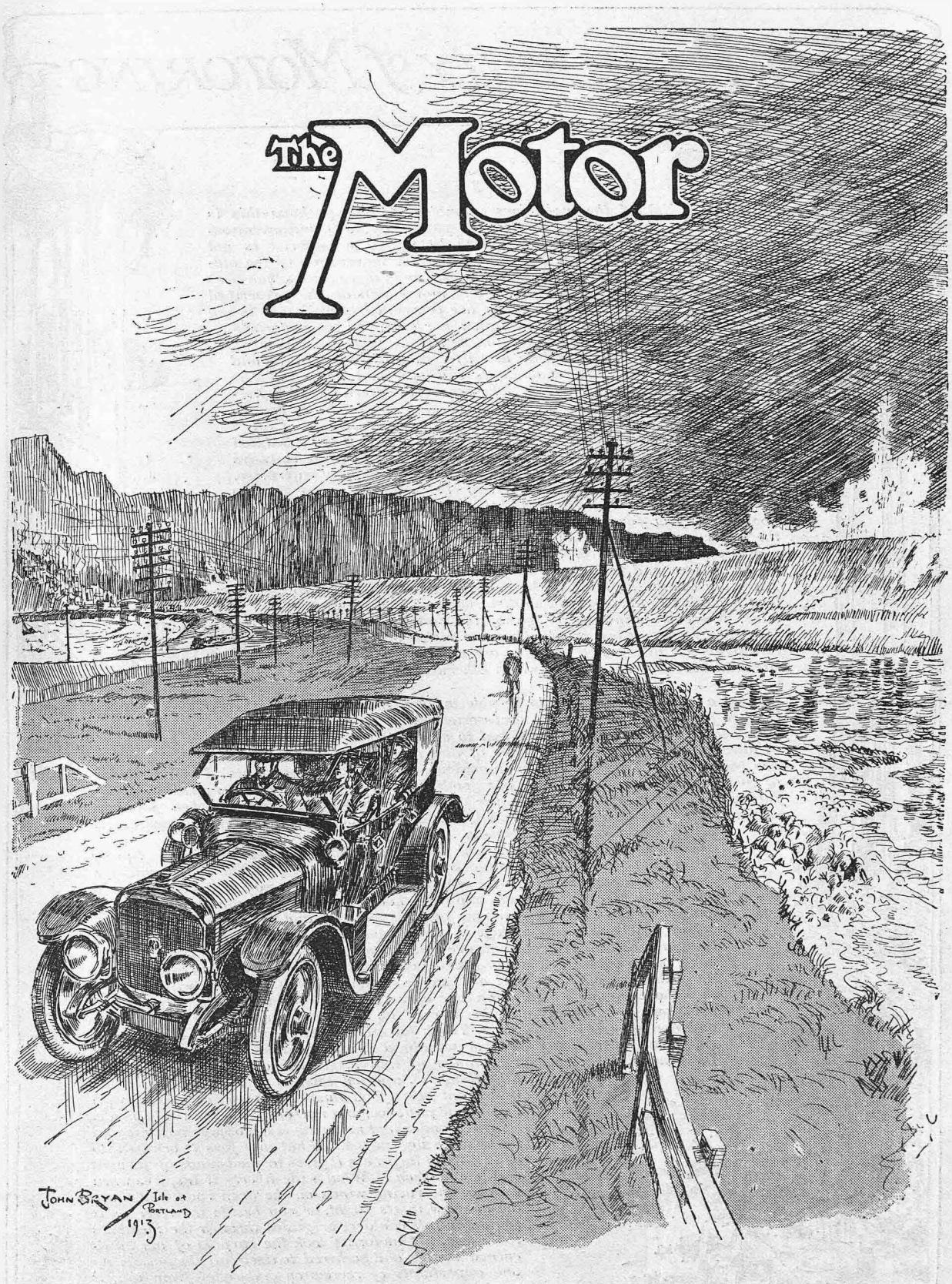
Vol. 23. No. 586. 11th March, 1913.

The Motor



Our illustration shows the causeway to Portland Island by the side of the Chesil Beach connecting it with the mainland. The spot is bleak, unprotected and unsheltered, but the modern motorcar affords comfort to its occupants even under the worst weather conditions existing at such a spot.

THE POPULARITY of MOTORING

ONE of the main joys of motoring, and perhaps this is the supreme secret of its popularity, is its unconventionality. The motor means liberty. The motorist is not bound by the laws that fetter the movements of the old-time tourist. He takes (possibly in more senses than one) his life in his hands, and moves outside the prescribed area wherein so many are compelled to walk. It is not merely power, for this sometimes fails; nor ease, for the motorist's toil is at times of no mean dimension, but rather the possibility of "awayness" that thrills him into new life. The call of the hills and vales is in his ears. The mountains call him and he goes. The moors invite him and he is there. The sea coast offers its attractiveness, and he glides along the border of the waves. He is free to answer the call of Nature, and freedom is the coveted prize of all.

No longer are we bound to the iron roads with their scheduled times and circumscribed routes. We need not follow the railways and limit our explorations by the measure of company enterprise. The motor has opened up the by-ways of the land, and we are finding choicer interest in the silent retreat of the village than in the populous city or famous resort. There is a stillness, too, in the lonely country, far from the madding crowd, that means new life to those who hear all day and every day the roar of the busy street and bend incessantly to the grind of daily toil. There are countless haunts in the by-ways of our land, far up long rambling lanes, or in the undisturbed quiet of the mountains, where we could never go by the railway track, and scarcely by the modest wheel; but the motor bears us into far fields of unexpected delight, and enables us to understand the beauty of our country which otherwise we could never know.

What a privilege, too, it is to be able to carry with us the luggage for a tour, with all the accessories which unforeseen circumstances may demand. No need to send a consignment in advance, only to find in the hour of dire necessity that it has gone astray. No need to keep an anxious, watchful eye upon the weird manœuvrings of porters as they juggle with our goods; or try to induce attentiveness with the furtive coin. It is wonderful how new an experience touring becomes when we can dispense with so much purchased civility, and guard our own property and possess it all in season and out of season.

What a privilege, too, to break from the fetters of scheduled times. Surely it were enough to watch the clock six days out of seven all the year round for fear of missing the business train, without having to carry a time-table as a holiday accessory, to break into idle hours with its peremptory commands and worry us with its suggestions of unpunctuality and the irremediable result.

How priceless an advantage is it to be able at all times to select our own company. Not that motorists are uncharitably disposed toward their fellowmen; on the contrary, a kinder-hearted class one will never find; but even though the fellow-travellers by rail or 'bus be congeniality itself, who will gainsay that the company we carry on our cars is more congenial still. To choose one's own companions and be sure of no discordant note is surely the sine qua non of a happy holiday. Think too of the unconventionality of the wayside meal. The grassy bank or woodland sward for table, the waving boughs for canopy, the birds for reminder of that larger life of liberty to which we all belong. Superior this, is it not, to the crowded restaurant where food must be ordered and awaited with long tried patience, and not always served à la mode.

Little wonder that motoring is a popular pastime and the expense ungrudged. What new joys it brings into life! What largeness it gives to the bounds of thought and imagination! What wide liberty it inspires when we race the racing winds on the open road, and chase the swallow in its flight, or run beside the river as it roars amid its boulders or glides through the meadows to the sea. If motoring took the surplus of our hard-earned wealth, and gathered to itself all the possibility and opportunity of recreation and relief from toil, it would be a good return and generous in its interest.

POPULAR MOTORING.

The Amazing Growth of the Motoring Movement—A Contrast Between Fifteen Years Ago and Now.

BY HENRY STURMEY.

TO grasp fully the real meaning of the words forming the title of this article we must go back a few years to obtain a contrast. Let us begin at the beginning, and I will relate an incident. It was just 15 years ago this year that I drove the first car from John o' Groats House to Land's End. No car had till then penetrated Scotland north of Aberdeen, and only one or two had been seen north of Edinburgh. At John o' Groats House, on my arrival, I found a coach-and-four, with a fashionably-dressed party on board. At Wick the same evening that party were located in the same hotel and were dining at an adjoining table. During the meal, one made the inquiry, "I wonder what that motorcar was doing at Groats to-day?" He was promptly answered with, "Oh! another beastly advertisement—Pears' soap, or something of that kind, I suppose," and that lucid explanation seemed to be tacitly accepted as the only possible one, for not another word was said on the subject. And that really did represent the views of society people at that time, only 15 years ago—or less than 15 years, for it was in October.

With a few notable exceptions like the Hon. Evelyn Ellis, Sir David Salomons, and the Hon. C. S. Rolls, the higher classes of the people scorned the very idea and simply could not conceive how anyone could find a pleasure in driving about in such things, and "Jeames," reflecting the opinions of "his people," gave it as his settled opinion that "no gentleman as *was* a gentleman" would demean himself by being seen on one so long as there was a good horse about.

Contrast this with the state of affairs at the present day. No longer is the motorcar looked at askance. Both Jeames and John, the coachman, as well as Tom, the stable-boy, have become, as they are pleased to term it, "chaffers." My Lord Tomnoddy has sold off his coach and his drag, his brougham, barouche, and dog-cart, and only keeps a horse or two for hunting. The old coachhouse and half the stables have been pulled down and converted into a garage, and within it stand ready to the call the pick of the world's cars. The big six-cylinder limousine, luxurious to a degree unknown with horse carriages, purrs stealthily out for my lady's shopping, or disappears into the darkness with the party for theatre, dinner or ball, and when the big touring car draws up at the country house and delivers at its door the friends from 100 miles away, there is no excitement, no gathering of all and sundry to look at the strange apparition, as would have been the case a decade since. It is only cousin William and the girls dropped in for a cup of tea!

And if the motorcar reigns to-day supreme in the service of society, what about its position in the estimation of the rest of the community? Although the movement owed its inception to the middle classes—to that portion of the middle classes with a little mechanical instinct, a little money, and much enthusiasm—it required the hall-mark of society usage to mark it "respectable" with many, and society having taken it so whole-heartedly into its affections, all fears of Mrs. Grundy were removed from the minds of the womenfolk of that large portion of our upper-middle-class population which takes its cue from the stratum immediately above it, and from being fearful and doubtful of the propriety of its adoption, the spirit of emulation of England's élite caused its universal acceptance, and as the great mass of the middle classes—the common sense of the people—had decided to adopt it on its own merits, ways and means permitting, it was not long before it had entered much more fully into our everyday life than ever the horse had done during the long centuries of its slavery in the service of man. Not only do people to-day keep motors who yesterday kept horses, but many thousands of people run cars of their own who never did so, and who, moreover, in the ordinary course of things, would never have done so. And why is this? Mainly because of the greater sphere of usefulness provided by the car. Some men are attracted by the horse itself and by the pleasure to be found in riding and driving it. But there are many more who know nothing, and care nothing, about horses—are rather afraid of them, as a matter of fact—and where they have used them, have only done so because they had to. To such men, not being attracted by

Viewing the wonderful ice formations at Ontario Lake, which is only a short distance from the building in which the 1913 Toronto Motor Show was held.

POPULAR MOTORING.—Contd.

the animal itself, the extreme limitations of its usefulness have been a deterrent. But the advent of the motorcar, and, later, its proved practicality and reliability, has opened up new possibilities and a new view of life altogether, and where the ability to potter 10 or 15 miles at 5 or 6 miles an hour behind a horse has proved no attraction, the power to get about and see things and people with a freedom from limitations and an independence of extraneous assistance hitherto unknown, which the motorcar has put into their hands, has proved irresistible, and the power-propelled vehicle has been absorbed into their daily life in a way which would not have been deemed possible but a decade ago. The tireless persistence of the new vehicle has caused it to be used far more than the horse drivers of old would have deemed either desirable or necessary, or than would, indeed, have been possible, in illustration of which I may mention that my house commands a view of about 50 yds. of one of the lesser main roads of the Midlands, a road leading to no large town near by, but mainly tapping the country districts. Ten years ago a horsed vehicle other than a milk cart or agricultural wagon, was virtually a rarity. Five or six in an hour at most would pass along the piece of road, yet yesterday, as I glanced out of the window, there were three private cars on that 50 yds. of highway at one and the same time, and rarely more than a few minutes elapse now without the passage of a car along it. Indeed, upon the road itself, cars are rarely out of sight.

Once the car was brought to a stage of reasonable perfection and reliability, the demand became unmistakable, and, demand creating supply, manufacturers set themselves to work to fill it, and have steadily not only further perfected their productions, but have as steadily cheapened them, and the market for such a commodity as a motorcar being limited by the factors of price and maintenance cost, every successive improvement in either of these directions has had the effect of considerably widening the market, and, development in this direction continuing, the demand is increasing enormously by the recent introduction of the cyclecar and of the small motorcar in miniature, which, in the matter of price and upkeep, is so closely allied to it. With this latest development, the gap between the motorcycle and the car has been completely filled, and now the pleasures of motoring are fully open to the "man of moderate means" in the truest sense of the term, and he is taking advantage of it to the full.

But what, you say, of the people? What of the masses, the great bulk of the community, to whom the purchase of even a second-hand small car, to say nothing of running it, is an impossibility? Is motoring popular with them. Is not the motorcar an anathema to them? Do not they curse it as an abomination, a terror to the countryside, and an added danger to life, and do not they hate the very name of it, as another indication of how the poor are ridden roughshod over by the rich? Not a bit of it. There are cranks and "old women of both sexes" in every portion of the community, and a few of these occasionally air their views in the columns of the daily Press, and there are those who are socialistically inclined and who look on the motorcar as merely another instance of the aggrandizement of the wealthy and an accentuation of the division between the "classes" and the "masses." But, when all is said and done, the number of such people to-day is small. It is true that a year or two ago an undoubted wave of somewhat violent opposition and dislike passed over us. But this antagonism was not so much against the motorcar as such, but against the dust which it raised in its passage through the country, and it must be admitted there was reason for it. But the creation of the Road Board and its practical methods of dealing with the dust nuisance by tar treatment, by robbing the motorcar of its dust-raising power, by removing the dust from its path, has at the same time removed the cause of public complaint, and to-day, apart from the mere question of mental bias for or against the motorcar by the people at large, it is a fact that the people themselves are the largest and most consistent users of motorcars in the country. And the popularity of any article can in no better way be shown than by use. True, they are not buyers of cars, and so are not patrons of motoring in that sense. But, apart from the fact that a drive in a car is a pleasure looked forward to, and an offer eagerly taken when made, in its support of the motor as a vehicle for public use the great British public has shown itself to be more than appreciative of the merits of mechanical transport.

Just consider for a minute the manner in which the taxicab has "caught on," not only in London, but in every other populous centre. Already more than two-thirds of the horsed cabs have disappeared from the London streets, and the once popular hansom, which, but a decade back, was synonymous with London life itself, is "as dead as the dodo," whilst the last of the horsed omnibuses has been taken off the city streets and the motorbus reigns supreme. And the motorbus carries more people per annum through London by far than ever did the horsed vehicles. It is safe to say that, whereas the private car is patronized in its thousands by the better-off class, the motor omnibus and the taxicab are patronized in their millions by the people. This year or next will probably see the last of the chars-a-bancs drawn by horses, which take the visitor over our historic and picturesque routes, for here, again, wherever the motor type of chars-a-bancs has been introduced, there is "only one in it" for the public patronage if it comes to a choice between the two; whilst as surely and as sweepingly for the conveyance of merchandize and the collection and distribution of parcels, for the work of the farm and the factory, for fire fighting, for the aid of the police force, and for army transport the same great and rapid revolution is taking place, showing that not only amongst the wealthy as a means of personal pleasure and gratification, but amongst every class of the community, from the highest to the lowest, from the mere idler with nothing otherwise to pass the time away to the merchant and manufacturer and the trading community in general, to whom time and facility of operation and economy are considerations of the highest value, the motor is popular in the highest and fullest sense of all that that word implies.

THE DESIGN OF THE MINIATURE CAR.

The Constructive Criticisms of the Small Car by an Engineer.

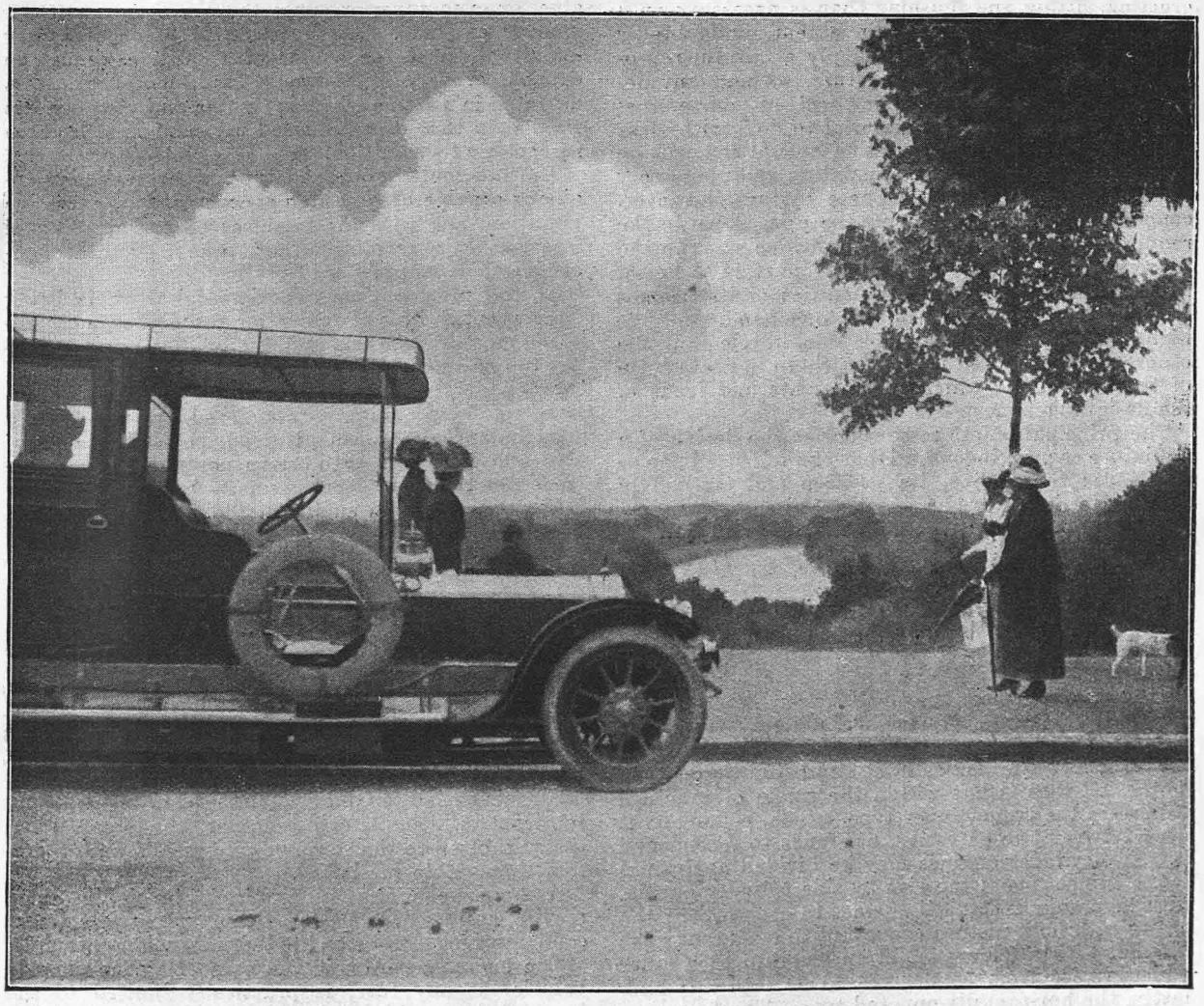
THE charm of the little car, the miniature machine which embodies the refinements of its larger prototypes together with much originality of its own, lies not altogether in its comparative cheapness and ease of handling, but in its individuality—a quality which is not susceptible of definition—a characteristic which a mass of words can do no more than suggest.

The type of miniature car—I am not dealing with the cyclecar—which has leapt into popularity during the past year appeals very strongly to those who prefer to get their motoring in something which is the best of its kind, rather than with a second-hand car which may be obtained for the same price or even less, but which will almost certainly be noisy and out of date in many respects, and far more expensive to maintain.

The Delights of Motoring.

To go motoring in a miniature car, a neat, compact little vehicle weighing 6 cwt. or so, is at present somewhat of a novelty—a delightful new experience which opens up, in many cases, a hitherto unknown aspect of road travel. The novelty of the situation will wear off, but the delight of the experience need not vanish with familiarity. There are now before the public a number of machines which can be purchased for £150 or less, which are light in weight, modest in their requirements as to petrol and tyres, and yet, withal, afford equal comfort and equal speed with many a larger car. It is no wonder, then, that these machines sell like hot cakes. They fill the void which would otherwise exist between the passenger-carrying motorcycle on the one hand and the cheap car with an engine of 15 h.p. or even 20 h.p. on the other. It may be urged here that some of the more expensive cyclecars at present on the market actually cost more than the cheapest full-sized cars; but more and more is the question of first cost likely to give way and become a secondary consideration compared with the matter of upkeep.

In the early days of motoring, the purchase of a car was a desperate adventure, or, at best, a speculation. These times are now happily long past, and cars are



A halt to look at the famous view from the Terrace, Richmond, Surrey.

DESIGN OF THE MINIATURE CAR.—Contd.

acquired to give good service over a considerable period of time—a period, moreover, which will probably steadily increase. There may be still many people who exchange their old cars for new every year, and not a few who do it more often. But these latter must generally be regarded as fortunate in being able to make motoring a hobby. For the many, it is and will be a utilitarian proposition. If, then, a miniature car costs only half as much in upkeep as a full-sized machine, and lasts at least as long, it will be a sound proposition, even if it costs very little less to buy. In criticizing and comparing prices, it is easy to forget or ignore the all-important factor of upkeep and consider first cost only, but time and experience will emphasize the merits of the new type.

Cost of Production.

As to first cost, this is partly a question of material and partly of design. It is not generally realized that the materials themselves which go to make a modern motorcar cost as much and, in some cases, more than the labour spent thereon. Therefore, one way in which the manufacturer can save money in the construction of miniature cars is at once apparent, namely, the saving in the cost of material. The next question which he has to ask himself is whether he can save in labour as well. Can he so design his vehicle that there may be less work in machining, erecting, fitting and finishing than is necessary on a large-sized car? To a certain extent, undoubtedly yes, even if the new type is simply a faithful reproduction of larger cars in miniature, without any departures of its own; machining will, of course, cost less because there is less material to deal with—less to cut away. Similarly, erecting and fitting will be slightly easier, and finishing, painting and upholstery will, of course, cost less. These savings, however, cannot be relied upon to bring the price down to the required level. The new type of machine must be and is being tackled on original lines from start to finish. It should combine the best qualities of its nearest kindred, the cheap car, on the one hand, and the high-grade passenger-carrying motorcycle on the other. It is proposed in this article to indicate some of the lines along which the thoughts and ideas of the designer may run.

The principal points to consider in the design of a miniature car, as, indeed, in that of a full-sized one as well, are: the engine, its position and method of attachment in the frame, the transmission, including gears and axle, the finish and general equipment.

The Engine.

The heart of the vehicle is its engine. All its qualities are subordinate to the capabilities and deficiencies of the power producer, and here the designer has a wide field from which to make his choice. First in favour comes the small four-cylinder engine, whereas the single-cylinder undoubtedly holds the field for simplicity and cheapness. Putting aside for the moment the six-cylinder and the two-stroke motor, all that is left within the range of practical politics is the two-cylinder type, which, coming as it does between two extremes, has much to recommend it. Two-cylinder engines may be divided again into four distinct types: the side-by-side cylinder engine, with its cranks set at 180 degrees to each other; the same, with both pistons connected to one crank; the V twin, with cylinders set at an angle to each other which varies from 50 degrees to 90 degrees; and, lastly, the horizontally-opposed type. The first-mentioned type of two-cylinder engine has the disadvantage of uneven torque, since the explosions in the cylinders occur at an interval of 180 degrees, followed by a dead period of 540 degrees, or one-and-a-half revolutions of the crankshaft, which defect is partially compensated by a reciprocating balance between the two pistons. This type is apt to give the impression of a four-cylinder engine missing continually. Such impression, however, is not associated with the second type, which, with its two pistons working together, gives an explosion at even intervals every revolution, and a steady torque at moderate speeds, so that it is often claimed to be indistinguishable from a four. It is unsuited to the very high speeds required in cyclecar work, owing to its inherent want of balance. The V twin combines, to a certain extent, the advantages of both the preceding types, and is a form of engine which is at present particularly associated with motor-bicycle design, although there are not wanting signs of its increasing use on small cars. The consistent use of this type of engine over a period of many years by the Riley Co. is worthy of mention in this connection.

The Horizontally-opposed Type.

Lastly, we have the horizontally-opposed type, in which the advantages of the others are realized and even surpassed in some respects. In this construction, in which both cylinders and cranks are placed at an angle of 180 degrees to one another, the balance may be equal to that of a four-cylinder vertical engine, or even superior, since there are only half the number of parts. The question of balance is very important, since the engine of a small car must be capable of very high speeds, and, moreover, it is mounted in a frame which is lighter and possibly less rigid than that of a full-sized car, and is thus more susceptible to vibration.

The horizontally-opposed type of two-cylinder engine is capable of very high speeds without excessive vibration, and with the impulses occurring at equal intervals every revolution the torque is good throughout its whole range.

At the present time experimental work is being done with this type of engine for aeroplanes and high-speed motorcycle work, and, by dividing one connecting rod so that the crankshaft has three throws and the cylinders are exactly opposite one another, instead of being slightly staggered, a wonderfully good balance has been attained, so that speeds of 4000 and even 5000 revolutions per minute have become practicable. There seems to be no reason why a small four-cylinder engine should not be constructed on similar lines.

Cooling the Engine.

The question of cooling is of the first importance. Can air cooling be relied upon to give permanent satisfaction, or is the slight extra cost and weight of water cooling justifiable? Much argument can be raised on either side, but the following are cogent reasons for the necessity of water cooling:—

It is unwise to leave an air-cooled engine running for more than a few seconds with the car standing.

An air-cooled engine requires a heavy, gummy lubricant, which, in cold weather, renders starting difficult, often to the verge of exhaustion, and, therefore, impossible for ladies.

A high-speed fan is required, involving extra moving and wearing parts by comparison with water cooling, which may be on the thermo-syphon principle.

The engine position in the case of a four-wheeled vehicle, at any rate, is practically limited to the front of the machine, not only on account of cooling but because immediate accessibility to compression

DESIGN OF THE MINIATURE CAR.—Contd.

taps, sooted plugs, broken valves, etc., is essential.

Other things being equal, petrol and oil consumption are materially reduced by water cooling: of preignition, rapid carbonization and durability—the ultimate life of the motor—nothing need be said, because these troubles can be overcome with air cooling, by careful design, moderate compression, adequate bearing surfaces and good lubrication.

The Frame.

That the chassis must be light and strong goes without saying, and to this end there are several different methods of construction. The frame may, for instance, be built up of light steel tubes, like that of its smaller rival, the motor-bicycle, or it may, on the other hand, be of pressed steel, or it may be constructed of ash planks, with steel flitch plates, or even, as in one or two instances in actual use, entirely of wood, relying on the elasticity of the planks in lieu of spring suspension.

The tubular frame, consisting of two longitudinal trusses with brazed cross-members, involves a lot of work in the making. It is lighter than a pressed-steel frame, but, in large quantities, the latter is cheap to produce. Some doubt may also be thrown upon the permanent durability of brazed joints, since crystallization is liable to occur, or, rather, to put the matter with pedantic correctness, repeated shocks on such a joint cause the metallic crystals to change into larger crystals, whereupon the metal becomes brittle and ultimately breaks. A simple channel-steel construction may be less rigid than the tubular frame, but the mounting of engine and gearbox should be such as to stiffen up the whole to a sufficient extent to allow of the radiator being fixed without fear of distortion.

The suspension of the axles, both front and rear, should be by means of leaf springs, and the engine, in the writer's opinion, should be placed further back than is usual in conventional car design; in fact, as nearly midway between the axles as is convenient or possible. In this position the least vibration from the road is felt, and it is also very desirable in light car design to keep the heaviest parts as close to the centre of gravity as possible. The disposition of weight in this way makes all the difference to the ability or otherwise of a light car to hold the road and get round corners without skidding. A simple experiment with a beam and two adjustable weights will serve to convince anyone of the importance of this point. If the beam be held at the centre of gravity of the weights, it will at once be apparent that the further the weights are from the centre of gravity the more effort is required to swing the beam, and, conversely, to stop it once it has started. Given a good distribution of weight and good springing, coupled with a reasonable length of wheelbase, a small car, no matter how light, can hold the road at least as well as an 11-ft. wheelbase 2-ton machine.

The horizontally-opposed type of engine already discussed could be slung in a steel cradle, with its cylinder heads below the level of the side members of the frame, and it is distinctly worthy of notice that such a disposition would limit the size of the engine far less than any other arrangement. In light car design the engine is apt to be too obtrusive for the entire comfort of the passengers. For instance, having advocated the central position for the power plant, it will be seen at once that a vertical engine would almost inevitably separate the two passengers—a state of affairs which cannot be tolerated in the modern miniature car.

Transmission.

We now approach a branch of the subject which bristles with technicalities, and which is often shirked by the unmechanical—relegated to that vague "hinterland" in which the engineer (mysterious being! spends his life in a state of abstruse thought. However, there is no real reason why questions of gears (differential and otherwise), axles, torque and radius rods should be less acutely interesting than any discussion of engines, valves and carburetters.

The ideal light car must be provided with a highly-efficient change-speed mechanism, and, as in the case of the motor-bicycle, there are three alternative positions for this gearing: the engine unit, the separately-mounted gearbox, corresponding to the countershaft position, and the back axle, corresponding to the hub gear of a motorcycle. Now, each of these three alternatives has peculiar advantages, so it is no wonder that we find all three systems flourishing in the light car market to-day. Should epicyclic gearing be used, the first position has obvious advantages. The choice of the designer, however, will be influenced by the number of speeds which he has to provide, and this will depend upon the considered decision of the public into whose hands will be gathered the maximum amount of experience. Assuming that the owners of light cars coming under the legal weight limit will not be content without a reverse, the next question to ask is, how many forward speeds will be required—two, three, or four? The answer is, that it does not matter in the least so long as the car will do all that is required of it. It must climb any hill in reason with full load; it must be flexible in traffic, and it must run up to high speeds—speeds which we talk of with a nudge and a wink—without undue noise and vibration. If the engine power is high in relation to the load, then two speeds may be sufficient, with a 50 per cent. reduction. If the power is not considerably greater in comparison with the weight than is usually the case with a full-sized car, then three speeds are essential and four are desirable.

The incorporation of two forward speeds and a reverse within a worm-driven differential live axle is a plan which presents advantages outweighing its difficulties—in overcoming which there is room for much ingenuity on the part of the designer.

The above suggestions with regard to the question of change-speed mechanism do not bring us to the end of the transmission problem. Having considered the arrangement by which power is conveyed to the road wheels, we have next to take account of those forces of reaction whereby the driving wheels convey their tractive effort to the frame of the car.

There are, broadly speaking, three alternative methods. To drive through the springs, using them also to resist the torque of the axle; to fit a torque member; to fit both torque and radius rods, shackling the rear springs at their forward ends. A discussion of the relative merits of these three systems is not possible within the limits of this article, but, for many reasons, the writer favours the third, in which the springs are employed for no other purpose than that of suspension of insulation from road shocks. Springing on the miniature car is of the utmost importance. Springs of ample length must be used and they must be flexible. In a large car, where the weight is so great that the torque of the axle never reaches more than a moderate proportion of it at a radius equal to that of the wheels, the proposition of driving through the springs is easier than is the case with a very light machine, in which the engine power is relatively high. Both on this account and because soft springing is essential for comfort on a light car, the use of separate torque and radius members is advocated. There are many pitfalls in the design of axle, torque and radius rods; indeed, as every designer knows, the whole ground, the whole question of light car design is studded with pitfalls. When progress is rapid experience is scarce and originality plays an important part. Let us have it in plenty. By such means is perfection most rapidly approached.

C.B.W.

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MORE ABOUT TYRE INFLATION.—A REPLY.

BY HENRY STURMEY.

I SEE Mr. Laird Nuttall is trying very hard to put himself right. But he is not, and his explanation of what happens in a tyre is as far from the mark as that of his friends, the pump vendors, who, a few months since, calmly told us—in correspondence in THE MOTOR—that the air was cooled *by its passage through the tube*, whereas, as I showed in my last—and as anyone can prove for himself—under compression, it is hot enough to burn the skin at the exit end.

Mr. Nuttall now gives us a very elaborate and correct explanation of what takes place during *the first few strokes of the pump*, and in quoting me he stops short before the passage in which I said "so for the first few strokes." *So far as those first few strokes are concerned*, he is right, and I have never disputed it. But it is so far as *those first few strokes only*. As I explained before, there will be a little pressure—and consequently slight compression—necessary to overcome the pressure of the valve, to overcome skin friction within the tube and to cause the air to move quickly along it, and the air passing at first into an "empty" tyre—i.e., containing air at atmospheric pressure only—is, as he says, expanded into and diffused throughout the interior of the tyre, with some slight cooling effect. What the pressure in the tube under these circumstances will be I cannot say, but it will be but slight, and *so soon as this pressure is reached*—whatever it may be—within the tyre, the conditions are altered. Let us see what happens then.

What takes place behind the tube is immaterial. The conditions within the tube line will be the same at all parts of its length when the valve is open, i.e., there will be air under pressure passing into a chamber—the tyre—which is also filled with air *at the same pressure*. The annexed sketch shows a section of a tyre at the valve. We now have a chamber—the tyre—with a branch chamber—the hollow valve stem and tube. Pressures within a chamber are at all times equal and opposite, and equal on all parts of the walls of the chamber, regardless of its shape. Hence, at the sectional point taken, we get equal and opposite pressures between A and B. I am supposing, for instance, that we have our tyre pumped up to, say, 50 lb. We then have a pressure of 50 lb. against the walls of the tyre at B, opposing a pressure of 50 lb. coming down the tube line under the force of the pump. The advance of the pump piston, however, raises the pressure first in the tube line, and the column of air within the tube advancing, it enters the tyre after the manner of a wedge—if it be permissible so to describe it—*compressing* the air already in the tyre to the same pressure which is being applied to the air in the tube line, and the pressure goes up correspondingly and uniformly throughout the tyre. There is no expansion and consequently no cooling.

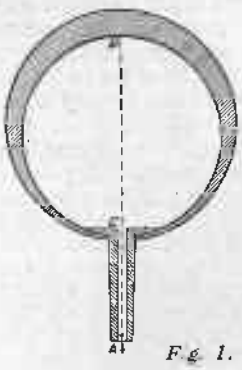


Fig. 1.

Mr. Laird Nuttall says that at this point, when the air leaves the tube and enters the tyre at C. it "*expands* over the whole available capacity" of the tyre—the italics are his. But to get expansion of a compressed gas we must have an atmosphere of less density for it to expand into. Gas cannot *expand* into a state of equal density to itself. And, as I said in my first article, *without expansion we cannot get temperature reduction*. Therefore it is plain that, *after the first few strokes of the pump*, air enters the tyre at whatever temperature it happens to be at in the tube, and that temperature rises rapidly as compression increases. Therefore no pump *can* pump cold air to the tyres throughout its operation.

I am afraid Mr. Nuttall's petrol can suggestion does not convince me, and as to his reference to my use of the word "volume," in the last paragraph of his letter, I used it in its dictionary (Johnson's, not Nuttall's) sense of "quantity," and as such it would be understood by readers of THE MOTOR, who, unlike my critic, have no reason to be hypercritical. Moreover, even here he is wrong, for, if the long-departed Mr. Boyle were here to explain his law to Mr. Nuttall, he would tell him that, as with the other law Mr. Nuttall so largely misapplies, "circumstances alter cases," and if other factors enter into the consideration they affect results. I said that, even if the weight of a car on the tyres flattened them till the load rested on the rim, the pressure would be but little increased, as the volume of air in the tyre would remain the same, and Mr. Nuttall tells me that the volume varies as the pressure, by which I understand him to argue that if, by such flattening, the pressure were raised, the volume must be raised simultaneously, and as that is impossible the flattening can make no difference to the pressure! In this Mr. Nuttall has again failed to allow for all the factors or to recognize the facts. Boyle's law is correct for calculations. In a receptacle *of given cubical capacity*, if the pressure is known, the volume of air, or gas, will vary as the pressure, and can be calculated accordingly. But *if the cubical capacity of a closed vessel be altered*, whilst the pressure will be different, the *volume will remain the same*, and that is what happens in the case of load upon a tyre. A tyre when inflated is round, or approximately so. But if a circle be flattened, whilst the linear measurement of its boundaries will not alter, the cubical contents may vary greatly and may even be reduced to *nil* (see Fig. 2). When extra weight is put upon a tyre the circle of the cross-section is flattened according to the pressure, and, in proportion to the flattening, so will the sectional area be reduced, with corresponding effect on the cubical capacity of the tyre as a whole. But, as this flattening takes place only at one point of the circumference and the flattening is but slight with a properly inflated tyre, the reduction in cubical capacity, and consequently the increase in the pressure, will, as I said, be but slight. Still, the pressure *will* be affected by the load on the tyre, but only to this extent, so that it is practically negligible.

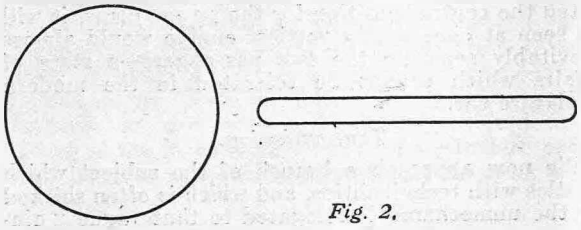


Fig. 2.

THE THRILLS OF MOTORING.

Piquant Sensations Denied to the Driver. Yet the Passenger, who Enjoys them, Never Speaks about Them.

WITH all that has been written about motoring, and the feelings and emotions arising out of it, it is curious that we have heard nothing of the impressions of the passenger—the person who has never once tried to drive a car.

To the experienced car driver, it is often a matter of interest to know exactly what is in the mind of the passenger, and to know whether the control of a car appears to him (we will adopt the masculine pronoun as being comprehensive) to be simple or difficult, whether emergencies seem to be well met or not, whether the driver's actions are, in the onlooker's opinion, reasonable or incomprehensible.

Yet the passenger seems to be strangely silent. One gets from him, during or after a drive, a mere expression of opinion that it was "most enjoyable" or "very fine," but neither verbally nor in writing does he seem able to convey his thoughts or his impressions, or to give us an insight into an interesting phase of life seen from a point of view from which we, as car drivers, can never hope to view it. For, once a man has controlled a car he has eaten of the tree of knowledge, and he can never see things again in the light from which he could view them in the days of his ignorance.

The motorist, acting for the time being the rôle of passenger, could only assume the outer garments and not the personality. He would be a motorist all the time, and would, inevitably, look at everything from a driver's view point. He could, at any moment, place himself, in imagination, in the driver's position, so that his state of mind would be similar to that of the driver, and his way of actually seeing a given set of circumstances would be influenced by his driving knowledge, and be entirely different from that of a non-driving motorist.

Apart from the fact that the story would, for its very novelty, be intensely interesting to the car-driving motorist, one feels that it should not be difficult to write. No more difficult, in fact, than sitting down to describe one's impressions of a flight in an

A STRIKING ILLUSTRATION.

The use of automobiles in western Canadian cities and towns is becoming more and more general. The accompanying photograph gives a good illustration of the popularity of the automobile in Regina, the capital city of Saskatchewan. The horse and wagon in the foreground are rather lonely. The scene shown above is a common one in Regina, and what may be said of Saskatchewan's capital may be said of other prairie cities. Of the 3600 automobile licences issued in Saskatchewan during the present year, 524 were issued to Regina citizens.

THE THRILLS OF MOTORING—Contd.

aeroplane, a ride on the footplate of a railway engine, a passage on a racing yacht or a racing motor boat.

We feel we could do a certain amount of justice, although probably not by any means all that it deserves, to each one of these subjects. We once went so far as to set out on a racing motor boat in a 100 kilometres international race in the Mediterranean, over a six-sided course of about 10 kilometres, with a different sea on each leg of the course. In the second round, when impressions were coming fast and furious, a shaft bearing began to show a tendency to heat, and the steersman relinquished the helm to us, and devoted his almost unremitting attention to the cooling and lubricating of the bearing. Gone for us were the thrills as we rounded the buoys, gone all the wonderings, the vague fears and alarms. In our second or third round, we were skimming the wicked flanges, just awash, of the buoys, with only inches between us and a ripped out strake, and with never a feeling or an emotion. The saving of so many seconds at every turn became a mere matter of calculation and judgment. As a passenger, each turn would have thrilled us to the marrow, and its safe accomplishment have left us with our blood aglow.

That is the kind of thing we want the passenger on the motorcar to tell us. He can point out to us those things which we do, which give the onlooker the impression that we drive recklessly. We know that the charge is too absurd to call for refutation, but, just as the cyclist coolly threads his way through the thickest of City traffic, whilst the observer of his movements from the top of an omnibus trembles for the wheelman's safety, so it may be that there are certain things we do which appear, to the uninitiated, to be dangerous and reckless. The helmsman of a racing yacht knows that, although his boat is heeling over under a press of wind until she is gunwale under, she will not capsize, but the passenger, not having his hand on the pulse of things, does not know it, so that he gets the thrills that are denied to the helmsman.

The passenger on a car has his judgment affected by a time error, for he sees practically simultaneously each problem and its solution. The driver, however, has dealt with the matter in a totally different manner. His brain has two distinct functions. One section studies the problem and provides the solution, which it passes on to another section of the brain to put into execution, devoting itself to the next problem in hand, and keeping a watch upon the previous one lest any new circumstance should occur to render it necessary to modify the plan of action first agreed upon.

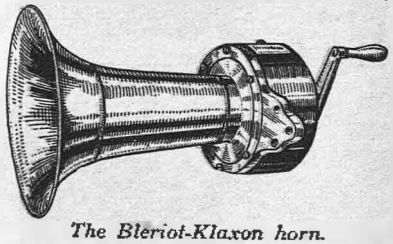
The negotiation of traffic, even the mere driving upon an unfrequented road, calls for a constant exercise of the faculties. Every turn or bend in the road, every house, cottage, cart, by-road or person entails thought and consideration, study and decision, so that a 100 miles drive may mean 10,000 problems—small and large—to be tackled, and due to this is the fact that motoring makes one so tired and sleepy.

The skilful driver who can thread his way through traffic merely deals with each problem as a distinct unit, and takes them all in rapid sequence, dismissing each as it is solved, and taking up the next without stopping to review the preceding ones. But the passenger does not, and cannot, so split them up, and the result is that he is taken off his feet, as it were, by the rapid flow of circumstance, and is in a maze, his only apparently logical conclusion being that the driver of the car is reckless—than which no conclusion could, as a rule, be more illogical.

So, as the passenger is the recipient of all the thrills and the piquant sensations and the inspiring excitations, he should tell us about them. For these joys are denied to the car driver, to whom everything becomes a matter of calm, cold calculation.

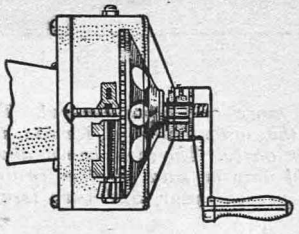
The Bleriot Mechanical Horn.

The Bleriot mechanical horn, which is a novel and an effective appliance, has just been introduced by Bleriot, Ltd., Bleriot House, Long Acre, London, W.C. It is very simple in construction and principle. A steel diaphragm disc vibrates rapidly under the impulses produced by a ratchet wheel driven by



The Bleriot-Klaxon horn.

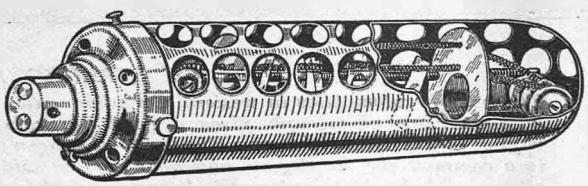
double gears, operated by a handle, and the sound thus produced is emitted by a horn. Only a very slight movement of the handle is necessary, and the attention required is reduced to the occasional oiling of the bearings. The volume of sound can be regulated by inserting thin cardboard washers between the diaphragm and the body. Any necessary adjustments can be easily and quickly made. There are two models, with large and medium-sized horns. The sound produced is claimed to be equal to that of the most powerful electric horn, without any of the complications involved by that system.



Mechanism of Bleriot-Klaxon horn.

Electric Bonnet Heater.

The appliance illustrated is claimed as an ideal method of frost protection for radiator and cylinders of motorcars. It comprises a spirally-wound resistance of special wire, suitably supported within a perforated aluminium tube. Being almost entirely composed of metal, it is practically unbreakable. With regard to the cost of working, this depends on the price per unit of current. The makers claim that the heater consumes only one-quarter of an electrical unit per hour, and as electrical energy is usually supplied for heating and power purposes at one penny per unit, the cost of operation is only one farthing per hour. As, however, private lighting current ranges from 3d. to 8d. per unit, according to the locality, the cost of working will be in proportion if used on this system. Simplicity of operation is one of its important features. The heater will fit any standard electric lamp-holder, and it is only necessary to place the heater inside the bonnet of the car and turn on the switch. It is made for circuits of 25 volts, 200 to 240 volts, 100 to 120 volts. Any further information about it can be had on application to Barimar and Co., 10, Poland Street, London, W.



An electric bonnet heater.

Messrs. Ward and Goldstone, Salford, Manchester, stock a very useful and handy dashboard inspection lamp, which is fitted complete with swivel ball bracket and nickel-plated shell reflector, and sells at the low figure of 5s., with auto-metal filament bulbs, 2, 4, 6 or 8 volts, 1s. 4d. extra. It is very easily attached, and the lamp's rays can be readily adjusted to any desired direction. The lamp can be wired to the accumulator, dynamo lighting set, or to a Volex giant dry battery.

SOME MINIATURE CARS.

Interesting Details of Some of the Recently Introduced Types of Popular Small Cars.

The Humberette.

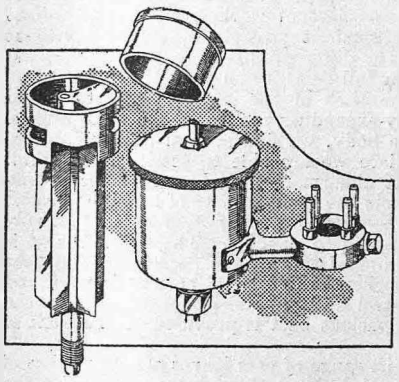
This little two-seated car, manufactured by the Humber Co., has now been before the public for some time, and comes with the additional recommendation behind it of the very great experience of the firm in the manufacture of small cars.

The latest Humberette is a machine of very light weight, of simple and straightforward construction, easy to handle, and inexpensive to maintain. The engine, which is of the twin-cylinder V-type, is air-cooled, and is placed in the normal position—in front—with crankshaft fore and aft, so that both cylinders get equally cooled, and cooling is also assisted by wind scoops under the bonnet. An external view of the little car from any aspect scarcely suggests the fact that the bonnet harbours an air-cooled engine instead of the usual water-cooled unit. The internal construction of the engine follows the best motorcycle practice on somewhat larger and more substantial lines. The crankcase encloses the flywheels, and both connecting rods work on the same crank pin which joins the two. The connecting rods, however, are not similar, the "king rod" principle being used: that is to say, the second connecting rod is merely a link joining the main big end to its gudgeon pin. The thrust of the second connecting rod, therefore, takes effect on the big-end bearing of the first or "king rod," so that both cylinders act on the same bearing surface, and, as they do not both exert their greatest pressures at the same time, by this method the equivalent of increased bearing area is obtained. The engine has a bore and stroke of 84 mm. by 90 mm. respectively, and the compression is moderate. An external flywheel is also used to accommodate the leather-faced cone clutch. The gearbox is bolted up to the crankcase, its casing partially enclosing the clutch and its mechanism. Three speeds and reverse are provided, actuated by a straight-through quadrant. An external band brake, foot-operated, works on the back of the gearbox, and double universal joints are provided on the propeller shaft, that at the rear taking the plunging movement due to the action of the springs.

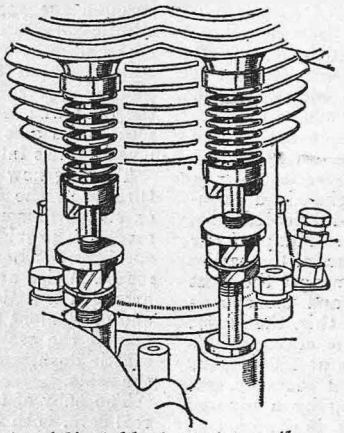
On the Humberette the whole transmission system has been very carefully thought out. The clutch is smooth in its action, the gearbox is very neat, and changing is simple and easy. The reaction of the bevel-driven axle is taken up partly by the rear springs (which are quarter-elliptics of good length) and partly by radius rods working beneath the springs and fitted with buffer coil springs. This system resembles the well-known Lanchester suspension, save that, instead of double radius rods which resist the torque (the one in tension, the other in compression), the spring itself does duty for the second rod.

The frame is tubular, and wire wheels, shod with 650 mm. by 65 mm. light-car tyres, are fitted. External band brakes work on the rear wheels, the hand lever applying them being conveniently mounted outside the body. The steering gear is of the rack-and-pinion type, the mechanism being enclosed in a dustproof case. The engine is controlled by means of an accelerator pedal, working in conjunction with a hand throttle mounted just under the steering wheel and an ignition lever on the centre of the column.

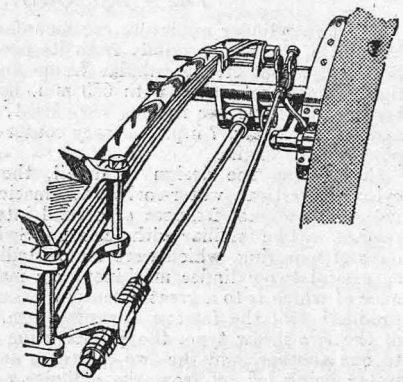
In practice, by far the most striking feature of the Humberette is the excellence of its springing. The front of the car is carried on a half-elliptic transverse spring, whilst the rear springs are quarter-elliptics, as has already been mentioned. This system of suspension has proved very successful for small cars, and the Humberette rides over pot-holes in a manner that many a large car might envy; for this very reason one is apt to forget at first, in driving the little car, how extremely light it really is—not more than 7 cwt. all on. The ample space and comfortable upholstery of the body, the



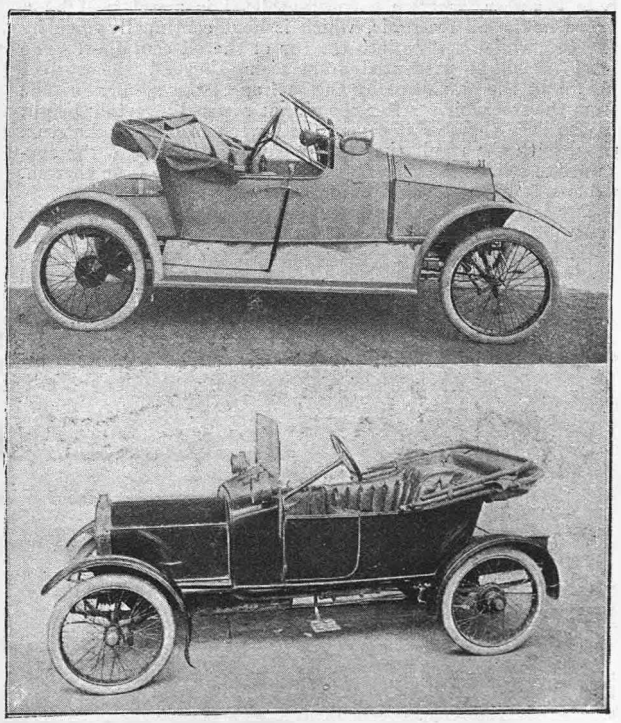
Four-jet carburetter on Humberette.



Adjustable tappets on the Humberette.



Rear band brake, quarter elliptic spring and radius rod on Humberette.



The Humberette (upper illustration) and the small Swift car.

MINIATURE CARS.—Contd.

protection afforded by the screen, and the unobtrusive running of the engine all combine to enhance this impression. At first, therefore, a little additional care should be exercised on corners and cambered roads.

The engine responds without hesitation to any movements of the accelerator pedal, however erratic, the four-jet automatic carburetter being of the same type as is fitted to the larger Humber cars. A small point of some importance is the very accessible position of the magneto, which is gear driven and right in front of the engine; indeed, accessibility has been well studied throughout, and the Humberette is essentially a vehicle to be looked after and wholly managed by its owner, save in those cases where it is used as an auxiliary to one or more larger cars.

The complete machine, fully equipped with hood, screen, and lamps, sells for the very moderate price of £125. Makers: Humber, Ltd., Coventry.

The 7 h.p. Swift.

The two-cylinder miniature car manufactured by the Swift Motor Co. differs materially from its predecessors in that it has a light but strong tubular frame and is equipped with light wire wheels, shod with 650 mm. by 65 mm. voiturette tyres. The little car is thus very light, neat in appearance and low built, and 7 h.p. is a very conservative rating for the power of the engine.

Considering the design in detail, the engine is a twin-cylinder, vertical, water-cooled, automatically-lubricated unit, possessing several features of special interest. Many of our readers will be familiar with the small Swift cars of the earlier days of motoring, which were undoubtedly amongst the most successful two-cylinder machines ever made, and the experience of which is to a great extent embodied in this, the latest, production of the famous Coventry firm. The crankshaft is of the two-throw type, the cranks being thus at 180 degrees to one another, and the two cylinders are cast together, the water being led off from the cylinder casting by a pipe of ample dimensions. Thermo-syphon circulation, in conjunction with a neat design of radiator, is relied upon, and the water spaces round the valves are large. The valves are all on one side, the camshaft being driven through a train of gears. The magneto is mounted in front of the engine on the distribution-gear casing itself, and is driven by skew gears off the end of the camshaft. The tappets are adjustable, and a neat cover plate encloses the valves.

The lubrication system of the engine is particularly interesting. Cast integrally with the crankcase is an oil reservoir, located on the same side as the valves. Oil is admitted to the base chamber, wherein a constant level is maintained by a valve in the oil reservoir, which is kept continually open by the cap, which screws into the top of the oil container. The level of oil is prevented from rising beyond the correct height in the crankcase by the sealing of the admission pipe from the reservoir. After the oil has reached a certain height in the base chamber it covers the lower end of the admission pipe, with the result that no air can pass back into the container to relieve the vacuum which commences to form therein. Thus a constant level is automatically maintained.

The latest type of Longuemare carburetter is fitted, and is controlled by means of an accelerator pedal.

Careful attention has been paid to the balancing of the engine, balance weights being bolted to the crank webs, and the crankshaft, which is made from the finest nickel chrome steel, and, together with the flange to which the flywheel is bolted, is forged in one solid piece. The engine dimensions are 75 mm. bore by 110 mm. stroke, and the power is transmitted through a leather-faced cone clutch to a miniature car type of gearbox, and, to compensate for any minute imperfections in alignment which may occur, a moderate degree of flexibility is allowed in the connection between the clutch and the gearbox. The latter provides three speeds and reverse and is controlled by a gate. Accurate alignment is assured by the method of constructing the sub-frame on which engine and gearbox are carried; this consists simply of two stout tubular members carrying brackets, on which engine and gearbox are mounted. These brackets are machined after the sub-frame has been brazed up with its cross members and before it is finally attached to the main frame by short tubes and brazed joints.

From the gearbox power is transmitted to the bevel-driven rear axle through a propeller shaft, which is enclosed in a tubular torque member. This torque member is flexibly connected to the cross member of the frame at its forward end and does not transmit the thrust of the axle, this being taken through the springs. The chassis is mounted on four half-elliptic springs of good length in proportion to its size. The rear axle is a very neat piece of work, its size and weight being reduced to the smallest possible dimensions without sacrificing strength. The differential is of the bevel type, and the road wheels run on ball bearings on the axle casing. The foot brake acts on the back of the gearbox, and the hand lever applies internally-expanding brakes on the back wheels.

Turning now to the body, we find several interesting features. In the first place we are able to testify from a full extension of somewhat abnormally-long legs that the accommodation provided meets the requirements of even the largest specimens of humanity—a point worth noticing now that tiny road vehicles are becoming so popular. The driver's seat is arranged a little in front of that of the passenger, and neat and convenient little lockers are provided both in front of and behind the seats. Petrol and oil tanks are mounted in the scuttle dash, and a capacious boot is provided at the back of the seats.

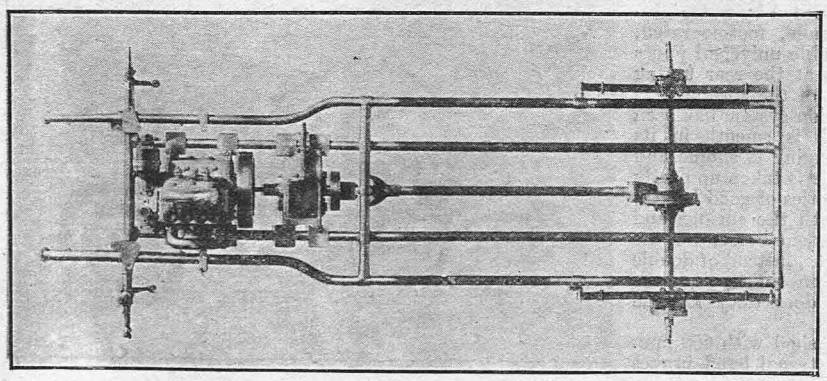
The baby of the Swift range of cars leaves an impression of real care, both in general design and workmanship and in the selection of suitable materials. The convenience of the owner, who will, of course, also be the driver and look after the car himself, has been studied in a manner that leaves little to be desired.

Completely equipped, the little car sells for £125. Makers: Swift Motor Co., Ltd., Coventry.

The Singer 10 h.p. Light Car.

The Singer is undoubtedly one of the most original and successful of the small four-cylinder machines which are rapidly swelling the ranks of the popular motoring.

Taking the chassis in detail and commencing with the engine, this is a beautiful example of modern practice in miniature. Unlike many, however, the cylinders are not cast en bloc, but in pairs. Cooling is on the thermo-syphon principle, the radiator being of the well-known Singer pattern on a small scale. From the cylinder castings the water passes to the radiator through piping, which is forced to allow the induction from the carburetter to pass through a grid, all round which the hot water flows, so that the incoming charge is warmed in its passage to the intake manifold. The contrary effect of cooling the heated water rising from the cylinders should also be beneficial. The Claudel-Hobson carburetter is fitted in a very accessible position on the offside of the engine, and the valves on the nearside are neatly enclosed. The magneto is also located on this side and is driven by spur gears, no chains being used in the distribution gear. The crankshaft runs on three large main bearings, and the lubrication system is very thorough. A small gear pump, driven off the back end of the crankshaft, draws oil through a filter from the sump and delivers it both to a gallery cast integrally with the base chamber and to a copper pipe running along the outside of the engine; from the former the main bearings are fed, whilst the latter delivers oil to troughs underneath the big ends of the connecting rods. The oil splashed up by the dippers on the big ends also runs into the troughs which feed the main bearings, so that the provision of a positive supply thereto is simply a precautionary measure. The level of oil in the sump is indicated by a float.



Plan view of Swift light car chassis.

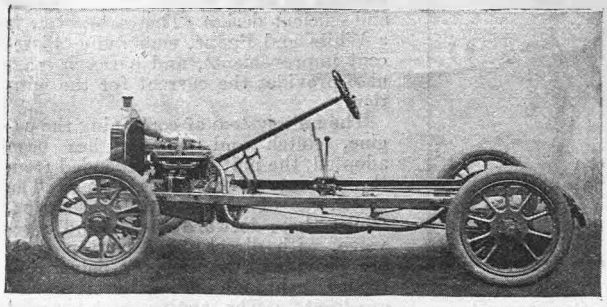
MINIATURE CARS.—Contd.

The valves are exceptionally large in comparison with the cylinder dimensions, 63 mm. bore by 88 mm. stroke. By the use of large valves, having a comparatively small lift, a very good cam action is obtained, the valves remaining fully open for a longer time than is possible with a big lift on the cam, and at the same time a large area is afforded for the passage of the gases.

The Singer light car on the road.

Within the flywheel is an inverted leather-to-metal cone clutch, enclosed and working in oil, and the universal joint of the propeller shaft is situated within the same casing, so that its overhang in relation to the rear crankshaft bearing is reduced to a minimum.

The details so far described are mainly conventional examples of good modern practice in light car construction; but the outstanding feature in the whole design of the Singer is undoubtedly the arrangement of the gears within the back axle. The plan adopted differs materially from many designs in which the gearbox is located on the back axle, and it is more just to say that the change-speed mechanism and the axle have been ingeniously combined than to describe the arrangement as a gearbox on the back axle. The drive is taken direct off the bevel pinion on to the lay shaft, on which is mounted the crown wheel, the reduction being in the ratio of 2⅔ to 1. The pinions providing the three forward speeds and the reverse are always in mesh, the selection being made by means of dog clutches. The drive, of course, passes in each case through the differential, which is of spur-pinion type, and operates on the axle-driving shafts in the usual way. This arrangement of the layshaft parallel with the axle-driving shafts instead of the more usual plan of setting it parallel with the propeller shaft, leads to a very neat design, and the speeds of the pinions are somewhat lower than is ordinarily the case, which makes for quiet running and easy changing.



The small Singer chassis.

The increased stresses have been allowed for in the design of the gears, which are cut from the toughest steel. Ball bearings of ample dimensions are used throughout. The three reductions are in the ratios of 1.69, 2.35 and 3.46 to 1, and these must be multiplied by the ratio between bevel and crown wheel to obtain the gear ratios. These then are, 4.65, 6.46 and 10.5 to 1. The axle is braced by a tie rod underneath, and the torque is resisted by a light triangulated member on the near side of the propeller shaft anchored at its forward end by means of a spring buffer mounted on trunnions.

The chassis, the frame members of which are of pressed steel, upswept behind and inswept in front, is mounted on four semi-elliptic springs of good length, those at the rear being provided with neatly designed coil spring shock absorbers. The brakes are of the internally-expanding type concentrically mounted on the back wheels.

The steering, which is of the usual worm and sector pattern, is exceptionally facile in action—indeed it may almost be operated by one finger. We found in the course of a trip on the road that the body is not only pleasing in appearance but is very comfortable, and affords all the leg room both for driver and passenger which one expects, but does not always get, on a large car. The seat is low and tilts at a very comfortable angle, and the forward part of the floorboards is sunk several inches below that immediately in front of the seat, so that one's whole anatomy takes up an easy and natural position.

We were challenged to attempt to make a noise in gear changing, but were completely unable to extract the usual grating sounds associated with a bad change. A little practice is required to get the gears in and out quickly when coming through the gate, but the change from second to third and vice versa can be made without the slightest noise or difficulty.

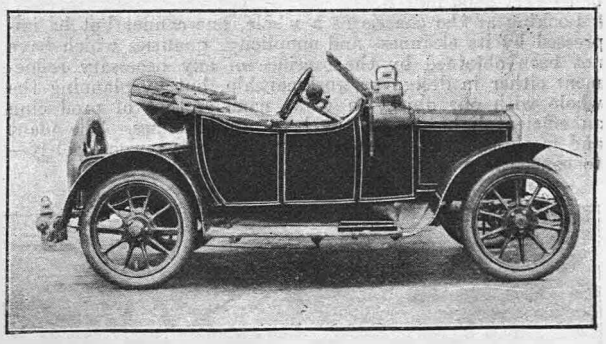
A hand throttle and accelerator pedal control the carburetter, whilst ignition is fixed. The equipment includes five Sankey steel detachable wheels, shod with 700 mm. by 80 mm. Dunlop tyre. The wheelbase of the little car is 7 ft. 6 in., the track 3 ft. 6 in., and the price fully equipped £185. Makers: Singer Motor Co., Ltd., Coventry.

The Perry Light Car.

This product of the Perry Motor Co., of Tyseley, near Birmingham, is a miniature car of very clean and straightforward design.

The unit construction of the engine and gearbox has been adopted; the latter, being bolted on to the crankcase of the engine, forms also the flywheel casing, the arrangement resulting in a very neat and simple-looking power plant.

The engine is of the twin-cylinder vertical type, the bore and stroke being 72 mm. and 108 mm. respectively. Both pistons work on the same crank, and therefore fire at even intervals. The crankshaft carries balance weights, and the



The Perry small car.

pistons and connecting rods themselves have been kept as light as possible in order to minimize the unbalanced force. Cooling is on the thermo-syphon principle, a neat design of radiator, rather high and narrow, being employed in conjunction with two very ample connections to and from the cylinder casting.

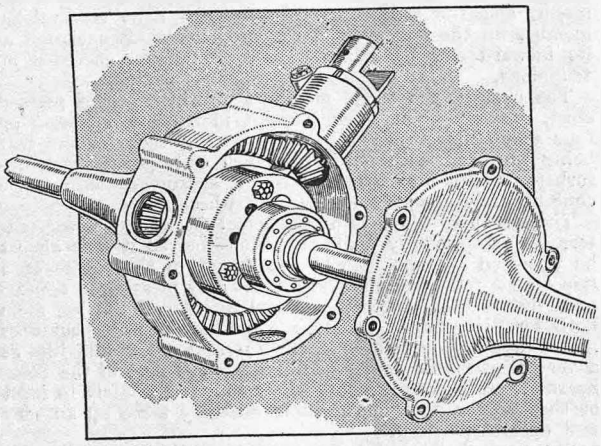
Oil is fed from the tank on the dash through an adjustable sight-feed drip and is distributed by splash. The valves are enclosed by an aluminium cover-plate, and the carburetter is mounted close up to the cylinder casting, and is controlled by means of an accelerator pedal. The magneto, which is mounted in front of the engine, is driven direct off the end of the camshaft.

A metal-to-metal cone clutch within the flywheel transmits

MINIATURE CARS.—Contd.

the power therefrom to the three-speed-and-reverse gearbox, which is controlled by means of a straight-through quadrant working beside the hand-brake lever.

Originally designed with worm-driven back axle, the worm being overhead, the Perry light car will in future be bevel-



The new bevel drive on the Perry light car.

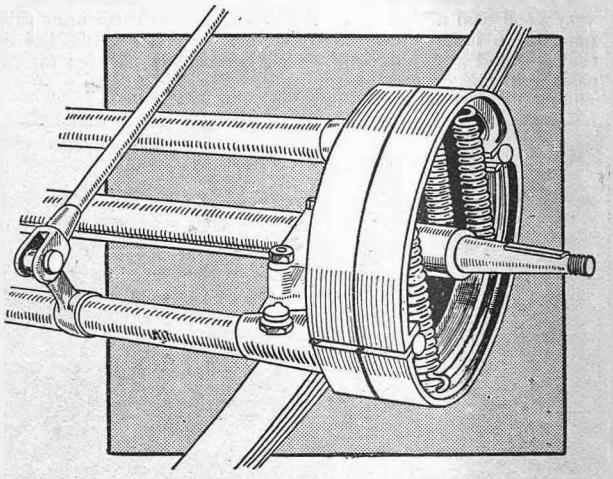
driven. On the occasion of a recent visit we were shown the first example of the new bevel-driven axle, which is a very neat job, Hoffmann ball and thrust races being used throughout. The differential is of the spur-pinion type, and easy means of adjustment are provided, both for the bevel pinion and the crown wheel, a point which is of importance, seeing that these little vehicles are essentially for those who look after their cars themselves. The brakes are of the internally-expanding type, mounted side-by-side on the back wheels, and are of exceptionally large dimensions for the size and weight of the little car.

The frame is constructed of pressed steel side members, which are upswept at the rear, and the springing—perhaps the most important item in the design of any small car—has been very well carried out. The chassis is mounted on four semi-elliptic springs, those at the rear being of exceptional length. Coil-spring shock absorbers, of the well-known type used on several makes of large cars, are fitted in place of the ordinary shackles at the back. The torque of the axle is resisted by the rear springs, no separate torque or radius members being used. Both the springing and the transmission are exceptionally sweet in action.

The car is equipped with a neat and comfortable body, with high side doors and hood and screen, the protection afforded being very good indeed.

Looking at the chassis as a whole, one cannot but be impressed by its cleanness and simplicity, qualities which have not been obtained by the sacrifice of any necessary refinement either in design or workmanship, but by planning the whole with one object in view, namely, that of producing an efficient light car on the best possible lines. The plant and machinery have been laid down for this purpose solely—to concentrate on the production of the one article.

The standard equipment also includes five detachable steel wheels, shod with 700 mm. by 80 mm. Dunlop tyres, side and tail lamps, and tool kit. The wheelbase of the little car is 7 ft. 1 in., the track 3 ft. 6 in., and the car, completely equipped, sells at the very moderate price of £130.



The internal expanding brake on the Perry light car.

The Calthorpe Miniature Car.

Identical in almost all respects with its larger prototypes, the latest addition to the range of Calthorpe models is a miniature four-cylinder car on standard lines.

The cylinders are cast en-bloc, and thermo-syphon cooling is employed, in conjunction with a radiator of the usual Calthorpe pattern on a reduced scale. A multi-disc clutch conveys the power to the gearbox, which is mounted separately from the engine, and provides three speeds and reverse, controlled by a gate.

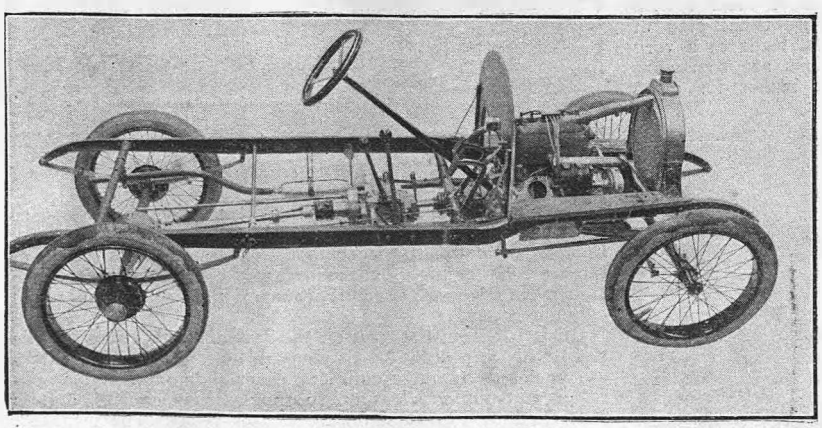
The rear axle is bevel driven, and the chassis, which is of the standard type with pressed-steel side members, is mounted on four semi-elliptic springs. A novel feature is the shackling of the rear springs at their forward ends, the drive from the back wheels being thus taken through their backward extremities.

The general impression of the design of the baby Calthorpe is one of neatness and compactness and a careful attention to detail, whilst the workmanship is very fine. The engine is mechanically lubricated by a pump driven off the back end of the camshaft, and the valves are enclosed. The little car is equipped with detachable wire wheels and is priced, complete, at about £150. Makers: Calthorpe Motor Co., Cherrywood Road, Bordesley, Birmingham.

The Morris-Oxford.

The Morris-Oxford light car is noteworthy for the adoption of component parts of a very high grade. The engine has been specially designed by Messrs. White and Poppe, Ltd. It is four-cylindered, the cylinder dimensions being 60 mm. bore by 90 mm. stroke, and the casting being en bloc with inlet and exhaust manifolds cast integral with it. The valves are on opposite sides, thus permitting them to be of large diameter. The tappets are adjustable, and they are enclosed by aluminium plates. A three-bearing crankshaft of ample size is employed. The engine is water-cooled, and, as the thermo-syphonic system has been adopted, the water channels are of large area. The radiator is of V shape and of special and efficient design. The carburetter is a White and Poppe, embodying all recent improvements, and a Bosch magneto provides the current for the ignition.

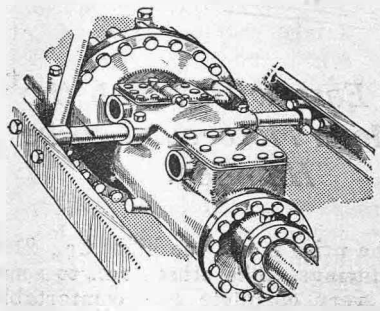
The unit system of combining the engine, clutch and gearbox has been adopted, the unit being suspended from three points of the main frame. The clutch is of the multiple-disc type, whilst three forward speeds and a reverse, with direct drive on top gear, are provided, the changes being controlled through a gate type of quadrant. The engine is lubricated



Calthorpe small car chassis.

MINIATURE CARS.—Contd.

under pressure from a pump which circulates the oil drawn from the sump, an indicator being fixed to the dash for the purpose of showing that the system is in order. The frame is of pressed steel, deep in section and of ample strength. The front axle is of H-section forged steel, whilst the rear axle is of the full floating type, the power being transmitted to the road wheels through worm gear. The driving shafts are easily removable without dismantling the axle, whilst the worm drive and differential are also easily removable for inspection.



Gear box end of the power-unit of the Morris-Oxford car

The propeller shaft and universal joints are entirely enclosed in a torque tube of large dimensions, so that the whole power and transmission system is entirely enclosed and protected.

Hoffmann ball bearings are employed in the gearbox, in the road wheels, and in the back axle. Steering is effected through a worm-and-sector gear, the sector forming part of a complete pinion, giving four changes of teeth, thus increasing its wearing capacity. The weight is carried on 32 in. semi-elliptic springs at the front, and 40 in. three-quarter elliptic to the rear axle. Sankey's steel detachable wheels are equipped with 700 mm. by 80 mm. Dunlop tyres.

The body is a smart two-seated flush-sided torpedo of up-to-date design, painted grey, and upholstered in real leather, brass fittings being employed throughout.

The price of this car is £175. Makers: W.R.M. Motors, Longwall, Oxford.

The 8 h.p. Globe Light Car.

The most unorthodox feature of the Globe car is undoubtedly the flat belt drive from a pulley on the engine shaft to the two-speed and reverse gearbox situated under the driving seat. The engine, an 8 h.p. Aster, 105 mm. by 120 mm., is set across the frame behind a gilled-tube radiator, and the carburetter fitted is a Claudel-Hobson, with a hand-controlled extra air valve on the induction pipe, and the throttle control is by an accelerator pedal. The change-speed lever works in a gate quadrant, mounted outside the body, and the final drive from the gearbox is by a roller chain to the off-rear wheel. The gearbox, operating levers, brake, and back axle are mounted together on an under-carriage, which can be moved backwards or forwards relatively to the frame. This under-carriage is drawn backwards by a strong spring, which puts tension on the flat belt. When the large centre pedal is depressed the tension of the belt is relieved, and the belt is thereby enabled to slip, thus providing the necessary clutch action. We had an opportunity recently of observing the running of one of these cars over a distance of about 70 miles, and as a result the flat belt drive proved quite suitable for light car work. Although we negotiated several stiff hills, it was only necessary to come off top gear on two occasions, all starting being done on top gear. This ability to keep to one gear is due to the fact that a flat belt can be arranged to slip progressively, the slip being controlled by pressure on the pedal. At the same time, no slip occurs when the pedal is fully released. Up to about 25 m.p.h., the big single-cylinder engine does not make its presence felt, but above that speed there is a certain amount of vibration, which never becomes excessive. The petrol consumption is very slight, in this case being 43 miles per gallon, which no doubt is largely due to the auxiliary air valve provided. The lubricating oil flows to the engine through a sight-feed lubricator set on the footboard, at the rate of 1 drop every 20 seconds, so the oil consumption is very small. The car is very speedy, the maximum being over 40 miles per hour, and the springing, even at high speeds, is very comfortable.

The Globe sells complete with hood, screen, speedometer and lamps, for £152, the makers' address being Globe Cars, Ltd., Duke Street, Manchester Square, London, W.

The Tyseley Light Car.

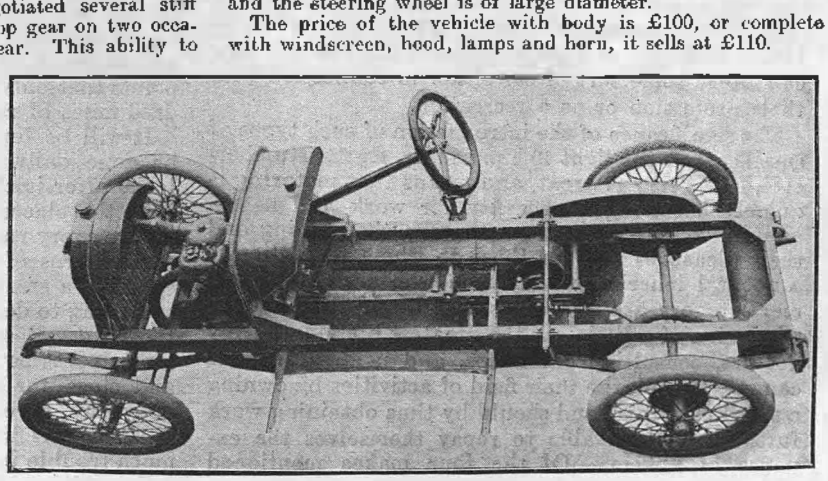
This small car, which has been recently introduced, is a comfortable two-seater equipped with scuttle dash, hood, screen and cupboard at the rear for the spare wheel, tools, and sundries. The car presents quite an attractive appearance, and looks what it is, a light car with nothing freakish about it. The mechanical details are as follow:—The engine, clutch and gearbox are combined in a self-contained unit supported by bracket arms on the side members of the frame. The engine is two-cylindered, the cylinders being set at an angle of 60 degrees to one another, magneto ignition being employed, and the lubricating oil delivered by pump to the working parts of the engine and gearbox. The cylinder dimensions are 3¼ in. bore by 4 in. stroke, and the normal engine speed is 1200 r.p.m., the R.A.C. rating being 8.4 h.p. The flywheels are contained within the crank-case, so that the whole power unit presents a particularly neat and clean appearance. The gearbox gives two speeds and reverse, and as the total weight of the car complete is but 8 cwt., the low speed need only be requisitioned for starting and for steep hills. The power is transmitted by a propeller shaft, suitably universally-jointed, to a bevel gear-driven rear axle. The front axle is of H-section steel. Irreversible steering through a worm and pinion is provided, and there is not only ample facility fo radjustment, but the worm pinion can be turned into four positions, thus giving four times the life to this important component of the steering. The brakes are ample, a foot-operated brake acting on a drum at the rear of the gearbox, and the internal-expanding brakes acting on the rear wheels operated by a lever. The wheels are of wire and detachable, and they are shod with 650 mm. by 56 mm. Dunlop tyres. The wheelbase is 7 ft., and the track 4 ft., the price of the car, complete with hood, screen, lamps, tool kit, spare wheel and tyre, being 160 guineas. Makers: Tyseley Car Co., Tyseley, Warwickshire.

The A.C.E. Light Car.

The A.C.E. car is made by the Salmon Motor Co., Ltd., of Burton-on-Trent. The power unit is a four-cylinder engine (56 mm. by 76 mm. stroke) with its cylinders cast en bloc, while a large water outlet on top allows for an easy flow of water, circulation being thermo-syphonic. The valves are all enclosed with neat aluminium plates, and the camshaft is driven by skew gears. Forced lubrication is employed, and a Binks carburetter is fitted.

The clutch is of the single-plate variety lined with Ferodo, and transmits the power to a gearbox giving two speeds forward and a reverse, the ratios forward being 6 to 1 and 14 to 1. At the back of the gearbox are placed two bevels suitably enclosed in an aluminium case, and the power is conveyed from these to the "live" back axle by a chain. The frame is constructed of channel steel, well strengthened by cross-members, and is isolated from road shocks by half-elliptical springs in front and quarter-elliptics at the rear. Steering is geared, and the lock provided allows the car to be turned in a small space, and the steering wheel is of large diameter.

The price of the vehicle with body is £100, or complete with windscreen, hood, lamps and horn, it sells at £110.



The chassis of the Globe flat belt-driven car.

THE LADY ON THE CAR

Motorcar Driving as a Popular Occupation for Ladies.

The Ease with which the Modern Motorcar can be Handled.

THE subject of the driving of cars by ladies grows more important every day. The word "driving" is best kept to its literal meaning, and not extended to the general management of the motor, as it is to the larger percentage of ladies who drive, or intend to learn to do so, irrespective of the point as to whether they understand the mechanism or not, that this article is meant to appeal.

On the road to-day are seen numbers of ladies driving about the country unattended by chauffeurs or male companions, who very certainly would answer, if asked the meaning of the differential: "Isn't it something to do with arithmetic?" and would have the same vague ideas of all technicalities. It is not my intention to discourage women from understanding the mechanism of their cars, far from it, but merely to emphasize the fact that none need be deterred from driving owing to the lack of knowledge of machinery. Neither is there necessity for them to refrain from enjoying the pleasures of the road because they cannot afford a chauffeur, nor, in these days of motoring improvements, can initial cost be called a stumbling-block, for tiny cars can now be purchased from £90, which, although of cyclecar type, are vastly superior for ladies' use to a motorcycle as regards seating accommodation, convenience for dress, and cleanliness. Therefore the wave of popularity of motor driving for ladies can range from low ebb to high tide in monetary matters.

As this is the Popular Car Number of THE MOTOR, it will be even more widely read than usual, and copies will come into hands that do not regularly take up a technical journal; among this number will doubtless be many professional women who are hovering on the brink of decision as to whether or not they can afford some sort of car either in connection with their profession or as a recreation.

The significance of the introduction of such types of small cars as the light 10 h.p. Singer, Swift, Humberette, and Perry is great, and means that motoring is quickly becoming a necessity for work and health equally to those who have to earn their living and their pleasures and for those to whom recreation is a natural inheritance. Women who are in the former category are now a vast band, and will find the possession of a little car the greatest blessing. Lady doctors, consulting gardeners, and poultry farmers can greatly enlarge their field of activities by owning a small motorcar, and should by thus obtaining work further afield be able to repay themselves the expense of upkeep. Of the four makes mentioned above, the Singer is the most expensive in first cost, but is a really sound little car, and can be strongly recommended, if the price is not too high, i.e., £185 complete with all fittings. The others run to some £60 less, and are very complete and comfortable little machines. All are easy to drive and manage.

Those who can only afford £80 or £90 should not be dissuaded from purchasing one of the types of excellent cyclecars supplied at that price. Very quickly is the handling of these small automobiles learnt. Only recently I heard of a lady who knew nothing of motorcars (and less of their internal mechanism) who, after a few lessons, was driving her little motorcar about quite alone, and is now constantly in it without any companion. The reliability of practically every modern car makes instances like the above very common, and one example, as a stone thrown into water, increases the popularity of driving by ever-widening circles.

Many enjoy driving without wishing to be bothered about mechanical details, and do not care to be accompanied by a chauffeur; these can now satisfy their wishes, and may take their cars out unattended, feeling every confidence that they will not be left in difficulties miles from help, for should such an untoward event as a breakdown occur, with the modern motoring organizations and their scouts, assistance is generally near at hand.

Then again, there are women who say that they cannot afford a man of any sort to look after a car, or merely a boy for washing and cleaning, and who have not the time or the inclination to pay much attention to the mechanism, although they are willing to do the few necessary things, if not entailing dirtiness or much knowledge of machinery. These people need not be deterred from motoring. For them it will be best to get a few lessons from a good motor engineer, and take particular note of what is necessary to be done before every run, and those points that only require attention after several hundred miles of running.

It will be found that there are but few things to be done daily. The up-to-date lubrication system looks after itself to a great extent; the maker will state the places that require the notice of the oilcan before every run. After the filling of the petrol tank, a few turns of the greasers on the steering joints, etc., and a small amount of attention to the clutch—according to design—and the car should be ready for the road. Respecting cleaning, good overalls with long sleeves bound into the wrist with elastic bands, and clogs for one's feet while washing down the bodywork, save clothes and temper wonderfully, and if the car is washed quickly after use there is not much trouble in keeping it spick and span.

Regarding the actual driving, the temperament of the driver has to have some consideration, but

THE LADY ON THE CAR.—Contd.

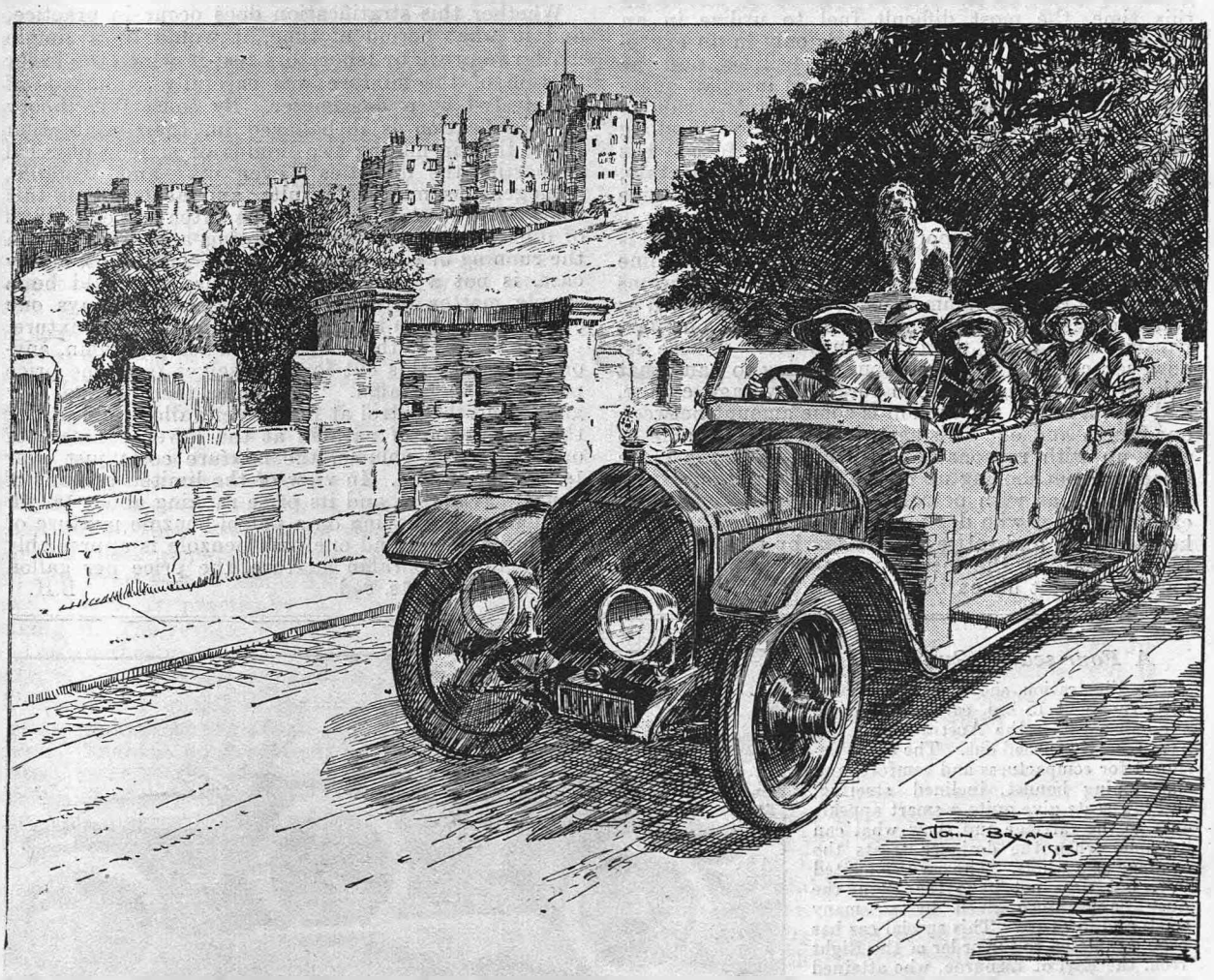
it is a curious fact that members of the feminine sex who are nervous by nature have great confidence in motors, and when encouraged to drive themselves and to find out how completely a motorcar can be under control, their nerves become much stronger, and they feel in time capable of driving wherever they may wish to go, through thick traffic or on the open road.

A car with a light clutch should be chosen, as in hilly districts it becomes a tax on most women to depress constantly a stiff pedal. The Metallurgiques have a good design in this respect, and cars that have multiple disc type clutch are seldom tiring. Here again, the advantage is apparent of the introduction of the new small type cars previously mentioned, as the driving of these is very light and suitable to ladies who cannot stand any fatigue.

It may be well to mention that although these little cars are noted as being the easiest and lightest to handle, it is not meant that the average woman who likes sport in any form will find a large car in the least too much for her to manage. All the best makes have beautifully flexible engines, which causes gear changing to be almost non-existent. The steering, when well designed, makes the guiding of big cars a simple matter, although from experience I would here recommend a careful choice in tyres for the front wheels, as very large, heavy ones sometimes make turning and manœuvring hard work.

A drive through London's crowded streets in a 60 h.p. Napier will, I feel sure, be a revelation to those who are nervous about driving a high-powered car. The ease with which these big cars can be controlled will be sufficient proof that it is not necessary for ladies to contemplate merely the handling of the wheels of small automobiles. Should the starting up be a lion in the path of those who are fortunate enough to be able to purchase a 40 h.p. or 60 h.p. machine, the many self-starting devices now on the market overcome any difficulty of this description.

The material advantages and the mechanical possibilities of ladies motoring having been considered, a word may be said as to the healthful and artistic reasons why our sex should be encouraged to own and drive cars. Even doctors do not disagree upon the health-giving properties of fresh air. There certainly cannot be found any occupation that supplies as much of this commodity in such a short time with as little bodily exertion. For those, too, who are the victims of sleeplessness, there is nothing to equal the driving of a car as a cure. MECHANISTE.



THE LADY ON THE CAR.

The modern car is so reliable and so easy to manage and control that a lady can drive with her lady companions without the attention of a chauffeur. In the picture the Lion Bridge, Alnwick, and Alnwick Castle are shown.

E1

PETROL-PARAFFIN OR BENZOLE-PETROL?

A Discussion on the Mixing of Fuels to Bring About Economy in Running.

THE possibilities of these mixtures as a means of economizing in the fuel bill are creating a considerable amount of interest just now, and it is therefore worth while going a little deeper into the practical aspects of the question as it concerns the private-car owner. Paraffin, unlike benzole, comes from the same base as petrol, and therefore the petrol-paraffin mixture would strike one, in a general way, as being a more workable one than the benzole-petrol mixture, and it also shows up more favourably in the matter of first cost, paraffin ranging from 8d. to 10d. per gallon as against benzole 1s. to 1s. 2d. per gallon when bought in the usual moderate quantities to which the private-car owner is limited.

But to set against this apparent advantage of paraffin is the fact that one is strictly limited to the proportion of paraffin that can be mixed with petrol to give satisfaction, whereas with benzole one can use any proportion of it with a given quantity of petrol and obtain satisfactory results. To what extent it is possible to economize benzole would seem, therefore, to depend on the quantity of it that can be obtained, which at present is not by any means great. Paraffin by itself is, as is generally known by this time, the most difficult fuel to utilize in an ordinary carburetter; in fact, it is only in an exceptional instance or so that it can be utilized, and the only reason why it can be used mixed in small quantities with petrol is that a limited quantity can be atomized or broken up sufficiently and carried along with the petrol vapour into the engine before it has time to condense back again into its liquid state, which state renders it useless as a fuel in the engine cylinders.

As to the exact proportion of paraffin which it is practicable to use, every car owner must determine this for himself. The general experience so far seems to point to the maximum amount that can be used as equal to one-third the volume of petrol, i.e., one part paraffin, two parts petrol by measure. There is, however, considerable testimony coming to hand that this proportion is too high for the average engine, and that a better proportion is some amount between one-fourth and one-fifth part, if one is to be able to start up with reasonable ease, and have the same freedom from sooting up of the valves and sparking-plug points as with petrol alone. This is just what each car owner who desires to economize in fuel must keep in view and settle for himself by making a few trials—what is the best maximum proportion of paraffin to suit his carburetter and engine.

One result of using this mixture that seems to be fairly generally experienced is that the engine runs hotter than with petrol, even when the smaller proportions of paraffin are used. A likely explanation of this is the fact that a slower-burning mixture is obtained as compared with all-petrol, and thus more heat is transmitted to the cooling water during the later part of the firing stroke, and also during the exhaust stroke. This, in theory at all events, means loss of energy, but whether it is enough to show up in practice is not clear. So far, there is no general complaint that the petrol-paraffin mixture causes loss of power.

A possibility in using this mixture that must not be overlooked is that, when the car has to stand for any length of time, "stratification" of the two liquids may occur. The paraffin being the heavier liquid, that is, it has a specific gravity of something like 840 degrees as against the 720 degrees of the petrol, it would gradually settle down to the lower part of the tank. The consequence one would expect is that all paraffin would first of all flow to the carburetter and render it impossible to start up.

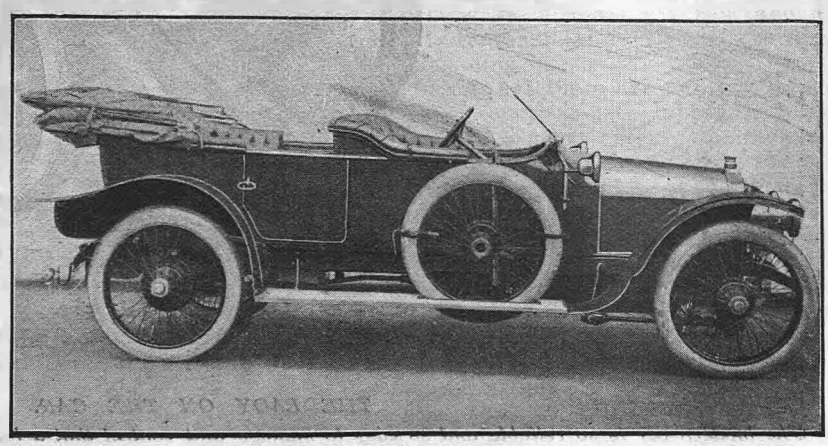
Whether this stratification does occur in practice, and in what period of time, it would be a simple matter to prove by laboratory test in which the lower portion of the mixture was carefully syphoned off and tested by a densimeter. By some this theory of stratification is disbelieved in, their contention being that in mixing two liquids of similar physical properties the densities "even up," and a stable, homogeneous mixture results, and as proof of this they point to the fact that one often mixes petrols of different gravity without noting any difference in the running or ease of starting up. The point, in any case, is not a serious one, because it would be a simple matter to cause, in a number of ways one could think of, an initial "shake-up" of the mixture.

With regard to the net saving in using paraffin, anyone can work this out for themselves from the price paid for the paraffin. If this be taken as 8d. per gallon and the petrol at 1s. 9d. per gallon, and taking the proportion of paraffin at the lower estimate of one-fourth the volume, the mixture costs just over 1s. 5d. per gallon. In view of the limited amount of benzole available, and its price ranging about 1s. 2d. per gallon, the saving on a petrol-benzole mixture of two parts petrol and one part benzole is appreciably less than the paraffin mixture, the price per gallon working out at 1s. 6½d.

B.H.

A Four-seated Runabout.

The illustration shows a very smart little runabout 15 h.p. car, one of quite a number which the Austin Motor Co. have recently turned out. The car is designed for compactness and comfort, and the sloping bonnet, inclined steering, and low seats give quite a smart appearance to the carriage and show what can be done when the designer treats the carriage as a whole. The car is mounted low, but does not have that "in the dust" appearance given by so many small and low cars. This special car has been completed to the order of the Right Hon. the Earl of Lisburne, who attained his majority on the 15th February.



A smart 15 h.p. Austin car.

The Motor

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Conducted by
EDMUND DANGERFIELD.

Proprietors: TEMPLE PRESS LIMITED.
7, 9, 11, 13, 15, Rosebery Avenue,
London, E.C.

Telegrams: "Pressimus, Holb., London."
Telephone No.: 5292 Holborn.
(Four lines.)

Popular Motoring and the Fuel Question.

THIS issue of The Motor deals with popular motoring, and whilst there is no gainsaying the popularity of the motorcar to-day, it would be idle to deny the appearance of a cloud upon the horizon, or that it is no larger than a man's hand! We refer, of course, to the fuel problem, which has yet to be solved in a way satisfactory to the motorcar user. The present position of affairs is that the motorist must pay an increased—and we fear an increasing—price for the petrol which he has hitherto regarded as suitable to his requirements. The alternative is to pay a lower price for a lower grade of spirit. So far as the present supply of both grades is concerned, our very carefully-conducted tests show that there is little, if any, difference between the two qualities at present being offered. We intend carefully to watch developments, and to report upon the outcome of our experiments. At present, however, we think it is sufficient to say that there is so little difference between the one's and the two's as to warrant our tendering to our readers the advice to be content with the two's. We have carried out further tests during the week with the grades of both popular brands on the market—Shell and Pratt's—and again have to report that at present there is practically no difference worth speaking of. The results of our further tests will be found on another page, and we commend them to the careful attention of our readers. In the meantime, with regard to benzole, we regret to say that prices in some quarters are fluctuating according to demand. There is no denying the fact that our recent treatment of the whole subject of benzole, together with the publication of addresses in The Motor of suppliers of the home-produced spirit, have had the result of creating a greater demand than the producers can supply immediately, bearing in mind the large quantities contracted for abroad. This only emphasises the importance of keeping our production of motor fuel, however small compared with imports, in our own country and for our own use. Events will prove that we shall need every gallon! That is why we so strongly urge the Government to defer, at least for a reasonable period, the imposition of the tax.

Business in the Spring of 1913.

THE general business of the motor industry appears to be from all accounts very good. The export trade of the country, despite the number of imported chassis which are completed with bodies, etc., in this country and sent abroad, is growing rapidly, and there are firms who are now finding that the pioneer work of some years ago is beginning to bring in a rich harvest of business and that the export side of their business is nearly equal to that of their home trade. The home market continues good for high-class work, and although this may be said to be an almost exclusive market there are a large number of motorists who, having had early models in use for some years, are now replacing them with the latest creations of the motor-carriage builder.

The Easter holiday falling early this year has made many firms busy preparing for the virtual opening of the season, and a large number of cars have been prepared for early use. All the signs point to a busy if not a record year in general trade, and motor manufacturing in all its branches will share in this prosperity. The position last year was very similar in many respects, the later falling of Easter making some difference to the urgency of the spring demand.

Theoretical v. Practical Mileages Per Gallon.

IT is rather a striking fact in these days when the fuel question is the one that most nearly affects each and every car owner that we do not know what the theoretical and practical mileages per gallon of fuel should be. Of course, it will at once be pointed out that all the factors in such a question are so variable that no definite figures, even if obtainable, would be of any use as a guide. But on the other hand, it cannot be questioned that both a laboratory and a track test of a given car ought to be possible. The theoretical quantities, such as the losses in the transmission and engine, can be measured to quite a working degree of accuracy nowadays, and the energy in a given weight of fuel can be calculated.

The heat energy losses which occur in the circulation water and the exhaust gases certainly present a more complex problem, but by no means an insoluble one, as many engine tests have already been carried out. If it were possible to say that, for example, a 20 h.p. car of given cylinder dimensions had shown a consumption by calculation and test of 40 miles to the gallon, even allowing for transmission losses on the various gears, it would convey something definite to the average car owner. That the figure seems a high one the writer admits, but it would probably not be far off the mark. It would serve as a "figure of merit" which it would be one's aim to approach in practice as nearly as possible.

Such a test as described should undoubtedly be supplemented by a track test, in which the important factors of road and wind resistances would be taken into account. The figures obtainable would necessarily be less favourable than those of the laboratory test, but would be more so than those of an ordinary road test, wherein the conditions would be so ever-varying that the figures would be unreliable. The factor of gear changing, which necessarily affects the consumption adversely, would probably have to be allowed for by calculation, although it would not be difficult to introduce an amount of gear

EDITORIAL.—Contd.

changing into a track test as would represent an average in a run of a given distance.

In view of the high state of development of speed, time, distance and horse-power measuring instruments for car tests there is practically everything ready to hand, and there is no necessity specially to invent or extemporize instruments; as would have been the case a few years ago. The results of such a real quantitative test would be most valuable to the modern car owner, who is beginning to understand that he cannot rely on the old time rule-of-thumb and guess-work opinions. Upkeep expense is the one important question to the motorist to-day. He wants some standard for petrol consumption badly, but no such standard is available. We know precisely how much light in "standard candle-power" can be obtained by the expenditure of a unit of electricity or by a cubic foot of gas, but no one can say with the same precision how far a pint of petrol should run a car—truly a curious state of affairs.

EVENT AND COMMENT.

Last week we announced that we should publish an article entitled "More Truth about Benzole." It appears on pages 265-268, and we hope our readers will peruse it with the care and attention which it deserves. We fail entirely to understand why the extremely pessimistic note was sounded in a certain quarter in regard to benzole, in view of actual facts regarding future possibilities, unless it was because of the undoubted lead we have taken in this matter culminating in the formation of a special committee to inquire into the whole subject. It looks very much as though pique prompted the line taken, and we shall look forward with interest to whatever reply may be forthcoming, for we are quite prepared with further argument, based upon facts known to us, of scientific research and actual experiments which prove beyond doubt that benzole is, at present at any rate, the only fuel to which motorists can look for relief from the present position as regards motor fuel.

This issue deals with popular motoring in its widest sense. Everything about motoring is popular—except the price of petrol!

A contributor makes the suggestion on another page of this issue that the scouts should attach pieces of paper in the shape of inverted triangles to lamps where unrolled stones are likely to be encountered. A future qualification for the A.A. scout will be "must be able to climb lamp-posts with agility."

On this subject of scouts we have not been able to refrain from pitying some of these excellent individuals on much frequented roads recently. The never-ending succession of badge-bearing cars in both directions and close up to each other has brought rapid saluting to a fine art. We deal with this subject pictorially on another page.

For the first time France has a President who is a practical motorist. M. Raymond Poincare has proved it by giving orders that the number of horses at the Elysee must be reduced from twelve to four, these four to be used largely for the service of Madame Poincaré. The chief postillion, who has seen service under Presidents Loubet and Fallieres, has resigned his functions, and his resignation has been accepted. For all his journeys about town, it is the intention of President Poincaré to make use of his private car, a Panhard and Levassor limousine. He has also given orders that the police should not interfere with the normal flow of traffic in order to give the right of way to his car or to any other car belonging to the Presidency. The drivers of these cars are supplied with a police pass, a document furnished to numbers of influential persons, and on presentation of this document a right of way can be secured. The police pass, however, is only made use of in cases of necessity.

The following gem of literary art and mechanical inexactitude is from one of the latest of our new magazines.

> Fifty miles now lay before the mud-spattered grey car, with an hour and a half still to go.
>
> "We'll do it easily, Tim," Dick shouted in his mechanic's ear as they flew through the market-place of Accrington.
>
> "Shure, sir—and Oi told yer we would," was the reply.
>
> One by one the miles slipped past till only 25 separated them from their goal. Then the unlooked for happened. A deafening report came from beneath the engine bonnet, and a moment later, amidst the sound of the grinding of brakes, Tim brought the car to a standstill. A hurried examination brought a look of consternation into Dick's face. One of his cylinders was split in twain and two more badly damaged.
>
> Shortly after midnight, with its speed reduced to 10 miles an hour, the travel-stained car ran into the station yard at Lime Street, Liverpool. A hurried consultation with the night stationmaster told them the worst. The 7.15 p.m. from Sunderland had arrived, and a couple answering the description of Doris and Kinch had been seen to leave it.

It is, of course, practically certain that the cylinder which split in twain was not the one driving the magneto, and one may also reasonably suppose that the two which were badly damaged were not the ones in gear with the differential. In any case, the car which can do its 10 m.p.h. with a cylinder split in twain (*and* minor casualties) should be entered for a R.A.C. test at once.

EDITORIAL NOTICES.

"THE MOTOR" is published in London every Tuesday morning. All editorial communications and copy must be addressed to "The Editors," and, to ensure insertion, should reach the office, 7-15, Rosebery Avenue, London, E.C., by first post Saturday. Important items of late news are received up to first post Monday morning.

INDEX TO CONTENTS.

The Index to Advertisements will be found on page 32 and Editorial and Business Notices on page 104.

FINANCE & BUSINESS

Another very busy week has been experienced on the Stock Exchange in motor shares, which have again changed hands freely. Prices, generally speaking, have been well maintained, and there are one or two interesting movements to record. Rovers have again been extremely active, but the higher price of last week brought in sellers, and the price weakened at one time to 37s. 3d.; the fall, however, was of short duration, as buyers came quickly in at the lower level, and the shares soon recovered from their drop. At one time, the buying was very big indeed, and we should not be surprised to see a further improvement. Swifts have been another firm spot, some big lines of shares being bid for and very few forthcoming. The price has slowly advanced to 23s. 3d., and there are still buyers at this figure: at the time of writing the market looks distinctly strong. In spite of more favourable reports, Darracq ordinary are unchanged at 11s. 9d. Small Arms have fallen to 48s. 9d. sellers. There appears to be no actual reason for the fall, beyond selling on a small market. Humber preference have slowly improved to 15s. and the ordinary to 8s. 1½d. Star preference and ordinary are now much firmer at 17s. and 14s. 6d. respectively. The inquiry for Sunbeams has fallen off.

The Dennis prospectus was issued to the public yesterday, one-third of the issue having already been subscribed.

In another column we announce the adoption of the style of Napier Motors, Ltd., by Messrs. D. Napier and Son, Ltd., who recently acquired the whole of the share capital in S. F. Edge, Ltd. Mr. H. T. Vane has been appointed general manager.

The sad intelligence of Mr. John Wilson's death from shock after a half-hour's struggle in the icy waters of the Mersey will have been received by his many friends in the motor trade with much regret. As evidence of his popularity, there was an attendance at his funeral last week of nearly 2000 persons, amongst whom were most of the leading personalities in the Liverpool and Manchester motor trade. The accident was due to forgetfulness in leaving a gear in, and the facility with which his car started on the switch. In his endeavours to reach the brakes he was swept with the car and two other persons who were standing by from the ferry into the River Mersey. Mr. Wilson was sales manager to Messrs. J. Blake and Co., Liverpool, and it was only a few weeks ago we heard him at the Manchester Show dinner humorously refer in his speech to the absence of Mr. Ellis Green, the Northern Section secretary, who "was indisposed through indisposition." We extend our sincere sympathy to his widow and relatives.

The recovery in the position of Messrs. Riley (Coventry), Ltd., has been going on for some time, and the directors are now to be congratulated upon the outcome of the year's working up to 30th September last, when a profit of £2167 18s. 11d. was earned, enabling the directors to reduce the amount standing to the debit of revenue account to £1426 19s. 8d. With the rapid development of the car and wheel businesses, Mr. Victor Riley and his co-directors should soon be in the happy position of announcing that the concern has once again reached the dividend-paying stage.

On a visit to the Mitchell-Lewis English headquarters in Great Portland Street last week, Mr. Harry Plow informed us that home demands in America are so great that he and his many agents on this side are suffering from a famine in Mitchell cars. This condition is not unique among representatives of American firms on this side. A chat with Mr. Eustace Watson, of the Studebaker Corporation, evinced the startling information that he has been absolutely starved for cars since the year began. He expects fairly satisfactory deliveries soon. Mr. J. Keithly Crowther tells us that his concern, the United International Motors, who handle the Maxwell cars, is also in a state of stagnation through shortage of deliveries. Our inquiries among the Continental representatives and British depots in London were met with most encouraging reports of good business being done and healthy inquiries being received.

Mr. Sydney A. Currin, the new managing director of the Captain Rim Co., Ltd., informs us that his contracts with European manufacturers now amount to nearly 75,000 rims. This is a healthy condition of affairs and speaks highly for the progress made by this concern under its new regime.

Mr. Sydney G. Cummings, proprietor of the General Motor Co., of 71, Britannia Road, Walham Green, London, S.W., has just concluded arrangements to take over the sole agency for the British Isles of the English-made Sirron car.

Mr. R. Le Grice Elers has retired from the board of directors and from the position of manager of Elers and Co., Ltd., of Hans Road, London, S.W., the sole concessionnaires for Miesse cars.

We know of a London firm, holding the sole concession for the United Kingdom for a well-known Continental make of car, who desire further capital for the purpose of extending their business, which has now been in existence for over two years. The car for which they hold the agency is well made and has given general satisfaction, having won honours in Continental trials and other events. There is a promising opening here for an energetic man with capital who would be willing to accept a post with the firm. We shall be glad to forward enquiries addressed H. F., care of the Editors of this journal.

"THE MOTOR" SHARE LIST.

The Prices recorded in the end columns are those ruling on the Stock Exchange at Mid-day on Monday, 10th March.

SHARES. Issued Capital.	SHARES. Paid Up.	NAME.	Dividend. Last.	Dividend. When payable.	Previous Prices 1912. Highest.	Previous Prices 1912. Lowest.	Prices 1913. Highest.	Prices 1913. Lowest.	Prices. 10th March. Buyers.	Prices. 10th March. Sellers.
£										
45,000	£3	Alldays & Onions...	5%a	Mar./Nv.	4½	3⅞	3⅝	3¼	3½	4
50,000	£5	,, ,, Cum. Pref. 6%	6%	Mar./Nv.	5⅝	5	[illegible]	5 7/16	5⅜	5⅝
209,802	10/-	Argylls, Ltd.	nil	Nov.	6/-	4/6	5/6	4/3	4/9	5/9
150,000	£1	Belsize Motors	10%	May/Nv.	27/9	25/3	26/9	26/-	26/-	27/-
767,225	£1	Birmingham Small Arms	10%a	Ap./Oct.	58/3	47/6	50/-	48/9	48/6	49/-
75,000	£5	Brampton Cum. Pref. 6%	6%	Oct.	4⅜	[illegible]	4	3⅝	3s.	4s.
100,000	£1	J. B. Brooks & Co.	10%	Mar./Nv.	37/6	31/-	36/6	35/-	35 6	36 6
100,000	£5	,, ,, Cum. Pref. 5%	5%	Mar./Nv.	5¼	5⅛	—	—	5⅛	5⅜
100,000	£5	Brown Bros., Cum. Pref. 6% ..	6%	Ap./Oct.	[illegible]	4⅛	4⅛	4⅛	[illegible]	5
384,000	£1	Charron, Ltd., Par. Pref. 7% ...	7%	Jne./Dc.	11/4½	8/-	9/8	7/9	8/6	9/3
275,000	£1	Darracq (1905)	3½%	Jne./Dc.	18/4½	8/9	15/-	11/6	11/3	11 9
375,000	£1	,, ,, Pref. Ord. 7% ...	7%	Ap./Oct.	19/-	11/10½	15/8	13/9	14/-	15/-
159,229	£1	De Dion-Bouton (1907) Pref. 7%	6%	Nov.	11/8	8/6	8/9	7/6	7/3	8/3
105,000	£1	Delahaye & Co.	25%	July	—	—	—	—	1½	1⅝
60,000	£1	,, ,, Pref. 7%	10%	Jan./Jul.	28/1½	23/9	25/7½	25/-	1⅛	1⅛
970,363	£1	Dunlop Rubber Co.	12½%	Ap./Nv.	56/6	27/6	39/6	35/6	36/6	37 6xd
200,000	£1	,, ,, 6% Pref.	6%	Ap./Nv.	21/-	17/-	20/-	18/6	19/3	20/-xd
312 786	£1	,, ,, French I. Stock	5%	May/Nv.	19/-	15/6	19/-	17/6	17/6	18/3
624,996	£1	Dunlop Tyre New Cum. Ordy. 8%	10½d	May/Nv.	18/7½	10/-	17/9	14/-	16/3	16/9xd
994,990	£1	,, ,, Cum. Pref. 5% ...	5%	May/Nv.	16/6	10/9	14/9	12/7½	13/-	14/-xd
499,962	£1	,, ,, Deferred	nil	May/Nv.	15/-	6/2	10/6	8/-	10/-	10/6
292,904	£1	Humber	nil	Nov.	7/6	3/10½	8/6	6/9	8/-	8/3
381,495	£1	,, Cum. Pref. 6% ...	nil	Nov.	10/9	6/9	15/-	10/4½	14/9	15/-
100,000	£5	J. Lucas, Ord.	10%	Ap./Nv.	9⅛	9	9⅝	9⅛	9⅝	9⅞
100,000	£5	,, Cum. Pref. 5% ...	5%	Feb/Oct.	5⅛	5⅛	110/8	[illegible]	5⅜	5⅝
200,000	£1	Rolls-Royce	20%	Jan./Jul.	46/6	37/7½	48/-	45/-	44/6	45 3
138,668	£1	Rover	10%	Nov.	29/-	14/-	40/-	31/-	39/-	39 6
41,621	6/-	Siddeley-Deasy	8½%	Nov.	10/6	6/-	10/7½	8/10½	10/-	10/6
70,000	£1	Star	5%	Mar.	18/6	10/6	17/-	14/-	14/3	14/9
69,157	£1	,, Cum. Pref. 7%	7%	Mar.	18/-	15/4½	17/6	17/-	16/9	17/3
87,550	£1	Stepney Spare Wheel	20%	Apr./Nv.	35/-	30/-	32/-	31/9	32/-	33/-
120,000	£1	Sunbeam M.C. Co.	25%	Nov.	59/-	37/6	56/6	53/6	54/-	54/9
80,000	£1	Swift	6%	Apr./Nv.	21/9	13/-	24/-	20/9	22/9	23 3
100,000	£1	,, Cum. Pref. 6½%	6½%	Apr./Nv.	17/6	14/10½	17/-	16/3	16/9	17/-
148,500	£1	Thornycroft, J. I. & Co.	5%	May/Nv.	26/10	12/6	27/6	23/9	1s	1⅛
198,000	£1	,, ,, Cum. Pref. 6%	15%c	May/Nv.	23/9¾	16/10½	19/-	17/6	[illegible]	1
80,000	£1	Triumph Cycle Co.	20%b	Nov.	71/6	43/9	74/6	68/-	71/-	73/-
50,000	£1	,, ,, Par. Pref. 5%	6¼%	Nov.	23/6	20/7½	22/7½	21/6	22/-	23/-

a Plus 5% bonus. b Plus 10% bonus. c In settlement of arrears. d Including 2%, being part of arrears.

All the shares are fully paid except Alldays £5 ordinary shares.
The dividend recorded is the dividend for the whole year unless otherwise stated.

A WONDERFUL LONG-DISTANCE NON-STOP TRIAL.

ONE of the most astonishing facts in relation to the mechanism of the motorcar (always provided that design, material and workmanship are good in the first place) is its extraordinary wearing properties. We have seen motors, gearboxes and back axles dismantled after the cars have travelled distances up to 40,000 miles or so, and it would have been difficult to point to any real signs of wear. The secret of this longevity and reliability is contained in the high quality of every part, and its perfect suitability for its task, and also in the fact that every moving part works under ideal conditions of perfect lubrication.

To put the matter on a definite and official basis, the Royal Automobile Club has conducted various trials of individual cars, and amongst those worthy of more than special note was the test of a 15.9 h.p. (R.A.C. rating) J. D. Siddeley type Deasy car entered by the Deasy Motor Car Manufacturing Co., Ltd., of Coventry. The car was entered for a test of 10,000 miles, the length of the trial being subsequently increased to 15,000 miles. The test was carried out in 1911 on Brooklands track, as affording an opportunity for increasing its severity, because the car could be driven at a speed in excess of the speed limit on the road. The first 5000 miles were covered at a speed of 33.9 m.p.h.; the second 5000 miles at 33.5 m.p.h.; and the third 5000 miles at 35.4 m.p.h. The actual distance run was 15,008.4 miles, including 83.2 miles between the lock-up and the track, and there was not a single involuntary stop throughout the whole of the distance—a really remarkable record, especially in view of the fact that the amount of work done on the car in the garage during the two months covered by the test took but 57 min. 6 sec., in addition to the time spent on refilling tanks and lubricating. The work done included inspection of plugs, the make and brake of the magneto and of the oil filter, the binding with wire of a rubber water connection, tightening of three nuts and bolts, finger adjustment of the brakes, and the knocking in of the hinge pin of the bonnet. The petrol consumption over the whole distance was 1 gallon to 23.143 miles, whilst the oil consumption was 1 gallon to 1184.49 miles. No additional oil was put into the gearbox, 5½ pints of oil were put into the live axle casing, and 7¼ ounces given to the clutch.

After the trial the car was completely dismantled, and a detailed account of the condition of all the parts was given by the examiners, which can only be summarized as having been extraordinarily good. The car has had nearly two years constant use since then, and is still running and giving full satisfaction to its owner.

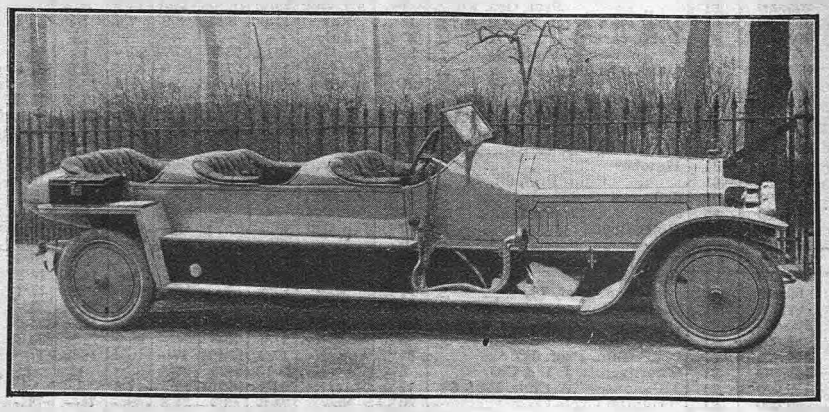
Such a trial is of extreme value to the maker as well as to the user. The latter is given a standard whereby he is able to form an opinion of the running of his own car. He learns that a comparatively low-powered car, with an engine of only 80 mm. by 130 mm., is capable of doing as good a performance, under most trying conditions of track surface, as the largest and most expensive cars, and he gains confidence in the ability of the standard chassis to meet the stress, long continued, of abnormal conditions. The makers learn from these trials the parts that call for improvement, or (as is generally the case when wear above the normal is apparent) for better protection against the ingress of sand and dust, or for better lubrication. The Deasy Co. retained the main ideas underlying the design of this particular car, except that they improved its efficiency by adopting the Knight sleeve-valve engine. The good effect of the trial has been seen by the wonderful growth in the popularity of the Deasy car ever since, and such popularity has been more than deserved and justified.

Motoring in Canada.

It is computed that in Canada at the present time there are about 50,000 motorcars, of which 40,000 were imported from the United States, 1500 from Great Britain, and 700 from France and elsewhere, the remainder being manufactured in Canada, and according to the official figures of the Washington Bureau of Statistics 4424 American cars were sent to Canada during the year ending April last. It is estimated that about £16,000,000 is the purchasing price paid to American manufacturers, and the tariff duty paid on the American cars amounts to about £6,500,000. The correspondent who sent us these figures says: "The English manufacturers could have had this trade if they had taken the trouble to build cars suitable to Canadian conditions, as they have a duty 33⅓ per cent. less than the duty on American cars.

A very interesting model of the Rudge-Whitworth Coventry works, made by Messrs. Bassett Lowke, is being shown at the Rudge-Whitworth London Depot at 230, Tottenham Court Road, W.C. The model is a very comprehensive one, and is stated by many who have had the opportunity of seeing the Rudge-Whitworth works to be a true facsimile, even so far as to include minute details.

In the latest Frodsham catalogue, obtainable post free from Messrs. Frodsham and Co., Ltd., 17, Dering Street, Oxford Street, London, W., although naturally the major portion is given to short descriptions and illustrations of their well-known speedometers and cardan shaft drive, considerable space is also devoted to excellent illustrations of other useful motor accessories such as lamps, roof lights, switches, horns, accumulators, neat motorcar writing cabinets, motor watches, driving mirrors, etc. There are nearly 50 pages of matter, with many more illustrations reproduced on art paper, and all prices are clearly marked, thus adding a note of finality and completeness to the catalogue. Reverting to the speedometers, it is interesting to note that two new models are illustrated, and the method of fitting the speedometer is also very clearly defined.



A SPORTING BODY.

A 65 h.p. six-cylinder Mercedes, the smart six-seated sporting torpedo body of which was fitted by Messrs. Chas. Lane and Co., Ltd., 311, Euston Road, N.W.

NEWS AND NOTES.

Sunbeam First Away.

A Sunbeam car will be the first to start in the Grand Prix race at Amiens on the 12th July. Probably the driver will be Victor Rigal, although this will be decided by the firm, the drawing of lots merely dealing with the order in which the cars will start, without paying any attention to the men at the wheel. After the Sunbeam the order will be as follows:—2, Delage; 3, Opel; 4, Mathis; 5, Excelsior; 6, Th. Schneider; 7, Itala; 8, Peugeot; 9, Sunbeam; 10, Delage; 11, Excelsior; 12, Th. Schneider; 13, Itala; 14, Peugeot; 15, Sunbeam; 16, Th. Schneider; 17, Itala; 18, Peugeot; 19, Sunbeam; 20, Th. Schneider. It has been decided to allow the competitors to use petrol gauges on their cars on condition that these gauges are of such a nature that they can be sealed to prevent the possibility of introducing fuel into the tank. Only the gauges having been definitely approved by the "octroi" of the City of Paris can be employed.

The Dennis Flotation.

The prospectus of Messrs. Dennis Bros. (1913), Ltd., was issued to the public yesterday (Monday). The capital is £300,000 in £1 ordinary shares, and these are being offered at par, 100,000 of the shares having already been applied for by the directors and their friends. The company takes over the old-established business of Dennis Bros., Ltd., of Guildford, Surrey, and will carry on the manufacture of pleasure cars and commercial motor vehicles. The business is to be taken over as a going concern as at 30th September last, Dennis Bros., Ltd., the original vendors, taking the profits (about £23,500) up to 31st March, 1913. The profits for the past three completed financial years were:—1910, £19,378; 1911, £30,914; and 1912, £41,085, subject only to remuneration of the directors, income tax and interest. The net value of the assets, after deducting liabilities, is put down at £131,917 17s. 1d., whilst the value of the goodwill is set down at £102,597 1s. 9d. The purchase price has been fixed at £235,000, and there will be provided by the issue an additional sum in cash of £40,000 available for the extensions now in progress and for further working capital. The business of Dennis Bros., Ltd., has shown continual expansion, the commercial vehicles which constitute the principal manufacture being known and in use all over the world. It is anticipated by the directors that the company after making ample provision for reserves, etc., will be in a position to pay dividends of not less than 10 per cent. from its inception, and it is proposed to pay the dividends half-yearly.

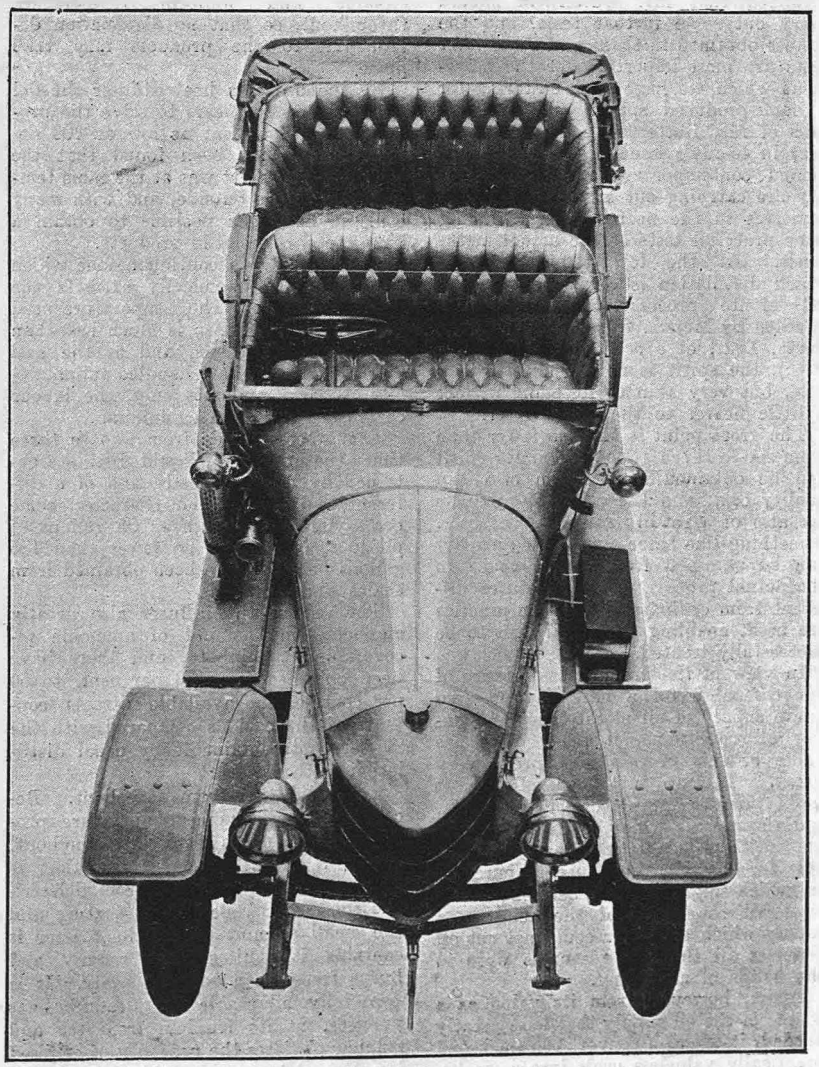
We are informed by the Challenge Rubber Mills that, subject to official ratification by the committee, the result of the third and concluding round of the tyre test is Victor (still running), 3878 miles; Dunlop, 3112 miles; Michelin, 2832 miles, and Continental, 2020 miles.

A New Car.

Euphony in nomenclature is not an attribute always considered in the introduction of a new car to the English market, but in the case of the new chassis now introduced by Messrs, Friswell's, Ltd., of Albany Street, London, N.W., the name is both pleasing and distinctive. The engine of the new "Knight of the Road" chassis has its four cylinders cast in pairs, with the valves all on the one side, and the tappet mechanism enclosed. The bore and stroke are respectively 80 mm. and 120 mm., the other engine characteristics including Bosch magneto, centrifugal pump circulation (with neat tapered radiator), Zenith carburetter, and forced feed lubrication. A leather-faced cone clutch transmits the power to the four speeds and a reverse gearbox, with gate change. The final drive is by bevel gear, the usual set of brakes are provided, that at the rear of the gearbox being of the contracting type, and those mounted on the rear wheel drums being of the internal order. The equipment of the car is most thorough, and the price most reasonable. The latter is £350 complete; the former include open touring torpedo body, scuttle dash, Cape cart hood and screen, dynamo lighting set of head, side and tail lamps, speedometer, horn, jack, pump, tyre levers and a complete set of tools.

On the following pages we give some most important information of recent developments in connection with the Del Monte process of motor spirit production.

There is no change to record in the price of petrol. A report of further tests of Shell and Pratt's spirit appears on page 272.



The new Knight of the Road car introduced by Messrs. Friswell, Ltd., Albany Street, London, W.

K15

THE DEL MONTE PROCESS.

Some Important and Greatly Improved Results from this Low Temperature Process of Coal Distillation. Six to Seven Gallons of Motor Spirit from a Ton of Cheap Coal, and Twenty Gallons from Cannel Coal or Low-heating, Rich Gas Coal.

SOME little time ago, a description of the del Monte process of coal distillation appeared in the columns of our contemporary the "Westminster Gazette," and in view of the claims advanced we sought further information on the system in question, and the facts of the tests and other data which we elicited did not lead us to enthuse over the said process at that stage of its development. Since that time, however, further tests have taken place, and naturally much information has been gleaned by experience, and we are now therefore doubly pleased to be able to report most encouraging progress. Mr. J. Owen, the motoring contributor of the "Westminster Gazette," has followed the tests and developments very closely, and also arranged that Mr. Butterfield should carry out some further tests, and the results obtained in these and other later tests are most important for the movement which we have been fostering for a home-produced spirit. The full details of Mr. Butterfield's tests will appear in to-day's issue of our afore-mentioned contemporary, and we personally are carrying out some further tests ourselves in the near future, including some practical tests of the actual motor spirit. At the low temperature at which distillation is carried out in the del Monte process (which is being handled by Messrs. Oil and Carbon Products, Ltd., of 37, Walbrook, London, E.C.), the spirit is not chemically benzole, but very akin to it, being in fact a little nearer to the paraffin series.

The great point is that no fewer than from six to seven gallons of motor spirit can be obtained from a ton of cheap quality coal, and the other by-products are also of a readily saleable character. Something like three times this quantity can be obtained from cannel coal. In the actual process, several features different from ordinary distillation practice are used, enabling slack and dust to be successfully treated.

In view of the growing importance of our campaign for a national and adequate supply of oil at all times and under all conditions, it seems that the value of this process may prove very great. If put into general use it could turn the waste of the coalfields, and those coals which, because of their impurities or friable nature, are unsuitable for common uses, into a source of oil which might in time be sufficient to meet all the needs of the country—a supply which even war could not cut off—unless all the coal resources were in the hands of an enemy.

Apart, however, from its value as a source of the oil supply that is so greatly needed, it can also convert the slack and practically valueless coals into a smokeless fuel, practically free from sulphur and other impurities, which when used for domestic purposes, by our own experiences, actually constitutes an excellent fire, and one which is practically smokeless—a most important commercial point.

Scientists and engineers are agreed that the low temperature distillation of coal yields an oil or tar of an entirely different character from that obtained by high heat distillation. The benzine, naphthalene and anthracine series of high heat tar disappear, and are replaced more or less by the paraffin series of the low heat tar or oil, which, upon fractionation, yields naphtha, burning oils, gas oil, fuel oils and lubricating oils, etc.

To be successful in low temperature distillation it is imperative that the mass under treatment must be at an equable and uniform temperature throughout, so that no dissociation detrimental to the products may take place.

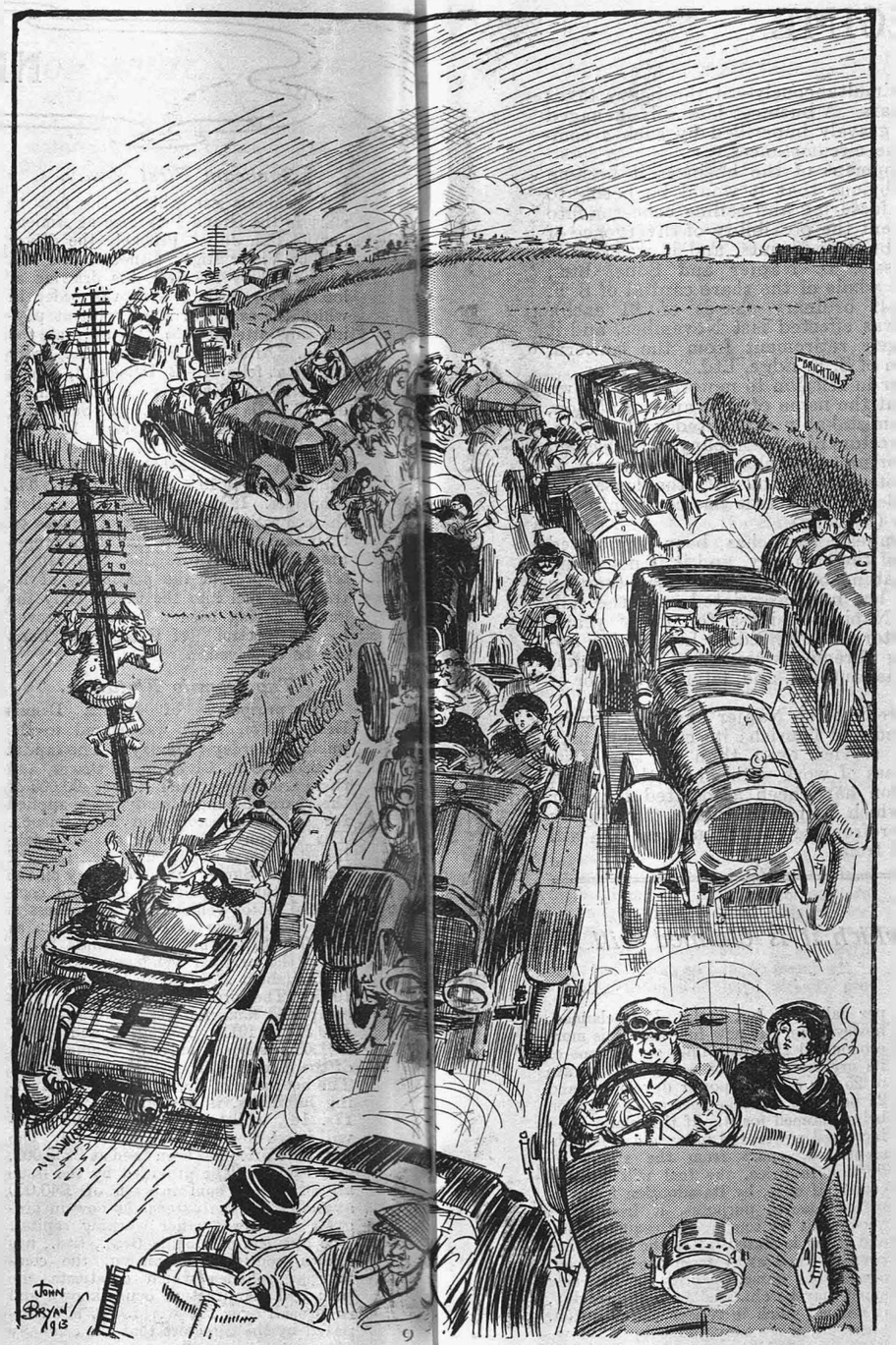
By the use of a heat diffuser the del Monte process appears to solve the problem. With a heat as low as 500 degrees F. it has been found that the centre of the retort was at the same temperature as the outside, and with many coals it has been possible to obtain a long range of volatile products.

The process is a continuous one which quickly and economically extracts the volatile matters. The temperature used being low the upkeep is much less than by common methods, and as the coal and resulting fuel are handled automatically in large amounts only, the labour costs are reduced to a minimum.

The process yields from two to three times the amount of liquid distillate obtained by usual methods, and of a different and far superior character, some coals yielding as high as 85 gallons of oil to the ton, and no fewer than 135 gallons per ton have been obtained from shales and bitumens.

The use of the diffuser also greatly augments the amount of ammonia recoverable as sulphate, and there have been obtained from 40 per cent. to 60 per cent. of the available nitrogen contents of the coal as compared with the 20 per cent. obtainable by usual distillation methods.

The solid fuel seems excellent. Because of the equable temperature procurable this fuel is identical throughout, giving a bright, cheerful fire that is quite smokeless and free from deleterious fumes. Because of its texture and the small amount of volatile matter it contains it ignites very readily and burns freely in a common grate. It is especially adaptable for producer gas practice, as its freedom from tar and sulphur obviates the necessity of employing the elaborate scrubbing apparatus so necessary when other fuels are employed.



POPULAR MOTORING ON A POPULAR ROAD.

In this illustration our artist depicts the unhappy plight of a motorist essaying a journey from Brighton to London on a fine Saturday afternoon. The car engaged in this venturesome performance is marked with a cross. Any reader of "The Motor" who thinks this exaggeration is invited to endeavour to perform the feat the next fine Saturday.

We append some figures of tests, and an average coal gives a smokeless fuel having the following composition:—

	As received.	Dried.
Volatile matter	5.71	5.91
Coke	90.85	94.09
Fixed carbon	84.30	87.31
Ash	6.55	6.78
Hygroscopic moisture	3.44	—
Sulphur (separately determined)	—	—
Thermal values	—	—
Calorific value	12.823	13.610 B.T.U.
Carbon equivalent	—	13.564 B.T.U.
	lb.	lb.
Evaporative power of water, from and at 212° F. per lb. of coal	13.271	14.09

We give below a typical fractional distillation analysis of the oil obtained:—

Specific gravity at 15.5° C. ... 1.0071

	Per cent.
First fraction up to 110° C., benzoles and light oils	13.22
Second fraction up to 114° C., light naphthas, etc.	15.44
Third fraction up to 170° C., naphthas	14.50
Fourth fraction up to 230° C., naphthalene, carbonic acid and heavy oils	23.27
Fifth fraction up to 270° C., heavy creosote and lubricating oils	8.89
Sixth fraction up to pitch, anthracene and oils obtainable by hot pressure	24.68
	100.00

We should add that in this process the coking mass is kept in continuous motion in the presence of steam, thus greatly augmenting the yield of ammonia. By common gas practice about 20 per cent. of the nitrogen in the coal is available as ammonia (according to Juptner), while in this case from 40 per cent. to 60 per cent. can be obtained.

Of course, one of the most important points is that this process allows the utilization of slack and coal dust, and seemingly, therefore, the transformation of this valueless dust into good quality coke and oils may prove of great value. In fact, it might mean that an average quantity of 120,000,000 gallons of crude oil, containing about 15,000,000 gallons of benzole (equivalent) for motorcar use could be obtained in London annually, if the oils were not cracked, whilst, if they were cracked, it would be some 50,000,000 gallons. We have brought this process to the notice of the Benzole Committee, and are also following it up closely.

Isle of Man Race.

Manufacturers having expressed their disapproval of the R.A.C. proposal to hold a race in the Isle of Man for four-cylinder cars with maximum engine dimensions of 90 mm. bore and 140 mm. stroke, and with a maximum chassis price of £300, the Club now proposes a race of 300 miles over the Tourist Trophy course (about 38 miles round) in the island on 25th September, the contest to be confined to standard chassis with the same engine size limitations, a minimum weight of 2000 lb. to be carried, standard touring design and, construction, as shown in makers' and agents' catalogues on 17th February last, being followed. The race will not be run unless there are 20 entries.

SWEDISH WINTER RELIABILITY TRIALS.

Winter Cup Goes to Minerva and Gothenburg Cup to N.A.G. "Darling."

STOCKHOLM, *7th March, 1913.*

THE distribution of prizes for the Winter Reliability Trials took place on Thursday evening at a grand automobile banquet held at the Grand Hotel, in celebration of the tenth anniversary of the Royal Swedish Automobile Club.

Hundreds of motorists who had been in suspense for more than a week were anxiously waiting for the results to be made public. As predicted by the local papers, the Winter Cup went to Mr. Hans Osterman's 38 h.p. Minerva, and the Gothenburg Cup to the winner of last year, N.A.G.-"Darling," driven by G. E. E. Karlsson; one more victory and the Gothenburg Cup will become the personal property of the winner.

The gold plate of the club, as well as various other prizes, was awarded to the following 16 cars in class I which had accomplished the trial free from penalizing and without any difference between the calculated and the actual driving time:—1, 38 h.p. Minerva (Enderlein); 2, 18-40 h.p. Opel (Jöerns); 3, 17-32 h.p. Hupmobile (Hogman); 4, 20-50 h.p. Pope-Hartford (Eck); 5, 30-45 h.p. F.I.A.T. (Janek); 6, 30 h.p. Overland (Holmer); 7, 30-45 h.p. F.I.A.T. (Schurmann); 8, 22-40 h.p. Mercedes (Enander); 9, 17-45 h.p. Horch (Paulmann); 10, 30-36 h.p. Scania-Vabis (Svensson); 11, 30-36 h.p. Scania-Vabis (Lindstrom); 12, 25-35 h.p. F.A.B. (Hüttenberg); 13, 45 h.p. Overland (Johnson); 14, 35-50 h.p. Cadillac (de Maré); 15, 35-50 h.p. Cadillac (Johanson); 16, 17-45 h.p. Horch (Triselli).

The gold plate of the club was also awarded to the following three cars, which had accomplished the contest free from penalties but with a difference between the calculated and the real driving time:—18-40 h.p. Opel (Eklund), 37 h.p. Hudson (Akerman), 10-30 h.p. Horch (Raaf).

In class II, besides the winner of the Gothenburg Cup, the following two cars which had accomplished the trials free from penalties received the gold plate of the club:—30 h.p. Overland (Fogelqvist), 17-32 h.p. Hupmobile (Nielsen).

A number of silver and bronze plates and other prizes were distributed to the prize-winners in both classes. Among those receiving the bronze plate of the club were two Lanchesters and one English Daimler. The Humberette entered for the contest (class II) did not reach Stockholm in time for the trials. A Palladium car, also entered, had the misfortune to be damaged when skidding into a ditch a few hours after starting, and did not continue the contest.

It was generally regretted that no Vauxhall cars took part in this year's trials, having been so successful last year.

The results of the contest have proved once more that the trial regulations must be revised and made more stringent.

Following the distribution of prizes a grand jubilee dinner was held, attended by more than 400 persons.

THE NEW NAPIER REGIME.

THE history of the Napier car is, in epitome, the history of the British motor industry. It begins with an extended experience of the pioneer cars of foreign origin, then the production of the hybrid—the Napier car with a Panhard engine—and then the development, gradually at first and rapidly accelerating, of the British-made vehicle with a growing independence of foreign parts, and eventually even of foreign ideas. Ultimately the day comes when the child passes the parent in fertility of ideas and originality of thought and becomes the leader, although perhaps not immediately so acknowledged. Credit for the introduction of the six-cylinder engine must always be given to Napier's whatever claims may be put forward on behalf of others. Certainly Napier's showed their confidence in this type of engine, and they were the first to overcome the difficulties which attended any attempt to utilize as many as six cylinders and secure perfect carburation, equality in gas supply, accurate firing, and freedom from periodic vibration.

The two men who have built up the Napier business are Mr. Montague S. Napier and Mr. Selwyn F. Edge; and in the year 1900 it was arranged that Mr. Napier's firm, Messrs. D. Napier and Son, should construct the cars to the order of Mr. S. F. Edge's company (at first named the Motor Power Co., Ltd., then S. F. Edge, Ltd., and later S. F. Edge, 1907, Ltd., the date feature being subsequently eliminated from the title), the latter acting as sole selling agents for the world. Both businesses have been extraordinarily successful, as is evidenced on the one hand by the magnificent works at Acton, Middlesex, and on the other by the goodwill and valuable clientele of the Burlington Street establishment. But this success has not been earned without an enormous amount of hard work, enterprise and pluck, or without many crises, not the least of which must have been the blow to powerful cars brought about by the development of the low-powered engine, and the imposition—almost simultaneously—of the heavy taxes on high-powered cars. A business less ably managed would have been gravely imperilled by such a combination of adverse circumstances.

With the development of the business it became more and more obvious that it would be better to combine the manufacturing and selling concerns into one, so as to prevent the possibility of divergence of opinion on many business points, and it was finally decided that Messrs. D. Napier and Sons, Ltd., should acquire the whole of the share capital of S. F. Edge, Ltd. (215,842 ordinary shares of £1 each). This transaction was effected last November, and it involved Mr. Edge's retirement from the concern, and the liquidation of S. F. Edge, Ltd.

The word Napier in relation to motorcars is known the world over, but the name of D. Napier and Son, Ltd., is not so unmistakably associated with the industry, and the directors of the company have decided to take the opportunity of changing the name to that of Napier Motors, Ltd., and with the consent of the Board of Trade this new title has come into use as from yesterday (Monday).

Mr. Harry Tempest Vane has been appointed general manager of the company, and it is not going too far to say that no one is better fitted than he for the post. He has been associated with the selling side of the Napier business for many years, having been director of S. F. Edge. Ltd., being appointed managing director when Mr. Edge relinquished the post last autumn, and, later, liquidator of the company.

Under the new regime the Napier business may be expected to expand and flourish: its customers may rely upon better service even than in the past, whilst the high class of work with which the firm of D. Napier and Son have been associated for over a century, and which helped to place the Napier car in the very forefront of motor engineering, will never be departed from.

A NEW MOTOR SPIRIT.

Standard Oil Co. of America Introduce a New Fuel which it is Claimed will Relieve the Situation.

NEWS has just come through from America of the discovery of a new motor spirit, which is being made by the Standard Oil Co., and for which substantial advantages are claimed over petrol. Unfortunately, the new spirit is, like petrol itself, a distillate of petroleum, so that the production and supply will remain in the same hands which at present control the petrol output. But, as it is stated practically to double the quantity of useful motor spirit procurable from the available supply of crude oil, the announcement is valuable indeed.

This new motor spirit, which is a distillate of the lower grades of petroleum, is obtained by a system of "cracking" the residue after the petrol has been distilled off, and is the subject of a patent by Mr. W. M. Burton. The Standard Oil Co.—the Rockefeller group—have secured the control of this patent, which was granted only on 1st January.

The new fuel is stated to resemble petrol very closely, but has a stronger smell, and is yellowish in colour, rather than colourless, as is petrol. It is of slightly heavier gravity, and has a somewhat greater range of boiling point, its minimum point being lower and its maximum higher than that of petrol, which peculiarity, it is stated, enables a motor to be started up more easily than when petrol is used. Both the colour and the odour could be, it is said, destroyed by further treatment, but, as this would add to the expense, this is not being given it. The Standard Oil Co., which is now putting it on the market in America, under the name of "Motor Spirit"—petrol being known over there simply as "gasoline"—is putting it forward as a fuel for commercial vehicle and stationary engines rather than for touring cars, although, of course, it can be used in the latter. It is stated that objection to it is found in the exhaust taking the form of a white smoke, somewhat of the same nature as that given off when too much lubricating oil is employed. It is said not to be free from carbonization, but that the deposit in this case is of a softer and more easily removed character than when petrol is the fuel, and that it is necessary to warm the engine up by a little preliminary running before it works sweetly.

The new fuel is stated to require but little carburetter alteration, somewhat more air being used than with petrol. The Standard Oil Co. are putting it on the market at a slightly lower price than gasoline, although the reduction—1½d. per gallon—is but little. It is claimed, however, for the new fuel that it is more economical than gasoline, on account of its greater output of work, an increase of 25 per cent. in power developed, and 25 per cent. mileage increase per gallon being claimed for it. If this claim as to increased power and mileage can be substantiated, apart from the slight reduction in price, the fuel will be welcomed, if only, by its adoption for commercial motor purposes, it frees more good spirit for touring car requirements, and if, as is stated, after the petrol has been distilled away from the crude oil, almost the same quantity of the new spirit may be obtained from the residue, it will do much to relieve the situation, although, if we may judge by what we learn, the Oil Company has no intention of giving away anything by any substantial reduction in the price, even though its supplies will be practically doubled.

With reference to the description we gave in our last issue of the Rayfield carburetter, we are informed that Messrs. E. H. Hindley and Sons, 11, Queen Victoria Street, London, E.C., have taken up the sole agency for the carburetter in Great Britain and Ireland.

NEWS AND NOTES.—Contd.

Midland A.C.'s Hill-climbs.

These are to be held on Saturday, 7th June, at Shelsley Walsh, and will consist of the following events:—

Open event for the president's cup, given by Mr. W. Ballin Hinde, and the club cup.

Closed event (members only) for Mr. H. C. Holder's cup and the club cup.

Team event, open to all clubs associated with the Royal Automobile Club, for the club cups.

Cyclecar event, for Mr. C. A. Bird's cup, open to all machines conforming to the A.-C.U. definition.

The regulations for all these events are being drawn up by Mr. A. G. Johnson, solicitor, and will be ready shortly.

With regard to the open event, it is proposed to have no restriction with respect to the competition for fastest time, so that this year for the first time racing cars will be allowed to compete for this cup only, and the same will apply to the closed event for the club cup, excepting that the competitor, of course, must be a member.

The team event last year was won by the Midland Automobile Club, and, in view of this, the secretary, Mr. C. P. Type, has written to all the associated clubs, asking those who intend to compete for suggestions with regard to the running of this event and the handicap.

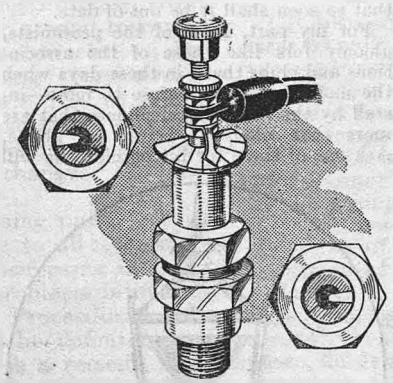
The cyclecar event is an innovation, and it is suggested that all machines shall conform to the A.-C.U. definition. Mr. C. A. Bird, a member of the committee, has very kindly offered a silver cup for this competition, and it is believed there will be a very good entry.

For the information of intending competitors, a booklet, comprising the club's past eight years hill-climbs at Shelsley Walsh, giving the names of competitors, cars, engine dimensions, weight, formula and time results, is published, and can be had on application to the secretary for 2s. 6d., and 1s. to members.

Among those who have already promised to enter are Messrs. Percy Lambert, J. Higginson, G. Hubert Woods, H. C. Holder, C. A. Bird, Arthur Cox, etc.

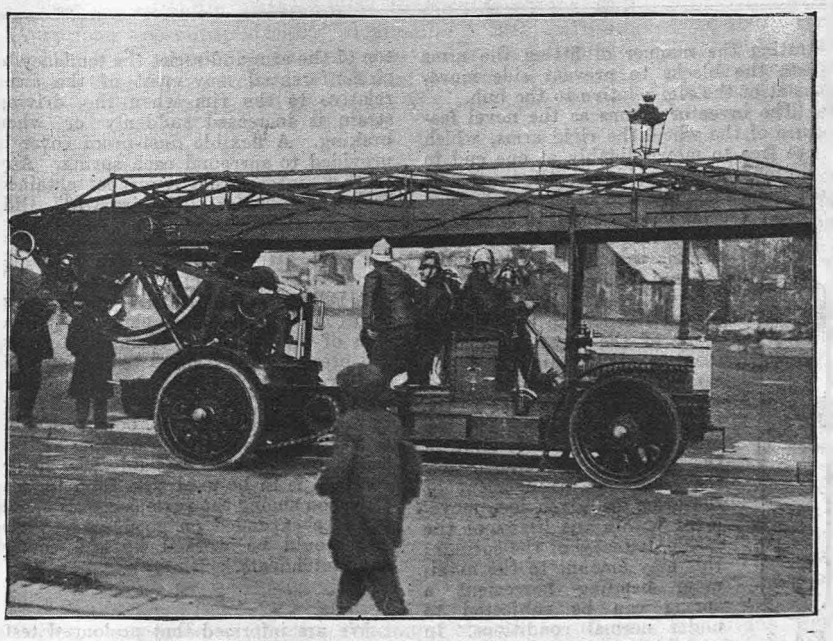
A New Sparking Plug with a Variable Gap.

The illustration appended clearly shows the features of a new sparking plug which has been placed on the market by J. H. Runbaken, 7, Peter Street, Manchester. The principle adopted in this plug is that of making the central electrode adjustable. The end views of the plug clearly depict the insulator with its electrode, which is



Sparking plug with variable gap. The end view on left shows gap at full width, and that on the right shows the smallest gap.

arranged eccentrically in relation to the body of the plug. Therefore, when the electrode is partly rotated it varies its gap from 7-1000th of an in. to 14-1000th, that is, about a range of two to one variation. The adjustment is effected by partly rotating the milled head, the various degrees of adjustment obtainable being shown on the dial by means of the pointer which passes over it. The electrode is limited in the amount of its travel by means of a step cut in the end of the insulator. The inventor claims that such a plug with variable gap is advantageous, insomuch that it can be set to the smallest width for starting up, and this ensures a spark being obtained even from a weak magneto. When the engine is started up the sparking gap can be adjusted to its wider normal working width. Another advantage claimed is that in the event of the electrodes becoming short-circuited by means of carbon deposit, this can be immediately removed by turning the electrode from one position to another, thus clearing the gap.



New motor fire engine and escape in the service of the Paris Fire Brigade.

Rubber Tyres:

Important Decision by French Courts.

The seizure by the Michelin Co. of a number of tyres of Bergougnan make at the 1908 Salon de l'Automobile, which they claimed infringed their patent in regard to the leather bands with which they were fitted, led to a series of prolonged legal actions, and the French courts' decision has been eagerly awaited on account of its importance to the rubber tyre trade. The Michelin patent, granted in August, 1905, covered a process of hot vulcanizing leather to rubber, which is applied in the manufacture of the Semelle Michelin. On the 15th March, 1911, the case was taken to the Third Chamber of the Tribunal of Commerce of the Seine, and here Michelins lost the day, and the patent was annulled on the ground of insufficiency in the description of the patent. The Michelin Co. decided to appeal, and carried the case to the Fourth Chamber of the Court of Paris, and the decision, only recently announced, was that the court confirmed the judgment of the lower court and maintained the nullity of the patent.

The Warland Dual Rim Co., Ltd., Alma Street, Birmingham, inform us that so large has their business become in converting detachable wire wheels to the Warland dual rim system that their works at Birmingham are congested with orders, so much so that they have been compelled to open works at Great Ducie Street, Manchester, specially for the purpose of converting wire wheels, and motorists who desire to have conversions made are requested to assist in the prompt execution of orders by sending their wheels to Manchester, at the same time advising the Birmingham works direct as to the size. We may mention that Warland rims can be fitted in 48 hours.

H.R.H. Princess Henry of Battenberg has ordered a landaulet car from Messrs. Mann, Egerton and Co., Ltd., the body of which is to be built in the company's own coachbuilding shops at Norwich. Her Royal Highness's order is the second obtained from this branch of the Royal Family, Messrs. Mann, Egerton and Co. having had the honour of supplying Prince Maurice with a car some three months ago.

Amongst the cars recently fitted up with complete Bleriot electric installation by Messrs. Bleriot, Ltd., 57-59, Long Acre, London, W.C., is a Berliet car owned by Prince Alexander of Battenberg.

UNROLLED STONES.

A Suggestion to Our Associations for Indicating Stretches of Road where Stones have been Left Unrolled.

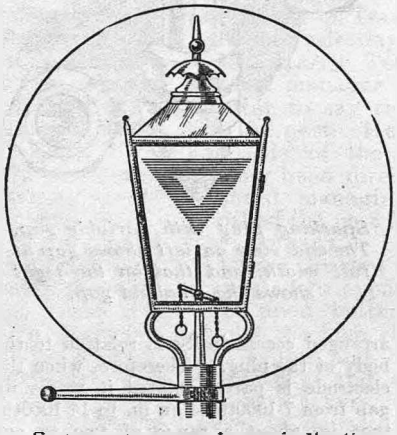
By THE ROADMAN.

The habits of man are indeed the cause of much trouble. It is unfortunate that man-the-motorist should consider it imperative to travel by night at a more than comfortable speed along a highway upon which man-the-road-repairer has left his unfinished work. The combination of circumstances is extremely annoying, and is only balanced, in Nature's wonderful way, by the joy of the tyre merchant. The newest habit is the most easily broken, and it therefore rests with us to indicate to the man-in-the-motor the presence of the half-done task of the man-in-the-corduroy. The reader will note that I do not admit the possibility of the roadmen taking care to warn those for whom the roads were made, that would be expecting too much. They may do so one day, but it will probably be the day when we are dodging one another in all three dimensions of space, and tyre and road upkeep are things of the past. For I am informed by all those newspapers that sell at one penny, and less, that the air is our coming highway.

There is something exceedingly satisfactory in the thought. Water is sadly lacking in the desert, dry land never more desirable than in the midst of a storm at sea, a decent road needed more than ever when your wheels spin a-racing in a slough of mud, but there is the comforting assurance that our new highway will always be there, until such time as some fatal genius invents a new petrol economizer which will use up all the breath of life in extra air. This new road-where-there-are-no-horses will cost us nothing for its upkeep; I have it upon excellent authority that it will never wear out, that it will not wear out our tyres, that spine-shaking shocks will be no longer known, and that we may make our uphills and downhills as we fancy.

Thus those optimists, the newspapers, and the district councillors who defer the purchase of the red lantern for fear that so soon shall it be out-of-date.

For my part, I am of the pessimists, gloomy folk like those of the associations and clubs that—in these days when the motorcars never refuse to mote—install by the roadside telephones that are more than likely to refuse to 'phone. Ask one of these for his opinion, he will



Suggested sign on lamp, indicating newly-laid unrolled stones.

tell you in sad manner that the road, its dangers, its bumps and its limiting accommodation will be in for ever, and there I am with him.

But to return to our stones.

The county surveyor and his kind, do, upon occasion, provide street lamps—grudgingly, it is true—and sometimes farther apart than the milestones.

Now, a scheme has occurred to me whereby not only could our associations and clubs find more to do, but could do some service to their members. For what could be more simple than for our scouts of the road to paste upon the nearest street lamp pieces of transparent paper bearing the mark of the red triangle, the sign of necessity for caution.

My unthinking critic will taunt me with the statement that our main highways do not as a regular thing find room for lamps, wherein he will be correct, but it is a sorry stretch, a long lane that does not show a solitary light.

And on this solitary light will be placed the sign.

Even were the distance a few miles, double as many minutes spent would permit a slackening enough to let obstructions be detected.

Or, again, the idea might be developed, and in the place of our triangle might be fixed a figure, 1, 2, 3 or so, indicating to the nearest mile the distance of the danger.

To my mind, however, this is carrying it too far. We have our signs, various enough already, and I make the suggestion merely in selfish anticipation of the other fellow.

Our inverted triangle should be enough for the man of moderation, who is willing to spend some extra minutes on the road to gain some extra miles' wear from his tyres.

As for the man-who-will-not, that is his affair.

A New Resilient Wheel.

The wheel illustrated is stated by its inventor to be intended as a substitute for the pneumatic tyre. Fig. 1 is an elevation of the wheel, showing an arm and part of the rim and tyre in section, to illustrate the method of providing freedom for movement of the rigid arms in the plane of the wheel. Fig. 2 is half cross-section and half outside view, illustrating the manner of fitting the arms into the blocks to prevent side movement of the rim relative to the hub.

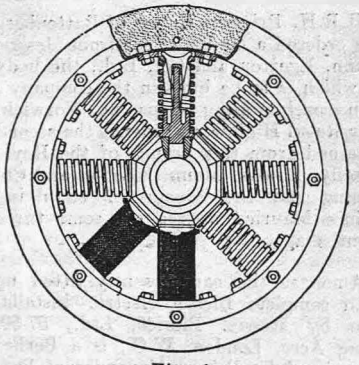


Fig. 1.

New resilient wheel.

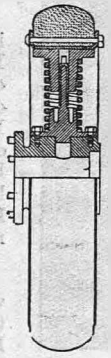


Fig. 2.

The inventor claims as the novel feature of the wheel the rigid arms, which are free to move slidably at one end in slotted blocks provided on the inner side of the rim, while the other end is fixed to the central boss or hub. A helical or other suitable spring surrounds each arm, being kept in that position by the tapered base of an arm and the conical block, which give the spring freedom to bend in the plane of the wheel, as shocks displace the hub from its central position. Side movement of the rim relative to the hub is prevented by fitting the arm into the block to slide in the plane of the wheel. By the foregoing arrangement of the arms are given free movement within the limits of the inside diameter of the springs; this may amount to the maximum bending movement a spring can be subjected to under normal conditions. In each block a flat steel spring is provided to press against the top of the arm and resist the tendency to circumferential movement of the arms relative to the rim when the driving strain is increased suddenly or when braking. A flexible dust-proof cover is provided to surround each spring. Any further information can be obtained from the inventor, R. Cairns, 287, Oldpark Road, Belfast.

A Bill is now before the Ontario Legislature calling for the complete reorganization of the system of taxing motorcars. All present legislation is to be repealed, and licences will be issued on the following scale:—1s. 3d. per 100 lb. on cars up to 2000 lb. in weight; 1s. 8d. per 100 lb. on cars up to 4000 lb.; and 2s. 1d. per 100 lb. on those over 4000 lb. The money received is to be used as a fund for distribution among the various counties, and is to be expended on good roads. The Act would be worked by the county superintendents.

We are informed that prolonged tests have shown the Zenith carburetter to be in every way suitable for benzole.

MORE TRUTH ABOUT BENZOLE.

Further Interesting Facts and Figures. Reasons why Benzole is the Only Alternative Fuel to Which Motorists Can Look at Present for Relief. The Beginning of the Smokeless Age.

THE fuel problem is involving the motoring industry in an uncertainty similar to that experienced by the railways in the battle of the gauges; but the battle of the fuels will have a broadening instead of a narrowing ultimate effect. The railways were assured of their ground to run on and were only concerned with one dimension; but fuel is motoring's vitality, affecting every circumstance of the industry's existence. The hazardous nature of the position cannot be suddenly or easily relieved, and the magnitude of the issues can only be permanently improved by changes of great external comprehensiveness.

Fortunately, motors are performing public service of incalculable importance, visible to all; therefore there is exerted a force of ever-increasing intensity towards the solution of obscure problems intimately related to the one root evil. Proceedings have reached that stage when it must be definitely and cogently explained how to establish a remedy. The subject must be stripped of super-optimistic adornments, and also relieved of over-weighted scepticism. Clarity of aspect can only be attained by adequate consideration, and the range for examination is admittedly extensive. But the right course is clear. We have the materials at hand to supply ourselves with all the motive oils we want; and the processes of obtaining them will coincidently settle other pressing questions. It means the setting up of a new industry for the fractionation of raw coal, and it provides a measure for the conservation of national resources that cannot be renewed.

The position well indicates the penalizing influences of the importation of vital necessities. Unfortunately our commercial methods lack a directive influence towards our general benefit. It may be that the individualistic aspects of the profit-getting are committedly antagonistic to considerations that appear communistically desirable. But without following remote economic reasonings, it is conclusive that improvement of the fuel position will accrue from the prospects of profit. We must show that there is money in it.

What Germany Has Done.

In Germany, intelligent directive effect has already taken place, and that country is taking a lead in all matters relative to the better use of coal. Germany, in 1886, imported 1½ million gallons of benzole from Britain; in 1890 a start was made in home production, and there has since been a steady fall in imports to some 140 thousand gallons in 1911; and this material saving is further augmented by German export of the recovery plants in which she has become so proficient in manufacture. Again, we have to note that Germany uses all her output of sulphate of ammonia herself; we, in this country, in spite of the constantly decreasing supply of animal manure, export the bulk, yet our wheat alone could use up our whole output. Further, we last year exported 4½ million gallons of benzole for foreign countries, from whom we accepted £36,000 less, plus the F.O.B. charges, than home market prices would have yielded. Some supervision of the tendency shown by these statistics seems necessary. A substantial export tax should commend itself to the authorities to help in the direction of retention here; an artificial barrier to trade, it may be argued, but effective in its aim.

Variety of Fuels a Vital Necessity.

Oil production remains steady; oil consumption rises rapidly. The rise in demand will incur the accompanying rise in price which consumers must meet if they continue to deal. The rise is obscured behind a temporary shortage of tank steamers; but as a shortage of oil is in view the top prices will continue to be maintained with varying apologies. The only manner in which motorists can obtain relief is by increasing the number of alternative fuels and their sources of supply, thereby helping the natural operation of antagonistic competitiveness towards a reduction of prices.

Variety in fuels is as necessary as variety in designs, otherwise stagnation is certain. Let us have alcohol, benzole, petrol, paraffin and mixtures of gases, fluids and solids; there is room for all. Many inventors are already working, and there is still room for more. Origin must also be differentiated. If inventors confine themselves to, say, carburetters for paraffin, or even heavier oils of foreign origin, their efforts are only of temporary value to the consumer here, and the oil monopolists abroad will be the greatest gainers, insomuch as the consumer's proficiency is the monopolists' opportunity for higher profits; their exacting power would only be greater if the whole range of crude petroleum from petrol to pitch could be used in motors; the supplier still controls the source. It is easy to regulate the fuel's price and standard to the wider demand of better methods; the base of usefulness would raise the apex of price if the areas of supply are unextended.

Mixed Fuels. Benzole Mixed with Alcohol on the Open Market 10 Years Ago.

In 1903 there was sold in Germany a mixture of 20 per cent. benzole with 80 per cent. alcohol. Both in America and this country there are even now many mixtures in use. Pre-heating, super-heating, steam-heating and electric-heating of the carburetter suggests wide possibilities of fuel mixing, all worth following up. But the mixture that offers the best prospects is coal naphtha with the benzole, toluol and zylol left in; the fuel being cleared of the phenols, sulphur compounds and other deleterious matter up to the point imposed by commercial requirements. This naphtha, or benzole, is the natural alternative fuel to petrol, inasmuch as it can be got in bulk quantities by an imitation of nature's processes. Seeking to convert public opinion towards a deficiency of supply of benzole is conceding ignorance of the matter, tending towards negligence; over-estimation might cause disappointment, but it would help activity. Let us have the facts truly before us—let them speak.

Some Telling Figures.

In round figures, our coke ovens are coking 21,000,000 tons of coal annually for metallurgical purposes; 7000 ovens are run on the by-products principle, using 7,000,000 tons of coal and producing, at 2 gallons per ton, 14,000,000 gallons of benzole; 14,000 ovens are of the bee-hive type, using 14,000,000

MORE TRUTH ABOUT BENZOLE.—Contd.

tons of coal and washing 28,000,000 gallons of benzole and all the by-products annually. Now on our blast-furnace coking plants, if they were all on the recovery system, we can, without adding to the production of coke, rely upon a supply of benzole of 42,000,000 gallons. As the general benzole yield is approaching 2½ gallons per ton of coal, this would give an annual output of 52,500,000 gallons, and if we extract from this that used as the raw material of the dry cleaner, the varnish man, and the chemical trade, we should have half our present consumption of imported petrol, besides checking this and other enormous wastes. It is beyond the point to labour the present or the possible production of benzole. The thing to consider is the time period; how long do we intend to take before we produce all the benzole we require? How long can motoring stand this increasing toll?

The absorbing quality of the market has hitherto been deficient, retarding benzole production, and favouring export trade. But absorption has become insatiable since the fuel's suitability became acceptable. Under trade euphemisms benzole has for years been used in motor vehicles; but its official recognition in its own name is recent.

This is not the mere paltry matter of the per-ton gallon or per-gallon price of benzole; the fuel is urging on larger reforms which would enable benzole to be given away without jeopardy to the whole. Until the steam engine came, coal was only used for heating; and steam opened pits and made seams profitable that were not regarded as worth working. Motoring and mining can now continue to sub-divide coal into all its respective valuable parts and give it a greater importance than it has ever attained.

The volatile contents of British coals are only extracted from one-thirteenth of our coal output. One-third of our coal can be worked for benzole.

Steam engines have reached the height of efficiency. Internal-combustion engines will maintain the value of our mines. The distillation of coal will centralize the pit-heads in the new radius of productivity. We can cripple the foreign monopoly of fuel oil, and give ourselves a supply that cannot be competed with. The quality and distribution of our coals have the corrective effect against a new monopoly. The range of operations must necessarily be as great as the variety and area of our coal-beds. We can distill 100,000,000 tons of coal for benzole as a by-product, with primary advantages of pre-determinable value.

Unfortunately, the proposal has previously prejudiced reputations which proved of greater ornamental verbosity than practical utility. But to-day alluring attractiveness dwindles before more prosaic considerations. The cost will be argued against; the capital outlay is great, but it will be gradual on known results. The railways have had a sum twice the size of the National Debt spent upon them. Motoring is constantly absorbing capital. Coal distillation will effect savings that will give it enviable security.

A Train of Operations.

It has been deemed worth while to argue that it is unlikely that a ton of coal will be distilled because it might yield two gallons of benzole, but the larger considerations are avoided. Benzole will be got because it is an integral part of the following train of operations:—

1. Low temperature distillation of coal.
2. Variable distillation of coal.
3. Collection and separation of the volatiles.
4. Distillation of the hydro-carbons.
5. Gasification of coke residues.
6. Production of sulphate of ammonia.
7. Production of smokeless fuel.
8. Generation of electricity.
9. Distribution of electricity.
10. Sale of industrial gas.
11. Production of disinfectants.
12. Rectification of fuel oils.
13. Preparation of road materials.
14. Special treatment of inferior coals.

This programme will be met by the charge of discursiveness, which, if one's brain is only big enough for benzole in a beaker, might convince. But this programme illustrates the basic standard value of British coal; and it can be sub-divided or partly worked.

Where Investigation is Trending.

The problem of the proper distillation of coal is being prosecuted by a number of vigorous investigators, and some have indulged in luxurious print, and the glowing reports might lead one to think that coal is only a liquid disguised as a solid, and that there has been sucked from its porosity such yields of oil that tank wagons will soon displace coal trucks. Let us take these as signs of nascent hopefulness, assuming that the experimenters have indeed struck oil in greater quantities than any of their predecessors. There is at present only one thing certain, we must wait and see. Meanwhile, let us not accept misleading under-estimation, for there has definitely been obtained a tar yield per ton of 40 gallons, this yielding 5 gallons of motor spirit, whilst we know of experiments wherein twice this quantity has been obtained.

The range of the initial coal distillation process will be from exposing carbonaceous shales and inferior coals to temperatures up to 800 degrees Fahr., up to the limits worked for pure carbon or blast-furnace coke. It has already been found that the light oils coming off the coals at the lower temperatures are, for motor work, superior to those now obtainable, and that they have characteristics quite their own. The coke residues of either one, wholly of the distillation processes or a mixture of several, will yield tar-free fuels for gas producers of many types, especially those with the capacity for complete gasification and automatic ash freeing. Besides adjustment to the variety of the coals, the adjustments to the market, occasioned by the seasons of the year or the fluctuations of trade, are possible. Still further, the exhaustion of the volatiles at the lower temperatures may be led to different receptacles from those for the higher temperatures.

The Smokeless Age.

Looking over the roofs of London from any point, say, in the Strand, stimulates one's imagination as to what a change smokelessness would effect in our big cities. One has only to look at the underground railways for example; they are now the cleanest instead of the murkiest places in London, and the dirt there is that deposited by the external atmosphere. It seems almost incredible that the pouring forth of all this vile polluting matter has been tolerated for so long; the cost has been incalculable, and the blue cloud represents a waste of admitted magnitude. No hope of improvement exists until the character of London's 17½ million tons of coal is materially changed by distillation; all the science and agitation of smoke-preventers have been meagre of result indeed. Besides the larger particles of unspent carbon that are sent into the air, there are all the microscopic atoms which go to stop up the pores of foliage and clothing and to form a nucleus for atmospheric dirt, damp, and fog. There are signs that the love of a blazing and smoking fire will now give way to the greater cleanliness and improved economy of smoke-free fuel, gas, or cheap heating electricity. Even if a proportion of the smoky chimneys could be stopped it would be beneficial.

The romance of coal tar may be said to have only just begun; a tumbler-full of it would take an analyst a life-time to explore. The dormancy of the hidden marvels of coal is beginning to be disturbed. Motoring is rallying the forces of science in a campaign of interminable possibilities.

MORE TRUTH ABOUT BENZOLE.—Contd.

An Example.

Let us consider a coal distillation plant set down in the Wigan district of the Lancashire coalfield, where there is coal high in volatiles. We will view the prospects for power gas, fuel oils, coalite, and the principal by-products, reckoning the base of operations on a daily supply to London of 10,000 gallons of motor spirit; the proposition to include a power supply of 25,000 kilowatt capacity with a load factor of .6; and the coke residue to be a smokeless domestic fuel.

Averaging the motor spirit yield at four gallons per ton, we have 10,000 ÷ 4 = 2500 tons of coal to be treated daily.

THE ESTIMATED COST WOULD BE:—

	£
Gas engines, dynamos, land, buildings and accessories	250,000
Coal distillation, coal handling, tar and by-products recovery plants	400,000
Power gas plant	20,000
Electrical mains	50,000
Preliminary costs	50,000
Working capital	130,000
Total ...	£900,000

ESTIMATED INCOME.

	£
63,000,000 units of electricity at ¼d. = ...	65,625
10,044 tons of sulp. of amm. at £14 = ...	140,616
481,500 tons coke at £1 = ...	481,500
32,100 tons breeze at 10s. = ...	16,500
1,125,000 gallons carbolic acid at 2s. = ...	125,000
187,500 gallons ditto (2nd grade) at 1s. =	9,375
3,000,000 gallons benzole at 9d. = ...	112,500
375,000 gallons heavy naphtha at 9d. = ...	14,067
2,250,000 gallons fuel oil at 3d. = ...	28,125
375,000 gallons neutral oil at 4d. = ...	6,250
28,125 tons pitch at £2 = ...	56,250
Surplus gas, say	5,000
Total ...	£1,060,808

ESTIMATED WORKING COSTS.

	£
750,000 tons mixed coals at 12s.	450,000
Depreciation on £770,000 at 15 per cent.	115,000
Labour and supervision	100,000
Stores, sundries and carriage	100,000
Total ...	£765,000

YIELDING.

	£
Income	1,060,808
Outlay	765,000
Surplus ...	£295,808

The Figures Analysed.

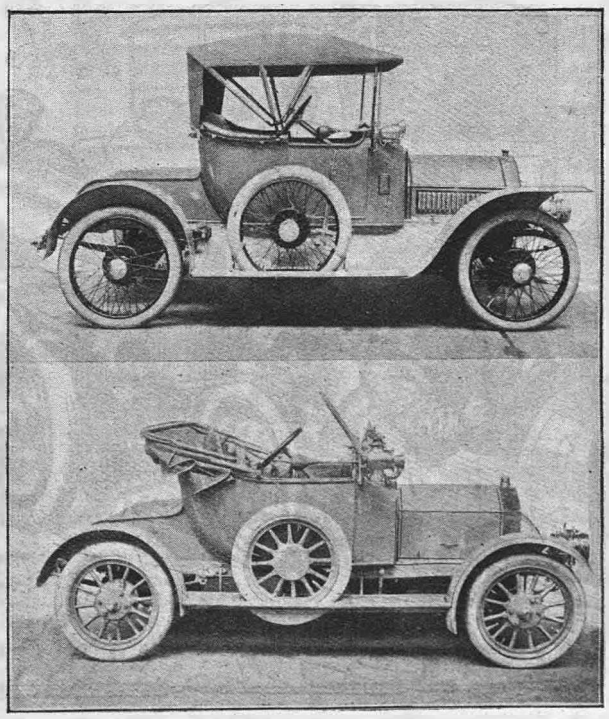
It will here be seen that, while making adequate allowance for contingent variation from the calculations taken, the operations show a handsome profit. The labour charge is at £333 per day, but, owing to the concentration of the plant, this figure is ample. The line of cleavage between the profitable working of the electrical side and the fuel side must be adjusted to the locality; the amount spent on electrical plant is a large influencing factor. It will be seen that the constituently separative processes of splitting up the raw fuel more than doubles its value to the owner of the mineral, and the productive side of industry is raised in very important directions. There is a growth of primary productivity, and an induced secondary increase of industry due to cheap power. At the same time there is a stoppage of the waste of two-thirds of the coal's economic contents. The negative effects are mainly in the handling of the lighter fuel product, which will occupy twice the room of that of coal. But the new fuel will have the heat units of coal weight for weight, and there will be no dirt in using. The year is taken at 300 working days in the calculations. Comparing the electrical results with 300 existing plants using steam, capitalized at £60,000,000, we find that the depreciation allowance is only 2½ per cent., and the average yield, net, 4½ per cent; the average charge is 1 9-10d. per unit, and the working costs 9-10d. Electricity at four units for a penny would scrap all the steam plants in the area of supply. It is admitted that, as railways radiate from large centres, so will electricity be ultimately distributed from the coal areas. At these prices the sectional and complete electrification of the railways would help the companies and avoid their expenditure on electrical plant.

Cheap disinfectants help the health of large communities, and coal tar derivatives are the most valuable of the series. To-day disinfectant manufacturers use resin as an adulterative. A comprehensive examination into the details of this whole matter reveals numerous defects of commercialism and parasitism better eliminated.

The practical results of coal distillation are ascertainable on small scales at moderate cost, upon which to base larger plans with safety. The chemical by-products recovery plants have all been fully proved by installations which can be inspected in this country, and their efficiency is always being added to. Large gas engines can be put down on guaranteed results from experience. Coal distillation for all purposes will quickly become as definite and certain as any of our other great principal industrial processes; it will be primary, other industries will be subsidiary.

Benzole Our Only Relief.

There is no truth in the advice that motorists need not look to benzole for relief. On the contrary, it is to benzole only that they can look. It is their only



The 11-9 h.p. Humbert (upper illustration) and the 10 h.p. Swift.

MORE TRUTH ABOUT BENZOLE—Contd.

relief. It can be produced at home, and is a better fuel than petrol. By all means let us have other fuels, but let us associate ourselves with the due, natural, and imminent movement which we know will give us what we want without any further proof or argument.

The expiry of foreign contracts will permit us to bid for benzole now made here, and it can be shipped at the ports for London in motor ships, as now for France and Germany by steamer. The bee-hive coke-ovens are being rapidly outclassed by the newer types, and there is an ever-increasing supply of motor spirit, which the naphthas can augment to four gallons per ton, thereby giving the import trade a shock. The distribution problem is one of organization, which distilleries usually solve, or, on the other hand, our motoring organizations could build up a scheme.

As a rule, proposals for the bulk manufacture of alcohol from what are usually food-stuffs is economically unsound, as it is generally better to turn these things into food for practical human sustenance than to dissipate them in smoke and theoretical preference. By extracting the fuel from coal, we are doing what it is most desirable and necessary that we should do from every point of view, and instead of deriving one thing we obtain many—now wasted—and yet in ever-growing demand, besides doing ourselves public services without drawing upon the fertility of land which would have to be restored. There is no need to dig, and sow, and glean, and carry, and germinate when the raw materials are to hand at one operation, ready-made. It is like taking all the materials to Newcastle in order to make inferior coal to what can be dug up already there.

It is rather to be feared that the golden offers of large prizes are predestined to failure, and the meditations of investigators can be terminated with the happy dispatch of a good result. Fuel substitutes cannot be concocted in the laboratory or reduced to simple synthesis; ardent desires cannot conjure up potent results in this matter. The substitute is already known, and its production only needs attention; there are no other points in dispute. Benzole should certainly become the fuel of the future in this country.

Not only will it be generally advantageous to us to collect the volatiles from the coals we use at home here, but there is also a large export trade in coals from which the volatiles could be removed without detriment to the purposes of the consumers abroad. Apart also from the coking of caking coals, the distillation of coals yields residues for the artificial agglomeration of block fuel for export trade both to Ireland and abroad.

The colliery proprietors' horizon is steadily widening, and it is being recognized that there is more in coal than tons, and they are wanting to try other measures of its worth. There are no complicated conjectures regarding remote considerations of invention, manipulation, or exploitation: the distillation of coal is a distinct increment in the value of raw materials.

W.W.S.

At Berlin recently, an Association of German Chauffeur Schools was founded, the object being to improve the all-round training of chauffeurs and raising their material condition. Engineer Kolsch, manager of the Mainz Chauffeur School, Professor Hopke, of Bingen, and Baron Niedheim, of the Royal Wurtemberg Motor Club, constitute the executive of the association.

Much more popular motoring and the present spring-like weather are responsible for this suggestion. The poor scout finds some difficulty in keeping pace with the never-ending streams of badge-bearing vehicles going both ways, which he has to salute. A lay figure worked from the back might bring him some measure of relief.

WHERE BENZOLE MAY BE OBTAINED.

List of Concerns that Supply 90's Benzole, with Some Important Additions.

WE repeat the list of suppliers of benzole which appeared for the first time in our last issue. The benzole supplied is what is known as 90's, and is quite suitable for use with most standard carburetters. We have been asked to make some additions to the list.

Accrington.—Altham Benzole Co., The Altham and Great Hanwood Colliery.

Barnsley.—Mitchell Main Colliery Co.

Birmingham.—M. Whittingham Jones, 27, Edgbaston Road.

Cleckheaton.—Henry Ellison and Co., Cleckheaton Road.

Cumberland.—West Cumberland Bye-Product Co., Ltd., Flimby, near Maryport.

Durham.—Dean and Chapter Colliery Co., Ferryhill.

Glasgow.—William Baird and Co., Ltd., Richard Smith's Executors, West Street; Brotherton and Co.; Provan Chemical Works.

Gateshead-on-Tyne.—Judge, Brand and Co., Ltd.

Hull.—Blenkin and Son, 76, Queen Street; Major and Co., Provan Chemical Works.

Knottingley, Yorks.—Stainsby and Lyon, Ltd., Aire Tar Works.

Lancashire.—Wigan Coal and Iron Co., Ltd.; Messrs. W. Metcalf, Ltd., Church.

Leeds.—Brotherton and Co., Ltd.; George Exley and Son, Hunslet Lane. In two-gallon tins.

Linlithgow.—James Ross and Co., Ltd.; Philipstoun Oil Co.

London.—Gas Light and Coke Co., Ltd., Westminster, Beckton, Woolwich, and Goswell Road depots; Gas Lighting Improvement Co., Ltd., Salisbury House, London Wall, E.C.; Otto Gas Co., Queen Street Place; A. W. Gamage, Ltd., Holborn, E.C. (who supply in two-gallon tins); Thos. Crow and Sons, West Ham, E.; South Metropolitan Gas Co., Ordnance Works, Tunnel Avenue, E. Greenwich; Southern Automobiles, Ltd., Westcombe Hill, Blackheath, S.E.; Central Motor Co., Ltd., 110, High Street, Croydon; The Elhurst Garage, 47, Streatham Hill, S.W. In two-gallon tins. S. Bowley and Son, Wellington Works, Battersea Bridge, S.W.

Liverpool.—Brotherton and Co.

Manchester.—Hardman and Holden, Miles Platting; J. E. C. Lord, Ship Canal Tar Works, Weaste; Messrs. Crawfords, Ltd., Chorlton Road and Stretford Road; The Clayton Aniline Co., Ltd., Clayton.

Middlesbrough.—Bolckow, Vaughan and Co., Ltd.; Sadler and Co.

Staffordshire.—Birchenwood Colliery Co., Ltd., Kidsgrove, near Stoke-on-Trent; Major and Co., Ltd., Wolverhampton.

Surrey.—Byfleet Automobile Engineering Co., Old Woking Road, Byfleet.

Sunderland.—Brotherton and Co.

The price varies from 1s. 2d. to 1s. 6d. per gallon, and at present there is no duty.

MINERVA HOUSE.

The vogue of the Minerva car has grown to such an extent in this country, as well as abroad, that it has been found desirable to erect in London a building which should provide show-rooms, offices, stores, repair shops, receiving and despatching garage, and all the other facilities necessary for the conduct of a large and important business, and Minerva House has therefore been erected by Messrs. Minerva Motors, Ltd., in Chenies Street, Tottenham Court Road, which is in the heart of the Metropolis. Among all the fine buildings which have been put up for or devoted to the motor trade in London, Minerva House is fitted to occupy first rank.

The show-room accommodates a sufficient range of Minerva models, is decorated in mahogany panelling, and has a marble floor, a wide staircase leading up to the office floor, whilst a waiting room and a writing room for the use of customers are provided on the show-room floor. This show-room has the merit of being decorated with extreme taste, and with an entire absence of any ornate feature. Although the main staircase leading from the show-room gives access to the offices, this staircase will only be called upon to carry a small portion of the traffic, as a separate entrance and staircase have been provided for general use. Of the offices little need be said, except that they are well arranged, light, and capacious. The private rooms of Mr. David Citroen, the chairman, and of Mr. W. C. Holloway, the managing director, having been decorated and furnished with excellent taste.

On the office floor level are the whole of the stores, from which any possible requirement in connection with Minerva productions can be satisfied; these stores are very cleverly arranged, so that there are different counters with separate approaches for private customers, trade customers, and works staff. On the floor above the stores is a machine shop, than which there is no better equipped in London, with lathes, vertical drills, grinding tools, milling machines, shapers, key-slotting machines, saws, and various other tools and appliances. Any possible repair can be carried out. In fact, the equipment is so complete that the staff would not hesitate to undertake the construction of a complete car, if it were necessary. Above the machine shop is the erecting and repair shop, where all work in connection with the maintenance and overhaul of Minerva cars is carried out for clients.

We were extremely interested in going over this department to come across a 26 h.p. Minerva which had been in use for three years, and had now been sent in for the first overhaul which had ever been given to it. The whole of the mechanism was completely dismantled and was then waiting instructions from the owner, to whom an estimate for the work had been submitted. The parts were in an extraordinary state of perfection; in fact, the cylinders, valve sleeves, junk rings and head rings were really in as good a state as when they were first made. The wear in the gudgeon pins and bushes, and in the big-end bearings and crankshaft bearings was practically negligible, and the same remark applies to the sleeve connecting rods and pins, whilst but a very small amount of slack was discernible in the chain which drives the eccentric shaft. Going over the whole of the parts, including gearbox and back axle, it is no exaggeration to say that there were no apparent signs of wear, and hardly anything that called for replacement. The actual mileage done by this car is not known, but, as it has been in use practically every day for three years, it is probable that it has run well over 25,000 miles.

The shops where the repair work and machining are carried out are fine, and light, and airy, and thoroughly well warmed, so that the work is carried out here under the very best conditions. On the roof is provided a large washing space, the lift going through from basement to roof. The ground-floor garage is employed for receiving new cars and chassis, and for delivery of cars to customers, whilst the basement is mainly devoted to heating furnaces, a kitchen, and to storage space, as Mr. Holloway does not believe in basements for working places.

Minerva House is a most interesting building to examine, as well as being one of the architectural features of the Metropolis, and we can thoroughly recommend owners of Minerva cars to seek a personally-conducted tour over the premises when they are next in town.

D27

THE PARIS SHOW.

The French Trade Unanimous for an October Show. Special Interview With the General Manager.

THE first announcement, made in THE MOTOR some months ago, that this year's Paris Salon will be held during the month of October, has been confirmed by the various trade associations responsible for this event. The Paris Show is in the hands of a joint committee appointed by six distinct trade associations having somewhat varied interests, for they comprise big-car manufacturers, accessory dealers, bodymakers, and agents. Without a single dissentient these various associations have approved the October Show.

"Although it is practically certain that we shall have our Show in October," declared M. Henri Cezanne, who is again general manager of the Paris Exhibition, "it would be premature on my part to make an official announcement. The whole of the French trade—there has not been a single dissenting voice—is in favour of an October exhibition, but in order to make this possible we must secure the use of the Grand Palais. At present there is only one difficulty: the autumnal art exhibition is held in a part of the hall on the date we have provisionally selected. In view of the overwhelmingly greater commercial interests of the motor Show, the artists will probably consent to withdraw in our favour. The aeroplane manufacturers, who also hold their exhibition in the Grand Palais, and prefer an early date, have consented to withdraw in view of our trade interests. In making this change from December to October, it should be pointed out that the French trade has only been animated by a desire to reduce the slack period intervening between the end of one active selling season and the opening of the new season. It means that two months which are practically lost will be gained to the trade. The change has not been made in any spirit of antagonism towards the London Show, it being our desire to co-operate with the English manufacturers on such matters as this, for a complete understanding can only be to our mutual benefit."

In certain quarters the announcement has been made that the next Paris Salon will last 10 instead of the usual 21 days. The initiative in this direction has been taken by the Chambre Syndicale de l'Automobile, its president, Marquis de Dion, proposing that the period should be reduced.

"The trade generally," explained M. Cezanne, "appears to be in favour of this proposal. With a show lasting 20 to 21 days business staffs are put to a severe strain and not a little inconvenience. It is believed that by adopting the English plan of a 10-day Show we shall do practically the same amount of business, have the same attendance, while economizing the time of the trade. Naturally, if this change is made it will merely be as a trial; its continuance will depend on the results obtained. It is proposed, if we make this change, to keep open later in the evening, probably until seven or eight o'clock, and to reduce, if not entirely to abolish, free passes. With a 21-day Show we can afford to lose a day at the beginning; but if the exhibition is reduced to 10 days it is important that we get the most desirable people in the hall from the moment the doors are thrown open. You will see that our manufacturers are adopting quite a number of English ideas with regard to the Show, and the only excuse that we put forth, if any excuse is needed, is to be found in your saying that 'imitation is the sincerest form of flattery.'"

The joint committee responsible for the Paris Salon is composed as follows: M. Armand Peugeot, president; M. J. Niclausse, M. Rodrigues Ely, and M. Cottenet, vice-presidents; M. A. Citroen, treasurer; M. Turcat, secretary; and M. Henri Cezanne, general secretary and manager.

A crisis has broken out within the Imperial and Royal Motor Club of Austria. The president, Margrave Pallavicini, as well as the two vice-presidents, have resigned; so, too, the former Governor of Lower Austria, Count Erich Kielmannsegg. According to the "Neue Wiener Tageblatt," which writes upon the crisis, the ballot determining the admission of new members does not always reflect the will of the club majority. A few days ago a distinguished Vienna actor was refused admission, although his sponsor happened to be the president's son, and a motor dealer experienced a like fate, because he is an engineer. Judging from these events, the club bids fair to die of ultra-exclusiveness.

The Hillman Motor Car Co., Ltd., Coventry, opened show-rooms at 107, Great Portland Street, London, W., on 1st March. In addition to Hillman pleasure cars, the company exhibit their 10 h.p. motor wagon and Electra stationary engines, and a large stock of spare parts for Hillman manufactures is carried.

For details as to motoring in its simplest and cheapest form see this week's issue of "The Cyclecar."

D28

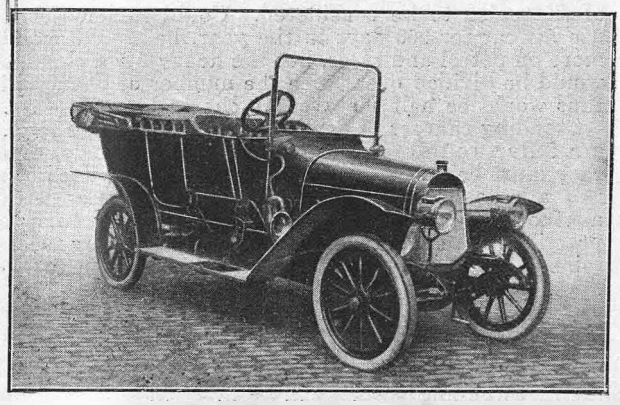
"Life," New York.

"Now it ain't a bit o' use you folks gittin' impatient. Dobbin's trotted six miles through the mud, an' won't budge a step till he's had his nap out."

THE NEW 10-12 h.p. APOLLO CAR.

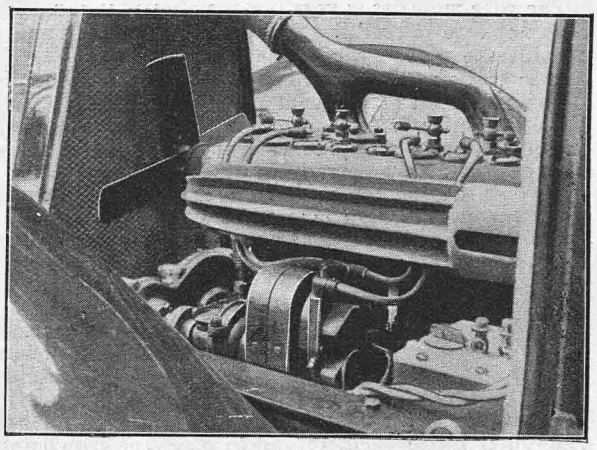
A new small car of German origin, known as the Apollo, is being placed on the British market by the M.A.L.D.A. Motor Association, whose offices are situated at 31, Finsbury Square, London, E.C., and whose works and garage are at South Woodford, Essex.

The car is manufactured by the Apollowerke A.G., of Apolda. It is made in three models, all of which are four-cylindered. The smallest of these is the 8-10 h.p., engine dimensions 62 mm. by 90 mm., the 10-12 h.p. has an engine 70 mm. by 102 mm., whilst the largest model, the 12-14 h.p.,



The new 10-12 h.p. Apollo car.

has an engine 75 mm. by 116 mm. The model which we are about to describe and illustrate is the 10-12 h.p., and it will be seen from the photograph, giving a three-quarter front view, that the appearance is smart, the lines of the bonnet merging into those of the body, and making a very attractive four-seated vehicle, which, with one-man hood, adjustable windscreen, Stepney spare wheel and carrier, five lamps, with acetylene generator, and an accumulator for the small lamps, horn, full kit of tools, and equipped with wood wheels, is priced at £300. The engine has its cylinders cast monobloc, the valves all being on one side, and the crankshaft running in three bearings; the valve tappets are adjustable, and are so arranged that they are unable to turn, the stems having square heads moving in square guides. The inlet valves are somewhat larger in diameter than the exhaust valves. The engine is cooled by thermo-syphonic circulation of the water, the cylinder jackets being very large and giving ample water space around the valve chests. The Eisemann magneto, which is employed for the ignition, is self-advancing, whilst the carburetter employed is known as the Marvel, which, besides being economical, provides so accurate a mixture that only the slightest movement of the starting handle is necessary for setting the engine going, starting being facilitated by the fact that compression in the cylinders is not very high. Three small pumps are mounted in an oil reservoir at the side of the engine, and these are operated by a skew gear-driven shaft, the pumps forcing oil to the two end bearings of the crankshaft and to the timing gear-case, the central crankshaft bearing obtaining its oil from a collecting channel cast in the crankcase, the big ends of the connecting rods dipping into lubricating oil, and the cylinder walls being lubricated by the splash therefrom. The drive is taken through a leather-to-metal clutch to a four-speed gearbox, the top gear being direct. All the shafts run on ball bearings, and the gear changes may be effected easily and silently. The propeller shaft is supported in a torque tube with a forked forward end, tie rods being taken from a collar on the forward end of the torque tube to the ends of the rear axle. The engine and gearbox are carried on a sub-frame, the gearbox coming just below the footboards, and therefore being quite accessible. The final drive is through bevel gear to the live axle. The foot brakes are all of the internal-expanding order, and are made readily adjustable, the foot-brake adjustment being accessible on lifting one of the foot-



The 10-12 h.p. Apollo car.

boards. The axle springs are long, affording comfortable riding; greasers are fitted on to all spring shackles; the front axle is of H-section, and the steering gear is well designed and strong, the connecting rod between the steering arms being adjustable. The petrol tap, whilst being accessible, would never be recognized as such by any person not familiar with the car.

The Apollo car is well worthy of examination by those in search of a smart and efficient vehicle at a low price.

The Three-litre Race.

Sunday, 21st September, has been definitely fixed as the date for the light car or 3-litre race for which the journal L'Auto is responsible. It has also been decided to run this race on the Boulogne course which was the scene, in 1911, of the Delage victory, after a severe struggle with Peugeot, and the course on which several of the voiturette races were held. The Boulogne course, as the many English visitors to this district will remember, is a somewhat hilly one measuring 32.3 miles round. As 14 rounds have to be completed, the total distance to be covered will be about 452 miles. There are practically no changes in the rules as originally announced, the race being open to any type 3-litre car and weighing not more than 1984 lb. without oil, petrol, tools and spares. It is forbidden to supply air or an explosive mixture to the cylinders at more than atmospheric pressure. There is an exception in the case of two-cycle motors, in which the charge must be partially compressed before being admitted to the cylinders. The present entries for this race are three Peugeots to be driven by Boillot, Goux and Zuccarelli, a pair of Delage cars with Bablot and Albert Guyot at the steering wheel, and four Koecklin cars, the drivers of which have not yet been announced. The Koecklin car is a two-cycle model with a piston sleeve. It is practically certain that Sunbeam will be among the starters in this race.

President and Grand Prix.

In view of President Poincaré's favourable disposition towards motoring, it has been decided to request him to be present at the Grand Prix at Amiens, on 12th July. A deputation composed of members of the Automobile Club of France, the Picardie Club, and the Chambre Syndicale of Manufacturers will wait upon the President at an early date and solicit the honour of his presence at the race. Should M. Poincaré accept, this will be the first occasion on which the head of the Government has been present at a motorcar race in France. Horse-racing has long received official recognition, but it has never been possible to convince the Presidents of France of the national importance of a motorcar speed contest.

CO-PARTNERSHIP MOTORING.

Some Suggestions as to How the Cost of Motoring Can Be Divided.

HALF a loaf has a definite value, and, to a hungry man, even a quarter of a loaf is most welcome. But if one suggests a system of part ownership in a motorcar, the general rejoinder is that half a car is no good. In England there is a good deal of prejudice against what we may call co-partnership in motoring, but it is of interest to learn that in America the system is finding considerable favour, and is likely to develop considerably.

The outstanding advantage of co-partnership motoring is that it brings the enjoyment of the motorcar to many people who, in the ordinary course of events, must deny themselves such a pleasure or convenience. By taking a half or a quarter share in the purchase and upkeep of a car, a man can get a certain amount of motoring at a very low cost.

The wise motorist is very jealous about his car. He does not care to lend it even to his best friend, and a considerate person who wishes to avoid trouble is averse to borrowing a friend's car. The automobile becomes a kind of personal possession, and a really keen motorist often develops jealousy about a favourite car to a degree whereby he will not allow members of his own family to drive it.

All this may be advisable from the point of view of self-interest, and the connoisseur who possesses a pet car of high value which he keeps tuned and adjusted to his own peculiar requirements may be forgiven for much of his selfishness. But there are thousands of cases where no such conditions need apply.

Motoring no longer is an art confined to a small number of expert people. The motorcar is no longer a fearfully complex and delicate piece of mechanism which dare not be trusted out of one's hands. Driving and car management have been simplified, and reliability has been increased to a degree which renders many cars quite safe in the hands of any man of common sense.

Then, again, the coming of the cheap car, coupled with a better insurance system, has taken away from motoring those terrors of crushing bills for repairs which made the pastime so expensive in earlier days. Popular motoring has arrived. Cars are cheap in prime cost, cheap in running, cheap in repairs and simple in management.

So there is a slackening in the jealousy of single ownership and control. Nevertheless, one does not care to lend one's car to every acquaintance, for there is nothing of co-partnership in such a one-sided affair. The object of partnership is to arrive at a fair and sensible manner of sharing expenses and sharing facilities. That a great future lies before this plan is evident, if we consider how little a car is used. Take first the case of a City man living in a London suburb, and with, say, Saturday and Sunday only free to him. His car is, consequently, used only on two days out of every seven, normally, if we exclude holidays. Now a car idle in the garage is incurring expense, for all the time the heavy fixed charges, such as rent, taxes, depreciation, interest on capital, etc., are going on. The smaller one's mileage the greater is the average cost per mile.

In actual running the car consumes petrol, oil and tyres in addition; but service is being given in return, whereas the idle car gives no service. Thus, to get full value out of a motorcar, it should be used as much as possible.

Now, if the City man has paid £500 for his car, and the total running costs come to £210 a year, he actually incurs all this expense for facilities which he can enjoy only on two days out of every seven. Allowing for inclement weather, illness and engagements, many City men use their cars on only 100 days in any year, and so the car is idle for perhaps 265 days. With running costs at £210, it means, therefore, that on each day the car is taken out the facility costs £2.

In a sense this is cheap, as compared with hiring, for example, or with travelling by other methods. But we must remember that there is the initial outlay of £500 also to be considered. Could this motorist use his car for 200 days in the year, he would spend more on petrol and tyres, but the heavy fixed charges would be divided over twice the number of days, and thus would be half the average charged on 100 days.

Standing charges of depreciation, rent, wages, etc., are fully two-thirds of the entire running costs, and they must be met each year, even if the car does not run a mile. Now if a man shared expenses with another, the car could be used for 200 days a year at practically the same standing charges. If three men joined, the running days might be brought up to 300 days. Here, then, is a contrast in expenses:—

FULL OWNERSHIP.

	£
Standing charges	140
Running costs	70
Cost of 100 days motoring ...	£210

ONE-THIRD OWNERSHIP.

	£
One-third standing charges ...	46
One-third running costs	70
Cost of 100 days motoring ...	£116

The great trouble, of course, is that most people want to use their cars on Saturdays and Sundays; but if a man can only use his car on one day a week (Saturday, for example), he can readily find a neighbour who could indulge in Sunday motoring. In country and suburban districts a car could be used almost every day by some member of a family which has taken up co-partnership motoring.

In one American plan the car is used every morning to take all the heads of the families to the railway station from their homes, and make the return journey at night. During the day the driver is at the service of the family to which the car is allotted, and the week-end use is divided evenly.

Modifications of this plan could be made to suit various requirements. The working basis is that each member bears an equal share of the prime cost of the car, and of the standing charges, including driver's wages and garage fees. Running expenses are then shared according to each member's mileage, with special provision as regards repairs and accidents. There must be fair dealing and full confidence between the partners, and if each man elects to be his own driver, he must be specially careful. A paid driver simplifies matters in this respect.

Where co-partnership in car-owning is not feasible, much might be done with co-partnership garages. In this case, car owners in a district would club together to rent a central building with lock-up sheds. In the Hampstead Garden Suburb, which is run on co-partnership lines, there is a large communal garage, and it has proved very successful. The founders of the Garden Suburb have provided the building, and they charge low rents for up-to-date accommodation.

There is great need for similar provision in other parts of London, and the local and county councils might well take up this form of public enterprise. Municipal garages are quite as essential as many of the other works carried out by the authorities. They would do much to reduce the cost of motoring, and they would prove an immense boon.

R.H.

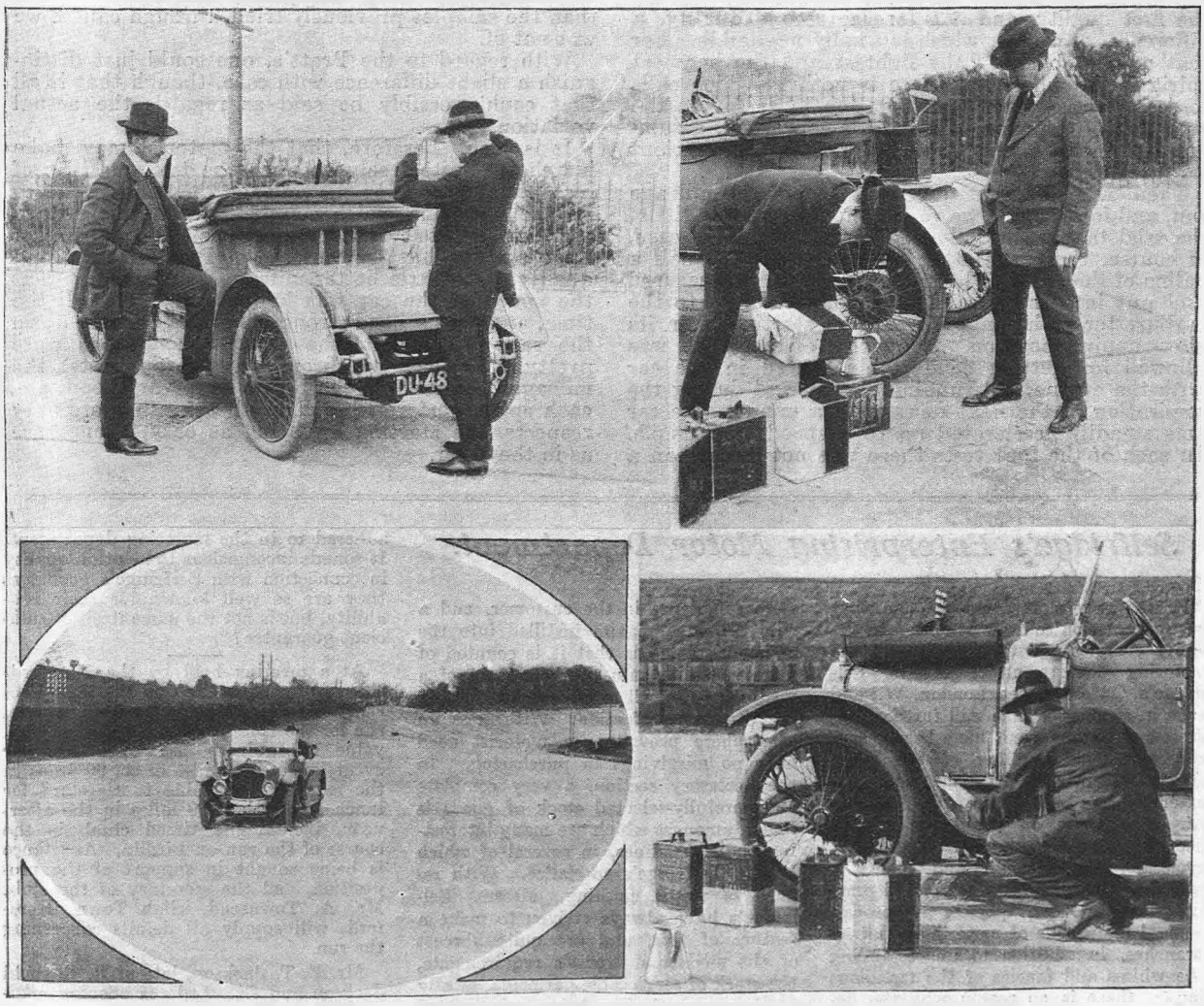
THE SPIRIT OF THE AGE.

Further Comparative Tests of Both Qualities of Shell and Pratt's Petrol.

THE results of the experiments which we carried out recently, which were published in our last issue, with the two qualities of Shell spirit, have proved to be of great interest, and much correspondence has evolved from our probing into the subject. As was naturally anticipated, Pratt's spirit has also been advanced in price, so that now the two great firms are on the same footing again so far as the question of "price upkeep" is concerned.

Briefly, then, as all motorists are no doubt aware, each of the two brands of fuel is now marketed in two qualities, the ordinary and the No. 2. Much has been said during the course of the last ten days or so in trade and authoritative circles anent the question of the shortage of petrol, and in many cases the "shortage" referred to had a dual meaning. Of course, the primary shortage is the one which results in difficulty in obtaining petrol, but the other type of shortage referred to is of quite a different kind. In fact, not only is the motorist being dunned to the tune of paying either 1s. 7d. or 1s. 9d. a gallon for his spirit, but in many cases reports have come through to us that the gallon when purchased was frequently not in accordance with imperial measurements. We decided, therefore, in view of the general interest taken in the matter to make a further series of tests, trying over again the two qualities of the Shell spirit, and also both qualities of Pratt's. We utilized once more the services of the little 12 h.p. Rover car belonging to Mr. Jenkins, the London manager of the Rover company, as, of course, the special tank and other requirements necessary for carrying out such a test were all readily available, and with an independent driver there is less possibility of any inadvertent favouring in the driving.

To start with, the quantity question was dealt with, and the volume of the petrol sold as two gallons carefully measured, and in this respect there was one delinquent, as Shell II was found to contain, by imperial measure, only 7 quarts, 3 pints, and 2.7 gills, thus being 1.3 gills short. On the other hand, Shell I contained a trifle above two gallons, whilst



In the left-hand top picture, pure sulphuric acid is being mixed with the petrol in graduated test tubes, for the qualitative test: on the right, the volume of petrol sold as two gallons is being checked. Below, en route at a steady 30 m.p.h., and a sheltered corner for reading the specific gravity of the spirit.

THE SPIRIT OF THE AGE.—(Contd.)

Pratt's I was also a trifle above the two gallons, and Pratt's II was dead measure. It is, of course, easily conceivable that on occasion a can may be accidentally of slightly short measure, but such should be as a matter of fact quite the exception, assuming that they are filled in the proper way and with the proper apparatus. The motorist, however, can generally tell by the "feel," and by shaking the can, whether it is appreciably short in measure, in which case he should, of course, refuse to take it, and the retailer can then weigh it, and knowing the weight of the tin approximately by means of testing the weight of a similar one, he can gauge the extent of the shortage, and then, of course, return the tin.

Then came the question of testing the specific gravity, and with regard to Shell the figures obtained were very much the same as in our previous test, and, of course, the temperature of the air makes a slight difference. The temperature of the spirit when measured on Brooklands track was 58 degrees F., and Shell I registered .718 for its specific gravity (as against .720 in our first test), and Shell II .736, or practically the same when viewed as against the .735 recorded in the former test.

With regard to Pratt's, in the open air it required very delicate reading to find any difference whatsoever between the two, so far as specific gravity was concerned, the figures as finally read being .725 for the first quality, and .728 for the second quality, a difference, of course, which is wholly negligible. For that matter, between the lightest and the heaviest spirit of the whole lot, there is nothing which calls for comment or even consideration in so far as the variation of the specific gravity is concerned, assuming a car with a reasonably up-to-date and efficient carburetter.

Then came the next question, that of the mileage run, and for this test we varied the procedure a little, the trial taking the following shape: In each case, of course, the carburetter was run dry, then half a gallon of the spirit to be tried was carefully measured and put into the special tank connected up to the carburetter. The engine was then started up in its slow-running position. A quarter of a minute was allowed for getting comfortably seated in the car with the engine still running slowly, and during the expiration of the next quarter of a minute, the car was steadily accelerated up to a speed of 30 m.p.h. In each of the four tests there was not more than a second or two difference in the speeding up of the car to the 30 m.p.h. mark on the speedometer, at which speed it was kept until the supply petered out. The time for which the car ran at 30 m.p.h. was carefully taken by a stop-watch, and the instant the supply gave out, of course, one could readily see how long the car had run at the given set speed, which, of course, was easily convertible into miles and yards.

The results obtained were as follow:—

Shell I, 12 miles 1086 yards.
Shell II, 13 miles 352 yards.
Pratt's I, 12 miles 1120 yards.
Pratt's II, 12 miles 1204 yards.

It is seen, therefore, that in each case the second quality gave a little better mileage, and that in regard to the first quality of the two spirits there was no practical difference.

In order that there might be no possibility of deterioration in the quality of the spirits when tested analytically, we took down the necessary apparatus used in carrying out an accurate qualitative test, and did the work immediately the tin of each spirit was opened. The results were rather striking. In the case of the two Shell spirits, the results obtained were again quite similar to those published in our last issue, that is to say there was practically no difference whatsoever in the strength of the impurities in the two grades. In each case, however, with the Shell spirit tests, the quality was a little better than the samples previously tried, through causes we wot not of.

With regard to the Pratt's, one could just distinguish a slight difference with care, though that is all that could possibly be said as regards the actual variation.

It is seen, therefore, that the motorist may make his choice quite freely between the two qualities of his special brand, as the mileage question seems to be the only one which counts, and in this regard there is but little in it between the two qualities of Shell spirit, whilst in the case of Pratt's the second quality did a little better mileage. Considering that the speed of the car was kept at 30 m.p.h. all the time, and that a good strong wind was blowing down the railway straight (the weather conditions were pretty much the same throughout the four tests), the mileages obtained on the Rover were very good, and each spirit performed well in all the other ordinary respects, the starting up being as easy in one case as in the other.

Selfridge's Enterprising Motor Department.

It was only a few months ago that we had occasion to draw attention to the active energies and thoroughness of the motoring department of Messrs. Selfridge's, Oxford Street, London, W., and even in so short a time still further progress and improvement have been made, and with the doubling of the space allotted recently to the department, the extension has been taken full advantage of. The space on the lower ground floor is now covered with motorcycles, cyclecars, and motorcars, and when it is said that all the staff are keen and practical motorists, who possess a thorough general knowledge of motoring in all its branches, in addition to understanding the whims and fancies of the fastidious buyer, there is no reason why the department will not extend still further. In addition to the understanding of a customer's requirements, a feature always aimed at by the staff is to inspire confidence in the customer, and a wise Selfridge maxim instilled into the assistant's mind is that it is counted of more worth to gain the confidence of a visitor than to sell to him without giving the utmost satisfaction. With such an atmosphere prevailing a motorist need have no misgivings in purchasing. In the accessory section, a very complete and carefully-selected stock of goods is found, amongst which are many interesting and novel lines, in several of which Messrs. Selfridge's specialize. With regard to motor clothing, Messrs. Selfridge's have always striven to make a feature of this, and are quite abreast of the modern motorist's requirements, the stock of serviceable garments, mostly of their own design, being very varied and extensive. As to prices of all goods from a car downwards, Messrs. Selfridge's well-known adage "London's lowest prices—always" is consistently adhered to in the motoring department. It sounds incongruous to mention quality in connection with Selfridge's goods, as they are so well known for their reliability, but is not the name itself of sufficient guarantee?

At a meeting held by the Herefordshire Automobile Club on the 28th February it was proposed to hold a trial run for the Herefordshire Challenge Cup, value 100 guineas, an open cyclecar event, about 150 miles or so, 80 miles in the morning, returning to Hereford for lunch, and nearly 80 miles in the afternoon, including a timed climb in the course of the run on Birdlip. Assistance is being sought in support of the proposition, and the secretary of the club, Mr. A. Townsend, High Town, Hereford, will supply all details concerning the run.

Mr. E. T. Jackson, late of R. Reynold Jackson and Co., Ltd., is opening engineering works and a motor garage at Pangbourne, and he informs us that he would like to receive trade lists, which should be addressed: Mr. E. Thomas Jackson, Engineer, Pangbourne, Berks.

POPULAR CARS.

A List of over 540 Motorcars on the British Market, Arranged and Classified According to Price.

THIS year we present a most comprehensive list of cars grouped according to price. In all they number over 540, and these figures show the extraordinary choice afforded to the British motorist.

The grouping is arranged with reference to the prices of the cars with standard touring bodies. These prices in many cases are only approximate, as there is a great diversity of practice with regard to "extras" and equipment. Some cars are turned out at an inclusive figure "ready for the road." Others require various additions to fit them for service.

To detail all these points would defeat the purpose of the present table by destroying its simplicity. The true utility of the compilation is to provide a ready index to cars of moderate price, and thus permit a man to confine his attention to the vehicles which come within his means.

Having cleared the ground in this way, he can then easily follow up his inquiry and go into details of equipment and "extras."

The British motorist as a rule wishes to take some part in the furnishing of his car, and inclusive figures cannot be given therefor. But this list of chassis prices, and the cost of chassis with standard bodies of stated capacity, will be most helpful in the preliminary inquiry.

Several cyclecars come into this list by reason of their price, but a complete table of these vehicles will be found in "The Cyclecar" this week.

Cars from £101 to £150.

	Chassis Price. £	With Body. £	Seats.	Tax £ s.
6 h.p. Wall, two-cyl. (75 mm. by 80 mm.) ..	—	102	2	3 3
8 h.p. Tiny, two-cyl. (85 mm. by 85 mm.) ..	87	103	2	3 3
6-8 h.p. Bedelia, two-cyl. (80 mm. by 100 mm.)	—	104	2	3 3
8 h.p. Lambert, two-cyl. (85 mm. by 85 mm.) ..	—	104	2	3 3
8 h.p. C. and H., two-cyl. (85 mm. by 85 mm.)..	—	105	2	3 3
9 h.p. Premier, two-cyl. (85 mm. by 88 mm.]	—	105	2	3 3
8-10 h.p. Tweenie, two-cyl. (72 mm. by 120 mm.)	—	110	2	2 2
5-6 h.p. C. and H., two-cyl. (70 mm. by 80 mm.]	—	110	2	2 2
8 h.p. Day-Leeds, two-cyl. (85 mm. by 88 mm.)..	—	110	2	3 3
8 h.p. Cripps, two-cyl. (85 mm. by 85 mm.) ..	95	110	2	3 3
— A.C.E., four-cyl. (56 mm. by 76 mm.)	—	110	—	—
8 h.p. Autocrat, two-cyl. (85 mm. by 85 mm.) ..	94	110¼	2	3 3
8 h.p. P.D.A., two-cyl. (85 mm. by 85 mm.]	—	110¼	2	3 3
8-10 h.p. Flycar, two-cyl. (85 mm. by 96 mm.) ..	105	115	2	3 3
8 h.p. C. and H., two-cyl. (85 mm. by 85 mm.]..	—	115	2	3 3
8 h.p. Kendall, two-cyl. (84 mm. by 94 mm.) ..	105	115	2	3 3
8 h.p. Humberette, two-cyl. (84 mm. by 90 mm.)	—	115	2	3 3
8 h.p. Monarch, two-cyl. (85 mm. by 85 mm.)..	100	115½	2	3 3
8 h.p. Arden, two-cyl. (85 mm. by 85 mm. ..	103	115½	2	3 3
18 h.p. Berkeley, four-cyl. (75 mm. by 100 mm.)	—	120	2	4 4
10-12 h.p. Phanomobile, two-cyl. (82 mm. by 84 mm.)	105	120	2	1 0
8 h.p. Arden, two-cyl. (85 mm. by 85 mm.] ..	110½	123	2	3 3
— A.C.E., four-cyl. (2¼ in. by 3 in.)	—	125	2	3 3
8 h.p. Tyseley, two-cyl. (83 mm. by 102 mm.)..	—	125	2	3 3
8 h.p. Salmon, four-cyl. (57 mm. by 76 mm.)	—	125	2	3 3
8.7 h.p. Humberette, two-cyl. (84 mm. by 90 mm.)	—	125	2	3 3
6 h.p. H.P., one-cyl. (80 mm. by 140 mm.] ..	—	125	2	1 0
22 h.p. Metz Lion, four-cyl. (95 mm. by 102 mm.]	—	125	3	6 6
8 h.p. Autocrat, two-cyl. (85 mm. by 95 mm.] ..	110	126	2	3 3
8 h.p. P.D.A., two-cyl. (85 mm. by 85 mm.] water-cooled	—	127½	2	3 3
7 h.p. Crouch Carette, two-cyl. (80 mm. by 90 mm.)	118	128	2	3 3
10 h.p. Beeston, two-cyl. (3½ in. by 4½ in.] ..	110	130	2	3 3
8-10 h.p. Enfield, two-cyl. (86 mm. by 88 mm.)	—	130	2	3 3
8-10 h.p. Eagle, two-cyl. (85 mm. by 88 mm.) ..	109	131	2	1 0
10 h.p. Beacon, two-cyl. (85 mm. by 98 mm.] ..	—	135	3	3 3
— Barimar, one-cyl. (80 mm. by 140 mm.] ..	—	135	2	2 2
8 h.p. Marshall-Arter, two-cyl. (85 mm. by 85 mm.]	—	135	2	3 3
8 h.p. Midget (Alldays], two-cyl. (86 mm. by 92 mm.)	—	130	2	3 3
20 h.p. Ford, four-cyl. (95 mm. by 102 mm.]	—	135	2	6 6
11 h.p. Lagonda, four-cyl. (67 mm. by 78 mm.]	—	135	2	3 3
8 h.p. Gordon, two-cyl. (85 mm. by 95 mm.]..	—	135	2	3 3
8 h.p. G.W.K., two-cyl. (86 mm. by 92 mm.]..	—	135	2	3 3
5-6 h.p. Rudge, one-cyl. (85 mm. by 132 mm.)..	—	135	2	2 2
8-10 h.p. Eagle, two-cyl. (85 mm. by 88 mm.) ..	119	141	2	3 3
4 h.p. C.L.C., one-cyl. (80 mm. by 140 mm).	140	145	2	2 2
8-10 h.p. L.E.C., two-cyl. (80 mm. by 108 mm.]..	—	145	2	3 3
4 h.p. Zebra, one-cyl. (88 mm. by 106 mm.) ..	—	145	2	2 2
8 h.p. Invicta, two-cyl. (85 mm. by 85 mm.] ..	—	140	2	3 3
10 h.p. Portland, four-cyl. (65 mm. by 110 mm.]	—	145	2	3 3
10 h.p. Calthorpe, four-cyl. (62 mm. by 90 mm.)	—	150	2	3 3
6 h.p. Vox, two-cyl., two-cycle (72 mm. by 95 mm.]	130	150	2	2 2
8 h.p. Ariel, two-cyl. (85 mm. by 85 mm.] ..	140	150	2	3 3
6 h.p. Zebra, one-cyl. (88 mm. by 106 mm.] ..	—	150	2	2 2
10 h.p. Pilot, four-cyl. (65 mm. by 110 mm.] ..	136	150	2	3 3
30 h.p. New Pick, four-cyl. (90 mm. by 127 mm.)	—	150	2	6 6
20 h.p. Ford, four-cyl. (95 mm. by 102 mm.] ..	—	150	4	6 6

Cars from £151 to £200.

— Globe, one-cyl. (105 mm. by 120 mm.] ..	—	152	2	3 3
8-10 h.p. Averies, four-cyl. (59 mm. by 100 mm.)	—	158	2	3 3
8-10 h.p. Autocrat, four-cyl. (59 mm. by 100 mm.)	130	157½	2	3 3
10 h.p. Gordon, two-cyl. (85 mm. by 120 mm.)	—	160	4	3 3
6 h.p. Peugeot, four-cyl. (55 mm. by 90 mm.)		160	2	3 3
8 h.p. Wilton, two-cyl. (85 mm. by 85 mm.] ..	145	160	2	3 3
8 h.p. Salmon, four-cyl. (57 mm. by 76 mm.]	130	162½	2	3 3
7-9 h.p. Wilkinson, four-cyl. (64 mm. by 75 mm.)	152¼	162 17s.	2	3 3
8 h.p. Forest, two-cyl. (84 mm. by 120 mm.)..	136	165	2	3 3
20 h.p. New Pick, four-cyl. (90 mm. by 127 mm.)	—	165	2	6 6
10-12 h.p. Phanomobile, two-cyl. (82 mm. by 110 mm.]	140	167	2	1 0
9 h.p. Renault, two-cyl. (80 mm. by 120 mm.] ..	168	184	2	3 3
7 h.p. Bayard, two-cyl. (75 mm. by 110 mm.]..	—	171	2	3 3
— Little Four, four-cyl. (3½ in. by 3⅝ in.] ..	—	173-5	2	6 6
8 h.p. Zebra, four-cyl. (58 mm. by 100 mm.]..	—	175	2	3 3
8 h.p. Mathis, four-cyl. (58 mm. by 90 mm.) ..	160	175	2	3 3
10 h.p. Morris-Oxford, four-cyl. (60 mm. by 90 mm.)	—	175	2	3 3
10-12 h.p. Phanomobile, two-cyl. (82 mm. by 110 mm.]	150	175	2	1 0
22 h.p. Maxwell, four-cyl. (95 mm. by 102 mm.]	—	175	2	6 6
8-10 h.p. Wilton, four-cyl. (58 mm. by 100 mm.)	160	175	2	3 3
12-14 h.p. Hupmobile, four-cyl. (83 mm. by 88 mm.]	—	180	2	6 6
8-12 h.p. La Ponette, four-cyl. (65 mm. by 110 mm.]	152½	180	2	3 3
10 h.p. Day Leeds, four-cyl. (59 mm. by 100 mm.]	—	180	2	3 3
10 h.p. Special Briton, four-cyl. (68 mm. by 120 mm.]	168	183¾	2	3 3
8-10 h.p. Marlborough, four-cyl. (59 mm. by 100 mm.]	180	185	2	3 3
10 h.p. Turner, four-cyl. (60 mm. by 100 mm.]..	175	185	2	3 3
10 h.p. Singer, four-cyl. (63 mm. by 88 mm.] ..	—	185	2	3 3
10-14 h.p. Jackson, four-cyl. (65 mm. by 110 mm.)	155	185	3	3 3
7 h.p. De Dion-Bouton, two-cyl. (60 mm. by 120 mm.)	187	—	—	2 2
— Clyde, four-cyl. (60 mm. by 100 mm.).. ..	165	195	3	3 3
10 h.p. Swift, four-cyl. (65 mm. by 100 mm.] ..	180	195	2	3 3
8-10 h.p. Phœnix, two-cyl. (90 mm. by 100 mm.]	—	195	2	3 3
8 h.p. Bayard, four-cyl. (80 mm. by 120 mm.) ..	—	197	2	3 3
22 h.p. Mitchell, four-cyl. (94 mm. by 133 mm.]	185	200	2	6 6
15-20 h.p. Studebaker, four-cyl. (92 mm. by 127 mm.)	185	200	4	6 6
10 h.p. Turner, four-cyl. (60 mm. by 100 mm.]..	188	200	3	3 3
14-20 h.p. Royal Detroiter, four-cyl. (3⅜ in. by [illegible]	—	200	5	6 6

Cars from £201 to £250.

15.9 h.p. R.C.H., four-cyl. (80 mm. by 127 mm.]	—	207	5	4 4
20-25 h.p. Marathon, four-cyl. (89 mm. by 114 mm.]	—	210	2	6 6
12-14 h.p. Hupmobile, four-cyl. (83 mm. by 88 mm.]	—	210	4	6 6
15 h.p. K.R.I.T., four-cyl. (94 mm. by 102 mm.]	180	210	5	6 6
10-13 h.p. N.S.U., four-cyl. (70 mm. by 78 mm.]	195	210	2	4 4
9-11 h.p. Salmon, four-cyl. (69 mm. by 90 mm.)	165	210	2	3 3
12-14 h.p. Lynx, four-cyl. (70 mm. by 100 mm.]	195	210	2	4 4
10-12 h.p. Belsize, four-cyl. (68 mm. by 130 mm.]	190	215	2	3 3
14 h.p. Special Briton, four-cyl. (80 mm. by 120 mm.)	189	210	2	4 4
13 h.p. Phanomobile, four-cyl. (74 mm. by 90 mm.)	158	216	4	1 0
10-12 h.p. M.A.F., four-cyl. (68 mm. by 90 mm.]	190	220	2	3 3
12.9 h.p. Phœnix, two-cyl. (102 mm. by 115 mm.]	—	220	3	4 4
10.5 h.p. Waverley, four-cyl. (65 mm. by 130 mm.)	210	225	3	3 3
15-9 h.p. R.C.H., four-cyl. (80 mm. by 127 mm.)	—	225	5	4 4
8-12 h.p. Opel, four-cyl. (65 mm. by 98 mm.]..	200	225	2	3 3
20-25 h.p. Marathon, four-cyl. (89 mm. by 114 mm.]	—	235	5	6 6
18-20 h.p. R.M.C., four-cyl. (95 mm. by 114 mm.]	—	225	3	6 6
16 h.p. Darracq, four-cyl. (68 mm. by 120 mm.]	195	225	2	3 3
15-18 h.p. Hupmobile, four-cyl. (83 mm. by 140 mm.]	—	235	2	6 6
10 h.p. Hertu, four-cyl. (70 mm. by 110 mm.]	215	225	2 to 5	4 4
9-11 h.p. Salmon, four-cyl. (69 mm. by 90 mm.]	165	230	4	3 3
12-14 h.p. M.A.F., four-cyl. (72 mm. by 96 mm.]	210	230	2	4 4
11.9 h.p. Phœnix, four-cyl. (69 mm. by 108 mm.]	195	230	3	3 3
16 h.p. Buick, four-cyl. (95 mm. by 95 mm.] ..	—	230	2	6 6
10 h.p. Riley, two-cyl. (96 mm. by 96 mm.] ..	214	231	2	3 3
20-25 h.p. Overland, four-cyl. (102 mm. by 114 mm.)	—	235	2 or 5	6 6
13.9 h.p. Licorne, four-cyl. (75 mm. by 120 mm.]	210	235	2	4 4
15-18 h.p. Hupmobile, four-cyl. (83 mm. by 140 mm.]	—	235	4	6 6

POPULAR CARS.—Contd.

	Chassis Price. £	With Body. £	Seats.	Tax. £ s.
12-14 h.p. Lynx, four-cyl. (70 mm. by 100 mm.)	195	235	4	4 4
10-12 h.p. Belsize, four-cyl. (69 mm. by 130 mm.)	185	240	4	3 3
7 h.p. De Dion, two-cyl. (66 mm. by 120 mm.)	137	240	2	3 3
10 h.p. Bayard, four-cyl. (65 mm. by 120 mm.)	—	241	4	3 3
15 h.p. H.L., four-cyl. (76 mm. by 120 mm.) ..	210	245	4	4 4
10 h.p. Standard Briton, four-cyl. (68 mm. by 120 mm.)	199½	246¾	2	3 3
10.9 h.p. Fafnir, four-cyl. (66 mm. by 115 mm.)	205	249	2	3 3
16 h.p. Buick, four-cyl. (95 mm. by 95 mm.) ..	—	250	5	6 6
12-15 h.p. Sperber, four-cyl. (70 mm. by 100 mm.)	225	230	4	4 4
10-12 h.p. Luxior, four-cyl. (66 mm. by 130 mm.)	209	250	2	3 3
13.9 h.p. Waverley, four-cyl. (75 mm. by 120 mm.)	225	250	2	4 4
8-10 h.p. Delahaye, two-cyl. (80 mm. by 120 mm.)	210	250	2 or 4	3 3
10 h.p. Mass, four-cyl. (75 mm. by 100 mm.) ..	200	250	2	4 4
10.5 h.p. Mathis, four-cyl. (65 mm. by 110 mm.)	230	250	2	3 3
25 h.p. Maxwell, four-cyl. (102 mm. by 102 mm.)	210	250	5	6 6
22.4 h.p. Paige Detroit, four-cyl. (95 mm. by 102 mm.)	—	250	2	6 6
18-20 h.p. R.M.C., four-cyl. (95 mm. by 114 mm.)	—	250	4	6 6

Cars from £250 to £300.

10.5 h.p. Delage, four-cyl. (65 mm. by 110 mm.)	221	251	2	3 3
14 h.p. Hurtu, four-cyl. (75 mm. by 120 mm.)	245	255	2 to 5	4 4
10-12 h.p. Zebra, four-cyl. (68 mm. by 120 mm.)	—	255	4	3 3
10-12 h.p. Crespelle, four-cyl. (65 mm. by 130 mm.)	245	260	2	3 3
12-14 h.p. Loreley, four-cyl. (70 mm. by 102 mm.)	240	260	2	4 4
12-14 h.p. Alcyon, four-cyl. (75 mm. by 130 mm.)	260	—	—	4 4
12 h.p. Brenna, four-cyl. (70 mm. by 102 mm.)	240	260	2	4 4
— Foy-Steele, four-cyl. (76 mm. by 127 mm.) ..	—	260	2	4 4
10-12 h.p. Star, four-cyl. (68 mm. by 120 mm.) ..	215	265	4	3 3
10-12 h.p. D.F.P., four-cyl. (65 mm. by 120 mm.)	220	265	2	3 3
13.9 h.p. Licorne, four-cyl. (75 mm. by 120 mm.)	240	265	2	4 4
10-12 h.p. Alldays, two-cyl. (3½ in. by 4½ in.)	210	265	4	3 3
20 h.p. Buick, four-cyl. (102 mm. by 102 mm.)	—	270	2	6 6
11.9 h.p. Pilgrim, two-cyl. (98 mm. by 102 mm.)	220	270	2	3 3
10-18 h.p. Palladium, four-cyl. (65 mm. by 130 mm.)	208 17s.	270 18s.	4	3 3
12 h.p. Brenna, four-cyl. (70 mm. by 102 mm.)	240	275	5	4 4
12-20 h.p. Buchet, four-cyl. (76 mm. by 120 mm.)	238	275	2	4 4
12-14 h.p. M.A.F., four-cyl. (72 mm. by 96 mm.)	210	275	4	4 4
14 h.p. N.S.U., four-cyl. (75 mm. by 88 mm.) ..	250	275	2	4 4
15 h.p. Sizaire, four-cyl. (70 mm. by 170 mm.)	—	275	3	4 4
8-10 h.p. Pilain, four-cyl. (55 mm. by 110 mm.)	200*	275	4	3 3
10 h.p. Adler, four-cyl. (65 mm. by 98 mm.) ..	—	280	2	3 3
11.9 h.p. Arrol-Johnston, four-cyl. (69 mm. by 120 mm.)	265	285	2 or 4	3 3
12-14 h.p. Loreley, six-cyl. (60 mm. by 92 mm.)	260	285	2	4 4
15.9 h.p. Alcyon, four-cyl. (80 mm. by 130 mm.)	285	—	—	4 4
25-30 h.p. Oakland, four-cyl. (3½ in. by 5 in.) ..	—	285	3	6 6
12 h.p. Turner, four-cyl. (69 mm. by 100 mm.)	250	285	4	3 3
15-18 h.p. Bedford, four-cyl. (95 mm. by 95 mm.)	—	285	2	6 6
10.5 h.p. Mathis, four-cyl. (65 mm. by 100 mm.)	230	290	4	3 3
10 h.p. Hillman, two-cyl. (90 mm. by 140 mm.)	230	290	2	3 3
10-14 h.p. Gregoire, four-cyl. (65 mm. by 130 mm.)	230	290	2	3 3
12.1 h.p. Falmir, four-cyl. (70 mm. by 125 mm.)	240	290	3	4 4
12 h.p. De Dion-Bouton, four-cyl. (66 mm. by 120 mm.)	283	—	—	3 3
10 h.p. Turner-Miesse (steam)	280	295	2	3 3
11.9 h.p. Pilgrim, two-cyl. (98 mm. by 102 mm.)	225	295	4	3 3
10-12 h.p. Metallurgique, four-cyl. (75 mm. by 96 mm.)	270	295	2	4 4
11-14 h.p. Chambers, four-cyl. (79 mm. by 102 mm.)	245	295	4	4 4
12 h.p. Darracq, four-cyl. (75 mm. by 120 mm.)	240	295	4	4 4
12.9 h.p. Gladiator, four-cyl. (70 mm. by 110 mm.)	—	295	3	4 4
14 h.p. Humber, four-cyl. (69 mm. by 130 mm.)	—	295	2	4 4
31-35 h.p. Marathon, four-cyl. (108 mm. by 114 mm.)	—	295	2	8 8
10 h.p. Motobloc, four-cyl. (65 mm. by 120 mm.)	—	295	4	3 3
12-14 h.p. Vinot, four-cyl. (70 mm. by 110 mm.)	—	295	3	4 4
30-15 h.p. Vulcan, four-cyl. (80 mm. by 120 mm.)	240	295	4	4 4
10 h.p. Stanley (steam)	230	295	3	3 3
12-22 h.p. Palladium, four-cyl. (75 mm. by 120 mm.)	254 2s.	296 2s.	4	4 4
12-18 h.p. Riley, two-cyl. (102 mm. by 127 mm.)	277	299	2	4 4
12 h.p. Ariel, four-cyl. (76 mm. by 120 mm.) ..	255	300	2 to 5	4 4
10-14 h.p. Chenard-Walcker, four-cyl. (69 mm. by 130 mm.)	265	300	4	3 3
9-11 h.p. Delahaye, four-cyl. (62 mm. by 100 mm.)	240	300	4	3 3
12-16 h.p. Dobson, four-cyl. (80 mm. by 120 mm.)	250	300	5	4 4
22 h.p. Mitchell, four-cyl. (94 mm. by 133 mm.)	235	300	4	6 6
6-16 h.p. Opel, four-cyl. (70 mm. by 100 mm.)	260	300	4	4 4
12-14 h.p. Oryx, four-cyl. (75 mm. by 88 mm.)	250	300	4	4 4
8-12 h.p. Vermorel, four-cyl. (66 mm. by 120 mm.)	239	300	4	3 3
12-15 h.p. Calthorpe, four-cyl. (69 mm. by 125 mm.)	235	300	2 or 4	3 3
— Kennick, four-cyl. (70 mm. by 100 mm.) ..	260	300	4	4 4
10-12 h.p. A.G.R., four-cyl. (70 mm. by 100 mm.)	255	300	2	4 4
10-12 h.p. G.R., four-cyl. (65 mm. by 110 mm.)	235	300	2	3 3
20 h.p. Buick, four-cyl. (102 mm. by 102 mm.)	—	300	5	6 6
15-20 h.p. Oakland, four-cyl. (3½ in. by 5 in.) ..	—	300	5	6 6

*Without tyres.

Cars from £301 to £350.

11 h.p. Bayard, four-cyl. (75 mm. by 110 mm)	237	302	4	4 4
13.9 h.p. N.A.G., four-cyl. (75 mm. by 85 mm.)	250	310	4	4 4
12 h.p. Mass, four-cyl. (75 mm. by 140 mm.)	250	310	4	4 4
30-35 h.p. Marathon, four-cyl. (108 mm. by 114 mm.	—	310	5	8 8
15 h.p. Loreley, four-cyl. (76 mm. by 115 mm.)	285	310	2	4 4
11 h.p. Humber, four-cyl. (69 mm. by 130 mm.)	—	310	4	3 3
13.9 h.p. Stoewer, four-cyl. (75 mm. by 88 mm.)	240	310	4	4 4
— Foy-Steele, four-cyl. (3 in. by 5 in.) ..	—	310	4	4 4
10.5 h.p. Delage, four-cyl. (65 mm. by 110 mm.)	248	312	4	3 3
10 h.p. Scout, four-cyl. (69 mm. by 125 mm.)	245	314	2	3 3
12-14 h.p. Alldays, four-cyl. (3 in. by 4¾ in.)	250	315	4	4 4
14.3 h.p. Enfield, four-cyl. (76 mm. by 120 mm.)	250	315	2	4 4
12 h.p. Rover, four-cyl. (75 mm. by 130 mm.)	275	315	5	4 4
14-16 h.p. Belsize, four-cyl. (93 mm. by 120 mm.)	260	315	5	6 6
10 h.p. Licorne, four-cyl. (65 mm. by 130 mm.)	275	—	—	3 3
10-14 h.p. Gregoire, four-cyl. (65 mm. by 130 mm.)	230	320	4	3 3
10-15 h.p. Sperber, four-cyl. (70 mm. by 100 mm.)	225	240	2	4 4
25 h.p. Stoddart, four-cyl. (102 mm. by 114 mm.)	290	320	5	6 6
12 h.p. Swift, four-cyl. (75 mm. by 110 mm.) ..	275	320	4	4 4
15-20 h.p. Sirron, four-cyl. (80 mm. by 120 mm.)	275	320	4	4 4
12-15 h.p. Star, four-cyl. (80 mm. by 120 mm.)	265	320	5	4 4
12-15 h.p. D.F.P., four-cyl. (70 mm. by 130 mm.)	275	—	—	4 4
12 h.p. Berliet, four-cyl. (70 mm. by 100 mm.)	285	—	—	4 4
10-12 h.p. G.R., four-cyl. (65 mm. by 110 mm.)	235	320	4	3 3
15-26 h.p. Palladium, four-cyl. (75 mm. by 150 mm.)	276 3s.	320 5s.	4	4 4
13.9 h.p. Vivinus, four-cyl. (75 mm. by 110 mm.)	250	325	2	4 4
12 h.p. Peugeot, four-cyl. (68 mm. by 130 mm.)	—	325	4	3 3
12.1 h.p. Mathis, four-cyl. (70 mm. by 120 mm.)	260	325	4	4 4
13.9 h.p. B.S.A., four-cyl. (75 mm. by 114 mm.)	250	325	4	4 4
11 h.p. Brasier, four-cyl. (67 mm. by 110 mm.)	266	325	2	3 3
10 h.p. Austin, four-cyl. (76 mm. by 89 mm.)	260	325	4	4 4
15 h.p. Loreley, four-cyl. (76 mm. by 115 mm.) ..	285	325	4	4 4
18-30 h.p. Palladium, four-cyl. (92 mm. by 130 mm.)	299	—	—	6 6
15-18 h.p. Bedford, four-cyl. (95 mm. by 95 mm.)	—	325	5	6 6
14 h.p. standard Briton, four-cyl. (80 mm. by 120 mm.)	236¼	325½	2	4 4
13.9 h.p. Renault, four-cyl. (75 mm. by 120 mm.)	272	328	5	4 4
12-20 h.p. Buchet, four-cyl. (76 mm. by 120 mm.)	238	329	4	4 4
12-h.p. Adler, four-cyl. (75 mm. by 103 mm.)	—	330	4	4 4
15 h.p. Brenna, four-cyl. (80 mm. by 102 mm.)	300	330	5	4 4
13.9 h.p. Delage, four-cyl. (75 mm. by 120 mm.)	292	330	2	4 4
10-12 h.p. G.R., four-cyl. (65 mm. by 110 mm.)	235	330	3	3 3
12.1 h.p. Gladiator, four-cyl. (70 mm. by 110 mm.)	—	335	4	4 4
12-14 h.p. Vinot, four-cyl. (70 mm. by 110 mm.)	—	335	4	4 4
15-25 h.p. Sirron, four-cyl. (80 mm. by 120 mm.)	290	335	2	4 4
15 h.p. Standard, four-cyl. (79 mm. by 121 mm.)	300	—	—	4 4
10-12 h.p. Delahaye, four-cyl. (65 mm. by 120 mm.)	258	340	2 or 4	3 3
14 h.p. Humber, four-cyl. (75 mm. by 130 mm.)	—	340	2	4 4
16-20 h.p. Bentall, four-cyl. (100 mm. by 95 mm.)	283	340	5	6 6
12-18 h.p. Riley, two-cyl. (102 mm. by 127 mm.)	277	341	4	4 4
12-15 h.p. Hillman, four-cyl. (89 mm. by 110 mm.)	306	342	4	6 6
14-18 h.p. Sava, four-cyl. (75 mm. by 140 mm.)	295	345	5	4 4
12-16 h.p. Chambers, four-cyl. (86 mm. by 102 mm.)	285	345	5	4 4
13.6 h.p. Hansa, four-cyl. (75 mm. by 90 mm.)	305	345	4	4 4
20.1 h.p. Vivinus, four-cyl. (90 mm. by 110 mm.)	300	350	4	6 6
12 h.p. Spyker, four-cyl. (69 mm. by 120 mm.)	270	350	2	3 3
12 h.p. Stoneleigh, four-cyl. (75 mm. by 114 mm.)	275	350	4	4 4
15 h.p. Rothwell, four-cyl. (79 mm. by 127 mm.)	285	350	4	4 4
12-18 h.p. Chenard-Walcker, four-cyl. (75 mm. by 150 mm.)	285	350	5	4 4
8-20 h.p. Opel, four-cyl. (75 mm. by 115 mm.)	300	350	4	4 4
18 h.p. N.S.U., four-cyl. (80 mm. by 104 mm.)	310	350	4	4 4
11.9 h.p. N.R., four-cyl. (69 mm. by 140 mm.)	250	350	4	3 3
14-16 h.p. Gregoire, four-cyl. (80 mm. by 130 mm.)	245	350	2 or 5	4 4
13.9 h.p. F.A.B., four-cyl. (75 mm. by 120 mm.)	300	350	2	4 4
12-16 h.p. Delahaye, four-cyl. (75 mm. by 110 mm.)	286	350	4	4 4
16 h.p. Darracq, four-cyl. (85 mm. by 130 mm.)	290	350	5	4 4
12-16 h.p. Crespelle, four-cyl. (75 mm. by 120 mm.)	285	350	4	4 4
10 h.p. Charron, four-cyl. (65 mm. by 120 mm.)	275	350	3	3 3
15.9 h.p. Belsize, four-cyl. (80 mm. by 150 mm.)	265	350	4	4 4
15.9. h.p. Vulcan, four-cyl. (80 mm. by 120 mm.)	285	350	5	4 4
12 h.p. Turner-Miesse (steam)	320	350	5	4 4
15-25 h.p. Sirron, four-cyl. (80 mm. by 150 mm.)	290	350	4	4 4
15 h.p. Knight of the Road, four-cyl. (80 mm. by 120 mm.)	—	350	4	4 4

Cars from £351 to £400.

10-12 h.p. Pilain, four-cyl. (65 mm. by 120 mm.)	250*	350	4	3 3
12 h.p. Bayard, four-cyl. (75 mm. by 130 mm.)	285	350	5	4 4
14 h.p. Humber, four-cyl. (75 mm. by 130 mm.)	—	355	4	4 4
12-16 h.p. Vermorel, four-cyl. (74 mm. by 120 mm.)	285	355	5	4 4
18.4 h.p. Enfield, four-cyl. (86 mm. by 130 mm.)	280	360	5	6 6
14-20 h.p. Zedel, four-cyl. (72 mm. by 120 mm.)	290	360	2	4 4
— Pearson-Cox (steam)	330	362	2	3 3
16-20 h.p. Alldays, four-cyl. (3⅜ in. by 5½ in.)	280	360	5	6 6
12-15 h.p. Hillman, four-cyl. (89 mm. by 130 mm.)	313	364	5	6 6
18-22 h.p. Bedford, four-cyl. (102 mm. by 102 mm.)	—	365	5	6 6
15.9 h.p. Star, four-cyl. (80 mm. by 150 mm.) ..	300	365	5	4 4
10-14 h.p. Schneider, four-cyl. (70 mm. by 120 mm.)	300	365	3	4 4
25 h.p. Chalmers, four-cyl. (102 mm. by 114 mm.)	—	365	5	6 6
15.9 h.p. Hansa, four-cyl. (90 mm. by 90 mm.)	315	365	4	4 4
18-22 h.p. Loreley, six-cyl. (70 mm. by 113 mm.)	340	365	2	6 6
20 h.p. Rothwell, four-cyl. (102 mm. by 127 mm.)	300	365	4	6 6
15 h.p. Valveless, two-cyl. (113 mm. by 127 mm.)	315	365	5	4 4
12 h.p. Motobloc, four-cyl. (80 mm. by 120 mm.)	310	—	—	4 4
15 h.p. Calthorpe, four-cyl. (80 mm. by 150 mm.)	303	368	4	4 4
15.8 h.p. S.C.A.R., four-cyl. (80 mm. by 140 mm.)	331	368	2	4 4
13.9 h.p. N.A.G., four-cyl. (75 mm. by 118 mm.)	310	370	4	4 4
14-18 h.p. Crespelle, four-cyl. (75 mm. by 150 mm.)	300	370	4	4 4
15.9 h.p. Arrol-Johnston, four-cyl. (80 mm. by 140 mm.)	335	370	2	4 4
15 h.p. Ariel, four-cyl. (80 mm. by 130 mm.)	325	370	5	4 4
14-18 h.p. Adler, four-cyl. (75 mm. by 120 mm.)	—	370	4	4 4
14 h.p. De Dion Bouton, four-cyl. (75 mm. by 130 mm.)	355	—	—	4 4
12-16 h.p. Unic, four-cyl. (75 mm. by 120 mm.)	296	375	2	4 4
12 h.p. Panhard, four-cyl. (70 mm. by 140 mm.)	300	375	2	4 4
32.9 h.p. Mitchell, six-cyl. (94 mm. by 133 mm.)	340	375	5	8 8
18-24 h.p. Mathis, four-cyl. (78 mm. by 118 mm.)	340	375	4	4 4
30-45 h.p. Marathon, four-cyl. (114 mm. by 130 mm.)	—	375	2	8 8
14-20 h.p. Excelsior, four-cyl. (85 mm. by 130 mm.)	300	375	5	6 6
16-20 h.p. Chenard-Walcker, four-cyl. (80 mm. by 150 mm.)	310	375	4 to 5	4 4
12-18 h.p. Argyll, four-cyl. (72 mm. by 120 mm.)	286	375	4	4 4
14 h.p. Singer, four-cyl. (78 mm. by 125 mm.)	315	375	4	4 4
32 h.p. Mitchell, six-cyl. (94 mm. by 133 mm.)	340	375	5	8 8
15.9 h.p. Delage, six-cyl. (65 mm. by 125 mm.)	340	378	2	4 4
12-14 h.p. F.N., four-cyl. (69 mm. by 130 mm.)	325	—	—	3 3
12-14 h.p. Clement, four-cyl. (75 mm. by 110 mm.)	290	380	3	4
12-14 h.p. Scout, four-cyl. (80 mm. by 130 mm.)	285	380	4	4 4
— Pearson-Cox (steam)	330	380	4	3 3
18-22 h.p. Loreley, six-cyl. (70 mm. by 113 mm.)	340	380	4	6 6
14 h.p. Bayard, four-cyl. (80 mm. by 130 mm.)	308	380	4	4 4

POPULAR CARS.—Contd.

	Chassis Price. £	With Body. £	Seats.	Tax. £ s.
15 h.p. Bayard, six-cyl. (70 mm. by 110 mm.)	305	360	4	4 4
39.9 h.p. Valveless, two-cyl. (127 mm. by 127 mm.)	335	385	5	4 4
14 h.p. Singer, four-cyl. (78 mm. by 125 mm.)	345	385	2	4 4
16 h.p. Bell, four-cyl. (91 mm. by 120 mm.)	325	385	5	4 4
20 h.p. Coltman, four-cyl. (101 mm. by 114 mm.)	320	385	5	4 4
22 h.p. Darracq, four-cyl. (100 mm. by 140 mm.)	320	385	5	4 4
20 h.p. Stanley (steam)	340	385	2	4 4
12 h.p. Panhard, four-cyl. (70 mm. by 140 mm.)	300	385	4	4 4
15 h.p. Straker-Squire, four-cyl. (87 mm. by 150 mm.)	328	388	2	4 4
12-16 h.p. Sunbeam, four-cyl. (80 mm. by 150 mm.)	350	390	4	4 4
12-15 h.p. S.P.A., four-cyl. (70 mm. by 120 mm.)	335	390	5	4 4
12 h.p. Peugeot, four-cyl. (70 mm. by 130 mm.)	315	390	4	4 4
15.8 h.p. Fafnir, four-cyl. (80 mm. by 125 mm.)	310	390	4	4 4
15.9 Hansa, four-cyl (80 mm. by 104 mm.)	340	390	4	4 4
15 h.p. Calthorpe, four-cyl. (80 mm. by 150 mm.)	350	394	5	4 4
15.8 h.p. S.C.A.R., four-cyl. (80 mm. by 140 mm.)	331	394	5	4 4
15.9 h.p. Arrol-Johnston, four-cyl. (80 mm. by 140 mm.)	335	395	5	4 4
15.8 h.p. F.L., four-cyl. (80 mm. by 160 mm.)	325	395	5	4 4
40-45 h.p. Marathon, four-cyl. (114 mm. by 130 mm.)	—	395	5	6 6
16 h.p. Ariel, four-cyl. (80 mm. by 120 mm.)	350	395	2 to 6	4 4
— Sizaire-Berwick, four-cyl (80 mm. by				
25-30 h.p. Overland, four-cyl. (112 mm. by 114 mm.)†	—	409	5	6 6
12-16 h.p. Unic, four-cyl. (75 mm. by 150 mm.)	296	400	4	4 4
30 h.p. Buick, four-cyl. (108 mm. by 115 mm.)	—	403	5	6 6
15.9 h.p. Sizaire-Berwick, four-cyl. (80 mm. by 150 mm.)	340	—	—	4 4
12-15 h.p. Pilain, four-cyl. (75 mm. by 110 mm.)	290*	400	4	4 4
15-20 h.p. Vulcan, four-cyl. (80 mm. by 150 mm.)	325	400	5	4 4
12 h.p. Talbot, four-cyl. (80 mm. by 150 mm.)	350	400	4	4 4
15 h.p. Charron, four-cyl. (90 mm. by 120 mm.)	315	400	5	4 4
26 h.p. Oakland, four-cyl. (4½ in. by 4¾ in.)	—	400	5	4 4
15.8 h.p. Renault, four-cyl. (80 mm. by 120 mm.)	340	400	5	4 4

* Without tyres. † With electric self-starter and lights.

Cars from £401 to £450.

Pearson-Cox (steam)		403	4	3	3
12 h.p. Motobloc, four-cyl. (80 mm. by 148 mm.)	360	—	—	4	4
12-15 h.p. Isotta-Fraschini, four-cyl. (75 mm. by 130 mm.)	365	—	—	4	4
12-15 h.p. Schneider, four-cyl. (75 mm. by 130 mm.)	325	410	4	4	4
18-20 h.p. Adams, four-cyl. (88 mm. by 120 mm.)	355	410	5	6	6
24.9 h.p. Enfield, four-cyl. (100 mm. by 130 mm.)	330	410	5	6	6
15 h.p. Mass, four-cyl. (90 mm. by 150 mm.)	335	415	4	6	6
15.9 h.p. Vinot, four-cyl. (80 mm. by 140 mm.)	295	415	4	4	4
13.9 h.p. Licorne, four-cyl. (75 mm. by 150 mm.)	315	415	5	4	4
12 h.p. Brasier, four-cyl. (70 mm. by 130 mm.)	305	416	4	4	4
15 h.p. Austin, four-cyl. (89 mm. by 115 mm.)	349	420	4	6	6
12 h.p. C.I.D., four-cyl. (75 mm. by 120 mm.)	320	420	4	—	—
16 h.p. L. and P., four-cyl. (3½ in. by 4¾ in.)	325	425	5	6	6
15-22 h.p. D.F.P., four-cyl. (80 mm. by 150 mm.)	345	—	—	4	4
12-16 h.p. Bianchi, four-cyl. (75 mm. by 120 mm.)	325	—	—	4	4
12-15 h.p. F.I.A.T., four-cyl. (70 mm. by 120 mm.)	325 from	425	4	4	4
25.9 h.p. Hansa, four-cyl. (80 mm. by 104 mm.)	370	425	5	4	4
20 h.p. N.S.U., four-cyl. (85 mm. by 115 mm.)	365	425	4	6	6
18-24 h.p. Oryx, four-cyl. (85 mm. by 115 mm.)	350	425	5	6	6
18-26 h.p. Sava, four-cyl. (82 mm. by 140 mm.)	375	425	5	6	6
20.1 h.p. Star, four-cyl. (90 mm. by 150 mm.)	350	425	5	6	6
13.9 h.p. Springuel, four-cyl. (75 mm. by 120 mm.)	375	—	—	4	4
14 h.p. Turcat-Mery, four-cyl. (80 mm. by 130 mm.)	370	—	—	4	4
16-20 h.p. Swift, four cyl. (90 mm. by 120 mm.)	350	425	5	6	6
12-20 h.p. Benz, four-cyl. (72 mm. by 120 mm.)	325	425	6	4	4
16-20 h.p. Pilain, four-cyl. (90 mm. by 120 mm.)	330*	430	4	6	6
15 h.p. Singer, four-cyl. (80 mm. by 130 mm.)	370	430	5	4	4
25-30 h.p. Alldays, four-cyl. (4 in. by 5½ in.)	340	430	7	6	6
15 h.p. Crossley, four-cyl. (79 mm. by 120 mm.)	350	430	4	4	4
24.9 h.p. Enfield, four-cyl. (100 mm. by 130 mm.)	340	430	7	6	6
15 h.p. Hotchkiss, four-cyl. (80 mm. by 120 mm.)	360	430	5	4	4
15-20 h.p. Baguley, four-cyl. (90 mm. by 130 mm.)	360	—	—	6	6
15 h.p. S.C.A.T., four-cyl. (85 mm. by 130 mm.)	335	435	5	6	6
16-24 h.p. Gregoire, four-cyl. (90 mm. by 160 mm.	315	435	2 or 5	4	4
15.9 h.p. Delage, six-cyl. (65 mm. by 130 mm.)	358	438	4	4	4
16-20 h.p. Wolseley, four-cyl. (90 mm. by 121 mm.)	—	440	2	6	6
15 h.p. Straker-Squire, four-cyl. (87 mm. by 120 mm.)	323	440	4	6	6
8-30 h.p. Opel, four-cyl. (70 mm. by 135 mm.)	—	440	2	4	4
14-18 h.p. Clement, four-cyl. (80 mm. by 120 mm.)	350	440	5	6	6
20 h.p. Ariel, four-cyl. (90 mm. by 130 mm.)	395	440	7	6	6
15.9 h.p. Stoewer, four-cyl. (80 mm. by 121 mm.)	351	441	4	4	4
15 h.p. Albion, four-cyl. (79 mm. by 127 mm.)	360	444	4	4	4
18 h.p. Germain, four-cyl. (102 mm. by 110 mm.)	340	—	—	6	6
14-20 h.p. Leon Bollee, four-cyl. (83 mm. by 110 mm.)	375	445	5	6	6
15-20 h.p. Vinot, four-cyl. (80 mm. by 130 mm.)	330	445	5	4	4
15-9 h.p. Gladiator, four-cyl. (80 mm. by 130 mm.)	330	445	5	4	4
20 h.p. Humber, four-cyl. (90 mm. by 120 mm.)	—	445	5	6	6
15 h.p. Germain, four-cyl. (80 mm. by 140 mm.)	350	—	—	4	4
15 h.p. Berliet, four-cyl. (80 mm. by 120 mm.)	370	—	—	4	4
20 h.p. Bayard, six-cyl. (80 mm. by 120 mm.)	368	446	5	6	6
20 h.p. Calthorpe, four-cyl. (90 mm. by 150 mm.)	370	447	5	6	6
18 h.p. F.N., four-cyl. (85 mm. by 120 mm.)	395	—	—	6	6
15-18 h.p. Pilain, six-cyl. (65 mm. by 120 mm.)	350*	450	5	4	4
18-20 h.p. Bianchi, four-cyl. (80 mm. by 115 mm.)	400	—	—	6	6
27.8 h.p. Vivinus, four-cyl. (106 mm. by 120 mm.)	400	450	4	8	8
14 h.p. Spyker, four-cyl. (80 mm. by 120 mm.)	315	450	4	4	4
15 h.p. Turner-Miesse (steam)	400	450	5	3	3
23 h.p. Star, six-cyl. (80 mm. by 120 mm.)	375	450	5	6	6
16-20 h.p. S.P.A., four-cyl. (85 mm. by 120 mm.)	395	450	5	6	6
18 h.p. Rover, four-cyl. (90 mm. by 130 mm.)	375	450	5	6	6
12-16 h.p. Lorraine-Dietrich, four-cyl. (75 mm. by 120 mm.)	339	450	4	4	4
15 h.p. Iris, four-cyl. (80 mm. by 114 mm.)	350	450	4	4	4
16-24 h.p. Gregoire, four-cyl. (90 mm. by 160 mm.)	315	450	2 or 5	4	4
18-22 h.p. Belsize, six-cyl. (93 mm. by 120 mm.)	375	450	5	8	8
15 h.p. Napier, four-cyl. (82 mm. by 127 mm.)	365	450	4	6	6
15 h.p. Panhard, four-cyl. (80 mm. by 120 mm.)	350	450	4	4	4

* Without tyres.

Cars from £451 to £500.

15 h.p. Napier, four-cyl. (82 mm. by 127 mm.)	365	450	4	6	6
15 h.p. Napier, four-cyl. (82 mm. by 127 mm.) (Colonial)	370	455	4	6	6
14-20 h.p. Itala, four-cyl. (77 mm. by 120 mm.)	350	455	4	4	4
20 h.p. Standard, four-cyl. (89 mm. by 133 mm.)	375	—	—	6	6
16-20 h.p. Benz-Sohne, four-cyl. (80 mm. by 130 mm.)	380	460	4	4	4
16-20 h.p. Wolseley, four-cyl. (80 mm. by 121 mm.)	—	460	4	6	6
14 h.p. Piccard-Pictet, four cyl. (80 mm. by 120 mm.)	380	460	5	4	4
19.2 h.p. Hansa, four-cyl. (88 mm. by 104 mm.)	400	469	5	6	6
15 h.p. Miesse, four-cyl. (80 mm. by 140 mm.)	315	465	4	4	4
12-15 h.p. Mercedes, four-cyl. (70 mm. by 120 mm.)	350	462	4	4	4
18 h.p. Bayard, four-cyl. (90 mm. by 140 mm.)	358	462	5	6	6
15-20 h.p. F.I.A.T., four-cyl. (80 mm. by 140 mm.)	365 from	465	4	4	4
20 h.p. Lagonda, four-cyl. (90 mm. by 120 mm.)	390	465	5	6	6
15.8 h.p. Komnick, four-cyl. (80 mm. by 130 mm.)	400	465	4	4	4
16 h.p. Motobloc, four-cyl. (80 mm. by 130 mm.)	417	—	—	6	6
18 h.p. De Dion-Bouton, four-cyl. (80 mm. by 140 mm.)	411	—	—	4	4
16-20 h.p. S.P.A., four-cyl. (85 mm. by 120 mm.)	415	470	6	6	6
15-20 h.p. Schneider, four-cyl. (80 mm. by 140 mm.)	375	470	4	4	4
10-25 h.p. Opel, four-cyl. (84 mm. by 118 mm.)	400	470	5	6	6
16.9 h.p. N.A.G., four-cyl. (83 mm. by 120 mm.)	410	470	5	6	6
20 h.p. Bell, four-cyl. (102 mm. by 140 mm.)	400	470	5	6	6
16-20 h.p. Benz-Sohne, four-cyl. (85 mm. by 115 mm.)	390	470	4	6	6
14 h.p. Piccard-Pictet, four-cyl. (80 mm. by 140 mm.)	392	472	5	4	4
20-30 h.p. Cadillac, four-cyl. (114 mm. by 145 mm.)	431	473	5	6	6
12-16 h.p. Unic, four-cyl. (75 mm. by 120 mm.)	310	475	4	4	4
15-20 h.p. Armstrong-Whitworth, four-cyl. (80 mm. by 135 mm.)	—	475	5	4	4
16-20 h.p. Delahaye, four-cyl. (85 mm. by 133 mm.)	390	475	5	6	6
20.1 h.p. F.A.B., four-cyl. (90 mm. by 140 mm.)	400	475	4	6	6
15 h.p. Iris (Colonial), four-cyl. (80 mm. by 114 mm.)	375	475	4	4	4
27.3 h.p. Pathfinder, four-cyl. (105 mm. by 133 mm.)	420	475	5	8	8
18 h.p. Turcat-Mery, four-cyl. (80 mm. by 130 mm.)	420	—	—	6	6
20 h.p. Germain, four-cyl. (92 mm. by 150 mm.)	420	—	—	6	6
16-20 h.p. Isotta-Fraschini, four-cyl. (85 mm. by 130 mm.)	425	—	—	6	6
18-22 h.p. Scout, four-cyl. (90 mm. by 140 mm.)	380	478	5	6	6
15-20 h.p. Gobron, four-cyl. (75 mm. by 150 mm.)	395	—	—	4	4
20 h.p. Dennis, four-cyl. (90 mm. by 130 mm.)	390	480	6	6	6
14-20 h.p. Siddeley-Deasy, four-cyl. (80 mm. by 130 mm.)	395	480	4	4	4
16-18 h.p. Austro-Daimler, four-cyl. (80 mm. by 110 mm.)	330	480	4	4	4
15 h.p. C.I.D., four-cyl. (80 mm. by 140 mm.)	380	480	4	—	—
28 h.p. Germain, four-cyl. (90 mm. by 130 mm.)	425	—	—	6	6
15-20 h.p. Armstrong-Whitworth, four-cyl. (80 mm. by 135 mm.)	375	485	4	4	4
20 h.p. Singer, four-cyl. (90 mm. by 130 mm.)	425	485	5	6	6
18 h.p. Florio, four-cyl. (85 mm. by 139 mm.)	385	485	5	6	6
12-16 h.p. Lorraine-Dietrich, four-cyl. (75 mm. by 120 mm.)	329	490	6	4	4
18 h.p. Thornycroft, four-cyl. (101 mm. by 114 mm.)	418	493	4	6	6
25 h.p. Ariel, four-cyl. (100 mm. by 130 mm.)	450	495	4	6	6
15 h.p. Talbot, four-cyl. (90 mm. by 140 mm.)	425	495	5	6	6
16 h.p. Motobloc, four-cyl. (80 mm. by 160 mm.)	442	—	—	6	6
15 h.p. Daimler, four-cyl. (90 mm. by 130 mm.)	380	496	4	4	4
16-24 h.p. Unic, four cyl. (90 mm. by 130 mm.)	365	500	4	4	4
19.8 h.p. Aberdonia, four-cyl. (3½ in. by 5 in.)	400	500	4	4	4
16-20 h.p. Pilain, four-cyl. (90 mm. by 120 mm.)	330*	500	5	6	6
15 h.p. Rochet-Schneider, four-cyl. (80 mm. by 130 mm.)	340	500	4	4	4
12-16 h.p. Martini, four-cyl. (80 mm. by 130 mm.)	375	500	5	4	4
16-20 h.p. Vauxhall, four-cyl. (90 mm. by 120 mm.)	395	500	4	4	4
25-30 h.p. Star, four-cyl. (108 mm. by 127 mm.)	425	500	5	6	6
16-30 h.p. Schneider, four-cyl. (83 mm. by 140 mm.)	450	500	2	6	6
15 h.p. Napier, four-cyl. (82 mm. by 127 mm.) (de luxe)	395	500	4	6	6
15 h.p. Gregoire, four-cyl. (80 mm. by 130 mm.)	375	500	6	4	4
15-25 h.p. Adler, four-cyl. (80 mm. by 130 mm.)	—	500	5	4	4

* Without tyres.

Cars from £501 to £550.

16-20 h.p. Isotta-Fraschini, four-cyl. (85 mm. by 130 mm.)	445	—	—	6	6
20-30 h.p. Dodson, four-cyl. (100 mm. by 140 mm.)	455	505	5	6	6
25-30 h.p. Vulcan, six-cyl. (89 mm. by 120 mm.)	425	505	5	8	8
20 h.p. Withers, four-cyl. (90 mm. by 130 mm.)	430	505	5	6	6
16 h.p. Motobloc, six-cyl. (80 mm. by 120 mm.)	450	—	—	6	6
20-30 h.p. Excelsior, six-cyl. (85 mm. by 130 mm.)	435	510	5	8	8
16-20 h.p. Sunbeam, four-cyl. (90 mm. by 160 mm.)	460	510	4	6	6
20.1 h.p. Springuel, four-cyl. (90 mm. by 120 mm.)	475	—	—	6	6
25 h.p. Hillman, four-cyl. (127 mm. by 127 mm.)	475	515	5	10	10
28 h.p. Humber, four-cyl. (105 mm. by 140 mm.)	—	515	—	8	8
14-30 h.p. Opel, four-cyl. (90 mm. by 130 mm.)	450	520	6	6	6
16 h.p. Brasier, four-cyl. (85 mm. by 140 mm.)	400	520	4	6	6
36 h.p. Hansa, four-cyl. (88 mm. by 130 mm.)	460	525	5	6	6
26 h.p. Hudson, four-cyl. (102 mm. by 133 mm.)	475	525	5	6	6
26-32 h.p. Sava, four-cyl. (100 mm. by 160 mm.)	475	525	5	6	6
15 h.p. Lancia, four-cyl. (80 mm. by 130 mm.)	385	525	4	4	4
20.1 h.p. Fafnir, four-cyl. (90 mm. by 140 mm.)	425	525	5	6	6
20 h.p. Standard, six-cyl. (79 mm. by 121 mm.)	450	—	—	6	6
24 h.p. Miesse, four-cyl. (100 mm. by 140 mm.)	380	530	4	6	6
20 h.p. Bayard, four-cyl. (100 mm. by 140 mm.)	426	530	5	6	6
18-24 h.p. Delahaye, six-cyl. (75 mm. by 120 mm.)	440	530	5	6	6
25-30 h.p. S.P.A., four-cyl. (100 mm. by 140 mm.)	475	530	5	8	6
16-25 h.p. Austro-Daimler, four-cyl. (80 mm. by 110 mm.)	440	535	4	4	4
17 h.p. Delaunay-Belleville, four-cyl. (85 mm. by 130 mm.)	430	—	—	6	6

POPULAR CARS.—Contd.

	Chassis Price. £	With Body. £	Seats.	Tax. £ s.
24 h.p. N.S.U., four-cyl. (97 mm. by 115 mm.)	465	537½	4	6 6
24 h.p. Dennis, four-cyl. (103 mm. by 130 mm.)	450	540	7	6 6
17-20 h.p. Armstrong-Whitworth, four-cyl. (85 mm. by 135 mm.)	435	545	2	6 6
30 h.p. Bell, four-cyl. (117 mm. by 150 mm.)	475	545	5	10 10
22 h.p. S.C.A.T., four-cyl. (100 mm. by 150 mm.)	435	545	5	6 6
18-24 h.p. Siddeley-Deasy, four-cyl. (90 mm. by 130 mm.)	460	545	4	6 6
19 h.p. Delaunay-Belleville, six-cyl. (72 mm. by 120 mm.)	480	—	—	6 6
20 h.p. Daimler, four-cyl. (90 mm. by 130 mm.)	430	546	4	6 6
17 h.p. Maudslay, four-cyl. (90 mm. by 130 mm.)	425	550	4	6 6
20.1 h.p. Komnick, four-cyl. (90 mm. by 140 mm.)	475	550	5	6 6
30 h.p. Stanley (steam)	475	550	5	6 6
25-30 h.p. S.P.A. (four-cyl. (100 mm. by 140 mm.)	495	550	5	6 6
20.1 h.p. N.A.G., four-cyl. (90 mm. by 130 mm.)	480	550	4	6 6
40 h.p. Oakland, six-cyl. (4⅛ in. by 4¾ in.)	495	550	5	10 10
20 h.p. Mass, four-cyl. (110 mm. by 130 mm.)	475	550	4	8 8
20-30 h.p. Delahaye, four-cyl. (95 mm. by 130 mm.)	480	556	5	6 6
15-20 h.p. Armstrong-Whitworth, four-cyl. (80 mm. by 135 mm.)	375	558	5	4 4

† Without tyres.

Cars from £551 to £600.

16 h.p. Berliet, four-cyl. (90 mm. by 140 mm.)	460	—	—	6 6
23.9 h.p. Arrol-Johnston, six-cyl. (80 mm. by 120 mm.)	470	560	5	6 6
18-24 h.p. Siddeley-Deasy, four-cyl. (90 mm. by 130 mm.)	465	560	5	6 6
20 h.p. Spyker, four-cyl. (90 mm. by 135 mm.)	430	560	4	6 6
25 h.p. Vauxhall, four-cyl. (95 mm. by 140 mm.)	465	560	5	6 6
16-20 h.p. Wolseley, four-cyl. (90 mm. by 121 mm.)	—	565*	7	6 6
22 h.p. Hotchkiss, four-cyl. (95 mm. by 130 mm.)	480	570	5	6 6
30-35 h.p. Alldays, six-cyl. (3¾ in. by 4½ in.)	450	570	7	10 10
24-30 h.p. Chenard-Walcker six-cyl. (80 mm. by 150 mm.)	495	570	5	6 6
16-24 h.p. Unic, four-cyl. (90 mm. by 130 mm.)	350	575	4	6 6
18-20 h.p. Lorraine-Dietrich, four-cyl. (90 mm. by 130 mm.)	451	575	4	6 6
15-30 h.p. Argyll, four-cyl. (80 mm. by 130 mm.)	450	575	5	4 4
18-24 h.p. Austin, four-cyl. (111 mm. by 127 mm.)	480	575	5	8 8
20 h.p. Crossley, four-cyl. (102 mm. by 140 mm.)	475	575	5	6 6
18-24 h.p. F.L., six-cyl. (80 mm. by 100 mm.)	475	575	5	6 6
18-24 h.p. Schneider, four-cyl. (95 mm. by 150 mm.)	475	575	5	6 6
28 h.p. Germain, four-cyl. (120 mm. by 130 mm.)	500	—	—	10 10
20 h.p. Motobloc, six-cyl. (80 mm. by 148 mm.)	510	—	—	6 6
26 h.p. De Dion-Bouton, eight-cyl. (75 mm. by 130 mm.)	507	—	—	8 8
25 h.p. De Dion-Bouton, four-cyl. (100 mm. by 140 mm.)	507	—	—	6 6
20-30 h.p. Nazzaro, four-cyl. (100 mm. by 140 mm.)	495	—	—	6 6
25 h.p. Singer, four-cyl. (100 mm. by 130 mm.)	525	585	5	6 6
25 h.p. Withers, four-cyl. (100 mm. 130 mm.)	500	585	5	6 6
25 h.p. Turcat-Mery, four-cyl. (100 mm. by 130 mm.)	530	—	—	6 6
45 h.p. Hansa, four-cyl. (96 mm. by 130 mm.)	535	585	2	6 6
25 h.p. Delaunay-Belleville, four-cyl. (100 mm. by 140 mm.)	540	—	—	6 6
25 h.p. Berliet, four-cyl. (100 mm. by 140 mm.)	495	—	—	6 6
25-30 h.p. Brooke, six-cyl. (92 mm. by 120 mm.)	495	590	5	6 6
20-30 h.p. Benz-Sohne, four-cyl. (90 mm. by 169 mm.)	525	600	4	6 6
20-30 h.p. White, four-cyl. (95 mm. by 130 mm.)	465	595	5	6 6
27.9 h.p. Sprinquel, four-cyl. (106 mm. by 130 mm.)	556	—	—	8 8
25 h.p. Vauxhall, four-cyl. (95 mm. by 140 mm.)	495	595	4	6 6
25-30 h.p. Bianchi, four-cyl. (100 mm. by 145 mm.)	550	—	—	6 6
20-30 h.p. Leon-Bollee, six-cyl. (83 mm. by 110 mm.)	545	—	—	6 6
29 h.p. Standard, six-cyl. 89 mm. by 130 mm.)	550	—	—	9 9
20 h.p. Miesse (Valveless), four-cyl. (90 mm. by 140 mm.)	450	600	4	6 6
15-20 h.p. Mercedes, four-cyl. (80 mm. by 130 mm.)	450	600	4	6 6
15-25 h.p. Benz, four-cyl. (80 mm. by 130 mm.)	450	600	5	4 4
20-30 h.p. Austro-Daimler, four-cyl. (90 mm. by 140 mm.)	540	600	2	6 6
20-30 h.p. Pilain, four-cyl. (100 mm. by 140 mm.)	470†	600	5	6 6
16-20 h.p. Wolseley, four-cyl. (90 mm. by 121 mm.)	—	600‡	7	6 6
15 h.p. Alda, four-cyl. (85 mm. by 140 mm.)	395	600	4 or 6	6 6
16 h.p. Rochet-Schneider, four-cyl. 95 mm. by 140 mm.)	470	600	4	6 6
16-24 h.p. Martini, four-cyl. (90 mm. by 140 mm.)	475	600	5	6 6
25-30 h.p. Zedel, four-cyl. (90 mm. by 140 mm.)	475	600	5	6 6
25-30 h.p. Vinot, four-cyl. (101 mm. by 130 mm.)	460	600	5	6 6
18 h.p. Piccard-Pictet, four-cyl. (90 mm. by 150 mm.)	520	600	5	6 6
18-30 h.p. I.T.A.L.A., four-cyl. (90 mm. by 130 mm.)	475	600	5	6 6
18-28 h.p. Gladiator, four-cyl. (101 mm. by 130 mm.)	490	600	5	6 6
25-35 h.p. Clement, four-cyl. (107 mm. by 130 mm.)	500	600	5	8 8
22 h.p. Charron, four-cyl. (95 mm. by 130 mm.)	445	600	7	6 6

* Cabrio-phaeton. † Without tyres. ‡ Landaulet or limousine.

The old Red Lion at Petersfield. A link with the old coaching days.

THE IDEAL CAR FOR THE OWNER-DRIVER.

Some Useful Practical Suggestions as to the Best Class of Finish, Lubrication Improvements, Etc.

GENERALLY speaking, the owner-driver is one whose leisure time is strictly limited. That which he is privileged to enjoy he desires to spend in driving his car, and not in paying it those various attentions in the motor-house which are at present indispensable. It is with a view to the reduction of this garage work that this article is penned, in the hope that designers and manufacturers will turn their attention to a point of view they are particularly prone to overlook, observing that what is good for the owner-driver is also beneficial to the professional chauffeur and should result in general improvement.

To begin with, why is the radiator almost universally of polished brass? To polish a metal is to render it least able to conduct away its heat to the air. The filling orifice is placed in such a position that it is almost impossible to avoid splashing the polished top of the radiator, with a consequence of unsightly blotches with the drying off of the water. Moreover, in the event of rain, a somewhat frequent occurrence in this country, considerable labour and time are required to remove the effects. The one thing to be said for it is appearance, and this is a matter of taste and does not afford the best solution in a great many people's estimation. For the owner-driver, the polished brass radiator is a mistake, together with all other polished brass-work which is liable to be at all exposed to the elements. The only place it should be permitted is in the dashboard fittings. In the writer's experience there is much room for improvement in the attachment of the radiator to the frame. It is not sufficiently isolated from the racking stresses to which the frame is subjected in travelling over rough roads, with consequent leakage sooner or later. The writer's most difficult repair jobs have been in making good his leaking radiators, and so far every one of his cars has developed this defect to a greater or less extent. This is not a legitimate way in which an owner-driver's time should be spent.

The writer's latest car was specially chosen from the owner-driver's point of view. It is the work of one of the most advanced designers, and is certainly the "dernier cri" in simplicity of mechanism, cleanness of design, and accessibility, yet it is far from perfect in many of its details from the garage point of view. There are twenty greasers to be filled at frequent intervals, which is necessitated by being of too small a size. There are no less than fifty-five places where movement takes place to which the oilcan must be applied, apart from those like the magneto bearings, starting handle, etc., which require fewer oil applications. And yet the engine, timing gear, pump and fan bearings are lubricated automatically from the engine base chamber. Moreover, two of the brake operation gear bearings are so situated that

A correspondent wrote us recently from a seaside address asking us in all seriousness whether, in view of the possible continued increase in the price of petrol, we would advise him to secure a good supply. He said he proposed to bury it in the beach! This suggests a return to the old smuggling days, and our artist depicts a scene that may be witnessed in the bad days (to come) of still dearer petrol.

BEST CAR FOR OWNER-DRIVER.—Contd.

they can only be lubricated by crawling under the car and using a force-feed oiler.

The engine oil filter is fitted in the sump, and requires all oil to be drawn off before removal, which can only be accomplished by further crawling under the car. The greasers on the rear end of the front springs are so situated that one's sleeve is covered with dirt whenever they are turned by contact with the front tyre and mudguard. The rear end universal joint of the propeller shaft is of the pot and sliding block type. It is furnished with a leather cover, which may keep the dust out, but by no means keeps the grease in. This involves further crawling at somewhat longer intervals than the brake connections do. And yet this car is distinctly above the average in its facilities for proper lubrication and attention. These things may seem trivial and of little importance, but the owner who performs them with frequency, and sees how easily these defects might have been avoided, may be pardoned for uttering warmer expressions at times than perhaps the situation calls for. There is no doubt that all owners who do their own "shuvving" have a similar tale to tell in different detail. It remains to suggest a happier arrangement from the standpoint of a minimum garage attention.

First, as has already been mentioned, the radiator should either be painted, or perhaps chemically or otherwise treated in a way which will produce a durable surface which will require only washing, and will possess good heat-radiating properties. It should be more flexibly attached to the frame than is usually considered necessary. Efforts in this direction are already made, but as a rule the designer is satisfied with one degree of freedom only. This does not appear to be sufficient, and it is suggested that another degree of freedom, at right angles to the first, should be incorporated, together with a slightly yielding bed to deaden direct shocks. The engine oil filter should of course be withdrawable from above without emptying the sump. It should be an axiom that lubrication for the engine, and the whole of the transmission, including all flexible and universal joints pertaining thereto, should be necessary in three places only. To this end, the engine oil filler should supply all the engine bearings, pump, fan, timing gear, and clutch spigot bearings, if the clutch is not of the plate type. If the engine and gearbox are of unit construction, there will be no flexible joints between clutch and gearbox. The writer prefers separate construction, however, owing to greater facility for dismantling when renewals, repairs or examination become necessary. This method of construction entails the employment of two flexible joints, and those of the disc type are suggested, using either steel or leather, being devoid of the need of any lubrication whatever; moreover, they are entirely free from shake and rattle after prolonged use.

The second place for oil application would be the gearbox, which is already generally arranged to lubricate the selection and gear-striking mechanism. The propeller shaft, which would be of the type furnished with one universal joint only at the front end, and encased in a torque tube rigid with the back axle, would have the universal joint protected by a spherical casing attached to the front end of the torque tube. This spherical casing would have the third filler orifice attached, which would be brought out in a position close to that of the gearbox. By this means oil would be supplied to the universal joint of the propeller shaft, would lubricate the surfaces, taking the thrust, of the spherical casing, and would run thence down the torque tube to the back axle. It is probable that some sort of packing ring round the moving joint of the spherical casing would be necessary to ensure the latter always being full of oil up to the level where the torque tube joins it, otherwise the universal joint within might be starved of oil.

This system would mean addition of oil to the engine about every 200 miles, to the gearbox and back axle about every 500 miles, through orifices large and accessible, without unnatural contortions, which are certainly necessary with the majority of cars when oil is added to the back axle direct, not to mention the propeller shaft joints, which it is feared are often neglected till they audibly complain. Thus all bearings carrying the power load of the car would be properly provided for with the minimum of attention.

In regard to the spring shackle bolts, they would be provided with larger greasers than is usual, to make filling easier and less frequent. The spring seats on the back axle would be similarly lubricated, the greasers being brought into an accessible position by a connecting piece. The whole of the joints of the steering gear should be provided with large capacity greasers, which would obviate the awkward and messy job of removing the leather covers now generally considered sufficient to contain the lubricating grease. The connections of the clutch and brake pedals, side brake and controls, are generally of the fork and eye type with a pin connecting them. The side face of each eye should be provided with a recessed annulus, to hold sufficient thick oil to last for about 500 miles running. Oil could be applied to these annuli, to completely fill them, by the ordinary forced-feed oiler, by a conveniently disposed hole leading thereto.

A car on these lines could be run every day for a week without any attention whatever, beyond filling the petrol tank, with the certainty that all bearings are properly lubricated, for on this entirely depends, given good design, the durability of the mechanism. Ten minutes once a week to turn all greasers, add oil to the three main fillers, and the application of the forced feed oiler to the minor joints would be the sum total of the routine attention necessary. In reference to tyres, less frequent pumping up will be found necessary, if the rubber disc in the cap which seals the hole in the valve stem is replaced by a leather disc. The rubber ones supplied, in the writer's experience, are not sufficiently tough for the purpose, soon disintegrating and developing a tendency to getting inside the hole in the valve stem. As regards paint-work, a matt finish is strongly advised, to avoid leathering when the car is washed. Detachable wheels of the steel or wood type are, in the writer's view, preferable. Wire wheels may be lighter for equal strength, but the time spent in cleaning far outweighs any advantages they may possess.

Such a car will be far more serviceable and cheaper to maintain and run than the "brass and glass" creations one is tempted to buy by their glossy finish, and can be made to look just as smart if a suitable colour scheme is adopted. The owner will also spend more of his time in the open air and less in the motor-house than he is compelled to with the ordinary type of car, and this is an end surely worth seeking.

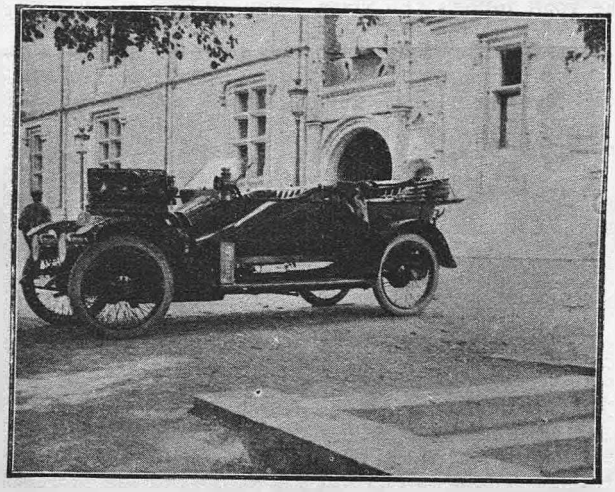
There are several cars now on the market which have the features outlined above in part, but on none are they nearly all present, and the best car for the prospective owner-driver to choose, other things being equal, will be that on which the least time need be spent in the garage. AN OWNER-DRIVER.

COVENTRY TO NAPLES.

A Long Continental Trip over Good, Bad, and Indifferent Roads on a 12-18 h.p. Riley.

ON being advised by the manufacturer that my new 12-18 h.p. Riley was ready for delivery, I journeyed to the works, and after a few friendly hints from the tester, drove the car to Haslemere, my headquarters, whilst I obtained the necessary papers from the R.A.C. I took the car up to London for the international pass and driving licence test, and apparently somewhat astonished the official tester, who had accompanied me on the drive, by telling him that the car was only a two-cylinder one, as all along he had been under the impression that it was a four-cylinder. So much for the silence of the Riley engine.

I left Haslemere on the Wednesday following, together with my cousin and a fair quantity of luggage. We stayed the night at Brighton, and the next morning drove to Newhaven, where a R.A.C. guide met us at the quay and helped us considerably in getting through the shipping formalities. The crossing was very rough, and two heavy closed cars on the lower deck had to have their fastenings reinforced when half-way across.



The car outside the Chateau of Blois.

Arrived at Dieppe, we had to wait about an hour before the cars were unshipped. The vehicles were all taken in a batch by the Custom House official at Dieppe, and by the time all the preliminaries were completed it was rather late (6 p.m.), but we decided to run on to Rouen. The country between Dieppe and Rouen is decidedly pretty, and the road is good, with no hills to speak of

Our next day's run was to Orleans, and after having considered the merits of various hotels, we put up at the Grand Hotel d'Orleans. After a lively discussion between two of the "elage garçons" (there are no chambermaids in most French provincial hotels) as to which of them was to have us, we were shown to our rooms on the first floor by the conqueror.

Bargaining is advisable and never resented; on the contrary, the keener you show yourself the more you are respected. The next morning we

Outside La Grave, Dauphine Alps.

COVENTRY TO NAPLES—Contd.

went round the cathedral, just to say we had seen it, as neither my cousin nor myself could enthuse over religious monuments, having seen so many of these in Italy, which is our home. We had received strict instructions from friends not to miss the Valley of the Loire, and so dutifully made for Blois, which we reached in time to have an excellent lunch at the Hotel d'Angleterre. It came on to rain here, and it was a very tight squeeze to get all the cars into the courtyard of the hotel. Fortunately, we were about the last to go in, and so were able to get out easily. The Chateau of Blois is most interesting historically. The guide who took us round became quite dramatic in recounting the murder of the Duc de Guise, and evidently enjoyed the thrills with which some of the members of our party followed his description.

From Blois to Tours the road follows the river. Whilst this is called the beautiful valley of the Loire, I consider myself that many other parts of France are more beautiful if not so historically interesting. The roads, as usual, were excellent, and we indulged in some short speed bursts, at times over 45 miles per hour. This speed is quite safe on the straight French roads. The routes nationales are very wide, and the hedges are kept quite low so that one can see a long way ahead. What pleased us most was the ready way carters and others got out of the path. At the first sound of the horn they immediately led their horses to the proper side. The French motorist is apparently a spoilt child, and is looked upon most indulgently by the population. The speed limit notices in towns and villages are ignored by the French motorist, and as we never saw gendarmes anywhere we ignored them ourselves. We were much struck by the small number of cars to be seen on the open road; also, by the fact that the Frenchman values the wearing qualities of the car more than appearance and speed. A car lasts a Frenchman I should think twice as long as it does an Englishman. When buying a car he is very anxious to know how long it will last, whilst the Englishman wants to know how fast it will go, and if it will do all hills on top speed. On the other hand the English car has much better lines, and there is no doubt that in the medium-powered light car we are now pre-eminent both as regards design and workmanship.

We reached Tours on market day, and put up at the Hotel de la Boule d'Or, quite a comfortable place, and set off next morning on the hunt for chateaux.

We became so disgusted, however, by finding that every little place had a chateau that we confined our attentions to those of Chenonceau and Blois. Blois because it is most important historically, and Chenonceau because of its unique position. The Chateau of Chenonceau is very picturesquely built on arches over a channel of the River Cher. The place belongs to an American named Terry, and is kept in splendid order. It is said that this gentleman has already spent over £80,000 on its restoration. It is in an exceptionally good state of preservation, as during the time of the Revolution it was respected by the mob on account of the proprietress, Madame Dupin, who had made herself generally beloved by her virtues and kindness.

We reached Bourges in pouring rain. Having been there before, I left out the cathedral and other places of interest. A photograph and a notice in the salon of the Hotel Central informed us that H.R.H. the Prince of Wales had lately stayed there. We left next morning with the rain still coming down heavily, and eventually put in at Ainay le Chateau, a small town in the Province of Allier. I was forced to stay here for about a week on account of a bad finger, caused by a crushed finger nail. I was most comfortably lodged and fed on seven francs a day. Some of these small towns, though not visited by the tourist, being off the beaten track and not near a railway, are quite interesting, and contain many picturesque old churches and buildings. Ainay le Chateau was at one time a fortified town of some importance, and bits of the old walls and fortifications can still be seen. The run from Ainay to Grenoble I was not able to do in a day, as I hoped, owing to the traffic and bad pavé from Etienne to Vienne.

The 12-18 h.p. Riley at the summit of the Lautaret (Dauphine Alps).

I found Vienne full of military, and had to go out into the night in search of lodgings. After being unsuccessful at the next two villages, I eventually found a room at Le Bourge de Peage. This was the cheapest place I struck, my bill for dinner, bed and breakfast coming to only frs. 4.80, equal to 3s. 8d., and I could not find anyone to tip. The last part of the road from Voreppe to Grenoble was very bad, and a foretaste of the worst roads we were to have in Italy. Although I had originally intended to cross over into Italy by Mont Cenis, I eventually decided to go over the Lautaret, as I had already done Mont Cenis before on a car.

The road to Bourg de-Oisans is fair, and rises gently to 2360 ft. Here the road ascends abruptly by the wild ravine up the Rampe des Commeres, with many windings to La Grave, 5000 ft. We had been passed on the lower slopes by several powerful cars, but had the satisfaction of seeing one of them on the steep bit waiting for the engine to cool. Our Riley spun along merrily on the second gear at about 15 miles an hour, and never required the first speed at any part of the Lautaret road.

The view from La Grave of the Meize group, with its eternal snows and glaciers, is magnificent. After La Grave one has to go through several long tunnels cut in the rocks, and very badly lighted. I felt quite eerie going through the gloom and sliding about, as the ground is always wet and slimy from the

COVENTRY TO NAPLES—Contd.

drippings off the roof of the tunnel. The road now became steeper, and although the gradient was not at any time especially severe (probably not more than 1 in 10), the climb was somewhat trying owing to the number of hairpin bends and the length of the hill.

At the summit of the pass, 6790 ft., we stopped to let the engine cool, and had lunch. The run down to Briançon was uneventful. Outside Briançon, at la Vachette, we were stopped by the Custom House officials, who stamped our international pass. To get into Italy we had another stiff climb before us, the colder Mont Genevre. This we found more trying than the Lautaret, as the heat was now terrific and the hairpin bends very narrow. At the top, 6200 ft., our water began to boil, but we just got over the summit without stopping, and the run down to the Italian Custom House gave the engine time to cool down a bit. The Customs formalities were soon over, as the official had been taken away from a game of cards, which he was anxious to renew.

We now began one of the most dangerous descents I have ever experienced. From Cesana to Susa the road drops in a series of hair-raising descents, at times as steep as 1 in 7, with most dangerous blind corners and hairpin bends. To add to this we had now entered into Italy, where there is absolutely no rule of the road, and one has to "wait and see" what the man ahead is going to do. If he ought to take to his left the chances are that he will go to the right, and one always has to keep the car well in hand so as to be able to stop immediately. From Susa to Turin the road is very wide, and the surface excellent but very dusty. We put up at Turin for the night after a hard and tiring day.

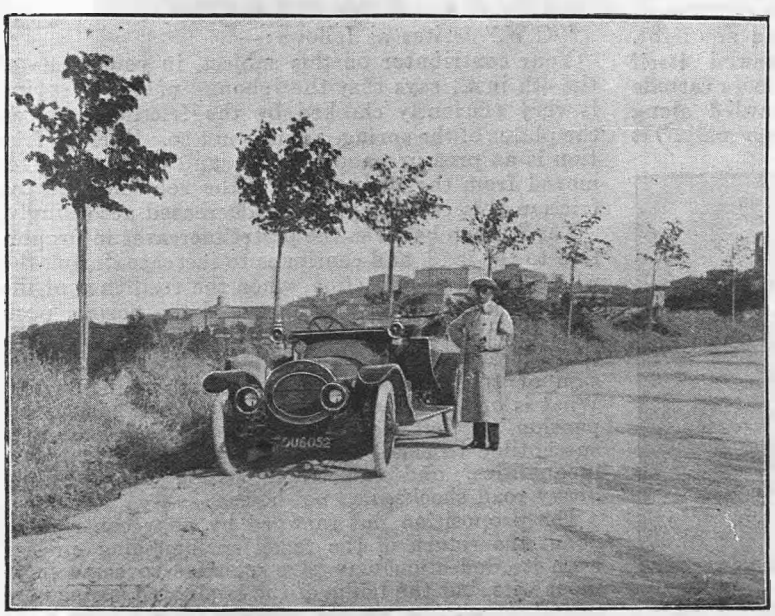
Next morning, after having filled up at the garage with American benzine at Italian price, we set off for Piacenza. The road from Turin to Piacenza is almost level; as far as Poirino it was abominable, and we had to crawl along at about 10 miles an hour. After Poirino it improved, and we were able to get along at 30 to 35 miles an hour. A stop just outside Alessandria to inquire into a curious knocking noise from the engine brought forth the fact that the radiator was empty and the engine frightfully hot. A friendly farmhouse near by furnished us with some water and we filled up. It speaks well for the cooling power of the fan that we had got so far without trouble. I had forgotten to fill up at Turin, as I ought to have done after a day's hard climbing over the Lautaret and Mont Genevre. Piacenza was reached about 6 p.m., and we found excellent quarters at the Hotel Italia and S. Marco. Piacenza is a quaint old town with a delightful "piazza," where one can sit down at a cafe and comfortably gaze upon the old communal palace with its curious winged battlements.

We set out next day for Florence. The roads as far as Bologna are fair, quite level, and very dusty. The heat was severe in the middle of the day, and we were glad to have a couple of hours rest at Bologna. From here to Florence the road goes over the Montepagano Pass; the road surface is good, but the constant twists and turns are very trying to the car and the driver. We soon noticed that we were in a country where the automobile is still a curiosity. The only way to get through the Italian villages is to make as much noise as you can, and go fairly quickly. The people will then get out of your way and think you are a great man. Near Prato we got into the manufacturing districts, and the traffic was very trying. From Prato to Florence the road was absolutely disgraceful, and we earnestly advise intending motorists to avoid this road and take the one over the Passo della Fula. My companion had not seen much of Florence before, so he spent the next morning sight seeing, whilst I watched the Riley being washed down at the garage. The Garage Nazliati is a most imposing building, with room for about 100 cars. After lunch we left for Perugia. This proved to be a most beautiful road with perfect surface and beautiful views. The view over Lake Trasimeno is most delightful.

Perugia is magnificently situated on a hill 1600 ft. high, reached by a long, winding road from the plain beneath. The Hotel Brugiani was the first hotel we came across, and we were so much taken with the position that we sought no further, and had no occasion to regret our choice. It is run by an English lady, Mrs. Collins, and is most excellently managed. The view from the hotel over the plains and hills of Umbria is wonderful. We regretted that time did not allow us to stay there longer.

The next day took us over some very hilly country. As we got further south the heat became worse, and at times I felt that it was as much as I could do to go on. Had it not been for the fact that both my companion and self were used to the Italian climate I doubt if we could have gone on right through the day as we did. At Narni, a small town perched on a rock by the side of the ravine, we felt completely exhausted, so we stopped at the first likely looking restaurant, and, having got the car put away in a stable hewn out of the rock, got our lunch, and a very good lunch, too. We were warned that the road was excessively hilly to Civita Castellana. This news did not worry me at all as I had found the Riley a most wonderful hill climber.

There are some very stiff bits of 1 in 10 to 1 in 7, and English motorists who have never toured in Italy or other mountainous countries do not know what hills are. Over here it is the length of the hills that try the car, for



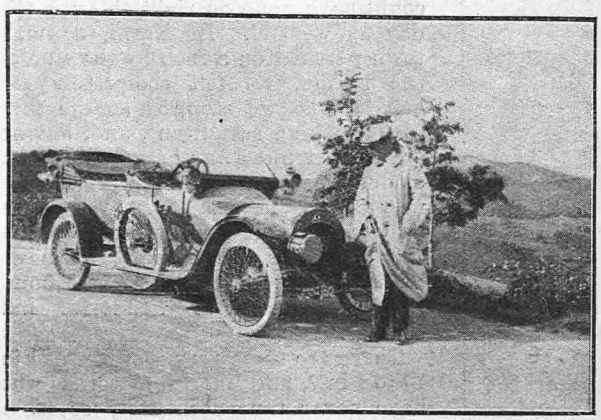
A view on the road looking towards Perugia.

COVENTRY TO NAPLES.—Contd.

some of them are from four to seven miles long. From Perugia to Rome, for instance, one descends gradually to Bastia, 670 ft., rises to Spoleto, 1070 ft., rises again to Somma, 2230 ft., descends to Terni, 435 ft., to rise again to Osteria, 1500 ft.

As we were much pressed for time, having to be in Naples on the Saturday, we decided to push on as far as we could, so that we could take our time over the Rome-Naples roads, which are so bad. Having passed through Rome, which we both knew well, we got on to the road to Valmontone. This road was absolutely frightful, and it is surprising that the Italians let such an important high road leading from the capital of the kingdom to Naples remain in such an abominable condition. Italian motorists tour very little, and the country people seem to be quite indifferent as to the condition of the road, so nothing is done to alter things for the better. After about five miles of this apology for a road, and being bumped and tossed about till I thought the springs must give, we got to Valmontone, where I thought we might put up for the night. Our entry into that place was somewhat sensational. I drove the car up what seemed to me to be a proper road, and seeing a gateway ahead of me shot under it, passed the astonished Octroi officials, and found myself on a flight of very broad steps leading up to the "piazza." I determined to hang on, but the wheels refused to grip for some seconds and buzzed round and round until I thought that all the studs would come out. Eventually we got up in instalments without any outside help, through a lane of wondering natives, and stopped triumphant and very hot in the square. My cousin mounted guard over the car, repelled the attacks of the irrepressible juvenile population, and then inquired if there was an hotel in the place. We were strongly advised, however, by the local chemist to go on to Frosinone, as there was no good accommodation in Valmontone.

I managed to coax the local grocer to sell me some benzine at an exorbitant price, and then with two native boy scouts as guards drove away, this time along the proper road to the main road below. It was now getting late, and I let the car out so that we should not be caught by darkness. At Ferentino we had to light the lamps, but found to our annoyance that the acetylene headlamps would not light. The water inlet had probably unscrewed itself slightly on the bad roads, and we had no more carbide to replace what was consumed, so crawled along at about six miles an hour with oil lamps only. It was extremely weird driving along in the dark; carts in Italy carry no lights, and my companion had to act as signalman and warn me of carts ahead.



On the summit of Montepagano, on the road from Bologna to Florence, looking towards Tuscany.

44

At last we got to Frosinone, and, having found out the only hotel there, the Garibaldi, we were rather staggered to hear there was no garage in the town. The proprietor suggested we should put the car up in the doorway of a palace in the square, and although this could not be closed, being half full of sand, we had no alternative, and got a watchman to sit by the car all night.

Next morning we started off on our last day's run. The roads gradually became worse as we got nearer Naples. Just outside Capua the engine gave a splutter and stopped. I immediately defined the cause of our stopping, and, taking off the cover of the petrol tank, found it was empty. Fortunately a cab happened to be passing by, so my companion, after some bargaining, got in and after about half an hour was back with a tin of benzine for which he had had to pay 2s. 9d. a gallon. The road from Capua to Naples is bad beyond description, full of holes, covered with about 3 in. of dust, and patches of loose stones; we had to crawl along, astonished beyond words that, in spite of the increasing traffic of motor vehicles, the inhabitants of this land have done scarcely anything in the last ten years to better the condition of the roads.

We arrived in Naples dusty but happy after a run of 1545 miles from Dieppe. The car behaved splendidly in spite of the terrific heat in the south of Italy. The brakes, in spite of the great amount of work required of them, did not require adjusting at any time. The best time for a trip of this kind is undoubtedly in the spring. It is deplorable that the roads are not better looked after, and until the authorities wake up to this fact motoring can never be the pleasurable sport it is in other countries. I must add a word of praise for my tyres, Michelin studded on rear and Dunlop grooved on front. I had no punctures since the time the car was delivered to me, having done 1920 miles, and they looked in such good condition when I arrived in Naples that my friends would not believe they were the ones I started with.

Roads and Springs.

"G.W." writes as follows:—

Your contributor on this subject, in your issue of the 4th inst., says that the rebound of a leaf spring is very efficiently checked by the friction between the plates of the spring. This is not so. Surface friction is as pressure and surface, and the load is removed from the spring during the rebound and the friction between the plates is decreased accordingly.

The friction between the plates increases in proportion to the load, and continues to increase during the whole period of deflection, when the resilience of the spring acting lifts the load beyond the normal position, in some cases separating the plates. The friction between the plates is a small matter in the design of spring suspension and may be neglected. What is of importance is the design of a spring suspension, so that when under the normal load it is susceptible to small additions to the load, i.e., road inequalities, and sufficiently strong to withstand heavy road shocks, i.e., pot-holes.

The proposition put forward by your contributor about the return of the recoil spring being quicker than its deflection may give exercise to some ingenious wits, but the faults of the laminated springs are mixed up with its virtues, and are often added to by the vagaries of chassis designers.

OTHER PEOPLE'S VIEWS

TRIALS OF VARIOUS FUELS—INTERESTING EXPERIMENTS.

Now that motor spirit has reached so abnormal a price, car users are naturally anxious to try heavier grade spirits, also mixtures of paraffin and petrol and benzole as substitutes for well-known brands of motor spirit.

I have carefully followed the correspondence in your columns as to the experience of users of benzole, etc., and you may possibly be interested in my own experiences in this direction.

My car is a 15 h.p. Darracq, which has proved its reputation for reliability, if not for silence, in the course of a long career.

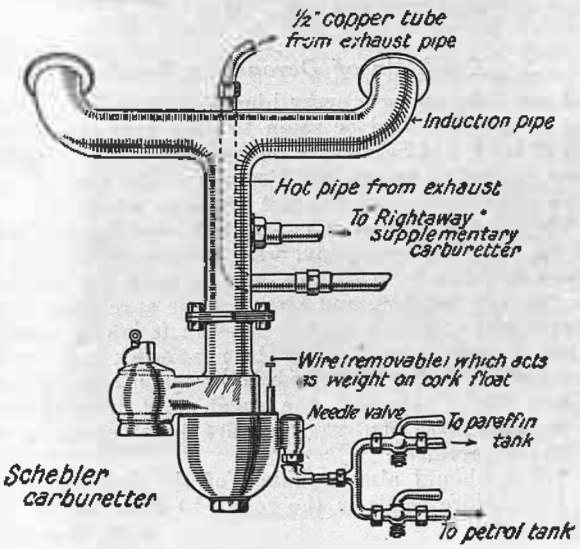
I have recently fitted a Schebler (American made) carburetter, which, owing to the fact that the jet is adjustable with the greatest ease, lends itself particularly well to experiments with high specific gravity spirits. It has a water jacket, which keeps it well warmed when the engine is running, and I have carried a ½ in. copper tube, right down the inside of the induction pipe, from the exhaust pipe, as per the sketch annexed. This pipe keeps hot enough, at any rate, partially to vaporize any paraffin spray which meets it on its way up the induction pipe.

I have fitted an ordinary carburetter jet on the top of the float chamber, which acts as a sleeve for supporting a wire, which can be cut to any desired length to give the correct weight to press on the float for any given mixture of paraffin and petrol or benzole.

I have fixed under the bonnet a spare tank, which contains the petrol-paraffin mixture, and a tube leads from this to the U connection near the carburetter. Each pipe is provided with a tap, so that either may be used separately or together. Petrol is carried in the main tank.

My experiences are as follow:—

Benzole.—The float should be slightly weighted, when it will give power equal to petrol with the same jet area as used for petrol. The engine should start from cold without difficulty. Tendency to soot is but slight.



One-third paraffin and two-thirds petrol.—Float should be weighted slightly more than when using benzole. Starting is difficult from cold, but not impossible. When the engine warms up it runs well, with comparatively smokeless exhaust. Jet area should be slightly increased.

Half paraffin and half petrol.—The float should be weighted still more, and jet area increased. Starting from cold is practically impossible. The engine should be run on petrol until well warmed up, and then the petrol-paraffin mixture admitted to the carburetter. The engine runs with a distinctly blue exhaust, which has the distinctive odour of paraffin, though this could be diminished by using a more efficient vaporizer than is provided by the single hot pipe through the induction pipe.

The engine is rather prone to misfire and gradually stop, owing to liquid paraffin collecting on the plugs, causing sooting up and misfiring. When this happens, the only remedy is to empty the float chamber of paraffin mixture and run on petrol until the plugs are dry and comparatively free from soot.

All paraffin.—Starting from cold impossible. Engine should be run till hot, and then possibly it will run with paraffin only, but the exhaust is very smoky, and causes much fouling of the cylinder heads, plugs, exhaust pipe, etc.

The starting in each case is made extremely easy by the use of the Rightaway supplementary carburetter, which consists of a small tank fitted to the dash, a vaporizing chamber, and a tube which leads to the induction pipe above the throttle, two complete turns of the starting handle usually being sufficient to start the engine under any condition.

D. E. Phipson.

The Fuel Problem.

In the interest of all who either manufacture motors or use them I write to ask you if some combination between the makers and users cannot be arranged to meet the constantly increasing price of petrol—it is now 1s. 9d. per gallon, and I am informed by traders that it may increase to 2s. I conclude from your remarks in The Motor that you have not much faith in either of the companies being formed to provide cheaper petrol for car owners, but, in my opinion, if every owner of a car put even £10 into one or other of them and agreed to stand by their own company when the Trusts reduced the price to possibly 6d. a gallon, an amount of money would be raised and a combination effected that no Trust could fight, as all owners would be users of their own spirit. The increased price will seriously interfere with the whole trade, as no one but the rich can continue to run a car. Men of moderate means will be crushed out entirely.

J. J. Russell.

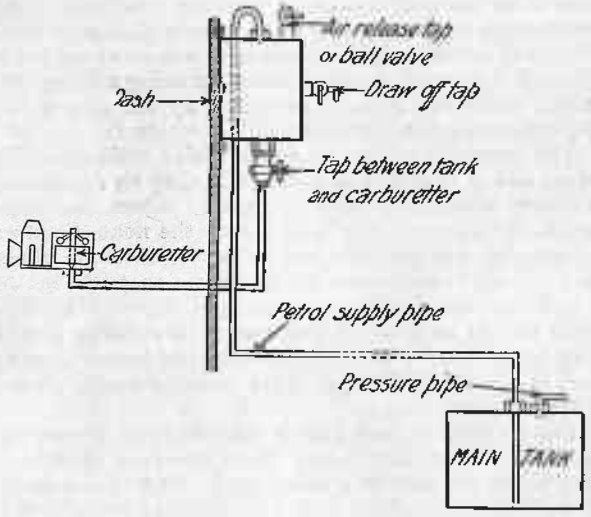
O.P.V.—Contd.

Auxiliary Petrol Tank.

I notice on page 177 of your 25th February issue a description of a patent device which lays claim to originality. I am in a position to say definitely that the idea of an auxiliary tank on the dashboard through which the petrol is supplied to the engine, with a device to retain the small tank full, and thus avoid the necessity for maintaining pressure in the main tank, for starting purposes, is by no means a new one. In December, 1911, I had a tank almost similar to the one described made for me by the Special Motor Repairs Co., of Eden Street, Hampstead Road, London, N.W.

(I send you herewith a drawing of the tank as fitted to a F.I.A.T. car.)

The only differences between the two are that (1) my tank is rectangular; (2) the petrol supply pipe on my car enters the small tank at the top; (3) the valve and float are absent from my tank. The shape is immaterial. By having the petrol entering the tank at the top the whole of the contents of the small tank are available for the engine, whereas in Mr. Richardson's design a certain amount of space is wasted. The float is, to my mind, an unnecessary complication. There is no need to shut off the main supply of petrol



when the small tank is full, provided there is no escape for the petrol.

In my tank the air vent is by means of the tap at the top, which is opened for starting when there is no pressure, and closed as soon as the engine produces pressure for itself. The right time to close the tap is easily discernible, owing to the petrol showing a desire to overflow. In the description of Mr. Richardson's device no mention of an air vent is made, though one is, of course, necessary, otherwise the petrol will not flow to the carburetter when there is no pressure in the main tank. The draw-off tap is an advantage, as small quantities of petrol are often wanted. Mr. Richardson makes no provision for this.

The upper tap can be replaced by an automatic valve to prevent overflow, but a tap is, in my opinion, preferable, as at the end of the day it is possible to open the tap, thus permitting the pressure to fill the small tank to the brim, all ready for the morning. Without this tap, or some similar means, it is not possible to ascertain definitely whether the small tank is full. The float contrivance should effect the same end, according to expectations, but there is no positive proof that the small tank is full. When the petrol in the main tank gets low and the pressure falls off, I have found that it is not sufficient to fill the tank to the top, but on these occasions I have assisted the pressure with the hand pump before leaving the car overnight, so as to be sure that no pumping will be necessary the next day. This only occurs when the pressure system needs cleaning out.

In your description it is stated that if the main supply of petrol becomes exhausted, the amount contained in the small tank will be sufficient to enable the car to proceed to the nearest garage. This is, however, incorrect, as the petrol will run out of the small tank even after the supply from the main tank has ceased. This is obvious owing to the action of gravity. Only when the small tank is empty will the lack of petrol become noticeable. What the small tank enables you to do, if the main supply becomes exhausted, is this: Supposing the engine stops owing to lack of petrol, it is possible, by means of the small tank and by placing the car on a flat surface or on the camber of the road (according to the position of the outlet pipe in the main tank), to pump up pressure with the hand pump, and collect up small quantities in the auxiliary tank. When the auxiliary tank is full then you may have enough to proceed a mile or two. I have frequently been "saved" by this means. The reason why the hand pump will often force petrol up to the tank when the engine has failed is that the car is stationary, and that the petrol remaining is more likely to surround the outlet pipe than when being jolted about by the motion.

Mr. Richardson has not provided a petrol tap to prevent possible leaks at the carburetter; such a tap is essential where gravity feed is used. My tank has this tap incorporated with it. I fear that Mr. Richardson's idea is not a novel one, except as regards the valve, which I consider an inferior, expensive, and unnecessary device.

My car has been now 15 months on the road, and many people have seen, and some have copied, the idea. It seemed all so simple to me that I did not deem it worthy subject matter for a patent, nor do I now consider it so. I thought out this idea myself, but I do not for a minute think that my car was the first to be so fitted; if it was, I shall be very much surprised, as the apparatus is simplicity itself, and an obvious way of eliminating that most annoying process of pumping up pressure by hand.

G. L. P. Henderson.

67, Guilford Street, London, W.C.

Condition of Devonshire Roads.

I can fully endorse everything Mr. Russell Coombe says. I myself had occasion to pass over the same bit of road, not only twice on Sunday, 2nd February (and happened to see Mr. Coombe at the time), but also several times during the previous week.

The road at this place is very soft, and the method of repairing it, seemingly, was to bring cartloads of these boulders from Haldin, and tip them up, chiefly on the soft patches, and after a little spreading, the stones were apparently left till the following week. They did roll them in a bit the next week it is true, but the result does not seem to be much better than before they repaired the road. A motorcyclist coming on these boulders unaware might easily have a serious accident.

Notice should also be taken of the fine example of Devonshire roads in the road (?) from Exeter to Chagford.

A. M. Ward.

DEGENERATION OF THE HORSE-POWER.

I notice in your 25th February issue a reply by Mr. Lowe, of Arrol-Johnston, Ltd., to my letter in your issue of the 18th ult., and with your kind permission should like to reply. Mr. Lowe thinks because I only replied to some of his remarks in his company's advertisement that I prefer not to discuss the remainder, but in this he is quite wrong. I only dealt with one or two principal points because I was mindful of the value of your space; if you can, however, spare me the space now I should like to deal with the matter more fully.

Firstly, with regard to the tax. Surely Mr. Lowe does not wish to make the public believe that the 11.9 h.p. Arrol-Johnston, with a bore and stroke of only 69 mm. by 120 mm., is as efficient as an American car with an engine of, say, 83 mm. by 140 mm. bore and stroke? My reply to this is that the tax per actual horse-power is no higher in the American car than it is in any representative British car.

Next, has Mr. Lowe seriously considered this alleged tax bogey? Suppose, for a moment, that the owner of an American 20 h.p. car is paying £3 3s. per year more tax than the owner of an equally-efficient British car (which is, of course, absurd). I presume Mr. Lowe will agree with me that the average motorist's annual running is, say, 5000 miles. Very well, £3 3s. spread over 5000 miles is just over a half-farthing per mile.

But the owner of the British car is running a much heavier car per horse-power, and his extra tyre cost is undoubtedly much more than this half-farthing per mile.

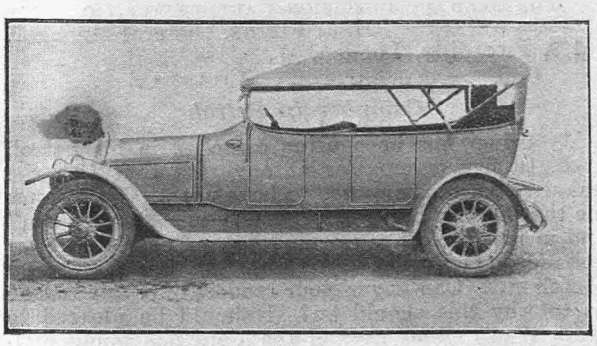
On the question of weight, Mr. Lowe mentions one well-known American car. It is possible that the manufacturer is making the same mistake as many of the British makers, and is putting a lot of unnecessary metal into his cars. In any case "One swallow does not make a summer."

Reverting for a moment to the tax question, does Mr. Lowe imagine that car purchasers buy cars from patriotic motives? I am quite sure that they do not; but they buy where they can get the best value for their money, and this is the only reason why so many American cars are being sold in Britain to-day. Mr. Lowe in his first letter mentioned back axles. Does he know that there are plenty of low-priced American cars with back axles that positively cannot be damaged except by the grossest misuse?

As to "sitting tight to the road." I am quite sure, from my long personal experience, that the Hupmobile car keeps the road as well as any other car, whether British or Continental, of similar type, and no doubt this remark will apply to many of the other American cars. Mr. Lowe makes several remarks which I think he would find it very difficult to prove, and his last paragraph, that the British car "goes better, looks better, lasts better, and is better" than the American car is a somewhat poetical statement, not necessarily borne out by actual facts.

Finally, does Mr. Lowe know anything of the road conditions of America, and if he does can he not realize that American cars scientifically built (as they undoubtedly are) with regard to "whip and torsional strain" allowances which stand the racketing for considerable periods on the shockingly bad roads out there will stand up for a number of years on the good roads of this country, and in this respect are quite equal to the more heavily-built British cars?

WHITING LTD.,
CHAS. R. CLARK, Sales Manager.



A smart 25 h.p. Berliet by Berliet Motors, 40, Sackville Street, W.

A User's Experience.

I should be obliged if you will allow me to discuss briefly the points raised by Mr. W. Lowe in your 25th sidering.

(1) Taxation. What is £3 3s. per annum compared with total running expenses—surely not worth considering.

(2) "Holding the Road." A steam roller "sits tighter to the road" than even a motorcar does, but that does not necessarily mean it is light on tyres.

"The proof of the pudding" is in the eating. I have driven a 20 h.p. American car 3900 miles over rough roads without even a puncture. In the course of the last nine months the car has been driven through a "splash" 100 yards in length, and in places 18 in. deep, at least twice daily for six days a week.

I have driven her up Chatham Hill, with two up, on top gear, and up Boughton Hill on top gear with five up, and the speedometer never indicated below 20 m.p.h.

In conclusion, so long as I can purchase an American car of double the horse-power for half the price of an Arrol-Johnston, I am likely to do so. I may add that the purchasers of the "cheap" American car are usually men who cannot afford a chauffeur or mechanic, and yet does one often meet these cars broken down on the road? At any rate I never have.

I enclose my card, which, although not for publication, will be sufficient to show you that I write solely as a private car owner. PRIVATE OWNER.

Motoring Brought Within the Reach of Men of Moderate Means.

I was rather amused at the somewhat extraordinary advertisement of Messrs. Arrol-Johnston in your issue of the 11th ult., re American cars v. the Arrol-Johnston.

If I had been an agent for American cars I am afraid I should have called it somewhat offensive.

As I am in no way connected with the motor trade I should like to give my views on the subject, as the driver of an American car.

I consider the motoring public are greatly indebted to the American "invasion," and for the following reasons. It has brought the pleasure and convenience of motoring within the reach of the family man of moderate means, which is in itself a great thing, but there is another advantage.

The British manufacturers are beginning to realize that it is not everyone who can afford to pay £300

O.P.V.—Contd.

to £400 when he wants a car, and they are now beginning to produce something less expensive.

A difference of £100 between one car and another is of considerable importance to many who would otherwise join the ranks of motorists.

I refer more especially to cars with seating accommodation for four or five. A two-seater car is not of much use to a man with a family of perhaps three or four, and until the advent of the American car he had to choose between going without a car or paying a high price for one.

Now things are altering, and in a few years I believe the man of moderate means will have several British makes to choose from, five-seaters, and in the neighbourhood of £200. At present he has only one or two, and that is why the Americans have gained ground. They were the first to supply cars at a moderate price, and so far they have retained their advantage.

I take it that the average Englishman would always prefer to buy a British car, but if there is not a suitable one within his means who can blame him if he goes in for an American production? It is quite a fallacious notion that because certain cars are cheap they are necessarily nasty. The family man is not exacting, and so long as his car runs well, is reliable, economical, and will stand knocking about he cares little about an ultra-silent engine, body finish, etc.

The car I drive has certainly done excellently on above points, and as to Messrs. Arrol-Johnston's remarks regarding the "cheap motorist," no decent man would think of estimating another by the price he has paid for his car. S.L.P.

Dry Batteries in the Tropics.

We noticed in a recent issue a letter in the correspondence columns from a reader who had been using 4½-volt dry cells for side lights, with considerable success. As he was leaving for a warmer climate, he wished to know whether he would have to use accumulators, as he thought the dry cells would become impaired by the heat, and consequently lose their efficiency.

We were rather interested at the Editorial reply, in which it was stated that the dry cells would certainly lose their efficiency, as the heat would draw out the moisture and render them useless, and also the recommendation to use fillable cells.

We have represented Messrs. Hellesens, Enke and V. Ludvigsen in Australia for a number of years, and have shipped hundreds of thousands of Hellesen cells to Western Australia, South Australia, New South Wales, and Queensland, where they experience all kinds of heat, from the driest kinds of desert heat, perhaps over 120 degrees, to the moist tropical heats of Northern Queensland, and the Hellesen cells show an unfailing efficiency under all these conditions.

These cells are used in Australia for all kinds of motor work, such as lighting, starting, and ignition, and show unfailing regularity in all conditions of climate and work, so long as they receive fair treatment at the hands of users.

Climate has no effect upon the efficiency of these cells, as we know from practical experience in all the varying climatic conditions of the Australian country, whether in the cool South, Torrid centre, or the Tropical North, so your correspondent need have no fear of results, wherever he may go.

We might also state that these cells can be procured in almost any country town throughout Australia. A. J. Sage and Co.

Melbourne.

Motorcar Electric Lighting.

The above subject is of considerable importance to most motorists now, and this has been an exceedingly useful winter for testing the actual driving light of electric lighting sets.

During my experiments I have found that a lot of generators depend upon large accumulators to help them out when being used at night. Now, it seems to me that no form of electric light dynamo should be purchased by a motorcar user unless the output from the dynamo is more than sufficient, when the head and other lamps are alight, to provide all the electricity required, without drawing upon the accumulator, because it means that if your journey is prolonged, the lights become feebler and feebler, whereas with a proper size generator, which gives, say, 18 amps., one can have a whole collection of lamps alight, and can use a small. and thus a light, accumulator, which, at the end of a night's run, has more electricity in it than when you started.

It is well to remember that accumulators are only a necessary evil—they weigh a lot, they cost a lot. The ideal generator some day will light the lamps without any accumulator. S. F. Edge.

[Mr. Edge's "ideal" dynamo, it seems to us, is one that would generate current even when it was *not* running. One must have light when the engine is stopped sometimes. Perhaps Mr. Edge's "ideal" dynamo will have a small engine of its own, otherwise we fear the accumulator must remain a "necessary evil."—Eds. "The Motor."]

Auxiliary Tank for Starting Up.

I have been considerably interested in an article appearing on page 177 of your 25th February issue, with reference to the desirability of fitting an auxiliary petrol tank for easy starting in cold weather.

Perhaps you will permit me to point out that, if a Stewart-Precision carburetter were fitted on the car this auxiliary petrol tank would not be necessary, since the carburetter itself is provided with a starting well, and, provided the engine is in anything like good running condition, the car will start every time on a half-turn of the crank.

I might be allowed to emphasize this by pointing out that a customer of our tells us that about three weeks ago he walked into his garage after his car had been standing for five weeks, started his engine up, drove the car out of his garage up a drive about 80 ft. long, which rose at a gradient of about 1 in 20, and out into the street, when his engine stopped. Investigation showed that the petrol had not been turned on from the tank, and that after standing five weeks the car had started up and run that distance on the petrol which had been left in the float chamber of the carburetter.

The secret of this perfect starting is, of course, that the carburetter is designed in such a way that the first movement of the engine piston, after the car has been standing even for a few months, draws in a very rich mixture which fires without difficulty, and, of course, succeeding revolutions regulate the mixture in accordance with the requirements of the engine, and certainly no such fittings as auxiliary tanks or anything of that kind are necessary with our carburetter.

The Stewart Precision Carburetter Co., Ltd.
H. J. Fitton, General Manager.
199, Piccadilly, London, W.

Camphor in Petrol.

My driver has been using camphor in his petrol, 1 oz. to five gallons (or at any rate that was the quantity he was supposed to have used). He informs me that he now has great difficulty in "starting up," and in fact the other morning he was nearly an hour getting a start. The car, I may say, is a Ford, new March last. Can any of your readers offer any reason as to why this should be? I should be pleased to know if any other user of the Ford has found difficulty in starting up, either on the camphor mixture or on just the ordinary Shell petrol. F.J.W.

TYRE INFLATION AND THE HEAT THEORY.

Air Enters Cold.

There is no doubt that the atmospheric air pumped into tyres enters cold. Atmospheric air, or gases, when compressed, give up during this process their latent heat in quantities commensurate with their nature and the pressure they are subjected to. Thus air or gases compressed into cylinders evolve a large volume of heat during compression, and when expanded to their original atmospheric pressure they absorb heat from the surrounding atmosphere and thus create cold in the immediate neighbourhood. This is the principle of refrigeration.

The same process takes place in a small way when air is pumped into the tyre. The compression chamber is the pump in which the air gives up its latent heat. It then passes through a small orifice into the tyre, and during its expansion inside the tyre it cools the air contained therein.

The volume of atmospheric air contained in the tyre may roughly be reckoned at one volume for every atmosphere of pressure. Thus, a tyre having been inflated to 60 lb. per sq. in., will contain five volumes of air, i.e., the original volume contained in a tyre before inflation, and four volumes in addition for the four atmospheres of pressure inside the tyre. Of course, this rough estimate only refers to low pressures.

Whilst atmospheric air, oxygen, hydrogen, etc., would show about 60 volumes at 60 atmospheres of pressure, a liquefiable gas, such as carbon dioxide, would at this pressure and at mean temperature represent 425 volumes of expanded gas

H. Steinem.

Tyre "Resiliency." What Is It?

With reference to Mr. Sturmey's article on "Compromise of Design," in your 25th February issue, I notice that your contributor touches upon the question of tyres, and in one paragraph states that "the idealist would give us tyres of great resiliency but of very short life."

Now, according to Webster, the definition of the word "resiliency" is—the act of leaping or springing back, or the act of rebounding.

I hardly think Mr. Sturmey can really mean this, as it is this continual rebounding and bouncing that we are most anxious to avoid.

Mr. Sturmey is not alone, however, in using the term resiliency in the sense that he has quoted, for we find it the general rule rather than the exception for the manufacturers of tyres themselves to use the term in quite the eulogistic sense when speaking of the qualities of their tyres.

Unfortunately, pneumatic tyres do possess "resiliency," but it is certainly not an asset; in fact, it is one of the defects of pneumatic tyres and the last thing that tyre manufacturers should talk about.

In conclusion, I might mention that the ideal tyre, in my opinion, is one that runs smoothly without bouncing, and, in short, possesses as little resiliency as a pneumatic tyre will allow.

Laird Nuttall.

That Wonderful Heat Theory.

I should imagine from Mr. Sturmey's previous articles that he is in no need of a champion to help him in replying to his critics. I cannot, however, help suggesting to Mr. Laird Nuttall that he consider the following remarks with reference to his wonderful heat theory in pumping up tyres:—

A volume of air at atmospheric pressure and temperature is compressed more or less adiabatically to occupy a smaller volume at a higher pressure. In compressing this air work is done on it, and this work done is partially converted into heating the air.

Whether the air expands or contracts or behaves in any other funny way during discharge from pump to tyres does not affect the final result, namely, that the air has been forced into the tyre and that it occupies a smaller space than when it formed part of the atmosphere.

Without going into mathematics, a volume of air at atmospheric temperature and pressure, when adiabatically compressed to 50 lb. per sq. in., has its temperature raised to about 340 degrees F. (taking atmosphere temperature at 60 degrees F). Of course in the case of the tyre and pump the compression is not perfectly adiabatic, as we have not got such a thing as a perfect non-conductor of heat, and the final temperature will be less than that stated in proportion to the amount of heat that has been conducted and radiated away through the walls of the pump and tyre and the surrounding atmosphere.

Narwhal.

Instruction and Amusement.

I feel sure that your readers must be very grateful to Mr. Laird Nuttall for the combined instruction and amusement which he provides for them through your correspondence columns.

He has a joyous way of "rushing in" where Mr. Sturmey would probably not dare to follow him.

Mr. Nuttall's famous experiment of pumping air into a petrol tin, and then feeling the tin to make sure that it was colder than before, is particularly happy. I gather from Mr. Sturmey's letters that he would have been prosaic enough to use a thermometer. If Mr. Nuttall had done so, I fear we should never have heard of his famous experiment, and the result of valuable original research would have been lost to the world.

An opportunity of demonstrating the behaviour of gases when suddenly expanding (which the experiment might have afforded) seems to have been missed by Mr. Nuttall. If he had pumped harder and longer he would have made further startling discoveries, and doubtless proved to demonstration that "an ounce of practice is worth a ton of quibbling," or that a whole petrol tin is worth half-a-dozen bits of a petrol tin sticking in one's anatomy.

F.C.J.

[An article in which Mr. Sturmey replies to Mr. Laird Nuttall appears on page 244.]

Auxiliary Petrol Tank.

We trust you will allow us space to point out to your readers that the "new" patent of Mr. Richardson, described on page 177 of your issue of the 25th February, was introduced by the Société Pilain, and fitted on all their pressure-fed models eight years ago, and was only discontinued when the principle of gravity-feed was adopted, a matter of two years ago. The only difference was that, instead of having a valve to cut off the supply, it was fitted with a three-way tap, but it was so arranged that the supplemental tank on the dash was fed automatically from the main tank whenever needed.

We make this notification because it is another instance of Pilain improvements being adopted by other concerns after they have been in use by the Société Pilain for many years.

A. Pellant, Ltd.
A. Pellant, Managing Director.

"Keeping in Touch with the Tail-lamp."

What is it that Mr. Appleyard has invented? I devised the pair of mirrors precisely as described and illustrated in your paper many years ago, and used them for years all over the three kingdoms, until they became unnecessary upon my adoption of electric lamps.

A. J. Wilson.
B55

INFORMATION BUREAU

SPECIAL NOTICE.

We are at all times pleased to answer any queries put to us by our readers, or to receive correspondence from them upon any motor topic. In consequence of the large number of letters received, however, we must insist upon the following simple rules being adhered to:—

1. Plain writing. Type-writing for preference.

2. All letters to be written on one side of the paper only.

3. Questions to be clear, terse, and to the point, without tedious preamble.

4. Should an immediate reply be required, an envelope must be enclosed bearing a penny stamp, and the name and full address of the sender. NOT a stamped undirected envelope.

5. Questions cannot be answered on the telephone.

Leaky Gearbox.

A.M. writes:—The gearbox of my car exudes oil from below. Close examination showed that there was a small crack starting at the edge. How can I repair this without having to remove the gearbox, which would be a difficult matter? Would red lead, if applied to the crack, be effective?

A proper repair can only be made by welding; this means taking the gearbox down and sending it to the aluminium repair specialists. It might, however, be possible to repair it from the inside. If the crack is small, it could be burred over by careful treatment with a cold chisel. Red lead or other preparations would quickly be affected by the lubricant.

The Consumption of Petrol Per Mile.

A.W. writes:—Is there any definite method by which one can determine the consumption for a given distance per mile? My car, in common with many others, has no petrol gauge connecting to the petrol tank, and although I have made several attempts to measure the consumption I cannot get any reliable figures. I presume I am right in assuming that if there were a certain petrol consumption for a given distance, that this would serve as a standard as to the condition of the engine and transmission. If the consumption increased, other factors being equal, I presume it would point to some defect either in the engine or transmission?

There are appliances sold specially for the purpose of measuring the miles per gallon obtainable from any given car. One of these consists of a graduated tank, which holds a small quantity of petrol, and it can be temporarily connected up to the carburetter, instead of supplying the carburetter from the tank in the usual manner. If a number of tests, say half-a-dozen, are made, and the mean of the figures taken, this will give, for all practical purposes, an accurate standard of the consumption of fuel under any given conditions. The consumption can then be tested from time to time, and any abnormal increase will at once be apparent. Of course, the tests must be made over similar road surfaces and under similar weather conditions.

Camphor Experiment.

F.T. writes:—I have read with much interest the claims made on behalf of camphor dissolved in petrol. Do you think the following plan would be better than actually dissolving the camphor in the petrol, viz, a small vessel or container placed over the exhaust pipe close to engine, in which the camphor could be kept in a molten state? From this container a pipe would connect with the induction pipe, and, therefore, some of the vapour would be drawn in with the mixture at every induction stroke. The mixture would thus become saturated with camphor vapour.

A definite opinion cannot be expressed on a question of this sort without making an experiment. The suggested method obviously is more complicated than that of simple solution of the camphor, and we should expect there would be risk of burning the camphor in the container, and thus a lot of carbon would be formed in the induction pipe. Still, it is not a difficult matter for anyone to try the experiment and form their own conclusions as to its value.

Self-starter.

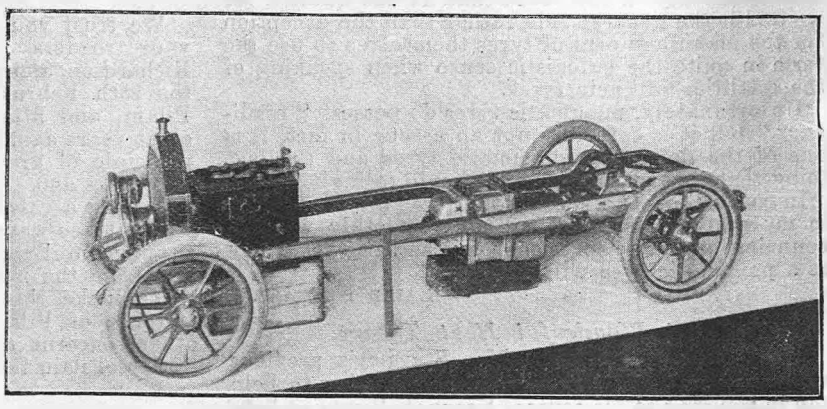
H.I. writes:—Is it possible to make an engine start on the switch without a coil and battery? Is it not a fact that if, when the engine is stopped, the magneto short-circuit switch is closed, suddenly opening it again will cause a spark at one of the plugs?

There would be no result whatever in opening the circuit. A short consideration of the theoretical principles on which the magneto works will show that no current can be generated without movement of the armature. For switch starting a battery is essential to supply the initial current.

Circulation Trouble.

M.A. writes:—I have just got possession of a six-cylinder 40 h.p. car, said to be four years old. Can you please suggest why the circulation water should boil after running about two miles? I find also that the car will not run on top gear unless going down a slight incline. The valves have just been reground, and the compression seems to be normal. Do you think the timing can be at fault? The car runs very well on the third speed, but the water boils immediately. The circulation pump is in good condition.

From a consideration of the difficulty, we are of opinion that it is due to a carburetter defect. For some reason the mixture is too rich. Flooding of the carburetter is a usual trouble on old pattern cars. We do not think the timing is wrong, but you will find the method of checking it (with diagrams) is given in our "Motor Manual."



Prince Olaf's new Cadillac model.

We give on this page an illustration of a miniature Cadillac, scale half-size, made entirely at the Cadillac works, designed by Mr. A. H. Bailey, the works manager, to the instructions of Mr. F. S. Bennett. It is to be supplied for Prince Olaf, the one recently made being too small. It is driven entirely by the Cadillac self-starter and is geared for a maximum speed of six miles per hour, although the ratios can be raised to attain 16 miles per hour. It has ball bearings throughout, thus conforming to the Cadillac practice, and is altogether an interesting model.

BUREAU.—Contd.

Dissolving Rubber.

B.L. writes:—Will you please advise in the following difficulty? As I am carrying out some experiments in connection with tyres, I have been endeavouring to utilize some worn-out air tubes to make rubber solution. Acting on the advice of an expert, I cut the rubber up into very small pieces and soaked them in petrol, which, I am given to understand, will dissolve rubber. Although the mixture has been standing some weeks, there is no sign of proper solution of the rubber. It has become soft and swollen, but it is quite useless for my purpose. Will you tell me how to proceed to make the rubber dissolve?

The expert who advised you certainly cannot know anything about rubber or rubber solvents, as, in the first place, vulcanized rubber, of which air tubes are made, cannot be dissolved, and it is necessary to use the pure and unvulcanized rubber. Moreover, even this is not soluble in petrol. This spirit is not a rubber solvent at all. What you require is benzole, or, as it is known in the rubber trade, coal naphtha. You will not find it worth while attempting to make rubber solution, as you can buy it very much better from any of the specialists who supply it for tyre work.

Lowering the Gear.

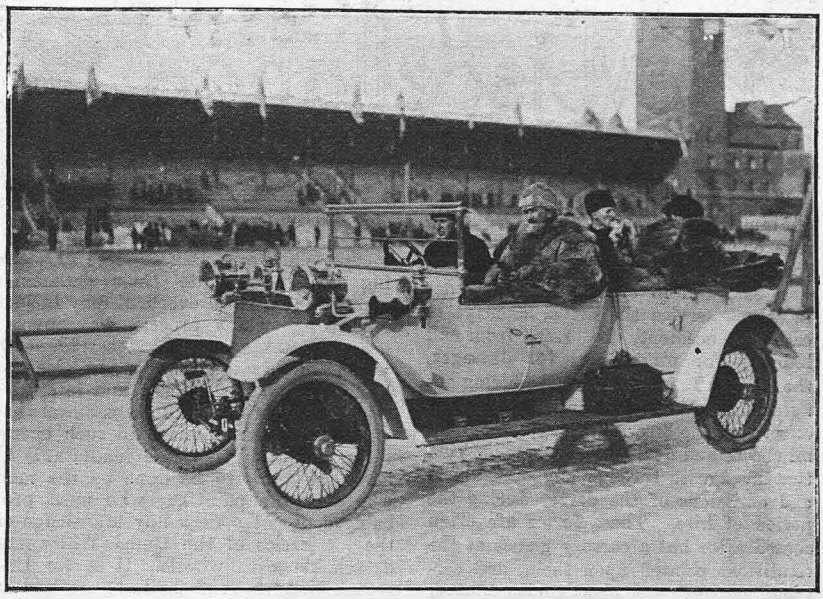
P.H. writes:—I am driving a two-cylinder car, five years old; the tyres have been altered from 760 by 90, the standard size, to 815 by 105. The car now seems geared too high. Would any advantage be gained by fitting a smaller pinion to the bevel drive? The gearing at present is 2 to 1 direct drive, top speed, weight 1 ton 2 cwt., 10-12 h.p.

A new driving bevel and crown wheel are required, giving a lower ratio of gear. To fit a smaller pinion to the present crown wheel would not do; even if you could adjust the crown wheel closer you would not get a smooth-running drive. You have probably not calculated the gear ratio correctly, as 2 to 1 would be impossible for a car of that weight and power. It is more likely to be 4 to 1.

Fixed Timing.

M.E.G. writes:—(1) Is fixed timing magneto ignition as efficient as variable, apart from other considerations? (2) On an old type of engine, automatic inlet with sparking plug between valves, would it be worth the trouble to take down cylinder and fit the plug where compression taps are, that is, in the top of cylinder? (3) With tyres fitted with solid preparations instead of air, is the increase in tractive energy much more than with pneumatic tube, and can the filling be used again on new tyres?

(1) The subject was fully discussed in an article in the 24th December issue. From this you will find that the author concludes that fixed timing cannot be so efficient as variable timing for a number of reasons. On the other hand, the loss of efficiency is, to some extent, compensated for by a simplification of control. The loss in any case cannot be appreciable, otherwise fixed timing would not have become so generally used. (2) No; it would not be advisable. You would not gain anything, whilst, on the other hand, you may spoil the cylinder by boring through to the water jacket. (3) It is claimed that the tractive force is not increased, and the filling can be used in new covers. The makers of these preparations are always willing to give full details on application.



A 38 h.p. 6 cylinder Lanchester car, which competed in the recent Swedish reliability trials. The photo shows the car starting from the Stadium.

Electric Petrol Tank Indicator.

C.T. writes:—Having on more than one occasion run out of petrol when on the road, and with great inconvenience resulting, could you give me an idea how to fit an alarm, that is to say, an electric contact which would ring a small bell on the dash when the petrol level in tank fell below a certain amount?

We question if this plan would be reliable, although it is an interesting one. It has been tried, but it is more complicated in practice than it would seem worked out on paper. The electric contacts would have to be controlled by a float, and it would be difficult to make this proof against vibration, and as the whole arrangement would have to be inside the tank, it would require a special design of tank. The simplest plan would be to fit up a petrol tank gauge. These are made for either the gravity or pressure type tank, can be adapted without much alteration, and always show how much petrol is in the tank.

A.P. writes:—Can aluminium be soldered with an ordinary copper bit if a special flux be used? I have a small repair to make which is not worth welding.

Yes, it is practicable, but you have to use a special solder for aluminium. There are several of these on the market. Accessory houses usually stock some.

Slack Gudgeon Pin.

J.R.C. writes:—I have taken my engine, which is a 1904-1905 pattern, down, and I find that the gudgeon pins in two of the cylinders are slack. Are they intended to be a tight driving fit? There are wide piston rings to keep the pins from coming out and damaging the cylinder. Can the pins be tightened? They do not seem worn.

The gudgeon pin certainly should not be a slack fit in the piston bosses. They are intended to be a driving fit, and for this purpose are made with a very slight taper. Unless they fit tightly, there is some possibility of leakage of gas, but unless the pins have actually worn the bosses in the pistons, there may not be any serious results in continuing to run the engine. The only way by which you could tighten them would be to take off the wide piston ring and drive the pins further into the bosses.

ROUTES.

All inquiries concerning routes and details of tours must be accompanied by a remittance of 6d. and a stamped and addressed envelope. *Owing to the very large number of such inquiries received it has become necessary to form a special department to deal with them. Letters should be marked "Motor Routes." We would, however, call our readers' attention to the fact that an excellent series of Motor Road Maps and Books can be had from our Publishing Department. Particulars of these Maps and Books are given from time to time in our advertisement pages.*

Routes cannot be sent by return. *All applications are replied to in strict rotation in the course of 21 days. We do not give recommendations to Hotels or Boarding Houses.*

Owing to pressure on our space a large number of replies are unavoidably crowded out. We are always pleased to reply, almost by return of post, to inquiries, when a stamped addressed envelope is enclosed. During the past week we have posted replies to 153 readers.

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Miscellanea

Hiring-out Agreements.

Manufacturers and traders frequently hire one of their drivers to a customer for the purpose of driving the customer's own car, and in order that the trader in whose service the driver is may, in case of accident, be free from all liability for proceedings for damages, the S.M.M.T. suggest that the hiring-out agreement should bear a clause to the effect that the hirer shall pay and satisfy all claims and demands of whatever kind that may arise through any of the acts and omissions of the driver during the period of hire. These forms are often signed after but a cursory glance at the conditions printed upon them, and certainly without any clear understanding of all that is implied and contained therein. It strikes us as being somewhat unfair to fasten these liabilities upon the hirer without first calling his attention to the fact that he is assuming them, and to the need for him to cover himself fully by insurance. It is quite possible that the insurance policy on his car might only hold him covered in case of accident when the car was being driven by him, or by his own servant, the insurance company holding that the driver was not the car owner's servant.

The Bosch Magneto in U.S.A.

An interesting little production is the "Bosch News," a copy of which we have received from the Bosch Magneto Co., 223, West 46th Street, New York. Whilst there is some generally interesting text and numerous illustrations dealing with American motor races in which the Bosch magneto has been used, it also shows in a very striking manner the enormous progress this famous ignition system has made over there. It is adopted by a large majority of the American makers, and bids fair to become as universal in U.S.A. as in Europe. The demand has now reached a huge figure.

The Emperor William Institute for Coal Research.

Under the chairmanship of the Government President, Dr. Kruse, of Dusseldorf, the Emperor William Institute for Coal Research held a meeting at Mülheim on the Ruhr for the purpose of considering and sanctioning the architectural plans of the Institute's building, which is to be erected within the next two years.

The Zenith Carburetter Co., 17, Harp Lane, London, E.C., have just brought out a new list of fittings for this well-known carburetter. The booklet contains dimensioned particulars of such parts as bends, T-pieces, flanges, etc., which enable the carburetter to be fitted to any arrangement of inlet pipe, however complex it may be. Particulars for fitting are also included.

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Detachable Wheel Warnings.

With the overhauling of cars in readiness for the advent of spring, Messrs. Rudge-Whitworth issue a note of warning with regard to their detachable wheels. A general overhaul may include repainting, which process may involve not only taking the Rudge-Whitworth wheels off the inner hubs, but also the lock rings off the wheels, and later the replacement of them. It is essential that care should be exercised in such operations, and it is therefore inadvisable to leave the work to be done by the man who does the painting, who most probably does not possess any knowledge of the intricacies of the Rudge-Whitworth detachable wire wheels. It is for this reason that the makers have deemed it advisable to impress upon car owners, on taking possession of their cars after overhaul, to check over each of the wheels and its fitting before driving. Although carefully-drafted instructions for this purpose are issued with each set of wheels, where these have been lost or mislaid the makers will be pleased to supply duplicates. Most of the wheels in use are of the 1912 or similar pattern, for no alteration of consequence was made from 1909 to 1913. The latest Rudge-Whitworth wheel, by reason of its simplicity and sparcity of parts, does not require much detailed instruction.

Golf enthusiasts will be glad to hear that some leading members of the R.A.C. are moving in the matter of the establishment of a new golf club near Epsom Downs. We understand that other locations for the projected new course are under consideration.

The Institution of Automobile Engineers.

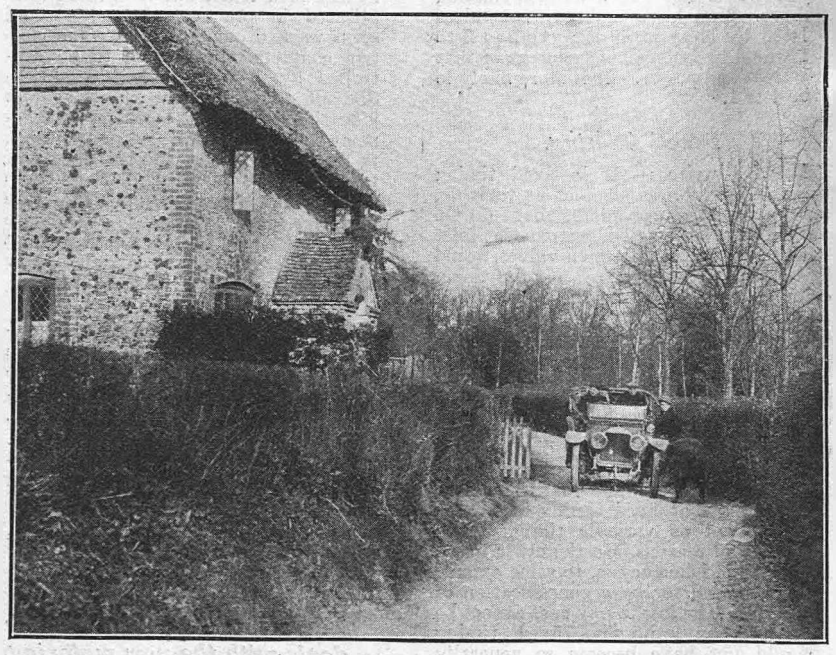
The eighth general meeting of the session of the Institution of Automobile Engineers will be held on Wednesday, 12th March, at the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W., at 8 p.m., when a paper on "Heavy Motor Vehicles" will be read by Messrs. Geo. W. Watson and D. S. Kennedy. Tickets of invitation to the meeting will be sent to those who are interested in the subject, and application should be made at the offices of the Institution of Automobile Engineers, 15, Queen Anne's Gate, London, S.W.

Representatives of makers and users of this class of vehicle are specially invited to attend and to give their views in the subsequent discussion on the paper.

Messrs. Oakley, Ltd., have opened a branch for their specialized coachwork at Chesham, Bucks, for the purpose of undertaking the manufacture of high-grade, light motorcar and other bodies, hoods and screens. Repairs and overhauls of all makes of cars, and in particular the Ford car, are also attended to. Messrs. Oakley have secured the head agency for the Mid. and South parliamentary divisions of Bucks. for Ford cars, and have a stock of these cars with standard or their special bodies at both the London and Chesham depots.

An interesting souvenir of the Talbot car's 50-mile record run has just been issued in the shape of a booklet, obtainable, gratis, from Messrs. Clement-Talbot, Ltd., Barlby Road, Ladbroke Grove, London, W., in which are many excellent illustrations of the various stages of the run.

The name of the popular lubricant formerly known as Vacuum Mobiloil "B" has recently been changed to Vacuum Mobiloil "BB."



The tyre test car on the estate of Sir Bache Cunard, at Nevill Holt, Market Harborough.