol, generally giving about eighteen miles to the gallon, lubricating engine oil, one pint per one hundred miles. The engine does not heat, the water circulation is efficient, and my conditions appear to be fulfilled, and I am satisfied. And now for some constructional details.

The frame is strong and light, of tubular construction, and of beautiful design and finish. Owing to the system of clips used it is possible to get engine and gear case accurately alignable. The engine is four-cylinder, $3\frac{1}{2}$ mm. by $3\frac{3}{4}$ mm., running at 1,200 to 1,400 revolutions per minute. It is capable of being accelerated to 2,000 and developing 19 to 20 h.p. Here, I think, is the secret of the perfect balance, smoothness, flexibility, and silence, and consequent absence from wear and tear. I am sure the slow speed engines wear out their brasses and "knock" much sooner than the De Dion type. Speed does not wear out bearings if properly lubricated, but unequal strain and want of balance do. For instance, I have a high speed dynamo for lighting my house, which has been running six hours a day for nine years at 1,800 to 2,000 revolutions per minute, and whose white metal bearings and steel spindle do not show a trace of shake. This means that the wear if anything must be less than 1,000th part of an inch on both surfaces together. Again, my old $3\frac{1}{2}$ h.p. De Dion engine must have run 50,000 miles without showing any appreciable wear. Another great advantage of the high speed engine is its lightness in proportion to its power.

The ignition is high tension, with Basse-Michel coil. The water circulation is either by pump tank and special type of radiator or by the now more fashionable fan and honeycomb. The clutch is not in the flywheel, but behind it, saving all end thrust, and it is particularly get at-able and easily adjusted from above. The carburetter is automatic and very perfect in action, the throttle valve being controlled by the governor and by a hand lever on the steering wheel. A very sensitive foot pedal controls the speed of the engine above the limit she is set to cut out at, and will vary the speed of the car 100 per cent. on any gear. A touch of the accelerator pedal causes the car to sprint away instantaneously. The gear-box contains four speeds and reverse, controlled by one lever. The gear wheels are widely cut and epicycloidal, thus meshing very sweetly and easily. Owing to the high speed at which they travel the wheels are much narrower than is usual, but experience shows they are of ample strength. The power is transmitted by

cardan jointed shaft and bevel gear to the wheels. The driving axle, however, does not carry the weight of the car, and this, in my experience, is the most important point of construction in chainless cars.

The back wheels run on a prolongation of the dumb axle, on a long bearing of large diameter, the driving axle passing right through and fitting into a square on the outer portion of the wheel hub. The brakes are metal to metal, very powerful, but gradual in action. A sprag of ratchet type acting on the propeller shaft is fitted. A test made by me on a hill of 1 in 9 showed that the car could be held on either brake going up hill. The ratchet sprag could be let in and the brakes



THE ENGINE FROM THE RIGHT-HAND SIDE.

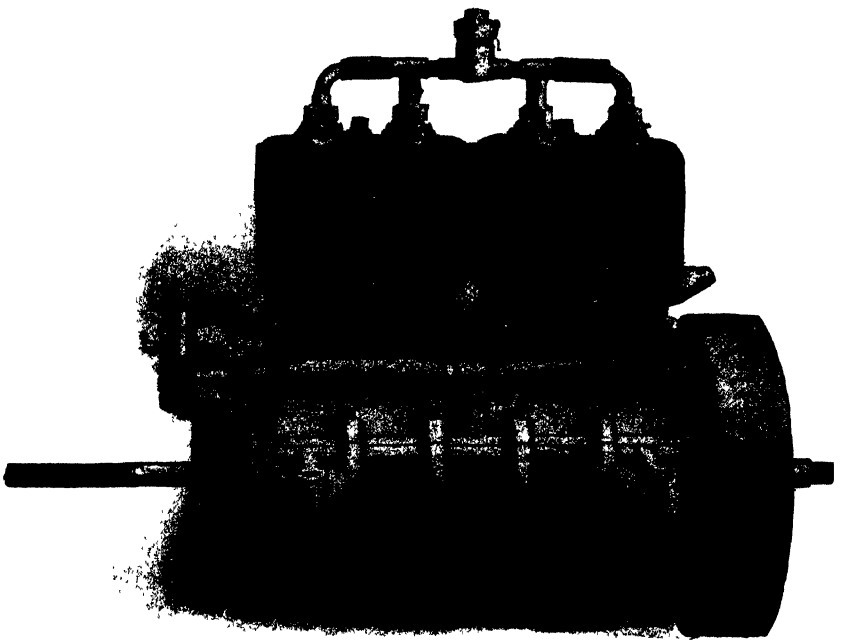
AA, *cylinders.* BB, *cylinder heads.* C, *inlet pipe.* D, *exhaust pipe.* E, *flywheel.* F, *throttle valve.* G, *carburetter.* H, *automatic air inlet.* J, *heated air regulator.* K[1], *commutator.* L, *cover of cam shaft gears.*

withdrawn without losing ground, and the car easily started again from this point. Everything can be got at easily from above, being well spaced out. I should think a pit would be rarely, if ever, necessary.

A small tank inside the bonnet supplies engine oil by means of a hand pump on the dashboard to the crank chamber, and all four cylinders are efficiently lubricated in this way. The gear case takes about half a gallon of gear oil per 1,000 miles, which is simply poured in through the manhole. The back axle lubrication consists of a pressure Stauffer box for each pinion and one for the speed ring, while there are screw caps into which oil is poured every 500 miles. The Stauffer boxes are given a turn every morning. The hubs of all four wheels

contain a good quantity of oil, and these are kept filled according to the mileage. I have a little squirted in twice a week as a matter of routine.

Thus there are no sight feed lubricators and long feed pipes to watch and be anxious over. My experience has been that conveying oil from the dashboard all over the mechanism of the car is a mistake, particularly to the back axle, as the pipes invariably are neglected and get choked up. Back axles and gear-boxes properly constructed do not shed oil all along the road, and therefore do not require a constant feed. Automatic oil feeding, however, is fitted if required, I am told. The steering gear is constructed with the ball and socket joints to every hinge, and the worm and segment can be adjusted for wear. The steering of the car is very easy and perfect.



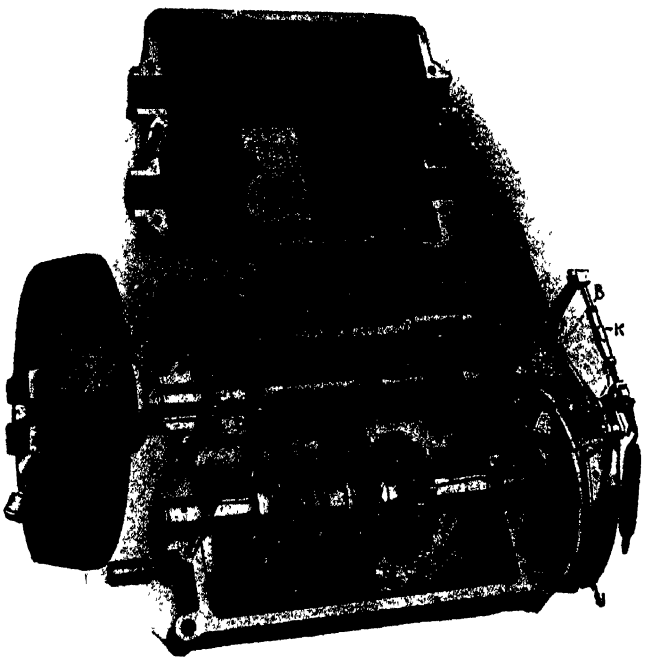
THE ENGINE FROM THE LEFT-HAND SIDE.

AA, *cylinders.* E, *flywheel.* KK, *entrance of cool water to cylinders.* L, *water outlet pipe from cylinders.* L[1], *water filler.* N, *oil outlet from crank chamber.*

Of the many cars I have driven, none is so exquisitely sensitive or so perfectly controllable as this 15 h.p. Ariel. The engine is started and the ignition lever advanced three-fourths. The driver may forget he has an engine, except to fill his pump occasionally and let the oil drip into the crank chamber from it. Looking down his gear lever he sees a notch just in front of it on the top of the quadrant, which tells him that his lever is in the neutral; pressing down his left-foot pedal will bring out the clutch. To go backwards, he moves his gear lever backwards; to go forwards, he *gently* pushes the lever forwards until he feels it slip into an undercut notch; letting his clutch in and giving the engine an imperceptible fillip with the accelerator pedal, the car glides noiselessly and smoothly away. In a similar manner he slips through second, third, and into the fourth speed, which will give him, where speed limit is unknown, an easy forty miles an hour. I have had various advice about changing speed forward and accelerating at the same time; but in the Ariel, having attained the speed to change gears, it is best to change forward without accelerating at the moment.

In driving a light high-speed engine like the Ariel one must not follow the ordinary practice in changing down from a high to a lower speed. Remember that speed of engine means power, and that when on a hill the speed has fallen off a little, it is advisable to change down at once, because, firstly, it is at this moment much easier to mesh the gears silently, and, secondly, there is much less strain on the driver than when the car is allowed to slow right down and then has to pick up again with a snatch and a jump. Of its power to climb hills, I need say little here, as in various public trials this has been made very evident.

It is quite safe to drive down every hill engine in, for it is an engine which bears accelerating; but I do not think it is good driving. I prefer to drive to the beginning of the descent, and, taking my right foot away from the accelerator pedal, at the same moment to pull out the clutch. There is no sudden check to the car and strain on the gears, but the engine governs itself, the car gathers momentum in its downward course, and a gentle steadying with the right-foot pedal brake—which, by the bye, also pulls out the clutch—gives perfect control. There is often a short, sharp hill opposite to be rushed, and with a clear road in front, so before losing way on the car let in the clutch, at the same moment accelerating the engine to the speed of the car. The change to driving again from free running is absolutely imperceptible if skilfully done.



THE GEAR-BOX.

AA, *aluminium box.* BB, *bearings.* C, *second shaft.* C_1, *main or engine shaft.* DDD, *gear wheels.* C_2, *sleeve on which second shaft gear wheels are fitted. This sleeve slides along shaft* C, *and by bringing various gear wheels into mesh effects changes in the gear.* C_3, *fork for sliding shaft,* C_2. E, *rod for moving* C_3. F, *clutch.* H, *foot brake drum on second shaft.* I, *sprag ring.* K, *brake adjustment nut.*

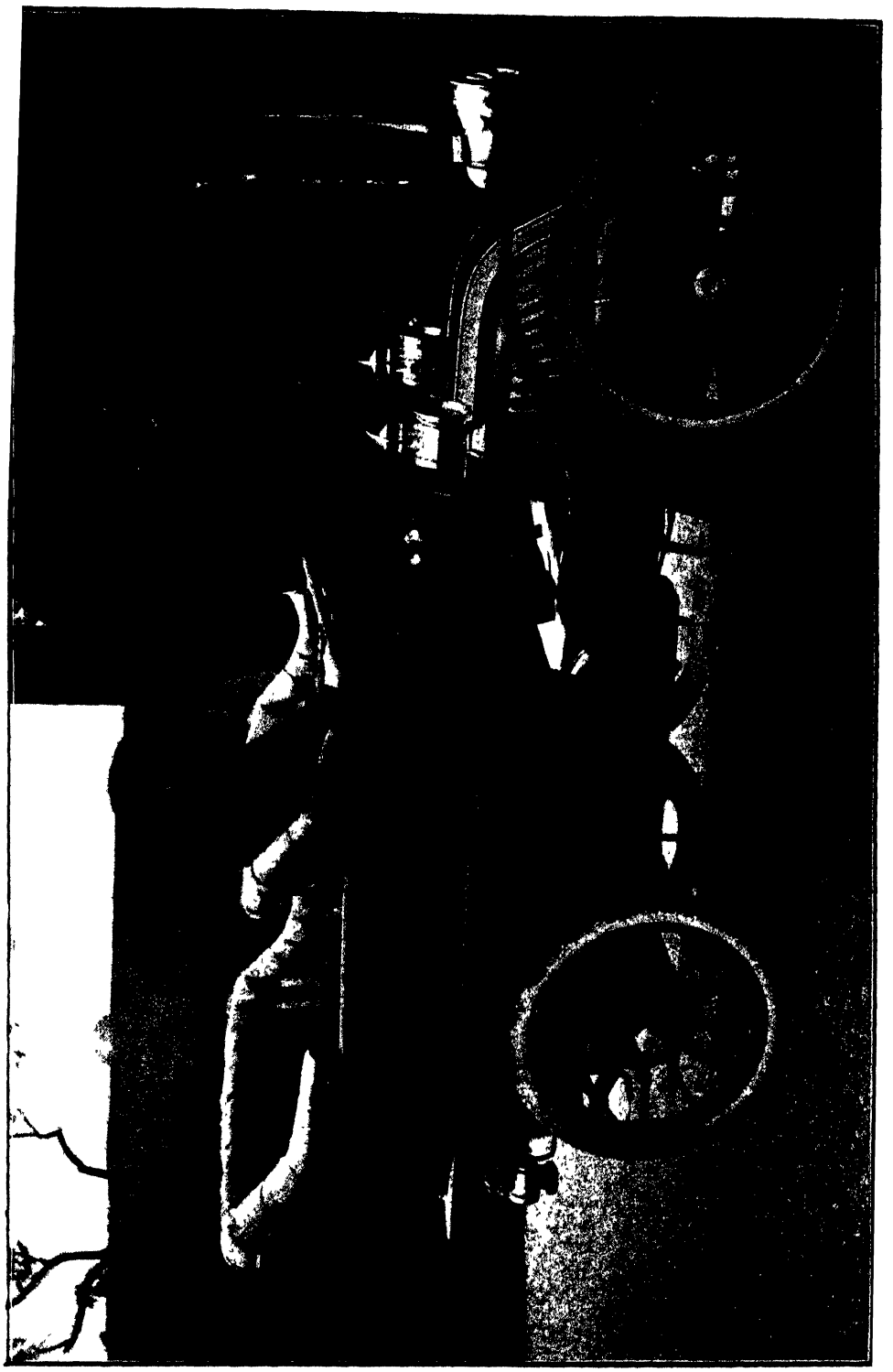
No sweeter car do I know to drive in traffic, the easy check and the quick sprint make it possible to thread the most crowded streets. She is like a racehorse, highly strung, delicate, but strong; and, like a racehorse, needs but a firm light hand and touch, and then she will do anything she is asked. If slogged and ill-used she will stop dead, for, remember again, she is a high-speed engine.

THE C.G.V.

By A. L. Allen.

I HAD much misgiving as to my choice of a car until I talked the matter over with a friend of mine who has had considerable experience in motoring, and he brought to my attention a car which I had heard but little of at that time. This vehicle, the Charron, Girardot, and Voigt, or the C.G.V. as it is now called, was the one my friend informed me he had ordered for himself, and thereupon I arranged for a trial run with the English agents for Messrs. Charron. At my request they sent a 15 h.p. car down to me at Hitchin, in charge of an experienced *chauffeur*, and on a Sunday morning we started out for a long drive. We had a splendid run over a distance of some one hundred miles without a hitch of any description. I was particularly impressed by the car's silence, both when it was running and stationary, but took the precautionary measure of trying several other well-known makes before finally deciding to purchase a 15 h.p. C.G.V. *chassis*, which was in due course delivered to me. In a short time this *chassis* was fitted by Rothschild with a Roi des Belges tonneau, and has now been running some time. I am extremely pleased with it, never having experienced trouble except on account of accumulators running down. My car is of 15 n.h.p., giving, I believe, about 22 b.h.p. at its maximum, and has four cylinders with a bore of 95 mm. and stroke of 130 mm. It has four speeds and reverse, all worked by the same lever.

I will now proceed to describe the method of preparing and driving the car. The petrol tank, which is usually placed under the front seat, is filled as well as the oil tank, which is a continuation of the former; water is then poured in through the funnel, which is placed in a convenient position at the level of the floor, until it begins to overflow from the tank. The accumulators being charged and coupled up, nothing remains but the lubrication, most of which, of course, is automatic. There are, however, eight grease cups which must be attended to, and these are placed as follows:—One on each fork of the front axle, one to the commutator, one to the water-pump shaft, one on the steering-gear box, one on each sprocket shaft bearing, and one to the bearing on the differential shaft. These should be kept well filled, and given a few turns every hundred miles. Beyond these, when starting for a day's run the free wheel of the starting handle and the bearing inside the flywheel should have oil squirted into them; a good supply should be squirted on the valve gear and cams, and also on to the gear which drives the water and oil pumps, the various pins and joints being given a few drops of oil from time to time. The car now being ready for the road, it should be seen that the change-speed lever is in the neutral notch, which is the second from the rear, and the side brake, which takes out the clutch, is pushed as far forward as it will go; besides these there are also two small levers set in racks on the steering column, the right hand of which



MR. A. L. ALLEN'S 15 H.P. C.G.V.

is the advance spark lever, and should on starting be pulled up to the top of its sector, as in this position the ignition is retarded; the left-hand lever operates the throttle valve in the induction pipe, and must also be pulled up to the top, so that the valve may be fully opened. The carburetter is then flooded, the air inlet slightly closed and the switch inserted, when, if the starting handle is smartly turned, the engine will start. The air inlet should then be fully opened and the sparking advanced by lowering the right-hand lever to about half-way down the sector, when the engine will give its full power and "cut out," which it does at about 720 revolutions. The left-hand or throttle lever should next be lowered until the valve is nearly closed; the motor will then run at about 200 revolutions, and will be almost noiseless.

The engine having been thus set at a low speed it is not necessary to touch either spark or throttle levers again, and the driver having seen that the automatic lubricator is properly working, and having glanced at the water gauge on the dash-board to see that the water is circulating, takes his seat, presses down the left or clutch pedal, and then pushes the change-speed lever one notch forward to the first speed (*i.e.*, to the third from the rear); then, pulling back the side brake, gently presses with his foot upon the outside or throttle pedal until the engine runs a little faster. He then gradually allows the clutch pedal to rise and the car starts off. When the clutch is well home the throttle pedal should be pressed further down, and the car will pick up speed. When a speed of three or four miles an hour is obtained put in the second speed. To do this, take pressure off the throttle pedal, which permits the engine to slow down; press down the clutch pedal and push the speed lever decisively one notch further forward, letting the clutch in, afterwards pressing down the throttle pedal slightly until the requisite speed is required, when the third and fourth speeds may be obtained by the same process. To slow down, pressure is taken off the accelerator pedal, and the pedal brake or side brake applied, either of which are sufficiently powerful to bring the car to a standstill very quickly.

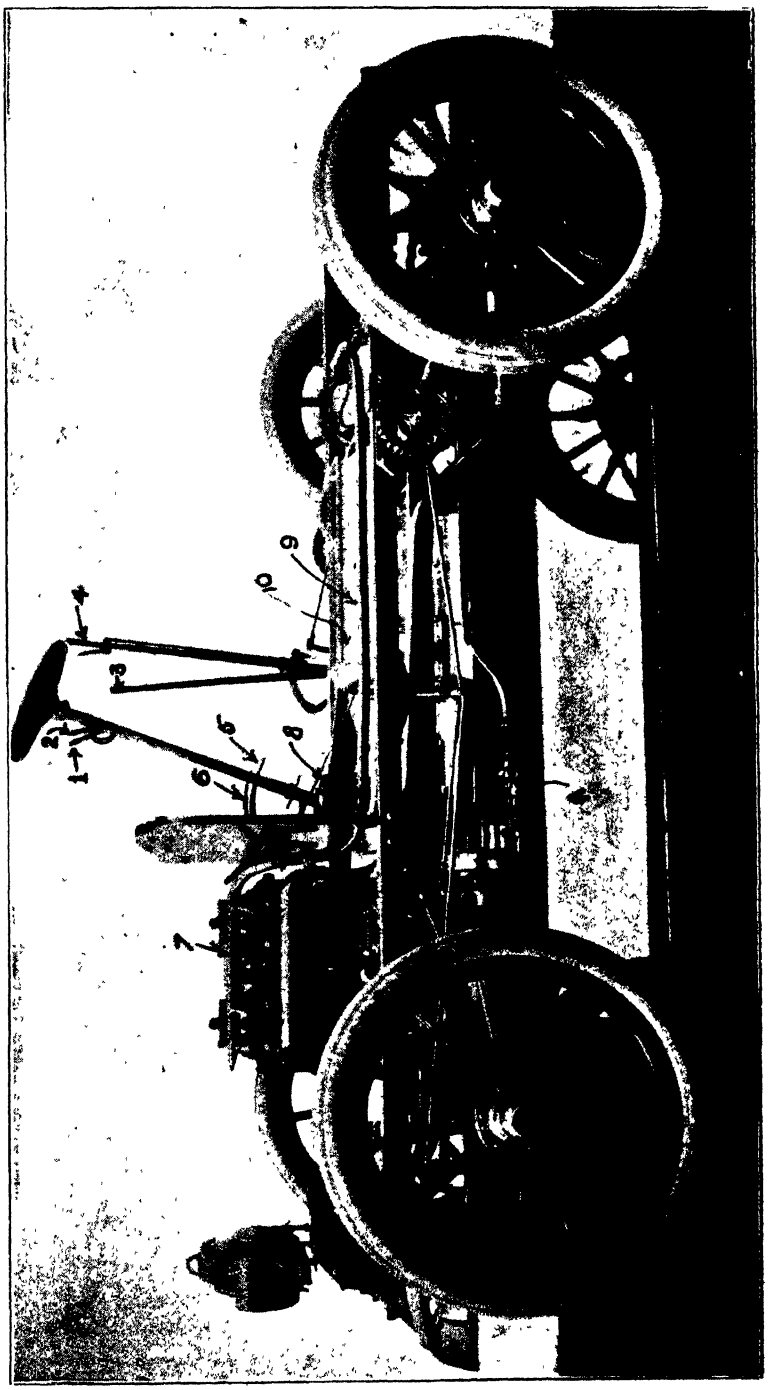
Accelerator and Throttle Pedal.—This pedal, which is the furthest to the right, when pressed down opens the throttle valve and allows the engine to take in more gas, and thus to run more quickly and with more power. When the pressure of the foot is released from this the valve is closed by a spring, and the engine slows down again. When this pedal is pressed down as far as it will go it cuts out the action of the governor, and the engine runs up to as much as 1,100 or 1,200 revolutions.

It will be seen that the throttle lever and this pedal are both coupled together, but the pedal alone is used when one is driving the car, and I find this arrangement most delightful, as one can run in the fourth speed at about eight or ten miles an hour and can immediately increase it up to forty miles per hour by simply pressing down this pedal.

Clutch.—It will be seen that, driving in the way I have described, there is very little wear on the leather of the cone, as one always adjusts the speed of the engine to that of the car, consequently very little slipping of the clutch takes place. Care must, however, be taken to well lubricate the bearing of the clutch shaft in the flywheel, and this is done through a hole in the hub of the cone. In my opinion this is the weakest point of the car, as it is not easy to reach and there is no cap to prevent the oil from running out.

Ignition.—This is of the ordinary high tension system with wipe commutator and trembler coil and does not need special attention, except to see that the tremblers are well adjusted and the plugs kept clean.

Brakes.—The middle pedal actuates a powerful double-acting brake on the



CHASSIS OF THE 15 H.P. C.G.V.

1. *Throttle lever.* 2. *Advance spark lever.* 3. *Gear-changing lever.* 4. *Combined clutch and brake lever.* 5. *Clutch pedal.* 6. *Brake pedal.* 7. *Water outlet pipe from cylinders.* 8. *Water filler and filter.* 9. *Return water pipe leading to tank.* 10. *Gear-box;* 11. *Three-way cock in water circulation.*

differential shaft, and is quite sufficient to hold the car on any incline. It will be noticed that this pedal does not take out the clutch, thus allowing the compression of the motor to be used in conjunction with this brake for retarding the progress of the car. The rear wheels are equipped with internal expanding brakes, which act perfectly in either direction and are exceedingly powerful; the lever operating these takes out the clutch and consequently should be used alternately with the foot brake on long descents, when one does not wish to stop the motor, as it takes the strain off the foot.

Gears.—It will be found that the gears need very little attention except to keep a constant supply of oil to the depth of 3 or 4 in. in the gear-box, and this should be thin oil, not grease as generally used, the different bearings being lubricated by the splash of oil. A copious supply of oil should be squirted into the differential gear case every 500 miles.

A feature which impresses me very favourably about this car is that I find it will nearly always start with its own compression, and especially so if one presses the accelerator pedal full down after withdrawing the switch. This, of course, saves a lot of trouble in getting out to start the engine again. On the whole I am extremely pleased with my car, which has given me no trouble at all, and I have found it as simple to drive and quite as silent as any car I know of.

THE WILSON-PILCHER.

By the Hon. A. Verney Cave.

MY experiences with a Wilson-Pilcher car have been with one of the standard size, the motor of which is of the four-cylinder horizontal type, and develops 10 effective horse-power at the road wheels. It is, with the change-speed gear, self-contained, and is suspended flexibly in the *chassis* from rocking brackets, so that, to a certain extent, it is free to move about independently of the *chassis* and car body. Automatic induction valves are used, the makers having found, so they say, that mechanically operated valves do not pay by results, for the reason of the extra expense and wear and tear involved by the additional working parts necessary to operate them. Their valves are easily removed, with seatings for examination, and so far have given splendid results. All the wearing parts are enclosed in neat aluminium casings, and are effectively oiled by forced lubrication to every part. The ignition is electric, a Wilson patent single-trembler multiple coil and commutator providing an excellent and accurate system.

The vibrationless character of the car is one of its greatest charms, and in addition to this its silence gives one the impression that it is propelled by steam or electricity. The change-speed gear, which is of a combined friction clutch and epicyclic gear type, consisting of a main driving clutch and two speed reduction gears, all with metal surfaces and enclosed in one case, provides four speeds forward and the same reverse. They are all operated by one lever, and changes can be effected without releasing the main clutch—a useful and novel feature. On the other hand, caution must be exercised when reversing, the main clutch being taken out and the lever moved slowly, thus avoiding all chance of fouling the teeth of the bevel wheels. No driving chains are employed, and the main drive is through a universal shaft and bevel gear of a special form.

The various long journeys and the speeds attained I hesitate to speak of, but I may say that I have never yet found a hill which the car would not climb with ease, and such gradients as River Hill, Sevenoaks, Richmond Hill, and Hindhead, Guildford, it will mount at fifteen to twenty miles per hour. One very usefu feature in its arrangement is the facility for taking up the wear on the clutches from the driver's seat, and therefore the old trouble of the clutch slipping on the road is removed. It is gratifying to know that such a successful car is the result of English design and English workmanship throughout.

How to Drive.—Fill the petrol tank; it is under the driver's seat, and the filling plug is under the cushion. It holds 16 gallons, enough for a run of 300 miles. A measuring stick is provided; take care of it. The water tank is under the bonnet and is filled through the lid. Carry two batteries—one in use and one for spare. See that both register fully four volts before starting out, and connect

the wires up according to instructions on the chart sent out with each car. Place the plug in the switch. NOTE.—This plug should always be removed when the car is left standing. The two holes in the switch each connect up either of the two sets of batteries. Fill the four sight-feed lubricators on the motor with heavy cylinder oil of the type recommended, and turn down the handles to stop them working until ready to start the motor, when they should be lifted up again. Lift the trapdoor in the footboard and fill the oil pump reservoir through the screw plug which will be found there with the same oil. This reservoir should be looked into occasionally to see if it contains its full complement of oil, as it supplies and lubricates all the wearing parts. A small drop-feed indicator is placed on the dash which shows when this attention is needed.

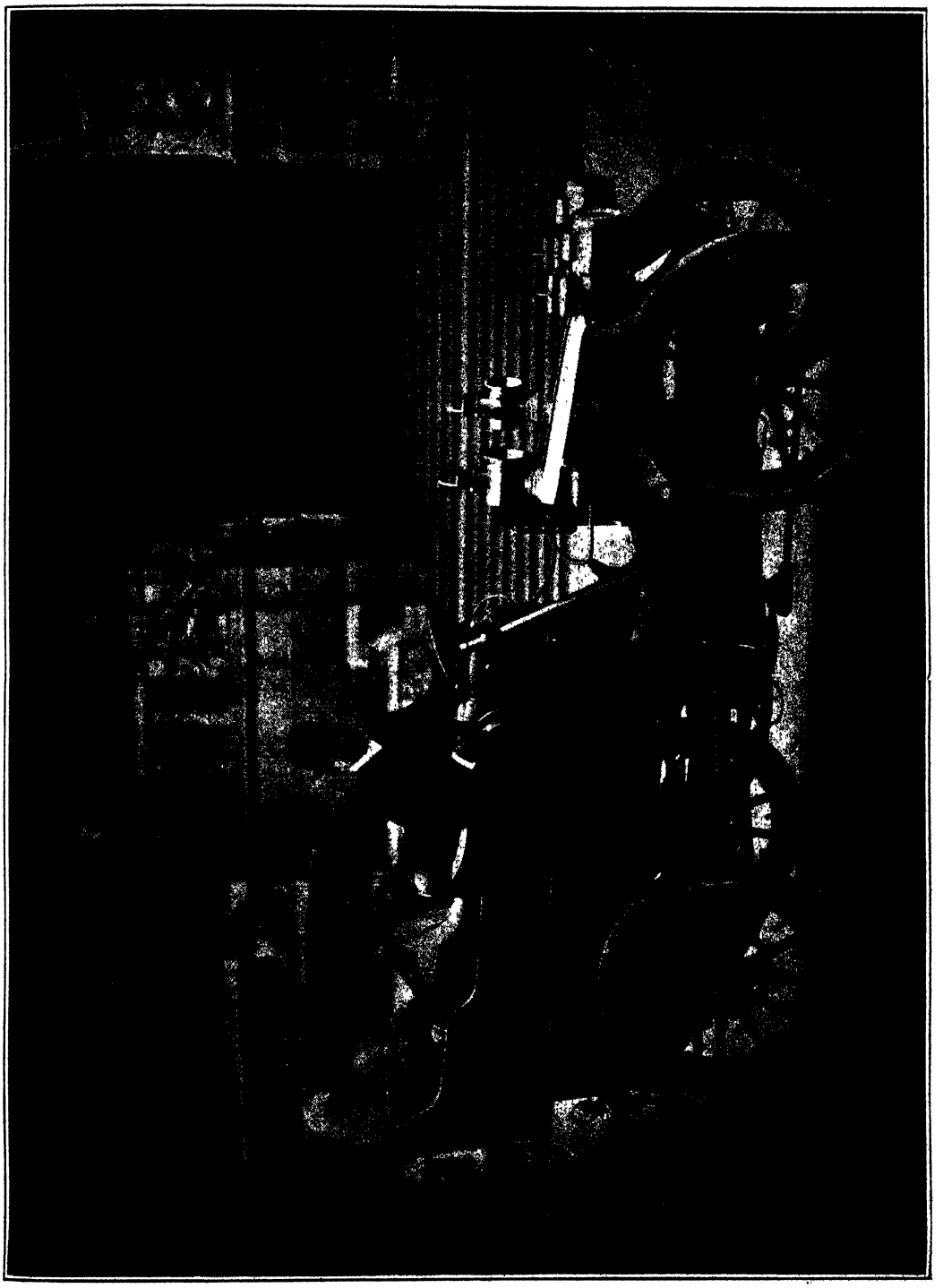
To Start the Motor.—Turn on the petrol. The wheel valve is under the frame on the left-hand side of the car, looking ahead. Put the plug in switch, lift up the handles on the sight-feed lubricators, look to the spark adjustment handle, viz., the bottom one on the steering pillar. For starting it should be in its *forward* position on the quadrant, if not the motor may fire early and twist back the starting handle. Its other functions will be dealt with later. The top lever should be in its midway position, as it thereby allows the governor free action. See that the reversing lever (the brass knobbed one) is in its central or neutral position, so that all the speeds are out of gear.

Take the starting handle, press it in until its ratchet end engages the projections on the flywheel shaft, give it a sharp turn, grasping it firmly the while, and the motor will start, leaving the handle free in the hand. Directly it starts go to the controlling handles on the steering pillar and set them so that the motor runs smoothly and silently until you are ready to start. It should be noted that the upper of these two controlling handles controls the governor and regulates the speed of the motor, and the lower one advances and retards the time of ignition in the cylinder, enabling the driver to find the best working position of the ignition according to the speed required, nature of the road, etc.

The motor, however, may not start, and if so, see that the carburetter is charged with petrol; sometimes the nozzle may be choked, but it is easily cleared by taking out two pins and removing the body of the carburetter; or, the sparking plugs may be dirty. Look to the spark gaps in the coil, if all are sparking well it proves that the current is right; then take each plug and try it. Inferior petrol is another cause of non-starting.

To Start the Car.—Press the left or clutch pedal, throw the clutch out of gear, and, while holding it out with the foot, shift the reversing lever into the rear notch for forward driving; take off the hand brake and gradually allow the clutch to come into action, and the car will gather way. The speed lever (the central one) should always be put into slow speed position for the starting, and, as the car gains movement, alter the speed faster as occasion demands, by shifting the lever into either of the four positions fixed for the purpose. Do not make the changes too rapidly.

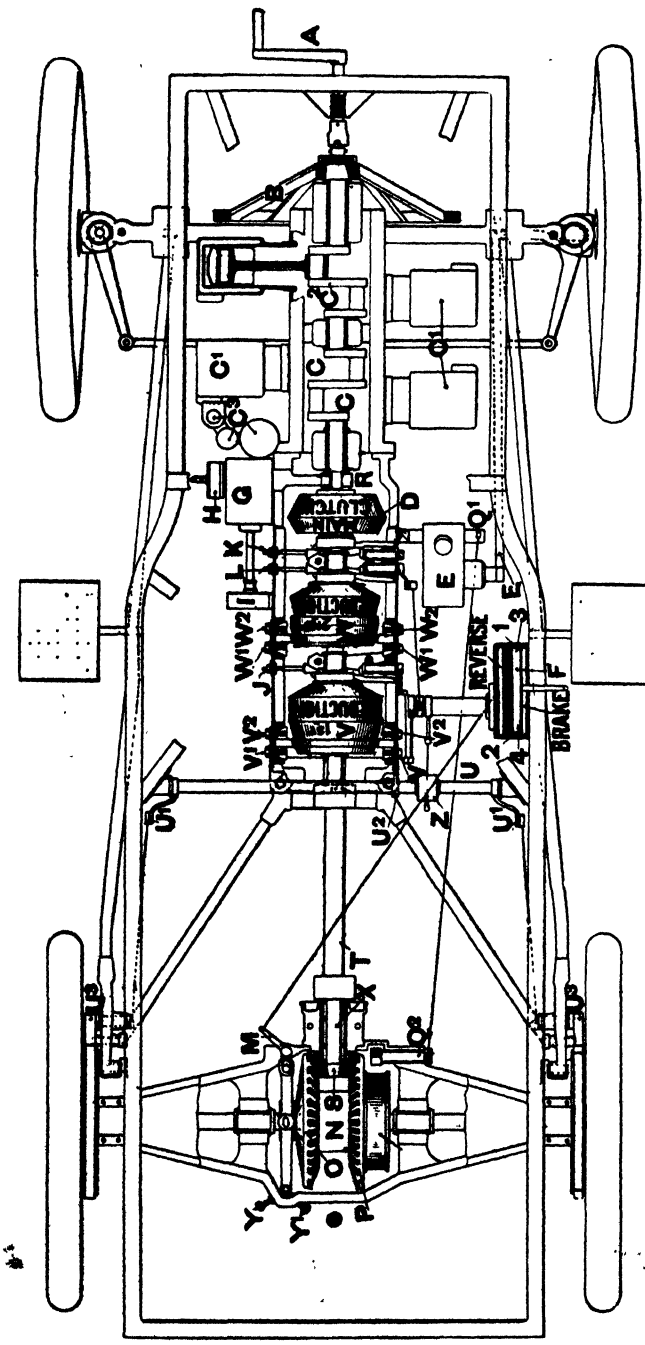
Upon approaching a hill, accelerate the speed of the motor by raising the accelerator pedal, upon the extreme right, with the toe, and always change speed down directly the motor shows signs of being overworked. When climbing hills it is naturally important that no slipping should take place. This is provided



THE HON. A. VERNEY CAVE AND HIS WILSON-PILCHER CAR.

against by the series of notches in the quadrant, and it is only necessary to press the lever into a further notch to take up any uncertainty in the drive.

There is another adjustment in the gear case, intended for taking up any wear upon the clutch surfaces which will necessarily take place in course of time. A



PLAN OF THE WILSON-PILCHER CHASSIS.

A, starting handle. B, *flywheel of motor.* C, *crank chamber.* C^1, *cylinders.* C^2, *crank.* C^3, *carburetter.* D, *main clutch.* EE, *steering gear and rods to front wheels.* F, *speed-changing levers and brake handle.* G, *oil pump to lubricators.* H, *commutator.* I, *water pump.* J, *adjusting screw for first reduction gear.* K, *adjusting screw for main clutch.* L, *adjusting screw for second reduction gear.* M, *reversing gear.* N, *compensating gear.* O, *forward bevel drive.* P, *backward bevel drive.* Q, *internal brake drum.* Q^1, *foot lever working same.* Q^2, *connecting levers to same.* R, *skew gear drive to pumps.* S, *main drive bevel pinion.* T, *universal joint shaft.* U, *brake shaft.* U^1, *levers working road wheel brakes.* U^2, *automatic clutch release with brake action.* U^3, *road wheel brake drums.* V, *first reduction gear.* V^1, V^2, *outer friction ring adjustment on V-gear.* W, *second reduction gear.* W^1, W^2, *outer friction ring adjustment on W gear.* X, *main drive roller bearing.* Y, Y^1, *adjusting screws for internal reverse lever.* Z, *brake compensating gear.*

simple half turn of the set-pins placed there for the purpose, as shown on the plan of the *chassis*, effectually does this, and always leaves the range of tension on the speed-changing handle the same.

When in traffic always keep the feet near to the pedals, and to slow down, depress the accelerator. To stop, for sudden obstacles in the way, press both pedals—the left to throw out the clutch and the right to apply the foot brake—also apply the hand brake, but put it on gently in order not to stop too suddenly, as a sudden stop punishes the tyres.

The steering wheel movement can be easily acquired. A good rule is—always allow yourself plenty of room and, until expert, never follow another vehicle too closely. Slow down when turning corners.

To Stop.—Slow down the motor by pressing down the accelerator pedal, press the clutch pedal to throw the clutch out of action, put on the hand brake, and shift the reversing lever into the central (or neutral) notch. If only stopping for a short time the motor may be left running, but if it is to be put away, take out the electric plug and shut off the petrol supply and sight-feed lubricators. In cold weather empty all the cooling water from the tank and condensers, pipes, etc. to prevent freezing.

These few hints will, I hope, enable any purchaser to take one of the cars from the makers and drive it without difficulty; but in this, as in any other car, practice and experience always bear their own fruit.

THE DECAUVILLE.

By Miss Agnes E. Wood.

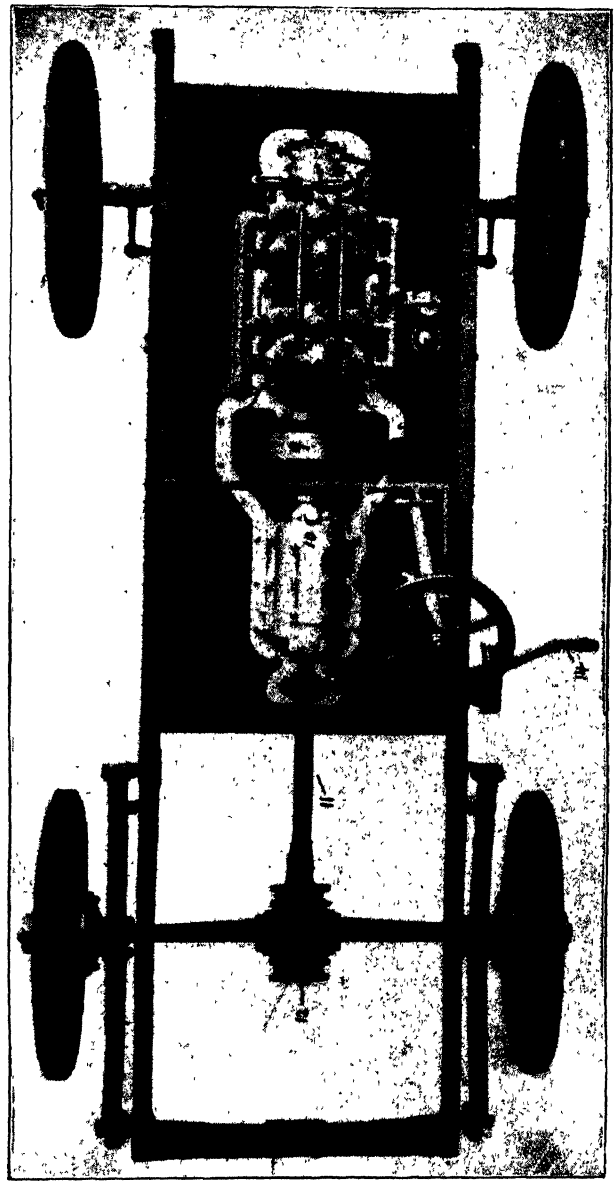
THE 12 h.p. Décauville may be taken as a good type of the Décauville car for all ordinary purposes, and I shall, therefore, select this model on which to base my remarks on the management of these cars. Although, broadly speaking, it follows somewhat upon the novel lines of the 16 h.p. of last year, various detail improvements have been introduced into the present pattern. Amongst these are increased simplicity of control, the adoption of a patent carburetter by means of which the admission of air is automatically regulated by the speed at which the engine is running; a new commutator, which is now of the wipe type; ball bearings for the rear wheels; the adoption of "push" pedals, and a more accessible position for the accelerator pedal, which can now be worked by the driver's toe, instead of by the heel as was formerly the case.

The Engine.—The motor, which has four cylinders, 90 millimetre bore by 110 stroke, rests upon a metal bed-plate to which it is bolted, and which, in turn, is firmly secured to the pressed steel frame. The object of this shield, besides affording additional support to the motor, is to prevent the mud and dust thrown up from the road, when the car is travelling, from reaching the mechanism. The inlet and exhaust valves, which are upon opposite sides, are interchangeable. This is no mean consideration for a tourist, since only one "spare" need be carried. The crank chamber and the lower portion of the gear-box are cast in one piece, so that the motor- and gear-shafts are necessarily in perfect alignment, and no possible springing of the frame can cause them to move in relation to one another. Three speeds and a reverse are provided, the top speed driving direct. Between each speed notch on the lever quadrant a neutral notch is made. A radius rod, working in a ball-socket joint, runs from behind the gear-box to the back axle. This axle is of special design.

The Live Axle.—The axle itself is really a fixed hollow metal sleeve, through which runs a propeller shaft in two halves. These halves are connected at their outer extremities with the driving wheel hubs by means of claws, and have their inner ends connected with the differential by dropping into squares prepared to receive them. The driving wheels run upon ball bearings upon the metal sleeve, which thus takes the weight, and also prevents any sagging strain. This sleeve is bored from a steel forging. The arbor shaft is carried in a similar manner through another metal sleeve, so that, as will readily be seen, all working parts are thoroughly encased and kept absolutely free from extraneous dirt. The cardan joint is also specially protected, and is kept always immersed in grease.

Lubrication.—The system of lubrication is very thorough. All bearings are automatically oiled, and sight feeds are placed on the front of the dashboard. The

drips should be set to about four per minute, with the exception of the fork which withdraws the clutch, and for this two per minute will be found sufficient. A fairly thin oil of good quality should be used; the No. 1 Vacuum will be found as good as any for this purpose. Such lubrication as must necessarily be done by hand, such as, for instance, that of the rear wheel hubs, the steering gear, brake bearings, etc., should be attended to about every 250 miles.



PLAN OF THE 12 H.P. DÉCAUVILLE.

1. *Cylinder.* 2. *Exhaust pipe.* 3. *Inlet pipe.* 4. *Water pipe.* 5. *Carburetter.* 6. *Exhaust valves.* 7. *Inlet valve.* 8. *Commutator.* 9. *Flywheel.* 10. *Gear box.* 11. *Enclosed propeller shaft.* 12. *Differential.* 13. *Enclosed driving axle.* 14. *Change-speed lever.* 15. *Metal bed plate protecting the mechanism from mud and dust.*

Water Circulation.—Particular attention has been paid to the matter of efficient circulation. A gear-driven pump is employed, and a chain-driven fan is also used. The radiator is of the honeycomb class, and this, with the water jackets, holds the small amount of water that the engine requires to keep it absolutely cool, so that there is no need for a water tank in the usual acceptation of the term.

Brakes.—The brakes, of the metal to metal type, are very powerful. The hand-applied brake tightens bands upon drums mounted upon the rear wheel hubs, whilst that actuated by the driver's foot tightens a band on the propeller shaft. The brake lever is long and can be reached by the driver without any effort. Both the brake and clutch pedals are of the push pattern and are also easily reached.

The Governor.—The engine is governed on the gas admission, the governor

being put in or out of action by a small pedal arranged in line with the other two. It works in a notched quadrant, and when pressed into the lowest notch the governor is thrown out of action. In a vertical position the governor is working, and when the pedal is pushed upwards into the higher notches it acts as a throttle. Consequently, with this arrangement, and with the special carburetter that is fitted, there is no need for any lever on the steering pillar, save that controlling the timing of the igniting spark.

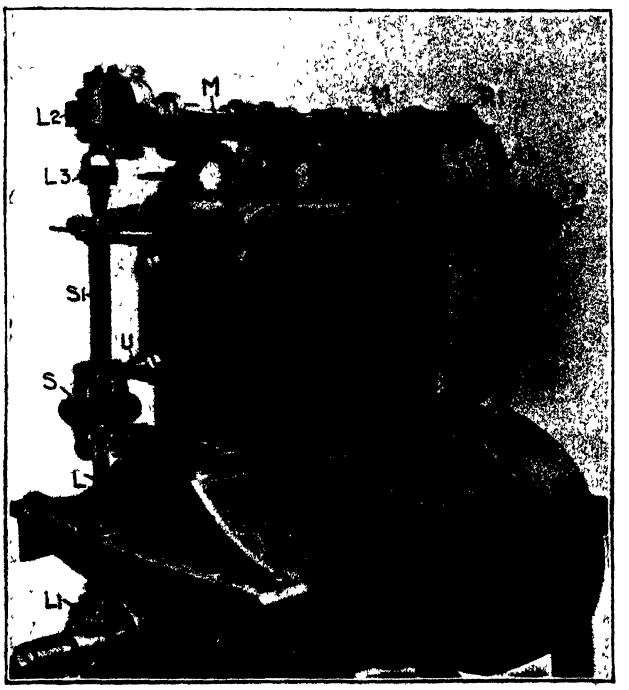
How to Drive the Décauville.—Having switched on the current and started the engine—which will be found to respond immediately to a short, sharp, half turn upwards of the starting crank—release the brake, and having put the change-speed lever into the first notch, let the clutch in gently. This will be found to work very smoothly, and the pedal pressure is so light and sensitive that there is no excuse for making a jerky start. The timing lever should be slightly advanced, and the accelerator pedal should be in about the central position. As the engine picks up, the timing must be gradually advanced and the pedal depressed, so that the governor is thrown out of action. When the engine is pulling her best with the accelerator down and the timing lever fairly forward the change to the second speed should be made, and in the same way the driver gets upon the direct drive, or third speed. Whenever possible this speed should be used, as the saving to the gearing is enormous, but it is hardly necessary to say that directly any signs of labouring are apparent a drop to the lower speed must be made. With a full load up she will be found to run well up to the legal limit on give-and-take roads. She will, moreover, take most short, sharp hills on the direct drive, and practically any hill on her second. In order to get the best results from the engine on the level, it will be found that the timing lever must be fully advanced and the accelerator pedal pushed down to its fullest extent.

THE MAUDSLAY.

By C. J. Lucas.

AS there are numerous special features about the mechanism of the Maudslay car, perhaps I had better begin with a short description of them. So satisfactory has the car been that I have few hints or cautions to convey; and by the exercise of common sense no driver should have trouble with one of these vehicles.

The engine is of the three-cylinder vertical type. The valves, both inlet and exhaust, are placed directly over the top of the pistons, and are mechanically operated. They are also interchangeable, which is a useful feature. To remove the valves it is simply necessary to hinge over the lay shaft by loosening two nuts, when all the valves can be quickly removed, with their seatings, by the aid of a box spanner. The operation is performed in the easiest and simplest manner imaginable.



EXHAUST PIPE SIDE OF ENGINE.

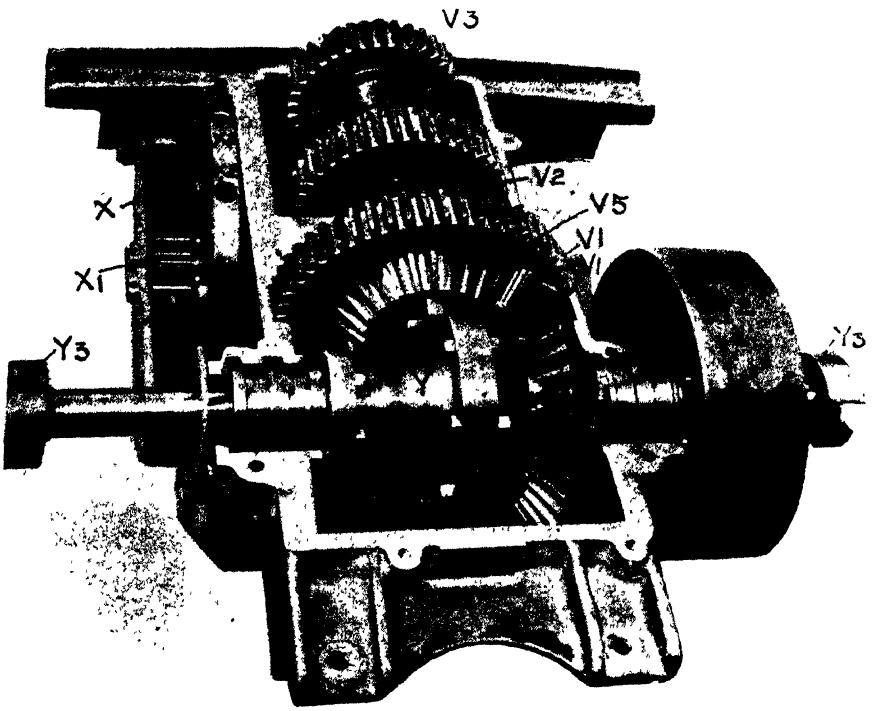
J, *cylinder casting.* J [1], *aluminium cover plate.* K, *upper portion of crank chamber.* K [2], *cover plates of crank chamber.* L, *vertical shaft working lay or cam shaft* M. L [3], *universal joint on shaft* L. M, *lay or cam shaft.* R [1], *commutator.* S, *governor.* T [2], *hot-air chamber.* T [3], *hot-air valve.*

The governor is mounted on the vertical shaft, which operates the lay shaft, and the engine is throttled by a rotary valve placed at the end of the inlet branch, a small "snifting" valve being fitted at the end of the inlet pipe forming an auxiliary air supply, actuated by the suck of the pistons, and therefore in proportion to the speed of the motor. The lubrication of the engine is entirely automatic, it being simply necessary to fill the crank case up to the top of the stand pipe through a hinged door, which is provided in the side of the base chamber. Circulation of the oil is

effected by means of a gear-driven rotary pump, which forces it through the centre of the hollow crank shaft into all the bearings of the crank shaft and piston rods.

High tension ignition is fitted (or magneto if specially ordered), and two sets of batteries are wired up, so that if one set runs down the other can be thrown into action by means of the two-way switch on the dashboard. The gear-box contains four speeds and reverse, operated by a single lever. The change-speed gear is of the ordinary Panhard sliding type, and provides four speeds and reverse, operated by a single lever, the drive being direct on top speed.

Lubrication of the gear-box is also automatic, and the oil is circulated through

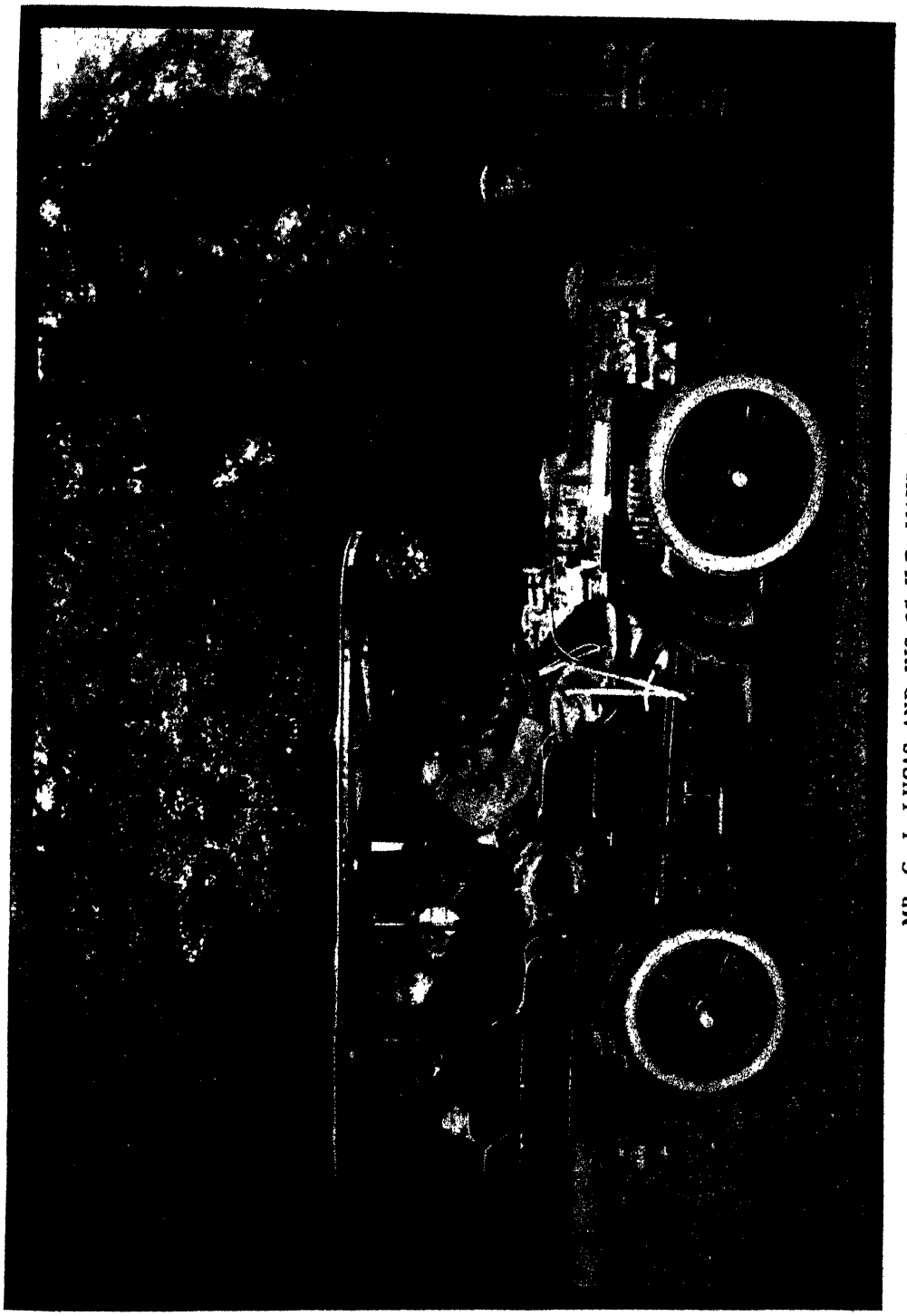


THE GEAR-BOX.

V, *second motion shaft.* V^1, V^2, V^3, *gear wheels on* V. V^5, *bevel wheel driving differential gear.* Y, *differential gear.* Y^1, *bevel wheel in mesh with* V^5. X, *cam plate for changing gears.* Y^2, *brake drum.*

the various bearings by means of another gear-driven rotary pump, similar to that fitted to the engine. A small tank is fitted on the dashboard, with two sight feeds, which are set to make up the waste in the engine and gear case respectively. By adjusting these to a nicety it is seldom necessary to do more than fill the tank on the dashboard as it gets low. The manufacturers of the Maudslay car make a strong point about the accessibility of the various parts of the mechanism, and their claim is thoroughly justified. To give an instance, the pistons and piston rods can be entirely removed by simply taking off an aluminium door on the side of the base chamber. The fact of this and other like details being properly thought out makes an immense difference in the ease with which a car like mine can be looked after.

I have had my 25 h.p. Maudslay now for over a year, and have covered a



MR. C. J. LUCAS AND HIS 25 H.P. MAUDSLAY.

considerable mileage with it, and, with the exception of a few detail adjustments which were necessary soon after the car was delivered, I have not had the slightest trouble with it. Its speed is anything you please (up to the legal limit!). The car travels smoothly, and is a splendid hill climber. It carries eight persons comfortably, whilst, for touring, the back portion of the "tonneau" can be removed and a rail substituted, which enables me to carry five persons and their luggage. I need say nothing further than that I am thoroughly contented with the car all round.

THE CHENARD AND WALCKER.

By L. P. Mell, M.I.M.E.

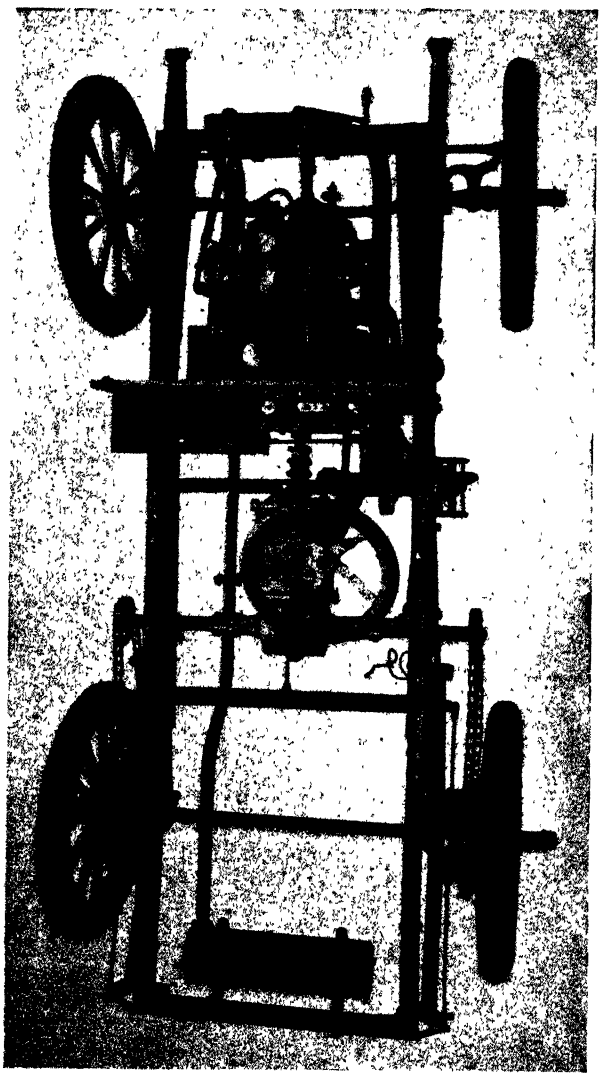
MY experiences with a Chenard and Walcker car have been with one of the two-cylinder 14 h.p. (14 n.h.p. type, giving seventeen on the brake). Before explaining the process of driving, a few particulars of the mechanical details will no doubt be of interest to my readers.

Apparently the ambition of the makers has been to attain simplicity, so as to obtain reliability coupled with ease of control, and this ease of management has been achieved through the patented cam which works the mechanically operated inlet valves, admitting a perfect mixture to the engine in direct proportion to the amount of work required. The valves are always open to the full, and not more or less so as to give a variable lift, as in some systems. This method of control dispenses with the gas, air, and ignition levers generally found clustered on the steering wheel; the control is beautifully simple, and by governing in this manner a great saving in petrol is effected, as when the engine is working lightly less mixture is admitted, and consequent silence is naturally the result; whilst at all times through having a perfect mixture in the cylinders perfect firing is obtained, and the engine is able to pick up its work very quickly. The electric ignition to the two cylinders is accomplished by the use of a single trembler blade, giving a spark to both cylinders simultaneously, thus ensuring absolute synchronism with the single contact. Having only one blade further simplifies matters and enables the engine to pull to the last, both cylinders working in perfect unison; this is very apparent when driving this particular make. The transmission of power to road wheels is novel. There are two distinct axles; the lower one is fixed and carries the weight of the *chassis*, whilst the upper, placed directly above it, is a driving shaft driven by bevel gearing; the driving wheels rotate on the lower axle and are fitted with gun-metal rings with internally cut spur gears which are driven by steel pinions. The advantage of propelling from a shaft comparatively free from strain overcomes the disadvantage so common to live axles supporting the weight of car, for being perforce divided where the strains are most accentuated, they rapidly become deflected and consequently cause considerable friction and loss of power in transmission.

I have given this car a trial of 3,500 miles without the slightest hitch, a refreshing experience after some of the machines I have driven. Although not particularly fast on the level the hill-climbing powers are very good, and an average of twenty miles per hour can easily be maintained on nearly any main road. The back tyres I have fitted with Wilkinson non-side-slip treads, which I found an excellent preventive, although, through faulty vulcanising, they have split and worn very badly at the sides. The makers have acted in a very fair manner and have promised to replace them free of all charge. These treads give one a sense

of security when driving on a greasy surface, and, although they no doubt slow the car, a much better average is obtained in anything like wet weather.

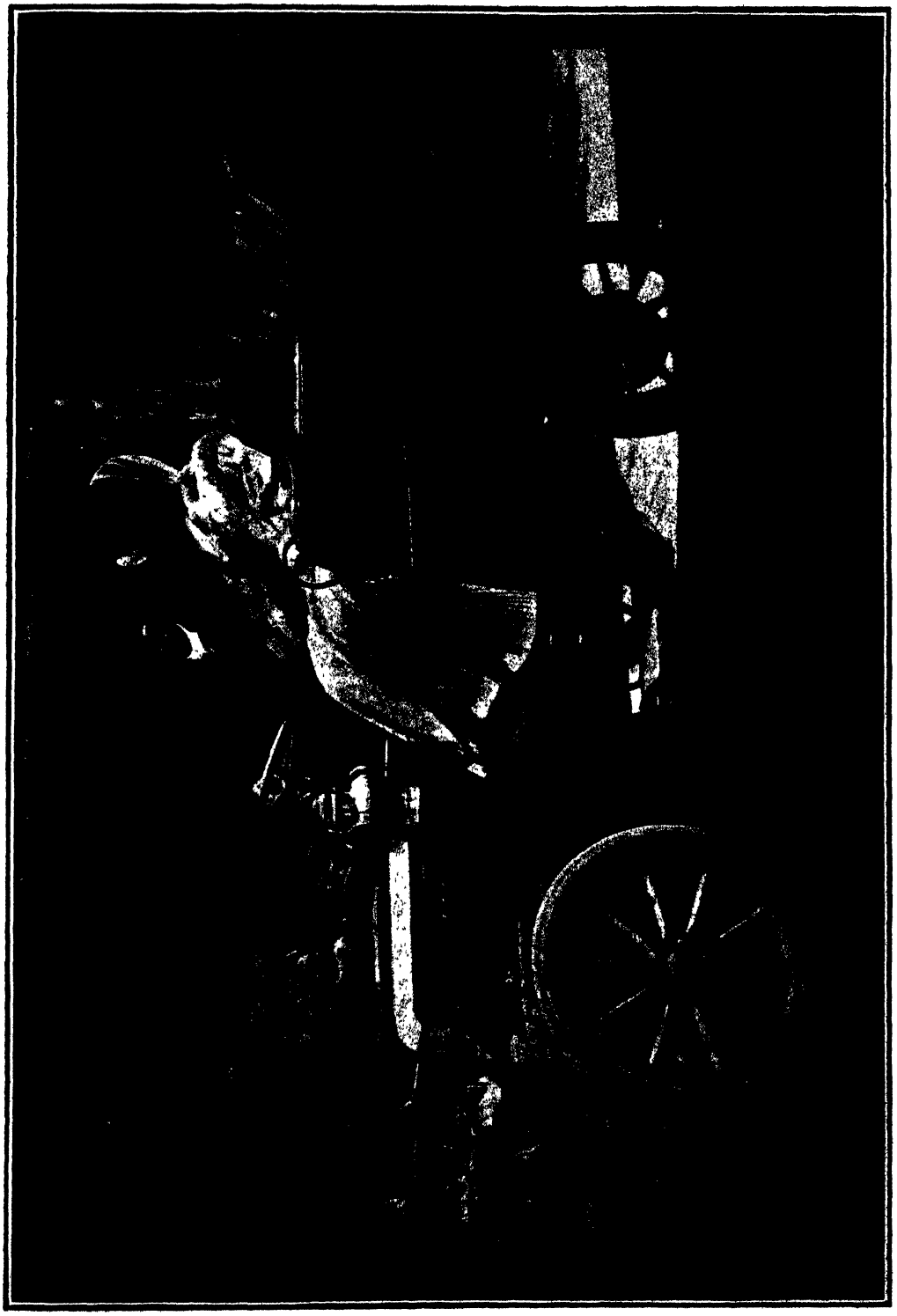
How to Drive.—Fill the petrol tank—which is under the front seats and contains eight gallons—enough for a run of approximately 200 miles. The lubricator on the dashboard should be adjusted to give about thirty drops per minute. A stroke of the pump on left of the lubricator should be given every thirty miles—this oils the bevel driving gear.



PLAN OF THE CHENARD AND WALCKER CHASSIS.

To Start the Motor.—Turn on the petrol by the tap under left-hand front seat, switch on spark, move arm on carburetter back as far as it will go—this shuts off the air. The governor lever on the dashboard should be set about halfway down the rack (exact position is found by experience). See that the change-gear lever is in its neutral position. Taking the starting handle, press it until its ratchet end engages the projection of the crank shaft. After a sharp turn the motor will start, leaving the handle in the hand. Set the air tap on carburetter, giving it as much air as it will take (the beat of the engine will determine the quantity). There is no necessity to touch the ignition, which is automatic, and is set in one position by the makers. If the small governor lever on the dashboard is low enough, the engine will be found to be making about one hundred revolutions per minute. If a quicker speed is required the lever should be raised a notch or two.

To Start the Car.—Press the middle pedal to throw the clutch out of gear, move the change-gear lever into forward notch and let the clutch in slowly; as the car gathers movement second, third, and fourth gears may be used as occasion demands.



MR. AND MRS. L. P. MELL ON THEIR 14 H.P. CHENARD AND WALCKER.

NOTE.—The forward notch is for first or lowest gear, next neutral, then comes second, third, and fourth gears.

A speed on the fourth gear of from five to twenty-eight miles can be obtained by the use of the moderator pedal only, which is connected to the sliding cam under the inlet valves; the gas can be shut off entirely or a full charge given by use of this pedal. The governor lever on the dashboard may be set for any speed, and the moderator pedal used for anything lower required. This combination gives a remarkable control of the car in traffic, and makes it one of the most simple to drive. There are, as previously mentioned, no levers on the steering column; the ignition is always set; and the mixture is practically automatic, as when the position of the air lever on the carburetter is found by experience it is never necessary to alter, except when starting the engine, when of course the air is shut off.

To Stop.—Slow motor by pressing down moderator pedal, press right-hand pedal which throws out clutch and engages a powerful double coned brake on back of clutch, put change-gear lever in neutral position; if the engine is required to be stopped, switch off; if on the other hand the stay is temporary a very low number of revolutions can be obtained by notching down the small governor lever on the dashboard.

The Chenard and Walcker car can be driven by any motorist in a few minutes, and an absolute novice should become a proficient driver in a few hours.

THE ALBION.

By E. G. Appleby.

THE car shown in the accompanying illustration is of 10 h.p., and fitted with two speeds forward, of seven and twenty miles per hour, and reverse, all being operated by one hand lever. The body of the car, which was designed and built by Mr. A. C. Penman, of Dumfries, was specially constructed to give the maximum room, and is somewhat of a departure from the ordinary practice in building a tonneau body; the cane work on the panels giving it, as will be noted, a lighter appearance and more graceful outline. This carriage is mounted on light springs to minimise vibration when passing over rough roads, and this enables solid rubber Buffer tyres to be employed without discomfort; and the car being hung high reduces the dust annoyance to a minimum. This car has also been fitted with a brougham top and basket for luggage, which is a most useful adjunct for station or winter evening work. It can also be fitted with a dust hood and rainproof canopy, and either covering can be fixed or removed in a few minutes, thus rendering it useful for many purposes.

Description of the Motor.—The engine is of 10 h.p., with horizontal cylinders, the fuel employed being petrol. It is automatically governed, and is fitted with magneto ignition. The inlet and exhaust valves are arranged at right angles to each other. The sparking plugs being of special construction, with one insulated terminal and a rotating spindle which breaks the current inside the cylinder, are not liable to get out of order.

Transmission Gear.—From the engine the power is taken through a coned clutch to the change-speed box. This gear-box contains oil to lubricate all parts, the covers being, of course, dust-proof.

Brakes.—These are three in number, and comprise an exceedingly powerful forged steel block brake on the rear axle, operated by the one and only foot lever that throws the clutch in and out of gear, a slight pressure further forward applying the brake. The other brake is on the rear wheels, worked by a hand lever close to the change-speed lever. This is seldom used except when the car is at rest. Experience has proved that these brakes are ample to control the car, when fully loaded and descending the longest and steepest hills in the country, the owner having recently taken it, fully loaded, down the famous Birdlip Hill in Gloucestershire, which is three miles long and has an average gradient of 1 in 7, and in places 1 in 6.

Water Circulation.—The engine is cooled by a pump, which is driven through a chain off the half-speed shaft, and is fitted just beside the water tank, so that automatic circulation is kept up through the radiator, which is of the ordinary

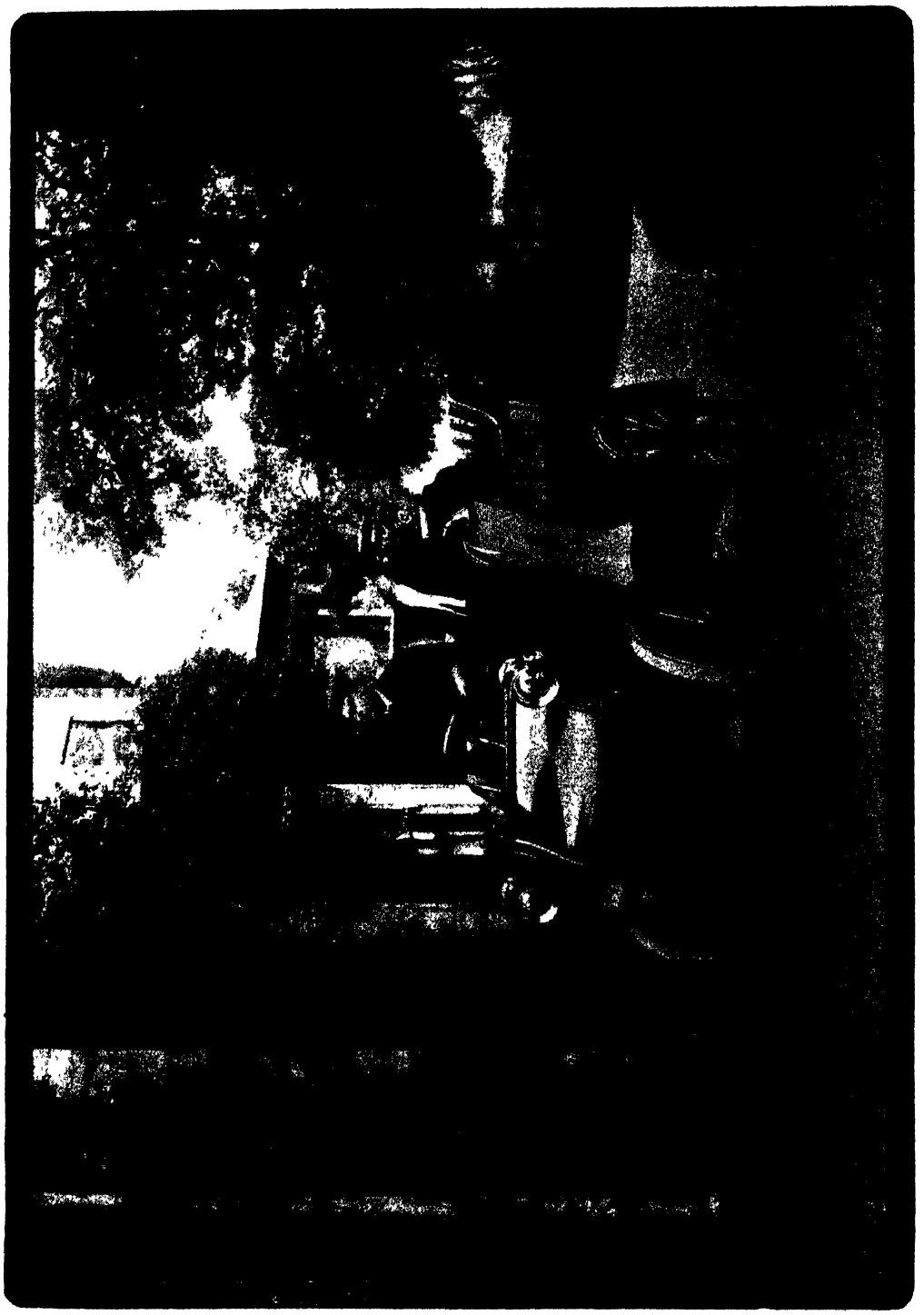
type, and fixed underneath the front part of the carriage. The cooling is extremely effective, and the only waste is that due to evaporation, so that a long day's run can be made without stopping to replenish.

Lubrication.—The lubricating arrangements are extremely simple. The gear case is lubricated entirely by splash, suitable gutters being arranged to feed the oil to and drain it back from all the bearings, and the differential gear-box on the rear axle is lubricated in the same way. About two pints of heavy oil should be put into the differential gear-box every month while running constantly, and both it and the main gear case below the engine should be drained out once every two months. Each cylinder is lubricated by a separate lubricator, consisting of a large gauge glass, and this should be adjusted so that the level of the oil falls one-eighth of an inch for every ten miles run by the car. The engine bearings and crank pins are fed with oil from a wick-feed oil box on the top of the engine casting. When starting the car it is only necessary to turn the cocks of the cylinder lubricators of this oil box. In addition to these there are five grease-cup lubricators, besides the axle hub boxes, which require filling very occasionally. The steering gear also works in a bath of oil, the hole for which is at the base of the steering pillar.

Carburation and Ignition.—The carburetter, which is fitted under the front cylinder, is heated by a small pipe from the exhaust, and the mixture of air and spirit is constant in all weathers. The supply of air, however, can be regulated to some extent by wire gauze screens duplicated on the air admission; and no fault can be found with the ignition, which is by low tension magneto. The time of ignition and the inlet of air to the carburetter are thus fixed, and simplify the driving very much. The ignition gives no trouble if it is occasionally cleaned and kept in proper adjustment. The adjustment is very easily made, as it is only necessary to turn the motor slowly to the point at which the current is broken. Just before this point the head on the ignition rod should be 1-16 in. clear of the wiper on the ignition plug spindle. If this distance is not correct, it is only necessary to screw the head backwards or forwards to adjust it.

Regulating the Speed.—The small lever on the right hand of the driver regulates the supply of petrol to the carburetter, and by pulling the lever back the supply can be stopped altogether; so that in running down a slight hill it is not necessary to apply the brake, or even to throw the engine out of gear, as the speed of the motor can thus to some extent be regulated, and of course the consumption of spirit is greatly reduced. It is one of the features of this engine that a full charge can be taken into the cylinder when the car is slowing on a hill, and perfect regulation is obtained by varying the tension on the inlet valve springs. Moreover, the small lever just referred to enables the driver to regulate the speed down to the minimum required by throttling the mixture, so that the high speed gear can be used on almost all roads, even through traffic; and on this gear especially the car is practically dead silent, which is a great advantage when driving through traffic or passing a restive horse. Thus it will be seen that, once the motor is started, the car is entirely controlled by the throttle lever and the one foot pedal, there being no other levers whatever to look after. On the low speed gear the car will travel up the steepest gradients, loaded with four passengers and their baggage.

Cost of Running.—My car has now been driven a little over 3,500 miles, and it has been found that one gallon of petrol will take the car fully loaded, on



MR. E. G. APPLEBY ON HIS 10 H.P. ALBION.

average roads, about twenty miles. The capacity of the tank (which is arranged to form the dashboard) is about six gallons; so that when starting for an ordinary day's run it is only necessary to see that the petrol tank is full. The expense of lubricating is, of course, very small; and, so far, the account for repairs has been practically nil, excepting for one overhaul, which was given after the first 2,000 miles, when some adjustment to the bearings was thought desirable. The car was driven direct from Scotland to Redhill, Surrey, without any adjustment being necessary; and, for an absolutely new car, this reflects considerable credit upon the makers. Since then the owner has driven the car himself mostly, and his coachman has become proficient in handling it, and in making the small adjustments which are necessary; so that, considered from all points of view, this car has many features to recommend it to people who do not require high speed, and who want an easily managed car. Under the new Act it may be considered quite an ideal car for everyday work. An indicator has been fitted to show the total distance travelled and the maximum speed during the last 110 yards, which may help to convince the Surrey police that no breach of the law has been made should the owner fall into one of their traps.

THE 12 H.P. ALBION.

A later type of vehicle is the 12 h.p. standard Albion, and we append instructions for handling this vehicle, which differs in several respects from the 10 h.p. and other types turned out by this firm.

In the first place, see that you have sufficient petrol in tank, that the water tank is full, and also that cylinder lubricators and oil box are filled with first-class oil for water-cooled motors; see also that the grease lubricators are filled up. Then open the cylinder lubricators and the crank-shaft lubricators by turning the cock handles in each case to the vertical position. The cylinder lubricators are each provided with a feed valve, which should be opened about a quarter of a turn and adjusted to give the proper feed to the cylinders.

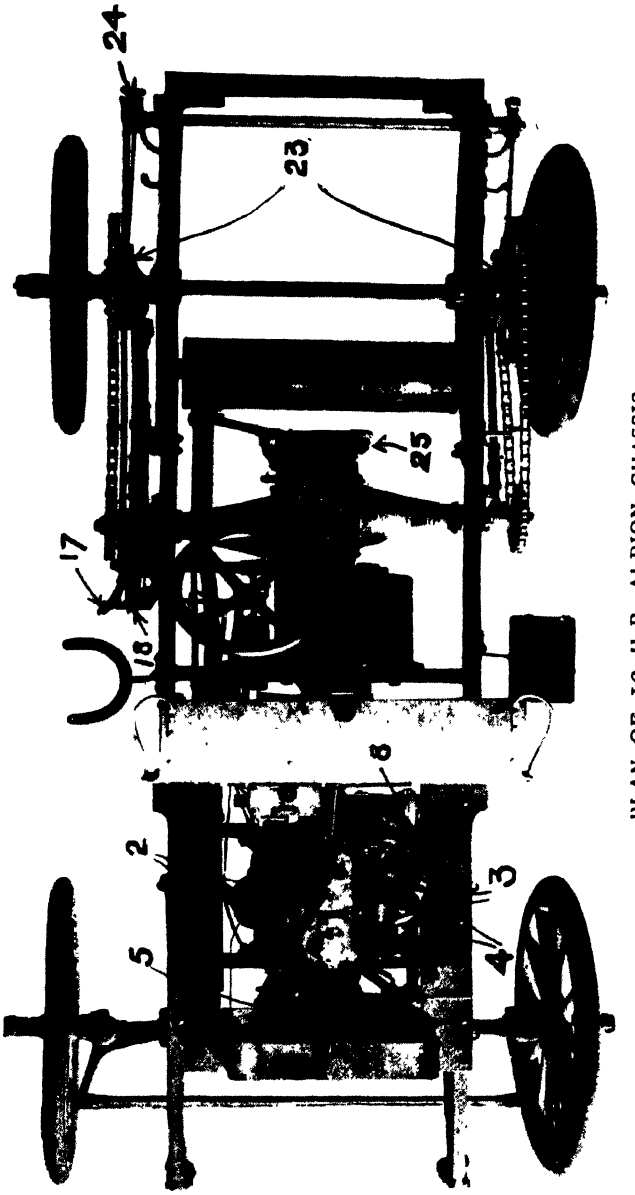
Starting.—Put the change-speed lever in the out-of-gear notch, and see that the hand brake lever is hard on; turn switch lever on dashboard into vertical position; open petrol cock at tank; put governor lever below starting wheel to mid position; put on starting handle and hold out half-compression rod, with left hand, while giving the motor one or two sharp turns in the same direction as the hands of a watch, whereupon the engine should at once start.

As soon as the motor is running, slow it down by moving the governor lever backwards; then, taking your place in the driver's seat, press the left pedal hard down with the left foot, and this unclutches the motor from the gearing Throw off the hand brake and move the change-speed lever into the first speed notch, now let the clutch pedal gently and slowly up, whereupon the car will start off at the first speed. It may be impossible to put the change-speed lever into first speed, if so, do not force it, but bring the change-speed lever back to the out-of-gear notch, and raise the left foot gently for a moment, so that the engine may spin the gearing, and bring it round to such a position that the gear will enter. This operation should be practised two or three times, special care being taken to avoid jerking when allowing the clutch lever to come up.

Changing Speeds.—After becoming fairly proficient at this, and also at the steering of the car, the second speed should be tried. To obtain this, depress clutch pedal as before, draw change-speed lever back and outwards into rear outside notch. This operation should be done fairly smartly so as not to allow the speed of the car to drop too much. The third speed is obtained in a similar manner to the second, but the position of the lever in this speed is in the forward outer notch.

In coming from a high to a lower speed, care should be taken, before the change-speed lever is operated, to see that the car is not running quicker than the motor would drive it at that speed. In reversing, the car must be brought to complete rest and both foot levers depressed, and then the change-speed lever pulled back to the reverse position, which is the near rear notch.

When changing the speed the clutch pedal must always be pushed well down before the position of the change-speed lever is altered.



PLAN OF 12 H.P. ALBION CHASSIS.

1. Cylinders. 2. Exhaust valves. 3. Inlet valves. 4. Sparking plugs. 5. Fan. 6. Radiator. 7. Throttle valve. 8. Carburetter. 10. Crank-shaft lubricator. 15. Gear-box. 16. Differential gear-box. 17. Hand brake lever. 18. Change-speed lever. 23. Hand brakes. 24. Hand brake compensating lever. 25. Foot brake. 26. Silencer.

It may be noted that when pulling over the change-speed lever you sometimes come against what appears to be a dead stop before you are into the notch. If so do not force it, but put the lever back into the out-of-gear notch, release the foot lever for a moment, and then press it down again, and then try the change-speed lever once more, when you will in all probability manage to get it into

the required speed notch with ease. A little practice will soon accustom one to the operation of changing the gears smoothly.

The Clutch.—The leather-faced friction clutch, operated by left foot, should be dressed occasionally with castor oil or raw linseed oil. The pressure on the clutch may be increased by screwing up the nut at the back end of the engine-shaft a turn or two. Care must be taken to see that the foot lever is free to move a little up or down when the clutch is home, otherwise it may hold the clutch from bedding right home. This can be adjusted by slackening the castle nut on the draw rod actuating the clutch lever.

The Brakes.—The right-hand pedal operates the foot brake, and as this wears it must be compensated by screwing up the nut on the tie bolt across the top of the two brake shoes. The brake pedal must never be allowed to come down on to the footboard of the vehicle, as this would prevent the application of the brake. The hand brakes are not so accessible for adjustment, and it is preferable to keep them for emergency work, or for holding the car when left upon an incline. The foot brake will be found quite ample for all work. The hand brake can be adjusted by shortening the connecting rod from the hand lever at the screw swivel provided for this purpose, or if more adjustment than this is required by shifting the bolts up a hole in the long link of the draw chains.

THE DARRACQ.

By Lieutenant W. G. Windham.

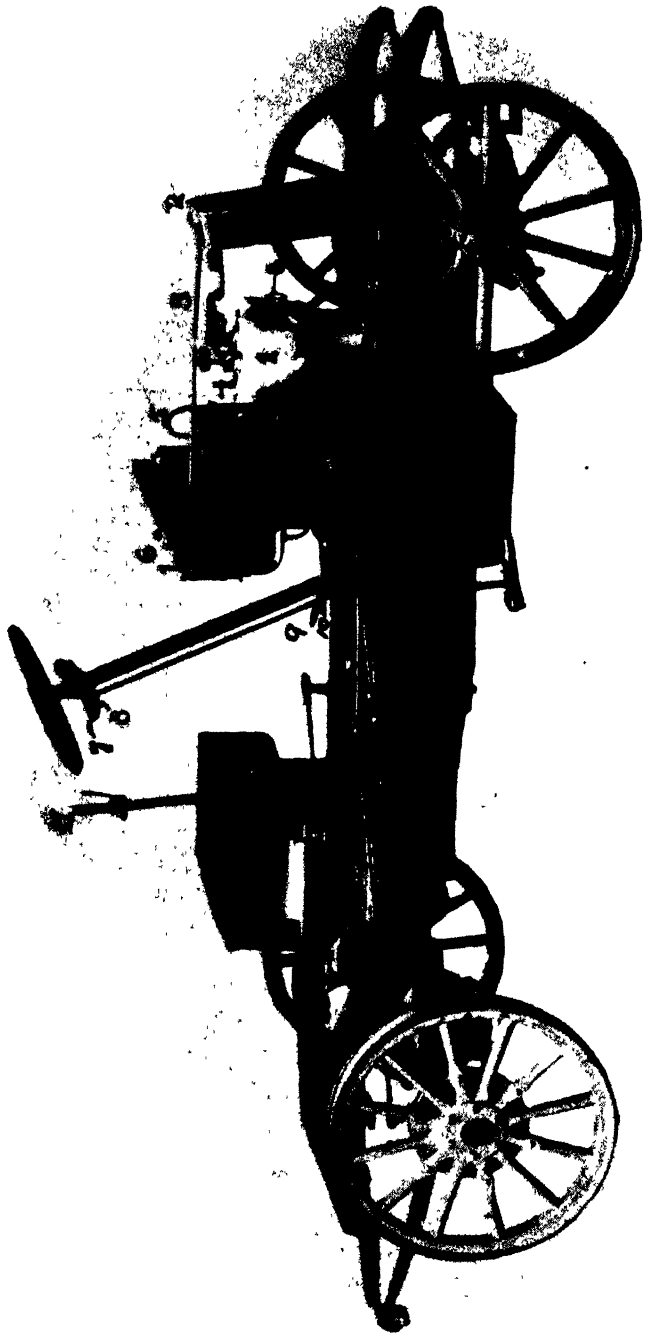
IT is probably because I know the Darracq car so well that I like it. I have owned and driven the 6½, 9, 12, and 24 h.p. cars, and having had several years' experience of these (and other) cars, I shall endeavour to put some of the good points of them forward and also, perhaps, for the benefit of my readers, I might put some of the bad ones. They exist in every car, but it is hard to find people who will put them in print for fear of getting themselves into hot water with the makers.

My experience of various cars leads me to think that, taking into consideration the price of the Darracq, there are few cars on the market which give one a better value for one's money. The chief point of merit is the safety with which one can drive these vehicles on a slippery surface. It was not so very long ago that I experienced my first sideslip on a Darracq, after several years of driving them in all weathers; and I can honestly say that I have never slipped more than a few feet, whereas on other cars I have had numerous very bad sideslips, and on several occasions the machine turned completely round. The reason of the Darracq's steadiness is, I believe, the long wheel base and the situation of the engine. The centre of gravity seems to me to be more in the centre of the car than in any other makes.

The machinery is of very simple construction and is very easily got at. The nuts are so placed that one can undo almost any of them with an ordinary spanner without it being necessary to use a tubular spanner. This applies more especially to the latest patterns, and not to the older models. Nearly every car is fitted with an inspection hole on the side of the base chamber, so that one can at any time ascertain the amount of oil in the crank chamber, and also see that the crank head dips into it. The Darracq has several other advantages, such, for example, as allowing an inspection of the wear in the crank brasses, facility for putting oil in the crank chamber should the pump get out of order, or of baling out any excess of oil. When running out any excess of oil by means of a tap fitted to the bottom of the crank chamber, it is a matter of guesswork, whereas by the Darracq method the exact amount can be seen at a glance, which prevents any mistakes being made. This plan should, I think, be adopted on every car, as the most important thing to guard against in any motor is the insufficiency of oil in the crank chamber.

As a hill-climber the Darracq is world-famed, and it may not be out of place here to remark that I have a favourite hill near the Crystal Palace up which I have tried several well-known cars. The majority have not beaten my old 6½ h.p. Darracq, although many have been three or four times the price and had much larger engines. Several improvements have been made on the latest 24 h.p. car, especially in the lubrication. The oil is forced into the crank chamber by means

of the circulating water on which it floats, and consequently the hotter the water becomes (possibly from want of lubrication) the more the oil is forced into the crank chamber.



CHASSIS OF THE 12 H.P. DARRACQ.

linders. 2. Radiators. 3. Stay for radiator. 4. Water tank. 5. Overflow and air vent from water tank. Pressure-fed lubricating oil tank. 7. Ignition lever. 8. Mixture lever. 9. Brake pedal. 10. Clutch pedal. 11. Brake lever. 12. Petrol tank.

An important feature of the Darracq cars, and one in which they are unlike most of the heavier type of car, is the position of the change - speed handle. This is placed directly under the steering wheel, and to my mind this is the best place possible for the change - speed lever. There is no bending down and forward; it is out of th
is very
Formerly the driver was able to mount and dismount on the right-hand side, and not disturb the person sitting on his left; but I am sorry to say that this is a thing of the past, as now they have put the brake handle across the entrance, following the example, I suppose, of other makers. The batteries on the 12 h.p. are placed under the bonnet on the left-hand side, which entails having only very short primary wires. The only fault against

LIEUTENANT W. G. WINDHAM (KING'S MESSENGER) IN HIS 24 H.P. DARRACQ.

this arrangement is that the boxes, as fitted, are made to take dry batteries, and when they run out, either new dry batteries must be bought or a new box made to take accumulators, which, as a rule, are not the same shape.

From Part I. of *Cars and How to Drive Them*, I extract the following in reference to the Mercédès radiator, which I thoroughly endorse. "I am afraid there will be some disastrous results when the French makers copy the Mercédès cooler." This is what happened in my 24 h.p. Darracq. The tank does not hold a sufficient amount of water, and, unless the car is travelling fast, the water boils over. I have found that if the spark is slightly advanced and the exhaust valves lengthened it helps to cure it, but I do not like this mode of water cooling. The fan, I find also, draws in the fine dust (especially in the hot weather) on to the very place where it should be kept away from at all costs, namely, the valves and the working parts of the engine. The pump for circulating the water is not quite satisfactory, being too small. The brass flanges which open by a spring placed between them on the centrifugal system perform the duties of a pump, but this, I think, is not so good as the Panhard arrangement. The small flange and spring of the Darracq pump can, however, be changed in less than three minutes, which is very handy, and, like everything fitted to the Darracq, they are very easy to get at. The brass tanks are very nicely made, and I wish other makers would take a "tip" from them. The edges of the tanks are rolled, then soldered, and not riveted. The latter, I find, usually work open after a few months' use and cause endless trouble.

The foot brake consists of two small brass flanges, which press on either side of the drum brake. In all the other sizes and patterns of the Darracq cars the brakes are very efficient, but in the latest 24 h.p. and 12 h.p. they seem to be fitted too close to the gear-box, and consequently, unless an iron plate is fitted between the two, the brake drum is liable to get covered in grease. Sometimes this, too, happens with the back wheels, particularly if the advice, as given in Darracq's notes on the car, is followed, *i.e.*, "to put oil in the differential box." I always put plenty of grease, especially as the bearings on the outside of the axle have separate oil holes, and do not require any lubricant to run through the live axle from the differential box for their oiling.

THE ORLEANS

By Claude Johnson.

MY attention was first called to the Orleans car (or the New Orleans as it was then styled) during the 1,000 Miles Trial of 1900, when Mr. Astell drove, with such great success, the little single-cylinder 3 h.p. belt-driven car.

In May 1901 a hill-climbing trial was held by the Automobile Club on Dashwood Hill. I had up to this time been the owner of a 6 h.p. Parisian Daimler and a 6 h.p. Darracq car. On the occasion of this hill climbing trial Mr. Astell was driving a 7 h.p. two-cylinder gear-driven Orleans, which, with three passengers, went up Dashwood Hill seven consecutive times at an average speed of 10½ miles per hour, thus beating many vehicles of higher price.

I then decided to give an order for one of these cars, and one evening in August of 1901 I took possession of my first Orleans in exchange for a cheque for some £265. I there and then set out to drive to Scotland. It was almost dark when we started, but we made Biggleswade that night and the following night we dined with Mr. Ernest Hutton at Northallerton, having covered 134 miles in a day. The next day I was in Scotland, and used the car there extensively, and afterwards drove it in the Glasgow Reliability Trials of 650 miles, where it gained very high marks.

Later on I gave an order for a 14 h.p. four-cylinder Orleans car, which I drove during the last six months of last year. I believe I was the second person in this country to give an order for one of these—Sir Alfred Harmsworth having been the first. As is often the case, the possessors of the first cars of a type undergo some inconvenience and trouble, as they are the means of discovering defects which in the later built cars are naturally remedied. In the car which I had there proved to be the following faults:—(*a*) An error in the design, which caused weakness in the back axle. (*b*) Weakness in the clutch rod.

Mr. Astell is fitting to all the new 14 h.p. Orleans cars gears of much larger size and having much larger teeth, and the two weaknesses above referred to have been amply remedied in the new models. Apart from these weaknesses, I cannot say that I had any trouble whatever with the car which could not be ascribed to ignorance on my part. I made some splendid runs on her, but will only mention two as evidence of her powers.

In September last, with four good sized men on board, she carried us in twelve hours, with lengthy stops for breakfast, lunch and tea, from London *viâ* Nottingham to Ripon, 217 miles. On the same journey, on the splendid wide high road between Penrith and Carlisle, she was timed to do a switchback mile at the rate of 42 miles an hour. In 1900 Mr. John Scott Montagu drove two ladies and myself on my 6 h.p. Daimler from the top of Shap Fell to Mint Bridge at its foot—a distance of ten miles—in 30 min., and I remember we thought we had made a rather fast descent. Last year my 14 h.p. Orleans car took four of us and luggage from the

middle of Kendal Market Place, which is half a mile or more from Mint Bridge, to the top of Shap Fell, making the ascent in 33 min., and this although the roads were somewhat greasy, and it was therefore impossible to run her fast round corners. So much for the performance of the car. Now for hints as to driving.

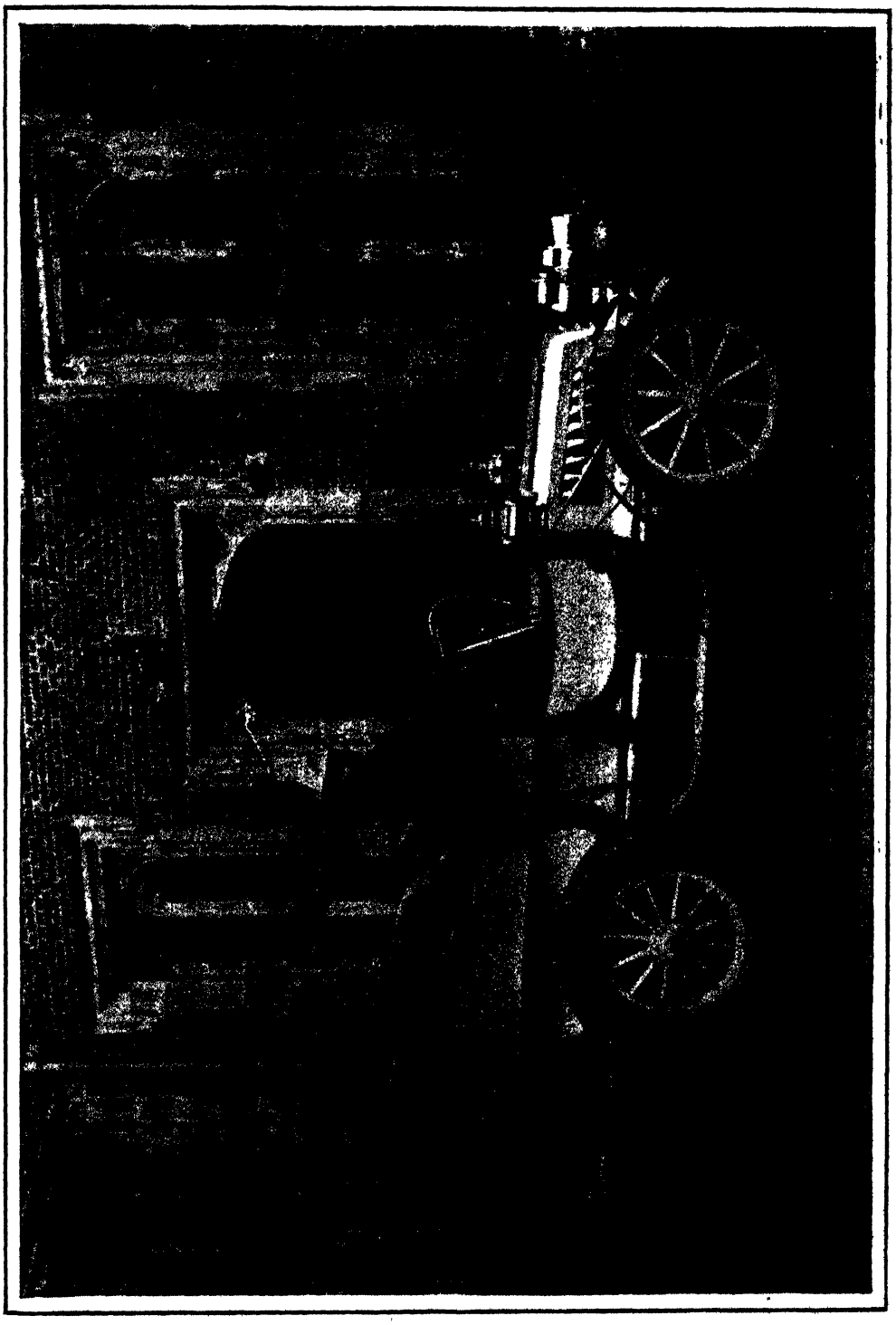
The Clutch.—The clutch pedal in the first model is on the left side. There is no leather on the clutch, as it is actuated by metal shoes. If the clutch slips, squirt petrol into it, and of course be careful that no oil or grease is allowed to enter it. If the clutch requires to be tightened, it is necessary to take off the sleeve at the rear of the gear-box and tighten the nuts on the end of the clutch rod. In the later types the clutches are of the internal cone pattern. The pedal by which the clutch is withdrawn is most cleverly designed, so that the pressure required to "declutch" is very light. A finger's pressure is sufficient.

Change-speed Gears.—The old Orleans car had a very objectionable "reverse," but this has been replaced by a "reverse" which is actuated by the lever that is used for the four forward speeds. The change-speed lever works in two parallel slots. To engage the first speed it is only necessary to press down the clutch pedal; pull the lever towards the driver in the slot nearest the driver. For the second speed push it to the far end of the same slot. For the third speed pull the lever back, but in doing so pass through the central opening into the outer slot, and continue to pull it back to the end nearest the driver. For the fourth speed push the lever to the far end of the outer slot.

The change of speed is delightful and noiseless. Perhaps the only difficult change is that from third to second, but this is made easier by touching the clutch pedal not only on beginning to push the lever back, but letting it up in the middle of the action and again pressing it towards the end of the action. Needless to say, injury may be done if attempt be made to change direct from fourth to first, or third to first speed, without slowing the car down to the proper speed for the first speed gear. The gear case must be kept full of oil, and all the working part of the change-speed gear must be carefully and frequently lubricated, especially at the points where lubrication is necessary to facilitate the speed lever being drawn backwards and forwards in a direction at right angles to the length of the car, that is from the inner slot to the outer slot of the change-speed quadrant.

Brakes.—The hand brake, which of course is the one that should be most frequently used, is applied by a side lever. It has been very much improved in design and there is no difficulty in adjusting it. The foot brake is an excellent little metal-to-metal brake on the driving shaft, very powerful and easily adjusted. It should be borne in mind that in applying the hand brake or the foot brake the clutch is not automatically released. To me this appears to be a great advantage, as it is possible to employ the retarding effect of the compression in the engine at the same time as the brakes, whereas of course, this cannot be done if the clutch is automatically withdrawn immediately the brakes are applied. Care must be taken, however, before the car is brought to a standstill or is reduced to a very slow speed, that the clutch pedal should be pressed in order that the engine may continue to work, otherwise it will stop.

Ignition.—The ignition is by battery and coil and the ordinary wipe commutator. I was told when I ordered the four-cylinder car that I should have twice as much trouble as I had had with a two-cylinder car. My experience, however, was



MR. CLAUDE JOHNSON ON A 15 H.P. ORLEANS.

otherwise. I had trouble from ignition from three causes—(1st) Being of a casual disposition I did not carry a volt-meter, with the consequence that I allowed my battery to run down. As two sets of battery are, however, supplied with the car it is a simple matter to switch on the spare set. (2nd) The wires attached to the commutator from frequent vibration sometimes broke; one heard in a moment that only three cylinders were going, and stopped the car, looked in the bonnet, saw the cause, remedied it, and was away again in two or three minutes. (3rd) Broken sparking plugs, owing to carelessness in replacing the bonnet, were not infrequent when the car was left for cleaning in the hands of inexperienced people. A very puzzling irregular "missing" may be occasioned owing to the fact that the springs on the commutator do not press sufficiently hard on the cam. On one occasion my diagnosis of the causes of missing was so far wrong that I pulled the carburetter to pieces, had all the valves out, had all the plugs out, changed the battery and accused the coil of misbehaviour, before I discovered that the simple method of pressing each spring tight against the cam whilst the engine was running was what was really the fault. I found then that when the springs were pressed against the cam the engine did not "miss." New springs were required.

The advancement and retardation of the spark is regulated by a small lever under the steering wheel. The unnecessary retardation of the sparking tends to heat the engine, which ought to be avoided. The car is fitted with five switches, one a general switch by which the connection between the coil and sparking plugs is made or interrupted, the other four being one switch for each cylinder. If, then, there is any doubt as to which cylinder is not doing its proper work, it is very easy to try them one by one by shutting off the other three. A lot of time can be saved on the road, in the case of only three cylinders working, by the use of these switches in discovering the defaulter.

Carburetter.—The carburetter is a peculiar one, inasmuch as by merely turning a screw on the outside of the bottom of it the admission of petrol can be regulated. A very slight turn of this screw will make quite a remarkable difference in the running of the engine. The car will soon tell one when the best results are being obtained from the engine. In making the test before being satisfied it is wise to open wide the throttle and retard ignition and then gradually advance it, and the trap door on the exhaust should be opened as the explosion can then be heard better than when it is closed. In winter the pipe leading from the exhaust pipe to the air intake should be used. In later types a new carburetter is used of simple but effective design. In addition to the automatic governor the throttle is opened and shut by means of a foot lever, which is, in my opinion, preferable to the Mercédès arrangement on the steering wheel.

Governor.—The Orleans was one of the first cars used in this country which had fitted to it automatic governing by means of the throttle. This device is extremely simple and needs no special description. Care must be taken, however, to see that the chamber on the induction pipe which contains the throttling device is so placed that the rod by which the throttle is regulated may pass backwards and forwards without difficulty. Unless this position is accurately gauged the throttle will stick. In addition to the automatic governing of the engine by means of the throttle there is a hand governor, by which the governing of the engine is done away with; that is to say, by which the full amount of gas may be admitted to the cylinders without

reference to the speed of the engine, and on the other hand the supply of gas to the cylinders may be entirely cut off. This is a most useful and charming device. If the car begins to sideslip shut off all the gas. The speed of the car is immediately reduced without the application of the brake and the car ceases to sideslip, as at the same time the back wheels are not being driven. If a restive horse is being passed shut off all the gas, and the car runs by as silently as a phantom. In descending a moderate hill, shut off all the gas; the car rolls down comfortably without the use of a brake, retarded simply by its compression, the two brakes being held in reserve.

Starting.—It is scarcely necessary to point out that no attempt should be made to start the engine whilst the ignition is advanced; it must be retarded to its lowest point, otherwise a back fire may cause serious injury. The engine as a rule, if the carburation is right, starts very easily. It is well to press the small trigger on the float chamber by which the float is depressed until the petrol runs out at the top of the chamber. With the switch still off then give the handle three or four turns with the throttle wide open, then switch on the ignition and work the ignition lever backwards and forwards from its greatest point of retardment towards its greatest point of advancement, and the engine should start.

Petrol Supply.—The petrol tank is on the back of the front seat. Underneath it, close to the floor, is a small tap by which the supply from the tank to the engine may be cut off. Before attempting to start the car see that this is open, and if tyre pumps or other stray gear are allowed to roam about on the floor of the tonneau, bear in mind that they may, in their peregrinations, turn off the petrol supply. Needless to say, endless fun may be had at the expense of the driver by passengers in the tonneau who amuse themselves by occasionally turning off this tap, when the driver is naturally distracted to know the cause of the behaviour of his engine. A further tap is provided on the petrol pipe within the bonnet. A wise owner will always see that this is turned off on leaving the car in any building; a wise owner will equally see that it is turned on before attempting to start the car. If from the behaviour of the engine there is doubt as to whether she is receiving a proper petrol supply, the union on the top of the float chamber may be unscrewed, and then there should be a steady stream of petrol from the pipe; drips are not sufficient. Near the step there will be found underneath the car a point in the petrol pipe at which there is a third tap. This is useful for clearing the pipe from impurities, and also for obtaining a small supply of petrol for cleaning the clutch or for other purposes.

General Care of the Car.—As was recently pointed out in the Automobile Club *Journal*, the most important points for special attention are those, the neglect of which may risk the lives of passengers.

Steering Gear.—The ball and socket joints of the steering gear should therefore receive frequent examination, frequent lubrication, and should always be tied up in leather bags, which in the event of breakage would prevent one member of the steering gear separating from the other.

Wheels.—The front wheel caps should be frequently removed and grease put therein. Failure in this respect may involve the sudden seizing of one of the front wheels. This is very dangerous, as, at high speed, the result would be that

the car would slew across the road and a fatal accident might ensue. If the steering suddenly tends to pull to one side, stop at once and feel the front axles. One is probably on the point of firing.

Brakes.—A man who takes out a car without satisfying himself before he has driven a few yards that both brakes are in working order should be imprisoned. He is a danger to himself, his passengers, and to other users of the roads.

The points next in importance are those, failure to attend to which may result in serious injury to the car.

Water.—Failure to fill a water tank, or to correct any leak in the water system, may ruin an engine. The pump on the Orleans car is gear driven. I can give no advice concerning it as on neither of my cars did the pump give trouble. I might also say that I was unaware that I had a pump. It was only necessary on one or two occasions to tighten up the glands of the pump. Care should, however, be taken when the radiators have been emptied to see that in re-filling them there is not an air lock. It is sometimes very difficult to secure the proper circulation of the water when the water system is refilled owing to this air lock, but this can generally be removed by unscrewing one by one the various junctions in the water system and then turning the engine.

Lubrication.—One cannot have too much lubrication in the back axle. Necessarily all grease cups must be filled. The universal joints on the driving shafts should be frequently examined, and new grease placed in the leather cups by which they are covered. Bear in mind that these universal joints have much work to do, and failure to lubricate them may end in your being stranded on the road. The lubricators to the four cylinders of the engine should be filled with oil, and should drop at least six times a minute, and more than that in the case of a new car. Generally speaking, I may say that I have never met a car at the price which could pass me, and over and over again I passed in ascending hills (for there is no sport in passing on descents) cars which cost £300 or £400 more.

There is another model of the Orleans which I would now like to draw attention to, viz., the four-cylindered 12 h.p. car. The wheel base is long; the frame, instead of being tubular, is of pressed steel; and there are but three speeds and reverse. The lubrication of the car is effected by an oil pump, one stroke of which has to be given every twenty miles. The universal joints are fitted with special brass grease cups, and the male portion of the clutch is made in two halves, each half of which can be removed by undoing three nuts. When one remembers what a long business it was to take down a clutch in cars of the old design, one realises how charmingly simple this arrangement is.

I have recently had an opportunity of driving one of these cars about 350 miles, and I must say that I was delighted with it. The three speeds are about ten, twenty, and thirty miles an hour, but the engine may be accelerated so as to give thirty-one or thirty-two miles an hour. The top speed is so low that the throttle is partially closed on the flat. One is easily able to maintain an average of twenty miles an hour, as the majority of hills can be ascended on the top speed. With two on board I only used the second speed twice in the journey from Oxford to London by the Stokenchurch road, namely, once in ascending the hill out of Oxford and once on the steepest portion of the Aston Rowant hill, which has to be mounted in order to cross the Chiltern Hills. With three passengers the car will run up the hill on entering Esher from Cobham on the top speed.

THE BROOKE.

By E. Estcourt.

TWO types of cars are now being made by Messrs. J. W. Brooke and Co., Ld., of Lowestoft; one is their standard and the other is their four-cylinder light car. The latter I do not intend fully dealing with, and will content myself by pointing out the main features in which it differs from my own car.

The standard Brooke is a car of entirely original construction, and is remarkably easy to drive. The weight is about 19 cwt. The three-cylinder engine gives 14 b.h.p. at a nominal speed of 900 r.p.m. It is fitted with three speeds and a reverse, all actuated by one lever, and efficient double acting brakes. The change-speed gear is original, and not worked by spur wheels, except the reverse, but by chains, and the changing from one speed to another is perhaps the easiest, instead of the most difficult, operation in the driving of the car.

The engine is placed transversely in a framework of its own, and the drive from the engine to the gear-box is by means of a Hans Renold silent chain. This chain occasionally requires adjusting, which is provided for by two cap nuts right on the front member of the frame. By screwing these up the whole engine and the two bars on which it is supported move forward, and so tighten the chain. This is an operation seldom necessary, but one must bear in mind that six nuts have to be slackened first, viz., the nuts of the four bolts which clip the two channels on which the engine is carried, and two nuts on the front arm of the steering box, which has slotted holes. The adjustment is only 5-8 in., and when this limit is reached the engine is forced back to its original position and a whole link taken from the Hans Renold chain and a half one inserted. This latter can be obtained from Messrs. Brooke and Co., with instructions for insertion—a very simple operation. After the chain is adjusted one should see that the foot accelerator when depressed fully cuts out the governor; if not, an adjustment for this is provided.

The contact breaker is driven by a chain from the timing shaft, and is also adjustable, but in so self-evident a manner that it is unnecessary for me to describe it. The clutch is carried on an extension of the crank shaft, with the result that there is no end thrust when running, and it is withdrawn by means of the left-hand pedal.

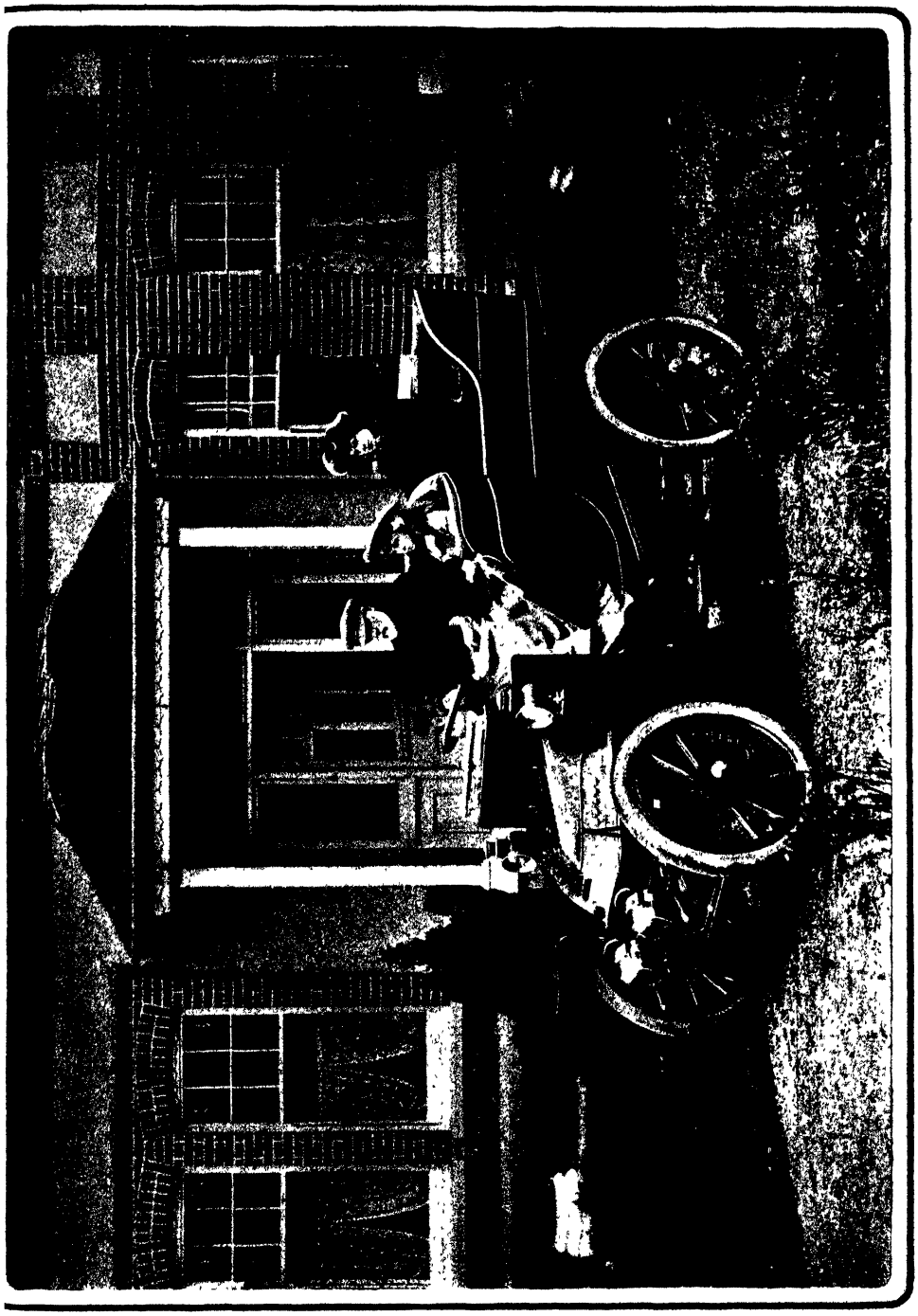
The action of the governor depends entirely on the suction set up by the engine. For instance, when the engine is running at, say, 500 r.p.m., the actual suction of the induction pipes is, I believe, about 8·5 oz. per square inch, whereas, when the engine is running at 900 r.p.m., the suction is about 17 oz. A leather disc of about 4 in. diameter is provided in the end of the carburetter, and when the suction much increases—that is, of course, as the engine begins to run faster—there is a

greater suction on this leather disc, tending to pull it forward, and in turn shutting off the amount of gas. The speed of the engine is reduced, whereupon the throttle and leather disc are returned to their original positions, by means of a spring. The tension on this spring therefore determines the speed at which the engine is to be run, and it is made adjustable by means of a nut at the end of the carburetter. By screwing up this nut the engine is made to run faster. Through the middle of this nut runs a small independent spindle, and by pushing it forward the governor is put right out of action, or partly so if desired. This is worked from an accelerator or moderator pedal alongside the clutch pedal. I have had another lever and spring fitted to my car to form a hand accelerator, so that the speed of the engine can be set according to traffic requirements. This I find a great advantage.

The carburetter is of the spray, constant-level type. Warm air is supplied to it over one of the exhaust pipes, and an adjustable auxiliary cold air from the dashboard worked by a shutter valve, but this requires little adjustment, and is generally worked at about half open.

The system of cooling is by gravity, and, as it is covered by patents owned by myself, I suppose I must not say too much about it. Before being adopted by Messrs. Brooke and Co., it was thoroughly tested by them, and latterly Mr. Mawdsley Brooke has been carrying out further tests with honeycomb and other radiators, but tells me he is still in favour of the system they have used right along. With gravity cooling it is necessary that the major portions of the cooler tubes should be considerably above the level of the engine, and to obtain this a special form of dashboard is used in the Brooke cars. This dashboard is higher than usual, but forms a splendid wind-shield, and makes the car particularly comfortable to ride in and to drive. On top of the cylinders is a large outlet pipe which directly couples with the offside cooler upright, and the hot water at once rises to the top and distributes itself over the upper cooler pipes, and as it cools, falls into the near side upright, thence right round the front of the frame of the car, still in the tubes, and eventually to the bottom of the offside upright, where it goes back to the engine through a much smaller pipe than the outlet. The offside upright is divided into two parts by a diaphragm having a small hole through it to let off air. On their four-cylinder car Messrs. Brooke fit a honeycomb type of radiator, and the water is circulated by means of a pump.

The gear-box is fixed to the frame of the car by four arms, and it has a large inspection hole in the top. The speeds are obtained by chains, as I stated before, and these make the car a delightfully smooth one to drive, doing away entirely with the grinding noises of gearing and also with the loss of power inseparable from bevel wheels. The reverse is obtained by pushing the change-speed lever as far away from one as it will go, and the up speeds by pulling the lever towards one, notches being provided in the quadrant to determine the position of the lever. The various speeds are obtained in the gear-box by claw clutches sliding on the differential shaft and engaging in turn with similar claw clutches on the sprocket wheels, which give in a standard car approximately ten, twenty, and thirty miles an hour at normal speed of engine. The different shafts are connected to the outside sprocket spindles by male and female joints, these spindles being carried in self-oiling ring bearings bolted to the channel steel frame of the car. The power is then carried from the outside sprockets to the road wheels by 1½ in. pitch



MR. E. ESTCOURT AND HIS 14 B.H.P. BROOKE.

Brampton roller chains. The back axle of the car is carried on long flexible springs fixed at the front end and by a link at the back end. In adjusting the chains it is therefore necessary to slack back the nuts on the axle clips so that the back axle may slide on the spring itself, but I believe Messrs. Brooke and Co. are altering this arrangement and suspending the springs by links at each end, which will necessitate a stouter radius rod. This is now fixed to the axle at one end, the other end being carried by a swivel in the countershaft bracket. The dashboard carries the coil, lubricators, switch, air and pressure gauge, and special tool cupboards fitted in the wings, which are a great convenience.

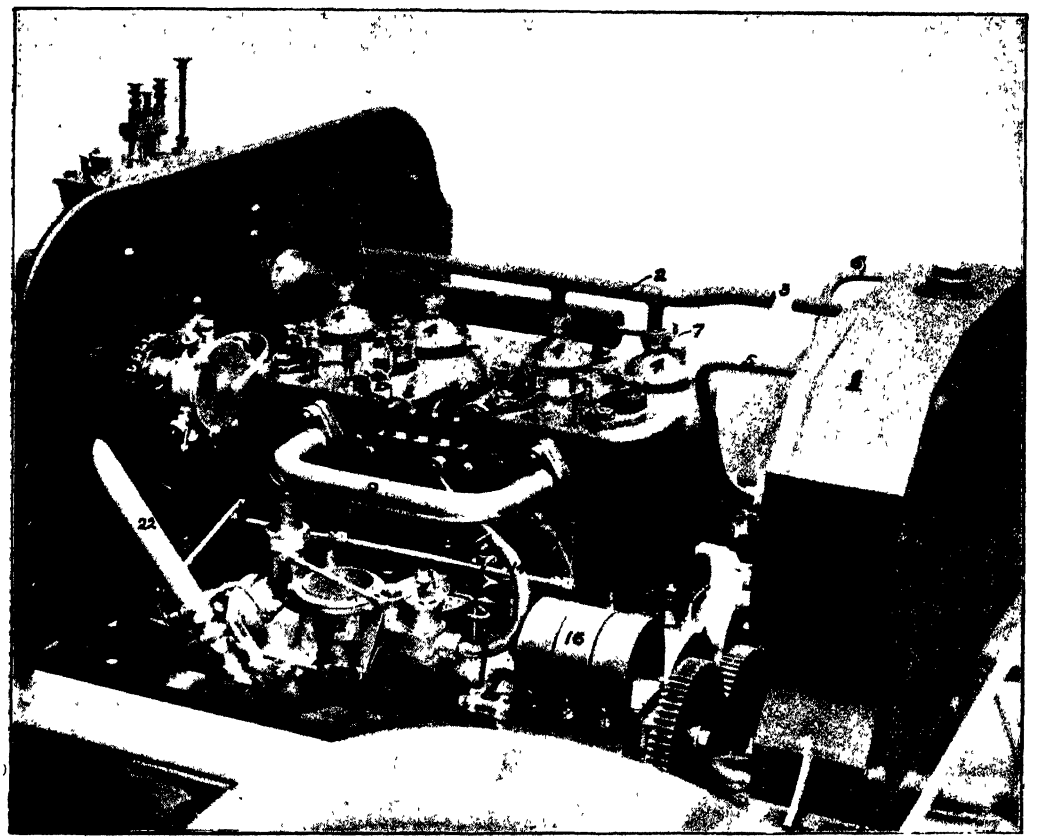
The advance apparatus for the electric ignition is on the steering pillar and worked by a rack. When starting, this should always be at the bottom, and when running the average position is a little more than half way up, but this, of course, is better determined after a little experience.

The brakes are double-acting. The countershaft brake is actuated by the right-hand foot pedal, and is adjustable by a right and left hand nut, which is easily got at by lifting one of the bottom boards. The sprocket brakes, actuated by a hand lever, are compensated and have two adjustments; one is on the compensating bar right at the back of the car, and there are two other right and left hand screws on each side of the car between the brake ring and the lever. Care should be taken in adjusting that the fulcrum is over the centre of the wheel; otherwise, the brake is apt to jam on when going backwards.

Nine gallons is the capacity of the petrol tank, which should carry one 200 miles (on average roads about twenty-four to twenty-eight miles to the gallon). The feed of the petrol is by pressure (about 1½ to 2 lb.) which is maintained automatically after once being pumped up by the foot accelerator, and the pressure is recorded on a gauge on the dashboard. I am a great believer in pressure feed, as it gives more room on the car, and it is undoubtedly safer to carry all petrol below the frame. The foot accelerator has two vertical links which connect to a small pump, and each time the accelerator pedal is depressed a certain quantity of air is forced past a small valve towards the tank. There is another valve in the relief fitting on the dashboard to make doubly certain that no pressure shall leak back to the tank. A greater pressure than 6 lb. should never be pumped into the tank, otherwise it is likely to burst. The relief on the dashboard can be set to blow off at any pressure, but I strongly advise it not being set lower than 6 lb., as, if this is often allowed to open, small particles of dirt are apt to become deposited on the face of the valve and so cause a leakage of the air pressure.

The crank chamber of the engine, if examined from underneath, will be found to have two plugs; one is for draining all the oil and the other is connected to an open pipe about 1½ in. up in the crank chamber, to which level the oil should always be. If oil is not found to run from here, pump oil into it by the injection lubricator on the dashboard until it does, and replace the plug. The drip lubricator on the dashboard feeds to the pistons and should drop at not less than forty drops a minute, and then, when running, the injection lubricator should have a few strokes every ten miles or so. Before starting out every day the pad for withdrawing the clutch just inside the Hans Renold wheel should be well oiled, and the grease lubricator at the end of the crank shaft should be given one or two turns. See also that there is plenty of oil in the countershaft brackets. If there be any doubt of this, take out the plug in the top of this bracket and fill with oil. The brackets

will then last for weeks if there is no leakage from the bottom; if there is, a new joint should be made. It is important, too, that all the brake pins, steering joints, etc. should occasionally be oiled to prevent rust and excessive wear. The gear-box should occasionally be opened and examined, and the oil should always be at a level sufficiently high that all chains dip well into it.



ENGINE OF THE FOUR-CYLINDER BROOKE.

1. *Radiator.* 2. *Water circulating pipe.* 3. *Water circulating junction for rubber tube.* 4. *Screwed water outlet tap.* 5 *and* 6. *Fan supports.* 7. *High tension sparking plug.* 8. *Low tension sparking plug.* 9. *Induction pipe.* 10. *Fibre tube for high tension wires.* 12. *Carburetter.* 13. *Governor rod.* 14. *Hot-air pipe.* 15. *Petrol pipe.* 16. *Magneto.* 17. *Magneto wheels.* 19. *Contact breaker.* 20. *Contact breaker chain.* 22. *Steering column.*

To put all the foregoing points as clearly as possible, I will imagine a stranger to this particular type of car starting for a day's run :—

1. Fill petrol tank to within 1 in. of top and screw cap firmly on.
2. Fill cooler until water shows in the top bar; this is sufficient for 200 miles.
3. Pump about 2 lb. pressure by means of the accelerator pedal.
4. Oil the clutch pad, steering and brake pins, and see that there is oil in countershaft bearings, gear-box, and crank chamber.
5. Flood carburetter.
6. Switch on, and one turn of the handle will start the motor.

To get in the first speed it is, of course, necessary to withdraw and then pull the lever into the first notch; if the lever does not come easily, do not force it, but ease the clutch pedal a moment to change the position of the claw clutches; the lever will then easily come over. Let the clutch in gently and accelerate; when the car has picked up speed change again to the second, but always withdraw the clutch. The same rule applies when reducing speeds, but do not change down until the motor feels that it wants you to.

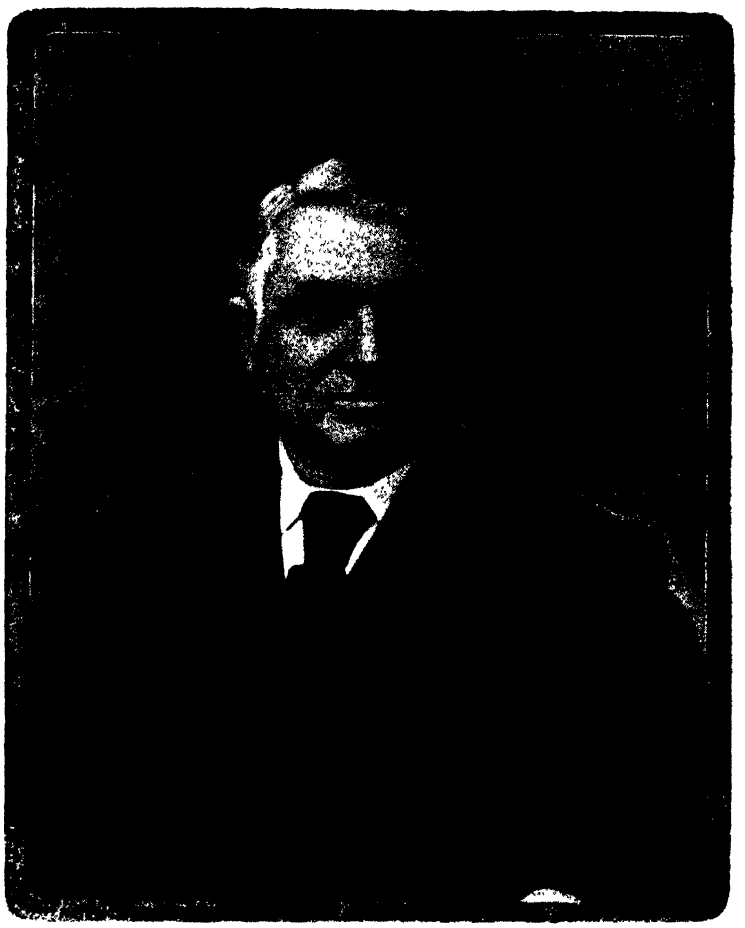
There are a number of small refinements on the cars, and no description would be complete without a word concerning them. The tool cupboards I have already mentioned, and these are a blessing; there is no other way of describing it. I would not drive a car without them under any circumstances. The steering wheel, fitted with a receptacle for small articles, is very useful. The steering locks are simply projections on the steering arms, making a very neat arrangement. The exhaust, which is practically silent, is carried transversely on the back of the car, and, in combination with a perforated apron, renders the car a less dust-raising one than the majority. The bulb of the horn is a fixture, so one knows instinctively where to put one's hand to it. One of the most useful refinements, however, in the car is, I think, the exhaust release. This is a valve on the first exhaust box worked by a rack on the left-hand side of the steering pillar (in my case by a loose chain, as I have used the rack for the hand accelerator), and when this rack is raised it opens the valve to the air, enabling one to hear each cylinder fire and locate a fault, if necessary, in the firing gear. Lubrication is by a drop feed to the crank chamber and pump to the cylinders; a stroke or two of the pump about every twenty miles, and the drip feed set so that half an inch of oil is dropped in the crank chamber about every twenty miles, I find quite satisfactory.

In conclusion I append some particulars of the 15-20 h.p. four-cylinder car, showing wherein it differs from the other models. The engine, instead of being placed transversely in the frame, as on most of the Brooke cars, lies longitudinally beneath the bonnet in front. The car also more nearly follows the lines adopted by many other makers, in that a honeycomb radiator is employed for cooling the circulating water. The air is drawn through this cooler, not only by a belt-driven fan fixed immediately behind it, but also by another fan formed by the spokes of the flywheel. Other interesting features of the car are the change-speed gear, the universal joint fitted between it and the main clutch, and the foot brake, which is mounted inside the gear-box. In accordance with previous practice the makers employ chain and sprockets instead of spur wheels for the gearing, and the required speed is introduced by jaw clutches, the action of which is controlled from the gear lever by a specially shaped cam, inside the box. The combined automatic carburetter and automatic governor, which is the most recent development of the suction governor invented by this firm is another interesting feature. The carburetter itself is now rendered automatic by the addition of a spring-loaded valve that regulates the admission of the auxiliary air, and the throttle valve, which is automatically controlled by the suction in the induction pipe, is—together with that portion of the mechanism which enables the driver to regulate the normal speed—considerably simplified in construction. All the valves of the engine are mechanically operated, and two systems of ignition are fitted—a low tension magneto, and a high tension electric from batteries and coils.

THE ARROL-JOHNSTON.

By Andrew Hunter.

THE designer of the Arrol-Johnston car is Sir William Arrol, who is well known as the engineer of the Forth Bridge; and although there is little similarity between a bridge and a motor-car, still, as his design, it may be taken for granted that it is based on sound mechanical principles, with all details thoroughly and carefully considered. The motor, which is 12 h.p., has two cylinders with two pistons working horizontally in each, the explosions taking place between the two pistons. The power is conveyed to the crank shaft by a link, which is connected, one end to the piston and the other to the top end of a rocking lever, the bottom end of which is connected to the crank pin by the connecting rod. This gives a perfectly balanced engine, and takes all thrust off the main bushes, which are generally the first to wear in an engine of the ordinary type. The induction valves are automatic; they are removed with the greatest ease, and require little attention, as the valve boxes are effectually

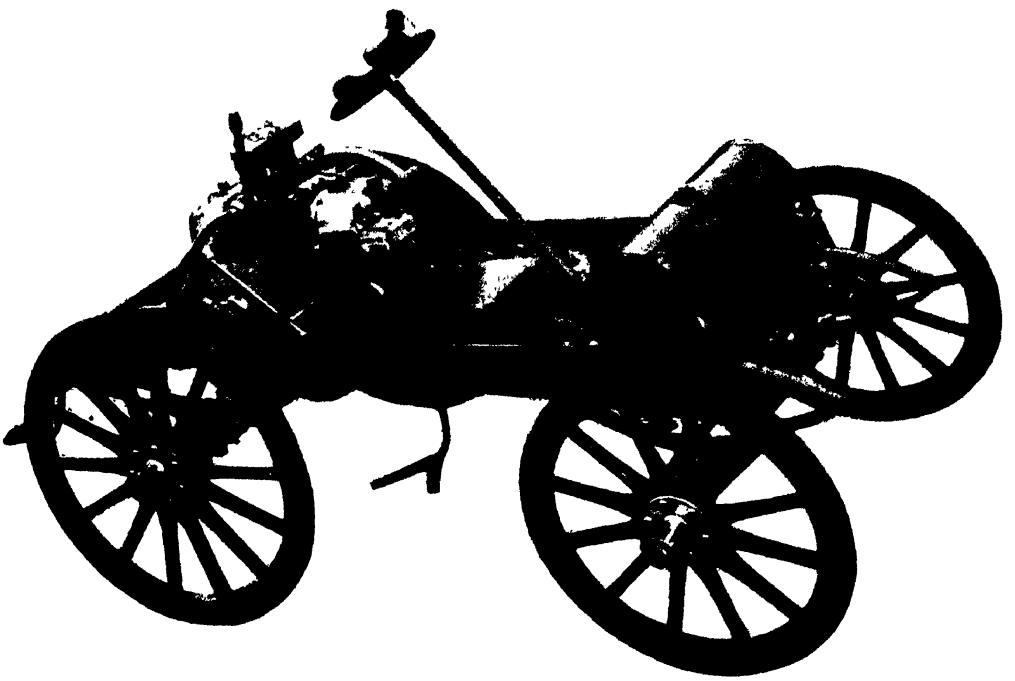


SIR WILLIAM ARROL, DESIGNER OF THE FORTH BRIDGE AND THE ARROL-JOHNSTON CARS.

THE DUKE OF PORTLAND'S ARROL-JOHNSTON, WHICH HAS RUN OVER 8,000 MILES.

water-cooled. The engine is governed by a well-designed hit-and-miss exhaust governor. A throttle is also fitted, controlled by hand, by means of which the engine can be run at a slow rate of speed with little noise or vibration. A chain-driven magneto of the firm's design and make supplies the current for ignition, and the sparking device has platinum-tipped contacts.

Inside the aluminium casing which encloses the working parts of the motor is a small gear-driven pump, which forces oil through all the principal bearings; it is a most effective and economical means of lubrication, and quite automatic. The gear case is situated directly under the motor, and the power is transmitted from the motor by a Hans Renold chain, which is absolutely silent. There are four speeds and reverse, the highest being about thirty miles per hour. The handle, which by a backward or forward motion lowers or raises the gear, is neatly arranged so that



CHASSIS OF THE ARROL-JOHNSTON CAR.

by twisting the top the speed of the motor is increased or reduced, thus dispensing with the foot accelerator.

The starting gear is quite a peculiarity of the car. Instead of the usual primitive-looking method the motor is started from the driver's seat by pulling a rope which is coiled round a pulley, and attached to a lever with a pinion which engages with another on the crank shaft, at the same time opening two valves to release part of the compression. When the motor starts, release the rope, and a spring in the pulley coils it up ready for the next time of starting. To facilitate the getting in and out of the car, the steering wheel is made to tilt to a vertical position, and immediately the driver is seated and brings it down horizontal it automatically locks itself.

The car is fitted with two very powerful metal-to-metal brakes, one situated on the second shaft of the gear case and actuated by foot; the other on the hind

axle, which is an emergency brake and is applied by the foot. A third, acting on the rim of wheel and actuated by hand, is also fitted. The rear axle is a live one, and driven from the gear case by a Hans Renold chain. All the road wheels are of the artillery type, and fitted with Shrewsbury and Challiner solid tyres. Considering that the car is running on solid tyres, it is marvellous how free from bumping and vibration it is, owing to the resiliency of the springs, and the free suspension of the frame.

The clutch is of the conical leather-faced type, and of ample dimensions. By a clever arrangement the end thrust of the clutch is overcome. The radiator is situated under the front of the car, and the water is circulated by means of a geared chain-driven pump. The cooling is effective, and the consumption of water very small.

The 12 h.p. Arrol-Johnstons are built in two styles, dog-cart for four, and a six-seated car, and are quite a departure from the ordinary style with the motor under a bonnet in front. The engine is under the two hind seats and is completely hidden. (The firm are now building 16 and 20 h.p. cars with engine in front if desired.) In fact, very little mechanism of any kind is seen, and it gives one the idea of a truly horseless carriage, as it runs along with no working parts visible. As the cars stand higher from the ground than the ordinary type, they almost entirely avoid the dust trouble, and enable the passengers to see the country in comfort over the top of the hedges and walls. They are very strongly built, and are both reliable and easily handled, as may be inferred from the large number of doctors who are now using them all over the country. His Grace the Duke of Portland has two Arrol-Johnston cars, the two together having covered over 12,000 miles practically without a hitch. Amongst other owners are Lord Rosebery, the Earl of Mar and Kellie, Lord Charles Montagu, Lord Elcho, and the Marquis of Tullibardine.

THE STAR.

By Howard Moore.

I FIRST possessed a 7 h.p. two-cylinder Star car, which I drove for about a year, and I then purchased a four-cylinder 10 h.p. Star, which I have now driven for some 3,000 odd miles. Both these cars are very easy indeed to drive, and very simple to look after. The following are the various points of detail:—

THE 7 H.P. STAR.

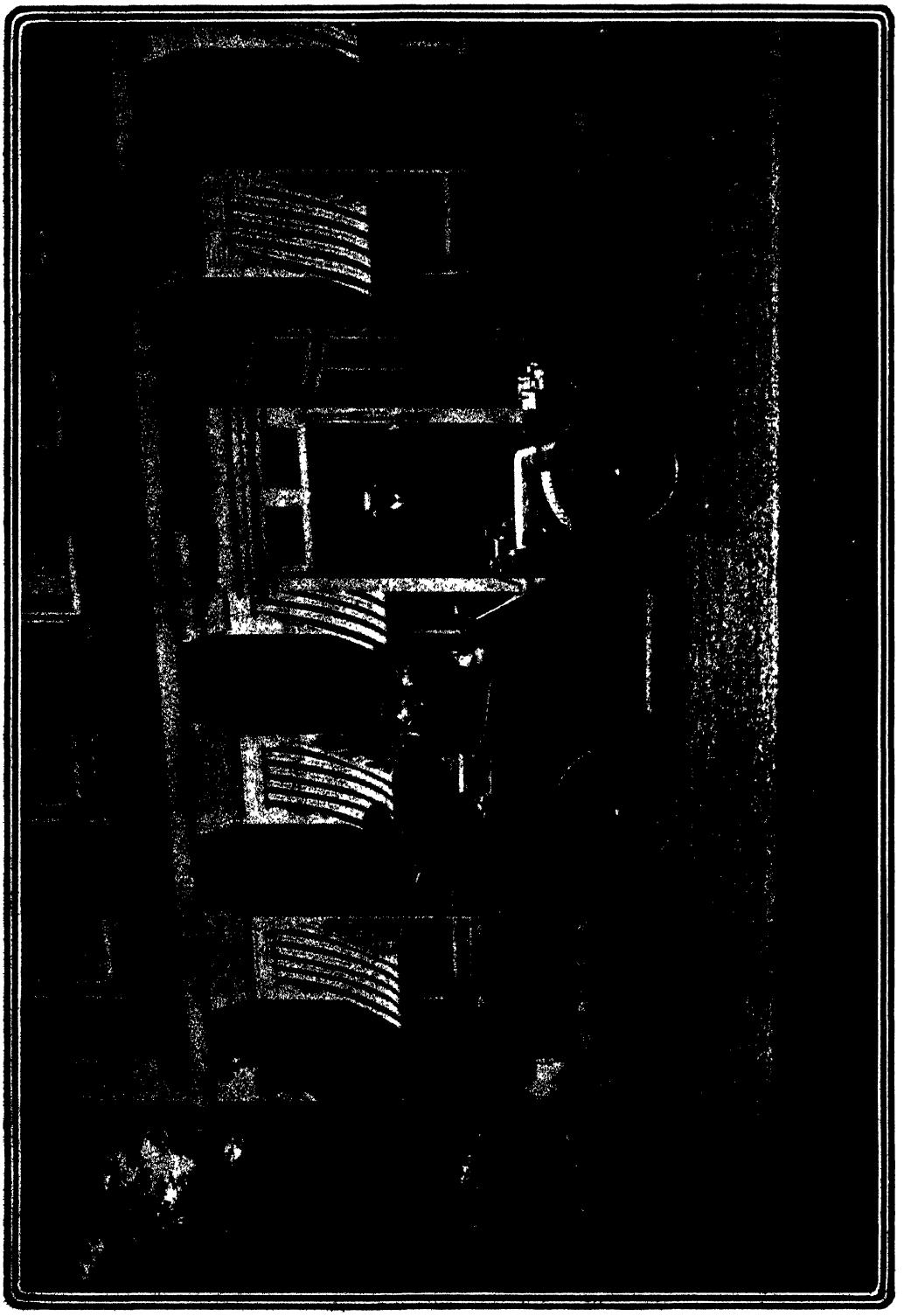
To Start the Engine.—Turn on the petrol and shake up the petrol in the carburetter by moving the spindle up and down two or three times. Then switch on the ignition, at the same time bringing the advance sparking lever to the position for late firing. A few sharp turns of the starting handle should then be sufficient to start the engine. As soon as this is accomplished place the sparking lever on the middle position on the rack, and the engine will then govern.

The Engine Governor.—The governor on Star cars is of the centrifugal type, and when in operation closes a valve on the inlet pipe. If the engine is required to run very slowly and silently the small pedal on the right of the brake pedal should be up at the top, and at the same time the sparking lever, which is on the dashboard, should be in the middle of the rack, which is the position between early and late firing.

To Start the Car.—Take your place on the driver's seat and depress the left pedal. This withdraws the clutch from the flywheel. Then push down the knob on the change-speed lever and very gently push it forward into the first notch. The speed of the engine may be now increased by depressing the accelerator pedal, and at the same time the clutch pedal should be allowed to rise, so that the clutch may engage with the flywheel. As soon as the car has got up its speed on this gear, which is about five miles an hour, the clutch pedal should be again pressed, and the speed lever pushed forward gently (there is no need to depress the knob again) into the next notch; this gives the second speed. The change from second to top speed is effected in precisely the same way, and when a fair rate of travel has been acquired, the advance spark lever may be thrown over to "early" firing, which with the accelerator pedal in action gives the maximum speed of the motor. It must always be remembered that in reducing speed from top to second, or from second to slow, the little knob on the speed lever must be depressed and the clutch released whilst the lever is being brought back gently into the required notch.

No force is required in changing these gears at all, and if used as above described they will change with little or no noise.

The Brakes.—The right pedal controls the double acting metal to metal



MR. HOWARD MOORE ON HIS 10 H.P. FOUR-CYLINDER STAR.

brake on the differential shaft, the outside lever controls the double acting brake upon the rear wheels.

Lubrication.—The lubrication of the cylinders is carried out by a mechanical lubricator driven off the half-time shaft by a gut band. In addition to this there is a hand pump which delivers oil direct into the crank chamber, and it is always well to give this a few pumps occasionally.

THE 10 H.P. STAR.

In many respects the driving of this car is similar to the smaller one, but there are, however, one or two points which are worth mentioning.

The Engine and Governor.—The governor on the four-cylinder engine acts directly upon the carburetter, similar to the method employed in the Centaure carburetter. There is an accelerator pedal which is also connected with a neat hand lever working in a toothed rack. By means of this hand lever the engine can be set to run very quietly, with a soft "cut-out." If this "cut-out" or governing action is not desired, the lever by being placed higher in the rack will then cause the engine to run continuously at but very few hundred revolutions per minute.

Starting the Car.—Place the accelerator lever so that the engine "cuts-out" gently and you can then move off quite easily, changing from first to second, second to third, and so on without difficulty. The best results are obtained by placing the advance sparking lever half-way over and leaving it there.

Of the two cars the 10 h.p. is perhaps the easier to drive, although naturally the difference between two cylinders and four is decidedly noticeable. The 7 h.p. car has only three speeds and reverse, whereas the 10 h.p. has four speeds and reverse. I cannot help noticing the great elasticity of the engine of the 10 h.p. car, and if the few points I have mentioned are carefully studied the users of this excellent car will never have anything but extreme satisfaction and smooth running under any circumstances.

The latest model of this car is built upon lines evidently very closely suggested by the 18 h.p. Mercédès model. The four-cylinder motor is cast with its cylinders in pairs. Its inlet valves are of the automatic type, but are mechanically operated through rocking levers attached to the cylinder heads. Simms-Bosch low tension magneto is used. The control of the engine speed is regulated both by an automatic governor and by a hand regulator on top of the steering wheel, both acting on the throttle valve. Variation of the time of ignition is attained in the same way. The water cooling arrangements consist of a honeycomb radiator, having an induced draught through an enclosed bonnet, together with a gear-driven rotary water pump. The whole of the lubrication is maintained by pressure from the exhaust. A simple form of gear transmits the power through chains to the driving wheels. Internal expanding brakes act respectively on the countershaft and rear wheels The side members of the main frame are of pressed steel; and the arrangement of springs is similar to the 18 h.p. Mercédès in that short laminated springs take the place of the ordinary dumb irons in front, a method of suspension which is without doubt the most comfortable yet devised. The bearings throughout the car are ball bearings, with the exception of those for the crank shaft of the motor.

THE BEAUFORT.

By W. A. Stephen.

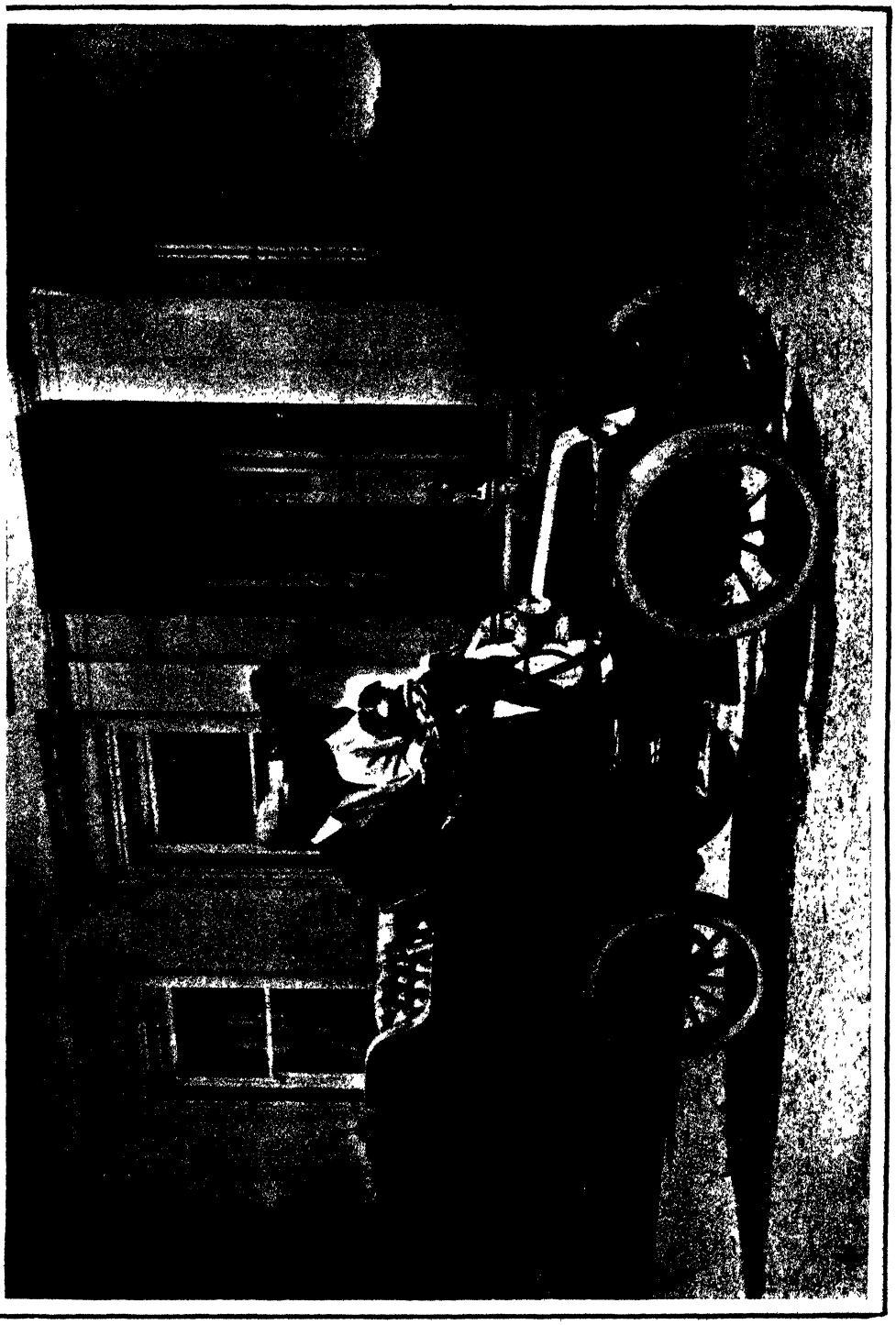
MANY people have an objection to a car driven by a single-cylinder engine, but in most cases, especially where the intending purchaser can afford to pay only a limited price for his car, it is, in my opinion, far better to buy a thoroughly reliable car with a single-cylinder engine than to go in for an inferior make with double cylinder, which may prove to be an endless source of trouble and expense.

The 9 h.p. Beaufort is an ideal car for the man of moderate means. It is thoroughly well put together, and every part is exceptionally strong and well finished, and though in appearance it cannot, perhaps, compare with some of the more expensive cars in elaborate outside finish, it is a smart looking car, and all the working parts are as carefully made and put together as on any of the so-called high-class cars.

Owners of motor-cars are, as a rule, no engineers, and do not understand the strains to which all the parts of a car are subjected. Accordingly a word or two here as to the principal points in the construction of the Beaufort may not be amiss. In the first place the channel steel frame is of ample section, with two joints only, which are butt jointed, strapped, and snap-riveted. The frame is well braced together with angle and tee irons, and the engine is carried on a channel steel underframe. The axles are very strong, and a special feature is the live back axle, which is made of cast steel, well ribbed up, so that it is next to an impossibility for the driving wheels to lean inwards at the top, a weakness of which one sees so much in cars driven in a similar way. The brake power is excellent, and I have found by experience that either of the two brakes will hold the car on any hill, either backwards or forwards. The springs are very long and of ample strength, and they make the riding of the car very easy. I think every nut on the car is protected by a split pin, and there is very little fear of ever losing a nut or bolt.

From an engineering point of view the engine is thoroughly well made in every respect, all bearings having an extra large bearing surface with efficient means of lubrication. The special features about this engine are the mechanically operated inlet valve and magneto ignition; both these points have raised a great deal of discussion in the technical papers, but I can only say from my own experience that I have found both thoroughly satisfactory, this engine running much more quietly than other single-cylinder engines which I have seen fitted with the ordinary suction inlet valve.

The magneto ignition is also a great blessing, as it saves all the trouble and annoyance connected with batteries giving out, short circuits in the wires, and other minor troubles which so often cause the amateur driver hours of unnecessary



MR. W. A. STEPHEN ON HIS 9 H.P. BEAUFORT.

delay in trying to locate a fault. I have also found the magneto very certain in its action, and the engine can generally be started with a single turn of the handle; provided, of course, that the petrol and mixture of gas and air are all right. The governor is very sensitive, and the variation in the speed of the engine when running on the governor is very slight.

The clutch is another feature of the car, and its construction renders any thrust bearing unnecessary. The gear has three speeds and reverse, all of which run in ball bearings; in fact, with the exception of the engine bearings, special ball bearings are fitted throughout; this, of course, reduces the friction of the working parts to a minimum. The water circulation is by a gear-driven pump; this and all the gearing for the valves, governor, etc., are enclosed in the forward end of the crank chamber and run in an oil bath. The lubrication of the engine is effected by an automatic sight-feed lubricator fixed on the dashboard. The oil is fed under pressure from the exhaust to the crank chamber, and the drip can be regulated to any number of drops per minute.

I think the foregoing short description of the car and machinery is necessary before going into the question of how to drive it, as it is very essential that the driver should thoroughly understand every part of his car before attempting to drive. We will suppose that the novice has bought his car, but before taking it away it is necessary that he should go thoroughly through every part with one of the principals of the Beaufort Company and get acquainted with the mechanism of the whole car. As a rule the manufacturers of motor-cars are willing to give advice and lend a helping hand when possible, and I have always found the several members of this firm particularly courteous and obliging. I have received every attention from them and a great deal of assistance, although I am not quite a novice, having been an enthusiastic motorist and the owner of a 7 h.p. Benz for more than two years before purchasing my present car.

In looking over the car before starting to drive, it is advisable to see that every nut and bolt is properly tightened up. The petrol tanks should then be filled up, taking care to pass the petrol through the strainer funnel provided for this purpose, as small particles of dust and dirt will lead to endless trouble if allowed to get into the tank, for from time to time they will find their way into the carburetter. If any such trouble occurs, the only thing to do is to thoroughly clean out the tank and supply-pipe to the carburetter and start afresh. The water tank should next be examined and filled up to within an inch of the top with clean water; it may save a great deal of trouble in the future to pass the water also through a strainer. The lubrication should then receive attention, first filling the lubricator on the dashboard with the special oil which the makers recommend for this purpose, and when ready to start, the lubricator should be adjusted to about thirty drops per minute. It is always better to give too much oil than not to lubricate sufficiently, especially in the case of a new engine, when all the bearings are somewhat stiff. The small hand-hole door on the top of the crank chamber should be taken off, and sufficient oil poured in so that the crank end may just dip into it at every revolution.

All the grease cups must then be filled with grease and screwed well down. On this car there are five grease cups, two on the dashboard, for pump and clutch sleeve, one on the clutch, and two on the cardan shaft; these should all be attended to at frequent intervals. The gear-box should be filled with sufficient grease and

oil to allow all the gear wheels to dip well into it. The grease in this case should neither be too thick nor too thin, but of just the right consistency. The back axle must also be filled with grease through the plug-hole provided for the purpose.

If all the above particulars have been attended to, the car is now ready for the road. Turn on the petrol tap, which will be found in the locker under the front seat, open the compression tap, and, after flooding the carburetter, one or two turns of the handle will start the engine. Of course it will be necessary to see that the two small levers on the steering column, which regulate the throttle valve and ignition, are in the centre of the quadrant, which will be found about the correct position for starting. After the engine is started close the compression tap and slightly advance the ignition. The engine may be throttled down until you are ready to move.

The driver may then take his seat, and, after releasing the hand brake, keeping his left foot at the same time on the clutch pedal, he gently but firmly moves the gear lever into the first or second speed, as may be necessary, then, gradually, lets the clutch pedal rise, until the car begins to move, at the same time increasing the speed of the engine by means of the throttle lever, until it is in mid position, when the engine will be running on the governor. If you are running on the level, or a down grade, the top speed may be slipped in almost immediately. It is important that all changes of speed should be done quickly, but the clutch must always be out when changing. Reducing the speed is more difficult than increasing it, there always being a right and a wrong moment to change, but this is only a question of experience.

This car is one of the simplest and easiest to drive and very reliable ; the throttle control is excellent. and I have driven through some of the thickest London traffic with the top speed in, simply regulating by the throttle lever.

The 9 h.p. Beaufort, though not what is generally known as a fast car, can maintain a steady average of eighteen miles an hour. It is an excellent hill-climber and will do most hills on the second speed.

THE RICHARDSON.

By Captain H. E. Newsum.

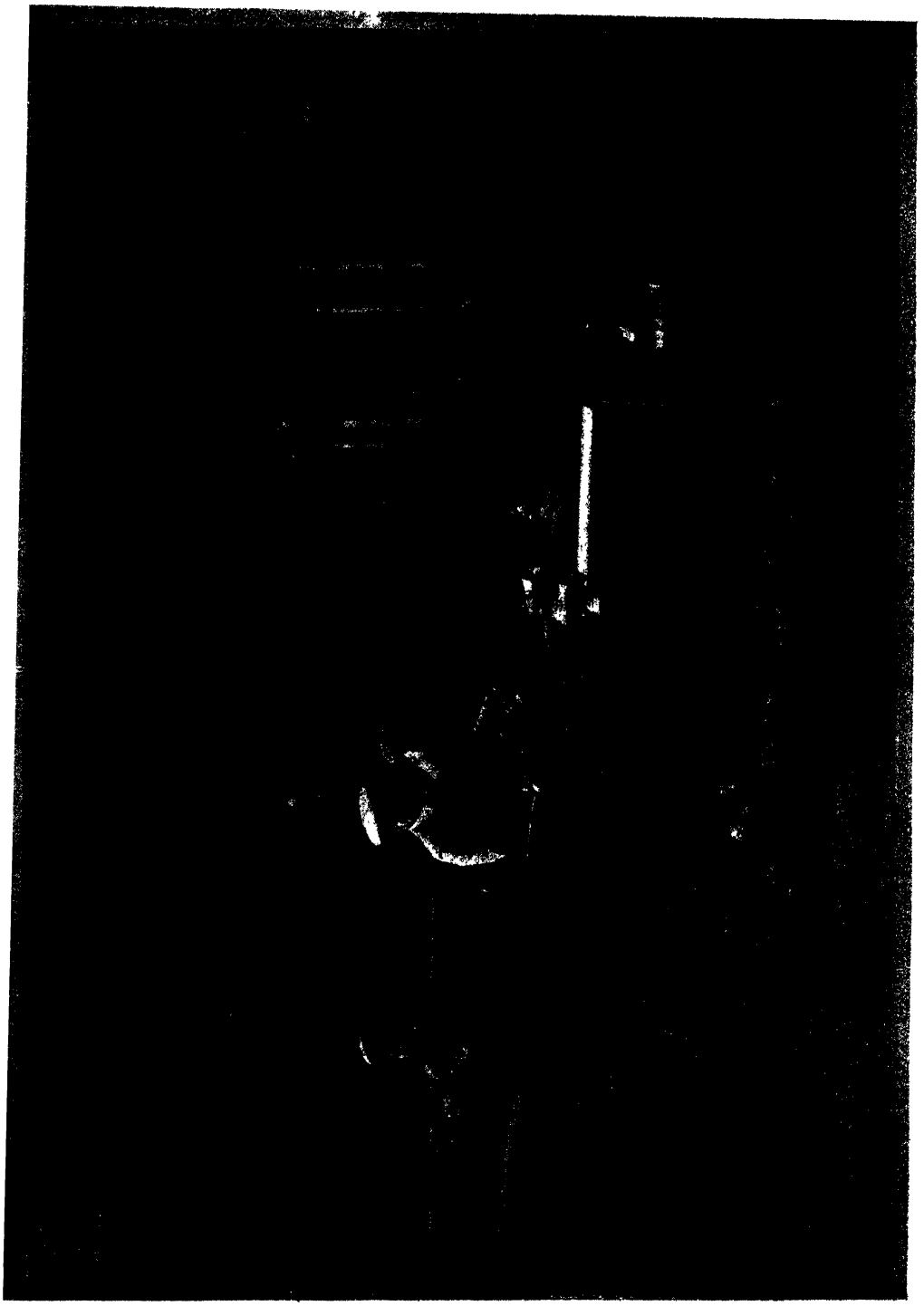
I PRESUME that I have been asked to contribute this article on the Richardson car, because I am one of the oldest users of cars of this make. Indeed, I believe I am correct in saying that I purchased the first car sold by the company. I had had some experience in motoring, as I had previously owned a Darracq ; and, desiring to change for a faster car, I decided, after examining and trying several makes, that the local production was good enough for me, a decision which I have had no occasion since to regret.

My car has a 12 h.p. double-cylinder engine, giving about 14 h.p. on the brake. It is water cooled, and the whole cooling system is contained within the bonnet, but is so disposed as not to interfere in any way with access to the engine. A pump, chain driven, circulates the water, but in case the pump ceases to work, the water would continue to circulate on the thermo-syphon principle, and the car can be run at a reasonable speed for a considerable time without damage to the engine. The cooler is rectangular in shape, and fixed vertically in front of the bonnet. The engine is governed on the inlet, and the speed can be controlled within a wide radius by means of the accelerator pedal. I find the latter very useful when passing horses, as by throwing it up to the top, the car glides by without noise, and when quite past, by depressing the pedal, the car darts forward again at once.

The ignition is of the usual style, by accumulators and coil, and I may add that two independent sets of accumulators are supplied to each car. The coil is of the double high-speed trembling type ; and the commutator is vertical and fitted with a transparent cover. It is very accessible and seldom needs any attention.

The clutch is a leather-faced cone, with the spring so arranged as to give no end thrust when in use. The gear box is of the sliding-sleeve type, giving four speeds forward and one backwards, with a direct drive from the engine to the back axle on the highest speed. The notches in the sector are arranged in regular order, that is to say, the furthest back is the reverse ; the second, neutral ; third, first speed ; fourth, second speed ; fifth, third speed ; and sixth, fourth speed. There are three brakes, one upon the hub of each driving wheel, operated by a hand lever, and an all metal very powerful foot brake on the propeller shaft. The application of either brake withdraws the clutch.

The method of driving differs little from that of most standard side-lever cars. Having turned on the petrol, switch on the electric current, and turn the engine smartly over the compression point, and she generally starts at once. If not, then press the finger on the carburetter float plunger. After the engine has been running, she will often start herself by merely switching on the current, and this



CAPTAIN NEWSUM AND HIS 12 H.P. RICHARDSON.

can sometimes be done even after standing as long as 15 or 20 min. Having got the motor running, take your seat, depress the clutch pedal, and move the gear lever into the first speed notch, then gently raise the foot and the car will glide away. The changes to second, third, and fourth speeds are done in the same manner, but must be done more quickly, so that the car will not perceptibly slow down while the change is being made. The steering is very easy, as the front pivots turn on balls.

One of the most important points is lubrication, and in the Richardson this has been well looked after. There is an automatic lubricator on the dashboard, which oils all the parts of the engine. This lubricator works by means of the exhaust gases, so that when the drips are once set, it requires no further attention beyond seeing that the reservoir is kept full—a simple matter, as a gauge glass indicates the quantity it contains. There is no turning off, and no hand feeding, as when the engine starts the lubricator starts, and it stops when the engine does. There is also a second compartment to the reservoir, and this contains paraffin which can be pumped into the cylinders when desired. I find this very useful for keeping the piston rings free from sticky oil. The gear-box is half filled with heavy gear oil, and lasts many thousands of miles; but there are upon the dashboard four brass solid grease cups, which are connected by pumps to the four main gear-box bearings, and which should be screwed down about every twenty miles or so. The bevel gear in the back axle is self-oiling, and requires practically no attention, beyond adding a little oil about once in six months. The grease cups for the hind wheels also require tightening up when the car stops after any run of considerable length. For all the other parts, such as the clutch forks, etc., attention once a day or even less often is enough, so that there is no need to dirty one's hands when out for a day's ride.

Concerning the car generally, I am more than pleased with its appearance, comfort, and running. The body is extremely handsome and roomy, and is beautifully upholstered and sprung, so that it rides easily over the worst roads. Lockers under the tonneau seats, and numerous pockets for maps, glasses, etc., make it very handy and convenient for long tours. The car is very powerful on hills, and I once had the pleasure of making the fastest time with my car in a climbing competition. On the level it is very fast, and I have often passed cars of other makes that cost £300 to £400 more than mine. There is one other point in its favour which I think deserves mention—the car was supplied to me complete; that is to say, with four lamps, horn, cocoanut mats, and a very full set of tools, spare parts, and accessories.

THE ROCHET-SCHNEIDER.

By R. Denys Dundas.

IT is hardly likely that you have heard the story of the queen, her twin sister, and the man, because I am going to invent that story for purposes hereinafter appearing. Here it is. There was once a queen, fair to behold and "all beautiful within," as queens should be, and the man saw and, manlike, desired her. But his principality was small, so he held aloof, yet watched her with undiminished longing from afar.

And men knew her wherever she went, for on her brow she wore a coronet with her name emblazoned. And her name was Mercédès. But she was unapproachable because---but that is a story best known to those conversant with the mysteries of *Messieurs les concessionnaires exclusifs*. And so the man at length turned away. But one day, ignoring still all other would-be loves, he returned to gaze once more upon his heart's desire. And with the queen, side by side, of equal grace and beauty, moved another—twin sister of the queen, and he, knowing she was not the queen, though wondrous like, and therefore not hemmed around with prohibitive exclusiveness, took heart of grace, and wooed and won her for his own. And his desire departed from the queen and went out unto her. And her name was——

. . . . . .

You see the point? *Bien!* So much for allegory. We can now "cut the cackle and come to the "—car, better, even alliteratively, than "the horses."

Before mounting, the rake of the car will have taken your eye; her long wheel base, 7 ft. 8½ in., the shape of her bonnet, horizontal and flush with her honeycomb radiators, giving her fine and well-proportioned lines. Instinctively she impresses you with a sense of her power, elegance, and good workmanship. She looks what she is, a thoroughly smart car. At the factory in Lyons, only one type is at present being made, a four-cylinder car of nominally 16 to 20 h.p., but in actuality 20 to 22 h.p. on the brake. This car, despite a powerful engine, is geared comparatively low, with a sprocket of eleven teeth, giving a speed of some forty miles an hour. It is hardly necessary, perhaps, to say that she can be sprocketed to run very much faster, and still be well within her engine capacity.

We will slip off the bonnet, and you will notice that the motor is of the vertical four-cylinder type, cast in pairs together with their water jackets. The cylinders are 100 mm. in diameter, and the pistons have a stroke of 150 mm. The number of revolutions can be varied from about 150 to over 1,000 a minute. The inlet valves are mechanically operated; this means that they are silent working. They are very large, and are interchangeable with the exhaust valves. The carburetter has a float feed, the petrol finding its way therein by gravity from the reservoir, which is placed under the front seat. A very striking feature of the carburetter is

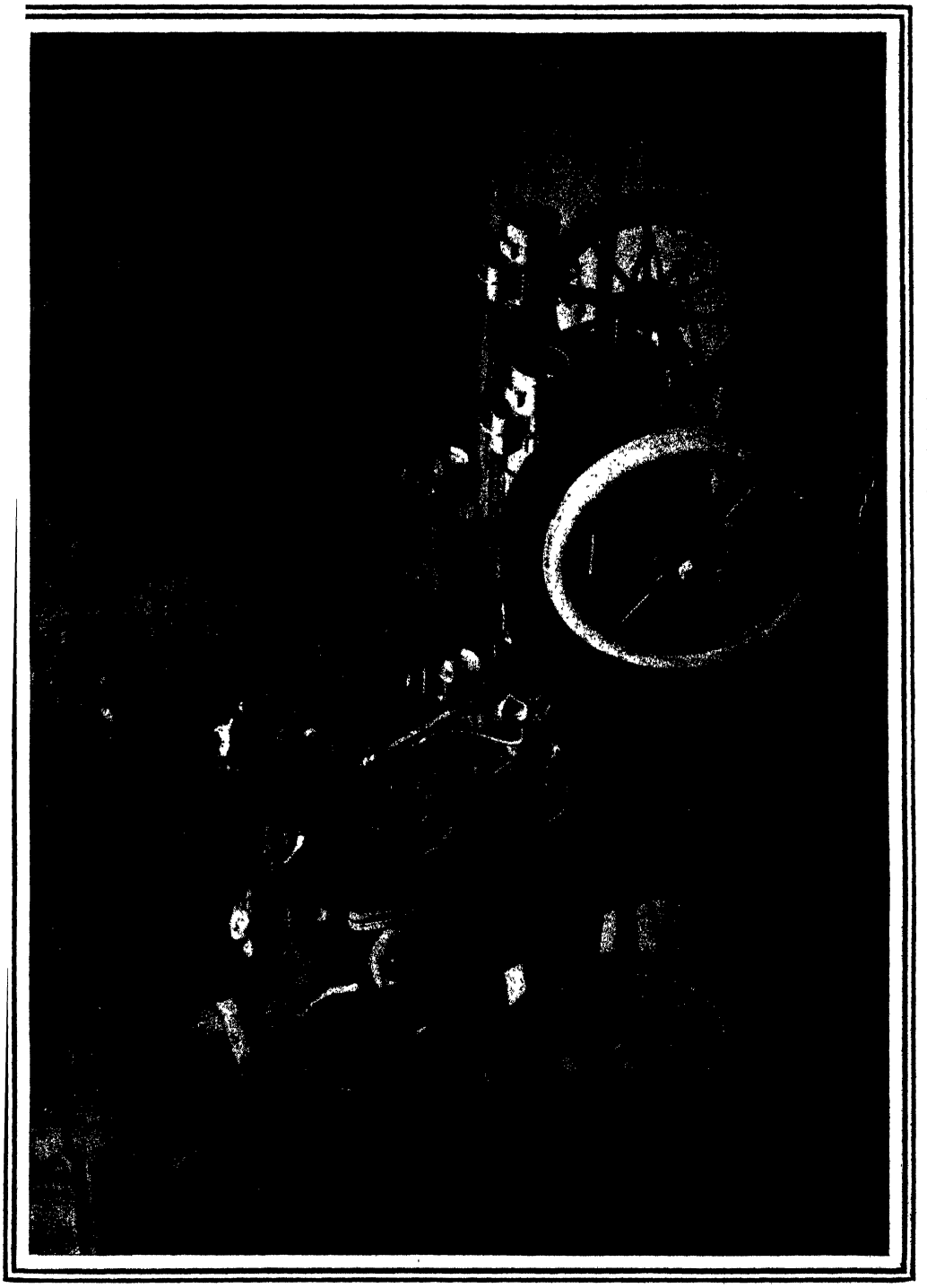
the arrangement by which the proportion of vaporised petrol to air is automatically altered according as the volume of mixture entering the engine is increased or reduced. The Krebs carburetter fulfils the same purpose. This is a long step towards a silent running motor and in obviating misfiring when reducing speed.

The ignition is by means of a slow speed Simms-Bosch rotary magneto plant, placed to the right of the engine and driven by gear wheels made of a special fibre, flanked with gun-metal, still another and important device helpful to silent running. An ingenious means for regulating the time of firing is operated from the dashboard by a small lever, which actuates a sliding bar of steel in which there are four diagonal slots. According as this lever is moved from left to right the sliding bar forces down the vertical tappet rods. This downward pressure causes the tappet rods to slip off the cams on the inlet valve shaft a little earlier than when the ignition lever is retarded. Another very simple arrangement enables each cylinder to be separately tested in the event of misfiring. Similar fibre-centred gear wheels are used in driving the water pump, which is very powerful, and thoroughly reliable, requiring no constant observation and attention as in the friction-driven type. The pump wheel being, however, very small, may require renewing from time to time. This is obviated in the later cars by making this pinion of steel.

The honeycomb combined tank and radiator, exceptionally strongly built, with a fast, large-bladed, belt-driven fan complete the water-cooling arrangements, which are wonderfully effective and contribute enormously to the car's power in hill-climbing. The consumption of water is so small as to be hardly worth considering. The lubrication is by means of a Dubrulle injector. This lubricates, besides the engine, all the principal bearings. In the injector is a separate compartment for paraffin for cleansing the cylinders. The transmission is by gear and chain. The clutch is a very large cone, with its thrusts taken by ball-bearings. A special feature is the accessibility from above of the clutch spring and the whole of the gear. Those who know what it is to lie under the motor and work hands above head are aware how great an advantage is this means of easy access. One lever operates four speeds forward and one reverse. The steering is delightfully sensitive and easy, and is of the irreversible worm type.

There are three brakes, each independent of the others. The right pedal operates a sprocket brake on the left side of the countershaft without throwing out the clutch. The central pedal withdraws the clutch and operates a sprocket brake on the right side of the countershaft. The hand brake also withdraws the clutch and acts on the hubs of the rear wheels. The countershaft brakes are water-cooled, and all are double acting. A ratchet wheel and catch on the countershaft allows the car to be stopped on a very steep incline without any brake being applied, and without the slightest danger of the car running back. The engine and flywheel are protected beneath from mud and dust by an aluminium shield.

So much for technicalities. Let us now on with the bonnet and out for a run. You notice at once how free the dashboard and steering wheel are from complicated top-hamper. Once started, the pump, lubricator, and ignition are automatic in operation and need no further attention. On the dashboard all you have is the lubricator, the ignition lever, and the water reservoir for cooling the countershaft brakes. On the steering wheel is the throttle lever working on a semi-circular rack, above which, protruding through one of the spokes, is the ignition switch in the form of a press button. That is all. We will assure ourselves that the petrol



MR. R. DENYS DUNDAS ON HIS 22 H.P. ROCHET-SCHNEIDER.

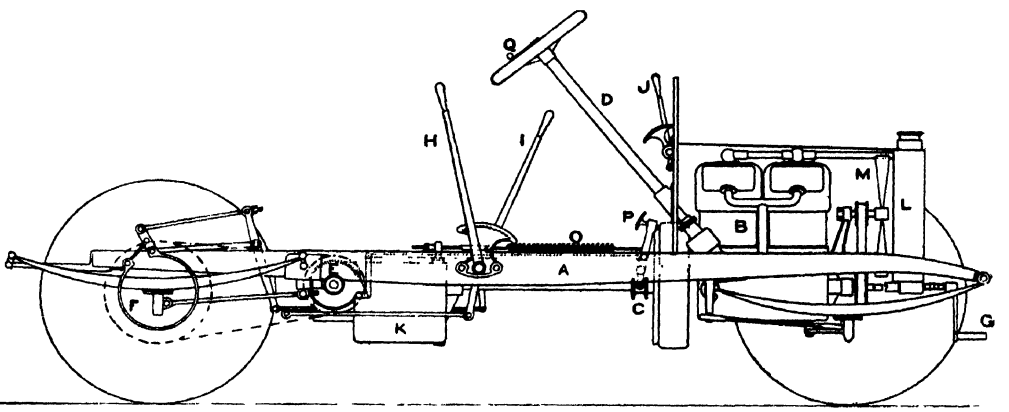
tank is full, and that the supply tap is turned on, and that there is a goodly supply of oil in the lubricator, working at, say, sixteen drops per minute for the engine and ten drops for each bearing for slow speed. It may seem superérogatory to insist on the former, but we were hung up only the other day in the Inner Circle of Regent's Park merely through believing, erroneously, that someone else had attended to this vital matter. Retard the ignition as much as possible by putting the lever over to the left or lubricator side; see that the throttle lever is about 1½ to 2 in. from the left of the rack; raise the carburetter float for a second or two; then press the starting handle (carried attached to the front of the car) inward and turn smartly. Almost invariably the engine will start on the first compression and with the air inlets into the carburetter fully open. At times, however, it may be found necessary to reduce the apertures by about one half. As soon as the engine has started the maximum amount of air should be given.

Now move the speed lever from the neutral position to first speed, off with the hand brake, which lets in the clutch, and we move away. We go on almost immediately to our second and then our third speed, moving over the ignition lever to the centre of the rack, as in that position the magneto gives the best result; then if our way is retarded by traffic, as is almost invariably the case in town, throttle her down. So, with an occasional spurt and many a check, we gradually clear the town and get away from bricks and mortar and intersecting tram-lines, and, at last, we give her her fourth and away we go. Now I want you to notice that, however she is being driven, on her first or fourth, throttle open or throttled right down, how steadily and well-nigh noiselessly her engine works, with only a pleasant, rhythmic, metallic babblement; with no snorting protests, cutting quibblings or vicious "swear words" flung angrily back into the exhaust-box. Throughout you and she are in sympathetic touch and accord; she runs on, however you drive her, with her amiable, confidential, chatter—not clatter, mark you—in excellent conformity and under easier control than ever dainty-mouthed mare yielded to the lightest of guiding hands.

And now you will want to see what she can do in the way of speed. But let me ease her down and bring her to her first, because I want you to note how quickly she takes up her speeds, from one to the other, till, just as quickly as talking, she is once more running on, with open throttle, whilst we are looking for a milestone. The road, which is in grand condition, is being ribbanded off behind us, our engine is running as sweetly and true as a transpontine heroine, and with the new pattern Dunlop tyres giving complete satisfaction, I shall be disappointed if we do not do the mile in clipping time. There's the milestone! Get out your watch, and strike when I touch you as we pass. Got it? Yes? Right! No traffic, not a soul about, a clear run, and—there's the next milestone a quarter of a mile ahead! Get ready to strike. But—"'ware, police!" There, just past the milestone! Surely I may be forgiven if an explosive ejaculation peculiar to the Briton finds vent as I throttle her down and retard her to her third. And then—you discover it isn't a policeman after all! "Confound it!" and I let her rip once more. The milestone hurries behind us and the watch shows a good time notwithstanding. That check spoilt what would have easily been a fine burst of speed; and this, remember, on a sprocket of eleven teeth and 36 in. wheels. With larger sprockets the results are very much better.

A claim by the manufacturers that the Rochet-Schneider car is above all

things a reliable hill-climber I have found fully warranted by experience. I am told that both in France and America this car has beaten, in this species of contest, more heavily powered racing cars, but as I do not know the particulars I can only say that to every test to which I have submitted her, and they have been severe, she has entirely satisfied my hopes and expectations. One little difficulty I had when the car first came over was the freezing of the carburetter owing to the colder climate, but this I have obviated by bringing round a pipe connected with one of the exhaust pipes and letting the exhaust gas blow against one side of the carburetter, which fully answers the purpose. Writing now with not a little experience of various motor-cars and their vagaries, I find none of their shortcomings in the Rochet-Schneider and many of their good points considerably bettered. In short, in the country, this car answers my every possible



CHASSIS OF THE ROCHET-SCHNEIDER.

A, *frame.* B, *engine.* C, *clutch.* D, *steering column.* E, *brake on differential.* F, *brake on rear wheels.* G, *starting handle.* H, *brake lever.* I, *change-speed lever.* J, *lever for advance sparking.* K, *gear-box.* L, *radiator.* M, *ventilating fan.* N, *silencer.* O, *clutch spring.* P, P, P, *pedals for clutch and brakes.* Q, *throttle lever on steering wheel.*

requirement, and when in town I have the secret satisfaction of feeling that I am driving the very smartest looking car of all the cars that turn into the park.

. . . . . .

Thus the yearning of the man for the queen passed and his heart knew no desire that the twin sister failed to satisfy, and henceforth he will cleave to her and falter not in his allegiance. Nay, not though Queen Mercédès herself, *without intermediaries*, besought him.

A *résumé* of a few performances of the Rochet-Schneider in actual competition during recent years may not be out of place here as bearing out the very high opinion I have formed of her :—

In April, 1903, at Nice, in the Three Days' Touring-car Competition, the two 16 h.p. Rochet-Schneiders finished first and second, with a Mercédès third. In May she was driven a practically non-stop run of 450 miles from London to Glasgow, *viâ* Edinburgh, in twenty-one hours, 300 miles of which was in the teeth of a north-east gale and over rain-sodden roads. She lost one mark only out of a possible 1,000 (through the driver's fault) in the Non-stop run from Glasgow to London. At Aix-les-Bains, in June, the two 16 h.p. Rochet-

Schneiders finished first and second in the second category in the Two Days' Touring-car Competition. She also won the special cup. The third category at this meeting was won by a car made under licence from Rochet and Schneider. She then finished up the season brilliantly by winning the gold medal in Class F. in the 1,000 Miles Reliability Trials of the Automobile Club of Great Britain and Ireland, beating all the other eighty-four cars that started in the Bury hill climb, and subsequently at Bexhill in the speed contest she showed over forty-one miles per hour.

The firm are now making two types of cars, 16–22 h.p. and 24–35 h.p., the main modifications being in the speed lever, which will have all speeds in a direct line, a direct drive on the top speed, actuated through a cardan joint, and a more handy control of the timing of the ignition and the air inlet by means of small levers on the dash. A very great point from the purchaser's view is that the new agents for Great Britain and Ireland have very wisely decided to offer these cars in England at Paris prices, plus the carriage across. Consequently the price of these excellent and, as I honestly believe, finest all-round touring-cars on the market is very materially reduced.

THE MAXIM.

By E. Elvy Robb, J.P.

TO the man of moderate means the choice of a car is a serious matter, and when some time ago I decided to become a purchaser, the selection of a suitable car was a matter of much doubt and difficulty. For an outlay not exceeding £500 or £600 I required a car to accommodate four people comfortably, and be of sufficient power to negotiate the hilly country in the neighbourhood of Tunbridge Wells without difficulty. I tried various cars on short trial runs without being able to arrive at a decision. I am bound to say most of the cars behaved satisfactorily, but a trial run of a few hours is not, in my opinion, a test of sufficient duration to afford an insight into the capabilities of a car. No doubt in the ordinary way the novice avails himself of expert advice. I did so in the first instance, only to find that the expert almost invariably advised that I could not get what I wanted for the price I was prepared to pay, and recommended an expensive vehicle.

Eventually I tried a 16 h.p. two-cylinder Maxim car; it gave me great satisfaction on its preliminary performance, but I mentioned my doubts and difficulties to the makers, and also mildly urged that their car was a recent introduction to the market and little known. They then made me a sporting offer. In effect they said, "You may select any car from our stock and submit it to any test you please, upon payment of a reasonable deposit to cover wear of tyres, etc.; if at the end of a fortnight you are not satisfied with the car you can return it to us." Naturally I closed with this generous offer on the spot, selected my car, and during the next fortnight tested it to my heart's content. Altogether I covered something like 1,000 miles, trying the car over all the stiffest country I could find in my own district, including Westerham Hill, River Hill, Folkestone Hill, etc. Practically every run was a "non-stop," and at the end of the fortnight I purchased the automobile without hesitation.

The Maxim car is a large and handsome vehicle, weighing about one ton and carrying five people comfortably. It is doubtless a cheap car compared with many of the well-known makes, but I am satisfied that it is thoroughly reliable, and an experienced car and coach builder told me the other day that he had never seen a car more strongly designed and put together. In proof of this I may mention that since my purchase I have driven the vehicle some thousands of miles over all kinds of country and in every description of weather, and, with the exception of tyre trouble and a trifling derangement of the electric ignition once or twice which has been easily adjusted, I have experienced no difficulties whatever.

At Easter I made a tour through Devon and Somerset, doing altogether 700 miles over some of the stiffest roads in the country with four people and their luggage in the car. During the whole of this trip I had not a single stop, except

owing to punctures and, on one occasion, through lack of petrol. The car is speedy, smooth in running, comparatively silent for a two-cylinder car, a grand hill climber, and last, but not least, the water circulation is most efficient and keeps the engine cool under the most trying circumstances. So much for the Maxim car; now a word as to the driving and management of it.

After the fortnight's trial before alluded to, I had four or five days' tuition by a driver supplied by the makers, and, since then, I have driven and managed the car without any assistance, save that of my coachman, whose sole experience consisted of a week at the Maxim works. Before starting on a run, however short, I have the car carefully overhauled in all material parts, see that the petrol and water tanks are full and that the lubricating receptacles, gear-box, and other necessary parts have their complement of oil and grease. I always carry a spare accumulator, and test both by a volt-meter, and also inspect the contacts of the commutator before starting.

Having concluded these preliminaries, I see that the change-speed lever is "out of gear," retard the sparking lever and advance the air inlet lever. I also raise the throttle and flood the carburetter a little. A single turn of the starting handle usually suffices to start the engine; the throttle should then be depressed and the sparking lever gradually advanced. Then, taking my seat, I put the clutch slightly out and move the lever into the first speed. Upon releasing the clutch and raising the throttle simultaneously and gradually, the car glides off smoothly and easily. If the throttle or clutch be raised too quickly the car goes off jerkily and unevenly. Once started, the change-speed lever is slipped into the second or top speed, as the nature of the road may permit.

Changing speed is one of the greatest difficulties to the novice, and nothing but practice will teach him how to effect the change quietly, speedily, and at the psychological moment. The car should be going well and have considerable "way" on before a change from a low to a high speed is made, and the engine should be slowing down before a change from a high to a lower speed is effected. The clutch must be taken slightly out, the engine throttled down at the precise moment of the change, and the lever should be slipped into the required position quickly, firmly, and without hesitation. In driving, I always keep one foot on the clutch ready for any emergency, and, moreover, I regard the skilful manipulation of the clutch based on the beat of the engine as one of the most important features of driving. The clutch of the Maxim car is of the friction cone type, leather-faced, and is so delicately adjusted that the smallest gradations of pressure upon it affect the running of the car, particularly upon top speed.

The engine is extremely reliable and efficient and very economical in its petrol consumption. My experience on this point quite bears out the figures given by Captain C. C. Longridge, I.M.E., in a recent article in the Automobile Club *Journal* on "Present Practice of the Automobile Industry," in which he demonstrated the efficiency and economy of the Maxim engine. Altogether, I am extremely pleased with my car and enjoy the sport immensely. I find it benefits my health and affords me a wealth of information, not otherwise attainable, about my native country.

I cannot conclude without referring to my first driving lesson; it was on the road between Lewes and Brighton. I had essayed the wheel for the first time, and had scarcely proceeded a hundred yards when a constable sprang from the hedge

MR. E. ELVY ROBB, J.P., MAYOR OF TUNBRIDGE WELLS, ON HIS 16 H.P. MAXIM CAR.

and stopped me. On my apologising for the slowness of the pace and expressing the hope that I was not, by my feeble initial efforts, retarding the traffic, the constable explained that I was under a misapprehension and that the pace had been in excess of the legal limit. A second constable appeared on the scene and informed me, from the inevitable pocket-book, that the pace had been twenty-seven miles per hour. I remarked that this was not bad for a beginner, and enquired how such accuracy of timing was arrived at. I was then shown an electrical timing apparatus, doubtless very ingenious, but which on being tested by a friend of mine, an electrical engineer, who was luckily on the car, failed miserably to justify the confidence reposed in it. The result was a summons before the Lewes Bench, when the defence was ably conducted by my friend, the Mayor of Brighton, and the case was dismissed.

BUYING A CAR.

Some Prices Current.

TO the prospective purchaser of a car it cannot fail to be of assistance if he has before him a list showing at a glance the approximate prices of the better-known makes of cars, and if this list furthermore contains particulars of horse-power, number of cylinders, and seating capacity he will know within certain narrow limits in what direction to make his definite enquiries, so as to suit his purse and particular requirements. Without such a preliminary guide, however, as is afforded by the annexed list he is faced with the annoying trouble and delay of writing to a large number of manufacturers and agents for their price lists, through all of which he has to wade before he can arrive at the necessary information. The names and addresses of the makers of any of the cars contained in this list may be obtained from the editor :—

Type.	Cylinders.	H.P.	Seats.	Price.
	£100 to £150.			£
Eagle Runabout	1	5	1	100
Vulcan	1	6	2	105
Beaufort Phaeton	1	9	2	115
Speedwell	1	6	2	123
Jackson	1	6	2	125
Speedwell	1	9	2	135
Elswick	1	—	2	141
Regal	1	6	2	141
Humberette	1	5	2	147
Firefly	1	6	2	150
Oldsmobile	1	5	2	150
Ridley	1	4½	2	150
Vauxhall Light Car	1	6	2	150
Vauxhall	1	6	3	150
	£150 to £200.			
Humberette	1	6½	2	157
Pelham	1	6½	2	157
Speedwell	1	9	3	157
Eagle Tandem	1	9	2	170
Brown	1	8	2	175
Peugeot	1	5	2	175
Siddeley	1	6	2	175
Star	2	7	2	175
Swift	1	7	2	175
Wolseley	1	6	2	175
Regal	1	8	2	178
Alldays	1	7	2	180
Belsize Junior	1	7	2	183
Cadillac	1	6½	2	183
Richardson	1	6½	2	185

Type.	Cylinders.	H.P.	Seats.	Price. £
£150 to £200 (*continued*).				
Star	2	7	3	
Farman Midget	1	8	2	192
Cottereau		7	2	195
Darracq		8	4	195
Peugeot		6½	2	195
Cadillac		6½	2	199
Clément		6½	2	199
De Dion-Bouton		6	2	200
Simms Welbeck	1	8	2	200
Swift	2	7	4	200
Thornycroft	1	7	2	200
£200 to £250.				
Roots (petroleum)	1	5	2	204
Cadillac	1	9	4	210
Clément	1	6½	4	210
Beaufort	1	9	4	220
Eagle	2	8	4	225
Simms Welbeck	1	8	4	225
Vulcan	2	10	2	225
Speedwell	2	10	4	236
Cottereau	2	7	4	240
Duryea	3	10	2	250
Minerva	2	10	4	250
Vulcan	2	10	4	250
£250 to £300.				
Argyll	1	8	4	250
Regal	1	8	4	252
Darracq	2	9	4	255
M.M.C.	1	8	4	255
De Dion	1	8	4	255
Albany	1	10	2	262
Regal	2	12	4	262
Argyll	1	8	4	275
Talbot	2	8	4	275
Vulcan	2	10	4	275
Dennis	1	9	4	280
Humber	2	10	4	280
Brown	2	8	4	285
Cottereau	2	10	4	285
M.M.C.	1	9	4	285
Orleans	2	9	2	294
Beaufort	1	9	4	299
Duryea	3	12	2	300
Georges Richard	2	8	4	300
£300 to £350.				
Panhard	2	7	4	305
Brown	2	10	4	315
Renault	1	7	3	320
Star	2	9	4	320
Peugeot	2	9	4	325
Simms Welbeck	2	10	4	330
Wolseley	2	8	4	330
Minerva	3	15	4	340
Sandringham	2	8	4	345
Argyll	2	10	4	350
Brown	4	14	4	350
Clément	2	9	4	350
Darracq	2	12	4	350
Duryea	3	12	4	350

Type.	Cylinders.	H.P.	Seats.	Price.
£300 to £350 (*continued*).				
				£
Herald	2	12	4	350
Simms Welbeck	2	12	4	350
Swift	2	9	4	350
Talbot	2	11	4	350
£350 to £400.				
Ryknield	2	10	4	357
Décauville	2	10	4	360
Gladiator	2	9	4	360
Delahaye	2	12	4	360
Vauxhall	3	12	5	365
Standard	2	12	4	367
Richardson	2	12	4	378
James and Browne	2	9	4	382
Rex	2	12	4	383
De Diétrich	2	10	4	385
Arrol Johnston	2	12	4	390
Pipe	4	12	4	390
Humber	2	12	4	393
Gladiator	2	12	4	395
M.M C.	2	10	4	395
Beaufort	2	10	4	396
Albion	2	12	4	400
Brooke	3	12	4	400
Duryea	3	15	4	400
Georges Richard	2	12	4	400
Minerva	4	20	4	400
Thornycroft	2	10	4	400
Wolseley	2	12	4	400
£400 to £450.				
Argyll	2	10	4	415
Dennis	2	14	4	420
Renault	2	10	4	420
Argyll	3	12	4	425
Georges Richard	2	12	4	435
M M.C.	2	12	4	435
Orleans	4	12	4	435
De Dion	2	12	4	445
Beaufort	2	12	5	448
Brouhot	2	10	4	450
Chenard and Walcker	4	12	5	450
Panhard	3	8	4	450
Peugeot	2	12	4	450
Siddeley	2	12	5	450
£450 to £500.				
James and Browne	2	12	4	457
Albion	2	12	11	460
Darracq	4	15	5	460
Arrol Johnston	2	12	6	470
Humber	4	20	4	472
Ariel	4	15	4	495
Belsize	3	15	4	495
Sandringham	4	16	5	495
Brooke	4	15	4	500
Brown	4	12	4	500
Cottereau	3	12	4	500
Lanchester	2	10	4	500
Star	4	12	4	500
£500 to £600.				
Spyker	4	14	4	510
Sunbeam	4	12	5	525

Type.	Cylinders.	H.P.	Seats.	Price.
£500 to £600 (*continued*).				
				£
Albany	3	16	5	525
Brooke	4	16	4	525
James and Browne	4	14	4	525
Arrol Johnston	3	16	4	530
Eagle	4	24	4	535
Talbot	4	14	4	535
Delahaye	4	16	4	540
Gladiator	4	14	5	545
Argyll	4	16	4	550
Ariel	4	15	4	550
Clément	4	12	4	550
Dennis	4	16	4	550
Décauville	4	12	4	550
Durkopp	3	15	4	550
Herald	4	18	4	550
Lanchester	2	12	5	550
National	3	15	4	550
Panhard	4	10	4	550
Star	4	18	4	550
Wolseley	4	16	4	550
Orleans	4	15	4	561
Beaufort	4	15	5	572
Darracq	4	24	5	580
Georges Richard	4	16	4	580
Mors	4	12	4	580
Pipe	4	15	4	600
Simms Welbeck	4	20	4	600
£600 to £700.				
Brouhot	4	12	4	600
Humber	4	14	4	603
Delahaye	4	24	5	610
Simms Welbeck	4	24	4	620
Ariel	4	18	5	625
Cottereau	4	16	4	625
Durkopp	4	18	4	625
Regal	4	24	4	630
Renault	4	14	4	630
Germain	4	16	4	640
Argyll	4	16	8	650
Belsize	4	30	4	650
Décauville	4	16	4	650
Decosmo	4	24	5	650
De Dietrich	4	12	4	650
James and Browne	4	18	4	650
Mieusset	4	16	5	650
Richardson	4	20	4	650
Siddeley	4	18	5	650
Spyker	4	20	4	650
Wolseley	4	16	6	650
Lanchester	2	16	5	660
Thornycroft	4	20	4	660
Dennis	4	20	4	680
Simms Welbeck	4	30	4	680
Talbot	4	16	4	680
Rex	4	24	4	682
Ryknield	4	20	4	683
Martini	4	16	4	700
Panhard	4	16	4	700
£700 to £800.				
Brouhot	4	15	5	700
Mors	4	14	4	710
Pipe	4	20	5	710

Some Prices Current.

Type.	Cylinders.	H.P.	Seats.	Price.
£700 to £800 (*continued*).				
				£
Lanchester	2	18	5	720
Clément	4	20	4	725
Wolseley	4	24	7	725
Wilson-Pilcher	4	12	4	735
Gladiator	4	28	5	745
C.G.V.	4	15	4	750
Darracq	4	30	4	750
M.M.C.	4	20	4	750
Peugeot	4	15	4	750
Ariel	4	22	5	760
De Diétrich	4	16	4	760
De Dion	4	16	4	760
Rochet-Schneider	4	16	4	760
Wolseley	4	24	8	765
Fiat	4	16	4	775
Maudslay	3	18	5	780
Beaufort	4	24	5	795
Brouhot	4	24	5	800
Daimler	4	28	5	800
Mercédès	4	18	4	800
Spyker	4	25	4	800
£800 to £900.				
Germain	4	24	4	840
Humber	4	25	5	840
Georges Richard	4	24	5	850
M.M.C.	4	25	4	850
Napier	4	15	5	850
Maudslay	3	18	8	865
Mors	4	19	4	890
Wilson-Pilcher	6	18	5	890
Wolseley	4	24	12	900
£900 to £1,000.				
C.G.V.	4	20	4	950
De Diétrich	4	24	4	950
Maudslay	4	25	6	970
Ariel	6	30	5	975
Mors	4	24	4	990
Dennis	4	90	2	1,000
Fiat	4	24	4	1,000
Pipe	4	30	5	1,000
Over £1,000.				
Napier	6	18	5	1,200
C.G.V.	4	25	4	1,030
Léon Bollée	4	24	5	1,035
Panhard	4	24	4	1,035
Maudslay	4	25	8	1,050
Mercédès	4	18	5	1,050
Napier	4	24	5	,050
Mors	4	30	5	,180
Germain	4	35	4	,200
Durkopp	6	40	2	,250
De Diétrich	4	35	4	,310
Panhard	4	35	4	,310
Mercédès	4	30-32	4	,350
Napier	4	24	5	,350
Léon Bollée	4	40	5	,500
Fiat	4	60	5	,600
Spyker	6	60	4	,600
Mercédès	4	60	4	,850

Type.	Cylinders.	H.P.	Seats.	Price.
STEAM CARS.				
				£
White	2	10	4	420
Serpollet Simplex	2	9	4	400
Turner-Miesse	3	10	4	430
Gardner-Serpollet	4	6	4	577
Turner-Miesse	3	16	4	640
Gardner-Serpollet	4	10	4	672
Chelmsford	2	12	5	730
Gardner-Serpollet	4	20	4	1,076
ELECTRIC VEHICLES.				
Baker Runabout	—	—	2	204
Baker Imperial	—	—	2	283
Baker Stanhope	—	—	2	367
Electromobile Brougham		—	—	700
Electromobile Landaulet	—		2	700
Electromobile Double Brougham	—	—	—	750
Electromobile Landaulet	—	—	4	750
Electromobile C-spring Victoria	—	—	—	800

"THE CAR" INSURANCE DEPT.

Insure Yourself and Car against Accidents.

By special arrangement with the Law Accident Insurance Society, Ltd., we are enabled to offer Owners of Private Motor Cars the Insurance Policies as issued by the Society AT THE SAME PREMIUMS, BUT INCLUDING FREE SUBSCRIPTION TO "THE CAR."

Two of the most Popular are as follows:—

For £10 per Annum.

(1.) **Accidents to Owner.**—Whilst driving or being driven in, or whilst mounting or dismounting from Insured Car, a sum of £500 in case of Death; £3 per week during Temporary Total Disablement, limited to 26 weeks any one Accident.

(2.) **Damage to Insured Car**—Accidental Damage through Collision up to £500 in any one year, with a limit of £100 for a single Accident (excluding Fire, Explosion, or Self-ignition, Damage to Rubber Tyres or Lamps, and first £2 10s. of any damage).

Note.—This is **NOT** limited to Collision with a Vehicle.

(3.) **Fire.**—Damage from Fire, Explosion or Self-ignition, up to £200 or value of Car, if of less amount, in any one year.

Note.—Insurance under this heading can be increased up to the full value of the Car at 15s. per cent. on the further amount to be covered.

(4.) **Public Liability (Third Party) Indemnity.**—Claims by the General Public (excluding Passengers) for Personal Injury or Damage to Property, up to £500 in any one year, with a limit of £100 for a single Accident.

(5.) **In addition to the above a copy of "THE CAR" will be sent weekly post free.**

Indemnity against **Burglary, Larceny** or **Theft** is not included in this Policy, but can be added if desired at 5s. per cent. on value of Car.

For £15 per Annum.

(1.) **Accidents to Owner.**—Whilst driving or being driven in, or whilst mounting or dismounting from Insured Car, a sum of £1,000 in case of Death; £6 per week during Temporary Total Disablement, limited to 26 weeks any one Accident.

(2.) **Accidents to Paid Driver.**—Whilst driving or being driven in, or whilst mounting or dismounting from Insured Car, a sum of £100 in case of Death; £1 per week during Temporary Total Disablement, limited to 26 weeks any one Accident.

(3.) **Damage to Insured Car.**—Accidental Damage through Collision up to £1,000 in any one year, with a limit of £150 for any one Accident (excluding Fire, Explosion or Self-ignition, Damage to Rubber Tyres or Lamps, and first £2 10s. of any damage).

Note.—This is **NOT** limited to Collision with a Vehicle.

(4.) **Fire.**—Damage from Fire, Explosion or Self-ignition, up to £300 or value of Car, if of less amount, in any one year

Note.—Insurance under this heading can be increased up to the full value of the Car at 15s. per cent. on the further amount to be covered.

(5.) **Public Liability (Third Party) Indemnity.**—Claims by the General Public (excluding Passengers) for Personal Injury or Damage to Property, up to £1,000 in any one year, with a limit of £200 for a single Accident.

(6.) **In addition to the above a copy of "THE CAR" will be sent weekly post free.**

Indemnity against **Burglary, Larceny** or **Theft** is not included in this Policy but can be added if desired at 5s per cent. on value of Car

SEE ALSO ANNOUNCEMENT ON OPPOSITE PAGE.

A Proposal Form will be sent on application to the Manager of Insurance Dept., "THE CAR—Illustrated," 17, Shaftesbury Avenue, London, W. Immediately it is returned, accompanied by a Remittance for the amount of the Premium, a Cover Note will be forwarded by return of post, giving protection until the Policy is ready.