Saturday, May 10th, 1913.

THE AUTOCAR

A Journal published in the interests of the mechanically propelled road carriage.

EDITED BY H. WALTER STANER.

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Notes.

Waterbound Roads.

In his contribution to the discussion on Colonel Crompton's recent paper on modern road construction, Sir John Macdonald very properly emphasised the fact that the frequently used term, "waterbound macadam," was really an insult to the memory of the great road builder, because Macadam's system was absolutely opposed to the practice introduced many years later of introducing water into the road. Macadam's one ambition was to keep water from the road, the basic idea of his system being that the stones of which the road was composed should combine and interlock themselves by their own angles, and not that water, which, of course, really means mud, should be introduced between the stones. The copious use of water came in many years later as an accompaniment of the steam roller.

When referring to this matter in our issue of April 19th we suggested that in one respect we found ourselves in disagreement with Sir John, who spoke of the methods of water-binding and mud-binding as though they were things of the past, whereas, as a matter of fact, the majority of roads, and main roads at that, are still built in this dirty and extravagant manner. Even within a few miles of London we find that the great north-westerly main road, the Holyhead Road, is still being repaired in this foolish manner. Of course, on this road there are many stretches of modern construction, some of them experimental but the fact remains that many miles of it are still constructed and maintained by the mud pie method.

Mud-binding on Main Roads.

We bring this matter up not to damp the enthusiasm of Sir John Macdonald, but because we think it shows so very clearly how necessary is some system of central control, at any rate so far as the main roads are concerned, and particularly those which are subjected to really heavy and constant through traffic. Now, in at least one of the sections under repair on the Holyhead Road in which the obsolete mud binding is being used, the ordinary roads in the same county are made in the same way and are really excellent, but for reasons which we are unable to give, those responsible for the repair of the Holyhead Road do not seem to have recognised that methods which may work reasonably well on less used roads are quite unsuitable for main roads which have to carry really heavy and constant traffic. We do not merely refer to the heavy traffic of private motor cars, but to the tremendous gruelling the Holyhead Road gets from the post office vans and from the volume of motor lorry and similar traffic which passes over it; indeed, if it were only private motor traffic we believe that the mud-bound road would be reasonably satisfactory, but it is quite unsuitable for the heavier work. This, of course, has long been recognised by the Road Board, and it is doing all it can to persuade road authorities to make their main roads properly, but it has no power to compel them to do so. Some such power will, undoubtedly, have to be given to it in the near future if the multitudinous authorities responsible for main road maintenance cannot be brought up to the level of those few who have adopted modern methods of road maintenance.

At the present time there is no doubt that the heavy traffic such as that of motor lorries, motor 'buses, and post office vans, is increasing at a much more rapid rate than the enlightenment of the road builders and repairers. The consequence is that, while the expense of road maintenance goes up the condition of the roads deteriorates still more rapidly. With the exception of the more enlightened counties there is no gainsaying that the roads are worse to-day than a year ago.

Useful Hints and Tips.

Fitting up a Workshop with a Place for Everything.

MOTORING has a special fascination for the amateur mechanic; not only does he enjoy the exhilarating rush through the air, the charm of visiting hitherto unknown places, the grandeur and majesty of beautiful scenery, and the sense of controlling and directing a machine of many horse-power, but he looks forward with pleasant anticipation to the various adjustments and experiments which will afterwards be made at home, and which he fondly hopes will result in improvement in the running and economy of his car. Amateurs have been the inventors, too, of valuable devices in motor cars as in other fields of applied science. For such, a workshop of some kind is necessary, and a few hints as to its equipment and arrangement, suggested by more than thirty years' experience, may be of help.

Many people are careless about the appearance of their equipment and tools, asserting that "handsome is as handsome does." The opposite, however, is very often also true, "Handsome does as handsome is." If a man use a nice, well kept, accurate tool he is more likely to do good work than if he use a rusty and battered implement. The mind unconsciously makes the tool or machine the standard of excellence for the work—at least, I find it so. My hints, therefore, are directed not alone to keeping the workshop tidy.

A bench is the first requirement, and it is important to have it strong and rigid. Its size will depend largely upon the space available and the amount of work likely to be done on it. It should not, as a rule, be less than six feet long. Three nine inch or three eleven inch planks, three inches thick, make a very good top, thus making it 27 or 33 inches wide. Its height will depend on the height of the vice jaws, which, in turn, depends on the height of the worker.

If one stand by the edge of a table with the elbow by the side, and the forearm bent upwards, and pile up books under the elbow until they just touch it, the distance from the top of the uppermost book to the floor is the height of a vice suitable for that person. The writer is 5ft. 8in. in height, and the vice which he can work most accurately at is 3ft. 6in. from the ground. The bench corresponding is 2ft. 11in. high. The legs of the bench are of scantling 3in. × 4½in., and the cross-pieces of the same dimensions. These are, perhaps, unnecessarily heavy, 3in. × 3in. would do fairly well.

The lower cross-pieces, which are 9in. from the ground, are mortised into the legs, while the upper crossbars are halved into them. A couple of bolts will secure these parts very firmly. The top of the bench would be best made of hard wood, and in some places beech planks 2in. or 3in. thick can be purchased quite cheaply. The two or three widths of which it is composed ought to be dowelled together, and be further secured with a couple of ⅜in. or ½in. iron rods passing across through the thickness of the wood. If it be desired to secure the bench against a wall these rods may be left long enough to pass right through the wall and be fastened with plates and nuts at the other side. This makes a very rigid bench, and is well worth the trouble entailed, where it is practicable. Nuts which are also fitted at the inner ends of the rods should be sunk into the wood so as not to project beyond the edge of the bench. The top of the bench should be planed true and smooth, and if of hardwood might then be rubbed well with a cloth saturated with raw linseed oil. A little of this rubbed in every day would soon bring up a fine dull polish which looks and wears well. If of soft wood it would be worth while covering it with linoleum or cork lino. In any case, I like a beading ½in. high to be nailed right round the edge of the bench, leaving a gap 3in. wide in two or three places, where filings, chips, etc., can be swept off. A bench top nicely finished will be treated far more tenderly, and last longer and conduce to better work than if it were merely rough planks loosely nailed together.

If the floor of the workshop be tiled or cemented a space of about three feet in width should be boarded or covered with matting round the bench, lathe, and any other tools that are much used. Not only is it more comfortable to stand on such a surface, but also if finished work should fall out of the hand it is not so likely to be bruised or injured on coming in contact with the floor.

In a 6ft. bench the legs ought to be 6in. from the ends. Allowing for the thickness of the legs, this leaves a space of 4ft. 6in. between them. This space should have a tier of drawers 15in. wide next each leg, and an empty space 1ft. 10in. wide between them, as is sometimes seen in sideboards. Four drawers of an average depth of 5in. can be put at each side, but it is better to have some shallow and others comparatively deep. Nothing is more handy in a workshop than these drawers, but they should not be crowded indiscriminately with whatever comes to hand.

A rough classification should be at least attempted. One drawer might be divided into compartments with slips of wood placed edgeways and be devoted to bolts and nuts. Another might hold valves with their springs, etc., and if the drawer were too large for these, part of it could be used for sparking plugs and their components or lamp sundries. Other drawers would contain steel rods, hacksaws, new files, etc., the last-named being left in their boxes until handled and hung on the rack.

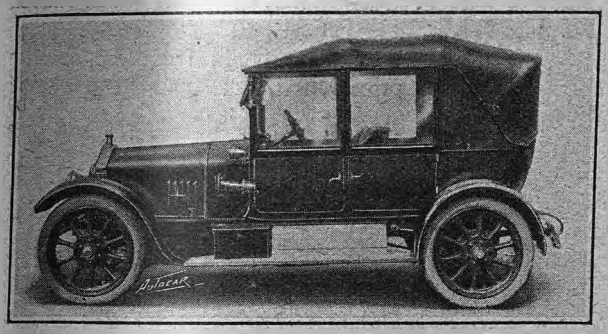
At the ends of the bench, shelves might be attached to the legs, occupying the 9in. from the inside of legs to the end of bench. Four shelves could be put at each end with strips nailed to their edges to prevent round bars falling off. They may hold tubes and bars, and, in my case, planes, gluepot, whetstone, oilcan, and many other etceteras. The large space in the middle of the bench, between the nests of drawers, should have one fixed shelf 9in. from the ground, and another movable one about a foot higher.

Cylinders, carburetter, and, indeed, an entire engine might be stowed there while other parts were being manipulated. If the bench be fitted as described it will contain in itself, tidily packed away, much of the litter usually found scattered round the amateur's workshop.

That most important article, the vice, should be attached just over the right-hand leg of the bench. Parallel vices are now popular, but the writer has a sneaking affection for a vice of the old blacksmith's pattern, which can bear so much abuse with impunity.

A heavy block of metal over the second leg will be handy for hammering on. An anvil of about 60 lbs. weight would be ideal for this purpose, and one may often be bought, second-hand, for a trifle.

So much space has been devoted to the bench because it is probably the most important fitting in the workshop, not even excepting the lathe. It can, as a rule, be made by the amateur himself, and the



A 14 h.p. Singer car (78 × 125 mm.) with a four-seated cabrio-phaeton body built by Charlesworth Bodies Ltd., Coventry. It might be mentioned that the height of the side panels is the same as that of the side lights, although they appear much less in the photograph.

difference between a convenient and a rough article is mostly a matter of trouble and not of cost.

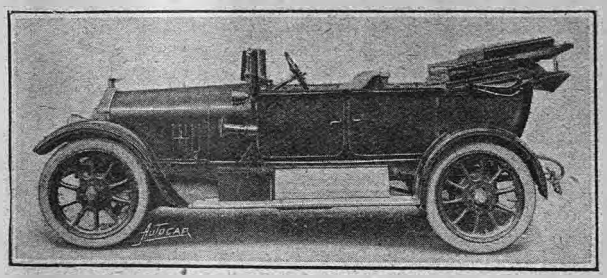
The toolrack should be placed behind the bench, or in some position easily reached. In its simplest form it consists of a backboard with a lath of wood screwed to it, and separated from it with blocks of wood, so as to leave a space of from half an inch to an inch between the lath and the backboard. This does very well for carpenter's tools, but it is not a good plan for files, etc., as they are liable to be rubbed together when withdrawn or replaced, much to the detriment of their teeth.

A better plan is to use clips such as are sold by most tool dealers, and which can be bought for about a penny each.

A better plan still is to procure a strip of hard wood the length of the backboard, 1¾in. wide, and about 1in. thick. Draw a line ¾in. from one edge and mark with a compass points along this line two inches apart. Now, with a sharp 1in. centre bit bore holes through the strip, taking the points for centres.

The strip will thus have a line of holes reaching to within a quarter of an inch of the front edge. If it be screwed by the back edge to the backboard it will form a convenient rack in which the tools may be hung. Some tools will be found too wide to pass through the 1in. holes, so it is well to cut passages ¾in. wide from the front into about every second hole, and the necks of the tools will then easily pass through these passages.

If the toughness of the wood warrant it, these passages might be cut in every hole, but, as a rule,



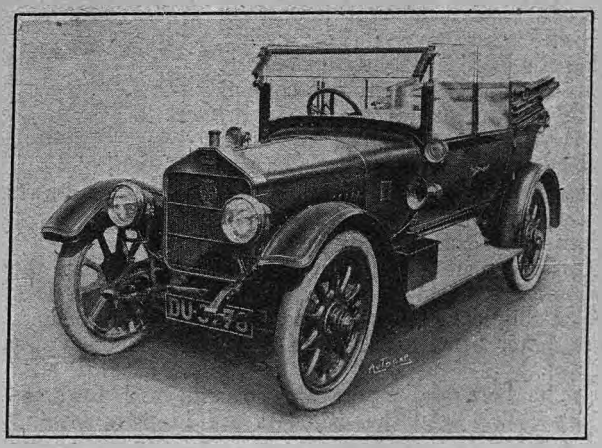
The Cabrio-phaeton shown at the top of the page, but with the head folded and the Triplex glass lights stowed away in a case at the back of the front seat panels.

alternate holes are quite enough. Smaller holes placed closer together may be used for smaller tools.

When the rack is finished the tools could be hung in their most convenient places, and a pencil run round their edges marking their profile on the backboard. This gives a sort of rough drawing of the tools and makes it easy to replace each tool in its proper place. Even the young folks of a family can have their hearts made happy by being asked to tidy the workshop.

Wrenches, squares, saws, lathe carriers, etc., do not easily fit in a rack. For them I use a board and a series of pegs.

The board is nicely planed and a couple of screw eyes secured in the upper edge near the ends. It is then hung in a convenient position against the wall and a tool laid against it. Pegs are then driven in so as to support the tool securely. For example, a saw hangs easily from one peg, while two, under the head, are required to support a hammer or axe. Squares have a hole bored through the haft and then hang from one peg.



A threequarter view of the Singer car with the glasses in position and the front screen up. This arrangement is particularly useful on a fine but windy day, as the car is open while the occupants are shielded from heavy side winds. See other illustrations on this page.

It is wonderful what a number of tools can be hung from a comparatively small board; and if the pencil be run round them when arranged, they can readily be put back in their places even by a stranger.

For pegs I find nothing better than wire nails with the heads cut off. They drive in readily, are smooth and not unsightly. All racks and toolboards ought to be finished with sandpaper and varnished. They had best be hung on strong nails with two or three screw eyes, so that they can easily be taken down to dust or distemper the walls.

A very tidy way to keep nails, screws, gimp-pins, small hinges, etc., is in glass bottles on shelves. Tin boxes are favourite receptacles, but they have the disadvantage of having to be opened to see the contents. Bottles of all sizes with screw tops can be procured, and they are clean, dry, and rust-proof. When steel or iron goods, steel balls, etc., are kept in them it is well to put in a small quantity of vaseline to prevent rust.

Many other devices suggest themselves to the experienced amateur, but what has been written is sufficient to give an idea of what can and ought to be done.

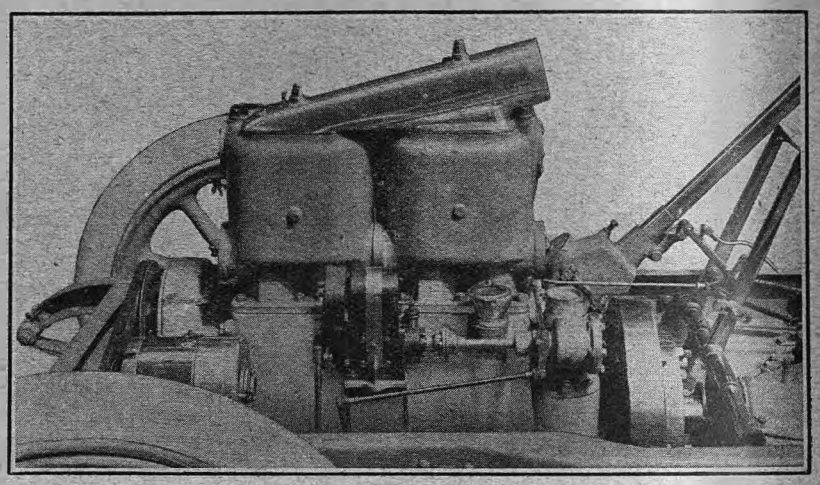
J.L.D.

The 15.9 h.p. Arrol-Johnston.

Four Cylinders, 80 × 140 mm. Four Speeds. Provision for a Car Lighting Dynamo.

BY even a cursory glance at the 15.9 h.p. Arrol-Johnston chassis the keynote of originality in design is struck immediately by the evident care which has been given to the production of the frame. The longitudinals are as usual of channel section steel, slightly inswept and flared at the dashboard and upswept over the back axle. The lower flanges of both these side members are, however, flared inwards to a considerable width to take the bed plate of the crank chamber and gear box. This flaring runs from the forward part of the frame and tapers back to the third cross member, as shown in the semi-plan view. The lower flange of the front cross member is also flared backwards to meet the bed plate already mentioned. The second cross member is downswept to clear the universal joint casing, and the third is slightly upswept to give clearance to the torque column. The rear angles of the frame are very strongly reinforced by angle brackets and angle plates. As suggested, the crank chamber and gear box are built up on a bed plate carried by extensions of the frame. This bed plate is made with a pit to accommodate the flywheel and clutch. The frame is carried on long semi-elliptical springs forward and full elliptics behind, the latter being anchored to brackets from the upper bows.

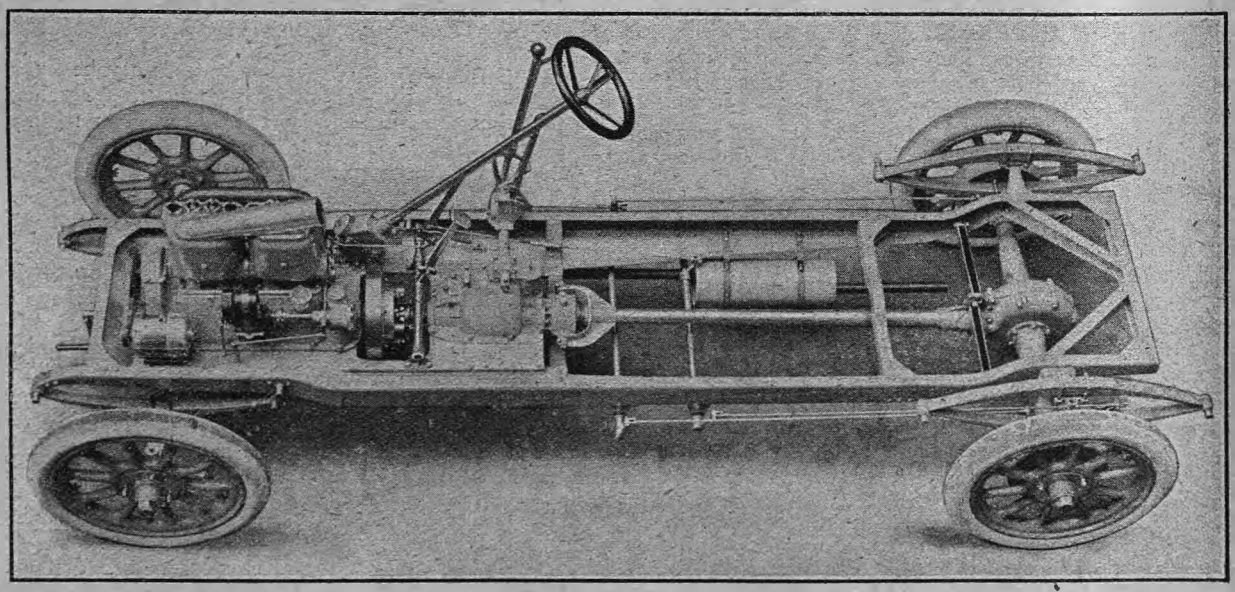
The bore and stroke are 80 mm. and 140 mm. respectively, and the cylinders are in pairs forming very neat clean castings, with all valves on the off side, these with the tappet guides and stems being enclosed by two easily detachable cover plates. The pistons are of excellent length with three piston rings above the gudgeon pin; the crankshaft is carried in three long white metal bearings. The camshaft is driven by means of a silent chain from the crankshaft, a simple provision being made for chain adjustment.



Near-side view of the 15.9 h.p. Arrol-Johnston engine, showing the magneto drive and the oil filler on the side of the crank chamber.

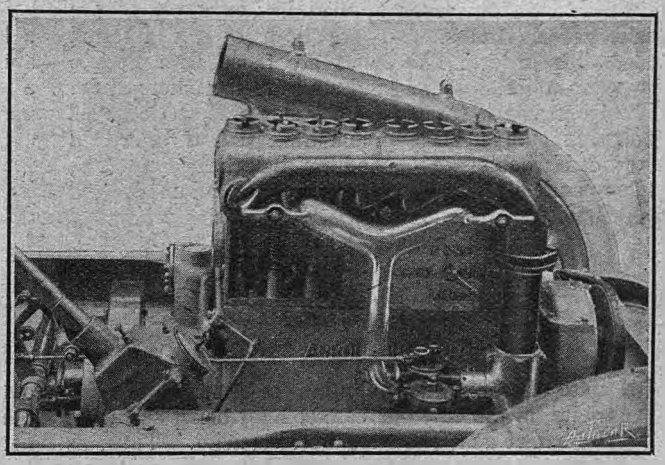
The exhaust trunk has four swept inlets and runs forward to a downtake pipe at the front part of the engine, being there embraced by a hot air muff forming the hot air intake of the carburetter. The exhaust pipe discharges into an expansion box immediately below the apron, whence another pipe continues to the usual silencer towards the rear of the frame.

With regard to engine lubrication, a sump containing a large quantity of oil is formed in the bottom of the crank chamber, and within a filter guard in the sump

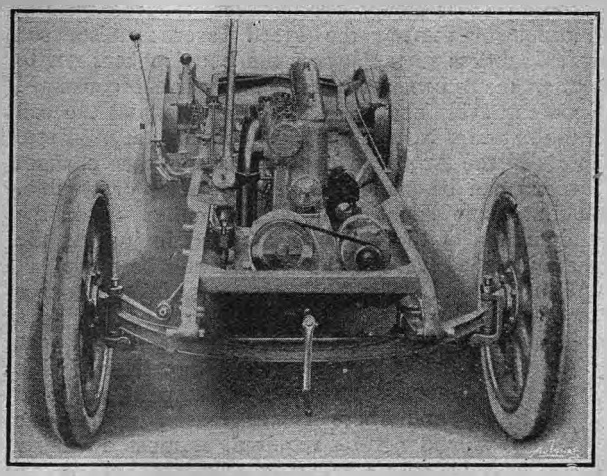


Semi-plan view of the 15.9 h.p. Arrol-Johnston chassis. In this view can be seen the manner in which the engine and gear box are mounted on a single bed plate with a pit formed for the clutch and flywheel. On the near-side of the engine, on a specially provided bracket, is the car lighting dynamo driven by belt from a pulley at the front end of the camshaft.

is a toothed wheel pump driven by skew gearing off the camshaft. The vertical pumpshaft also serves to drive the magneto, also through skew gear, the magneto itself being carried on a bracket table formed on the left-hand wall of the crank chamber. The magneto driving-shaft is connected to the armature spindle by means of a vernier adjustable coupling. The oil is delivered through suitable leads to the crankshaft bearings, and thence by ducts drilled in the shaft and crank cheeks to the big ends. The camshaft bearings, tappet guides, cylinder walls, and gudgeon pin are lubricated by the oil thrown from the cranks, the excess returning to the sump through a diaphragm filler. The pump can be withdrawn from beneath the crank chamber for cleaning by detaching a cover placed in an accessible position. The oil is introduced to the crank chamber through a filler in the near side of the crank case, the correct level being indicated by an overflow tap, but an oil level gauge is also fitted. The petrol tank is set upon the rear face of the dash, and has



Off-side view of the 15.9 h.p. Arrol-Johnston engine with one valve tappet cover removed. It will be noticed that the carburetter is close to the down take pipe of the exhaust branch and that a large hot air muff is fitted. On the steering gear box will be noticed the large circular inspection plate.



Front view of the 15.9 h.p. Arrol-Johnston chassis. In this view also can be seen the car lighting dynamo and its belt drive.

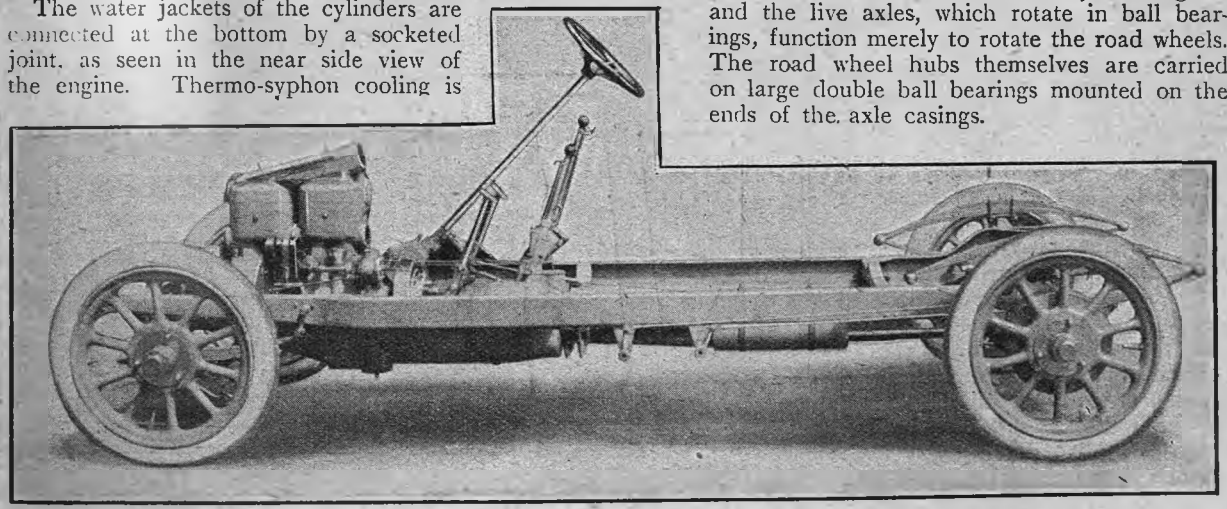
a capacity of ten gallons. A White and Poppe carburetter is used and is placed accessibly on the right-hand side of the engine.

The water jackets of the cylinders are connected at the bottom by a socketed joint, as seen in the near side view of the engine. Thermo-syphon cooling is adopted, with the radiator in front of the dashboard. In the design of the engine special attention has been devoted to the cooling of the valve chambers and cylinder heads.

The drive is transmitted to the gear box through a plate clutch formed of three metal plates held in frictional contact by spring pressure and working in an oil bath, an effective clutch brake being provided. The clutch can be removed simply and quickly without dismantling any other portion. Very thoughtfully, a dynamo platform is provided on the near side at the front of the engine, as shown in three of the illustrations, and a belt drive pulley is fitted to the end of the camshaft.

The gear box provides four speeds by gate change, with both shafts running on ball bearings, these shafts being set above one another. The secondary-shaft is well below the oil level and runs wholly immersed. A level inspection cover is provided, and this also forms a filling orifice. To the rear of the gear box is bolted a socket enclosing the universal joint from which the propeller-shaft runs to the back axle through a crutch-headed tapered torque column, the centre of the rocking trunnions of the head of the torque column being in transverse alignment with the universal joint.

The drive to the back axle is by bevel gear, and the live axles, which rotate in ball bearings, function merely to rotate the road wheels. The road wheel hubs themselves are carried on large double ball bearings mounted on the ends of the axle casings.



Near-side view of the 15.9 h.p. Arrol-Johnston chassis. Among points to be noticed are the full elliptical rear springs.

The 15·9 Arrol-Johnston.

The pedal and lever applied brakes apply to the back wheel drums, and are both of the internal expanding order. The shoes are faced with Ferodo or other material of the kind, and are interchangeable. The front axle is formed from a single H section steel stamping; the steering pivots have ball thrusts, and the road wheels are carried on ball bearings. The screw and block type of steering is adopted, and adjustment is provided by means of a single bolt.

The control is by a foot accelerator connected to a hand setting device fitted on the extension of the aluminium footplate. This footplate is provided with a large inspection door, allowing of easy clutch adjustment or removal.

Sankey all-steel wheels are provided as a standard fitting, with 815 × 105 mm. tyres all round. The wheelbase is 9ft. 3in., or 10ft. 3in. at option, and the wheel gauge 4ft. 8in.

An Electric Gear Change Mechanism.

Push Button Control on the Steering Wheel.

IN spite of the wide adoption in America of electricity on the car, one cannot help being surprised to hear of gear changing by electricity. Thus, as has been the case with the starting handle on many cars, especially in America, it is now, in the case of the car to which this idea is fitted, been arranged also to dispense with the change speed lever.

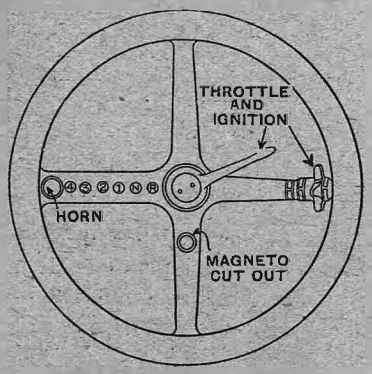


Fig. 1.—The wheel control of the electrical gear change. Six push buttons are provided for gear manipulation

In this speed-changing mechanism each of the gear wheels is moved into and out of mesh by means of a magnet and solenoid, the solenoid being attached to the gear striking fork, and the magnet being energised by current from a 12 volt battery. On the steering wheel, in addition to the usual control devices, there is arranged a number of buttons indicated as shown in fig. 1, and assuming that one wish to engage a gear the correspondingly numbered button is pressed, and the clutch subsequently pushed to the limit of its movement. The gear wheels then engage and the clutch is released.

Assuming the car to be travelling on first speed, it is obvious that the next gear change will be into the second speed, so button number 2 is pressed, but the gear is not engaged until the next time the clutch is pushed out to its extreme limit of movement. The diagram in fig. 2 shows the arrangement of the solenoids and the clutch pedal. The pedal actuates the clutch in the ordinary way, and it is also coupled through a slotted link to a sliding rod. This sliding rod forms part of a switch, but it will be understood that in consequence of the slotted link the rod only moves when the clutch is fully depressed. Consequently the clutch can be disengaged in the ordinary way without affecting the sliding rod. The buttons on the steering wheel also constitute switches connected with the corresponding solenoids. Thus when No. 2 button is depressed half the switch for the corresponding solenoid is brought into the closed position, but the remaining part is only closed up when the sliding bar is moved, which occurs when the clutch pedal is pushed to the limit of its movement.

One can therefore engage and disengage the clutch as rapidly or as slowly as one likes, but the delicate operation of moving the speed lever is dispensed with, doubtless to the joy of the body maker, not to mention many owner-drivers. The current consumed is comparatively heavy, *i.e.*, 15 ampères, but the call on the batteries is, of course, only momentary. From reports in the American papers it seems that changes of speed can be made without any noise or trouble, but that some slight skill is still called for in the manipulation of the clutch pedal, and in judging the time and speed when a change can well be made.

With the particulars available it is difficult to see how a quiet change can be made from a high to a lower gear in those cases when, with the normal type of gear box, the clutch is merely slipped or double clutching is practised. If a clutch stop of any kind be fitted, and there is no reason to imagine why it should not be required, it must obviously be brought into use when changing either up or down; and all drivers know what it means to bring a clutch stop into use when a downward change is made—noise, and a great deal of it!

Messrs. Geo. Main and Co., Packe Street, Loughborough, are interesting themselves in this device, and have fitted it to a B.S.A. car.

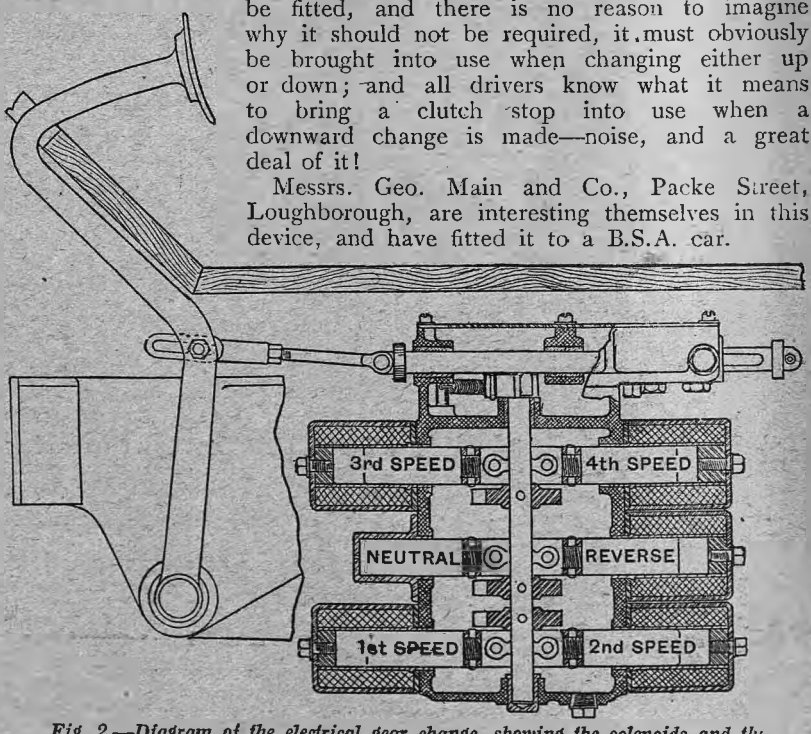


Fig. 2.—Diagram of the electrical gear change, showing the solenoids and the coupling link on the clutch pedal.

Are We Dull?

By Owen John.

A MAN I was talking to a few days ago informed me that he thought *The Autocar* was getting dull. "Why," he said, "do you not make it more cheery, more lively?" I told him that it never was meant to be light and chatty, it was a serious paper, a journal with a message, and one produced to be a help to motorists and a standard work of never-failing reference. "What you see," said I, "in *The Autocar* is right. You do not seem to realise that one paper cannot be all things." No doubt he went away convinced, but his remarks have made me think a little as to whether or not here and there it is not a trifle too pontifical. Therefore, with a view to inviting criticism, I have been racking my brains to produce "stuff" of the kind we occasionally get elsewhere, and I have come to the opinion on reading it over that it is a question whether or not this journal would be improved by its frequent insertion. Of course, I need not say that I have any one or other distinguished author or humorist in my mind in any of the extracts, merely a compendium of brains and an assorted mixture of styles. Personally, I take it as a compliment that my little innocuous effusions have been read with gravity: I had at times feared that unmeant jocularity has been presumed and that some of my home-truths have been interpreted as merely "my fun." Which has never been my intention at any time, for I have always tried to point a moral, even if it necessitated adorning a tale. But, to get to my subject, let me submit a few samples, quite impersonal, of course, yet embodying the wit and wisdom of many of our lighter and brighter writers. We will begin by the chatty and humorous type without a sting or a reproach in a hogshead of it. We will call it

A Swift cycle car on Glencullen Hill, Co. Dublin, which at the two hairpin corners has a gradient of 1 in 4½. Glencullen runs between the two Dublin-Enniskerry roads, one via Terenure and Killakee, and the other via a rocky defile known as The Scalp. Enniskerry is a charming village within easy reach of the best of Co. Wicklow scenery.

No. I. Blitherings.

These things always happen on the Sawbath. Just when the wife and I have got our best "biled rags" and sauciest things in spatlets (Oh! Ethelbert, how *very* muddy it can be in the pine-woods —where the matches are made) on, the girl—I should say the second footman—came running down the front drive (mind the scraper and take care of the projecting catch the gate bolts on!) and informed us that the bathroom tap refused to stop running. To doff my two-buttons and retrace my steps was but the work of one moment. Napoleon took one hour, it is said, to settle the fate of Continents. In the matter of domestic aquaticism I am his superior by 59 min. 59.9 secs. Stripping off my outer garments as I ran, I reached the cleansing apartment — copyright phrase—at a period parallel with the turning up of my right-hand cuff. (Does one wear cuffs on the hands?) To take in the situation was the work of an instant

MOTORING IN THE ORKNEY ISLANDS. Although we do not make a practice of reproducing photographs of club groups we make an exception in this case to show the enthusiasm of the inhabitants of the Orkneys as motorists under comparatively adverse conditions owing to the small mileage of available roads. The vehicles comprise two Argylls, one Sunbeam, one Arrol-Johnston, one Talbot, one Airex, one Humber, two Rovers, and two Fords. Also one tricar, ten motor cycles, and two sidecars. The photograph was taken on the occasion of the recent opening run of the Orkney Motor Club, the route of which extended to thirty-six miles.

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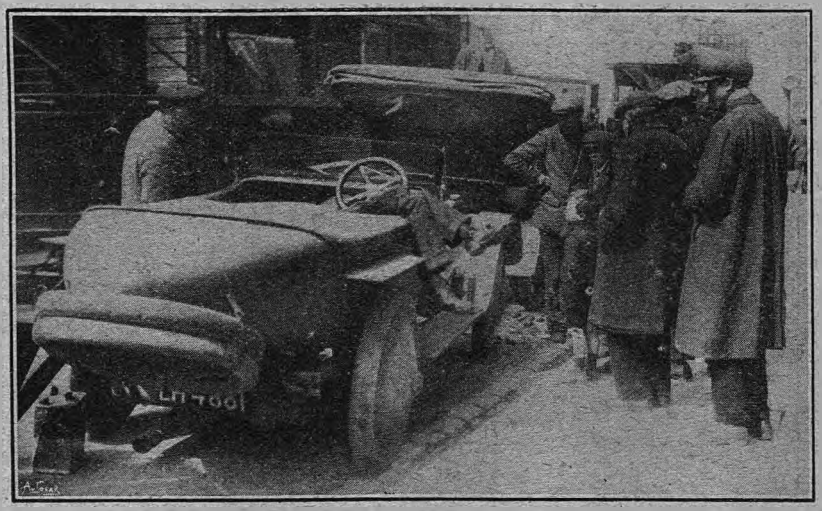
"Lucretia!" I shouted to the domestic before-mentioned. "Hither! Place your left hand under the offending tap and brace it against the flow of liquid with the other." It was done; but a tiny stream of water escaped between the ball of her thumb and her index joint. (That stream, by the way, found my wife's best Robespierre collar—the *pièce de résistance* responsible possibly for our meditated appearance that *matin* at *matins*.) Then I left the room. A born engineer, if ever there was one, blindfold I knew all about my domestic pneumatics and hydrostatics. High up in my dressing-room hung a key with a square hole that made it look like a quizzing eyeglass. It had a use, and I intended to use that use. So I took it down, and, armed with it, I ventured behind pots and pans and brushes and cloths and horses and dusters and towels and jars until at last I found, in the utter outer darkness, a projection on the pipe I knew was there. I tried it on. It fitted. *Eureka!* (This should be in Greek letters, but I believe they cost two shillings a line. The editor will not notice it. Hush!) I turned it off and retraced my steps to the source of all trouble. Saved! The plague was abated, the water had ceased to run. But why do I frown? What horrid thought overcomes me? Do—I—not—remember—while toying with my new sponge this very morning that I knocked off the top of the tap handle? And that I put it on—that the soap was in my eyes must be mine excuse—at right angles to the usual aspect? I gazed at the winking brass spanner. According to Cocker—or whoever is the plumber's deity—as it was it should be off. Then a pale perspiration broke out on my brow. I must dissemble. We men must not be found out. All men are plumbers—or gas pliers. I turned round to my domestic circle and smiled. "It may be somewhat hard, perhaps dirty, perchance even a dangerous job, but I can see the light. Leave the room, prithee, there is no need for anyone else to incur risk." They begged to share the peril, but I wouldest not. So they went and I was alone. Quietly but firmly I took off the offending brasswork and adjusted it in its usual place, first, however, striking it ten times against the other tap. Then I turned it off. Very dignified, but with creased brow, I left the apartment and climbed heavenward to my former eyrie beneath the roof. I could hear anxious feet behind me on the stairs, waiting, waiting, waiting. To turn the master-key straight again took less than no time. Whereupon, after coughing discreetly, I retraced my feetsteps—I mean footsteps. Then I permitted myself to unbend. "Jemima!" I said. "Veni! Vidi! Vici! Ecce! Thalassa! Thalassa!" So saying I turned the tap off, and then on, and then off again. "Every man," I concluded, "ought to be brought up to understand the mechanics and intricacies of the web that modern civilisation spins in every dwelling. You may embrace me." Which reminds me—— (Editor: *No.* Not even with a humorous headpiece. Try some of your other ideas.)



***ONE OF THE SHORTCOMINGS OF THE DOORLESS BODY.** A car seen at Old Portsmouth recently, waiting to cross Portsmouth Harbour by the floating bridge. The owner improved the time by making an adjustment to the clutch, but had, or chose, to adopt the uncomfortable attitude shown.*

No. II. Bits o' Turf.

Wot? Our Willyum found a new set o' golf links and never let on till now? Finish up and just one more and we'll be off, la-ads. We fizzed, we fairly fizzed, for Willyum's new 10-40 Blizzard is a bit of stuff and she *can* git. Willyum—when I wasn't hangin' on by my eyelids and he wasn't playing hub-scratching with the prams—told me that this new buzz-waggon can touch ninety at Brooklands, runs forty to the gall., oils herself, and takes her tyres along for ten thousand miles. We stopped—well, what does it matter?—anyhow we got to Bungingwell in "plenty linnets"—as they say in the Jago—and after one more little one just to wet the other eye

A 12-20 Buchet (76 × 120 mm.) in India, the property of Major J. E. Blois Johnson, stationed at Jubbulpore. It is interesting to note how the costumes of the onlookers differ, there being apparently no two alike.

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we went off on the Cris. Columbus tack. We— (*Editor:* Is he supposed to be a golfer writing about motors or a motoring journalist writing about golfers, or a drink specialist, or a brewer's traveller, or what? *Answer:* Dear sir,—Please do not be too hard. If you only had to write a column each week on golf in a motor paper or on automobilism in a golfing journal you would appreciate his position. Some of 'em bheit, and he tries to mention all the cars and all the tyres and all the pubs and all the clubs and all the balls he can. It fills up. *Editor:* Enough. He has my sympathy, but I must also think of my readers.)

No. III. The Fly on the Wheel.

Dear Aut. (*Editor:* What is this? What is an Aut? *Myself:* This is literary; the style was prevalent in the days of the purists; it is very classic.) Gadzooks! But what is very certain is that totally enclosed cars have come not a whit too soon. Should I not rather say not a Whit Monday too soon, for verily there would have been but cold comfort to me, dear Aut, in no otherwise? Not but what I *do* remember aforetimes pleasant jaunts in less sheltered vehicles, but, since it is said that the appetite grows from what it feeds upon, undoubtedly, having tasted of the best, only the same or better is in demand. Whereby, as the judicious Hocker puts it, men's ideas do thrive, and the march of civilisation is in no way hindered. Yet well do I remember, remember, remember—what the devil of a lot of mocking birds—as the ever-lamented Dan Leno used to remark, for, between ourselves, it was in no way singing, although the libretto was known as a "song," and thus was it described in the charge sheet, otherwise called the programme, though the word "charge sheet" perhaps more exactly describes the production, a sum of no less than sixpence having to be disbursed in order to see at what times one need not be at the bar so as not to miss items of importance. Which mention of "bars" leads me to discuss whether the Colonial and American plan of having two brass rails attached to the bar, the one to put one's feet on and the other to hang one's cane—or, in this pestilential climate, umbrella—on, is an advantage or otherwise. It has been said that it is possible to consume more liquid refreshment in an upright position than when seated. Possibly there is *raison*, because one naturally when standing has less to do, hence one imbibes, while in a more comfortable position other things might intervene—such as conversation or the smoking of a cigar that did not go out all the time—and consequently times might elapse when the *fons et origo* of our presence might be forgotten. That the present state of our laws governing the consumption and sale of liquors favours the upright position proves once again, dear Aut, that the law is a hass—though I must confess the statement is not absolutely original.

(No time for more. Fill in with supplied trade notices and photographs of ladies in or near cars.)

No. IV. Motrescence.

Things we do want to know.

Why he never goes down Castelnau Road now?

Why her hair is another colour this summer?

Why—— (*Queries by Editor:* Do you imagine this sort of stuff interests anyone? Do you think ordinary readers want to read about drinks, and barmaids, and barmen? Enough! *Me:* Certainly, with pleasure.)

Two views of a Ford car taken during an attempt to cross the River Coquet, in North-west Northumberland, at Linshields Ford. The water was about 2ft. 8in. deep, and the car ultimately had to be towed out. The car which did the towing was a 15.9 h.p. Armstrong-Whitworth.

Very well, then, we will return to our ordinary spheres, and it is to be hoped that our little excursion into other styles and notions will not be *encored*. Because, although it is meet to jest at times, yet too much jesting is wont to abolish reputations and the remarks of a jester meant sanely are often wont to be considered as only humorous. Of course, one can sometimes get in a true saying wrapped up as a jest, and very often it calls for more attention because of its untoward surroundings, just as we smile at phrases in a sermon which we should never even notice out-

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side a church. Motor journalists—not here, of course, we have nothing to do with anything but motoring—are in rather a cleft stick. To be pontifical and technical is not to be read. To be frivolous is to be skipped. To be truthful is to get into the law courts; and to be merely a recording medium is to be too deadly dull. To be informing is but to repeat stale news, and to be learned is to confess one is gravelled for lack of matter.

Here, as I have said, luckily it does not matter, for I can always get out on the plea that I am trying to do good to someone.

The 15 h.p. (Shelsley Model) Crossley.

FOR a two-seated, or a light four-seated, body the chassis of the 15 h.p. Shelsley type four-cylinder Crossley is very hard to beat. The newly designed tapered and pointed radiator, with the tapered bonnet, merges perfectly into the taper scuttle as shown in the accompanying illustration.

This new model (named "Shelsley" by reason of the success of the 15 h.p. Crossley last year at the Shelsley Walsh hill-climb) has a particularly neat four-cylinder *en bloc* engine, 80 mm. bore × 130 mm. stroke.

The drive is transmitted to the four-speed gear box through a partially enclosed leather-faced cone clutch to one or other of four speeds, with a ratio of 4 to 1 on the fourth. A Claudel-Hobson carburetter of the latest design is fitted. The steering is very smartly raked, excellent for a two-seater, but necessitating some sacrifice of seat room, so far as the driver is concerned, if a four-seated body is to be carried.

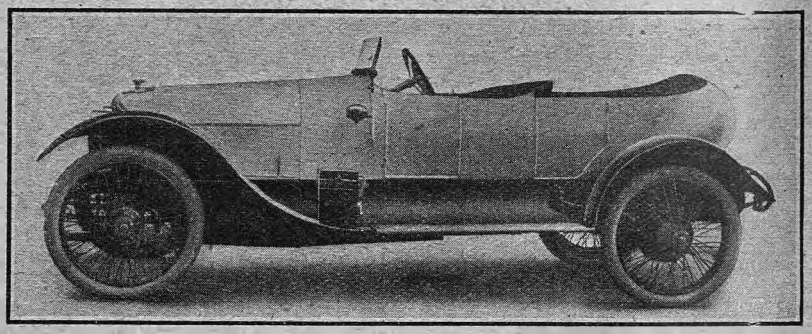
The particular car illustrated was loaned to us for a week-end by Mr. Harold Lambert, of 3, Elizabeth Street, Eaton Square, London, S.W., who is making a speciality of this type, and from whom the chassis can now be obtained.

One trip was made from London by the Portsmouth Road and East Clandon to Newlands Corner, returning by Shere, Gomshall, Dorking, Leatherhead, and Kingston, and the other from Roehampton to Ditchling *via* Coombe Hill, New and Old Malden, Ewell, Burgh Heath, Horley, Worth, Balcombe, and Haywards Heath.

The initial attack of Roehampton Lane gave us the first inkling of the wonderful efficiency of this little, for after all it is but a little, engine, as the car took the fourth gear, held it, and gained speed on it, notwithstanding a slow run through the village, right up to the cross roads on the heath. It is difficult to convey the extraordinarily ready, nay immediate, response of this engine to any manipulation of the throttle. The car seems to sweep irresistibly forward as the throttle pedal goes down. There is a sense of immediate shockless propulsion which must be felt to be realised. It seems almost impossible that so much responsive power should issue so readily and so smoothly from an 80 × 130 mm. engine.

In the first part of the test run it would, of course, be absurd to suggest that anything but the fourth was required, for the climb up out of Robin Hood Vale was a heedless thing, and nothing thereafter gave thought of the change-speed lever till the northern slope of Newlands Corner was tackled. Owing to the narrow and curved approach, this slope cannot be taken at any speed, but the fourth still served for some way, and the third made absolutely light of the rest with less than half throttle. On such descents as occur between this Surrey vantage point and Dorking we essayed both systems of brakes, and have to compliment the makers upon the improvement since we owned a Crossley in 1910-11. Both pedal and side lever applied are smooth, sure, and nicely progressive in action, either being capable of holding the car on any road grade. The gear change is satisfactory both up and down, and a little practice would obviate such noise as we provoked from time to time. Each car has its own idiosyncrasies in gear changing, which can only be learned by experience.

On the second trip the whole of the run outwards was taken on top speed without any suggestion from the engine that it would like any other gear, but seeming to roll the car on over the crests in Worth Forest without effort or complaint. On the return journey the third was resorted to twice only, the second time for the last half of the tram stones on Reigate Hill.



The new Shelsley model 15 h.p. Crossley, the engine of which has bore and stroke of 80 × 130 mm., with a pointed radiator, four-seated body, and bulbous back.

Another delightful and most praiseworthy feature of this car is the sweetness and sensibility of its steering. The steering wheels have not to be set continuously as so often happens. With the hand laid upon the wheel the car seems almost to obey thought rather than the pressure on the wheel. We know nothing which conduces to the enjoyment of motor driving more than to have in company with a responsive engine and a quiet transmission something approaching perfection in steering. This excellence of control has, of course, much to do with the reassuring manner in which the little car holds the road at speed, even when rutty and pot-holed beyond the average.

We may say here that these steering characteristics are not singular to the car under review. Such were possessed in a marked degree by the 12-14 h.p. Crossley we possessed some three years ago, and were remarked by all our expert friends who ever took a turn at its wheel. The springing, semi-elliptics forward and threequarter elliptics behind, is all that can be desired—indeed the car would not hold the road as it does unless the springs were as well proportioned to their work as they are. Although we have written somewhat enthusiastically, it is no more than is merited by the two days' driving of this vehicle, and the makers have assuredly produced a car which to be owned by the sympathetic motorist is assuredly to be loved.

The Cadillac Electric Starting System.

Important Patents.

IT will be remembered that an electric engine starting plant for cars was first introduced into this country by the agents for the Cadillac cars. The British patent specification No. 28,903 of 1911, in the name of C. F. Kettering, deals with this system, and as it is somewhat in the nature of a pioneer it merits description at some length. The patent specification is a lengthy one, profusely illustrated, but a single illustration is here reproduced, which shows the near side of the engine with the starting plant fitted.

Mounted beside the engine is the dynamo A which is employed for the double purpose of turning the engine and charging a battery. The dynamo is compound differentially wound, that is, the two windings are arranged to oppose each other in effect. For starting the series winding alone is used, but for charging both windings come into operation, and the arrangements are such that, while the current for charging is of low voltage, the dynamo is capable of taking a higher voltage for starting. The different voltages are obtained by connecting the cells in series for starting and in parallel for charging. The necessary alterations in the connection of both battery and motor dynamo are brought about by a pedal controller which also controls the gearing, two sets of which are provided. The starting gear is of considerable reduction, while the running gear is of less or no reduction. When the pedal controller is in its forward position the high reduction gear is in mesh, and when the controller is in its backward position the low reduction gear comes into operation, and, as stated, the proper electrical connections are made in each position. As will be seen from the drawing, the starting gear is arranged on the flywheel B, while the dynamo is normally driven through a shaft C. When the starting pedal is pushed forward the clutch D on the dynamo driving-shaft is disengaged, and at the same time the pinion E of the starting gear slides into mesh with the teeth cut on the flywheel B. This pinion is fitted with an over running clutch. (Reference is made to another pending patent application for a means of providing a slow movement of the motor in order to ensure the possibility of the wheels coming into mesh.)

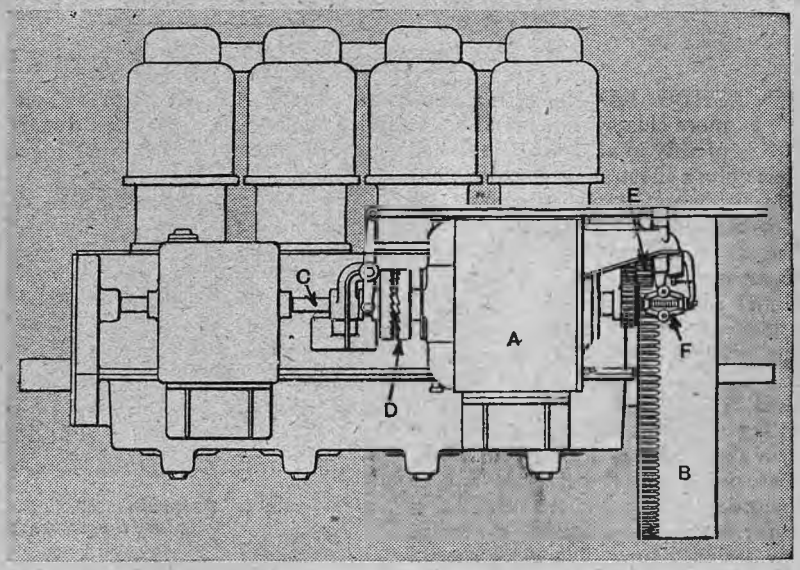


Diagram of the Cadillac self-starter reproduced from the patent specification.
A, dynamo. B, flywheel. C, driving-shaft. D, ratchet coupling. E, gears engaging with teeth on flywheel. F, governor.

The ball governor F shown is connected with a bolt which prevents the gear from being re-engaged, after disengagement, until the electric motor A has come to rest; the object of this is to prevent accidental damage to the cast iron teeth on the flywheel. The starting pedal is inter-connected with the speed gear lever, the ignition advance arrangement, the throttle and the automatic cut-out, so that the starter cannot be brought into operation unless the speed lever is in the neutral position, the ignition retarded, and the throttle in the proper position for starting.

In order to prevent overcharging, an electric meter is arranged to introduce resistance into the shunt circuit of the dynamo when the cells have reached a state of saturation, and by this means the output of the dynamo is reduced to a negligible amount. When current is taken from the battery the electric meter cuts out the shunt resistance, so that charging automatically begins again. In addition to the meter a cut-out is provided to prevent the battery discharging back at low speed, and as the effect of the introduction of the resistance into the shunt circuit is the same as when the speed to the generator is reduced, viz., the charging current falls below a given value, the cut-out operates on both occasions, when the batteries are fully charged and when they begin to discharge through the dynamo.

A motor car lighting dynamo should be so arranged that while at high speeds it does not give an excessive current, it gives a sufficient charging current at the lowest possible speeds. The method of differential winding, while it prevents the development of too great a current at high speeds, does not conduce to a high output at low speeds, and in this system provision is made for this defect by putting an iron wire resistance in shunt across the series winding which, as has been stated, opposes the shunt winding. As the resistance of the iron wire is much less when cold than when hot, it is obvious that when there is insufficient current to heat it, the current intended for the opposing series winding will pass through the shunt iron wire and so prevent or reduce the opposing action of the series winding. As the speed increases, more and more current is available, and as the iron wire becomes heated more current passes round the series winding.

The following supplementary patents are published in the same name, and refer to parts of the system:

No. 29,083 of 1912 relates to the interconnection of the starting pedal with the throttle, ignition, and speed levers.

No. 504 of 1913 deals with the slow initial movement of the starting motor for the purpose of insuring

The Cadillac Electric Starting System.

the gear wheels being easily meshed. This slow initial movement is brought about by an arrangement of connections whereby the low voltage battery is connected to the starting motor before the gear wheels are brought fully into mesh. This patent, although numbered as of the year 1913, actually takes the date 15th June, 1911.

No. 29,070 of 1912, dated, however, 17th April, 1911, refers to the system of double gearing of the type shown, one set for starting and one set for driving the dynamo, the two sets being of different ratios. The centrifugal device for preventing damage is also covered. Among the more important claims is the following:

"5. A starting system for automobiles comprising a power operated starting device arranged at the side of the engine with its driving-shaft parallel with the engine-shaft and gearing for connecting the starting device with the toothed periphery of the flywheel as and for the purpose specified."

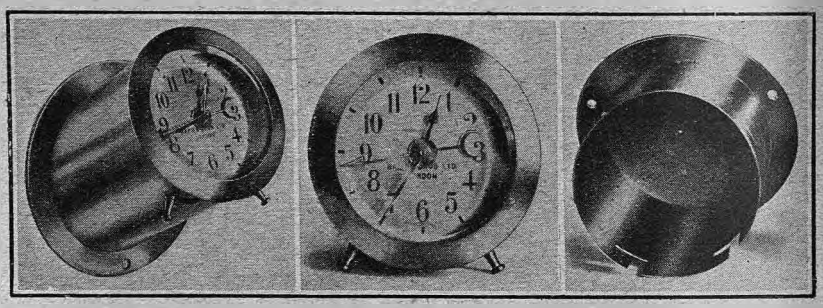
No. 29,344 of 1911 covers an arrangement of the ignition lever so that it may be used for switching on the starting device, and, at will, may also be used for advancing and retarding the ignition without bringing the starter into operation.

No. 29,085 of 1911 covers the use of the ordinary clutch pedal for actuating the starter. Normally, the clutch pedal is connected to the clutch only, but by an electro-magnetic arrangement it may be coupled to the starting gear. This arrangement ensures the engine being started while it is disconnected from the transmission.

The foregoing patent applications are all open for opposition until, approximately, the end of May. The patents in question are very broad in scope, and some of them, notably No. 29,070 of 1912, are not limited to electric starting mechanism. They merit the close attention of those interested in engine starting mechanism of the electric or the separate compressed air engine types. ERIC W. WALFORD, F.C.I.P.A.

A Neat Dashboard Alarm Clock.

DASHBOARD clocks are occasionally somewhat more clumsy than could be desired, but criticism of this kind cannot be aimed at the dashboard alarm clock illustrated herewith, and now being put upon the market by Messrs. Brown Bros., Ltd., Great Eastern Street, E.C. This neat accessory, which is known as the Model B Midget alarm clock, consists of two parts, one the shell with the flange for attachment to the dashboard, and the other the clock itself, which slips into the casing and is firmly secured thereto by a slight turn and a bayonet joint. Two hands tell the time of day in the ordinary way, but the other hand is for setting the alarm to go off at any desired hour. This clock should appeal to tourists, for it can be readily removed from the dashboard as shown, set to alarm at any time, and placed conveniently on the toilet table. The alarm, though sufficiently loud and persistent to wake an average sleeper, is not shrill and piercing enough to give anything of a nervous shock. The clock is very well and neatly made, goes for thirty hours without re-winding, and is guaranteed for a year. It is sold at 11s.



Brown Bros.' dashboard alarm clock; also shown detached from its outer case by which it is secured to the dashboard of the car.

Aston Open Hill-climb.

On Saturday, the 24th inst., the Herts County Automobile Club will hold this well-known annual event.

There will be four classes as under, all for petrol cars:

Class 1 up to 10 h.p.
Class 2 over 10 h.p. and up to 16 h.p.
Class 3 over 16 h.p. and up to 25 h.p.
Class 4 over 25 h.p.

For the purposes of the above classification the horse-power will be calculated by the following formula: $\frac{\text{Engine capacity in cubic centimetres}}{150}$

Each car must carry its full complement of passengers, and must be essentially a fully equipped standard touring car with properly upholstered body, mudguards, and efficient silencer. Exhaust cut-outs may not be used.

It may be remembered that Aston Hill is situated between Tring and Wendover, Bucks. The competition will commence at 3 p.m. A prize will be given to the winner of each class, and to each competitor a certificate showing the performance made on the hill.

A special prize will also be given for the best handicap performance, irrespective of class, the handicap being based on the following formula:

$$\frac{\text{Time in seconds} \times \text{horse-power}}{\text{Weight in lbs.}}$$

Entries close at 6 p.m. on the 16th inst., and must be made to the hon. secretary of the meeting, Mr. Arthur J. Salmond, Woodlands, Langley Road, Watford.

The Targa Florio.

The entries for the Tour of Sicily, which includes the contest for the Targa Florio, and takes place on the 11th and 12th inst., closed on Friday evening last week, and are as follow: F.I.A.T. (6 cars), S.C.A.T. (4), Aquila (3), Lancia (2), Isotta-Fraschini (2), Sigma (3), De Vecchi (2), Ford (2), Metz (1), Itala (1), Mercédès (2), Storero (1), Nazarro (1), Overland (1), Studebaker (1), De Dion (1), Minerva (1), Renault (1), and two cars unnamed. The distance to be covered is 625 miles run in two stages.

The Indianapolis Race Track.

Where the 500 Miles International Race for £10,000 in Prizes is to be Run on May 30th. Four European Cars entered: two Peugeots, a Sunbeam, and a Knight-Mercédès.

ON Friday, May 30th, will be held the third annual 500 miles International Sweepstake Race for cars of 450 cubic inch or less piston displacement, having a minimum weight of 14¼ cwt. In the event of the Friday being a wet day the race will be postponed until the Saturday or some subsequent date. The race is run under the rules of the American Automobile Association. As May 30th is a public holiday, it is not too much to say that spectators will come from all over the continent to view the race, as Indianapolis is fairly central, situated 170 miles south-east of Chicago. Additional interest is given to the event by the magnitude of the prizes offered, amounting to £10,000 in value, distributed as follows:

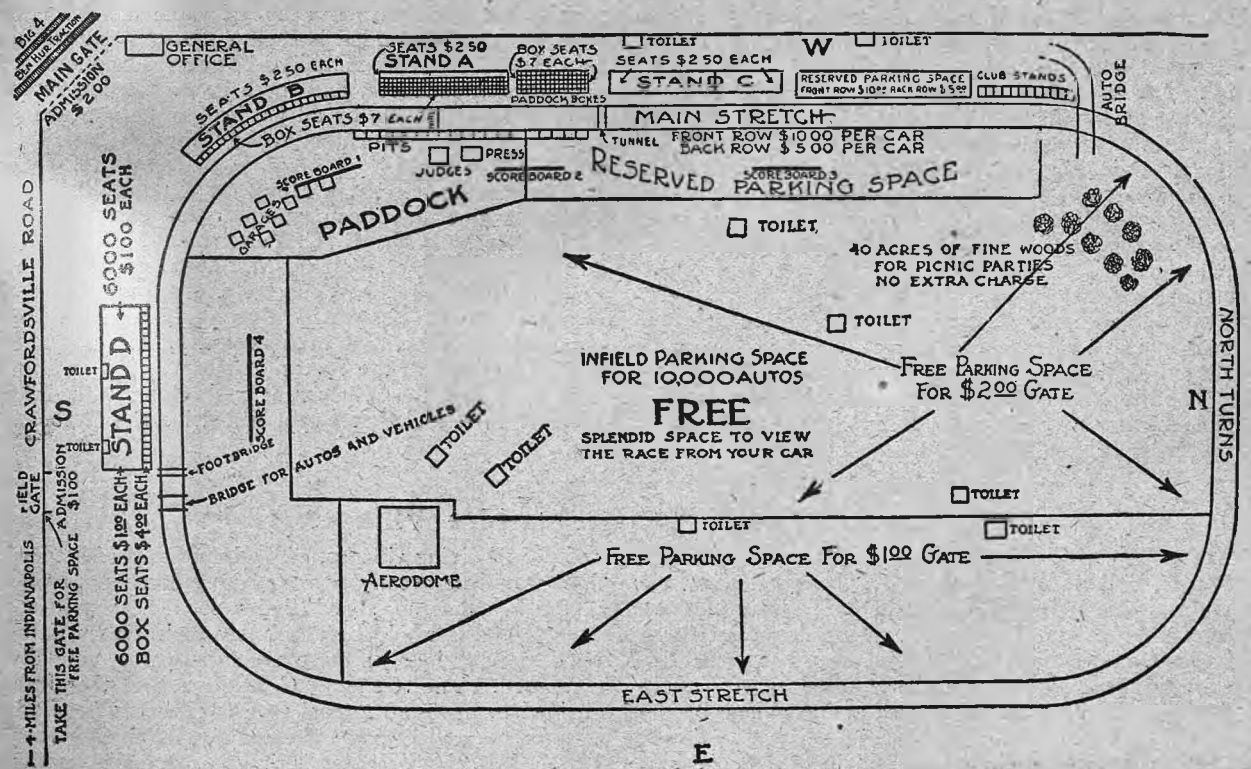
	£		£
First Prize	4,000	Sixth Prize	440
Second Prize	2,000	Seventh Prize ...	360
Third Prize	1,000	Eighth Prize ...	320
Fourth Prize	700	Ninth Prize	300
Fifth Prize	600	Tenth Prize	280

Hitherto this event has been open to cars having engines of a capacity of 600 cubic inches (9,834 c.c.), but this year the maximum capacity is limited to 450 cubic inches (7,375·5 c.c.)

To those who have not seen the race track the following description may be of interest, particularly in view of the fact that European cars will compete this year. The track is a parallelogram of 2½ miles circuit, covering an area of 328 acres, and it differs from Brooklands in its having four corners all alike, of 1,500ft. radius, necessitating comparatively short "straights" as shown on the adjoining plan.

The track was built in the summer of 1909, and the first race meeting was held in August of that year. At that time the surface was entirely of cement, but such pains had been taken to provide a smooth finish to the cement that it was found to be exceedingly dangerous to drive upon, and later on the entire track was covered with a layer of vitrified brick. The turns at the corners are banked to a height of 16ft., and a cement wall 3ft. in height and 11in. in thickness extends around the upper rim of the banking. As will be seen from the plan, a great deal of seating accommodation is provided in the grandstands, which altogether will accommodate 60,000 persons at prices ranging from $1 to $7 each (4s. to 28s.) Excellent accommodation for cars (termed in America "parking space") is provided in an enclosure on the finishing stretch at prices from $5 to $10 per car, and on the far side of the track the whole of one side of the area is set aside for a free parking space for any car, the owner of which has to pay the admission of $1 only. The central part of the park, as will be seen from the plan, will accommodate 10,000 cars, and from most portions of this an uninterrupted view of the track is obtained. There is also, following the example of Brooklands, an aerodrome on the ground. One feature to be noticed, which is of interest in a long race, is that opposite stand A will be seen the pits, opposite which the competing cars pull up for replenishment of fuel and tyres, and some remarkable mechanical gymnastics may be witnessed here.

As already stated, the race is run under the rules of the American Automobile Association, and the following conditions may be of interest:



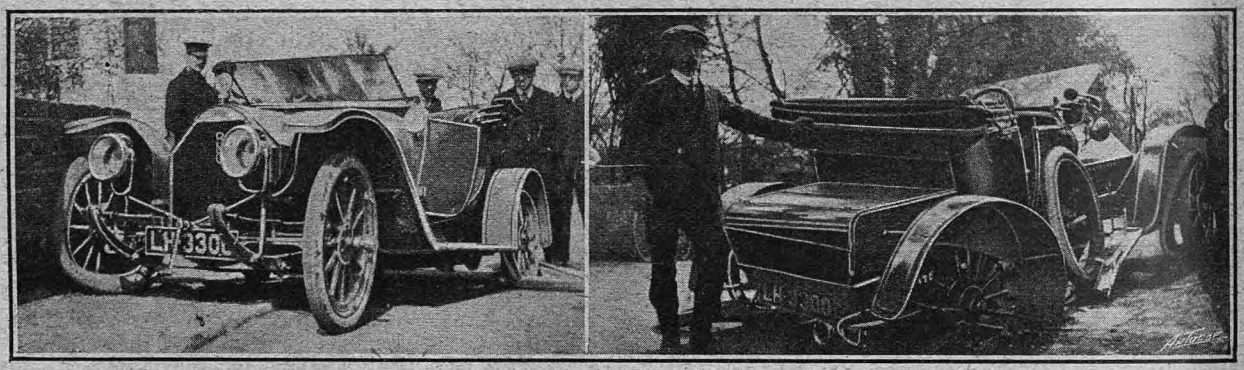
The official plan of the Indianapolis motor track, where a 500 miles race is to be held on May 30th. This year the race has assumed a serious international aspect by the entry of cars from France, Great Britain, and Germany.

The Indianapolis Race Track.

Cars must be shown to be capable of 75 miles per hour for one full lap of 2½ miles in order to qualify for the race. Teams of three cars of any make may be entered, but as only thirty cars are allowed to start, if more than thirty be entered three-car teams may have to be reduced to two-car teams, the thirty fastest cars in a speed trial of one lap being eligible for the actual race. These rules, of course, prevent undue congestion during the race itself, a very necessary precaution, as the width of the track is not nearly so great as that of Brooklands. There is a further regulation that all steering knuckles, front axles, spring hangers, and steering mechanism including tie rods, shall be subject to the approval of the mechanical engineer of the Indianapolis Speedway. Cars failing to obtain this approval are not allowed to start.

Perhaps because there is less demand for such refinements, particularly such as conduce to extreme economy of running, the various race tracks in the United States are used less for scientific testing than for a rather spectacular form of advertising. As far as the race itself goes, however, it is sure to provide plenty of interest and excitement, and those members of the Institution of Automobile Engineers who will be able to witness it on their visit to the States are not likely to be disappointed.

The scenery and road surfaces of Indiana cannot be compared with those of Surrey, and English visitors will miss the pine-covered hills of Weybridge. Moreover, Indianapolis enjoys one of the most sultry climates of the Middle West, and in the end of May visitors will be liable to complain, not unreasonably,



The results of mistaking the entrance to the Swan Inn, on the Bath Road, for the main road itself, where it turns to the left over the Lambourne Stream, a mile from Newbury on the Reading side. The correspondent who sends us the accompanying illustrations suggests that this would be a good point for an R.A.C. guide. By the appearance of the R.M.C. car the force of the impact must have been considerable.

In addition to the cash prizes already mentioned, the fullest interest is kept up at all stages of the race by the following trophies, which are presented by various organisations. For example, the Remy Grand Brassard and the Remy Grand Trophy will be presented to the driver and owner (or maker) of the car leading at 200 miles. The Remy Electric Company, in addition, offer the driver of any car equipped with the Remy ignition a prize of £10 per week for twenty consecutive weeks. The Prest-o-lite Company (vendors of dissolved acetylene) offer a trophy to the car leading at 300 miles, and the Wheeler-Schebler Company, makers of the Schebler carburetter, will give a cup and a prize of £200 to the car leading at 400 miles. This is, perhaps, a somewhat regrettable feature, introducing, as it necessarily does, a strong flavour of advertising into the whole business.

The Brooklands Track has undoubtedly been responsible for many refinements in modern English cars, thanks to the admirable testing facilities it affords, of the lack of shade on the open grandstands. The short distance of four miles from the city of Indianapolis to the track precludes the enjoyable drive to and from the meeting, which is such a pleasant feature of Brooklands. Its accessibility, however, conduces to enormous attendances, and there is no question as to the enthusiasm shown by all parties for the interesting race and for what is claimed to be "the greatest race-course in the world."

It is announced that a Mercédès car with a Silent Knight engine has been entered, the entry having been made by a Mr. E. C. Patterson, of New York. An amateur driver, Pelette, has been nominated as driver. There are two Peugeots and a Sunbeam, the others up to the time of writing all being American cars without a reputation in this country, though doubtless well-known in the States.

It is stated that Zuccarelli and Goux will drive Peugeot cars, and that Guyot will drive the Sunbeam car.

Speed through Cambridgeshire Villages.

The attention of the General Committee of the R.A.C. and Associated Clubs has been called to the reckless manner in which motor cars and cycles are frequently driven by some undergraduates of Cambridge through the village of Melbourn, in Cambridgeshire, in disregard of the "Please Drive Slowly" signs recently erected at the entrances to the village by the R.A.C. and the Cambs. and Isle of Ely A.C. Owing to the resultant public danger and inconvenience it is believed that the authorities may probably have no alternative but to apply for a ten-mile limit in Melbourn and the adjoining villages. The imposition of a speed limit would be greatly regretted by motorists, in view of the fact that no speed limits so far exist in the county, and it would be absolutely unnecessary if the reckless behaviour of these undergraduates were discontinued. The General Committee has, therefore, decided to make an appeal to the offenders generally by means of notices posted in suitable places and otherwise, asking them to exercise reasonable consideration for other road users, and it is hoped that this action will achieve the desired result.

Possibilities of Six-cylinder, Three-throw, V Engines

By Archibald Sharp, B.Sc., Wh.Sc., A.M.I.C.E., M.I.A.E., Author of "Balancing of Engines: Steam, Gas, and Petrol."

I HAVE been asked, in view of Mr. W. G. Aston's article in last week's issue of *The Autocar* concerning the eight-cylinder V-type engine, to discuss the possibilities of the six-cylinder V engine. It has been suggested that the usual six-cylinder engine is very long and necessitates a stiff heavy crankshaft and crank case, as well as extra length of chassis frame, and that it would be interesting to know if the balance and torque of a six-cylinder three-throw crankshaft V engine can be made satisfactory. It is pointed out that such a six-cylinder V engine, if feasible, would be very light, and would require less length of chassis frame than even a four-cylinder engine.

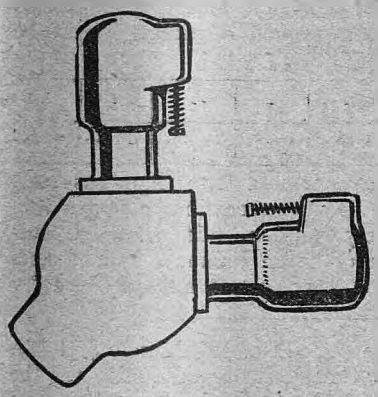


Fig. 1.

Before discussing this let me supplement Mr. Aston's article on one point. In my opinion his article is a very fair statement of the cases for the six and eight-cylinder engines, except that he overstates the degree of balance of the eight-cylinder engine. The eight-cylinder engine may be considered as made up of four sets of twin engines, cylinders set at 90°. Such a twin engine, with suitable counter-balance masses opposite the crank pin, has its primary balance perfect, but it has an unbalanced force of the second order which tends to move the engine from side to side, as is well-known in the Riley engine. Such secondary unbalanced force may be considered as due to an imaginary unbalanced mass reciprocating horizontally at right angles to the crankshaft, at twice the frequency of the pistons. Taking the second set of twin engines, the crank being opposite to that of the first (*i.e.*, at 180° difference of phase), the corresponding imaginary unbalanced mass is at 360° phase difference, *i.e.*, it is exactly in line with that of the first set. Thus the four secondary unbalanced forces from the four cranks do not neutralise each other, but are cumulative. The total secondary unbalanced force in an eight-cylinder V engine, with its four cranks lying in one plane, is, in fact, 1.414 times that of a four cylinder engine of the same bore, stroke, etc.; or approximately .707 times that of a four-cylinder engine having the same total mass of reciprocating parts.

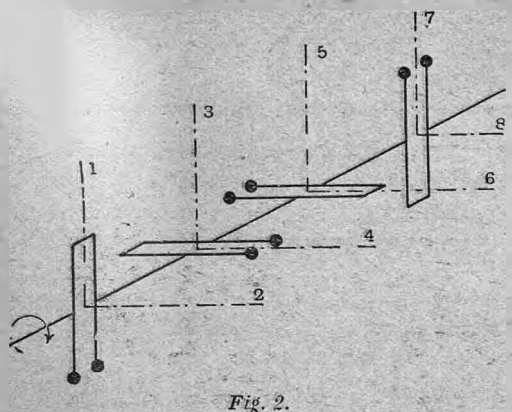


Fig. 2.

In my book on "Balancing of Engines" forty-three different types of engines are compared and the results tabulated, the same mass being taken for each individual piston, and the same stroke and revolution speed being taken for all engines. The eight-cylinder V engine with its four cranks in one plane has a secondary unbalanced force 32.57 lbs.

Mathematically, even the six-cylinder engine is not in perfect balance, its largest unbalanced force is of the sixth order; this, however, is negligible in comparison with unavoidable deviations from ideal accuracy in the very highest class of workmanship, and it is practically correct to say the six-cylinder engine is, or should be, perfectly balanced. Mathematically the unbalanced force of the six-cylinder engine is .00 lb. The absolute values of the above figures are not important, but their ratio gives a measure for comparing the degree of perfection of balance of engines of various types.

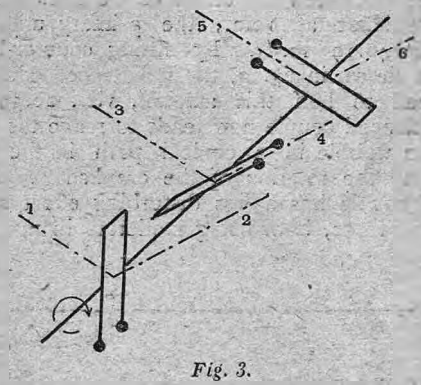


Fig. 3.

But a much better balance of the eight-cylinder V engine can be obtained by setting the four cranks at right angles, the two middle cranks being opposite each other (fig. 2). Using Mr. Aston's method of describing the timing of the impulses, and supposing the cylinders arranged as in fig. 4 of Mr. Aston's article (fig. 1 herewith), one system of timing might be as follows (see fig. 2):

No. of cylinder	1	3	7	5	6	2	4	8
Impulse at	12 P.M.	3 A.M.	6 A.M.	9 A.M.	12 NOON	3 P.M.	6 P.M.	9 P.M.

Each crank must be provided with counter-balance masses, as shown in fig. 2. The four imaginary unbalanced masses of the second order are now at 180° (twice the crank angle), somewhat like the crank pins of a four-cylinder engine, and the four secondary unbalanced forces neutralise each other. With the same data as in the two former examples, the unbalanced force is now of the fourth order, its value 0.32 lb., *i.e.*, one-hundredth part of that in the usual type of eight-cylinder V engine. This engine is practically in perfect balance. Its only disadvantage is that the crankshaft is more expensive to make than that of the usual eight-cylinder type.

Possibilities of Six-cylinder, Three-throw V Engines.

In a six-cylinder engine working on the four-stroke cycle, if the impulses occur at equal intervals this interval must correspond to 120° rotation of the crankshaft. To secure the most uniform torque, therefore, in a V-type engine, the cylinders must be set at 120°. The three cranks must also be set at 120°, as in the old three-cylinder engine. The arrangement is shown in fig. 3, and one system of timing might be as follows:

No. of cylinder	2	4	6	3	5	1
Impulse at	2 A.M.	6 A.M.	10 A.M.	2 P.M.	6 P.M.	10 P.M.

If no counter-balance masses be fitted to the crankshaft, the want of balance will be like that in a three-cylinder three-crank engine, in which there is a primary unbalanced longitudinal couple which tends to

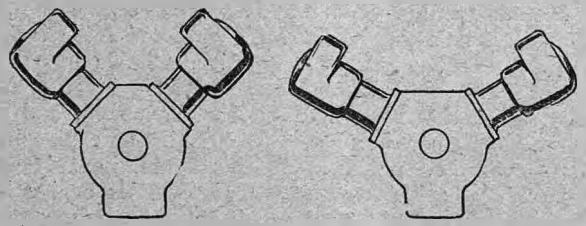


Fig. 4.—Diagram of cylinders at 90 and 120 degrees respectively.

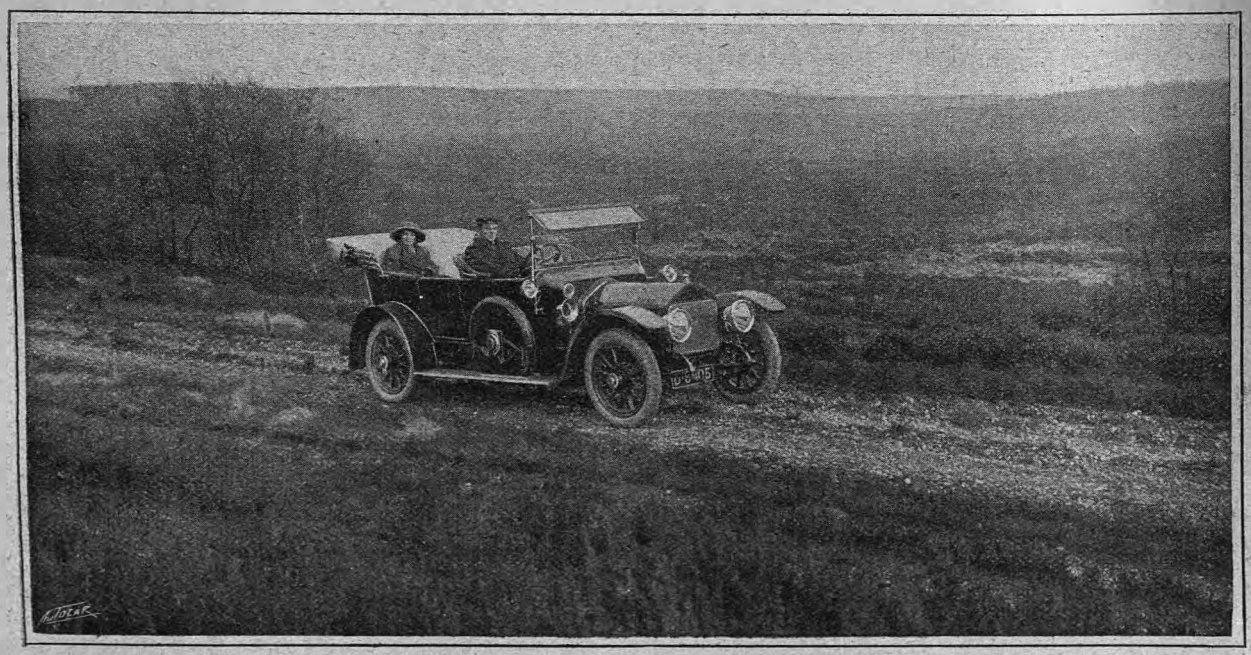
rock the axis of the engine in a vertical plane. With the same data as in the former examples, and taking the distance between the crank centre lines measured along the shaft at 10in., the primary unbalanced couple is 40.19 lb.-ft. By fitting counter-balance masses as shown in fig. 3, the unbalanced couple can be reduced to half this amount, viz., 20.59 lb.-ft. The unbalanced couple now tends to make the axis of the engine wobble in a conical path in the reverse direction to the rotation of the crankshaft. An unbalanced couple has a less disturbing effect than an unbalanced force, both being moderate in magnitude, and I am of opinion that such a six-cylinder V engine is quite a feasible proposition.

A six-cylinder V engine can be arranged to be in better balance than the above engine, at the expense, however, of sacrificing uniformity of torque. If the cylinders are set at 90°, and the cranks at 120°, the engine may be considered as made up of three sets of twin V engines. The three secondary unbalanced forces from the three cranks merge into an unbalanced secondary couple of magnitude 7.86 lb.-ft. (taking the same data as before). This is about one-third the magnitude of the primary unbalanced couple in the previous example, and its disturbing effect, as measured by amplitude of engine vibration, would be about one-twelfth. One system of timing might be as follows:

No. of cylinder	6	2	3	5	1	4
Impulse at	1 A.M.	2 A.M.	6 A.M.	10 A.M.	5 P.M.	9 P.M.

In any possible arrangement two impulses must follow each other in rapid succession, giving a very uneven torque. In my opinion, this drawback outweighs any advantage of better balance, and of compactness in making the V angle 90° instead of 120°

In a return for the quarter ended March 31st, Sir William Nott-Bower, Commissioner of Police for the City of London, reports that of 283 street accidents in the City 7 resulted in death. Five of these fatal accidents were caused by motor omnibuses, 1 by a motor car, and 1 by a horse-drawn vehicle. Of the non-fatal accidents, 2 were caused by horse-drawn omnibuses, 124 by other horse-drawn vehicles, 3 by tramcars, 50 by motor cars, 64 by motor omnibuses, 2 by motor cycles, and 31 by ordinary cycles. The total number of accidents was less by 51 than for the corresponding quarter in 1912.



Although from many large cities in the Midlands open country is within easy reach, it is difficult to realise that the above view was taken within sixteen miles as the crow flies from the centre of Birmingham. Nevertheless the wild open expanse of Cannock Chase is within that distance. The road shown runs from Rugeley, in Staffordshire, to the town of Cannock, and although far from being of good surface it is quite negotiable. The car shown is a 16-20 h.p. Wolseley.

On the Track.

Prospects for the Whit-Monday Meeting.

AS we anticipated in our notes last week, the Brooklands Whitsun entries are full to repletion, there being reserve entries in nearly all events. It figures out to a lengthy programme of ten races on the track and one in the air, the first timed to start at noon and the last at 4.50. It seems that many of the London members have urged Major Lloyd to commence racing sooner and finish earlier, so that they may return to town in comfortable time for dinner and perhaps a theatre afterwards. Not only has Major Lloyd decided to start two hours sooner than usual, but by spacing out the earlier events with longer intervals he hopes to avoid any risk of delay at the entrance gates, while at the same time affording ample time for lunch. Altogether, it seems an excellent arrangement, and the only sufferers are likely to be those members and others, and there are many, who come from the shires and even further afield, for they must be up with the lark to arrive in time for the noon start.

In such a large entry there are naturally many new cars, but two stand out from all the others by reason of the importance that attaches to them as the latest achievements of two of the most go-ahead motor concerns in this country, if not in the world. We refer, of course, to the new Vauxhall and the new Sunbeam. The dimensions of the new Vauxhall are 98.5 × 150 mm., giving a rating of 24 and a capacity of 4,572 c.c. It is rather difficult to see a reason for building an engine of just these dimensions so far as the track is concerned. It comes, of course, into the old 26 rating class and into the new cubic capacity class F, in both of which the Talbot has strongly established itself. If it were designed to beat the Talbot records it might well have had a bore of 102 mm., unless it is to boast of beating the Talbot figures with a smaller engine. It is useless at this stage to speculate upon its probable speed, but it may safely be counted upon to lap at over 100 m.p.h. on Monday, and will be well matched by Mr. Engley's monster F.I.A.T. Of course, these very fast cars have their days. If the F.I.A.T. be in the mood it may run the Vauxhall very hard, but in any case these two cars doing well over the 100 m.p.h. should make a most exciting spectacle.

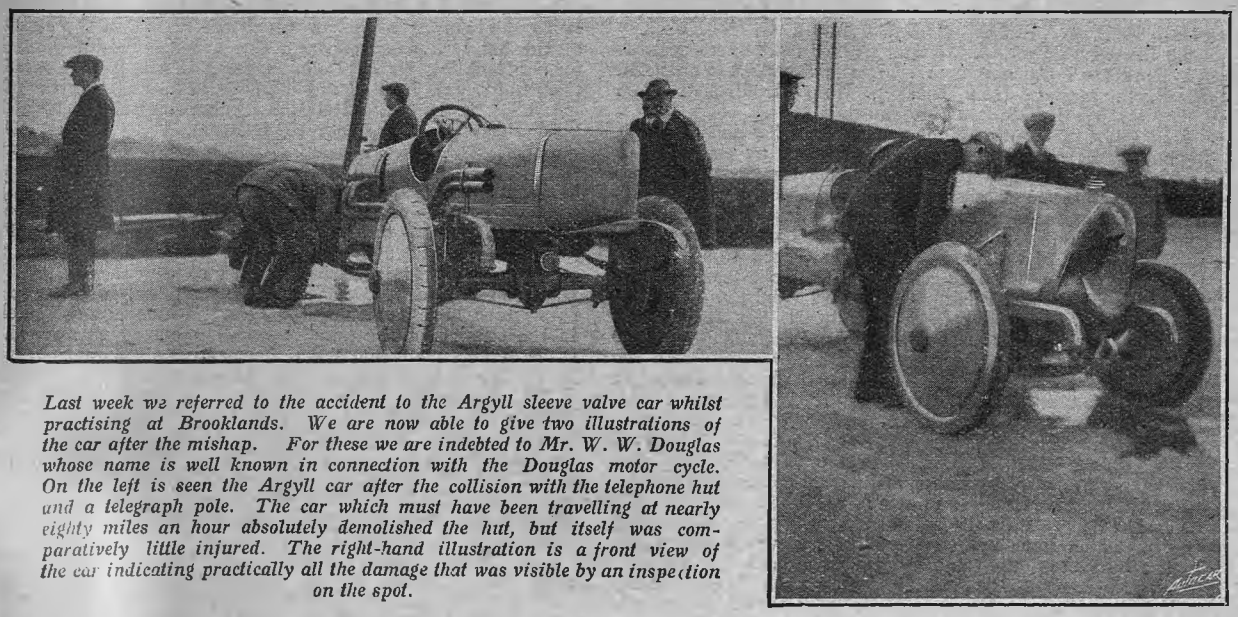
The other new car of which we are expecting so much is the new 15.9 Sunbeam. Here again we are all at sea when we learn the stroke is only 120 mm. When so many sixteens have had strokes of about 150 mm. and over, or, as in the case of the Hispano-Suiza, 180, this moderate stroke seems a strange reversion to earlier types.

The most important race on Monday will undoubtedly be the Benzole Handicap, the last race of the day. This will constitute the most notable public test of benzole yet seen. We understand arrangements are being made for benzole to be on sale in bulk at the Track shortly.

The Hon. Ralph Beckett will have quite a new Grégoire, a six-cylinder 80 × 120 mm., while another private competitor, Mr. Read, has one of the Grand Prix Calthorpes. Really there is such a hot lot of cars in the Private Competitors' Race that we wonder why the entries are not limited to the round dozen, as in the case of the 100 m.p.h. races.

There are four cars in this race that should make the running, namely, the F.I.A.T., Sheffield-Simplex, Sunbeam, and Rolland-Pilain, but of the four we should fancy the first, if only because Mr. Noel Macklin will be at the wheel. Then come a whole bunch of cars in a second category, all of which should lap at over 73 m.p.h., say Loder's Mercédès, the two S.C.A.R.'s, the Calthorpe, Vauxhall, and Beckett's Grégoire. When the first-named four come in among this second group, as they probably will do towards the end of the race, there will not be much room to pass.

Coming to the 100 m.p.h. races we do not remember having seen twelve cars with such a small difference of speed between them, and here again there will be considerable difficulty for some of the back markers to pass.



Last week we referred to the accident to the Argyll sleeve valve car whilst practising at Brooklands. We are now able to give two illustrations of the car after the mishap. For these we are indebted to Mr. W. W. Douglas whose name is well known in connection with the Douglas motor cycle. On the left is seen the Argyll car after the collision with the telephone hut and a telegraph pole. The car which must have been travelling at nearly eighty miles an hour absolutely demolished the hut, but itself was comparatively little injured. The right-hand illustration is a front view of the car indicating practically all the damage that was visible by an inspection on the spot.

On the Track.

The 70 m.p.h. races will be rather overshadowed by the senior events, but there are good cars in plenty and the newcomers we spoke of last week.

The cycle cars have turned up, seven of them, and have a chance to vindicate their inclusion in such a fine programme. Curiously enough, the cycle car race is to be followed by the Sprint Race, generally the last race of the day, and what a contrast the two races will be!

A big end will have to be made good on Mr. Stewart's Sunbeam if it is to run on Monday, but there is expected to be no difficulty in doing this.

We are informed that Mr. Cain's Calthorpe is one of the cars that actually ran in the Grand Prix and Coupe de l'Auto last year.

Mr. Engley's F.I.A.T. is said to be the car first owned by Sir George Abercromby, then by Mr. Baker White, and afterwards by Mr. Noel Macklin, and is the one on which Mrs. Macklin was timed to do a flying half-mile at 90.94 m.p.h. in January, 1911, at Brooklands.

Mr. Wilkie has scratched his Itala for all events for which it was entered.

Mr. McBain has scratched his Motobloc.

Brooklands Automobile Racing Club.

Entries for Whit-Monday Meeting.

THE entries in the car races for the Whitsun Meeting (Whit-Monday, May 12th, 1913) are as follows:

12.0 noon. The Whitsun Private Competitors' Handicap. About 5¾ miles. Prizes—Cups, value £15, £10 and £5. For motor cars propelled by means of internal combustion engines only. To be entered and driven by private competitors of the Brooklands Automobile Racing Club.—O. D. Pollak (17.9 S.C.A.R.), R. Robertson-Shersby-Harvie (30.0 Rolland-Pilain), A. H. Wilkie (41.9 Itala), Donald Cohen (15.9 Grégoire), Neville Hardy (17.9 Vauxhall), C. V. Stewart (30.1 Sunbeam), Paul Meyer (59.6 F.I.A.T.), Eric Loder (35.7 Mercédès), R. H. Townsend (48.4 Sheffield-Simplex), McL. N. Staight (17.9 S.C.A.R.), G. N. Cadbury (18.8 Straker-Squire), T. Ingram Walker (24.8 Mercédès), J. W. Read (15.7 Calthorpe), W. M. Dickson (20.1 Vauxhall), G. B. S. McBain (15.9 Delage), Hon. R. Beckett (23.8 Grégoire), W. R. McBain (Motobloc).

1.10. The Eleventh 100 m.p.h. Short Handicap. About 5¾ miles. Prizes—£40, £20, £10, or cups at option. For motor cars propelled by means of internal combustion engines only, the observed speeds of which are about seventy miles an hour or more for a Brooklands flying lap, or, in the case of cars which have not competed before, which are likely, in the opinion of the handicappers, to exceed this speed.—Gordon Watney (48.6 Mercédès), R. Robertson-Shersby-Harvie (30.0 Rolland-Pilain), C. A. Bird (15.9 Sunbeam), A. S. Henderson (52.1 Isotta-Fraschini), N. S. Hind (35.7 Berliet), Paul Mayer (59.6 F.I.A.T.), P. C. Kidner (24.0 Vauxhall), L. R. L. Squire (18.8 Straker-Squire), H. E. Mills (22.4 R.M.C.), Eric Loder (59.6 Benz), Percy E. Lambert (15.9 Singer), J. W. Read (15.7 Calthorpe). Reserve: G. T. Cain (15.7 Calthorpe).

2.15. The Tenth 100 m.p.h. Long Handicap. About 8½ miles. Prizes—£50, £25, £15, or cups at option. For motor cars propelled by means of internal combustion engines only, the observed speeds of which are about seventy miles an hour or more for a Brooklands flying lap, or, in the case of cars which have not competed before, which are likely, in the opinion of the handicappers, to exceed this speed.—Gordon Watney (48.6 Mercédès), Robertson-Shersby-Harvie (30.0 Rolland-Pilain), W. R. McBain (52.8 Lorraine-Dietrich), C. R. Engley (89.5 F.I.A.T.), C. A. Bird (15.9 Sunbeam), A. S. Henderson (52.1 Isotta-Fraschini), L. Coatalen (15.9 Sunbeam), N. S. Hind (35.7 Berliet), M. Campbell (59.6 Darracq), C. V. Stewart (30.1 Sunbeam), Eric Loder (59.6 Benz), Percy E. Lambert (15.9 Singer). Reserves: H. E. Mills (22.4 R.M.C.), L. R. L. Squire (18.8 Straker-Squire), P. C. Kidner (24.0 Vauxhall), G. T. Cain (15.7 Calthorpe).

2.40. The Ninth 70 m.p.h. Long Handicap. About 8½ miles. Prizes—Cups, value £30, £15, and £7 10s. For motor cars propelled by means of internal combustion engines only, the maximum observed speeds of which are about seventy miles an hour or less for a Brooklands flying lap, or, in the case of cars which have not competed before, which are not likely, in the opinion of the handicappers, to exceed this speed.—O. D. Pollak (17.9 S.C.A.R.), K. Yano (15.9 Hispano-Suiza), A. H. Wilkie (41.9 Itala), S. G. Cummings (13.9 Cummikar), R. W. A. Brewer (8.9 Pilot), Neville Hardy (8.9 Morris-Oxford), McL. N. Staight (17.9 S.C.A.R.), W. Turner Smith (13.9 Stoewer), W. Turner Smith (15.9 Stoewer), G. N. Cadbury (18.8 Straker-Squire), W. G. Tuck (11.8 Humber), W. O. Bentley (12.1 D.F.P.), E. Herington (15.9 Ariel), W. M. Dickson (20.1 Vauxhall), Henry J. Poole (10.4 Majola), Reg. R. Smith (15.9 Armstrong-Whitworth), T. B. Andre (8.6. Marlborough). Reserves: Hon. R. Beckett (Grégoire), S. N. Beattie (17.9 S.C.A.R.).

3.5. The First Cycle Car Handicap. About 5¾ miles. Prizes—£8, £4, and £2, or cups at option. For cycle cars, as defined by the Royal Automobile Club and the Auto Cycle Union, carrying one male passenger at option.—H. Boissy (4 cyl. Baby Peugeot, 55 × 90), J. F. Buckingham (1 cyl. Chota, 89 × 120), J. V. Carden (1 cyl. Carden, 85 × 85), F. W. Carryer (2 cyl. Lester, 85 × 85), G. Nash (2 cyl. G.N., 84 × 98), C. M. Whitehead (2 cyl. G.N., 84 × 98), and J. C. Humphries (2 cyl. Arden, 85 × 85).

3.30. The Whitsun Sprint Race (a Handicap). About two miles). Prizes—Cups, value £25, £12 10s., and £7 10s. For cars which have been timed to do flying laps at Brooklands at about 70 m.p.h., or which are likely, in the opinion of the handicappers, to attain this speed.—Gordon Watney (48.6 Mercédès), O. D. Pollak (17.9 S.C.A.R.), L. Coatalen (15.9 Sunbeam), N. S. Hind (35.7 Berliet), Paul Mayer (59.6 F.I.A.T.), L. R. L. Squire (18.8 Straker-Squire), H. E. Mills (22.4 R.M.C.), Eric Loder (59.6 Benz), W. G. Tuck (11.8 Humber), G. B. S. McBain (15.9 Delage), W. O. Bentley (12.1 D.F.P.), and P. C. Kidner (24.0 Vauxhall). Reserves—W. R. McBain (Motobloc) and S. N. Beattie (17.9 S.C.A.R.).

3.55. The Eleventh 70 m.p.h. Short Handicap. About 3¼ miles. Prizes—Cups, value £30, £15, and £7 10s. For motor cars propelled by means of internal combustion engines only, the maximum observed speeds of which are about 70 m.p.h. or less for a Brooklands flying lap, or, in the case of cars which have not competed before, which are not likely, in the opinion of the handicappers, to exceed this speed.—O. D. Pollak (17.9 S.C.A.R.), K. Yano (15.9 Hispano-Suiza), A. H. Wilkie (41.9 Itala), S. G. Cummings (13.9 Cummikar), R. W. A. Brewer (8.9 Pilot), Donald Cohen (15.9 Grégoire), Neville Hardy (8.9 Morris-Oxford), W. Turner-Smith (13.9 Stoewer), McL. N. Staight (17.9 S.C.A.R.), E. Herington (15.9 Ariel), W. G. Tuck (11.8 Humber), W. O. Bentley (12.1 D.F.P.), H. E. S. Huth (22.4 Ford), G. N. Cadbury (18.8 Straker-Squire), T. Ingram Walker (24.8 Mercédès), W. M. Dickson (20.1 Vauxhall), and T. B. Andre (8.6 Marlborough). Reserve—S. N. Beattie (17.9 S.C.A.R.).

4.20. The 100 m.p.h. Benzole Handicap. About 8½ miles. (The entrant of the winner to receive 100 sovs. and a cup, both presented by the Royal Automobile Club; the entrant of the second car to receive 50 sovs., and the entrant of the third car to receive 20 sovs., the second and third prizes being presented conjointly by the Society of Motor Manufacturers and Traders and the Automobile Association and Motor Union. The entrant of the car which, having also competed in the Tenth 100 m.p.h. Long Handicap, accomplishes in this race a speed for a flying lap comparing most favourably with its best lap speed accomplished in the former race, to receive a cup. For motor cars propelled by means of internal combustion engines only (using as fuel benzole supplied free to competitors by the Club), the observed speeds of which are about 70 m.p.h. or more for a Brooklands flying lap, or, in the case of cars which have not competed before, which are likely, in the opinion of the handicappers, to exceed this speed.—W. R. McBain (52.8 Lorraine-Deitrich), C. R. Engley (89.5 F.I.A.T.), C. A. Bird (15.9 Sunbeam), A. S. Henderson (52.1 Isotta Fraschini), L. Coatalen (15.9 Sunbeam), N. S. Hind (35.7 Berliet), C. V. Stewart (30.1 Sunbeam), M. Campbell (59.6 Darracq), Gordon Watney (48.6 Mercédès), Eric Loder (59.6 Benz), Percy E. Lambert (15.9 Singer), and H. E. Mills (22.4 R.M.C.). Reserves—Paul Mayer (59.6 F.I.A.T.), L. R. L. Squire (18.8 Straker-Squire), and P. C. Kidner (24.0 Vauxhall).

4.50. The Whitsun Aeroplane Handicap. About 12 miles. There will also be two motor cycle races.

The Highways and Byways of England.*

THERE is no motorist to whom the road is not more or less dear. For road users and road lovers, this book, from the eloquent pen of a great road lover, will come as a joy and a pleasure beyond words. Our pen must altogether fail to convey anything like an idea of the pleasure we have experienced in its perusal. The history of our highways in all their vicissitudes, from the days of the British tracks, which "at all events were practical for wheeled traffic," down through the long years when inter-communication was possible by means of the great Roman ways, the mediæval roads, the pack-horse tracks, the pilgrims' and other ways, the Tudor and Stuart roads, to the coaching highways of Telford and Macadam, is recounted in the most lucid and fascinating manner. Not the least interesting section of this wholly interesting work is the introduction, in which the author speaks with much conviction and knowledge of the road question of the present day. He says —and his words impel attention—"As a result of the return of traffic to the old lines which touch our history at so many points, the faults of those lines are no longer, as they were during the great development of railways in the Victorian era, matters of academic or antiquarian interest; they are matters of practical importance, and as such they are steadily forcing themselves upon public notice. For they are already a serious impediment to cheap, rapid, and safe communication, and on whether they can be remedied, and our roads thereby made suitable for modern methods of transport, may depend the solution of many great problems that confront the nation. One of these problems may be the retention of our place in the domain of trade."

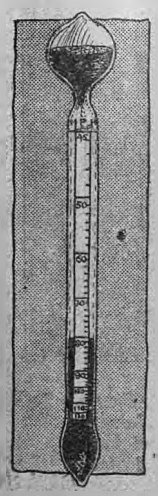
The signpost at Wolferton, on the Sandringham estate, which has been erected by command of the King. The device depicts Tyr trying to wrench his arm from the jaws of the mythological wolf of the Norsemen. The road in the background is the private road to Sandringham

Further on we find Mr. Wilkinson expanding a statement which, in commenting upon the present system of our roads, the writer has made from time to time in these columns. We have said frequently that for the roads of this country George Stephenson was born thirty years too soon. Mr. Wilkinson says: "It is probable that, had not traffic temporarily left the roads, England would have followed the example of France, who solved her 'road problem' by constituting a Minister of Roads and Bridges, in whose hands was placed the supervision of her highway system. Under his directions the roads were divided into several classes, the most important of which are *Routes Nationales* (constructed and maintained by the various departments at the expense of the Government). By this means the whole of the French highway system was re-made and brought up to its present high standard." But to return to the body of the book itself. Viewed at this distance of time, it would be thought that the turnpike system might have been the salvation of our road system, and properly and capably administered, it might have done as much for us as the French system did for France. And it would have done but for the muddle and mess which has characterised English highway legislation. The book, in addition to being most interestingly written, is most instructively illustrated, so that once commenced it is as holding as a good romance and as difficult to drop. Motorists, too, will value it further for its last chapter, XII., which deals descriptively with many enthralling objects of interest to be met with in passing over the roads of this country.

* "The Highways and Byways of England: Their History and Romance." By T. W. Wilkinson. (Iliffe and Sons, Ltd., 20, Tudor Street, London, E.C. 4s. 6d. nett.)

The Brooklands Lapometer.

THIS is a most fascinating little instrument which has sprung from the prolific mind of Dr. A. M. Low. Its use will undoubtedly add to the enjoyment of an afternoon's sport at Brooklands, where the speed of cars is very difficult of estimation by onlookers unless they possess a stop watch and know how to use it. Even then, after the lap has been timed, the mileage per hour has to be looked up in the lap time book, whereas with the lapometer in use it is readable off the scale at sight.



Dr. Low has adopted and adapted the principle of the old hour glass, or the more vulgar egg boiler. It consists, as may be seen from the illustration, of two glass bulbs connected by a tube, the upper bulb communicating with the straight tube by a very fine neck. Sand when properly sifted runs through an orifice with perfect regularity, and as the distance for a lap is constant, the tube can be graduated in miles per hour from any point upwards. As a car passes any given point on the track the lapometer is inverted, and upon the car returning to the same point the level of the sand which has accumulated in the straight tube will show the speed in miles per hour at which the car has encircled the track. By an additional scale upon the straight tube it is clear that the lapometer could be used for timing the speed of a motor car running between any two milestones, or over a measured mile on the road. In this way if properly calibrated it could be used for testing speedometers. Particulars of this fascinating instrument can be obtained of the Low Accessories Co., Ltd., 15, Great St. Helens, London, E.C.

A fatal accident which illustrates the danger of allowing horses to travel on the highway without being kept under proper control occurred at Holdenby, near Northampton, one night last week. A cyclist ran into one of a couple of horses which were thirty yards in front of the man who was supposed to be in charge of them and was killed. There was no light to show the whereabouts of the horses, and the jury at the inquest added to their verdict of accidental death a rider asking for a byelaw to compel everyone in charge of cattle on the highway at night to carry lights.

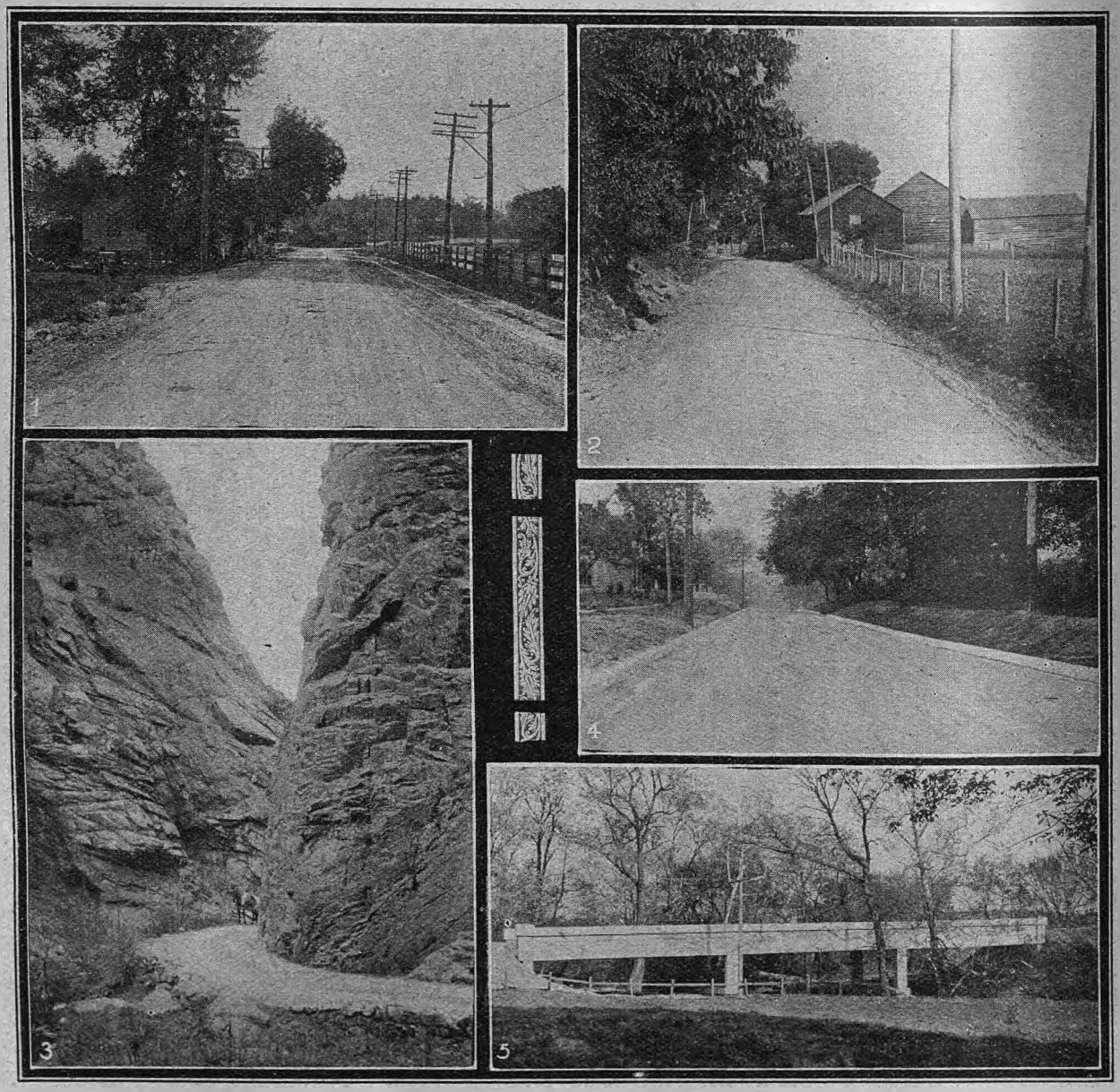
An "Ocean to Ocean" Highway Across America

A Gigantic Scheme which is being Energetically Prosecuted in the United States.

A GREAT scheme for securing the construction of a highway from the Atlantic to the Pacific coast, a distance approximating 3,500 miles, across the North American continent, is in process of realisation.

Mr. Carl Fisher, the originator of the idea, laid his plans before a gathering of motor car manufacturers recently on the occasion of a banquet at Indianapolis. While most of the 300 persons present were astounded at the magnitude of the project, the details showed such careful consideration, and the whole plan seemed to be so feasible, that more than £60,000 was subscribed before the banquet ended.

It was considered by Mr. Fisher that such a highway would cost, approximately, £5,000,000. Of this the material would cost about £2,000,000 and the labour of construction about £3,000,000. This would be at the rate of about £1,500 per mile, an amount which has been presumed to be sufficient when all the varying factors of the project were considered. It is proposed that engineers from the National Government, either from the United States Office of Public Roads or from the War Department, or both, should attend to the engineering part of the work, planning and construction. This may require a special Act of Congress, which should not be difficult to obtain.



THE "GOOD ROADS MOVEMENT" IN AMERICA. Views of several State roads which may be adapted to the new scheme for an "Ocean to Ocean" Highway. 1. A Massachusetts State road. 2. A New York State road. 3. The Narrows, North Cheyenne Canyon, Colorado Springs, built by convict labour. 4. A road near Edwardsville, Illinois. 5. A reinforced concrete bridge near Springfield, the capital of Illinois. This type of bridge has been adopted by the engineers of several States, and will probably be adopted for the "Ocean to Ocean" Highway wherever possible. Illinois has erected more than 1,100 of this type of bridge, including single span structures, within the past three years.

An "Ocean to Ocean" Highway Across America.

It is proposed that the £2,000,000 for the materials be raised by subscriptions among automobile manufacturers, dealers, accessory manufacturers, and others interested in the automobile industry, each corporation, firm, and person engaged in the business being asked to contribute an amount equal to 1% of their gross receipts for one year; this may be made in a single payment, or by contributing one-half of 1% for two years, one-third of 1% for three years, or one-fifth of 1% for five years. This percentage will bring in the required amount and leave some latitude for possible delinquency.

It is announced that the pledges already amount to more than £400,000, though many of the largest concerns have not yet held their annual meetings, on which occasion the subject must be discussed. Some large companies have made direct appropriations without reference to the percentage plan. One company which makes automobile tyres has subscribed £60,000. The entire fund will probably be promised by midsummer. It is expected that the £3,000,000 to pay for labour will be raised by the localities through which the great highway will pass.

The selection of the route across the continent is attracting a vast amount of attention. Wisely, the temporary committee which is engaged in securing subscriptions declines to select the route; the selection will be in the hands of a special committee to be chosen when the subscriptions are complete by a meeting of the representatives of all the contributors for the formation of a permanent organisation.

In the meantime a strong rivalry is growing up in localities within the zone through which the road may be reasonably expected to pass. Some states, the legislatures of which are now in session, are endeavouring to secure enactments providing for the share of the cost which will be represented by the proportionate mileage of the highway within these states; in others convict labour is being discussed.

Between the Missouri River and the Pacific Coast the field notes of Mr. A. L. Westgard, official pathfinder of the American Automobile Association, will probably form the basis on which the selection of the route will be founded. Mr. Westgard has crossed the continent about a dozen times, most of them along different routes. On each route he has made exhaustive studies, primarily for map purposes, but also for such other purposes as may arise in the future when improvements of the roads are taken in hand. Mr. Westgard is now engaged in putting his data in shape for the use of the committee when appointed.

With the exception of a stretch of about 200 miles in Western Kansas and Nebraska there is plenty of road material within reasonably close proximity to almost any route which might be selected.

The construction of a great trans-continental highway along these lines and by these means must have a far-reaching effect. It must be considered that every mile of the highway, except the comparatively few miles in the mountains, will serve the purpose of a local road, and originate and carry its share of local traffic. In states and localities where no provision has been made for road improvement the ocean to ocean highway will be an object lesson, which will show to the people the essential value of good roads, and stimulate them to action for the construction of "laterals" or feeders, so that advantage may be taken of the improvement. Other sections of states, not reached by the great highway, seeing the advantages gained by the improvement of the highways will improve those of their localities. States will be encouraged to construct roads where most needed by the inhabitants, and the Federal Government, which is even now considering some form of co-operation in the construction of highways, may find its problem completely solved, and proceed with the construction of a system of much needed national roads.

While the plan of Mr. Fisher is a pretentious one, it is entirely in accord with the spirit of American development, which has placed more than a million cars on the roads within the past fifteen years, and has made highway development necessary.

The Del Monte Process.

IN recent issues we have published two critical articles upon this process as set forth in the prospectus and advertisements: one by Dr. Ormandy and the other by Mr. Alex. E. Tucker. For reasons which we are unable to understand, these articles appear to have greatly upset a contemporary, which suggests that we should test the Del Monte experimental plant for ourselves.

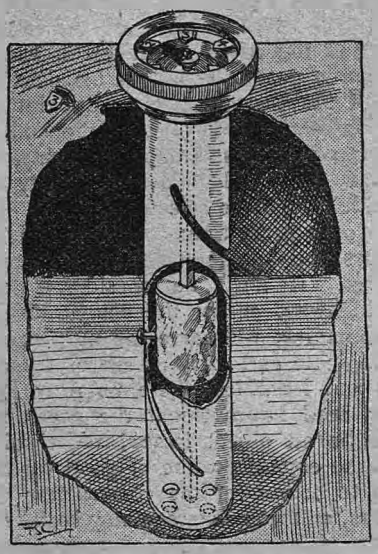
It appears to us that our contemporary rather misses the point: our contributors have not criticised it, but the Del Monte process, which should soon prove by its success or failure on a commercial basis whether our contributors were mistaken or not. If those responsible for the Del Monte process invite us to check the working of their experimental plant, such an invitation would receive every consideration, but we cannot consider undertaking such an investigation at the bidding of any journal or other intermediary.

As things stand at the moment, we have published certain reasonable criticisms of the Del Monte claims, criticisms to which those directly interested in the process have not seen fit to reply, and we decline to be drawn into any controversy on the subject by any third party. We have the strongest possible objection to being drawn into disputes with contemporaries, for our experience is that, however well conducted the controversy may be, neither side ever receives credit for impartiality: it is assumed at once by many readers that the one side or the other is adopting its attitude from motives of its own or from mere partisanship, and the thing becomes regarded simply and solely as a newspaper squabble.

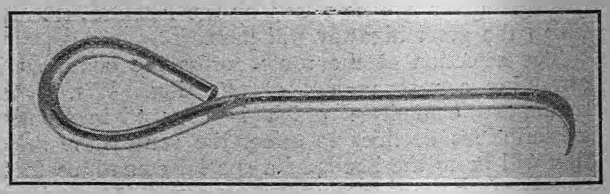
To return to the Del Monte process, or, for the matter of that, to any other process which may enable the yield of benzole from coal to be increased, it is hardly necessary to say that we welcome them all as we welcome any other means or process which will enable the supply of motor fuel to be increased, and, above all, the supply of home-made motor fuel. Nevertheless, while we are most anxious that each new process should be successful, we have no intention of withholding criticism any more than we have of refusing to permit the criticised to reply. Therefore, it only remains for us to say that the columns of *The Autocar* are open to the Del Monte people if they wish to reply to any criticisms we have permitted, and, further, that if they are anxious for us to appoint representatives to check the working of their plant we shall be pleased to consider their application when they choose to make it themselves, but, as we have already intimated, we cannot consider it through any third party.

The Mills Petrol Tank Gauge.

THE illustration herewith shows a petrol tank gauge which has recently been introduced by Mr. H. E. Mills, 441, Brighton Road, South Croydon, Surrey, the designer of the well-known Mills jet. This gauge is intended to be soldered, or otherwise fixed, into the top of the petrol tank, or it may be embodied in the filler cap. It consists of a tubular extension from a glass-covered dial, and in this tubular extension is a cork float which follows the level of the petrol in the tank, and in doing so is caused to rotate the square section central spindle. This rotation is brought about by the fact that the tube has a helical slot, as shown in the illustration, and a screw passing into the cork float moves in this slot as the cork rises or falls. The square spindle carries at its uppermost end a short indicator hand, and the dial of the gauge is provided with detachable numbers, so that these may be fitted and arranged in accordance with the capacity and shape of the tank. One of these detachable numbers is shown in the left-hand top corner. The gauge is made suitable either for gravity or pressure tanks, and any of various lengths of tube can be obtained to suit the depth of the tank to which the gauge is to be fitted. The only dimension necessary to be stated when ordering one of these gauges is the depth of the tank, but the approximate capacity of the tank must also be stated so that the requisite number of detachable figure plates may be sent. The figures on the dial are, as stated, adjustable and removable, being sprung into position in a narrow groove running round the outer circumference of the dial. By unscrewing the glass cap the figures may be adjusted instantly. The price of this accessory is 20s.



The Mills petrol tank gauge with the tubular extension broken away in order to show the cork float within. In the left-hand top corner is shown one of the detachable figures forming the dial.



In a recent issue of "The Autocar" a Hint and Tip was published, the writer of which advocated the use of a special "tyre pick" for removing flints and dirt which may become embedded in the tread of a tyre. The Victor Tyre Co., Ltd., having appreciated the wisdom of the suggestion, have had a supply of these tyre picks made, and one is shown in the above illustration. The Company inform us they will be pleased to send one of these, free of charge, to any motorist applying to them.

Internal Combustion Turbines.

Mr. R. W. Worby Beaumont has suggested that the R.A.C. in its capacity as a Society of Encouragement should countenance effort to produce, as an internal combustion motor, some useful analogue of the steam turbine, or motor of that order, doing work by means of one of those modes of combustion of fuel comprehensively known as internal combustion. Mr. Beaumont has repeated the suggestion made in March, 1912, when he wrote: "The time has gone by for trials of the kinds that formerly were so usefully organised and carried out by the R.A.C. for the development of the automobile, but I think the Club might now do important service by offering a prize for the best practically useful rotary or turbine oil or spirit engine satisfactorily applied to a motor vehicle and entered for trial under R.A.C. regulations in 1914 (now altered to 1915). I shall be pleased to help in the matter by a small contribution or by offering a challenge cup or plate."

This suggestion has been accepted by the Technical Committee of the R.A.C., which proposes that it be accepted by the Committee of the Club. It is not contended that there is at the present time any internal combustion motor that meets the requirements, but that invention, so far as it has progressed, offers sufficient inducement to expectations of success to make it desirable that the Club should offer encouragement in a direction which may result in automobile and aeromobile development, or may usefully direct inventive effort with that object.

Road Direction Post Competition.

A competition for designs for direction posts and plates is announced by the Organising Council of the International Road Congress, which is to be held in London next month. The Council invite competitors to submit drawings and models of various types of direction posts and plates with a view to obtaining the means of most effectually indicating the different routes at various junctions, both on rural and urban thoroughfares. In preparing suggestions it is necessary to study the best size, shape, and materials for the posts, also the style and colour of lettering and any information which in the opinion of the competitors the post should convey. Preference will be given to those competitors who design a direction post and plates that can be best adjusted to suit the varying conditions existing on the roads of this country; that can be cheaply manufactured and maintained, easily erected, soundly constructed, and visible at a sufficient distance. Prizes amounting to £35 will be awarded. Particulars may be obtained from the hon. secretary, Mr. W. Rees Jeffreys, Queen Anne's Chambers, London, S.W.

The Essex Motor Club has arranged to hold an open race meeting and gala day at Brooklands on May 24th. The car events are two open handicaps of three laps and two laps respectively, a cycle car open handicap, and several events confined to members only. Entries must reach the hon. secretary, Mr. H. Fuller, 51, Pulteney Road, South Woodford, Essex, by first post on Monday, 19th May.

An Outing on an Oakland Car.

A Short Trial of the 26 h.p. Four-cylinder Model.

AMONG the latest, but by no means the least interesting, cars to come to us from across the Atlantic are the 26 h.p. four-cylinder and the 40 h.p. six-cylinder Oaklands, cars of quality as may be realised by the prices. They enjoy a first class reputation on the other side, and if we may take a line through a short trial trip we made on a 26 h.p. model a few days ago that reputation will be well sustained on British soil.

In bonnet, radiator, and body this car is as un-American from a British point of view as it well can be. The fine-looking German silver chamfered V shaped radiator leads well into the bonnet, and the bonnet into the protective overhanging scuttle. Rearward the lines of the body are parallel, and the hood packs away very neatly and nearly flush.

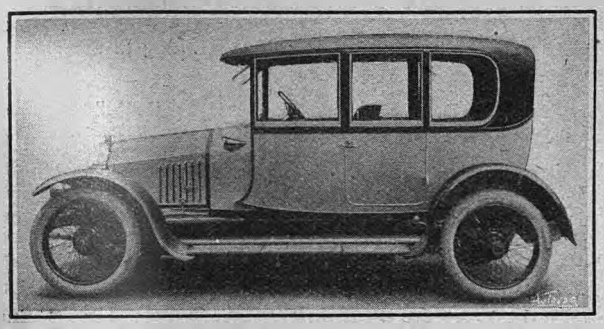
The cylinders are cast in pairs with valves on left, the engine having a bore of 105 mm. and stroke of 120 mm., giving plenty of power with soft and quiet running. An easily manipulated cone clutch transmits to a four-speed gear box, the gears of which are as nearly noiseless as may be. Springing is by semi-elliptical springs forward and threequarter elliptic behind, and these must have been specially fitted for English roads, for they took bad pot-holes as few, if any, native American cars which we have driven have hitherto done.

The engine, which we have already referred to as a soft and quiet-running motor, is, as may be imagined from its dimensions, thoroughly up to its work under all circumstances; indeed, with the four-seated body fully equipped and two heavy passengers there was nothing between London and Guildford which suggested even a falling off on the top speed. Robin Hood and Pains hills were taken as fast as was desirable with polite driving on less than half throttle. The acceleration synchronises with the throttle movement, and is particularly pleasing to a critical driver. The car is sold complete with Delco electric lighting system and self-starter, which operated most satisfactorily upon the occasion of each halt. The brakes, both of which are of the internally expanding order, take effect upon the back wheel drums, are very powerful, but quite smooth and progressive in action.

The car steers satisfactorily, and holds the road well at speed. The equipment is most complete. In addition to the Delco system of ignition, lighting and self-starting, with its five lamps, there is a Klaxon horn and full tool and tyre outfits. Also a very easily manipulated form of detachable rim which reduces tyre trouble to a minimum. At the price quoted there is no gainsaying the fact that the 26 h.p. four-cylinder Oakland is wonderful value for money. It is sold completely equipped at £400.

The St. Petersburg Motor Show.

Mr. W. G. Williams left London for St. Petersburg last Wednesday in the interests of the members of the Society of Motor Manufacturers and Traders to attend the St. Petersburg Automobile Show, which opens on the 18th inst. for a fortnight. Intending visitors to St. Petersburg should note that, although there is a daily service of trains between London and Berlin, there are only two fast trains each week between Berlin and St. Petersburg, and these trains leave at 7.30 a.m. on Thursdays and Sundays.



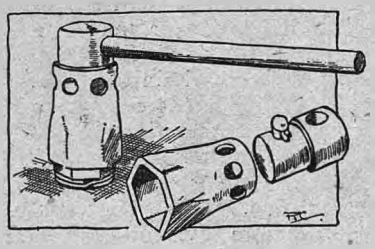
A 16-20 h.p. Vauxhall with saloon body which will be exhibited at the St. Petersburg Show.

The Austin Motor Co. are sending a representative exhibit, which will include a 20 h.p. Defiance, with streamline body, a 10 h.p. Clifton coupé to seat five persons, and the 20 h.p. chassis first exhibited at the Paris Show.

The prominent part that a 40 h.p. Defiance took in the competition for the Czar's Cup last year will be remembered. It won every hill-climb and speed test, and obtained maximum marks up to the penultimate stage, when owing to an accident due to a tyre bursting the car was put out of the competition.

A Ratchet Tubular Box Spanner.

A tubular box spanner is often indispensable to the motorist, particularly for dealing with such nuts as those which hold the cylinders down to the crank chamber. Unfortunately, in places where a tubular box spanner has to be used, there is but little room to swing the tommy bar, with the consequence that the spanner has to be removed and replaced frequently. This is obviated if a ratchet box spanner of the type illustrated be used. This particular construction, which is a very neat and simple one, is the invention of Mr. George Bedford, Gretna, Hugh Road, Stoke, Coventry. The box spanner itself is very short, and is provided with a ring of holes near the top of the circular part. In this part lies a circular stem which is engaged by the tommy bar, and the stem carries a bevelled spring-backed plunger, which springs outwards and drops into one of the holes, allowing the box spanner to be turned in one direction. When the tommy bar is moved in the opposite direction, the spring plunger clicks from one hole to another and acts as a pawl. To reverse the step-by-step movement, the stem is withdrawn and the small bevel plunger turned round so as to operate in the other direction.



With this arrangement a very good construction could be produced if there were two plungers working in the same hole and projecting on opposite sides and co-acting with an odd number of holes in the tubular part. The minimum effective angle of movement of the tommy bar then would be very small.

A.A. and M.U. Notes.

Communicated by the Secretary, The Automobile Association and Motor Union.

Whitcomb Street, Coventry Street, W.

Level Crossings.

Motor cyclist members occasionally report the existence of railway level crossings over which it is difficult to take their machines. Such complaints are always taken up by the Association. The gates at the old Leake Gatehouse crossing, Sibsey station, and High Ferry crossing (in Lincolnshire) are stated to be very difficult for motor cyclists, who find it almost impossible to get their machines through the gates without damaging them. This complaint has been forwarded by the Association to the railway company.

Unlighted Centre Tramway Pole.

As the central standards on the Wallsend-Heaton road constitute a serious danger to vehicular traffic, the Association has suggested to the Corporation that the danger could be minimised to a very great extent by fixing lights on the standards.

Dangerous Road Surface.

Owing to one side of the main road in Berkhampstead High Street being higher than the other, the camber of this road has a very downward slope, so that after rain cars running at speed are liable to skid. The Association has been in correspondence with the district road surveyor, but has been informed that improvement is impossible, and that chippings are always spread when the surface is slippery. Motorists are therefore advised to exercise care when using this road.

Misleading Speed Limit Signs.

The Association is at present in correspondence with the local authorities with regard to the misleading manner in which the speed limit posts at Malden Road and Collingwood Road (Chelmsford) have been painted. The notices appear on both sides, so that motorists leaving a ten-mile speed limit area may, if strangers to the district, go on for miles thinking that they are still within the limit.

At Witham (Essex), where a ten-mile speed limit is enforced, motorists were placed at a disadvantage owing to the absence of warning notices of the speed limit at the corners of certain roads leading on to the main road. This matter was brought by the Association before the attention of the county surveyor, who has since arranged to have warning signs placed in the side roads leading to the main roads, as suggested.

Latest Road Information.

CHESHIRE.—Northwich-Altrincham Road: At Lostock Gralam, 1½ miles from Northwich is under repair for the laying of pipes; lights shown at night. Stone setts being laid half width at Northwich; lights at night. Members are warned to slow through Altrincham and Northwich.

GREAT NORTH ROAD.—Remetalling two miles south of Potters Bar, half width for 100 yards, roller at work, clear at night. Water main being laid at Knebworth, half width, lights at night. Tarring in hand at Tempsford, clear at night. Buckden-Eaton Socon Road: Under repair and roller working near the 58th milestone, half width at the time. Under repair at Welwyn and Codicote. Remetalling four miles north of Grantham, full width, also North Parade, Grantham, full width. Members are warned to slow through Doncaster, as complaints have been made with regard to the speed of cars. Under repair two miles from Doncaster, clear at night. Under repair between Morpeth and Felton, full width, roller working, no lights shown.

LANCASHIRE.—Preston-Blackpool Road: Tarmac being laid half width between the 3rd and 4th milestones west of Preston, roller working, lights at night. Preston-Lytham Road: Full width under repair on Freckleton Marsh, roller at work, clear at night. Rough surface and frequent holes between Freckleton and Lytham. Blackpool-Poulton Road: Especial care is necessary through Poulton-le-Fylde and district. Preston-Garstang Road: Members are warned to drive with special caution between Withy Trees, Fulwood, and Broughton Village, also through Garstang. Preston-Wigan Road: In very rough state in many places between Bamber Bridge and Standish. Preston-Blackburn Road: Full width in bad condition on Brockholes Hill, two miles east of Preston. Preston-Liverpool Road: Control likely to be working between the Windmill and Tarlton Bridge.

YORKSHIRE.—Otley-Bradford Road: Repairs to main water supply west of Otley, threequarter width of road up; care is necessary, as the work is on a dangerous bend in the road. Leeds-Huddersfield Road: Remetalling and rolling, full width, between the 7th and 8th milestones from Leeds. York-Malton Road: Under repair, full width, between the 9th and 10th milestones from York; no lights at night.

COVENTRY ROAD.—In bad condition right through, owing to loose metal. Remetalling in progress on Hockliffe Hill; roller working; lights at night. Members are warned to slow through Redbourn, Fenny Stratford, and Stony Stratford.

TEWKESBURY-WORCESTER ROAD.—Sewer pipes being laid at Kempsey, between the 4th and 5th milestones, half width.

WOLVERHAMPTON-STOURBRIDGE ROAD.—Tarring at Penn, two miles south of Wolverhampton working towards Stourbridge.

LONDON-YARMOUTH ROAD.—Members are specially requested to stop and interrogate the patrols on the Colchester Road. Main road is entirely obstructed in South Lowestoft owing to tramway repairs, and members are advised to take the alternative route: Turn to right along Kensington Road, then left along Marine Parade, rejoining main road at Harbour Bridge.

LONDON-HARLOW ROAD.—Control likely to be working at Buckhurst Hill, near the 7th milestone.

ROYSTON-CAMBRIDGE ROAD.—Tarring in hand between Trumpington and Cambridge; also between Cambridge Cemetery and Quy Church on the Cambridge-Newmarket Road.

SHREWSBURY DISTRICT.—Welshpool Road: Remetalling full width between the 4th and 5th milestones from Shrewsbury. Hereford Road: Remetalling full width 3½ miles from Shrewsbury, will last about a month.

BATH ROAD.—Under repair between Theale and Thatcham, tarmac being laid full width. Members are warned to slow through Hounslow and Colnbrook. Repairs are in hand in Barkeley Avenue, Reading, for about 100 yards full width, clear at night. Control likely to be working in the Datchet ten-mile limit.

BRIGHTON ROAD.—Roller working between Kingswood and Reigate; between Reigate and Crawley; Redhill to Povey Cross; Horley to Balcombe Road; and between Redhill and Horley.

LONDON DISTRICT.—Controls are likely to be working at the following points: Between Lancaster Gate and Notting Hill Stations, flashlight; on entering Sutton; between Bedfont and Staines; Morden: Banstead; Purley; Putney High Street; between Putney Hill and the reservoir will be closed, alternative route second turning on right after passing the sentry box.

SOUTHAMPTON ROAD.—Under repair between Staines Bridge and Egham. Also between Bagshot Station and Bagshot; special care is necessary here. Basingstoke District: Road is still under repair at Oakley, on the Salisbury Road; loose metal left at night. Tarring in hand in Basingstoke, half width.

SURREY.—Reigate-Dorking Road: Control likely to be working in the ten-mile limit at Betchworth. Portsmouth Road: Flashlight control likely to be working between Kingston and Esher.

SUSSEX.—Control likely to be working in the ten-mile limit at Uckfield. It is intended to repair the main roads between the following points: Between Wych Cross and Chailey Cross Roads; Brighton and Lewes; Lewes-Polegate; Lewes-Hallands; Horsebridge-Horeham Road; Laughton Dicker; Newhaven-Rottingdean; Eastbourne-Hailsham Friars Gate-Groombridge; Robertsbridge-Hurst Green Beckley-Peasmarsh.

Royal Automobile Club Trials.

Traffic Tests of a Globe Car.

TRAFFIC tests of a Globe car were conducted on April 10th and 17th, and certificates of performance have been issued. The first of these is as follows:

Particulars of Car.—Bore and stroke of engine, 105 mm. × 120 mm.; number of cylinders, 1; weight of car—front axle 4 cwts. 3 qrs. 5 lbs., back axle 5 cwts. 2 qrs. 6 lbs., total weight 10⅓ cwts. approximately; weight of load, 2 cwts. 2 qrs. 17 lbs.; total running weight, 13 cwt.; type of body, two-seater; gear ratio on top gear, 4 to 1; size of wheels, 700 mm.; country of origin, England (French engine); weather, rain, roads greasy

Description of Trial.—The route followed was between Russell Court, St. James's, and Bow Bridge, E., *viâ* Pall Mall, Cockspur Street, Trafalgar Square, Strand, Fleet Street, Ludgate Hill, St. Paul's Churchyard, Cannon Street, Queen Victoria Street, Mansion House, Lombard Street, Fenchurch Street, Aldgate, Whitechapel Road, Mile End Road, and Bow Road. The length of the double journey was 11.6 miles.

The trial was started at 8 a.m., and ended at 1.3 p.m., the total distance covered being 45.4 miles.

There were voluntary stops of 6m., and in addition fifty-eight stops for traffic, totalling 2⅞m. 36s.

The average speed (running time only) was 8.3 m.p.h. The car was started and driven upon top gear only. After the luncheon stop it was found impossible to restart the engine, and the car was withdrawn from trial. On subsequently dismantling the engine the exhaust valve stem was found to be sticky in its guide.

Second test over the same route:

The trial started at 7.50 a.m., and ended at 5.40 p.m., the total distance covered being 79.0 miles.

There were voluntary stops of 1h. 50m. for lunch, etc., in addition to 112 stops for traffic, totalling 39m. 46s.

The average speed (running time only) was 10.7 m.p.h.

The car was started and driven upon top gear only.

The "Favorit" Carburetter.

A road trial of a "Favorit" carburetter was conducted on April 15th, the fuel used being benzole, and the following certificate of performance has been issued:

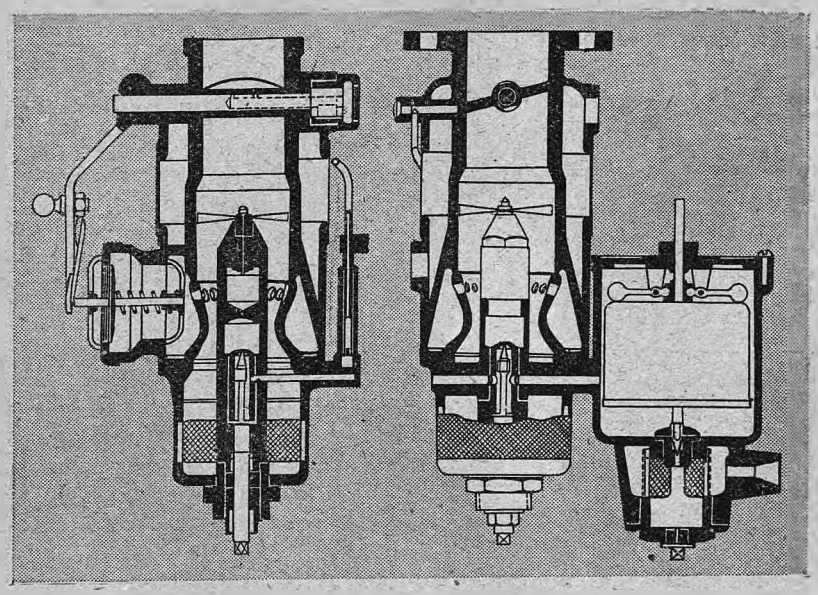
Description of Carburetter.—The carburetter is of the usual form, with float chamber and mixing chamber. There are two sources of fuel supply to the engine: *(a)* The usual central jet (which is adjustable by a taper needle); and *(b)* a bypass entering the induction pipe at the point at which the lip of the butterfly throttle touches. Provision is made whereby an air valve is opened progressively as the throttle is opened. In addition, air is admitted to the engine through the throttle spindle when the throttle is completely closed and the engine is not firing.

Description of Trial.—The carburetter was fitted to a 28-35 h.p. (22.4 R.A.C. rating) Benz car. The carburetter was warmed by the engine-cooling water. The particulars of the car were as follows: Engine (four cylinders), 95 mm. × 140 mm.; volume of the compression space of a cylinder, 296 c.c.; volume swept by the piston, 991 c.c.; compression ratio, 4.3; weight of car, 3,770 lbs. (33¾ cwts. approx.); weight of car and load as run 4,495 lbs. (40 cwts. approx.); gear ratio on top gear, 3.25 to 1; size of wheels, 880 mm.; wind area of body, 14.0 square feet; country of origin, Germany.

The weather was fine and roads good. The route traversed was London, Ewell, Reigate, Westerham, Crawley, Horsham, Weybridge, the distance being 106 miles. On two occasions the engine was stopped accidentally, once when letting in the clutch and once when starting on a hill after having come to rest when changing to first speed. The average speed throughout the trial (running time only) was 19.3 m.p.h. The fuel consumed (benzole) was 3.87 gallons, being a consumption of 27.38 m.p.g., or 54.94 ton-miles per gallon. The following is the result of a distillation test of the benzole used:

First drop distilled at	...	...	75° C.
10 per cent.	,,	...	84.5° C.
20 ,,	,,	...	85° C.
30 ,,	,,	...	86° C.
40 ,,	,,	...	87° C.
50 ,,	,,	...	88° C.
60 ,,	,,	...	89° C.
70 ,,	,,	...	91.5° C.
80 ,,	,,	...	94.5° C.
90 ,,	,,	...	103.5° C.

The specific gravity of the fuel, which was 0.873 at 15.5° C., may indicate the presence of an extremely small quantity of petrol, so small as probably to be caused by imperfect draining of the tanks and pipes prior to the filling up with the benzole.



Two sectional views of the "Favorit" carburetter.

A second series of tests was made with benzole and petrol respectively on Brooklands track, from April 7th to 12th.

After tests 1 to 7 the carburetter was adjusted and the valves of the engine ground in. No adjustment or alteration was made between the tests in which benzole was used and those in which petrol was used.

SUMMARY OF TESTS.

No. of test.	Fuel used.	Speed, m.p.h.	Consumption. m.p.g.	ton miles per gal.
1	Benzole	13.17	19.5	36.4
2	,,	18.85	19.5	36.4
3	,,	25.99	18.77	35.03
4	,,	31.41	17.55	32.75
5	,,	38.45	17.55	32.75
6	,,	44.02	17.55	32.75
7	,,	48.79 (maximum)	15.59	29.09
(The carburetter was then adjusted.)				
8	Benzole	13.35	33.40	62.34
9	,,	19.31	30.44	56.82
10	,,	25.10	28.63	53.44
11	,,	31.12	26.52	49.51
12	,,	37.17	21.67	40.44
(Higher speeds were not attempted by the entrant.)				
13.	Petrol	13.53	26.57	49.60
14	,,	19.21	25.30	47.22
15	,,	25.21	23.93	44.67
16	,,	32.01	22.36	41.74
17	,,	36.45	20.68	38.60
(Higher speeds were not attempted by the enfrant.)				

Note.—The speeds are average speeds, but were kept as constant as possible during each test.

The Lancashire A.C. Hill-climb.

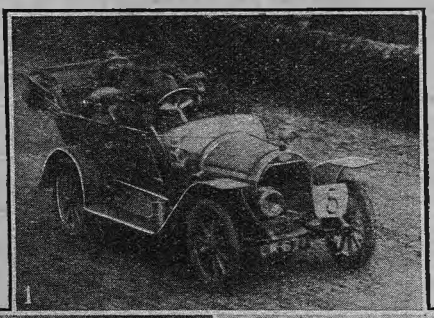
Run Off at Rivington Pike in a Deluge of Rain.

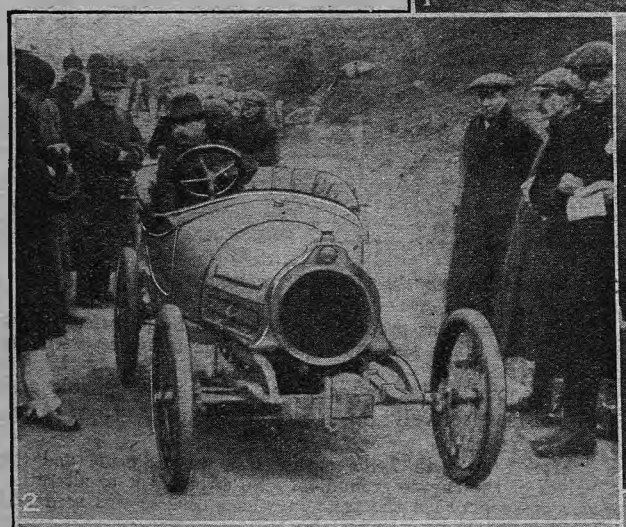
THE annual hill-climb of the Lancashire A.C. took place on Saturday last. A large number of entries had been received, especially in the open event, but the proceedings were entirely spoilt from the spectators' point of view by the weather. Rain commenced to fall prior to the start of the first car to be sent up the hill, and continued for the rest of the day, gaining in intensity, until in the open event the drivers were almost blinded and the surface of the hill was rendered extremely dangerous by its greasy condition.

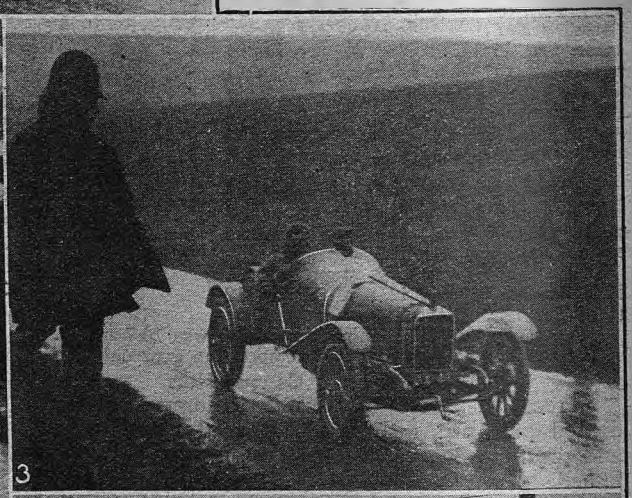
The competition was divided into two closed classes for amateur members of the L.A.C., a cycle car class, and four open classes. There were twelve entries in the closed class for four-seaters; this was won on formula by Mr. F. Stansfield on the 10-16 h.p. Stoewer, who took the silver cup presented by Mr. G. E. Baxter for the best performance, his handicap result being 2.831. The fastest time was made by Mr. E. Hoyle's 25 h.p. Napier, better known as the 4in. Hutton. The next class—closed, for two-seaters only—brought three entries, the best on formula being Mr. H. P. Forshaw's 10 h.p. Stoewer, and the fastest time Mr. J. H. Brereton's 15 h.p. Straker-Squire. In the open cycle car class the 10-12 h.p. Calthorpe of Mr. G. W. Hands made the fastest time, and was also first on formula; Mr. W. M. Cunningham's 8 h.p. "Little Midland" was second, and Mr. C. Inglefield's 8 h.p. Enfield third.

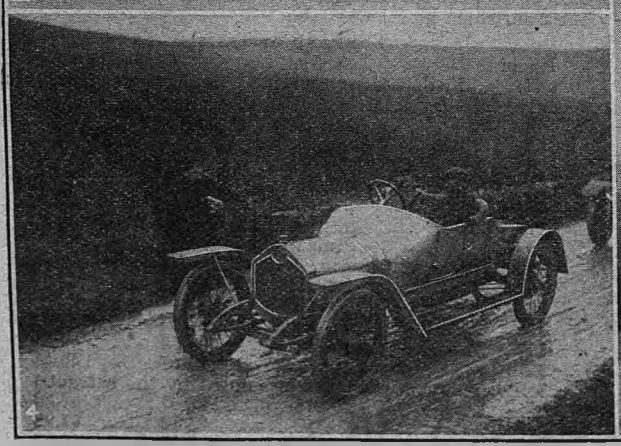
An interval was then taken for lunch, which was served in a marquee close to the road. The pouring rain almost drowned the strains of the band which had been provided for the occasion.

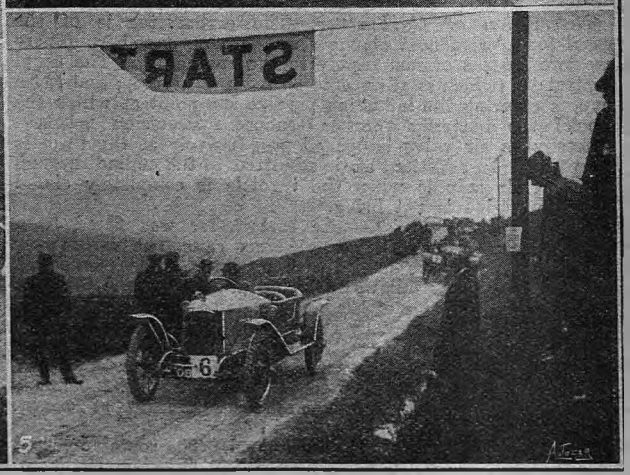
The open event attracted twenty-seven entries, and included many well-known drivers and cars; the weather conditions, however, were such that many of the fast cars were not "let out,"











Some prize winners at the Lancashire A.C. hill-climb at Rivington Pike. 1. G. W. Greenwood's 10 h.p. Stoewer, first on formula in the small class of the open event. 2. Mr. G. W. Hands on the Calthorpe cycle car, winner of the cycle car event. 3. Mr. L. Coatalen on the Sunbeam, finishing. 4. Mr. W. M. Letts's 15 h.p. Crossley, driven by C. Bianchi. 5. Mr. J. Higginson's Vauxhall, which made fastest time of the day.

the drivers easing at several of the bends owing to the treacherous surfaces, thus destroying any chance of record time. Mr. J. Higginson, however, on his new Vauxhall (only delivered to him the previous evening), made a sensational ascent, and in the 47⅕ seconds that he took for the hill the spectators had a series of thrills. He went up alone, and, the car being light, skidded on the series of bends in an alarming manner. His time was by many seconds the best of the day. The second fastest time was acomplished by C. Bianchi on the 15 h.p. Crossley; he had one bad skid on the second bend, but recovered smartly and made a good ascent. Other cars which made fast climbs were: A. C. Whitney's 14 h.p. Humber, W. G. Tuck driving; W. Paddon, 27 h.p. Benz; E. Genna, 12-16 h.p. Sunbeam; L. Coatalen, 12-16 h.p. Sunbeam; T. Hoyle, 25 h.p. Napier; G. W. Hands, 12-15 h.p. Calthorpe; J. S. Cordingley, 11.9 h.p. Arrol-Johnston.

Four silver cups, each of the value of £10 10s., were given for the cars doing the best performance on formula in the respective sections of cylinder capacity, and were awarded as follows:

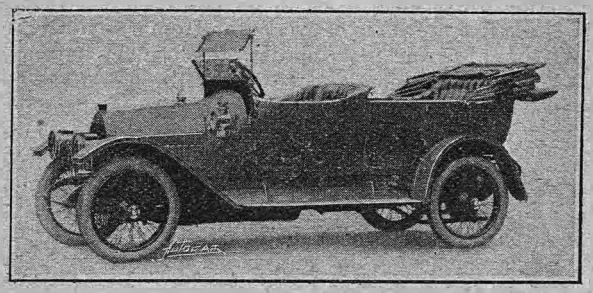
The Lancashire A.C. Hill-climb.

SECTION 1 (maximum capacity in c.c. 1,639).—G. W. Greenwood, 10 h.p. Stoewer, 2.08.

SECTION 2 (maximum 2,458, minimum 1,640).—W. M. Letts, 15 h.p. Crossley, driver C. Bianchi, 2.409.

SECTION 3 (maximum 3,769, minimum 2,459).—A. Fillingham, 20 h.p. Vauxhall, 2.2044.

SECTION 4 (maximum unlimited, minimum 3,770).—L. Coatalen, 16-20 h.p. Sunbeam, 1.63.



The 15-30 h.p. Stoewer car which has a four-cylinder engine with a bore and stroke of 80 × 120 mm.

Searle Unburstable Air Tubes on Trial.

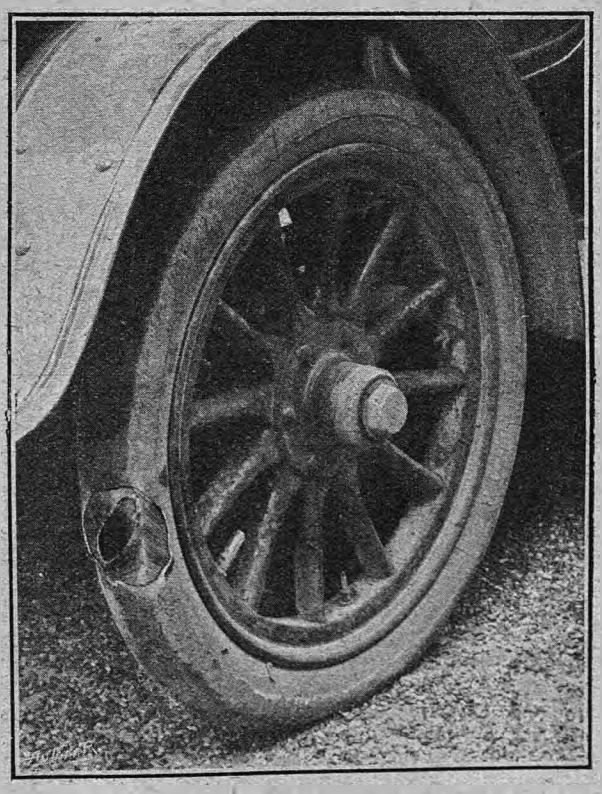
London to Brighton and Back on Derelict Tyre Covers.

THE Searle Unburstable tube has already proved itself satisfactorily by dint of a severe trial under the auspices of the Royal Automobile Club, so that the tests to which it was subjected on Friday of last week seemed to us to be somewhat redundant. But as Messrs. Hall and Searle, Ltd., seemed anxious intimately to demonstrate the capabilities of their tube to a score or so of motor journalists, the opportunity was afforded them on the near side wheels of a dozen 15 h.p. Napier Gamage-Bell taxicabs, in which the party of writers with certain representatives of the firm travelled from the Motor Club in Coventry Street, London, W., to the Royal York Hotel at Brighton for this purpose.

The order to the Gamage-Bell Co. was to mount a discarded cover on the near side driving wheel of each cab, over a Searle Unburstable tube, but we fancy that those concerned with the trial could hardly have been quite conversant with the point of destruction to which motor cab tyres are run before they are finally scrapped. A more shocking lot of covers we have never seen, and with ordinary tubes within them we should have esteemed it a marvel if any one of the vehicles so tyred had travelled even so far as Croydon.

All the covers were worn down to the last layer of fabric in many places, and all of them had one or more holes through which the bare tube could be seen. Loose stones were encountered on several stretches of the Brighton Road, which accounted for the failure of six of the tubes, which were not burst but actually punctured. Half a dozen of the cabs, however, made the out and home journey of 104 miles without any stop for tyre troubles, a thing absolutely impossible from the start had ordinary tubes been fitted. Of the three which were punctured on the return journey, that in which the writer travelled reached just short of Reigate, entering which town the tyre on the Stepney gave up the ghost, solely, to our mind, because the driver did not pump it up sufficiently when he put it on. The proof of this was the fact that the tyre had crept in the rim and torn out the valve.

The peculiar features embodied in the construction of the Searle Unburstable air tube are too well known to our readers to need description here (they have been dealt with on previous occasions), but it is certain that the central circumferential rubber ridge in which the interlining fabric is caused to take a downward bend is at the root of the success of this type of tube.



One of the tyres used for the demonstration of the Searle Unburstable air tubes.

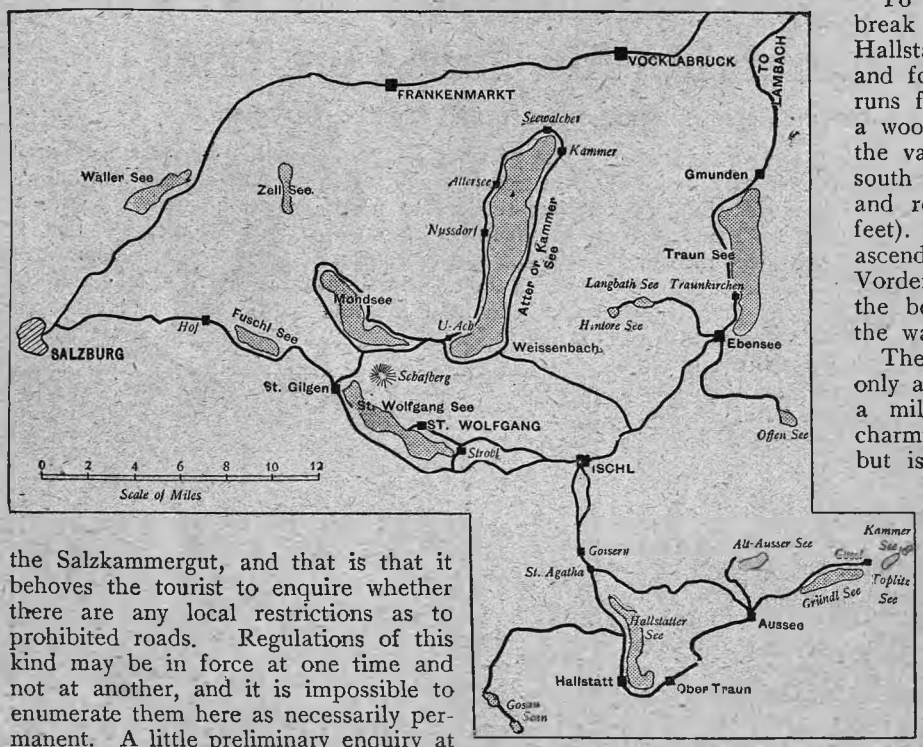
In the Salzkammergut. II.*

Bad Ischl as a Centre. The Hallstatter, Gosau, and other Lakes. The Road to Gmunden.

By Chas. L. Freeston, F.R.G.S., Author of "The High-roads of the Alps," "The Passes of the Pyrenees," etc.

SO far we have considered the lakes to the west and north-west of Bad Ischl, but the resources of the district are as yet very far from reaching the limit of available possibilities. Before embarking, therefore, on the continuance of the through route to Vienna we may take in review the very attractive cluster to the south which is made up by the Hallstatter See, the Gosau Seen, the Altausser See, the Gründl See, the Toplitz See, and the tiny Kammer See; the latter is not to be confounded, of course, with the expansive lake north of Weissenbach which has already been dealt with, and which is more generally known as the Atter See.

Only one drawback needs to be mentioned in connection with a systematic exploration of the lakes of the Salzkammergut, and that is that it behoves the tourist to enquire whether there are any local restrictions as to prohibited roads. Regulations of this kind may be in force at one time and not at another, and it is impossible to enumerate them here as necessarily permanent. A little preliminary enquiry at Bad Ischl, however, before starting may save trouble and disappointment.



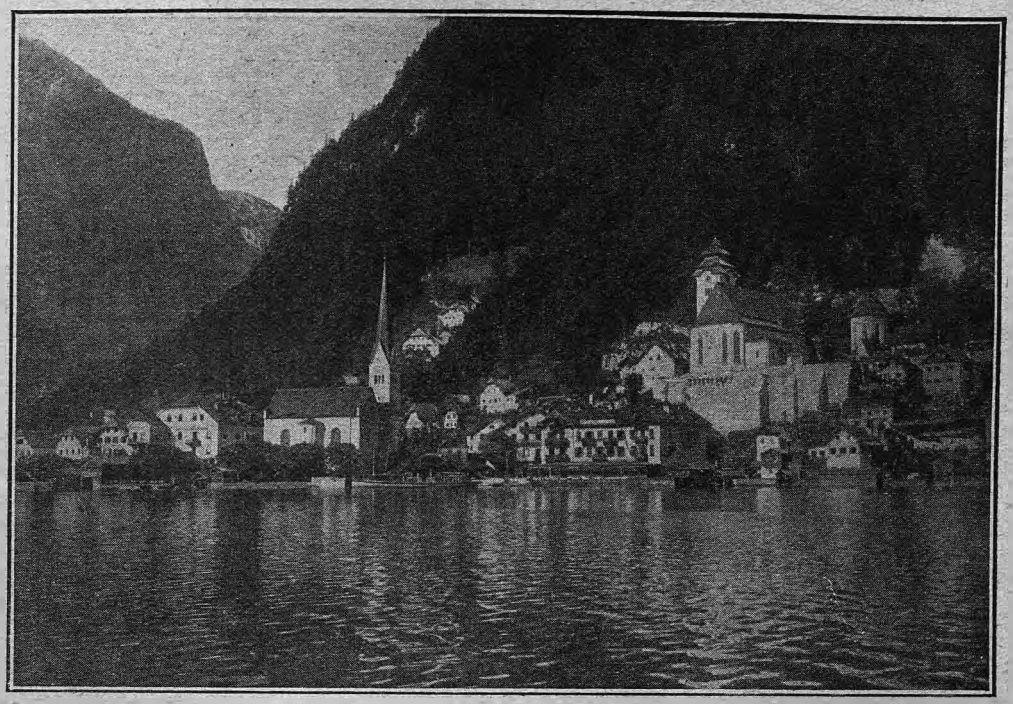
In the first instance a visit to the Hallstatter See may be recommended. The distance to the foot of the lake is only 13 kilometres, while the village of Hallstatt itself is 8 kilometres further on. The lake is five miles in length, and like all save the very small lakes of the Salzkammergut, it is in nowise circular in form, its greatest width being two miles. If the road between Gosaumühle, halfway up the lake, and Hallstatt be closed to cars the rest of the journey may be undertaken by steamer; there is no road on the east bank, which is occupied by the railway. The lake is enclosed on three sides by the Plassen, Krippenstein, Sarstein, and other lofty mountains, while Hallstatt itself lies in a sequestered nook at the base of a thickly wooded hillside, the space between which and the edge of the water is packed with small but picturesque buildings, chief among which is the parish church. Above its doorway are mural paintings of the Crucifixion, with carvings at the sides of the porch. The church commands a view of the Château of Grub, on the opposite side of the lake.

West of the Hallstatter See are the delightful little Gosau Seen, the road towards which is not marked on any but the most modern maps beyond the village of Gosau itself. I mention this fact because a fine large-scale map of the Salzkammergut is obtainable in Salzburg, very useful in many respects, but not quite up-to-date. In addition to omitting the continuation of the road beyond Gosau it ignores a new road from Hallstatt to Ober Traun, which we shall come to later.

To reach the Gosau lakes we break off from the bank of the Hallstatter See at Gosaumühle, and follow the Gosaubach, which runs for 10½ kilometres through a wooded ravine until, at Gosau, the valley widens. Here we turn south for another five kilometres and reach Gosau-Schmied (2,540 feet). From here a footpath ascends some 440 feet to the Vordere Gosau See (2,980 feet), the beauty of which well repays the walk through the wood.

The bright green lake, which is only a mile long and a quarter of a mile broad, has not only a charming environment of woods, but is dominated by the impressive Dachstein with its twin glaciers, and the picture which is presented to the eye, whether from the bank of the lake or from a rowing boat, is one of sublime beauty. Even more striking, however, is the little Hintore Gosau See, which stands a thousand feet higher than the Vordere lake, but involves a steep walk of two hours ere its grandeurs can be attained and admired. It need hardly be remarked that this excursion to the Gosau lakes is one for the lover of wildly remote beauties rather than the tourist who measures his enjoyment by the distances he may cover and the speed at which he may travel.

Below Hallstatt, as previously mentioned, a road runs round the end of the lake to Ober Traun, whence one may follow the valley of the Traun to Aussee (2,079 feet), in Styria, a favourite watering place from which three lakes may be visited. The Altausser See, lying about 250 feet higher than the town, is reached by a wood-bordered road in four kilometres, or fourteen from Hallstatt, and is two miles long by half a mile in breadth. Numerous attractive pedestrian excursions enhance the popularity of the lake itself, among them being one to the ruined castle of



Hallstatt, on the Hallstatter See.

Pflintsberg, with an adjoining waterfall. The Grand Duke of Luxembourg has a villa in the neighbourhood of the lake.

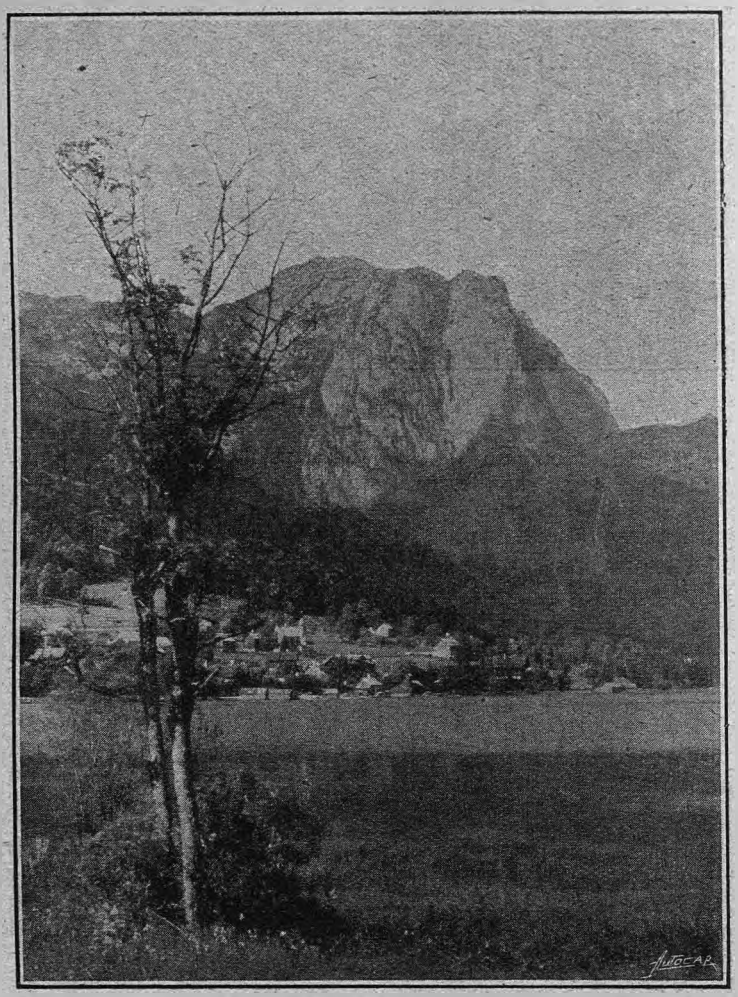
The Gründl See lies to the north-west of Aussee, and is reached in four kilometres, the road then following the north bank of the lake to its head at Gössl, 11½ kilometres in all. The lake lies at practically the same height as the Altausser See, and is surrounded by wooded mountains, above which rise the striking precipices of the Todte Gebirge ("Dead Mountain"). A tiny steamer flits to and fro, and, as the lake is but 3¾ miles in length and half a mile broad, its voyages are not particularly formidable. As with the Vordere Gosau See, a little pedestrian exercise leads one from the Gründl See to a smaller lake, one mile distant. This is the Toplitz See, which is 1¼ miles in length, and in its turn it all but joins on to the little Kammer See, at the foot of the Todte Gebirge. These little lakes are most romantically situated, and no one need regret the necessity for leaving the car and walking to them.

The Gosau See, with the Dachstein peaks beyond.

In the Salzkammergut, II.

From Aussee there is no need to retrace one's wheel tracks to Hallstatt, as a road leads across to St. Agatha and Goisern, and thence to Bad Ischl, in twenty-eight kilometres; careful driving, however, is required at various points owing to the windings and undulations. At Potschenhöhe, half way between Aussee and St. Agatha, the road rises to 3,222 feet.

It may be interesting at this juncture to indicate the extent to which the Salzkammergut district is served by railways, in case the tourist may prefer, in certain cases, to run out to a particular lake by train and leave his car at Bad Ischl or elsewhere as his base. As a matter of fact, however, the road traveller has a much wider range of opportunities than the railway passenger. There is a line from Salzburg to Ischl, by way of Mondsee, St. Gilgen, and Strobl, and there is also the rack and pinion line, mentioned last week, from St. Wolfgang to the Schafberg summit, with a connection between St. Wolfgang and Bad Ischl. The first-named, however, only touches a portion of the left bank of the Mond See, while the right bank can only be traversed by road; hence the ordinary traveller is dependent upon the steamboat for a full exploration of the lake. There is no railway on either side of the Atter See, nor even an approach to it from the south; an electric line, however, connects the steamboat service at See, at the western end of the Mond See, with Unterach at the foot of the Atter See. Beyond this the only railway route to the latter is one from Vocklabruck, on the main line between Salzburg and Vienna, and Kammer, at the northern end of the lake.



The Grundl See.

From Bad Ischl there is a railway to the Hallstatter See, the station of Hallstatt being on the opposite side of the lake from the village itself. This line is continued to Aussee, but the Altausser See and the Gründl See must then be reached by omnibus or carriage, as from Aussee the line goes off to the south-east for Mitterndorf. The only other railway route from Bad Ischl is the one to Ebensee and Gmunden, but though it runs near the lake at times the road is nearer still, while the railway station is a mile above the town and lake. A steamboat excursion is therefore essential to the train traveller.

We may now consider the continuation of the through route by road from Salzburg to Vienna, by way of Bad Ischl. Before leaving the last-named town, however, the tourist may usefully visit the Imperial Villa, if the Emperor be not in residence; the Kalvarienberg, above the town; the Sophien Doppelblick, for the sake of the view; the Hohenzollern waterfall; and, above all, the salt-mine. The road runs in seven kilometres to Pernegg, or Perneck, and from there a walk of twenty-five minutes brings one to the mine, the exploration of which takes about an hour and a half, and is a very interesting experience. If a further ascent of a thousand feet be not objected to, a fine view-point may be attained by following a path to the Hüttenack Alp (4,185 feet), the panorama from which includes the Hallstatter See, the glorious Dachstein, and other peaks.

The road from Bad Ischl to Ebensee, at the foot of the Traun See, is good throughout, and in parts quite first-class. Once the way out of Ischl has been found there is no difficulty as to direction, for the river adjoins the route throughout, while any additional indications which may be necessary are furnished by boards erected by the Oesterreichischer Automobil Club. At the fork to Mitter Weissenbach already mentioned, on the trip to the Mond See and the Atter See, we keep, of course, straight on, and reach Ebensee in another 11½ kilometres, or 16½ kilometres from Bad Ischl.

Ebensee of itself lies picturesquely enough at the foot of the Traun See, but is spoiled by the smoke from the chimneys of an ammonia factory. There are also salt works and a watch factory here, so that Ebensee is a busy place. Just outside the town a level crossing may cause delay, but when the gates have been opened one may easily race the train and leave it standing.

Before proceeding further north two side excursions of interest would be available, to the Langbath lakes and the Offen See respectively, but the road to the former is at present prohibited to motor vehicles. It

branches off to the west, and in nine kilometres reaches, by way of the Langbath Thal, the Vordere Langbath See (2,215 feet), from which one may walk to the even more beautiful Obere or Hintere See (2,385 feet). This is the third occasion, as will have been realised, on which there is no road between two nearly contiguous lakes. There is no question, however, as to the desirability of visiting the Obere See, for it lies most picturesquely beneath well-wooded banks, above which towers the noble Höllen Gebirge. I can only express the hope that the—in this rare case unnecessary — restriction against motor cars may speedily be with drawn.

The road to the Offen See (2,135 feet) lies in the opposite direction, and involves a journey of fourteen kilometres, passing through the Traunweissenbach Thal and the Offenseebach Thal in succession. At the foot of the lake, which is dominated by the Todte Gebirge, stands the Kaiserlicher Jagd Schloss, or imperial hunting seat. The Offen See is the last of the small, but essentially charming, minor lakes of the Salzkammergut to be noticed, but we have still to consider the most important of the larger lakes —the Traun See.

The front of the parish church at Hallsta't, with a view of the Chateau of Grub.

Beyond Ebensee the road winds along the lake side, but the railway dives into a tunnel nearly a mile in length. Care is required as far as Traunkirchen owing to a variety of circumstances. The road is bordered on the left by rocks, and winds considerably. When nearing Traunkirchen, moreover, one passes through a series of rock tunnels in quick

Traunkirchen on the Traun See.

In the Salzkammergut, II.

succession. The first three are magnificent avalanche galleries of unique construction, as they have on the outer side a substantial parapet from which straight pillars are carried up to the roof. The next tunnel is somewhat dangerous to approach from either side. Then comes the Franz Josef tunnel, beyond which we enter Traunkirchen, beautifully situated on a peninsula running into the lake. The surface of the road hither has occasionally been quite good, but with variations of width and quality alike.

In the middle of Traunkirchen the road suddenly swings up a sharp, steep bend to the left, and brings into view the fine pinnacle of the Erlakogel mountain. The remainder of the road is on the flat and, provided one is in no mood to hurry, it offers a very agreeable run. There are windings, of course, and further variations of width and surface, with one stage between hedgerows. The first time I passed this way, early in June, I found some amount of loose metal, but on returning three weeks later I met a steam roller at work. The driver, by the way, not only steered out of the way as much as possible, but greeted us with a courteous bow.

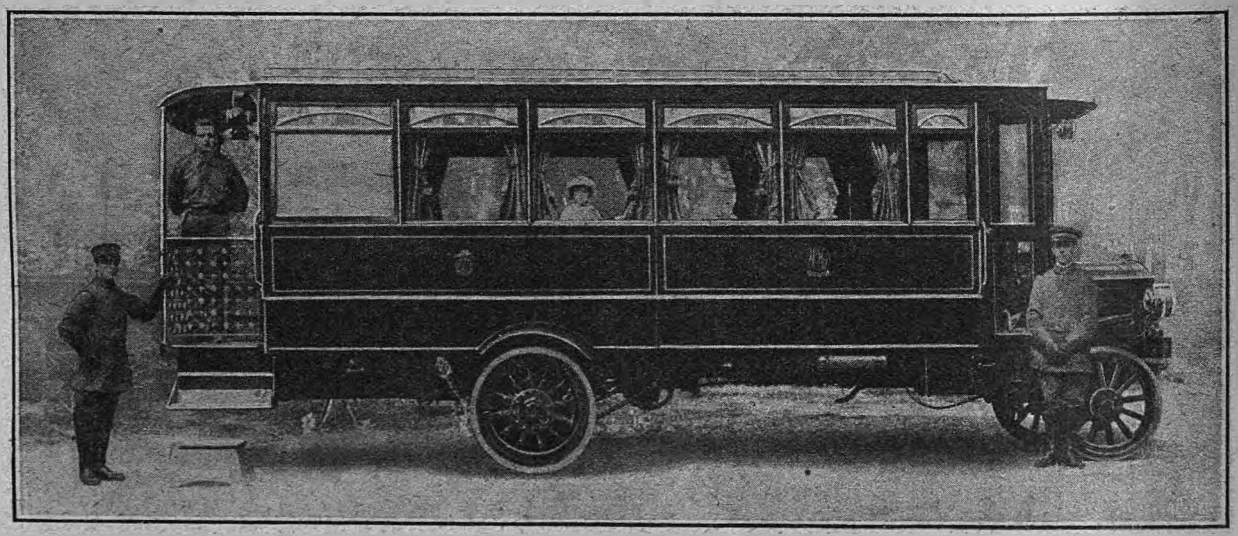
As one nears Gmunden one finds the villas that are the inevitable accompaniment of a lakeside town of appreciable size, and include one belonging to the Duke of Wurtemburg. The road gradually edges away from the bank, but eventually returns to the lake and crosses it by a bridge at Gmunden. The retrospective view from this point is charming, while the town itself is brightly picturesque, with many attractive buildings. Its importance is sufficiently indicated by the fact that it is the capital of the Salzkammergut, and it is here that the Duke of Cumberland has a splendid château, while another royal resident is the Queen of Hanover. Of pleasant walks and minor ascents to favourite points of view there are many, and Gmunden vies with Bad Ischl as a suitable place for a stay. The lake measures seven and a half miles in length, and has regular steamboat services; on the east bank there is an esplanade extending for several kilometres, but it is not carried through to Ebensee.

The distance between Ebensee and Gmunden, I may add, is only seventeen kilometres, and the "kilometrage" of the entire Salzkammergut is the reverse of formidable. The amount of space I have thought necessary to devote to this delectable region, however, is by no means proportionate to its inherent attractions, and I can only recommend every motoring tourist to drive thither at the earliest opportunity if he covets the opportunity of enjoying a particularly pleasant holiday. He will find many more interesting features than I have found practicable to detail in two short articles, especially if he be prepared to saunter occasionally afoot, and will have realised ere the conclusion of his explorations that no district in Europe of the same degree of beauty has received so small a measure of attention at the hands of visitors and authors alike.

A Residence on Wheels.

WHAT might be described as a residence on wheels is the touring car built by a Canadian motor enthusiast, which has sleeping quarters for eleven persons, a kitchenette with lockers for food and dishes, a complete equipment of electric lights, telephones and call bells, an observation platform, a lavatory, and everything one would expect in a modern flat except a lift and a roof garden. The furnishings are exceedingly luxurious, being of solid mahogany, green plush, silk hangings, and green velvet carpet. The car is 25ft. 3in. long, 6ft. 6in. wide, and 9ft. 6in. high, with an interior height to ceiling of 6ft. 6in. The interior is divided into two state rooms each six feet square; a chauffeur's quarters in front, with sleeping accommodation, while in the rear of the car are the kitchen, lavatory, and a large observation platform.

This car was designed by a nineteen year old boy, Henri Dandurand, of Montreal, whose father is President of the Comet Motor Co., of that city. The body was built according to young Dandurand's specifications by a local builder upon a Packard three-ton lorry chassis, and is intended for long-distance touring. Every detail is thought out to provide safety as well as comfort. For instance, the lighting is by gas, oil, and electricity, so that no ordinary accident will leave the car in darkness. A complete outfit is carried for the repair of the car, and an outfit for the reinforcement of weak bridges. In many respects the exterior of the car resembles a railway coach.



Springs.

A paper read before the Institution of Automobile Engineers on Wednesday last, by Mr. G. H. Baillie.

MOTOR car springs have received less attention from those who talk and write than any other part of the car. The author does not know whether those who do things have been equally neglectful, but they have been remarkably silent about what they have done. A hunt through the automobile literature has shown practically nothing of interest, apart from the question of the qualities of steel suitable for springs. An examination of the practice in cars now on the market shows that, with two or three exceptions, all springs are to the same pattern, neglecting differences too subtle for the ordinary observer. The most notable exception is due to the man who has introduced more novelties into motor cars than anyone else, and, unlike most other novelists, has introduced successful novelties.

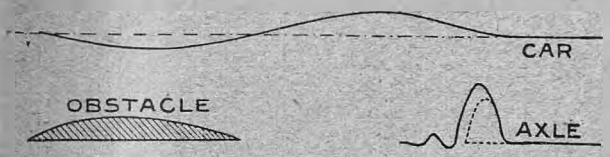


Fig. 1.

The author was first induced to commence investigations on the subject of springs by owning a car which was peculiarly uncomfortable to ride in. The next impulse towards an endeavour to find out something about springs was the rage for auxiliary springs and shock absorbers. At the present time it is rare to see a car without a fitment of this kind, a fitment not belonging to the car but stuck on to it. Now, unless it is assumed that the utility of all these things is entirely imaginary, their existence is a grave reflection on chassis builders; it means that the makers have not done their best in springing the chassis, and have left room for improvement, and if any improvement can be effected by an owner by casually putting on the first contraption he sees advertised, it means that the room for improvement must be very large.

Some makers certainly have given a great deal of thought to their springs, and the results can be felt in their cars, but the author knows others, and he believes their number to be large, who do not give the springs anything approaching the attention they deserve. Now that cars have given up breaking down, the author considers that their springing is the most important feature. It is only necessary to run for a few hundred miles over a flat, dull, and bumpy road on the Continent to realise how much the pleasure of the trip depends on the springs.

And something more than comfort depends on it. The author believes that tyres are more affected by the action of the springs than by anything else, both as regards wear and bursting.

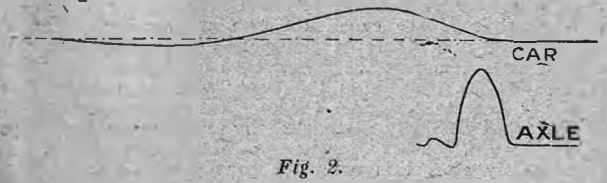


Fig. 2.

He started by constructing a model car to one-eighth linear scale, having wheels with solid rubber tyres. For convenience, he made the road move under the car, the road consisting of a strip of webbing twelve feet long passing round a motor pulley and an idle pulley. The webbing ran over a board where the car rested on it. After trying a front and back wheel, he discarded the front wheel and retained only a single wheel on the end of an axle pivoted some way back, so that the wheel had an approximately vertical motion.

Fig. 10 shows the arrangement of the model and its equipment after the second wheel had been removed.

To the axle was fixed the lower leaf of a double elliptical spring made of two single pieces of clock spring, the upper leaf being fixed to a framework and also pivoted some way back.

The framework, which represented the spring portion of the car, had provision for carrying load. Pencils were fitted to the car and to the axle and recorded on a moving strip of paper.

Obstacles of different kinds were attached to the road, and frictional devices were attached between the axle and the car.

Figs. 1 and 2 show two sample records, the obstacle being a bent piece of thin steel of the actual shape shown. According to the linear scale of the car, the obstacle would be two inches high to a full size car.

It will be noticed that the wheel jumped above the obstacle in each case and came to ground beyond the obstacle, and the shape of the obstacle appeared to make no appreciable difference unless its slope was very gentle.

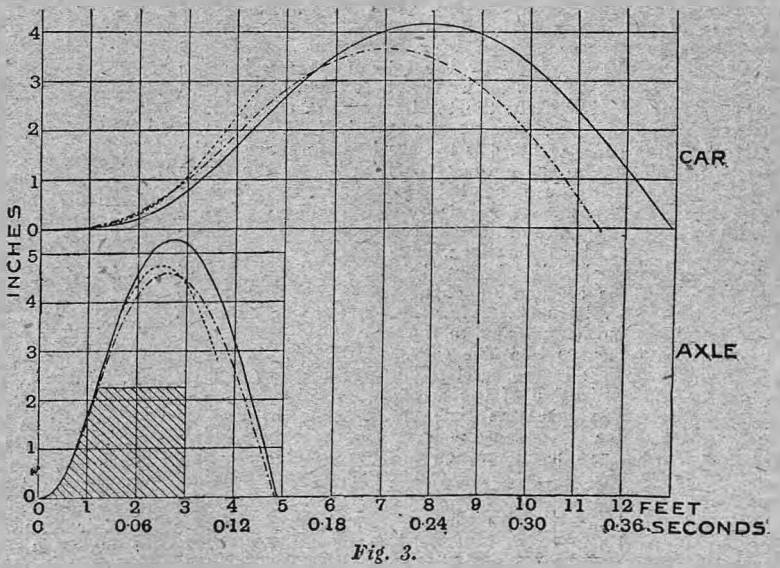


Fig. 3.

It will also be noticed that the wheel reaches the top of its path before the car has moved appreciably, and by the time it has returned to level ground the car has completed only some 40% of its upward path.

In fig. 1 no friction was introduced to damp the oscillations, the amount of damping being actually about the same as that which exists in an ordinary leaf spring. In fig. 2, in which the track speed was about double, friction was introduced, and the damping effect is very noticeable in the rebound of the car.

Now, examination of a considerable number of records, without friction, with constant friction, and with friction increasing with the amplitude, showed no appreciable difference in the first half oscillation of the car, and in this respect the model car was most disappointing. It became clear, in fact, that the difference lay in the initial movement of the car, while the axle was rising, and, in the model records, this part of the curves was on too small a scale to admit of accurate examination.

The author then reckoned out the motions of the axle and the car on meeting an obstacle, making certain assumptions in respect to the obstacle to circumvent the difficulties which arise while the tyre is "drinking the obstacle." The resulting curves are, as far as comparison is possible, of the same type as those given by the model, and this leads him to hope that the calculated curves do show what actually happens.

Fig. 3 shows in full line curves the motions of the axle and the car with no friction, and it may be noted how

Springs.

closely the curves agree with those from the model.

The assumption made in regard to the obstacle was that it was of a shape to give a constant pressure on the tyre, and the pressure assumed was that required to flatten the tyre till 40 sq. in. of tyre with 85 lbs. air pressure were in contact with the obstacle. This is approximately what happens with a large section tyre. The obstacle is 2½in. high and the tyre is in contact with it for 14½in. The author assumed a car with 750 lbs. sprung weight per back wheel and 250 lbs. unsprung weight, including the weight of the spring, a spring deflecting 1in. per 200 lbs., and a velocity of 22½ miles per hour

It had to be assumed that the tyre left the top edge of the obstacle suddenly, and released the pressure suddenly, but this point does not show any break of continuity on the curves in fig. 3. The abscissæ of the curves are feet of travel of the car and the ordinates inches of rise. It has been assumed that there is no rebound of the axle from the road.

Now, the path of the car, as shown in the curves, is not really of much importance. So long as the maximum movement does not pass the limit reluctantly allowed by the coachbuilder, a large swing causes no discomfort merely because it is large. In crossing a humped bridge at just the right speed, there is often a very big swing with a gentle switchback movement and no sign of a jerk.

The measure of the jerk given by an obstacle is undoubtedly the change in the acceleration. A rapid acceleration in itself gives no jerk, it merely increases or diminishes the pressure between the body and the seat. It is only the change in this pressure that gives discomfort. The measure of the jerk can only be expressed by the amount of change in the acceleration in a finite time. It is not necessarily measured merely by the rate of change, because the rate may continue only for a very short time, and though the rate may be very high, the total amount of change may be very small and may give no appreciable jerk.

The full line curve in fig. 4 is the acceleration curve of the car, corresponding to the curve of path in fig. 3, the curve being plotted from the calculated figures, and not deduced from the curve of path. In this figure the abscissæ are feet of travel as before and the ordinates accelerations, those above zero being upward accelerations. The maximum upward acceleration is reached just before the axle reaches the top of its path, and the acceleration changes sign just before the axle returns to level ground. After this point the car executes free harmonic motion up and to the end of its travel, and the acceleration curve is a sine curve.

Now, the change in the acceleration over a given time is given by the inclination of the acceleration curve, and the steeper the curve over this time the greater the rate of acceleration. The steepest point on the curve considered is marked A, where the inclination is 32 ordinate per unit abscissa. This, then, is the measure of the jerk given by the motion. A curve drawn for a hollow instead of an obstacle shows considerably higher accelerations.

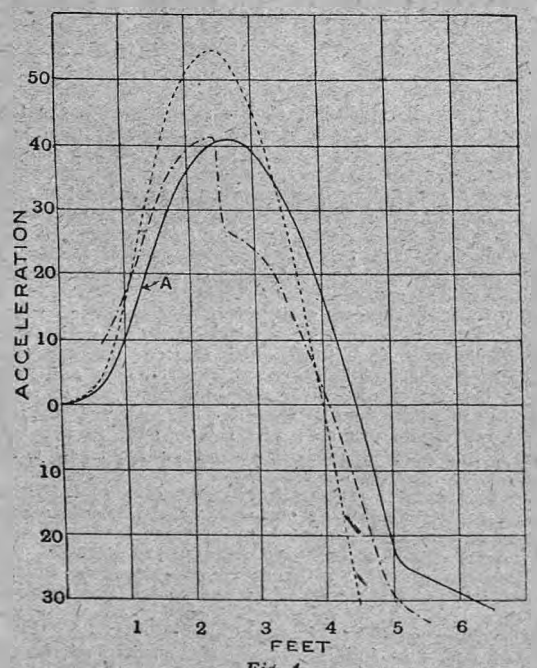


Fig. 4.

The broken line curves in figs. 3 and 4 are corresponding curves to the full line curves, with the one difference that the strength of the spring is 300 lb. per in. instead of 200 lb. The whole movement is over sooner, but otherwise there is little difference to be seen in the curves of path. Turning, however, to the acceleration curve, this, at the corresponding point, is markedly steeper. The maximum inclination is 48 ordinate per unit abscissa, or 50% more than with the weaker spring. The inclination is in the same proportion as the strength of the spring, and this clearly shows the importance of having a spring no stronger than is necessary.

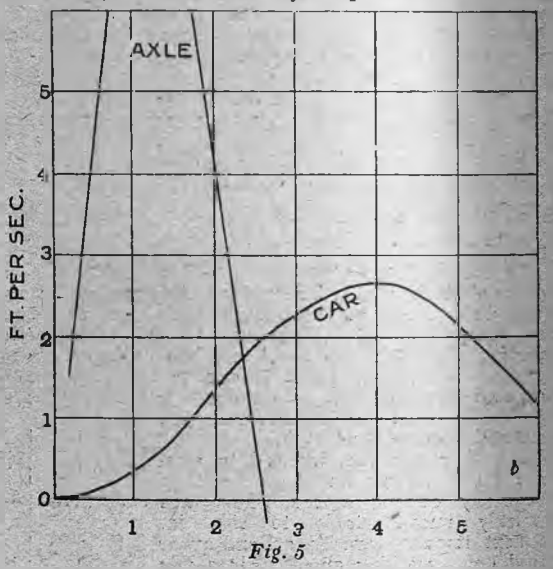


Fig. 5

The dot and dash curves in figs. 3 and 4 correspond to the full line curve, with the single difference that friction has been assumed to exist in the relative motion of car and axle. The friction has been assumed constant and equal to a force of 170 lbs. To give an idea of what this means in practice, it may be said that the friction in an ordinary seven-leaf spring tested by the author was, when clean and well greased, about 50 lbs., and when rusty about 85 lbs., these values being obtained by measuring the decrements, which were 1.24 and 1.45 respectively. Now, the author does not know what friction shock absorbers are supposed to give. After a few months on a car the friction is generally negligible, but when new he presumes they have a fair amount. The frictional force of 170 lbs. he has assumed is not, therefore, out of the way for a spring in average condition fitted with a shock absorber.

The curves of path are not very different from those without friction, but the acceleration curves differ markedly. Fig. 5 shows the corresponding curves of velocity of axle and car, the former rising to 9.5ft. per sec. off the diagram, and it may be noted that up to a distance of 2.34ft. the axle is rising at a greater speed than the car. During this interval, therefore, the friction device (whether merely the spring leaves or a special shock absorber) is being worked in one and the same direction, and the direction is such that the frictional force tends to push the car upwards, and therefore acts with the spring pressure in accelerating the upward motion of the car. At the moment the velocities of car and axle are equal, the two are moving up as a single body, and there is no motion between them, no movement to compress the spring, and no movement of the friction device. There is then only the pressure of the spring tending to accelerate the car, and the acceleration is at this point suddenly diminished by that due to the force of 170 lbs., which is 9 in the case of a mass of 750 lbs. Immediately after this point the car begins to rise faster than the axle, and the movement of the friction device is in the opposite direction, and the acceleration due to it is also in the opposite direction, that is to say, it tends to retard the rise of the car. Thus in a very short period of time, during which the acceleration of the car due to the spring pressure is sensibly constant, the acceleration due to the friction device falls from plus 9 to zero and then to minus 9, a total change of 18 in an acceleration of 41½. The change shown on the acceleration curve

between 2.4 and 2.6ft. is 14.7, and the change per unit abscissa is enormously higher than at any other point of the path.

The author believes that it is this change of acceleration due to friction which causes the jerk which is felt, and not the change due to the increasing spring pressure. If this view be correct, the all-important thing is to diminish the friction as far as possible.

The author has drawn out a curve to show the effect of the progressive friction generally arranged for in shock absorbers, that is to say, friction which increases as the deflection of the spring increases from the normal. The curves of path hardly differ at all from those with constant friction, but the acceleration curve shows higher accelerations and higher changes of acceleration. This is because the progressive friction assumed was such as to represent the same total amount of work done in friction over the deflection given, as in the case of the constant friction of 170 lbs.; the friction, therefore, at the point of maximum acceleration has a much higher value. The effect, then, of progressive friction as compared with constant friction is to increase the jerk for large deflections and to diminish it for quite small deflections when the friction is small.

While on the subject of friction, the author would like to call attention to what appears to be a remarkable inconsistency in ordinary practice. It has generally been held that friction in a spring is to be avoided. The driver is advised to keep the spring leaves well greased, and there is a special tool on the market for opening the leaves to enable this to be done. It is said to be of advantage for the spring in its normal condition to be nearly flat, and the author has always supposed that the object of this was to diminish friction, because the motion of the leaves over one another is a minimum for deflections from the flat condition. On the other hand, there are a large number of devices on the market for introducing friction, and some makers fit them as standard to their cars.

The inconsistency may, perhaps, be explained by saying that the friction devices do not introduce sensible friction for small deflections, and merely serve to prevent excessive deflections by damping out the rebound from one deflection, so that the effect of successive obstacles is not cumulative.

This, however, is not altogether a satisfactory reply, because, to be effective in damping out the rebound, the friction must be considerable, even for a moderate deflection. All that can be said is that if, by the use of a friction device, a weaker spring can be employed than would be the case without a friction device, this gives some advantage to compensate for the disadvantage of the friction. One thing is nevertheless clear, namely, that, given a car sold by the maker without a friction device and with a spring of suitable strength, it must be bad to fit it with a friction device and

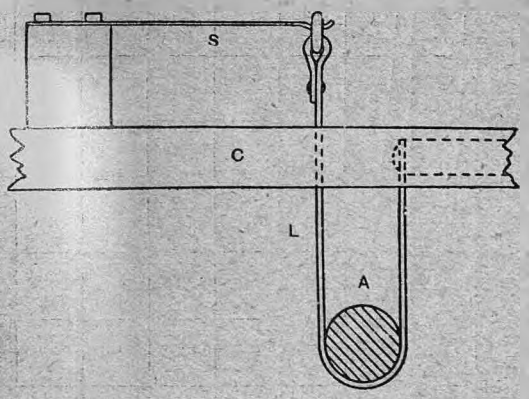


Fig. 6.

leave the spring unaltered. If the spring is not too weak, its rebounds will not be excessive, and the attempt to diminish them by adding a friction device does not, therefore, give any appreciable advantage to compensate for the disadvantage of the friction.

The conclusion come to by the author is, then, that friction devices of the kinds mentioned, namely, those which give constant friction or friction increasing with the deflection, are bad.

There are, however, two other kinds of friction device, to which this conclusion does not apply. First comes the fluid friction device, which has been put on the market in many forms. This gives friction varying as the square of the velocity, so that when the velocity is very small, the friction is negligible, while the friction becomes large only when the velocity is high, that is, only when the car gives a very big swing. Such a friction device will not cause any jerk as the velocity of the car upwards exceeds that of the axle, and therefore avoids the chief objection to friction devices. It also becomes rapidly more effective just as it becomes more needed, that is, as the swing increases, and it should be possible to employ a weaker spring, and trust to the friction device to keep the maximum deflection within proper limits.

The fluid friction device, then, appears to be an excellent thing, and the only trouble about it is that, as far as the

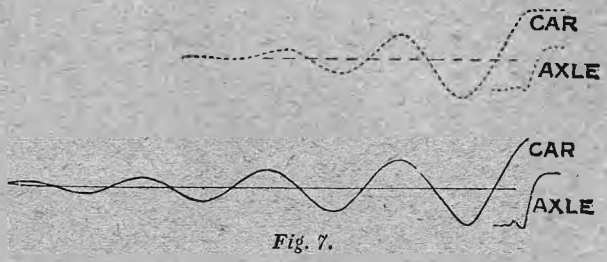


Fig. 7.

author knows, it will not work in practice. The viscosity or internal friction of liquids, which is nearly the same as their friction in passing through a small orifice, rises so rapidly with the temperature that the friction acquires widely different values according to whether the car has been standing or has been running over a bumpy road. The only two liquids the author has heard of as being used are oil and glycerine. The viscosity of glycerine at 26° C. is one-fifth of what it is at 8° C. As the temperature would rise above 26° C. after the shock absorber had done very little work, it is evident that a glycerine-filled device cannot be of any use. Oil is much worse because it freezes solid, and the shock absorber promptly breaks on starting out. The ineptitude of selecting the two substances which show exceptionally large variations of viscosity with temperature is quite remarkable. Mercury would be the best liquid, but its viscosity is only about one-four-thousandth part of that of glycerine. The author knows of no other substance with a sufficiently low temperature coefficient except liquid CO_2, which would be troublesome in use.

A liquid friction device with mercury as the liquid would be quite practicable, and might be of considerable advantage, provided always that both it and the spring were designed together.

The other kind of friction device is that which comes into action only on the rebound. The author's assistant, Mr. Gregory, designed a very ingenious form of this, which he fitted on the model car. It is shown in fig. 6, in which A is the axle, C the car, and L a leather strip fixed to the car at one end, passing under the axle and hanging at the other end on a spring S, fixed to the car. In the normal position of the spring, the leather band is quite free, the spring S exerting no force on it. Therefore, for any compression of the spring from its normal position no friction is introduced. On the rebound, however, as the axle passes beyond its normal position, it comes against the leather band, which rubs round it with pressure increasing with the rebound deflection.

Fig. 7 shows two graphs of the model car fitted with this device taken with the road stationary, merely by dropping the car through 15/16in. The lower graph represents the undamped swings, the upper graph shows the result obtained with the leather band.

Fig. 8 shows two graphs taken with the road running and with three obstacles at equal distances, the speed being adjusted to make the effect of the obstacles cumulative. As before, the lower graph represents the undamped swings and the upper graph the effect of the leather band.

In the case of the undamped swings, the road was too short, so that the swings had not died out before the first obstacle was under the wheel again. The effect of the leather band in diminishing the swings is very marked.

The author has seen a device advertised, called by the opprobrious name of a "Rebound Snubber." The illustration shows a leather band in a flat spiral, and it may act in a similar way to Mr. Gregory's device. The author hopes to find out its action between the writing and reading of this paper.

The objection to this form of device is that it may be good for a hump in the road, but it must be extremely bad for a hollow. The kind of friction device that is wanted

Springs.

is one that comes into action only after the first big deflection in either direction, but there would be little chance of its working if it were ever designed.

The author will now mention some tests made on a motor car spring which was very kindly lent to him by the Wolseley Company. It was a light spring, deflecting 1in. with about 135 lb., and was 49in. long and had seven leaves. This was hung by its ends on two long shackles, and a platform was hung from its centre to take weights. Weights up to

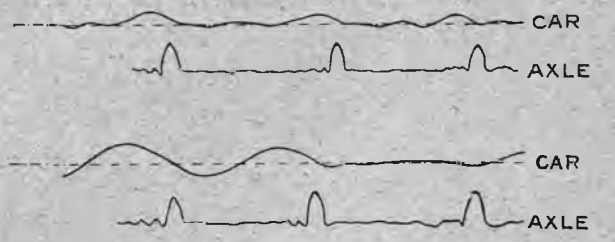


Fig. 8.

690 lb. deflected the spring till it was nearly flat, the height above the chord being only 16 mm. A pencil attached to the centre of the spring recorded on a drum. The spring was made to oscillate by hand, and at the moment the hand was removed the pencil was put in contact with the drum upon which the records were taken.

For the first tests the spring was cleaned and well greased, and then the grease was thoroughly cleaned off and strong sal ammoniac put between the leaves, with the result that in a day the spring was as rusty as the ordinary motor car spring generally is. The author apologises to the Wolseley Co. for requiting their kindness in this brutal way.

From the graphs obtained, the decrement was measured as the ratio of one half-oscillation to the next half-oscillation. The ratio of the positive amplitude to the negative was not taken because the zero position, owing to friction, was not quite definite. Fig. 9 shows curves plotted from a number of records, the abscissæ being the total amplitude, plus to minus, of the first half-oscillation from which the decrement (ordinates) was reckoned. It is rather remarkable how rapidly the decrement increases as the oscillations get small.

To gain an idea of what the decrement means in friction, the average frictional force over a swing was calculated by equating the loss of energy in the system over a whole oscillation to the work done by the movement of the centre of the spring. The frictional force so calculated would be that in a friction device attached to the centre of the spring if the spring itself were without friction. The second scale of ordinates gives this force in lbs. The difference between the two conditions of the same spring is very striking, especially when it is remembered that the deflections are small ones in a nearly flat spring. Thus, for a total swing of 24 mm. the frictional force is 100 lbs. in the lubricated spring and 175 in the rusty one. For a larger swing of 54 mm. they are 46 and 83 lbs. respectively.

It would be interesting to ascertain the difference in friction between a flat spring and a highly cambered spring, but it would mean the construction of a number of different springs. The author took a number of graphs with a weight of about 380 lbs. with which the height of the chord was 80 mm. instead of 16 mm. with 690 lbs. The resulting curve is of the same shape as those in fig. 9, but the decrements are lower. For a swing of 30 mm., with lubricated spring, the decrements are 1.253 and 1.420 for 380 and 690 lbs respectively. He does not think, though, that any deduction can be made from these results to give an indication of the difference in friction due to camber only.

It would be easy to calculate the difference in the relative motion of the leaves over one another for different cambers, but it is doubtful whether the friction could be taken as being proportional to the movement, bearing in mind the shape of the curves in fig. 9.

The spring was also tried with a J.M. shock absorber consisting merely of a pair of helical springs put in place of one pair of shackles. These auxiliary springs had no apparent effect on the main spring, the frequency remaining the same. The auxiliary springs oscillated in unison with the main spring, and the result was merely that the total oscillation was increased by the amplitude of the auxiliary springs. The range of compression of these springs from normal is only about 1in., so that they have the effect of weakening the spring by 10 to 15%. If a car spring fitted after delivery with one of these is not then too weak, it shows that the maker had made an error in fitting too strong a spring to the car.

There is, however, one important point to be considered in connection with these auxiliary springs. The helical spring is practically without friction, and its use gives a means of reducing the friction in leaf springs. Leaf springs are, of course, necessary because there is no other type which is so convenient and which forms so good a means of attaching the frame to the axle. They give the small amount of elasticity in restraining side movement which is, the author feels sure, of great advantage. It may be, however, that a stronger leaf spring with an auxiliary helical spring is better than a leaf spring of equivalent strength, because the friction of the combination is less, and also because the frictionless helical spring may lessen the jerk due to friction. The author has fitted these auxiliary springs to his own car and has found the springing distinctly improved, but how much of the improvement is due to the weaker spring combination and how much to lessened friction he is not prepared to say. If there is, as he believes, an advantage in the lessened friction, credit is due to the Daimler Co. for introducing the combination as a standard. The author has been speaking of auxiliary springs as being nearly frictionless, but he does not suggest in any way that all the fanciful forms of them on the market are frictionless. They can, however, as in the Daimler form, be made nearly frictionless.

Turning now to springs in general, the essential data which have to be settled in a spring are the maximum deflection which the chassis will admit and the maximum load to be assumed, which must be some multiple of the weight of the car. These two fix the strength of the spring. Therefore, the weight being fixed, the larger the maximum deflection which can be allowed, the weaker the spring can be. There is no question but that the weaker a spring is the more comfortable the car is, and there is little doubt but that the weaker a spring is the better it is, taking everything into consideration. In saying this, the liability to roll must, of course, be taken into consideration in settling the maximum load to be allowed, and an allowance must be made for the springs to sag. The strength of the spring for a given car is best expressed by the frequency of oscillation of the spring which =

$$1/2\pi \cdot \sqrt{p/M} \text{ per sec. or } 0.9 \cdot \sqrt{P/DW}$$

where p is the force of the spring per foot deflection and P the maximum load for the maximum deflection D, and M and W the mass and weight of the car respectively. The lowest frequency the author has measured on a car is 76 per min. unloaded, and it was a very comfortable car to ride in. A frequency of 100 is more usual. Anything above 100 begins to get very uncomfortable, and he regards 100 as the upper limit for a spring with a normal load on the car. The frequency of a car can easily be measured with a watch by standing on the footboard and dancing up and down till a large swing is obtained. It can be obtained only by dancing

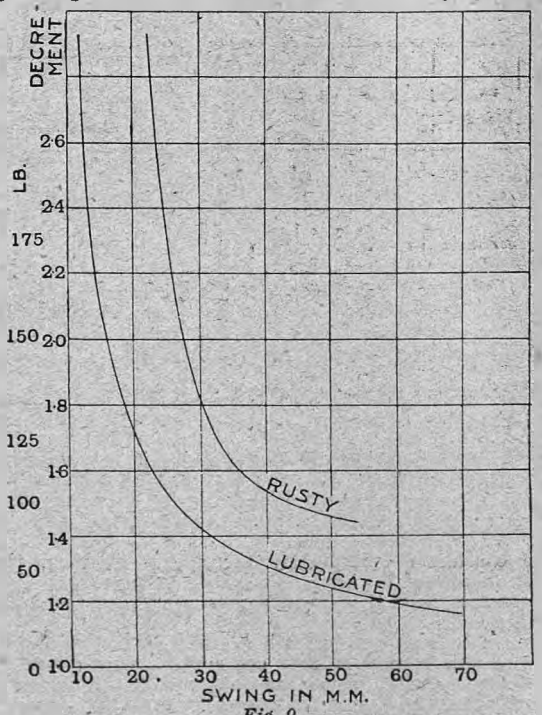


Fig. 9.

in unison; forced vibrations by dancing out of unison cannot be made of large amplitude.

Apart from questions of friction, the comfort of a car may be said to depend on the distance between axle and frame and between wheel and wing, that is, on the possible deflection of the springs. This distance has a comparatively small limit, though the possible distance which the chassis construction would allow is frequently diminished by trivial details. If the maximum distance possible with a reasonable chassis construction has been allowed, improvement in springing can only be obtained by providing a spring with a larger deflection for the maximum load than the car will allow, and fitting some device to prevent a deflection occurring which would bump the axle. The simplest form of such device is the rubber buffer, and the author attaches great value to this, and thinks that makers would do well to fit it as a standard, or anyhow to provide means for fitting it. It is, of course, equivalent to a strong spring which adds itself to the leaf spring when a certain deflection is passed, and a metal spring might with advantage be substituted for it. Properly, a similar buffer or spring should be fitted to prevent excessive deflection in the opposite direction. Devices of this kind seem to flourish more in France than in this country. The advantage of this type of device is that it is normally out of action and does not interfere with the proper working of the spring. It comes into action only on rare occasions, and it is of no consequence if it then causes a bad jerk. A fluid frictional device seems the only good alternative.

The author designed another device of which he was for a time very proud. It was an addition to the ordinary spring such that the combination gave a force increasing more rapidly than in proportion to the deflection. He thought that this would have the effect of a very strong spring for deflections approaching the limit, and a very weak spring for ordinary deflections. The calculation of the acceleration curve, however, shattered his hopes, showing that it was no better than a spring with a straight line law.

Friction should be diminished as far as possible, and with this object the author thinks that spiral springs might be used more than they are, to take a portion of the load. Spiral springs have another great advantage over leaf springs. To show this a few facts about springs are given which are to be found in text-books but which are not widely known. Once the essential data for a spring—maximum load P, and maximum deflection D—are fixed, the volume of metal of the spring is at once determined, and is very different in leaf and in spiral springs. The store of energy in the spring when at its maximum deflection is $\frac{1}{2}$PD, and this is termed the total "resilience" of the spring. "Resilience," it may be said, is a word more misused even than "strain." Now, the resilience per unit volume is a fixed quantity for any particular kind of spring and metal. In a leaf spring, properly constructed so that there is the maximum stress in each section, and in a spiral spring subjected to torque only, the resilience per unit volume is f/6E inch-pounds, where f is the working tensile strength of the material and E Young's modulus. That of a spiral spring of round wire subjected to axial loads is f/4G, where f is the working sheer strength and G is the modulus of rigidity. The highest resilience per unit volume is given by a spiral spring of thin circular tube and is f/2G. Taking the following values for hardened cast steel: f=85,000, E=30,000,000, G=13,000,000, the resiliences per unit volume of metal are as follows—

For leaf springs	40
For spiral springs of round wire	139
For spiral springs of thin tube	278

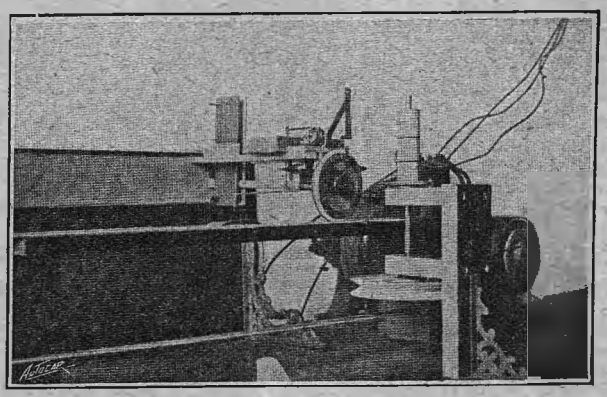


Fig. 10.

Calling the resilience per unit volume R, the volume and therefore the weight of the spring must be PD/2R. A leaf spring, therefore, for the same duty, must weigh 3.7 times as much as a spiral spring. Since the weight of motor car springs is considerable and is mostly unsprung, the lightness of spiral springs is an important point.

The author would have liked to have been able to carry out a series of tests on an actual car on the road, and so obtain some results on which to base a paper more worthy to rank with the valuable contributions to which our Institution has become accustomed, but there are more difficulties in the way of such tests than appear at first sight. He can only hope that the few facts he has put forward and the excess of theory based on them may prove of some use in calling attention to a much neglected subject.

Dangerous Road Opening in Notts.

Flagmen Needed to Direct Traffic through a Long Single Track.

WHEN driving from Nottingham on the Alfreton road last week-end we found an extremely dangerous state of affairs, as far as the road is concerned, on the last half-mile or so approaching Nuthall. For approximately the distance mentioned, two-thirds of the roadway was rendered useless to traffic by the laying of tramlines, a gaping pit of 10in. to a foot in depth having been opened up near the centre of the road, the traffic passing only on one side. This of itself is nothing unusual; the objectionable and dangerous state of affairs was due to the fact that, at any rate when we passed that way, there were no flagmen or warnings of any kind to control the traffic. The result was that after running behind a motor lorry for two-thirds of the distance we were brought to a full stop by the lorry meeting three heavy vans drawn by two and three horses each. Fortunately, where we stopped there was a wide footpath and a sloping way to a gate, so we lost no time in getting on to the path. But the lorry was not so fortunate, and had either to reverse some fifty yards to an opening—which naturally was not attempted with only 12in. to 15in. to spare from a yawning pit on one side—or else to climb the kerb. The latter was attempted, and after many failures the two front wheels and one back wheel were driven on to the footpath. The horsed vans then scraped past, one of them catching the projecting corner of the lorry and dragging it back four or five feet. After about fifteen minutes delay we got through. At Nuthall, where the road opening ended, were two policemen enjoying a chat at the road diversion there. When we suggested that they would be better occupied directing and controlling the traffic, we were informed that they could not be in two places at once! Maybe they had received no instructions, so perhaps one can hardly blame them, but surely it should be someone's business to see that the traffic is controlled. What would have happened after dark, had the incident we have described occurred then, we can only vaguely imagine; it was dangerous enough in the daylight, and only the skill of the various drivers prevented much damage. Who is responsible? Surely the county surveyor or the police should see that the safety of the public is considered.

Correspondence.

EDITORIAL NOTICES.—No letters from members of the motor industry will be published when they deal with subjects which may be regarded as advertisements for the writers, or their business interests. At the same time as many of the most practical suggestions come from those engaged in the motor industry, their letters will be inserted when possible, though the names of the firms they represent may be expunged, and the initials of the writers substituted.

Letters of a personal nature will be withheld.

The Editor, although accepting no responsibility for the opinions expressed by correspondents, reserves the right to publish a portion of a letter, and to omit any part which he does not consider interesting or essential.

All communications under a *nom de plume* should be accompanied by the name and address of the writer, not necessarily for publication, but to assure the Editor as to good faith.

Enquirers who ask for the experiences of private owners with specified cars, parts, or accessories, are requested to enclose a stamped addressed envelope, so that replies which space will not permit us to publish may be forwarded to them. Circulars or letters from interested parties will not be forwarded.

THE DEL MONTE PROCESS.

[19510.]—Surely your correspondent "W." [letter No. 19488] is somewhat hasty in accepting Mr. Alex E. Tucker's article on the del Monte process as sufficient to condemn it, for he obviously cannot have studied the opinions and reports of others, which have appeared in the pages of your contemporaries.

"W." appears very solicitous for the welfare of the shareholders in the company which is now dealing with this process, but I think perhaps if he was, like me, a speculator (or should I not, in view of recent events, say an investor?) in this invention, that he would be better informed of the general opinion regarding it. I, also, happen to have discussed this process with well known practical men, whose knowledge of the coal and oil industries make their opinions of value, and I am pleased to say that they regard it with favour.

I have carefully read Mr. Tucker's article, and I think it would assist those of us who have been anxiously awaiting a solution of the petrol problem better to appreciate this gentleman's opinion and the value of his information, if Mr. Tucker had explained to your readers on what practical grounds he bases his "facts" and assumptions.

I do not wish to belittle Mr. Tucker's authority as a F.I.C., but I cannot refrain from taking exception to his complete disregard of the reports made upon the del Monte plants at Redditch and Barnes by such practical chemists as Mr. Bertram Blount and Mr. W. J. A. Butterfield, both of them men of high standing in their profession. Both of these gentlemen obtained results which "fully justified every claim of the inventors." These are undisputable "facts."

I think it would have been wiser if Mr. Tucker had obtained practical experience of the process by means of a proper test before recording his opinion and venturing to give information on a process of the practical working of which he evidently has no knowledge. At any rate, I am happy to inform "W." that I am, for the present, a well contented

SHAREHOLDER.

WORM GEAR CHALLENGE.

[19511.]—My attention has been called to the letter of Messrs. David Brown and Sons, Ltd., on the subject of the above. I believe the Daimler Co. have done all that they can be reasonably asked to do in the way of giving facilities to Messrs. David Brown and Sons to make good their assertions in the matter of the relative efficiency of the Daimler-Lanchester gear and the parallel worm gear cut by them.

Messrs. David Brown and Sons now apparently endeavour to evade the whole issue by raising what at the best may be described as technical objections. Firstly, they take exception to the worm gear box being maintained approximately at a given temperature artificially. I do not know whether or not Messrs. David Brown and Sons expect their remarks on this point to be taken seriously; if they do, then, as I think my subsequent remarks will show, they must be painfully ignorant of the whole question of the relationship of temperature and efficiency and of the considerations involved.

When a worm gear rear axle is under actual road conditions the worm box and surrounding parts are exposed to rapid and violent air currents, and by thermometer tests it is found that under these conditions the lubricant temperature usually averages less than 40° C. If the same axle be tested *without an equivalent air blast* on a bench or on a testing machine, it will, if working under precisely similar conditions as to h.p. transmitted, show a rapid rise of temperature, because the cooling means has been removed. If it is desired (and I maintain for most purposes it is desired) to test a worm gear under road efficiency conditions, then cooling means must be applied to the gear box equivalent to that which exists on the road. Under these circumstances it is ridiculous for Messrs. David Brown and Sons to suggest that tests made at artificial temperatures are misleading; the truth is that tests made without any temperature regulation would be misleading, as the conditions then cease to approximate to those existing under actual use.

Beyond the above, if Messrs. David Brown and Sons will refer to the National Physical Laboratory's reports they will find that the effect of higher temperatures was made the subject of a separate investigation, the matter being considered of sufficient scientific interest to justify study, and the temperature tests so carried out are some of the extremely few temperature tests that have ever been made and published.

In paragraph 2 I can only presume that Messrs. David Brown and Sons' reference to their "intimate study of the subject" is intended to impress the uninformed readers, since it would appear that Messrs. David Brown and Sons have never made any tests that are worth the paper they are written on from a scientific point of view. Messrs. David Brown and Sons have only quoted one actual series of tests that I have been able to trace and investigate, and I showed clearly in a former letter that these tests have a probable error *according to their own internal evidence* of something like two or three per cent., as against a possible error certified as of less than a tenth of this amount in the National Physical Laboratory's tests of the Daimler-Lanchester gear.

In the next paragraph of their letter Messrs. David Brown and Sons make what is in substance an attack on the management of the Institution of Automobile Engineers. If Messrs. David Brown and Sons have a grievance against the Institution of Automobile Engineers let them address themselves to the secretary and council of that body, and give them an opportunity of explaining matters. Personally I know nothing of the rights and wrongs of the main subject of complaint of Messrs. David Brown and Sons; I do, however, consider that they are most unreasonable in making a grievance of the fact that their written communication on the subject of my paper has not been given to the press for publication. It is perfectly true that written communications relating to a paper read are sometimes as an act of courtesy given by the Institution to the press, together with the author's reply; there is no regular rule, however, that this should be done. As a matter of fact, Mr. Bostock's letter (presumably the letter referred to) has been sent to me, also a whole quantity of other communications and matter relating to the discussion. Up to the present I have not had time to get through the work of revision and reply. However, the matter cannot be of much importance from anybody's point of view, as practically everything contained in the letter has been ventilated by Messrs. David Brown and Sons in letters to the press.

In view of the whole history of this worm gear controversy, the opening remarks of Messrs. David Brown and Sons' concluding paragraph smell strongly of bombast. When, however, Messrs. David Brown and Sons descend to the following: "*We desire to avoid unnecessary quibbles, so will conclude by remarking that if the 700 ft. lbs. tests mentioned in their* [the Daimler Company's] *letter was a printer's error, it is somewhat remarkable that it took just four weeks to correct it,*" I ask whether they expect to receive any man's respect or consideration.

Taking into account the whole tone in which Messrs. David Brown and Sons are conducting this correspondence, I think it fair to the Daimler Company and to myself to ask you, sir, to close this discussion. I have no wish to deprive Messrs. David Brown and Sons of the privilege of making a further communication if they so wish, but unless it may be to give a categorical denial to an untruth or a misrepresentation, I have no intention of writing further, and I am sure that the Daimler Company have said their last word on the subject.

I am authorised to say, however, that the challenge as published is open for a further month if Messrs. David

Brown and Sons or any other firm should notify their intention to take it up. If the terms are not stringent enough, let Messrs. David Brown and Sons take up the challenge as it stands without more waste of printing ink. I can assure them that a few additional tests of added severity will not be refused; but one parting word, the challenge must be accepted. F. W. LANCHESTER.

[19512.]—The writer has been much interested in the correspondence in your columns regarding the relative efficiency of various types of worm gears, and especially with the letter of Mr. Lanchester [19313] in your issue of March 15th.

Mr. Lanchester's method of testing worm gears is a most ingenious one, and the tests with his machine conducted by the investigators of the National Physical Laboratory are above criticism. For that reason it was interesting to note that, in general, the conclusions of the National Physical Laboratory's report were in remarkably close agreement with the experience of Mr. Waterman and the writer.

Being most familiar with one's own apparatus and experiments, it is perhaps natural for an experimenter to discredit the work of others and lightly to cast aside that portion not in close agreement with his own experience. Having in mind Mr. Lanchester's most carefully conducted tests, it is perhaps especially pardonable for him to take such an attitude.

It is hardly expected that a mere statement will be convincing, but the writer can assure Mr. Lanchester that the use of the transmission dynamometer and brake as handled by Mr. Waterman did not, in the case of the tests discussed, introduce such errors as he assumed in his attempt to bring the results of both series of tests into agreement. An earnest effort to know the facts regarding the matter leads us to look for other explanations, and these are probably not difficult to find.

Apparently the point most seriously questioned by Mr. Lanchester is the rise in efficiency which, "unless something happens," will soon "enter the region of perpetual motion." Our experiments showed that the thing that would surely happen was the breaking down of the oil film and the consequent decrease in efficiency and roughening of the gears. Perhaps it would have been well for us to have carried the test quite to this point, but we wished to make further tests with the gears.

In Mr. Lanchester's paper before the Institution of Automobile Engineers, he states, "A third fact brought out is the great variation in efficiency due to differences in the lubricant employed and *the individual character of the diagrams or curves obtained* when different lubricants are submitted to tests." The report of the National Physical Laboratory tests to which he refers in his paper shows (fig. 3) a most peculiar irregularity. In reference to this (on page 11) it is stated, "The curves for the 8/35 and 9/34 gears are similar in shape as a rule, but there is a rather remarkable exception in the case of the 8/35 gear with a pressure of 1,200 lbs. on the teeth which is shown on curve 3. The rise in efficiency at 1,000 r.p.m. is most marked, and the observation was repeated and found to be quite correct." The reason for this peculiar irregularity is not explained, but would hardly justify one in following the argument set forth in Mr. Lanchester's letter above referred to, and so discredit the whole test. It is probable that if we knew more the explanation would be forthcoming.

The oil used in the tests conducted by the writer was of a different character from that used in the tests referred to by Mr. Lanchester, and the writer quite agrees with the opinion of Mr. Lanchester as quoted above from his paper, and feels that the difference in lubricant, together with other variables, may account for the difference between the two sets of observations.

A considerable number of tests not described in the paper referred to were made, using various oils for lubricants, and these tests showed a great variety and irregularity in the behaviour of the gears under various conditions of pressure and temperature. Other variables, such as tooth clearance, the distribution of the oil bath in the gear case, as well as other factors, affect the efficiency, as has been pointed out by Mr. Lanchester. That the exact shape of the curve in the two sets of experiments does not exactly coincide is rather to be expected in view of the difference in conditions. The substantial agreement in the principal conclusions derived from both groups of experiments would seem to confirm each other rather than to discredit either. Further extended experiments will probably show that, due to the many variables involved, curves of widely different character will be derived.

The writer will watch with interest for the publication of further tests with Mr. Lanchester's machine, which should add much to our knowledge of a most important subject. W. H. KENERSON.

Brown University, Providence.

ROAD PATCHING.

[19513.]—Should the following questions catch the eye of any road surveyor who would be, naturally, interested, and answer them, I would be very grateful, not for myself alone, but for the bulk of road users, whether by horse traction or self-propelled vehicles.

(1.) Can a steam roller be beneficially and economically used to "set" ordinary darns in roads, provided that such "darns" are fairly continuous?

(2.) How do these "darns" so treated compare as regards—*(a)* lasting, *(b)* improvement to surface, and *(c)* economy in material with the present system of allowing the ordinary road traffic to set the metal into the road surface, taking into consideration that the metal used may be far larger, consequently cheaper, but to be used when the road is wet and in a soft condition?

From what I see around me in this county (Limerick) the metal placed upon the road surface is either ground to dust by passing traffic in dry weather or mud in wet without ever entering the road surface at all. There are few stretches of road upon which I travel daily that a continuous patch could not be applied with benefit, and if a roller were put over this a few times a good surface would be the result, instead of what happens—the metal is scattered all over the road, causing lameness to cattle and horses.

At this time of year I encounter numbers of young cattle on this particular road, and, returning home, I notice a great number footsore and lame, which I put down to loose metal on the road. A. E. BROWNING.

GUARANTEES.

[19514.]—I have been much interested in the correspondence on the subject of manufacturers' guarantees which have recently occupied a portion of the Correspondence columns of *The Autocar*, for, like many other of your readers, no doubt, I have been sadly misled, not to say hoodwinked, in the past.

One of my earliest and, as it turned out, in some respects perhaps my luckiest experience, took place in connection with a "reputable" car of English manufacture, which must necessarily be nameless. Within three months of taking delivery (from the makers) the steering gear collapsed without rhyme or reason. Only the fortunate proximity of a fairly solid hedge saved me from anything more serious than a few bruises.

This particular accident (there were others in connection with this car) happened on the East Coast, and despite the fact that the makers of the vehicle—to call it a car would be flattery—admitted that the accident was due to a flaw in the material and repaired the damage free, they resolutely refused to pay the cost of transit to or from their works, leaving me to bear the cost of this as well as that of repairing the various accessories which had been damaged in the impact. Being green in those days, I accepted the makers' statement that such flaws could not possibly be foreseen or guarded against and left it at that.

Not long after this inspiring performance, the same car, which was, by the way, fully covered by the so-called manufacturers' "guarantee" for six months, shed a front wheel when negotiating a level crossing at about 6 m.p.h. On this occasion the makers, on the technical grounds that the guarantee had a few days expired, refused to do anything at all, not even attempting to contest the opinion of three independent and impartial experts that the breakage was due to defective material, and the whole cost of rebuilding and redesigning the front axle fell upon me.

Needless to say, soon after this I sold this "car," the various components of which I had found it necessary to replace as time went on. The whole transaction, as may be imagined, was not remunerative.

Another experience, and a more happy one, of the manner in which manufacturers interpret their so-called "guarantees" was recently brought to my notice. A French car which I had run for nearly eight months and some 5,000 miles developed a most mysterious knock, which proved beyond the powers of all the "experts" to which it was submitted. I returned the car to the English agents, who at once discovered a flaw in the aluminium web carrying the centre crankshaft bearing, and, without pressure of any sort from me, and before, indeed, I was aware of the cause of the trouble, volunteered (volunteered, mind you) to repair the

Correspondence.

damage and to lend me a car until mine was returned to me, free of all cost. This voluntary engagement the firm most honourably carried out, and my car has now been returned to me. The flaw in the crankshaft has been remedied, and, incidentally, the engine has been thoroughly overhauled. Naturally, there has been some delay, but on no occasion did I suffer the least inconvenience through want of a car. The car is a 15.9 h.p. S.C.A.R., and the English agents referred to (and with whom I have no interest whatsoever) the College Motor Co., Fulham Road, S.W.

There are doubtless other firms, and English ones, too, which are equally honourable in interpreting their "guarantees," and the Wolseley Co. and the Austin Co. I have heard bear good names in this respect. Your correspondents, Messrs. Armstrong, Whitworth and Co., hit the nail on the head when they infer that guarantees are only given to safeguard the manufacturer, and that the customer has to rely upon the reputation of the firm in question for protection. There is no manner of doubt in my mind that this is the case, and the disappointed owner might just as well endeavour to cash a note drawn upon "The bank of love" as to attempt to enforce the ordinary guarantee against a manufacturer who has not the remotest intention of meeting his obligation. I would suggest that if any of your readers contemplate investing in a new car they should endeavour to obtain independent testimony from private owners as to the manner in which a manufacturer treats his customers after they have bought the car. We all receive courteous treatment when buying the car; it is after the car is bought that we really require consideration. S.C

[19515.]—We have read with interest the correspondence under the above heading appearing in your recent issues, and particularly the letter from St. Albans Rubber Co. [19479], for the reason that we have had an experience of their interpretation of the term "guarantee."

In December, 1911, we took delivery of a new Scout car, which had been ordered with Dunlop tyres, and until the car had been in use a week or so we did not notice that it was fitted with Grimston tyres. On approaching the Scout Co. for an explanation, we were informed that these tyres were fitted in error, but they assured us the Grimston tyres would be quite satisfactory, and anyway were guaranteed for 3,000 miles. Within two months the tyres were getting bad, and before 1,600 miles had been covered their appearance was so bad that we were afraid they would "crack up" at any moment, and we replaced them. At the suggestion of the Scout Motor Co. we sent the tyres to St. Albans Rubber Co., and after a lot of correspondence we were informed that they would reinforce two of them at a cost of 32s. 4d. each, and that if we ran the other two to destruction and the mileage covered was short of 3,000 they might again consider the matter.

After an experience of this kind we cannot but feel that buyers should give every attention to obtaining really high quality at a standard price, rather than risk the trouble and annoyance invariably experienced with a cheap article, regardless of the form of guarantee accompanying it.

In fairness to Messrs. Scout Motors, we must add that they recognised our claim in the above matter and treated us quite fairly. The St. Albans Rubber Co. sued us in the County Court for 1s. 11d. carriage on the tyres sent for inspection. PEWSEY MOTOR CAR CO.

The St. Albans Rubber Co., to whom a proof of the above letter was sent, make the following reply:

In November, 1911, we first issued a guarantee with our tyres. This guarantee (like all others) was designed to be the basis on which complaints would be considered and dealt with. It specifically excluded mechanical damage, cuts, accidents, etc.

The tyres referred to by the Pewsey Motor Co.—two non-skids and two grooved—were supplied under this guarantee, but the postcards provided for advising us of the speedometer readings were not sent us, so that strictly we were under no liability whatever. Apart from this, however, the two studded covers were neither worn out nor burst, nor for any reason unrunable. Their treads were badly cut about, and must have been run on roads unfit for motor cars.

The two grooved covers had several cuts, some of which penetrated the casings. Clearly, under our 1911 guarantee this was a case of mechanical damage, for which we were not liable.

We will leave it to you, sir, to decide whether the last half of your correspondents' letter is fair comment, or whether it is not inspired by the 1s. 11d. carriage they had to pay, it being one of our conditions of sale that complaints must be returned to us carriage paid. To enable you to judge we append copies of the reports we sent on the condition of the tyres and of the letter we also wrote to our customers the Scout Motors, Ltd., of Salisbury.

[These reports we have received and read. They bear out our correspondent's statements as above, and contain an offer to send the tyres to Scout Motors, Ltd., for their inspection, carriage paid both ways.—ED.]

In conclusion, we would like to point out that we ran our 1911 form of guarantee for a year. At the end of that time we again considered the whole matter, and, seeing that we had greatly improved the quality of our tyres, and that the results we were obtaining at the end of 1912 fully justified the step, we decided to issue our 1912 guarantee which has no limitations. To-day, if for any reason whatever, even for one entirely beyond our control, a Grimston tyre does not run its guaranteed mileage, our customer can claim and we must meet the claim. Our only escape from such unscrupulous persons as, unfortunately, are to be met with in all communities is by refunding the proportion of the money paid and declining to have further dealings with them.

Our 1912 guarantee is, therefore, free from the objections of your correspondents. Also, it was not the guarantee under which the Pewsey Motor Co. claimed. Your readers can decide whether this is exactly the impression gathered from their letter, following our letter 19479.

The St. Albans Rubber Co.

THE S.M.M.T. AND PRICE MAINTENANCE.

[19516.]—Referring to the report in your issue of May 2nd respecting the action for libel brought by the Challenge Rubber Mills against the *Field*, the witness for the defendant who did not know that the S.M.M.T. was an institution formed for the maintenance of prices must live in a world of his own, and I hope the following facts will enlighten him.

A certain retail agent sold an American car outside the district inside which he was entitled to trade by his agreement, and he further fractured the canons of sound trading by conceding a heavier discount than his agreement with the importers sanctioned. The deal was discovered by the agent into whose territory the car was sold, and the Motor Trades Association at once brought the offender to book. His whole profit on the transaction was not more than £20, and he was offered the alternative of paying the full commission on the sale to the agent whom he had deprived of the deal, £10 in liquidation of damages for breach of contract, and £200 as a fine to the Motor Trades' Benevolent Fund, or being suspended from commercial dealings with the members of the Society of Motor Manufacturers and Traders. Comment is needless. C.S.

PERPETUAL MOTION (?).

[19517.]—My attention has been called to the following reprint, which appeared in the *Hardwareman and Ironmongers' Chronicle* under the heading of "Petrol's Rival."

Have any of your readers any knowledge of the remarkable system referred to in this article, as it seems more than revolutionary? I have seen no reference to this in any motoring paper, but possibly some of your readers have some knowledge of it. The first cutting appeared in the journal mentioned on March 20th, and the second on April 3rd this year. W. S. BROMHEAD.

PETROL'S RIVAL.

"We have frequently emphasised in these columns the necessity of finding a substitute for petrol, in view of the great advances in the price of that commodity, which may render motoring but a luxurious pastime for the rich alone. Our motor correspondent is now in possession of particulars of a system which may easily oust petrol and all petrol 'kings' from their lofty position. This device is the nearest approach to the long-expected 'perpetual motion' that has yet been evolved, and, if subsequent tests prove it as good in practice as it is in theory, its future is assured. The idea of running from London to Brighton and back five times for nothing seems at first blush absurd. Yet the latest idea is that 500 miles can be easily covered by the new patent spring-work system. As yet little may be said about this device, but, apart from motor cars, the device may be applied to other machines, such as cotton-spinning, printing, cycles, clocks, watches, etc. As regards cars and cycles, no engine, electricity, cooling apparatus, or radiator is required, and the cost of a 16 h.p. car will be from £80 to £100, while the running cost will be nothing except wear and tear and tyre expenses. Ten minutes' winding is, according to the inventor, sufficient for a *500 hours' run*. We hope to give further particulars later."

How Power is Supplied.

"The power is produced from what may be called a 'main' or 'reserve' spring, which is wound up fully at the works when the car is made, and the same applies to a second spring which intermeshes with the driving wheel and the 'main spring. A third wheel is wound up by the second as the latter unwinds. Thus, when wheel number two is unwound, wheel number three is wound up, and while wheel number three is providing the power it is at the same time winding up wheel number two, the 'main spring' acting as a kind of reserve. Although no model is to be seen in England as yet, a foreign Government has offered to buy the rights for that country alone for £85,000 as soon as the models are ready. If the inventor can justify his claims, there is no doubt that motoring will be revolutionised and come within the reach of practically everyone."

ROADSIDE ADVERTISEMENTS.

[19518.]—I recently wrote to three tyre companies asking them to remove three unsightly boards at Iver Heath, and I enclose copies of the very satisfactory replies I received. I hope that many of your readers will be encouraged to continue the campaign against this most offensive form of advertisement. Is there no chance of getting the petrol companies (to say nothing of other offenders, mostly hotel proprietors) to follow the excellent example set by the tyre vendors? Norman MacKinnon.

Copies of Letters Received.

18th April, 1913.

We beg to thank you for your favour of the 17th inst., and note your objection to the Michelin road sign in position at the "Crooked Billet," Iver Heath. We are accordingly instructing our advertising agents to remove this sign forthwith, and think we may safely promise that the work will be carried out within a week or ten days from date. Should there be any delay, however, we shall esteem it a favour if you will kindly advise us. The Michelin Tyre Co., Ltd.

25th April, 1913.

In reply to your letter of the 24th inst., we beg to inform you that we are now making arrangements for the removal of our sign which is at present erected at the Black Horse. We have already given instructions for the sign to be removed, and no doubt these will be carried out during the coming week. Trusting this will meet with your satisfaction, we beg to remain

The Continental Tyre and Rubber Co., Ltd.

18th April, 1913.

We are obliged by your letter of the 17th inst. in reference to advertisement boards on high roads. Not on account of any other company's method, but on our own initiative, as soon as it became apparent that there was a general public feeling against road signs, we decided to discontinue this form of advertising, not renewing any contracts and cancelling many that already existed. With regard to the Uxbridge sign near your residence, we are looking into the contract between ourselves and our stockist in connection with same, and if there is nothing to prevent us moving it, we will have this done. Thanking you for your letter, and assuring you we are always pleased to accede to any reasonable requests on the part of motorists, The B. F. Goodrich Co., Ltd.

INCONSIDERATE DRIVING.

[19519.]—I think, in the interests of decent motorists, you will publish my statements below.

On May 1st, at about 6 p.m. I was driving up Haldon Hill from Exeter, at about 16 m.p.h., when a large limousine car (dark blue) went by at quite 30 m.p.h., the only occupants being two men in dark blue liveries, with light cuff and collar facings. At the right angle turn they took it sharp on the off side. When I got round the bend the second chauffeur was leaning right out to see how wonderfully he had left us.

I am writing this in the hope that the owner of the car will see how his man behaves when on his own.

Albert Bartleet.

ADVERTISING.

[19520.]—In regard to the question of advertising, which has recently cropped up in *The Autocar*, may I suggest that advertisers commonly omit two very essential details of their cars? These are cubic capacity and maximum revolutions per minute, both of which are required in the computation of actual horse-power developed.

A purchaser naturally wants to know how much horse-power a car really develops. He can find this from the following formula: Cylinder capacity in litres × maximum revolutions per minute × .0064. This gives quite accurate results.

Under the present methods the novice is woefully misled. Take the case of the 30 h.p. Lancia (100 × 130 mm.) The R.A.C. rating gives 24.8. I compute the i.h.p. (from bore and stroke) to be 32.6 h.p., whereas if we assume the maximum r.p.m. to be 2,000 (I do not know if this is correct for this particular car), the *true* horse-power is 52.2. This is not a freak case, but a typical example.

Here, then, is a suggestion for next year's "Buyers' Guide": Include the maximum r.p.m. as well as cylinder capacity. La Tour.

THE VICTOR TYRE TEST.

[19521.]—I am sure that you will grant me space to say that the Victor Tyre Co. have been misinformed as to my position. I am credited with being a representative of the Dunlop Rubber Co. As a matter of fact I am nothing of the sort. I am a journalist in the employment of Messrs. A. J. Wilson and Co., Ltd., but the fact that this firm does the advertising of the Dunlop Co. does not make me a member of the Dunlop staff or in any way capable of representing the company. This correction may or may not be important to the Dunlop Co., it is of vital concern to myself for personal and professional reasons. In joining the Tyre Test Committee and acting as an observer, I did so unknown to the Dunlop Rubber Co., whose permission I did not require to obtain, nor, on the other hand, did they or anyone else authorise me to act on their behalf; I joined as a private individual, who has been more or less concerned with motoring since 1896, and was very much interested in the Quadruple Contest.

E. C. Stewart.

UNOFFICIAL TRIALS.

[19522.]—I see in *The Autocar* of May 3rd a letter [19486] from Dr. A. S. Whitehouse-Cole with regard to that question which most people hoped had been buried, viz., Yarworth Jones *v.* R.A.C. This letter is so obviously written as a "leader up" to another effusion of (probably) many pages, that I am impelled to write to ask if nothing can be done to save your readers from suffering another flood of Mr. Jones's verbosity being poured on their devoted heads. Believe me, sir, the average motorist is thoroughly tired of the whole thing, and, be the rights and wrongs what they may be, prefers any other topic. Ignotus.

[19523.]—Dr. Whitehouse-Cole [19486], in your last issue, is quite right and quite wrong. I agree that I owe the explanation he calls upon me for both to the committee who supervised the tyre trial and to the public generally. I had sincerely hoped that the need would not arise, but the particularly mean conduct on the part of the R.A.C., which it seems in no special mood to remedy, makes the need urgent. Dr. Whitehouse-Cole was right when he wrote that my explanation was necessary; he was wrong when he suggested that I had changed my view as to the value of the tyre trial, as I shall show.

The tyre trial having finished, I was publicly invited by the Editor of the *Auto* (issue March 15th) to bury the hatchet. As I had no animus in the matter, I accepted the invitation, and when the Editor of the *Auto* (Mr. Stanley Spooner, himself a member of the R.A.C. Committee) conveyed to me an invitation to lunch at the Hotel Cecil as the guest of the R.A.C., in order to discuss matters with Mr. Julian Orde, the secretary, I went.

I am afraid, in the light of what transpired later, I must now regard the move of the R.A.C. as unfair to me, and if it had been a business transaction I should be ashamed of my lack of business acumen, but I went as a sportsman, to help the Club through a troublous time. It was not a business deal.

Mr. Orde, with Mr. Spooner present, made no attempt to disguise the fact that the Club was in need of a good turn, that criticism was rampant within and without, that the annual general meeting of the Club was due within a few days, and Mr. Orde asked me to enter Victor tyres for an R.A.C. test at Brooklands, so that the matter could be referred to by the chairman in his opening speech at that meeting, and thereby head off expected criticism.

Mr. Orde further stated that he wanted a reasonable and valid excuse for removing the ban on Victor tyres at Brooklands and other R.A.C. competitions.

I made it quite clear that no good purpose would be served from the point of view of my firm's interests by an R.A.C. trial at Brooklands. We should incur the risk of failure through the outside possibility of a Victor tyre

Correspondence.

proving a bad one. We had already won the tyre trial, and nothing attracted me except a direct competitive test, and that the R.A.C. ban did not interest me. I pointed out that, had my firm been a weakling, the Club and Trade Society's ban would have ruined it.

When I finally consented to help the Club out of a hole by entering Victor tyres for an official test I had commercially nothing to win for my company. It was, as I pointed out, purely a matter of good nature. My only conditions were, of course, that my company should not by any chance be represented as the suppliants and penitents they were not, and that, if we took the initiative, the Club must publicly and promptly respond in the same spirit.

I promised to write to *The Autocar* and to the *Auto* and to see the Editor of *Truth*, who had severely criticised the R.A.C. Mr. Orde stated that he would see two well-known press gentlemen, mentioned by name, in order that my company should not appear in a false position.

That was the arrangement, and the Hon. Arthur Stanley, chairman of the R.A.C., who also invited me to lunch, expressed a wish to have my letter in time to read at the Club's general meeting.

I did my part honourably and at once, glad to be able to help the R.A.C. out of its difficulty.

The R.A.C. responded, through its chairman, by placing my company in the position of a penitent pleading for pardon, and one of the pressmen, particularly named by Mr. Orde as one who would be seen to prevent any misconstruction being placed upon my action, improved the shining hour by writing the following gem, which was reprinted next to the report of the chairman's speech in the *R.A.C. Journal* of April 11th:

"Irresponsible Critics.

"Mr. Arthur Stanley chid the idle critic with his own little axe to grind, or jealousy in his petty soul, in his own happy fashion, and incidentally referred to the much-debated Victor tyre test, about which much unnecessary ink has been spilt during the past few months. I cordially agree with him that it was not in the best interests of the user to hold it. . . . The Club's attitude was absolutely justifiable throughout, despite the reams of drivel which have been written on the subject and all the ink squirted against the Club, and its attitude of not even replying has been the correct one. . . ."

The Chairman's gem, culled from the *R.A.C. Journal's* report of his speech, is:

"Another thing which some of you may have read about in the papers is a certain unofficial trial of a tyre. There has been a good deal in the papers about it, which, of course, we have read with great interest. I am not going to enter into a controversy as to whether the Club was right or wrong in what it did. But I should like to say that I am perfectly convinced now, as I was at the time, that the Club did quite right."

The Chairman then read the letter I had sent to the Club that day, which intimated that my company would enter for an R.A.C. test of Victor tyres, and added:

"Well, we take up the position which we always have taken up, and always shall take up, that is, we are perfectly ready to carry out any test *which we think a fair one.*"

The Club has acted meanly. I have therefore declined an invitation to discuss the matter further verbally with Mr. Orde, and refused to deal with the Club except by correspondence.

I have withdrawn my offer to have Victor tyres officially tested by the R.A.C., and until the R.A.C. makes public and honourable amends, I must decline to have any further communication with it except of a strictly formal and commercial nature.

These are, shortly, the facts, and I think upon them Dr. Whitehouse-Cole and other members of the Tyre Trial Committee and public who have censured me will agree that my action is not blameable.

W. Yarworth Jones,
Managing Director, The Victor Tyre Co., Ltd.

LONG V. SHORT STROKE.

[19524.]—Your correspondent No. 19502 wants to know why makers turn out two models of the same bore and different stroke. We turn out 75 × 100 mm. and 75 × 140 mm. The chassis price is £200 and £250. We have found a great number of people, both at home and abroad, who want a cheap small runabout car. They are content with 40 m.p.h. as their best speed, hence the 75 × 100 mm. The man who wants a fast car or a landaulet goes in for the 75 × 140 mm. The chassis of these models is practically the same. The only difference is the engine. The 75 × 100 mm. gives 16 b.h.p. The 75 × 140 mm. gives off 27 b.h.p. We shall be pleased to give any further information if "Small Man" will communicate with us. Mass Cars.

CLIMBING PEN-Y-BALL HILL, HOLYWELL.

[19525.]—Referring to the letter of the Northern Depot, Ltd. [19495], in your issue of the 3rd inst., I beg to state that I climbed the above hill in mistaking the main road to St. Asaph on the 8th of April, 1913, on a 40-50 h.p. Rolls-Royce car, landaulet body, with five passengers and luggage when on tour in North Wales. I did not notice speed on the steepest pitch, as there was rather a sharp bend at the top. Rolls-Royce.

PETROL CONSUMPTION.

[19526.]—In view of the present high price of petrol, which price I am informed is likely to go still higher in the near future, I think that possibly my experience, after a trial of about six weeks with Messrs. S. Smith and Sons' automatic carburetter, might be of interest to your numerous readers. I adjusted the carburetter to my old 28 h.p. Daimler 1907 car about six weeks ago, and, though I have not yet got the magneto and air inlet controls adjusted, I find a marked improvement in the running of the car. I get from five to six miles more running per gallon of petrol (or benzole) out of the car than I did formerly with the standard Daimler carburetter. The car pulls evenly and well with Messrs. S. Smith's automatic carburetter; in fact, I am extremely pleased with its performance and the consequent saving of petrol which ensues, and I consider this one of the best carburetters I have ever used.

V. H. Birch Reynardson.

BENZOLE.

[19527.]—Owners of 1912 Stoewer cars may be interested to hear that these cars run on benzole, not merely as well, but much better than they do on Pratt or Shell. All the "alteration" required is to change your motor fuel, nothing more that I can see. Even if the exhaust is somewhat smelly, it does not stink in my nostrils nearly so much as do the iniquitous prices of petrol. I estimate a gain in power of some 20%, and starting appears quite as easy.

M. Haggard (Capt.)

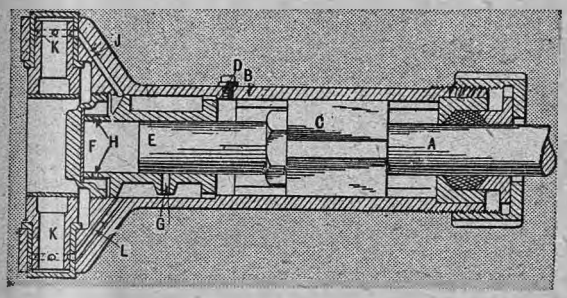
Hotels.—Mr. C. E. C. Lowry writes in high commendation of the Carlton Hotel, close by the L.B. and S.C. Railway Station at Tunbridge Wells, and adds: "I have stayed there on several occasions, and would willingly go some miles out of my way for the sake of the usual cleanliness and comfort. The charges are very moderate and the staff attentive.

Some Recent Patents.

By Eric W. Walford, F.C.I.P.A.

A Universal Joint Improvement.

COMBINED with this universal joint is a plunging coupling, the plunging movement of which is utilised to circulate oil through the universal joint. The shaft A moves in relation to the tube B, the drive being transmitted from one to the other by a square sliding block C engaging squared surfaces inside



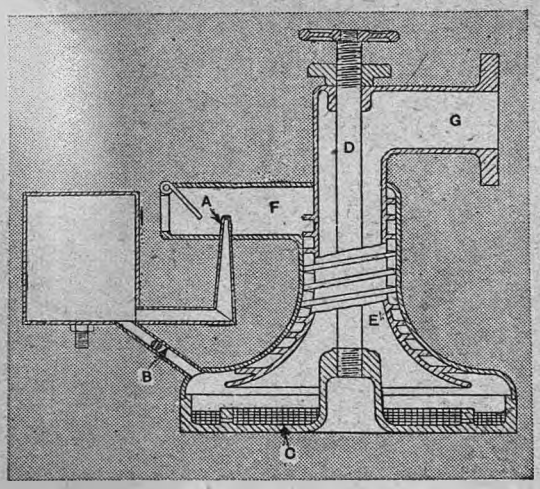
the tube. Oil is introduced through the plug D, and as the end E of the shaft A moves backwards and forwards the space F is first filled with oil through the inlet G, the oil being subsequently forced out through the apertures H, which are closed by non-return valves, and passages J to the universal joint bearings K. From these the oil returns by the duct L, subsequently entering the chamber F through the passage G.—D'Orsay McCall White and D. Napier and Son, Ltd., No. 331, 1912.

Silent Chain Construction.

The guide plates are made stiffer than the driving links out of a material more flexible than the latter, so as to prevent unequal stretch of the links and guide plates.—C. G. Renold and Hans Renold, Ltd., No. 3,888, 1912.

A Heavy Oil Carburetter.

There is a somewhat interesting type of heavy oil carburetter in which part of the fuel is burnt in order to vaporise the remainder, which is then delivered to the engine. The present construction is of this nature, all the fuel being supplied by means of float feed

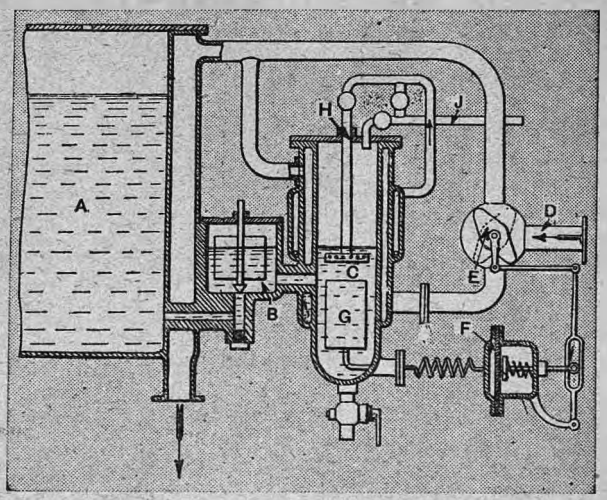


mechanism to a jet nozzle A which projects into the main spraying chamber. From the float chamber oil can also be allowed to pass by a branch pipe B, in which a tap is provided, to a tray C. In this tray are arranged absorbent wicks, and the tray can be raised and lowered by the adjustment of the screwed spindle D.

At starting the wicks in the tray C are saturated with oil passing along the tube B. The tray is lowered and the wicks are ignited, so that the flame therefrom heats the trumpet-shaped pipe E, which it will be noticed is jacketed, the jacket communicating with the spraying chamber F. Consequently the trumpet-shaped pipe E is heated considerably before the wicks burn out. On starting up the engine rich mixture is drawn from the spraying chamber F and is caused to travel down the jacket and up the trumpet-shaped pipe E. In doing so it is ignited at first by the flame from the wicks, and subsequently combustion is continuous. Consequently the heat in the carburetter is maintained, but as the air drawn in through the spraying chamber is insufficient for complete combustion, a rich mixture passes off to the engine by the outlet pipe G. In another case the carburetter is supplied with a sparking plug to provide the preliminary ignition in the carburetter.—F. G. S. Biddlecombe, No. 29,021, 1911.

A Naphtha'ene Carburetter.

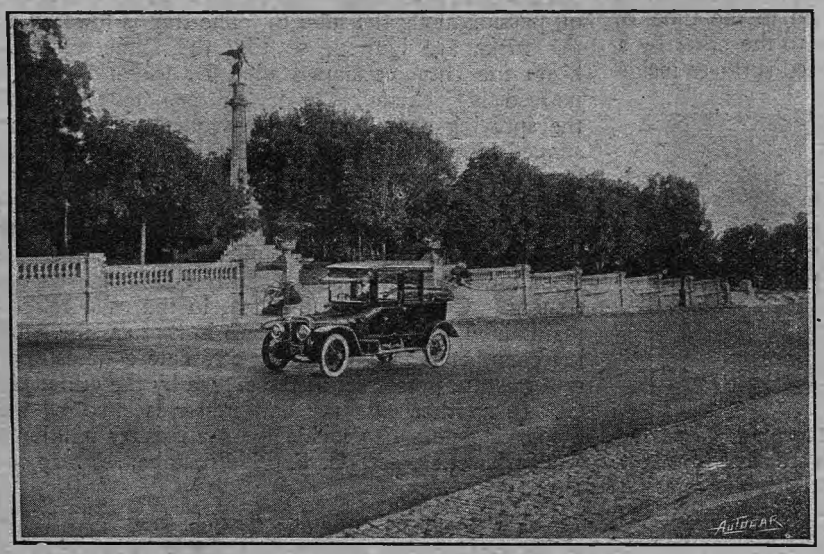
The naphthalene, which is a solid, is contained in the tank A, which is exhaust jacketed, so that when heated it enters the float chamber B in a molten state, a float controlling the level in the carburetting chamber C. The exhaust gas arrives by the pipe D and can travel either through the jacket of the carburetting



chamber C or through the jacket of the naphthalene tank according to the position of a valve E. This is automatically moved according to the temperature of the carburetting chamber through the intermediary of a diaphragm F and link motion, the diaphragm being acted upon by air pressure in a sealed chamber G in the carburetting chamber. This device, therefore, acts as a thermostat, and as the carburetting chamber warms up the diaphragm F moves so that less exhaust gas is directed through the jacket of the carburetting chamber. Hot air enters the carburetting chamber through a pipe H, and the air bubbles through a ring of holes beneath the surface of the liquid passing off through the outlet pipe J to the engine.—G. P. J. Lion, No. 5,139, 1912.

Flashes.

It was announced at the meeting of the London County Council last week that the Grand Duke Michael of Russia had offered to present a motor ambulance to one of the hospitals in North London.



MOTORING IN THE ARGENTINE. An Argyll car at the entrance to the Recoleta, one of the beautiful parks in Buenos Ayres.

It is proposed to construct a special motor road, nearly 80ft. wide, between the towns of Dusseldorf, Essen, Steele, and Dortmund, Germany.

* * *

The heavy thunderstorms last week at night caused sudden floods in many districts, and we never remember having so many reports of cars being held up. We suppose that the fact of so many cars being driven into water splashes from two to four feet deep was due to the darkness, the terrific downpour, and the lightning, a combination which made it difficult for the drivers to realise that they were driving into a flood, inasmuch as all the road looked alike, being water practically everywhere. With the downpour upon it, the road looked the same whether covered by merely an inch of water or whether the water was deep enough to bring the car to a standstill. However this may be, the fact remains that we never remember so many cars being held up by a sudden rainfall since motoring became general. Probably the nearest approach to it, although from another cause, was on almost precisely the same date during the memorable snowstorms of 1908, when cars were snowed up in various parts of the country. To return to the adventures of the past week, many of the motorists managed to get away again after two or three hours' delay, as in most cases the road floods very quickly subsided. Others were not so lucky and had to wade out and desert their cars for the time being till they could obtain the assistance of horses.

A ten-mile speed limit is now in force in the parish of Stansted on the main London-Newmarket road, from a point forty yards south of the entrance to the recreation ground to a point fifty yards north of its junction with Chapel Hill; also on Chapel Hill, Lower Street (from its junction with Chapel Hill to its junction with Grove Hill), and Grove Hill (from its junction with Lower Street to a point 320 yards from that junction).

* * *

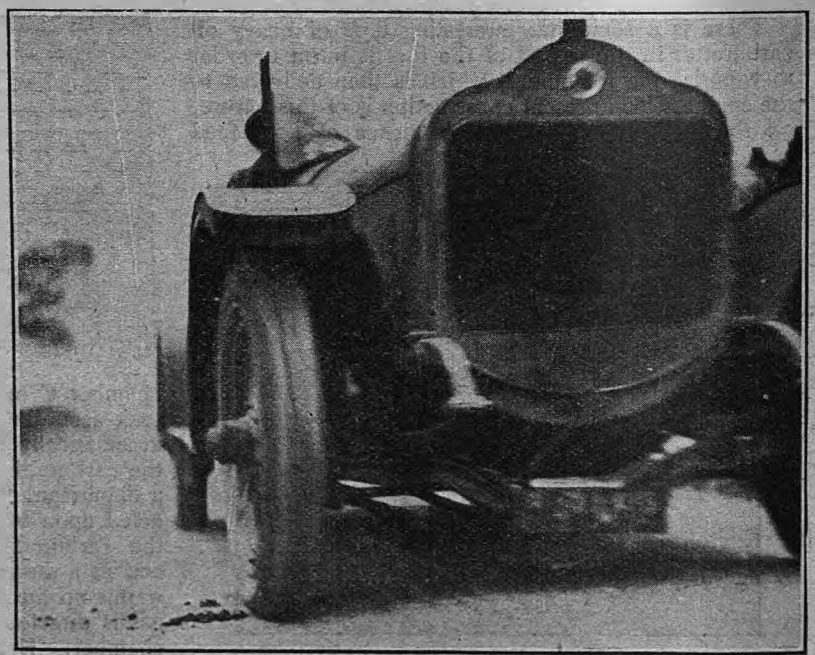
The annual automobile meeting at Ostend is to be held on the 7th, 8th, and 9th September next. The programme includes a 440 mile race over a twenty mile circuit for the Grand Prix d'Ostende, a 12½ mile race, and a series of kilometre speed trials.

* * *

We are informed that the Austin racer *Pearley III.* referred to in the article "The Increase of Efficiency," published in *The Autocar* of April 26th, was fitted originally with two carburetters, and that the 8-shaped induction pipe had consequently to be adapted to suit. The original carburetters were removed and replaced by Solex carburetters, with which the car is still fitted, but it now carries a comparatively heavy touring body.

* * *

The speed trials at Saltburn annually promoted by the Yorkshire Automobile Club will this year be held on Saturday, July 5th. All horse-power ratings of the competing cars will be based upon the cubic capacity of their engines.



A "dog's eye view" of a car travelling at about twenty-five miles an hour. The view, of course, was obtained by placing the camera a few inches above the road level and driving the car quite close to it. We are indebted to the Warland Dual Rim Co., Ltd., with whose rims the car shown was fitted, for the original photograph of this unusual point of view.

Some Queries and Replies.

Readers seeking the experience of users of specified cars, parts, or accessories are invited to insert their queries in these columns, and their fellow readers are invited to reply.

Queriists are asked to enclose a stamped addressed envelope, so that replies may be made direct if the subject is not considered of sufficient general interest to publish

Letters should be addressed to the Editor, "The Autocar," Hertford Street, Coventry, and replies to queries should bear the number of the query to which they refer.

Editorial advice is at all times willingly given to our readers.

REPLIES.

No. 2365.—Carburetter for 7 h.p. Swift.

I have fitted a Breeze carburetter to my 1911 7 h.p. Swift, and have a great improvement in (1) starting, (2) petrol consumption, and (3) power. It takes a few days to tune the jet and air valve, and the fitting, which I did at home, can be done in half a day with the help of solder, blow lamp, and a lathe as this joint is sweated in.—H. J. FINCH.

No. 2656.—Running Costs of 20 h.p. Singer

In reply to query No. 2656 in your issue of April 26th, I have run a 20 h.p. Singer landaulet over 20,000 miles with the utmost possible satisfaction. The mechanical upkeep has only amounted to a few pounds. Tyres (820×120 mm.) work out at a set and a half for about 10,000 miles. For a few months back I have used benzole only, and find it gives better results all round than petrol. It gives about 20 m.p.g. If "Novice on Upkeep" is fortunate in his chauffeur, he will find this car very economical to run. I have found the wearing qualities of Singer cars to be of a very high order. —PRIVATE USER.

No. 2658.—Loss of Magnetism.

Jerky irregular running just when the engine is labouring on top gear on a hill is one sign that the magneto is at fault. Also if the car runs all right when starting in the morning and then gets worse during the day, that is a sure symptom of magneto fatigue. I had a car through my hands after it had been to a few garages, the people at which could not find out the reason of the car failing to pull well. The owner told me that the car started to run badly after it had been out a few hours and he had to come home on accumulator and coils. (The car had a Nilmelior magneto fitted.) After taking the car out for a trial run I applied a simple test to find out if the magneto was at fault, and having found out that it was, the owner had it remagnetised, and it has been a different car since. The car had been in use for five years and the magneto had never been touched.—EXPERT TESTER.

No. 2659.—Carburetter for 14-20 h.p. Renault.

The amount of petrol drawn out of the jet depends on the suction in the inlet pipe. If "S.J.S." can "side track" this suction by fixing an extra air inlet that is operated from the steering wheel he will find his petrol consumption resume the normal amount, which I may inform him is about as much again as he is getting. If his is a bad case, perhaps the air inlet he may fix will not give him enough air. In that case he will have to alter the level of the petrol. When he has got the proper adjustment of mixture he will certainly find a great increase of power, and also a cooler and sweeter running engine. He will also find the engine runs with a clearer exhaust and not a "woolly" muffled one that I expect it has at present. Always remember that the faster the engine is turning the more the air valve needs opening. He will soon find a setting that will give him the best results. He does not say if he experiences any loss of power.—EXPERT TESTER.

No. 2360.—Polyrhoe Carburetter.

I had the same trouble with a Polyrhoe carburetter fitted to a 15 h.p. Singer with thermo-syphon circulation and overcame it as follows: A ¼in. copper pipe leads from the main circulation system immediately above the cylinders to the carburetter water jacket. From the carburetter the pipe is taken through the exhaust pipe diagonally for a distance of about six inches, nearly opposite one of the exhaust ports, and thence, with a continuous rise, to the main circulation system near the radiator inlet. I find this arrangement heats the carburetter perfectly. It is absolutely necessary, however, to have a sufficient length of pipe inside the exhaust pipe to ensure that the water therein actually boils, for unless it is hotter than that in the main system there will be no circulation. The carburetter makers suggested brazing a length of copper pipe to the outside of the exhaust manifold, but I did not try this, as, in my case, it was easier to run the pipe through the inside of the exhaust pipe. I did not find that heating the carburetter made a very great difference to the petrol consumption, but it much improved the acceleration. The petrol consumption is about 23 m.p.g.—G.P.

No. 2657.—Tour in Scotland.

I can strongly recommend the following tour to include Loch Lomond and some of our very finest scenery. It will probably approximate 500 miles, and it leaves the beaten track at many points with the object, in some cases, of avoiding traffic, and, in others including scenery which should not be missed. The roads are by no means bad, and there is only one bad gradient, viz., 1 in 9 (up) near Tummel Bridge. Leave Glasgow by Maryhill, Bearsden, and the Stockiemuir Road to the cross-roads one mile beyond Drymen Station. Take turning on left for Dumbarton, but break off road at Balloch, crossing the Leven for Luss, Tarbet, and Ardlui, the head of the loch. Thence by Crianlarich, Killin, Kenmore, Whitebridge, Kinloch-Rannoch, and Tummel Bridge to the junction of the Perth-Inverness High Road at Killiecrankie, thence by Blair Atholl, Dalwhinnie, and Grantown to Inverness. If returning to Glasgow, follow the Perth Road through Pitlochry to Dunkeld, branching off there to Amulree, Crieff, St. Fillans, Lochearnhead, Callander, Thornhill, Kippen, Fintry, and Lennoxtown to Glasgow. There are good hotels all along this route.—G.C.P.

QUERIES.

No. 2673.—Extra Air Inlet on 12.20 h.p. 1910 Humber.

WILL any reader who has fitted an extra air inlet to a 12-20 h.p. 1910 Humber car give me his ex-

B40

Some Queries and Replies (*Continued*).

perience? At present I get about sixteen miles to the gallon. Does it make any difference in the running of the car?—S.I.I.

No. 2674.—Oildag.

I SHALL be glad to know the experiences of readers with regard to the use of Oildag, especially as to whether it prevents valves from pitting.—J.A.

No. 2675.—10-12 h.p. Briton Car.

I SHOULD be obliged for experiences of the 10-12 h.p. Briton car, especially as regards reliability and lasting properties. Are there any weak points in the car?—J.S.S.

No. 2676.—Carburetter for 40 h.p. Napier.

WOULD some of your readers who are owners of 40 h.p. Napier cars, 1907 and 1908 type, kindly state their experiences with any carburetter other than that fitted by the Napier firm, and, if possible, state what improvements have been found by making the change?—SCOTIA.

No. 2677.—Garner H.P. Carburetter.

I SHALL be glad to have the experiences of any readers who have fitted the Mills or other special jet to a Garner H.P. three-jet carburetter. With a 14-16 h.p. Argyll I am at present averaging 15 m.p.g., and I am wondering whether I can do better than this with one of the patent jets.—E.A.R.

No. 2678.—Knight Sleeve Valve Engine.

I SHOULD be glad to have the opinion of your readers on the following points with regard to the Knight sleeve-valve engine as made by the Daimler Co., 75 × 114 mm. (1.) Are these engines more liable to carbonise than the poppet valve type? (2.) Is it more difficult to take down a sleeve-valve engine and remove the carbon deposit than in the case of a poppet valve engine? (3.) Are these engines liable to become noisy after a fair amount of use, say 10,000 to 15,000 miles? (4.) Is there a greater tendency to overheating in the case of the Knight engine than there is in the poppet valve type; in other words, are they suitable for use in a tropical country, *e.g.*, India?—EXECUTIVE.

QUERIES AND REPLIES.

No. 2679.—Water Charges for Doctors' Cars.

I HAVE given up horses, etc., and have two cars. Recently I received a demand note from our council for a water rate, 2s. 6d. each car. I refused to pay it, as I remember the Harrogate Corporation suing a medico on the same grounds and losing the case. Am I right, and if so, where can the case be found quoted?—H. WILSON.

The question of water rate charges to medical men for water supplied in connection with the cleaning of their cars was decided by the case referred to. The reference to this case is, "Harrogate Corporation *v.* MacKay, 71 J.P. 458 (1907), 2 K.B. 611." The Corporation were not able to substantiate their claim. The ground upon which the decision was given was that the water supplied for the cleaning of a doctor's car comes within the scope of water supplied for domestic purposes, and is not, therefore, chargeable as an extra. This is the general state of the law, but sometimes powers are conferred upon corporations by local Acts of Parliament under which they can make claims of the kind to which you refer, therefore, before deciding to resist the claim, it would be well to make sure that no such power under any local Act exists.

Flashes (*Continued*).

The New Engine Co., Ltd., notify a change of address from their former works at Acton Hill to new and larger works, and their address will in future be Junction Works, Hythe Road, Willesden Junction, N.W.

Messrs. George Spencer, Moulton and Co., Ltd., 77 and 79, Cannon Street, London, E.C., send us their retreading price-list by which we note that their prices for retreading motor tyres have been revised and reduced. We note that the firm are always open to inspect customers' covers, and advise as to their fitness for retreading, but will in no case undertake work on a tyre which they do not consider will repay the cost of the retread.

The Captain Rim Co., Ltd., Marsh Street, Bristol, inform us that the increase in the business of the Captain wire wheel and twin rim has been so considerable that a further addition to their Coventry branch has been rendered necessary. Their new wire wheel catalogue deals with the subject of the Captain products in an interesting and instructive manner, and the company will be pleased to send copies on receipt of a postcard. An important feature of the Captain wire wheel is that existing artillery wheels may be easily converted into wire wheels in which the existing hubs and bearings are used.

The sole agency for the Wilkinson light car has been taken by the London and Parisian Motor Co., Ltd., Davies Street, London, W.

The directors of Belsize Motors, Ltd., have declared an interim dividend at the rate of 8% per annum less income tax on the ordinary shares for the half-year ending March 31st last.

We are in receipt from Messrs Chas. Frodsham and Co., Ltd., 17, Dering Street, Oxford Street, London, W., of a copy of their catalogue of speedometers, etc. As is well known, the Frodsham speedometer is constructed on the centrifugal principle The instruments are in various styles to suit different types of cars, cycles, and commercial vehicles. There are also combinations of speedometers and watches, and of speedometer, watch, and electric communicator; also milometers, odometers, and revolution indicators. These are all described and illustrated so far as their mechanism is concerned. The catalogue also contains particulars of other useful fitments for cars, including companions or cantines, card trays, ash trays, folding tables, tablets, watches, lamps, roof lights, switches, horns, volt and ampère meters, accumulators, etc Any readers interested may obtain copies of the catalogue from the address given above.

Week-end and Touring Notes.

Entering Russia.

An Account of a Motorist's Experiences in Crossing the Frontier from Germany to Russia.

One feature in which the Russian frontier differs from others is the complete ignorance of those living near the border of what lies beyond. I called at the Automobile Club of Silesia at Breslau, hoping to gain some information. The members received me most kindly and did all they could to help, but explained that they never crossed the frontier and had no first-hand knowledge.

They gave me the best road out of Germany, and telephoned to a Russian gentleman living in Breslau, who advised travelling from Kalisch *via* Kolo and Kutno, as the road was better and the natives of Lodz disliked motor cars; he said there was an hotel at Kutno (Hotel de Boulogne) at which one might stop if necessary, though he advised trying to get through to Warsaw in one day. He recommended my calling on the Russian Consul to make sure that the day I might choose to cross was not a Russian feast day, these being very numerous with customs open for an hour or two only. I accordingly visited the Russian Consul, who told me that Kalisch was a first-class office, and he felt sure it would be open from sunrise to sunset, even on Sundays and feast days.

A group consisting of a Russian lady, the Mayor of a village, some peasants and children.

No further information being obtainable, I left Breslau about eight on Sunday morning, intending to breakfast at Ostrowo, the German frontier town, and to travel as far as possible into Russia before night. Leaving Breslau, the road was rather bad for some miles (cobble-stones and square sets), then better, through a fertile, well-wooded flat country, pretty but monotonous.

After Göschütz land became much poorer, with long ranges of sand hills covered with firs. There were great numbers of storks and multitudes of gulls—the country had the appearance of being quite close to the sea. The road continued excellent, but required watchful driving, as there were numerous beams suspended across it, reminding one to pull up to pay a 10 or 15 pfennig pflasterzoll. I got to Hotel z. Traube in Ostrowo about ten o'clock, and proceeded to breakfast. The waiter, hearing where I was going, said he thought the frontier was closed, but said there was an inn within fifty yards of the Russian custom house to which I might telephone for information. I therefore telephoned, and was told that the frontier was closed until 3 p.m. This being so different from what the Russian Consul at Breslau had told me, I finished breakfast and went at once to the frontier to investigate for myself.

The Russian custom house is only a quarter of an hour's run from Ostrowo, over a splendid road, at a place called Schtschipiorno. Arrived there I found a great chain stretched across the road, behind which stood an unshaven Cossack in a dirty calico blouse, carrying a rifle which had a long and most unpleasant-looking bayonet. Conquering my awe of this person, I ventured to ask him whether a rouble or two would hasten the dropping of the chain. He regretfully replied that the custom officers had gone to spend the day at Kalisch, six miles away, and had taken with them the key of the chain padlock. He also mentioned that the custom officers would probably be back shortly after five o'clock! This was worse than ever; I should have to wait before this wretched chain all day; and it began to rain. However, there was nothing else for it—wait I must.

I was fortunate in finding the German customs officer as bored as I was and quite a good sort. So we smoked cigars and drank coffee and German cognac, and talked of many things. This German officer, living for years within ten yards of Russia, spoke no word of Russian—and the Russians beyond the chain spoke no German. There is a neutral strip some three or four yards wide between Russia and Germany along which I saw many Russian sentries stationed and mounted Cossacks pass at short intervals "riding the boundary." My German customs friend told me that at night there was a Russian sentry every 100 yards all the way from the Baltic to

Week-end and Touring Notes *(Continued).*

the Black Sea, and that they did not hesitate to shoot. Their chief care was to prevent people entering or leaving without passports. In the day the distances are double. He told me that in the coldest winter's night as in the hottest day in summer the sentries are on guard for six hours at a time, and that their period of military service is five years (since reduced to three). Many of them come from the remotest parts of Russia, and have two or three weeks' train journey between them and their homes.

About five o'clock some stir was noticeable on the other side of the chain, and soon the padlock was unfastened and the chain removed.

I drove across to the customs shed, where a swarm of Polish loafers seized every article in my car, including spare petrol tins and oilcans, and carried them inside. They dragged the things out without regard for paint or leather. But in Russia it is useless to protest, as apparently the native may do what he likes except meddle with politics. The customs house search was most severe, every article was unpacked and examined, but I knew from my German friend that a special revision had been ordered, so I was prepared for this. Luggage passed and passport vised, I tried to induce the customs officer to stamp my motor papers. He referred me to the collector, and gave some indication of where I should find this person, which with my limited knowledge of Russian I could not follow. I presented my papers to everybody I saw who might be the collector, and then in despair I got into the car determined to go without. To my surprise a Cossack with rifle and bayonet seated himself beside me. I thought of what I had just read in the only English paper I could find in Breslau of an English lady being sent to Siberia for life for taking tea with a Polish Nationalist—and considered what I had done lately. But other considerations followed. I was now in Russia, and the road I was on required attention. The road from Schtschipiorno to Kalisch would check an Irish hunt. It was an earth road sixty feet wide, and was churned up into ruts and gullies by heavy traffic in winter. I had seen such roads in Argentina, but never thought it would be my fate to try to drive a motor car ever one. As we rolled against one another, travelling at five to seven miles an hour, my chief anxiety was to prevent the Cossack's bayonet getting under my chin. After about a mile of this the Cossack told me to pull up near a large red building on the left side of the road, and I guessed this must be the collector's abode. I went in with my motor papers, and after half an hour's wait, during which I had to watch my car being mauled by a swarm of Jewish and Polish children, the collector appeared. He was polite, as in my experience the higher officers always are, but my triptych seemed unfamiliar to him—apparently most cars coming in are cars bought abroad for use in Russia, on which duty is paid in cash. He would not sign my international driving licence, saying that my passport was enough. But knowing that in Russia it is all important to have one's papers in order I insisted and explained that all Western nations did it. Having inspected the stamps of some half-dozen other countries he eventually consented to add that of Russia. Then my Cossack left me after first whining for copecks, which I didn't give him just because he had frightened me so much, and I resumed my journey to Kalisch over the same horrible earth track. Kalisch is only six or seven miles from the frontier, but I shall long remember that jolting. Near the town cobbles appear in parts, and at last the cobble roads, full of holes, of Kalisch. It was getting dark when I arrived, I had left Breslau in the hope of being some 200 miles further on at that hour. The town has two hotels—the Widenski and the Europeiski—which are of about equal quality and are owned by brothers. I stayed at the Widenski, as it had a shed for motors. It was not very bad, but was not without what Mark Twain calls "chamois" and similar fauna.

Next day I resumed my journey towards Warsaw, and this was the worst day's motoring I have yet experienced, and I am now fast wearing out my third car. I felt I had to reach Warsaw or die (and be eaten), but eighty miles of this road occupied nine hours continuous running—the other eighty to eighty-five miles I easily covered in three; I could have done them in two if I had dared open the throttle, but stretches of perfect surface alternated with stretches of so-called road which was like a relief map of the Bernese Oberland, and which had to be entered tactfully. There may be times when this road is good from end to end. When newly metalled and rolled it is as good as a French *route nationale*, but before repairing it is allowed to fall into a condition which would never be allowed in France or Germany. I had the misfortune to travel it whilst it was being remetalled or was just going to be. But parts of it were delightful, and on these I had a chance of seeing the country. It is flat or slightly undulating with some forest, and is pretty though monotonous.

The soil seems about equal to that of Posen, but is not worked with anything like the same skill or energy. There is much more pasture. The towns are more crowded, and the country more thinly populated. All the horses I met on the road were terrified of the car, and the waggon drivers often being asleep the horse frequently saw the car first and was in the ditch or in the middle of a barley field before its driver could find the reins. The peasants took these mishaps very well. Even when one waggon tumbled into the ditch and a lady passenger was thrown out of another they made no fuss about it. These waggons travel half-a-dozen together, and I always approached at a walking pace. There was always one driver awake who saw that the blame for the accident should not lie on me, and he doubtless explained this, as all the other waggoners and their passengers merely roared with laughter at the unfortunate ones.

The worst half of the Kalisch-Warsaw road is the Western half—the road leaving Kalisch is terrible and must be permanently bad, as it is cobble with deep holes. After four or five miles one comes on to bad macadam and then to occasional good patches, but the road is mostly very bad through Kolo until after Kutno. After Kutno the good patches were longer but bad patches

Week-end and Touring Notes (*Continued*).

were not wanting. Banging and hammering through the holes burst two covers and tubes, and as I had feared to bring more than two spares through the customs I was left with no reserve and thought it advisable to spend the night at Lowicz rather than risk more bursts at night far from help. On arrival I found Lowicz a filthy town with awful cobble stones, and its population, chiefly Jews, dirtier even than is usual in Poland. I visited the best inn, but dared not attempt to sleep there. I preferred the fields in spite of the rain which had fallen, so decided to go on and trust to luck. I bought half a pood more petrol at a chemist's. This was supplied in large glass bottles, but the price was not unreasonable. I also wanted to buy something to eat and drink, but was surrounded by such a swarm of filthy and diseased Jewish and Polish children that I gave up the idea, and only thought of leaving the town as quickly as possible.

After this I had luck. The road became better; it was often like a Brooklands track, and no other tyre burst. So on through pretty country on a good road lined with fine trees, until near Warsaw, where I found cobbles again, but these were in better condition than I had previously met with that day, and then through the south-west suburbs of Warsaw (a dirty Jewish quarter) over black, slimy, cobble-stone roads, which have on either side a deep wide ditch intended to remove surface water, but which receives and retains much more. The playful Jewish children amused themselves by throwing stones, hanging on the back of the car, or, by crouching in these drains or sewers and placing both hands together, throwing the foul water over me. This part of Warsaw is as squalid and insanitary as a town in China, although only a mile from the asphalt and wood pavement, the fine houses, good restaurants and theatres of the centre, which is a little Paris. The Polish Jew is not like other Jews; he is of a race apart. I understand better now the Russian prejudice against him.

Warsaw is quite a fine town if one does not move from the centre. It has all the luxury and extravagance of a capital city, as it seems still to be considered by Poles of Russia, Germany and Austria, many of whom are very wealthy. Imported goods are expensive—tyres cost £2 or £3 more than in Germany, and other things in proportion. Petrol ranges from 3 roubles to 4.80 roubles per pood according to quality. I can make no comparison, but believe the best quality costs little more than I had recently paid in Germany.

It has an excellent hotel, the Bristol, where English is spoken; but the Bristol's restaurant charges will surprise people who don't know their New York or Monte Carlo. The Hotel Europe is also good; French and German are spoken there. I know no other hotel in Warsaw where anything but Polish and Russian is understood, but there will be changes in Warsaw hotels very shortly, as the city is becoming Westernised very rapidly.

The Mercédès garage in the Hotel Europe building has not very much covered accommodation, but has a magnificent closed courtyard. The headquarters of the Warsaw Automobile Club are also in this hotel building. Someone saw my car with its R.A.C. badge enter the courtyard, and reported the fact to the W.A. Club. A message was sent to me at once inviting me to make use of the club, followed by a letter from the president offering me all the help he could give. He asked me to wait until 11.30 next day, and his messenger said that if I would do so a detailed itinerary from Warsaw to Moscow would be prepared for me. I had intended to depart at nine o'clock, but such courtesy must be gratefully acknowledged, so I remained. I called at the club at 11.30, and was received most kindly by the president and several members. The president spoke English well, and the other members French. Maps were produced, and I saw it was then intended to begin working out the 800 mile journey. This would have taken more time than I could spare just then, so I arranged to return to Warsaw or to ask for information to be sent to me by post.

The president informed me that no member of his club had ever motored to Moscow, and that Moscow people who bought cars in Warsaw or Germany almost invariably had them sent through by rail. There are 300 motor cars in Warsaw, but apparently they are only used for town work or to carry their owners between the town and their estates. The president remarked to me: "We never go into Russia; we have no relations or interests there." He spoke as though Russia were quite a different country from Russian Poland, just as Russians in Smolensk or Moscow speak of "going to Europe" when they are starting for the Western frontier.

The members of the Warsaw Automobile Club I met were particularly good to me, and I am very grateful to them, but, with the best wishes in the world, they could not help me so much as they might have done had they known the road from experience. They pointed out some difficulties I had not expected. I had believed there was a good road running within easy distance of the railway, but it seems the only practicable route runs sixty or one hundred miles south of the line, and it is possible at every few points to run north of the railway; also, along the road there are distances of 200 miles between towns at which petrol and sleeping accommodation can be found. This is not far on a good road, but one needs to know one's road. Even in these towns it appears one cannot rely on finding petrol without telegraphing in advance.

I don't know how few touring Englishmen have travelled into Warsaw by car, but my arrival there caused quite a sensation and gave birth to many false rumours. The president of the Warsaw Automobile Club asked me quite seriously whether it was true that I intended to motor through to Vladivostock!

I left Warsaw in the early afternoon by roads which were bad in the town and for some five miles out, fair for ten miles, and afterwards excellent—every bit as good as the average German road. Some of the country was quite pretty for Russia, and I passed through a charming strip of forest. After a very enjoyable run I arrived in the evening at my friend's house (where I wrote the foregoing), some hundred miles east of Warsaw, on the Moscow Road.

"The Autocar" Share List.

The following table of some of the companies connected with the motor, motor cycle, and allied trades, is not published for the benefit of speculators, but for the information of investors. The speculative buyer is referred to the daily financial press.

Issued Capital.	Amt. of Share	Name of Company.	Present Prices.	Last Year. Highest	Last Year. Lowest.	This Year. Highest	This Year. Lowest.	Last Div.	Div. Payable
£	£							%	
2,520	1/	Abingdon-Ecco, Ltd.	2/6 3/6	3/-	2/3	3/6	3/-	Nil	Nov.
45,000	£5	Alldays & Onions (£3 paid)	3⅞ sellers	4¼	3⅞	3⅞	3⅝	5	Ap/Dc
50,000	£5	,, 6% Cum. Pref.	5 5¼	5⅛	5 3/32	5⅛	5⅛	6	Ap/Dc
209,802	10/	Argylls, Ltd.	5/6 6/-	6/-	4/-	6/-	4/9	Nil	Dec.
150,000	£1	Belsize Motors, Ltd.	25/3 26/3	28/1⅛	25/-	27/6	26/-	12	My/Nv
100,000	£1	,, ,, Cum. Pref.	19/9 20/1½	20/9	20/-	20/3	20/-	6	Fb/Au
44,771	£1	Bowden Brake, Ltd.	5/- sellers	7/-	3/1⅛	5/-	5/-	Nil	Dec.
786,982	£1	Birm'gham Sm'l Arms, Ld.	48/- 48/9	53/3	46/3	50/-	47/9	10	Mr/Sp
203,150	£5	,, ,, Cum. Pref.	5 5⅛	5 1/16	5 7/16	5⅛	5⅛	5	Mr/Sp
75,000	£5	Brampton Bros. Cum. Pref.	3⅞ 4¼	4⅛	3 11/16	4	3⅞	6	Oct.
100,000	£1	Brooks, J. B., & Co., Ltd.	36/6 sellers xd	37/6	31/-	36/6	35/-	5	My/Nv
100,000	£5	,, ,, Cum. Pref.	5⅛ sellersxd	5½	5⅛	5 7/16	5⅛	5	My/Nv
100,000	£5	Brown Bros. Cum. Pref.	4½ 5	5	4½	4½	4⅜	6	Ap/Oc
330,000	£1	Charron Par. Pref. Ord.	12/9 13/-	11/6	8/-	14/-	7/9	9	Ju/Dc
200,000	£1	Clement-Gladiator	4/6 sellers	3/-	1/6	6/-	2/1½	Nil	Dec.
100,000	£1	,, ,, 6% Cum. Pref.	14/6 sellers	14/9	10/1½	15/-	12/6	6	Ju/Dc
55,000	£1	Components, Ltd.	6/3 6/9	6/9	4/-	7/9	6/1½	Nil	Dec.
25,347	£1	,, ,, 7% Cum. Pref.	12/6 13/6	15/-	11/4½	13/-	12/-	7	Dec.
275,000	£1	Darracq, A., & Co., Ltd.	14 - 14/3	18/4½	8/9	15/-	9/9	Nil	Ju/Dc
375,000	£1	,, 7% Cum. Pref. Ord.	14/- 15/3	19/1½	11/10½	16/-	13/-	7	Ap/Oc
159,229	£1	De Dion-Bouton, 7% Ord.	8/9 9/3	11/3	8/9	10/-	7/6	6	Dec.
1,000,000	£1	Dunlop Rubber	37/9 38/3	56/9	27/6	39/6	35/6	12½	Ap/Oc
200,000	£1	,, ,, Cum. Pref.	19/9 20/3	21/-	17/-	20/-	18/6	6	MJSD
312,785	£1	,, ,, Income Stock	17/3 17/9	19/-	15/6	19/-	17/6	5	Ju/Dc
624,995	£1	Dunlop Parent Co. 8% Ord.	15/9 16/3	18/7½	10/-	18/-	13/9	10	Ju/Dc
994,990	£1	,, ,, 5% Cum. Pref.	13/- 13/6	16/9	10/6	15/1½	12/7½	5	Ju/Dc
499,962	£1	,, ,, Deferred	9/6 bid	15/-	6/3	10/1½	8/-	Nil	Ju/Dc
99,977	£1	Enfield Cycle	21/4½ 21/9	19/9	13/9	21/9	18/-	5	Oct.
24,985	£1	,, ,, Cum. Pref.	20/6 21/6	21/3	20/6	23/-	21/-	7	Fb/Oc
292,904	£1	Humber, Ltd. (New)	10/- 10/3	7/6	3/7½	14/-	6/9	Nil	Nov.
331,495	£1	,, ,, 6% Cum. Pref.	15/- 15/4½	11/-	6/9	17/9	10/1½	Nil	Nov.
50,000	£1	James Cycle	12/6 sellers	6/6	5/-	15/-	6/6	Nil	Oct.
100,000	£5	Lucas, Joseph, Ltd.	9¼ 9½ xd	9⅞	9	9¾	9¼	5	Ap/Nv
100,000	£5	,, ,, Cum. Pref.	5⅛ 5½	5½	5½	5½	5½	5	Mr/Sp
73,385	£1	New Hudson Cycle Co.	25/4½ 26/-	24/6	14/6	28/-	24/6	10	Nov.
18,033	£1	,, ,, Cum. Pref.	18/6 19/6	20/-	18/-	19/6	19/6	6	Mr/Nv
50,000	4/-	Premier Cycle	4/9 5/-	5/-	3/-	5/6	4/4½	15	Sept.
125,000	10/-	,, ,, Cum. Pref.	7/9 8/3	8/9	6/9	8/6	7/3	7½	Sept.
31,000	£1	Riley (Coventry), Ltd.	6/3 6/9	8/9	5/3	7/4½	5/3	Nil	Feb.
200,000	£1	Rolls-Royce	44/3 44/9	47/3	36/3	48/6	44/6	30	Jn/Ju
138,662	£1	Rover	39/6 39/9	31/3	22/6	40/-	30/9	10	Nov.
100,000	£1	Rudge-Whitworth, Ltd.	23/9 24/-	24/-	15/-	25/3	22/6	5	Oct.
100,000	£5	,, ,, 6% Cum. Pref.	4 4½	5 1/16	3⅞	4	3⅞	*12	Oct.
41,621	6/-	Siddeley-Deasy	10/6 11/6	10/6	6/-	10/9	8/10½	8½	Dec.
50,000	£1	Singer & Co., Ltd.	17/6 18/6	19/6	6/6	19/1½	16/-	Nil	Oct.
70,000	£1	Star Engineering, Ltd.	13/3 sellers	18/6	10/6	17/-	13/6	5	Mar.
69,157	£1	,, ,, Cum. Pref.	17/- 17/6	18/-	15/4½	17/6	17/-	7	Mar.
87,550	£1	Stepney Wheel	29/6 30/6	35/-	30/-	32/6	31/-	20	Mr/Oc
120,000	£1	Sunbeam Motor Car	58/6 59/-	59/-	37/6	59/-	52/-	25	Nov.
30,000	£1	,, ,, 6% Cum. Pref.	21/- 22/-	23/3	20/4½	22/6	21/6	6	Ap/Nv
80,000	£1	Swift Cycle	20/- 20/6	21/9	13/-	24/-	20/6	6	Dec.
100,000	£1	,, ,, 6½% Cum. Pref.	17/6 sellers	17/3	14/10½	17/3	16/3	6½	Ju/Dc
80,000	£1	Triumph Cycle	79/6 80/6	71/6	43/9	82/-	68/-	30	Nov.
50,000	£1	,, ,, 5% Cum. Par. Pref.	24/- sellers	23/6	20/7½	24/6	21/6	6½	Nov.

* Including all arrears.

There has been a slacking off in business during the past week, and few alterations in prices. Darracq ordinary and preferred ordinary have been well bought, but Humber ordinary and preference, Triumph ordinary, and Components are easier. Premiers have also weakened slightly.

"The Autocar" Diary.

May.
8, 11 and 12.—A.C. de la Sarthe et de l'Ouest. Le Mans Meeting.
11 and 12.—Targa Florio Race.
12.—Brooklands Whitsun Meeting.
14 and 21.—Examinations for R.A.C. Driving Certificates. Pall Mall, S.W., 9 a.m.
18.—Opening of the Russian Automobile Exhibition.
24.—Cardiff M.C. Annual Hill-climb.
24.—Essex M.C. Race Meeting at Brooklands.
24.—Herts County A.C. Aston Hill-climb.
30.—500 Miles Race on Indiana polis track, U.S.A.

June.
4 and 6.—Tourist Trophy Races, Isle of Man (see *The Motor Cycle*).
7.—Shelsley Walsh Hill-climb.
19.—Cardiff M.C. and South Wales A.C. Open Hill-climb at Caerphilly.
21.—Cardiff M.C. and South Wales A.C. Open Speed Trials at Porthcawl.
22-29.—Austrian Alpine Tour.

July
5.—Yorkshire A.C. Speed Trials on Saltburn Sands
12.—Grand Prix Race. Picardie Circuit.
19 and 20.—R.A.C. of Belgium Grand Prix Race.
28.—Grand Prix de France and Coupe de la Sarthe. Le Mans.

August.
10.—Mont Ventoux Hill Climb.

September.
21.—Coupe de l'Auto, Boulogne Circuit.
25.—International Stock Car Race, Isle of Man.

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