example, an axle hub, or a driving bevel gear forging, or a coupling sleeve stamping. Straightaway, the machine sets to work; one set of cutters faces the rough surfaces; another set bores out the central hole; a third process results in the carving out of any necessary recesses—for ball bearings, perhaps. Suddenly the machine stops; a man steps up and takes out the finished part, inserting a fresh stamping in its place. The parts are carefully inspected, and, almost invariably, found accurate to the required limit. Day and night, these twelve machines, almost human in their actions, are kept working away, turning out each hour their allotted number of finished parts, with an occasional short stoppage to change a set of cutters, or to adapt the machine for some new part.

Close at hand, another set of machines are occupied with the crankshafts and eccentric shafts—some 50 men being kept hard at work with these parts. The illustrations show clearly the arrangements of these machines; but it is particularly here that the highest degree of accuracy is required, and so more time must be taken in the operations.

All these parts, and many of the others, are finished off on the grinding machines, of which an excellent collection is to be found in the grinding shop, situated at the North end of the main machine department. Here all the machines are hissing away, with the parts covered with a stream of water to prevent any heating of the metal. This is quite an interesting sight; for the noise of the revolving wheel grinding away the metal, the shower of sparks, and the penetrating odour of the emery dust, all combine to make this one of the most attractive departments for visitors.

The milling shop is, like the grinding department, a branch of machining practice which has experienced great development during the past few years. Operations which used to be performed with much labour on a planing or shaping machine, or which used to be dodged by the artifice of making intricate castings or forgings are now accomplished with comparative ease on a milling machine. a most interesting sight to see the rev cutter eating its way through the cas or forging with as much ease as if the material were wood instead of tough steel. Almost as surprising as the actual work done by these high grade milling machines is the facility with which they can be adapted to suit a dozen different kinds of work, and it is this fact which makes the milling shop so important in the scheme for the rapid production of the thousands of necessary parts—all of which must be dead to size and interchangeable with similar parts turned out months before.

At the end of this department, there are dozens of milling machines roughing out the teeth of spur gears. These gears subsequently pass through several other machining operations before they are carbonized and finished off. The most fascinating process in this gear cutting section is the planing of the teeth of the large bevel wheels. The machines for this work, known as Bilgram bevel planers, have to actuate the cutter by a combination of no less than six movements in order to secure perfect accuracy in the angle and size of the bevel teeth. The time and trouble involved in this department, however, are well repaid by the resulting quietness and smooth running qualities of the gears.

Alongside this shop, a set of boring machines are continually occupied in machining the holes in the aluminium crankcase and the gearbox. The layman has been known to suggest that these holes should be made by means of a long drill, but a moment's consideration will show that the extreme accuracy required in the lining up of the five or more bearings cannot be secured save by careful work on the most modern machines.

Then there are the other sections—the inspection department, the tool room, the case-hardening shop, and so forth, but a description of some of the interesting work which is performed here must be postponed till a future number of the *Bulletin*.

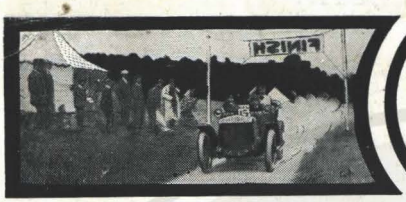
M.

FROST & SONS, TYP., RUGBY.

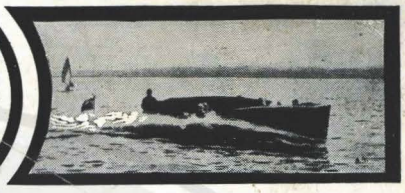
The . . . Daimler Bulletin

VOL. II. JUNE, 1910. No. 3

HIS LATE MAJESTY KING EDWARD VII. AT RUFFORD ABBEY.



The Daimler Bulletin



VOL. II. JUNE, 1910. No. 3

THE DAIMLER BULLETIN

Published Monthly.

Editorial Offices: Daimler Works, Coventry.

Contributions, both literary and artistic, are invited, and will receive every consideration. In all cases stamped addressed envelopes must be enclosed for their return if unsuitable.

CONTENTS.

THE PASSING OF EDWARD VII.

IT is with very great regret that we have to chronicle the death of our beloved Sovereign King Edward VII. The tragic suddenness of the blow makes our loss seem all the greater, and possibly there has never been a Sovereign so much beloved of his people or one more truly mourned by his subjects, both rich and poor, than our late King, Edward the Peacemaker. As far as motoring is concerned, King Edward was an early and enthusiastic adherent of the cause, and it is not going beyond the limits of ordinary reason to say that his late Majesty accelerated the progress of motoring in this country to a very great extent. As a matter of fact King Edward's connection with the movement dates back to its earliest days, when he, with that foresight and appreciation of all that made for the progress of civilization, manifested the liveliest interest in the new locomotion, and both by precept and example set a fashion that has made automobilism what it is—both at home and abroad. In the earliest days of the motoring movement in this country no one but a few enthusiasts had the faintest idea of the tremendous revolution about to take place in road locomotion; and there is not much to wonder at in this—it had its beginning under conditions which were from many points of view the very antithesis of favourable—the machine itself crude in the extreme and its use on the public roads almost universally decried as an outrage and a menace to the safety and pleasure of the public. We do not

need to go back to the oldest inhabitant for memories of the first motor cars; it is but a few years ago since the motor car was not allowed to run on the public highway unless preceded by a man carrying a red flag—we can afford to smile at those memories now—but in the early days it was no smiling matter, and long and weary was the fight until the authorities began to see the light of sense and reason through the clouds of mistrust and prejudice. However the red flag days are over, and to those few hard-working and whole-hearted enthusiasts in the cause of motoring our thanks is due, and the motoring community in general ought ever to be grateful to the memory of Edward VII. for his timely appreciation of the huge possibilities in store for motor vehicles, as well as the eminently practical manner in which he showed it.

With characteristic foresight, His Majesty, realising that if this new movement was to develop to its maximum of usefulness, it must be made the pursuit of the aristocracy—did the best possible thing to ensure this consummation by adopting the motor car into his own service—and this at a time, too, when the car was crude, unreliable, and all that a car, in the light of our present developed knowledge of construction, should *not* be. The natural consequence was that motoring became at once the fashionable pursuit of the highly placed and the wealthy, and thus money was forthcoming for the development of the car and the industry, which could never have been found if left to financiers as an ordinary commercial enterprise. Not only did King Edward ensure for automobilism speedy success, but his interest was maintained and every new development received his close attention, until, as soon as the movement was established on a firm and substantial basis, he gave it the open and official seal of his recognition by extending his patronage to the Automobile Club and conferring upon it the powers of using the prefix " Royal."

To Edward VII., whose untimely death has plunged an Empire into mourning of no merely conventional kind, we, as motorists, consequently owe an even deeper debt of gratitude than most of us are apt to realise, for the fostering and beneficent interest he showed in that great movement with whose interests we are identified.

A. F.

MOTORING BY LAND AND WATER

By E. M. C. INSTONE.

Reprinted from THE MOTOR WORLD, *May 12, 1910.*

IN commencing these notes, the first thing *I remember* is, paradoxical though it may appear, something I had forgotten—namely, my promise to send to the editor of *The Motor World* a few recollections of pioneer days.

This, however, by way of preface, for I *know* that my first outstanding remembrance in automobilism is the feeling of awe and curiosity with which I regarded a 3½ h.p. Canstatt Daimler phaeton when initially shown to me in the spring of 1896. The awe and curiosity were replaced by feelings of rapture and astonishment when a few days later, at the Imperial Institute, I hurtled round the grounds upon it, under the guidance of Van Toll, at a speed approximating ten miles an hour. Not the least difficult task of this demonstration was to appear cool and unconcerned, so that spectators might be imbued with the idea that it was a performance to which I had been accustomed for many years previous, and when one adds to these mental sensations extreme physical discomfort, the experience must always stand out in my memory as one of the most palpitating of the many incidents I have passed through during a fairly long association with automobilism. *I remember* that as time progressed, and we became more skilful in handling the powerful Daimler, Panhard, Peugeot, and Bollée cars entrusted to our care, and more accustomed to that sensation of speed so strikingly manifest at ten miles per hour, the exhibition management provided us with a wooden bridge, up one side of which we laboriously climbed, so that we might enjoy the unique experience of dropping down the other side at a greatly accelerated speed. The primary object of this bridge was to demonstrate to an enquiring public the fact that motor cars could run not merely on the level and down hill, but actually, under stress of circumstances, on up grades. The method had its drawbacks, however, for not infrequently our motors, despite the 3½ h.p. which they developed, jibbed and jibbed badly; indeed on one occasion a particularly vicious mount hurled itself and Hankinson or Charles Rush—I forget who was in charge—over the embankment, where it caught fire, and was extinguished only with difficulty.

I remember that, at about the same time too, we had many exciting adventures with our Daimler motor launches on the river. These boats were troubled with many idiosyncrasies, and through their motors' pernicious habit of spluttering petrol around, they were not exactly fireproof, with perhaps the possible exception of the burners, which invariably refused to light. The clutches of the engines, too, not infrequently declined to de-clutch, resulting in an occasional aggressive entry into a lock. Join to this the marked tendency to belch forth exhaust gases in profusion, and one can appreciate how cordial was the welcome accorded to us when joining in the throng of craft assembled in a lock or at a regatta.

I remember one occasion in particular when, as an adventurous trio, A. H. D. Altree, Hankinson, and I voyaged from Twickenham to Margate in one of these boats. Altree, on the strength of a trip he had once made at some remote period of his existence to the United States, prided himself on a profound nautical knowledge which would have been alike the envy and despair of an Admiral of the Fleet, and so armed himself with a most encumbering compass and a complicated drawing, which, he assured us, was a chart of the Thames Estuary. The compass and chart, however, had evidently been brought up in different schools of navigation, and as individually interpreted by Altree from time to time, they showed an unfailing difference

of opinion as regards our whereabouts, which ultimately led to our undoing. Even under these circumstances matters might still have gone well with us, but that the water-circulating pump became so constantly choked with weed that one might have imagined we were navigating the Sargasso Sea. The continued trouble involved great and unaccustomed labour of a dampness of character compared with which a diver's occupation might be termed almost agricultural, and this, coupled with what Altree termed the "negligent inexactitudes" of the Admiralty chart, and the indecisions of the compass, untimately resulted in our drifting so far out of our course that at dusk we found ourselves firmly embedded on a sand bank some ten miles out from Margate. Our only remedy was to jettison ourselves, and although this performance on a chilly spring evening presented no particular charm, we had to adopt it in the absence of any other alternative, and after considerable pushing, splashing, and struggling in three feet of sand and water, we eventually got our frail craft afloat at about midnight.

After this experience of the mystic deep, the highway, in spite of its then insurmountable hills, appeared to me to be infinitely safer than either sea or river, and from that time onwards I confined my attention almost exclusively to the motor car.

I remember that a week or two previous to the Brighton run in 1896—to be exact, in the month of October of that year—the winning Panhard in the Paris-Bordeaux race, the celebrated No. 6, was purchased by the Daimler Company, and when Van Toll, our greatest expert, was deputed to fetch it from Victoria, he absolutely declined, upon ascertaining that it was fitted with a four-cylinder engine of no less than 8 h.p., and had actually averaged fifteen miles per hour throughout the race. Dear old Toll was only ultimately persuaded to undertake the dangerous task when the glories resultant from such an enterprise as that of guiding the monster through London streets at four miles an hour behind the office boy brandishing a red flag were brought home to him.

I remember the Brighton run, too, but only a very limited portion of it, and perhaps the most vivid recollection it has left upon my mind was the scene at the Central Hall, Holborn—now, I believe, occupied by a firm of carriers. There, at a very early hour in the morning, were congregated a gathering of motor notabilities, including the celebrated Panhard drivers, Merkel and poor Mayade, who was ultimately killed in a road accident in France. All were enthusiastic in their admiration of the skill with which Leon Bollée drove his weird-looking three-wheeled machine in and out of the collection of milk cans, etc., which happened to be stored upon the premises. It was, too, upon the return from the Brighton run that many of the same experts spent much time and concentrated study upon a refractory De Dion tricycle, the engine of which absolutely refused to start in spite of all the skill and attention expended upon it, and it was only after several hours of careful investigation and heated—overheated, shall I say?—discussion that some genius suggested the possible absence of the ignition contact plug, which, in fact, was actually found to be missing. The mental condition of some of those present is clearly exemplified by the fact that when Critchley left the machine for a moment to send a telegram advising the works of a later arrival than he had anticipated, the self-same telegram came back to us ten minutes afterwards, owing to its having been addressed to "Daimler, London," instead of to "Daimler, Coventry."

I remember the demonstration given to His Majesty the late King (then Prince of Wales) in the grounds of Buckingham Palace in the autumn of 1898. The arrangements were made by Mr. Evelyn Ellis, at that time a director of the Daimler Company, and Altree, Van Toll, Gorton, and I were deputed to display the powers of two Daimler cars and two motor tricycles, one of the latter machines being a De Dion, and the other a Beeston. The Beeston was gifted with the possession of tube ignition, the outstanding feature of which was its liability—nay, more, its pronounced tendency to flare up at unexpected moments and in a manner hardly conducive to the comfort of its rider. That Gorton came through the ordeal of demonstration without any actual breakdown of this tricycle speaks volumes for his ability. It is true that I once found him behind a shrub in the grounds extinguishing a kind of miniature conflagration, but such was his discretion that none but I were aware of the circumstances, and the demonstration as a whole passed off with great success. The speed achieved by the machines was not perhaps notable, but then the pathways were somewhat too heavily gravelled for the use of motor vehicles, and anything over fourteen or fifteen miles an hour could not reasonably be expected under these conditions.

I remember the first time I met Charlie Jarrott. It fell to my lot to explain in painful detail to him the peculiarities of construction of two or three cars held in stock—peculiarities of which I was as ignorant as was probably the person who had at turn pointed them out to me. The fluency and perfect disregard of accuracy with which these and similar explanations were given would, I am convinced, bear comparison with the best efforts of the modern expert, and can only be accounted for by the fact that none of us having ever seen the inside of a car, and being forced by a public thirsting for knowledge to enlighten them, had of necessity to invent what we did not know.

Altree, Jarrott, and I, as well as many others moving in what I may term "the hub" of the motor movement of that time, displayed extraordinary enterprise in this particular direction.

I also remember the eventful participation in the Lord Mayor's Procession of that year of a wonderful Daimler landaulette, in charge of Turrell, and which carried, stowed away discreetly in its commodious interior, the burly form of Van Toll, the only man—with the possible exception of Otto Meyer — who knew its mechanism and could be relied upon in cases of those certain mechanical troubles which were ever present to our mind when engaged in any motor expedition.

Then, too, *I remember* at that period some curious episodes with Charles Rolls, whose skill as a driver was then, as now, of outstanding merit. I accompanied him on one occasion to the city, when he left me with his Peugeot while he transacted momentous business. He left me so long, and placed with such a painful disregard of traffic regulations that an officious constable, failing to recognise in my shame-faced appearance a genuine pioneer of a great industry, and unmindful of the fact that this motor visit to the heart of the Empire was one of epoch-making importance, curtly bade me "take it away." My expressed inability to move it, accompanied by a chorus of derisive comments from the crowd, would certainly have resulted in summary treatment to both the machine and myself had it not been for the timely reappearance of Rolls.

Mention, too, of the old No. 6 Panhard, subsequently sold to Rolls, reminds me of an experience enjoyed upon it with Bert Altree—that best of good fellows and most loyal of friends. The occasion was a drive to Hampton Court, where, after many roadside vagaries inseparable from every expedition in those days, we duly arrived in that begrimed and heated condition characteristic of the old-time motorist. Having acquired fresh courage — and spirits—at a local hotel, we sallied forth prepared for any troubles which might await us on the return journey to town. We found the usual throng around the car, and were reduced to the customary state of nerves by the ironical encouragement and strenuous advice pressed upon us. The burners were lit, and we proceeded to climb into our seats. Altree put in the forward gear, but when he released the clutch pedal nothing happened, and nothing continued to happen for the next half-hour, although we had the footboards up, and half the engine bonnet off in our exertions to ascertain the cause of the trouble. It was not until the bright idea occurred to one of us that it might be advisable to start the engine before attempting to drive the car

that the problem was solved, and by that time all the inhabitants for five miles around had, I think, congregated about us.

I remember what I believe to be the first really lengthy trip on an English-made machine, and that was an expedition in which Altree, Critchley, and I participated. The performance was achieved on a 4½ h.p. Daimler built in Coventry, and took the form of a drive from Coventry to Manchester and back. I say "back," but I am bound to admit a portion of the return journey was made by train, the result of a breakage in the steering, and the consequent repair being of such a character that the vehicle could only be steered to the left, and that, too, with a somewhat disconcerting abruptness. Determined to leave nothing to chance, we gave the whole day up to the outward run, and left Coventry before six o'clock in the morning. That matters went well with us is shown by the fact that, in spite of devoting upwards of an hour to meals en route, we actually arrived in Manchester by five o'clock in the afternoon. By that time Critchley had deserted us, doubtless hyper-sensitive in the matter of speed, and Altree and I were left to our own resources. He had driven that type of machine once or twice before, but had never investigated its intricacies to the point of knowing how to start it. On the other hand, I had never driven it, but was a master of the art of starting, and consequently neither of us could go out unaccompanied by the other.

A day in Manchester, and then another day devoted to the homeward journey—brought to an untimely end by the breakage to which I have already referred—made up what we were pleased to term "an Easter motor tour."

I remember, too, the so-called display at Wembley, the Sheen House meetings, the formation of the Automobile Club, and its earlier tours, and in connection with them come memories—memories in their hosts, too paltry in themselves to interest your readers, too trivial to warrant repetition, except possibly among those old comrades who saw the dawn of modern automobilism in England, and among whom the most petty incidents have long ago assumed no insignificant proportions, and who, I am sure, treasure up the smallest details of their old-time work, with all its pleasures and disappointments.

No, such memories could have but little interest and no particular charm to those who have seen but the later and easier side of motoring, and as, due to the popularity of *The Motor World*, these notes are for the many and not merely for the few, I will at this stage ring down the curtain and remember no more.

We have received the following interesting communication from New Calabar:—

5 Duke Street,
Buguma, New Calabar,
26th March, '10.

To Mr.
Motor Co. 212–229 Ltd.,
London, W.C.

Dear Sir,

I hope this will please your mind to let me have one of your full and complete illustrated catalogue with price list for the same should my need are supported and if it be so as am proposing I shall endeavour my best by showing you fair satisfaction by renting terms aright. With compliments,

I am yours
faithfully,
DAGOGO Y. HARRY.

CAR-SORY REMARKS

By E. N. D.

The Modesty of Frederick.

YES; on reflection I fear that it does sound rather theatrical, but really, you know, one has to use something abnormal in the way of side head, for Frederick is no ordinary critter.

One day during the mess-up suffered by the best-organised car concerns' staffs during Show week, I had a letter from Fred. You might be rather tone-y without knowing Fred, though he probably would say that not to know him was to be oneself unknown. He is Mr. Frederick Scotch, light-weight champion of the world, or so we will name him, as he seems to be rather coy.

Now do you know Fred?

His letter, to get to business, asked me if I would "kindly let him know my best terms to him for a fifteen horse-power car, with hood, to seat five persons." Admire the simple, manly directness of Fred's enquiry.

He has recently, continues Fred, won the title of Light-weight Champion of England, and is on the point of signing contracts to appear in the music halls of London and elsewhere.

"At the present moment I think I may say that I am the most widely advertised person in the kingdom, and in a sense one of the most popular," says Fred. One can imagine him saying "No; no! Dash it all, *don't* say that! It's true, I admit, but leave that out." For doubtless Fred numbers at least one secretary among his retinue.

Then Fred tells me that he is to be paid between £300 and £400 a week for his appearance in the music halls. That's the kind of fact that the lamented Richard Swiveller would have admitted to be a staggerer, I should imagine.

"I shall need a motor car to take me from one hall to another," states Fred, "and any car I use will obtain an extraordinary amount of advertising, because the streets outside the theatres are always so crowded with people eager to have a look at me that it is always necessary to make use of the services of the police."

Rather Ambiguous.

I don't think Fred is as clear here as might be desirable. Whether one is to understand that police are necessary when Fred bursts on the scene, to keep a friendly eye on his admirers, or whether he means that the police are needed to restrain the too-zealous adulation of hero-worshippers, I can't quite see. But no matter.

"The value of such advertising was so appreciated by the motor car firms in America that I always had the use of a car free of charge." Just here I begin to see Freddie's drift, dimly, as through a glass.

"The Blank Dash Car Company, for example, put one of their touring cars at my disposal in Los Angeles, and Battling Nelson, light-weight champion of the world" — presumably so before Fred clouded o'er his luminosity by one or two hot ones—"was presented with a £2,500 car outright by a firm that saw a sufficient profit in doing so." I believe you, Fred; but you might have named the clairvoyant concern in question.

Well, I feel by now that you are just yearning to know that I telephoned our managing director, who at once told me to wire Fred, asking him to step up to Olympia and take the pick of the Stand—select something subdued in cabriolets, or a lashing limousine, peradventure.

But you are wrong. No such thing happened. Somehow, the firm did not see the advantage of hitching one of our wagons to Fred's star, and the opportunity of an age slipped out of our grasp.

I am mentioning the facts to-day simply so that Fred shall realise that *I* appreciated his manly candour—saw the force

of his appeals to any spark of acumen we might possess—recognised that take it for all in all we should never have Fred make us such an offer again.

I am depositing Fred's touching little missive with the Editors of the *Bulletin*, whose publication of these halting lines is evidence of their knowledge of the genuineness, the reality, the actuality of Fred's well-meant suggestion. Some firms don't seem to have a snap of enterprise! Never mind, Freddie! *Tout vient á qui sait d'essayer*, old chap!

By Way of Apology.

You see, Fred, old man, the particular firm on whose staff I try hard to be usefully ornamental spend some two thousand pounds per annum in newspaper advertising, another thousand in public competition entrance-fees, and another thousand in postal advertisement.

They are conservative, Fred. They have never seen the force of lending cars to Miss Fifi Flapper, or Mademoiselle Chaud-Etôffe, and hiring some photographer to procure a pictorial record of the loan. They have never seen the value of this kind of thing, and all I can say won't make 'em. All this makes doleful reading, my dear chap, but it's honest Injun!

"You will find this a very profitable way of bringing your car into notice," you say. Exactly! *I* saw it in a minute, Fred. But my myopic employers seem to think that the mere fact of having brought-off a percentage of "places" out of a number of "entries" that is exactly 100, just that mere fluking-through the season's competition list, entitles them to turn-up their silly trunks at so sporting an offer as yours. Hard lines on me, Fred! Not *my* fault!

The Old, Old Romance.

Not that this is suggested by Fred's letter at all, but what a number of people there are who want something for—well, rather less than its ordinary cost price.

"It occurs to me," writes another altruist, "that well-known as is your car, you could appreciate a little advertisement that costs nothing. I am one of the greatest living authorities on ecclesiastical architecture . . . ." (Here follows evidence, in the way of heart-stoppingly exciting publishers' prospectuses, of this correspondent's mastery of his subject.) . . . . "Just now I am purposing to make a tour of the glorious British Cathedral cities.

"I shall take with me one of the most able photographers I have met, and I propose that he should secure pictures of each of the Cathedrals from a point-of-view never before utilised."

Now don't suppose that my good friend is going to obtain permission from the National Telephone Company to utilize their wires as focusing-pitches, or anything like that. No; no bird's-eye views.

"Instead of photographing the Cathedrals from the points used by earlier operators, my assistant will in each case select quite a new position from which to make his exposures.

"*Now*, my dear Sir, for the idea. In the foreground of each of the pictures I suggest that one of your cars should stand. The new six-cylindered 27 h.p. chassis, with what I understand is called a torpedo body, would do admirably. Thus, you see, every illustration in my new work (which one of the leading publishers has promised to consider most carefully) will contain a striking advertisement of your car."

Kind, Kind and Gentle.

Now there's a nice old boy for you! Primarily, of course, he is making this tour to collect material for a new Work on our Cathedrals, but he is one of those good sorts, bursting with generosity, who really must do good on every hand, and he proposes to give us what would really be quite a good advertisement, if and provided that he should succeed in getting "one of the leading publishers" to consider his Work favourably. Nothing to pay, I suppose? . . . . . But hush!

"I ask nothing in return for this advertisement. I am, thank goodness, so circumstanced as to be quite freed from the need to ask payment for this matter. My tastes are simple, my pleasures few. My own modest income supports me in what to me stands for comfort. Money is nothing to me.

"I presume you would have no objection to this advertisement, and would not spurn it because it cost you nothing?"

By jove! The man's a philanthropist! "Spurn" it? Not much!

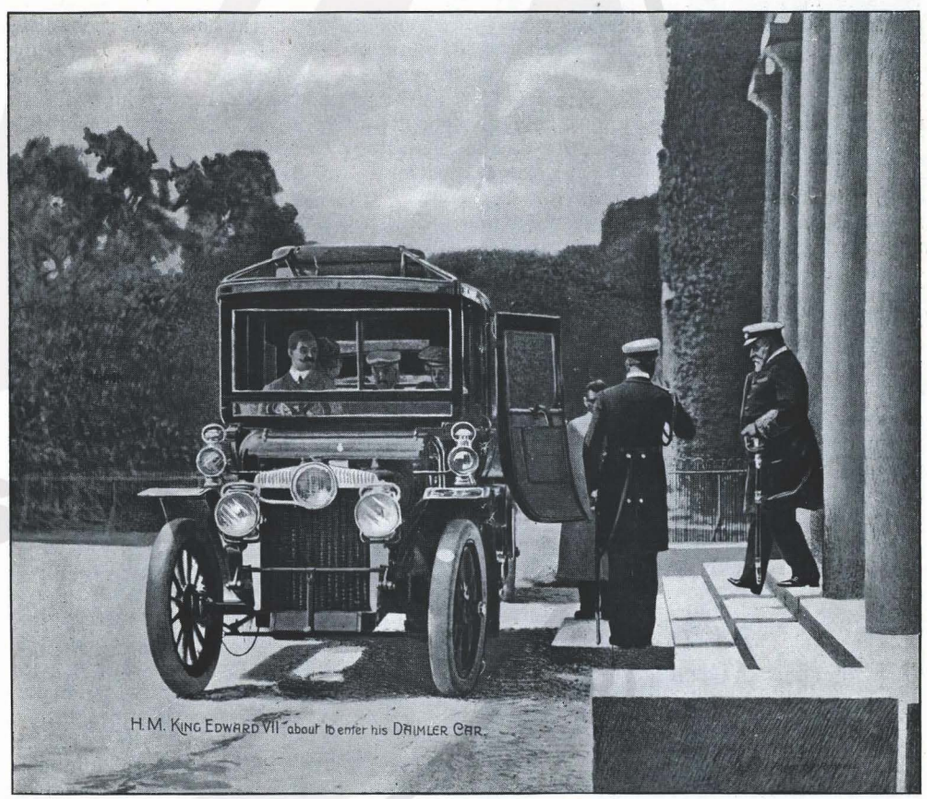
"If you agree with my little suggestion, just let me know, and the thing is done. Yours sincerely." Just that and his signature. Decent old bird, this!

Oh, but there's something over leaf.

"The car should be fitted with hood and screen, and I must have a pair of six-inch Rushmores, because a lot of my travelling will be done at night. I suppose you could supply a good, trustworthy, sober driver, who would not be everlastingly on the look-out for gratuities?

"When my Work is published, as it will be purchased by practically every archæologist and Church dignitary in the Kingdom, you can reserve me a small commission of, say, 25% on all sales to purchasers of your cars who mention my Work. I shall ask nothing more. The car, of course, you would present to me.

"If purchasers should not specifically mention my Work, I ask no commissions." Noble soul! Of such indeed is the Kingdom!



H.M. KING EDWARD VII about to enter his DAIMLER CAR.

THE LATE KING AND THE BRITISH MOTOR INDUSTRY

ONE of the outstanding features of the reign of King Edward has been the development and final success of the application of mechanical traction to road vehicles. It is remarkable that during a reign so short such a complete revolution in the matter of transport by road should have been witnessed, and a few moments' reflection will show that it was to a great extent due to the efforts and example of His late Majesty that motoring—and, in particular, the British Motor Industry—has risen to the position of national importance that it occupies to-day.

The foresight that led His Majesty to regard the motor car as a factor likely to play an important part in the future daily life of his subjects is but another instance of his sagacity and sureness, while the steps he initially took, and continued to take, throughout his reign to foster and develop the young and backward British industry show his constant solicitude for the welfare of his people. Each of these efforts have been crowned with success. The motor car has become a beneficial and indispensable feature of modern life, and the British motor industry, so weak and backward a decade ago, has risen to a position of national industrial importance and to the premier place in the like industries of the world.

Great as was his love for the horse, King Edward quickly recognised the utility of the car, and began to make use of it at a time when only the most sporting people would associate themselves with motoring—at a time, in fact, when the motor car had only recently been differentiated in the eyes of the law from a traction engine. It was a memorable day for the cause of automobilism when the King took his first run, driven by the Hon. John Scott Montague, now Lord Montague of Beaulieu. It was in 1899, and the car, quite a monster for those days, was one of the first twelve-horse Daimlers.

The King was extremely pleased with his first experience, and the further drives which were arranged subsequently led to the purchase of His Majesty's first car—a six-horse power Daimler, with an Iveagh phaeton body. On this car the King was taught to drive, and he quickly acquired considerable proficiency in the art; nevertheless, he was rarely to be seen at the wheel. Soon the car became a recognised feature of State life—a stud of cars being acquired for various purposes—for private use, for station work, for working distant shoots, and so on. It was just at this period that the King proved so valuable a patron to the British motor industry. The motor car was clearly becoming a factor in fashionable life, and hence a considerable demand for cars arose among the upper classes of society. Continental cars, by reason of their successes in the great road races, loomed large in the public eye, and there was great danger of the British car being passed over and left to sink into oblivion. At this crisis the King purchased his cars—British productions—and at all important functions His Majesty appeared on a British car. Quickly the leaders of fashion and public opinion decided that the King was at least as good a judge of cars as were themselves, and their orders were diverted from French and German factories to British industrial centres, thus establishing the foundations of another great national industry.

In his Royal garages, the King has cars of various types and powers—some purchased on his various Continental journeys—but he never deserted his first choice, and his fleet of Daimler cars numbered one for almost each year. It is only a few weeks ago since His Majesty ordered his twelfth Daimler—a 57 h.p. six-cylinder

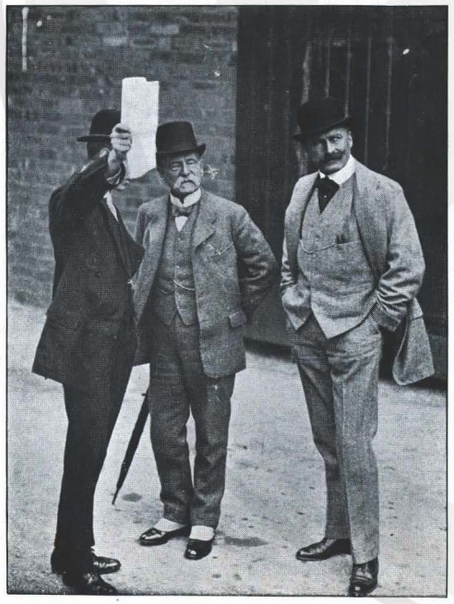
THE LATE KING ON MR. MONTAGU'S (now Lord Montagu) 24 H.P. DAIMLER.

car, which stands in the works now—a silent tribute to the Father of British Motoring.

One aspect of the King's relations with motoring was his constant indifference to motor racing on the public highways. His Majesty fully realised the immense possibilities of the car for touring and for extensive journeys from point to point, and except for special State occasions, he practically had abandoned the use of horse-drawn vehicles. Apart from constant motor excursions when away at places like Biarritz or Marienbad, he used his cars in this country for visiting friends and for driving to race meetings and other events. But His Majesty was never a visitor at Brooklands, nor did he honour any of the earlier road races with his presence. It was not that he considered it dangerous to travel at speed on an open road, under conditions which rendered this free from inconvenience to anyone, but rather that he objected to motor racing on principle, as something opposed to the best interests of the industry and as contrary to the correct progress of its development. It is noteworthy that this attitude has come to be adopted by the leading bodies of motoring in this country—the Royal Automobile Club, voicing the opinions of the private motorists, and the Society of Motor Manufacturers and Traders, representative of the manufacturing and trading interests.

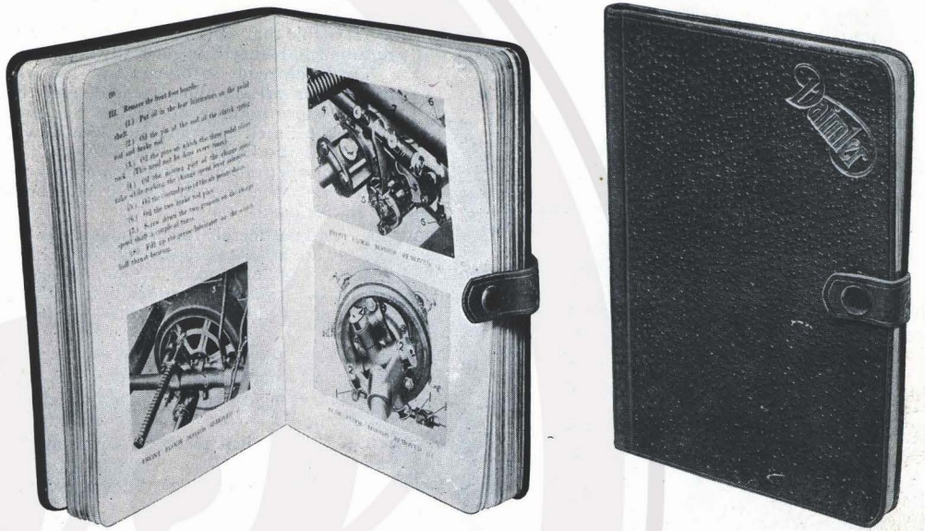
Both of the above Societies were honoured with official recognition of His Majesty—the former by the conferring of the title "Royal," and the latter by the patronage accorded to the successive exhibitions at Olympia. Only a few weeks ago, too, King Edward conferred a similar honour upon the Aero Club, with the result that its efforts have received the stimulus they needed and deserved. As with automobilism, His late Majesty was keenly alive to the future of aviation, and desired by lending his personal assistance to help forward the cause.

King Edward has many titles to recall his memory to his subjects. "Edward the Peacemaker" is the one which would have been most dear to his own mind, but a second title whereby he will be remembered for long to come is that of "Edward the Sportsman and Champion of Motoring."



A Snapshot during Lord Roberts' visit to the Daimler Works.

THE NEW DAIMLER INSTRUCTION BOOK



DESPITE the fact that the modern car is simplicity itself compared with its progenitors of a few years ago, there is still ample scope for a concise instruction book which will briefly, yet in detail explain to the owner just where he must pay attention to his new car. The result of the possession of such a *Vade Mecum* is that the owner is freed from that slight feeling of uneasiness which frequently springs from a lack of knowledge of the "innards" of the car.

Quite the best Instruction Book which we have seen recently is that just issued by the Daimler Motor Co., Ltd., Coventry. This attractive little manual, daintily bound in black Morocco leather, is conveniently sized for slipping into the pocket. Its pages contain a full description and adjustment, these being divided into headings, "Weekly," "Monthly," and "Half-yearly." Then follow a few hints as to sources of trouble and the appropriate cures, for, while Daimler motors have a well-deserved reputation for reliability, one must admit that accidents will happen even in the best regulated cars, and hence the instructions under this heading are given for use if ever necessary. The fourth section contains some useful driving hints, of which the "Maxims for the Careful Driver" deserve to be printed on the face of every driver's license, so that they might frequently be referred to. Lastly, this complete, yet by no means bulky, guide contains a useful appendix, which gives a host of valuable information in the way of licensing information, distance and lighting up charts, metric, speed and other conversion tables and so forth. We can strongly recommend all our readers—whether Daimler owners or not—to apply for a copy of this useful production, which is being sold by the Daimler Co. at a charge of 5/-.

"DEFINITIONS" (UP-TO-DATE)

By ANITA LEA.

PETROL.—Sold at the wayside inn. The most dangerous part of the car—next to the colour.

SILENCER.—The thing that makes such a row when you haven't got it.

SPARE PARTS.—Those you haven't got, can't get, and want badly.

STEP.—The seat of honour, eagerly sought by all young brothers who haven't got a license.

SPARK.—The root of all evil.

CHAUFFEUR.—From an old Greek word meaning "as one of the family." He will marry the Motorist's daughter, but will not wash the car.

If you can't afford a chauffeur you can have a driver.

NOWHERE.—Miles and Miles from Anywhere. The place that every motor gets to sometime, "Where there ain't no tins of petrol, and a car *can* raise a thirst!"

MOTORIST.—Himself. The nearest thing to a Teddy-Bear.

REPAIR-KIT.—In which you find those things which you ought not to find and do not find those which you ought.

RACING RUNABOUT.—Built for honeymooners.

TOOL-BOX.—Where the chauffeur keeps his clean collar and tooth-pick when on tour.

LICENSE.—Like the poor, you have it always with you.

DRIVER.—Common or garden chauffeur. A gentleman in large gauntlets. He will wash the car.

BOSCH.—A swear word, used in sparking troubles.

SPANNER.—Look in the Pocket.

BROOKLANDS.—Place all good motorists go to when they die.

ROAD-HOG.—One who blows his own trumpet.

MAGISTRATES.—(The collection will now be taken).

COUNTRY-BUMPKIN.—A great authority on Motors.

VALVE-LIFTER.—A little thing that "knocks off work" on the slightest provocation.

POCKET.—A place full of spanners.

BRAKE.—Like its name; with it you break everything if you're not careful.

CARBURETTOR.—The heart of the mystery. Nobody knows what it will do next.

SPEED.—A word that is never mentioned in the Police Court. Though you may not think it, there are only two speeds on every car—the one you go at, and the one the Bench says you go at.

CYLINDER.—The thing that burns your fingers.

POLICEMAN.—The true friend of the naughty motorists. The real George Washington.

SMELL.—It is this that kills most of the victims, not the front wheels, as generally supposed.

Thus one reads so often that "the *end* of the car *struck* the deceased, and the driver knew nothing about it." It was really the Smell that knocked him down, with fatal results.

So this petroleous smell may rather be considered as a sort of deadly aftermath or *In Memoria*.

GOGGLES.—Are not merely for ornament.

They are used to preserve or conceal the beauty, not to enhance it.

Part of the *tout ensemble*, but nothing whatever to do with the working of the engine.

They do not even make a car go faster.

H.P.—The great what is it? and where is it?

BONNET.—The thing to cover the brains of the machine.

TONNEAU.—A convenient place to stowaway the chaperon.

PUNCTURE.—This word, like "Punctuation," literally means "Stops."

HORN.—Something to play with, and make the welkin ring. *'Ip 'Ip* without the *'Urray*.

A continuous performance on this instrument will break the monotony of a long run (and cause the public to run, too).

Strange that Richter has not yet thought of forming an orchestra of motor horns.

PEDESTRIAN.—The funny man in the play.

A person who walks by instinct and considers himself a special charge of Providence.

EXHAUST.—The stronger the better. You *must* have an exhaust, or the thing might burst with bad temper. But the good old hearty exhaust to be found on the cars of ten years ago seems to be going out of fashion!

HOTEL BILL.—The heavy charge of the light refreshment brigade.

CHASSIS.—The most stylish car on the market.

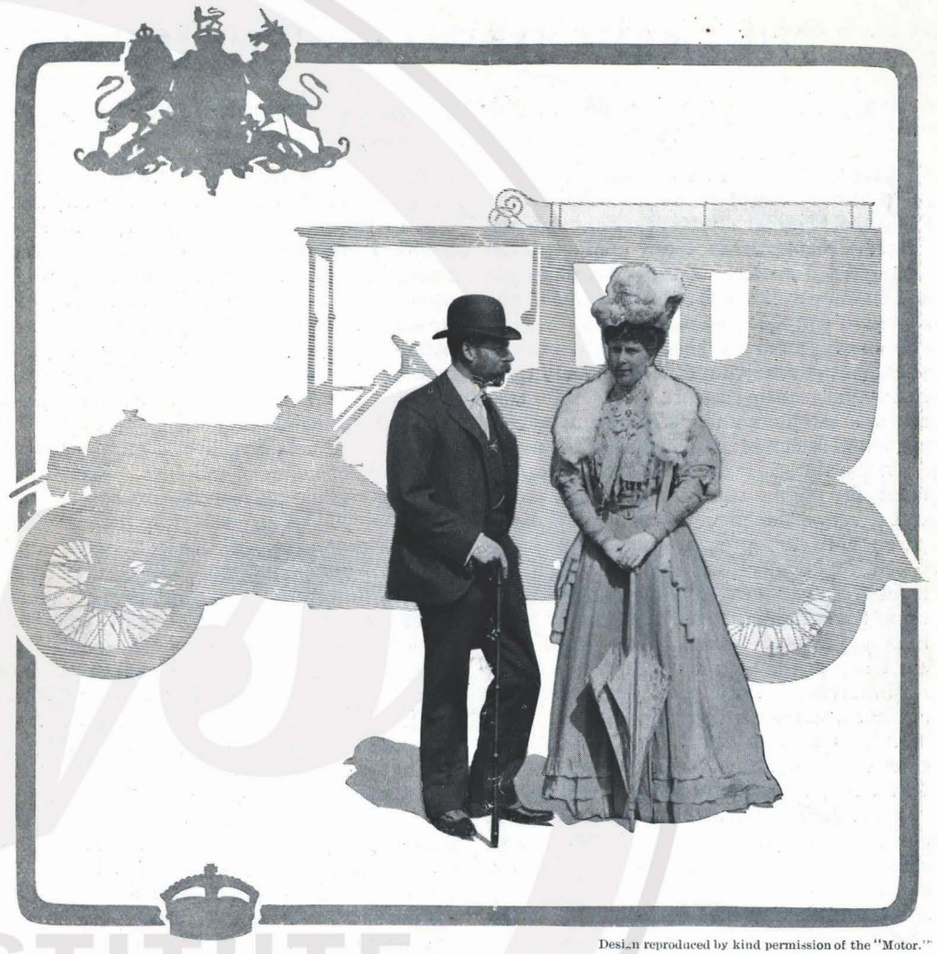
This is the car *par excellence* for the young man who would look important.

With a loud engine and a bucket-seat he can appear really classic, especially without a hat.

A.A.—Denotes that there are two of them!

(Some ignorant people confuse this sign with the "*Aut. Ass*," in which there is only one, as you will observe.)

DAIMLER.—"The car you drove six years ago (since when you have driven no other.")



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THEIR MAJESTIES KING GEORGE AND QUEEN MARY.

NO two opinions can be held as to the value of the late King Edward VII.'s influence upon the automobile movement in this country. It is satisfactory to reflect, however, that the motoring sympathies of King George V. have been shown to be no less marked. As a matter of fact, our new King began his motoring career no less than seven years ago, and has owned in all no fewer than six cars. The first was a 22 h.p. Daimler, which he acquired in 1903. In the following year he obtained a 28·36 h.p. car of the same make, while in 1906 he was so far converted to the indispensability of the motor vehicle as to order two new Daimlers of 30 h.p. and 35 h.p. respectively. Two years later he increased his stud by the addition of a powerful 58 h.p. Daimler, and in 1909 ordered another, this time a 38 h.p. with a Knight motor. Still maintaining a preference for British products he has since ordered and will shortly receive delivery of a six cylinder Daimler of 57 h.p.

THE NEW DAIMLER ENGINE

Paper read before the Wolverhampton and District Engineering Society by J. S. IRVING, A.M.I.A.E., *on 17th January, 1910.*

BEFORE giving a technical description of the Knight engine, as now used by the Daimler, Mercedes, Panhard, and Minerva Companies, I am going to take you back a matter of eight years to the beginning of Mr. Knight's experiments, and give you a brief summary of the difficulties overcome by sheer hard work and persistency, and the different ideas tried and found wanting before the present system was adopted, and its efficiency proved by actual road test in the hands of the users.

At the time Mr. Knight began to experiment, the engine used for motor car work was a very crude piece of mechanism, compared with the present mushroom valve type of engine; one of the chief disadvantages from the point of view of a man who up to that date had been a steam car enthusiast was its noise. The actual fuel efficiency of the engine as then used, being far in advance of the best of steam engines, did not enter so much into Mr. Knight's calculations as the elimination of noise, the chief cause of which was the chatter of the valves and valve actuating mechanism.

He experimented with numerous schemes to subdue the noise, but after some considerable time was forced to the conclusion that any efforts in this direction could only afford temporary relief, as the action of the cam and tappet, etc., were such that noise was inseparable from their use. If noise was to be entirely eliminated an altogether different type of valve gear had to be designed, which from its method of working would act smoothly and without any violent action, such as happens with the cam type of mechanism.

The first idea tried was for ports to be opened and closed in the top of the cylinder as is done in the two-stroke motor at the bottom, using an inverted piston at the top and reciprocating this piston in such a manner as to open and close the ports at the time required. However, the additional complications, the weight of the connecting rods, etc., to stand the stresses due to the explosion, the interposition of toggle joints, etc., which under the great forces would wear and probably cause more noise than the type of valve gear it was intended to supplant, rendered it unsuitable. It was also possible to reciprocate the cylinder, but the additional weight and complication of water and gas made that unpractical.

Mr. Knight then had the idea of putting a "cylinder inside a cylinder," and from this, by gradual stages, the present engine was evolved. The idea simplified everything, the sleeve, working in cylinder and in which the piston worked, could extend down into the base chamber, and be reciprocated by an eccentric shaft, and all working parts would be enclosed. By causing the ports in the sleeve to be covered by a wide ring on the inverted piston during the compression and firing strokes, the compression could be kept tight.

The single sleeve was first tried, but it was found that the opening and closing of the ports were too slow, the period of maximum opening of the ports being extremely short. As regards efficiency it was only on the same level as the slide valve used on steam engines and discarded years ago by steam engineers for mushroom valves on high speed engines.

A second sleeve was then used, practically in the same manner as in the present type of engine, and the setting of the eccentrics and ports in the sleeves, to obtain the correct movements for the best periods of opening and closing of the valve ports, was a matter of the greatest difficulty. The original type of engine had, in addition to the usual inlets and exhaust ports, a "Clerk" port, which was uncovered by the piston at the end of power stroke, and the timing of its action also had to be taken into consideration. The sliding sleeve and fixed head combination was quite opposite to the principles laid down by general engineering practice, and when first tried all sorts of troubles were predicted, the chief being that it would be impossible to work it at the speeds required in modern motor car engines and maintain efficient lubrication, and that it would absorb a great deal of power.

Probably, if Mr. Knight had allowed himself to be influenced by the adverse criticisms which the idea received at its conception, we should never have had the present engine, which has done more than any other invention to stir the designers of internal combustion engines out of the rut in which they were working, and show them the infinite possibilities yet in front of them.

obtained from engines whose R.A.C. ratings only showed 26 horse-power, opinions were expressed that the motor car engine was developed to its utmost extent, and in the majority of cases the designers rested on their oars.

The introduction of the Knight engine by the Daimler Co., in 1907, caused a tremendous stir in the trade, and all sorts of dire endings were predicted, but now, after nearly two years of running in the hands of the actual user, who can hardly be accused of being biassed, and the number of orders received for cars fitted with these engines by the Daimler and Minerva Companies, it can be accepted as a sound engineering proposition, which has more than proved its claims and disproved its critics.

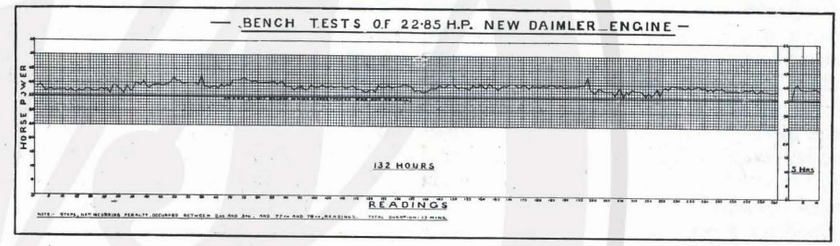


Fig. 1

Two years ago, the mushroom valve type of engine was unhesitatingly accepted as standard, and, although designers had made vast improvements, both in design and efficiency of the type of engine made and used when Mr. Knight first started his experiments, the lines of advance were simply due to a better appreciation of the principles underlying the action of an internal combustion engine. The progress was in the direction of obtaining higher speeds by using better materials, making reciprocating parts lighter, and valve areas larger, and the better balance of the engine as a whole.

These were the lines along which improvements could be expected and were obtained, but any deviation from the standard type of engine was not favoured. After the 4-inch race in the Isle of Man, when between 40 and 80 horse-power was

As stated earlier in the paper, Mr. Knight only introduced this type of valve gear to obtain silence of working, but its flexibility and power, its freedom from breakdown and troubles, place this engine in a class by itself. Numerous types of engines have been invented and placed on the market since the introduction of the Knight engine (some of which are simply resurrections of old steam engine practice), but up to the present time it cannot be said to have an equal.

The tests which a 22 and 38 horse-power motor underwent under the supervision of the Automobile Club, in March, 1909, were harder than any engine had undergone, under official observation, and in very few cases, outside of the Daimler works (where the confidence in the Knight design is supreme) was it considered that they would stand up through the arduous task imposed.

The engines, however, came through the tests "without a stain on their character," and an examination of the charts (Figs. 1 and 2) will show the splendid results obtained. It will be seen that the 22 horse-power engine developed an average power of 38·83 horse-power for 132 hours 58 minutes without a stop incurring a penalty, and the 38 horse-power engine developed a power of 54·3 horse-power for 134 hours 15 minutes without a penalised interruption.

After the successful conclusion of these tests the Daimler Company issued a challenge to the trade offering £250 for any engine showing better results, a challenge which remained open for three months without an acceptor.

The R.A.C. have awarded the Dewar challenge trophy to the Daimler Motor Company for the most meritorious performance during the year 1909. Out of 39 certified tests the Daimler engine test is considered the most meritorious.

I have spent some little time in giving you the history of the development of this engine solely with the intention of pointing out that it is not of mushroom growth, but has been constantly experimented with and developed for a matter of eight years. It can confidently be said to be a thoroughly reliable mechanism, and, in the horse dealer's parlance, "free from faults, powerful in action, and quiet to ride or drive." You probably are anxious to know what are the advantages over the standard motor which have decided the Daimler and other prominent firms to take up the idea.

These advantages, as claimed by Mr. Knight and verified by the Daimler Company, are as follows :—

1. *Absolute silence*, not that which is silence by contrast only, but the genuine absence of sound when under load. People who build six-cylinder motors obtain, by increasing the number of cylinders, a continuity of noise which they call silence! The only difference between the noise of a well-balanced single cylinder motor and six-cylinder is that in one it is intermittent and clearly distinct, while in the other it is continuous, and therefore less objectionable to the senses. The silence of the new engine is entirely different from the so-called "silence" of the poppet valve type.

2. *Extraordinary smoothness in operation.*—The sensation of riding in a car propelled by one of these motors is distinctly different from that experienced in a car where eight hammers in the form of valve tappets are continuously pounding away and producing a tremor or vibration which is felt throughout the entire car. As speed increases, the difference between the new type and the old type becomes even more marked, and the sensation of riding in one of these cars over a smooth road at the rate of a mile a minute is what, in the absence of actual experience, I imagine flying to be like.

3. *Greater flexibility.*—This advantage should have preceded the first two claims. Given a fly-wheel of average weight and, regardless of compression, one can do almost as he pleases with these motors. From four miles an hour up to 60 without change of gear is not difficult with the standard 38; in fact, only a little slipping of the clutch is necessary to reduce the minimum to zero and we can get from a standstill to 60 miles an hour. In traffic it performs like a steamer. Starting on top speed is not confined to level stretches, but can be done on quite moderate gradients. In traffic driving with a 3 to 1 gear on top it is hardly necessary to change except when reversing.

4. *Reliability.*—We believe the motor to be as near fool proof as any piece of power producing mechanism that has ever been devised. "What," some one asks, "will happen to this motor if it is not properly lubricated, or if the weather gets cold and your oil is bad and gums up and sticks, and you try to start it, or if the water runs out, or in case of a thousand and one possibilities of neglect?" In turn I ask: "What would happen to a poppet valve motor if subjected to the same sort of abuse?"

I may say here that I can cite authorities upon the care of motor cars who devote pages to a recital of what may happen to valves alone, and further space to suggestions for their care. This is not

surprising when you realise that outside of nuts, bolts, and cotter pins, fully one-fourth of the number of parts required to assemble a poppet valve motor belong to the valve system.

5. *Greater fuel efficiency under normal conditions than with the Otto type.*—Upon the bench we produce one horse-power for one hour with from ·54 to ·64 pints of petrol according to compression pressure.

6. *Much greater working endurance.*—The tendency to lose power under continuous load, which is so frequently the case with other types of motors in time, is not characteristic of this motor. There is no valve or valve seat to warp, heat, or

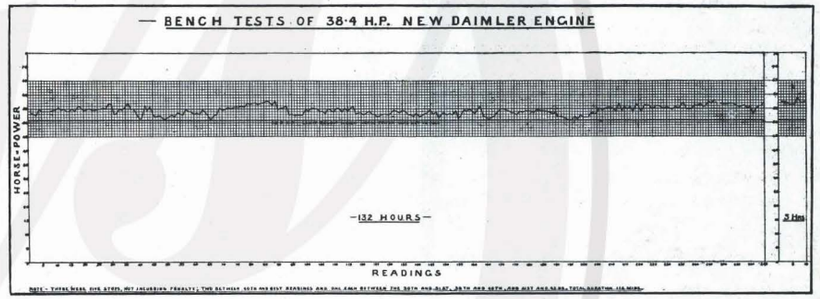


Fig. 2

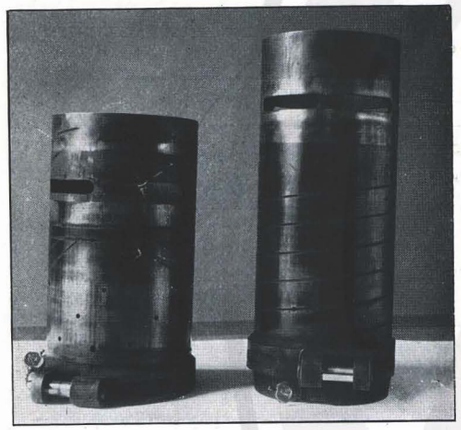
break, or springs to weaken under continuous heavy work.

The valve action on this motor is positive; the valve mechanism is symmetrical and can be thoroughly and equally cooled, and the very free inlet and egress of the gases prevents attenuation of the charge, etc. In the tests of the 22 and 38 horse-power motor already mentioned, the engines increased their power output with constant running under full load, and the power curves show an increase of power output towards the end of the test.

7. *Great power and speed.*—We claim in this matter of power this motor will give the purchaser anything within reason he may desire. The Daimler Company have settled on a compression which gives slightly over 57 horse-power at 1,200 revolutions per minute for the 38 horse-power R.A.C. rating. This motor is capable of being accelerated up to 2,500 revolutions per minute, or throttled to less than 150 revolutions per minute.

This compression was chosen, not because it could not safely be exceeded and more power thus secured, but because the chassis was designed for about that amount of power. If the purchaser should desire a motor to do more, for instance, to climb Edge Hill on direct drive, it is a matter of very little time to substitute cylinder heads which will very materially increase the power, but this would be beyond the limits recommended by the Daimler Company for the accompanying chassis. Up to 100 lbs. per square inch gauge compression the motor is as silent and flexible as at 75 lbs. The only disadvantage we have found with high compression is the possible necessity of more frequent cleaning of the carbon from piston heads and combustion chamber, but as this is a job of not over an hour for four cylinders, because of the use of detachable heads, the problem of carbon deposits is never serious, and the amount of attention necessary in this direction in a motor with polished cylinder walls is much less than that required when there is a rough cast surface above the piston travel. On the other hand, should a customer conclude he did not care to place in the hands of a driver a motor developing the power the "38" gives at 1,200 revolutions per minute, then in the same time the cylinder heads can be fitted, which give an increased volume of the

explosion chamber and less power, but decreased fuel efficiency. We have driven motors of this type with compression ranging from 45 lbs. to 95 lbs., and tested them upon the bench with as high as 114 lbs., and have come to the conclusion that for the general public the 75 lb. compression is about right. With this compression a fairly intelligent driver should easily do 20 miles to the gallon of petrol, and run 450 miles to the gallon of lubricating oil. Very few of the rank and file who operate cars realise the relation between compression and smooth running. Long experience



Sleeves 38 h.p. Engine used in R.A.C. test.
No wear perceptible.

has convinced me that nine-tenths of carburettor and ignition troubles can be directly traced to loss of compression largely due to leaking valves. The nature of the work of the valve is such that it commences to go wrong from the very beginning. It is not meant that it goes wrong suddenly, but if it does not do so ultimately, it is a different valve to any I have seen. The unequal heating of the valve head and valve seating causes distortion and consequent loss of compression and power. The valve mechanism, sleeves, segment ring, etc., of the Daimler motor, however, improve with running, and the longer they are in use the more perfect their fit and tighter the cylinder. The travel of the sleeves is only about one-twelfth of the piston travel and, owing to the large bearing surface over which the pressure is distributed, the wear caused by a whole season's use is almost too small for measurement.

As a result of this absence of wear, we know of no such thing as loss of compression on this motor, with the exception of that due to breakage of piston rings. Five full season's running in the hands of the public have not brought to light a single instance of such trouble.

It is well understood by every designer of multi-cylinder internal combustion motors that it is impossible to get absolutely smooth running unless we have perfect explosive as well as mechanical balance and not very heavy reciprocating parts. To obtain proper explosive balance it is necessary that each cylinder should have exactly the same initial compression, which means that for the best results the combustion chamber must be machined all over to exact dimensions. With the usual type of engine having poppet valves the combustion chamber includes the pockets in which the valves operate, and from their shape it is impossible to machine them. You have to rely upon the accuracy of the core makers in the foundry, and it is practically impossible for a series of cylinders to be cast with combustion spaces exactly uniform, and because of this the explosive balance of the usual type of multi-cylinder is not uniform, and a varying unevenness of running is the result.

With the new motor the combustion space is all machined to dimensions, and therefore the explosive balance is a certainty. These machined and polished walls have also the advantage of presenting no projecting particles upon which carbon can burn and become sufficiently phosphorescent to cause premature firing of the charge.

In the matter of gas passages, this design affords an almost unlimited scope; it is possible to have areas of gas ports equal to cylinder bore if necessary; it is entirely a matter of eccentric stroke.

Honest criticism of this motor is always welcomed. Its design being upon entirely new lines raises many honest doubts in the minds of those who are not familiar with its operation. The bulk of criticism of this motor is directed at lubrication. Probably this is because the majority of critics have the idea that we depend upon the accuracy of the fit of the sleeves to hold compression. On examination of the engine, however, it will be seen that the accuracy of sleeve fitting has no effect whatever on the compression. Any loss of compression could only occur between the inner surface of the inner sleeve and piston or cylinder head, as they are the parts which in this motor constitute the combustion chamber, and the only parts of the engine exposed to compression forces of any sort. The fitting of the inner sleeve in the outer sleeve, and the fitting of the outer sleeve in the cylinder casting itself has no bearing on the compression value.

We have tested motors with sufficient clearance between the sleeves to permit of the introduction of a thin piece of cardboard. We do not recommend this fit (or lack of fit), but I only mention it to illustrate my point about compression. We have also tested, both on the bench and on the road, motors with sleeves an absolutely "dead fit." We do not regard this to be good practice either, and both the above instances are simply taken from our many experiments to determine the limitations. Compression, so far as the ports are concerned, is held solely by the wide junk ring at the bottom of the cylinder head from inside the cylinder. This junk ring is in two pieces, and a spring ring underneath the segments forces them outwards and in close contact with inside surface of the inner sleeve. During the entire duration of compression and firing strokes the sleeve is in such a position that the ports are covered by this ring and protected from the compression, and also from the intense temperature obtained during the firing stroke. As both sleeves and cylinder head are kept cool enough to permit of efficient lubrication this seating is practically sealed by the film of oil, which is always present, and makes it a matter of impossibility for the pressure to escape.

Here is an advantage which no poppet valve motor can ever possess, as its valves and valve seating can never be lubricated, and the seating of the dry metal is depended upon to hold the compression, and obviously this seating must be always becoming less efficient. The junction of the junk rings (or compression segments, as we call them) is exactly similar to the ordinary piston ring, and no more care is required in their manufacture than in the case of a piston ring. The statement that a cylinder is down in compression is never heard at our works.

The parts are assembled with the certainty that they will each perform their function properly, and the engine is taken straight from the erecting shop and started up under its own power exactly as if it had been run for weeks and not newly assembled from unused parts. The power is obtained with absolute certainty and without tinkering with valve settings, etc., and there are no unknown quantities.

The valve timing is obtained from an eccentric shaft, the eccentrics of which are made integral with the shaft with mathematical precision. It is impossible for the timing of the port openings and closings to vary with continued use, and as no attention is required and no adjustment is possible, it is absolutely "fool-proof" in every sense of the word.

HOW A MAGNETO MAKES ELECTRICITY

The Principles Involved and Method of Operation Explained and Illustrated.

By P. S. TICE.

(*By kind permission of the* AUTOCAR.)

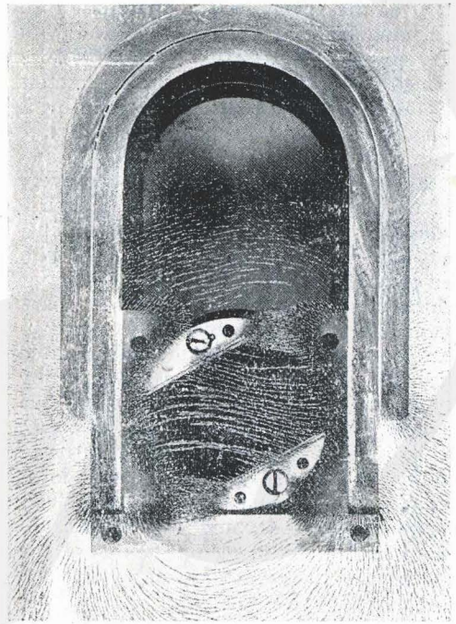
IN figs. 9, 10, and 11 of a magneto the armature is shown in three characteristic positions. Fig. 9 (page 35) shows the armature in such a position that its main body of metal lies directly across the poles, and therefore conveys the greatest possible number of lines of force through the coils of the movable conductor. In fig. 10 the armature has been displaced through 45°, and shows in what manner the lines of force, which extend from one magnet pole to the other, are distorted and tend to follow the direction of the main body of metal.

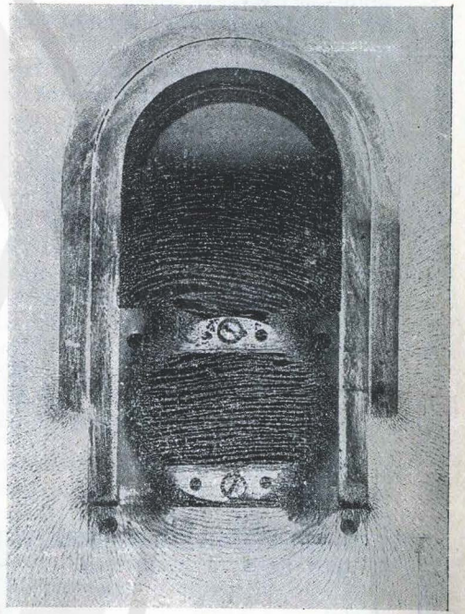
Almost all the lines which traverse the armature in fig. 9 still do so in fig. 10, and therefore there has been no appreciable electric pressure induced in the conductor winding, since a current depends for its induction upon a cutting of its lines of force. Between the positions shown in figs. 10 and 11, however, all of the lines which are shown as traversing the armature and its windings in fig. 10 have been caused to assume new courses, and leave the armature winding without lines of force running axially through it. At this point (fig. 11) the cutting of the lines of force by the coil has been extremely rapid, as is readily seen, and an electric pressure has been induced in the conductor winding.

The photographs of the magneto fields show the armature as having been moved through 90°—from the maximum to minimum inclusion of lines of force. During this travel the lines of force are distorted from their normally straight paths because of their tendency to travel the path of least resistance, namely, through the most permeable medium, the soft iron armature. However, when the segmental armature pole pieces are set directly across the pole pieces of the magneto field magnets (fig. 11) they furnish the most direct paths for the lines of force without including in their circuit the main body of the armature upon which the wire conductor is wound. It is when the armature pole pieces come into action to divert the lines of force from their paths through the armature body (fig. 10) that the cutting of the lines by the armature winding becomes rapid enough to induce a current of sufficient value for ignition purposes, the really rapid cutting beginning shortly after the armature position shown in fig. 10. In fig. 11 the cutting of the lines by the winding is presumably completed at the highest speed possible, and therefore the value of the induced electric pressure is a maximum at this point.

As the armature continues its rotation in a clockwise direction from the position in fig. 11, the lines of force re-enter the armature core and pass through it in the opposite direction from that in which they passed with the armature, in the position shown in fig. 10. In re-entering the armature core and passing through it in increasing numbers as the armature continues its rotation, the winding is again cut by the lines of force, and an electric pressure is induced within the winding. The second cutting of the winding upon the entry of the lines induced an electric current which is the same in direction as that induced by the exit of the lines, but is an exact reversal of the pressure values due to the exit of the lines. The diagram (fig. 12) shows this. Here, beginning at the horizontal zero electro pressure line, the pressure within the armature winding has progressively increasing values as the armature is rotated from the position in fig. 9. The curve in fig. 12 represents the rise and fall of this pressure value with its reversals of direction. In this figure the armature positions of figs. 9, 10 and 11, corresponding to the electrical pressure values of the curve, are indicated. Evidently the current is at a maximum value in the armature position (fig. 11) and is maintained at about this value for a short time by the sudden re-entry of the lines of force in the opposite direction. From the maximum position in fig. 11 the current value falls off as the armature continues its rotation, until it again becomes a minimum when the armature core lies directly across the field poles.

From the foregoing it appears that two current impulses of opposite direction, ranging in value from zero to maximum and back again, are induced per complete revolution of the armature. This reversal





Figs. 10 and 11.—How an electric current is induced in the armature winding (b and c).
In fig. 10—to the left—the armature is shown midway between the extreme positions (shown in figs. 9 and 11) assumed in the process of current generations. The photograph shows how the lines of force are distorted from their naturally direct paths from one pole of the magneto to the other to pass through the armature core and thus through the centre of the windings of wire. The lines are actually distorted to a greater degree than can be shown photographically. The number of lines passing through the winding is not, therefore, reduced from the maximum, as shown in fig. 9, to any appreciable extent when the armature is in the position here shown. In fig. 11—to the right—the armature is shown where no lines of force are passing axially through the windings. It is at the instants at which the lines of force enter and leave the core that the current is induced in the winding and passes through the external ignition circuit to produce the spark.

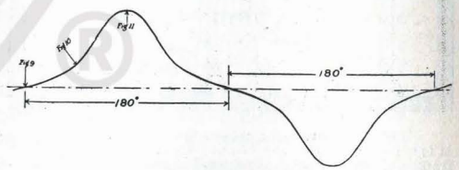


Fig. 12—Electrical pressure fluctuations and changes in direction of flow in the armature winding through one complete revolution.

of the direction of current flow through the winding has caused the induced current to be termed an alternating current. All magnetos, no matter with what type of ignition system they may be employed, generate their electric current in the manner above indicated, although there are several distinct ways in which the induced current is made to cause the ignition spark and ignite the gas.

Utilising the Induced Current.

The low tension system, or that directly employing the induced current in the ignition of the charge, will be taken up first and considered as type A. Here the sparking points within the cylinder are arranged so that one of them is movable with reference to the other. In fact, these points form a simple contact switch within the combustion chamber. One of these points, or electrode, is supported in an insulation which prevents its electrical contact with the metal of the engine cylinder. One end of the armature winding of the magneto is connected to this insulated electrode through a conductor or bus bar and an intermediate spring plunger or spring, called a brush, which latter conveys the induced current from the moving winding. The other end of the armature winding is electrically connected with the body of the armature, and therefore with the main body of the magneto and with the engine. This latter connection is termed "earth," and the electric circuit for the induced current is completed by it when the sparking points are in contact.

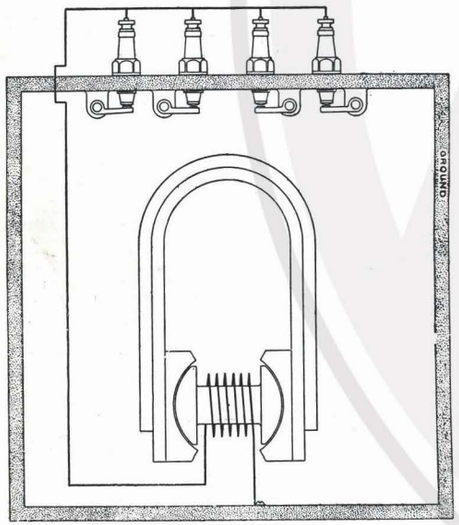


Fig. 13—Wiring diagram of low tension system. It is here shown how the circuit is completed through the framework or "earth," the insulated electrodes, and the movable "earthed" contact points. The points on the left are in contact and complete the circuit, which will be broken by their separation at the point of maximum induction in the armature winding.

In this system, called the make and break, the magneto armature is positively driven from the engine by gears in such a manner that the points of maximum current induction in its winding coincide with the piston positions within the cylinder at which it is desired that the ignition spark occur. Also the movable and the stationary electrodes are so mounted and operated that the points are separated sharply by the make and break mechanism at the instant at which the spark is to occur. At some time previous to the occurrence of the spark, the movable electrode is brought into contact with the stationary insulated electrode, and the current induced in the circuit by the motion of the armature is therefore short circuited upon itself.

When the points are separated by the operating mechanism at the instant at which the induced current in the armature circuit is at its maximum, the lines of force through the winding, due to the field of the magneto magnets and to the field of the current through the winding, are suddenly removed and replaced by lines acting in the opposite direction. The removal of the lines, due to the break in the circuit, causes a sudden electric pressure to be produced by self-induction, and this self-induced current is supplemented and strengthened by the induction of an electric pressure due to the re-entry of the lines of force in the opposite direction. As explained in the above, when the lines acting in one direction are removed from the armature winding, the pressure thereby induced in the circuit acts in the same direction as does the pressure induced by the re-entry of the lines in the opposite direction. Thus it appears that the spark produced at the electrodes in make and break systems is due both to self-induction and to the pressure regularly induced by the motion of the armature winding within the magnetic field.

High Tension System.

In this system, a wiring diagram of which is shown in fig. 14, there are, properly speaking, no primary and secondary windings. That is to say, while there are two windings, and there is, therefore, a certain amount of constructional similarity between the parts of the systems classed as types C and D, the actions are dissimilar, in spite of the similarity of the descriptive terms applied to the several parts of each system. Referring to fig. 14, it will be noted that two windings are placed upon the armature core, but separated and insulated from each other. One end of one of the windings, shown in light line, is connected to the revolving distributor arm. The other end is electrically connected with one end of the second winding, shown in heavy line. The heavy line winding, commonly called the primary, has its ends connected to the circuit breaker points, one of which is insulated and the other earthed in such a manner that when the breaker points are in contact any current which may be induced in the winding will be short circuited upon itself.

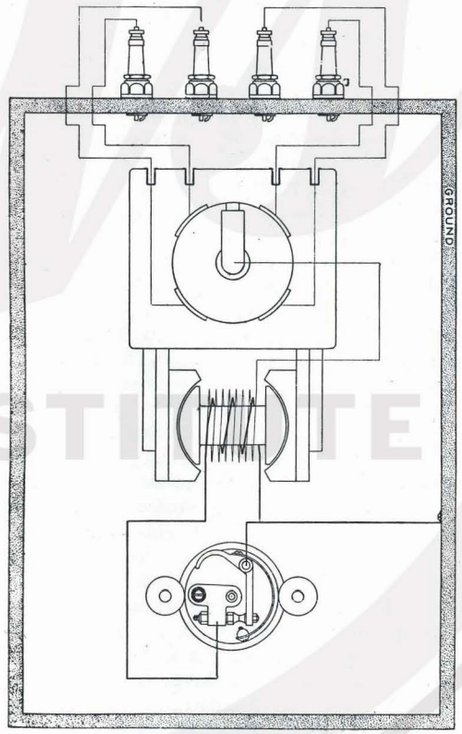


Fig. 14

As the armature is revolved through its positive driving relationship with the engine crankshaft two separate and distinct pressures are induced in the two windings. That induced in the light line winding does not flow because its metallic circuit is incomplete, but it is welled or dammed up in the conductor of the incomplete circuit, so that it is virtually a potential pressure in the same sense that a weight placed upon a shelf possesses potential or stored energy. The number of turns in the winding directly connected with the distributor—here called the light line winding for the purpose of distinguishing it from the other winding, called the heavy line winding—is insufficient for the induction of a great enough pressure to cause the bridging of the plug gap and the unaided production of a spark. However, the current or pressure induced in the second (heavy line) winding is brought to the aid of the pressure in the light line circuit in the following manner :—

The pressure values induced in the two windings increase from zero to a maximum (fig. 12), and at the instant at which the potential pressure in the light line winding is at a maximum that in the heavy line circuit is also at its maximum. When the point of maximum induction is attained in the rotation of the armature (fig. 11), the circuit of the heavy line winding, heretofore closed through the circuit breaker,

is opened by the engagement of one of the cam rollers with the lever arm carrying the "grounded" contact point, and the pressure theretofore existent in the heavy line circuit is suddenly impressed upon or added to the potential pressure latent in the light line winding. This impressment of one pressure upon the other, so increases the value of the resultant pressure that the air gap at the spark plug is bridged and an ignition spark produced.

A RUN ON A 15 H.P. NEW DAIMLER

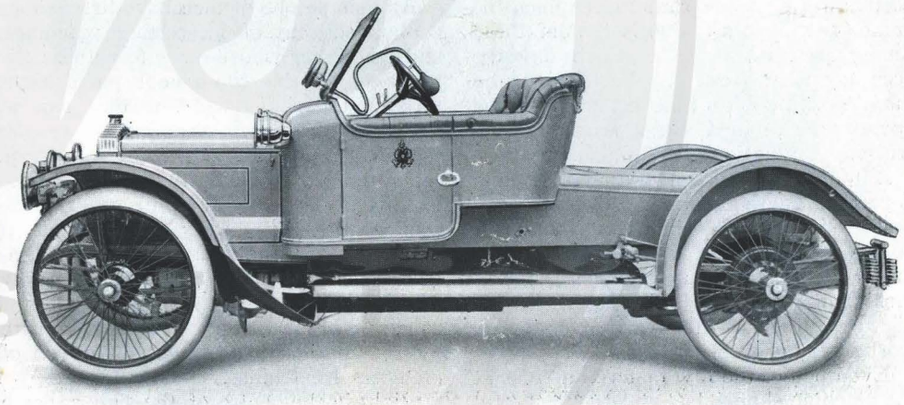
Reprinted from THE MOTOR WORLD, *April 7, 1910.*

BEING the owner of a 38 h.p. Silent Knight Daimler which has run well over 10,000 miles since I obtained delivery eleven months ago, and which has not lost me a second on the road except for tyre troubles, I was pleased to take advantage of a friend's offer to have a trial run on his 15 h.p. New Daimler. The 15 h.p. has been put on the market by the Daimler Company to meet the requirements of the man of moderate means, the price of the side-entrance cars being £445, and landaulettes £525. On raising the bonnet, one is struck by the absence of complicated parts usually evident on cars of similar power. There is no fan belt, the fan being gear-driven in an oil-tight case, four black polished cylinders (80 mm. by 130 mm.), a carburettor, magneto, inlet, exhaust, and water pipes, so arranged to occupy the least possible space, giving the interior of the bonnet an appearance of extreme nakedness, cleaning, therefore, being accomplished with ease.

The route of our trial run being left to me, and as I was desirous of thoroughly testing the car, I selected Church Street as a test hill, a narrow street off the main thoroughfare of Stockbridge. The upper portion being 1 in 5 is seldom, if ever, used for traffic. Any attempt at rushing this incline was out of the question, but notwithstanding a full load, we ascended on second gear. The third, which is top speed with direct drive, was then slipped in. Our destination was Pathhead, twelve miles south of Edinburgh. The "maze" at the west end was negotiated without changing, our speed at times being a mere crawl. We were soon on our way to Dalkeith; the half-mile gradient of 1 in 14 after passing Craigmillar Castle on the left was easily negotiated, as was also the short steep hill into Dalkeith. After leaving Dalkeith the road ascends for nearly three miles, with an average gradient of 1 in 24. I was very dubious as to whether the ascent could be accomplished without changing, as on several occasions when I have been on four-speed cars of from 25 h.p. to 30 h.p. they had to come down to second, and that when the road was at its best in summer; but no such changing was required on this occasion, as we sped on up the ascent with ease. Considering that there was frost overnight, and the roads were now sticky and lifting, and about as heavy as possible, the performance was all the more praiseworthy. Shortly before reaching Pathhead the petrol gave out, but a spare tin in the back soon put us in motion again. We started on second, and this was the only time we came off the direct drive during the entire run, except when reversing for our return journey. The half-mile gradient of 1 in 19 through Pathhead village was also easily ascended without changing. The return journey, being mostly downhill, can pass without comment, except to remark that forty-five miles per hour on the level can be easily attained. There appeared in one of the technical papers recently an account of "A Short Trial on a 15 h.p. Knight Daimler," which stated that the external rear brakes caused some trouble by becoming clogged with mud, but although our brakes were simply smothered, they caused no trouble whatsoever, the solution being their correct adjustment.

In conclusion, a description of some of the car's features may not be out of place. As previously stated, the great simplicity of the engine, and the entire absence of rods, piping, etc,, to be found on other cars which claim similar advantages could not be otherwise than a self-evident fact even to the uninitiated. Although high-tension accumulator ignition is also fitted, starting on a high-tension magneto is a very easy matter. The clean dash is also a special feature, there being only the petrol pressure gauge and single-drop feed to indicate that the automatic lubrication is working. As on the higher-powered models, the foot-brake is connected to the rear wheels, but under ordinary circumstances fully retarding the throttle is all that is necessary to slow the car. The silence and entire freedom from vibration can only be described as wonderful, not only when the car is stationary, but when running at a high speed. In my opinion, there is only the following phrase to truly describe the car both in detail and as a whole, and that is—a little marvel.

A MEMBER OF THE S.A.C.



H.I.M. THE CZAR OF RUSSIA'S 15 H.P. CROMARTY PHAETON.

MODERN MACHINE SHOP METHODS AT DAIMLER WORKS

THE manufacture of a high-grade car calls for the employment of the latest and most up-to-date machine shop methods, and thus the large building at the Daimler Works, which contains some 2,000 men occupied with the machining of the several thousand parts which go to make up the finished car, is replete with all the best and most efficient machines that the art of the tool-maker can produce.

The average motorist has little or no idea of the extraordinary degree of accuracy which is necessary in the machining of the principal parts of a car—say, for example, the crankshaft or a piston. A sixteenth of an inch is usually considered to be a small length, and a one-hundredth part of an inch would be said by most people to represent an extremely fine division; yet, in the machining of these important parts of the car's mechanism, the greatest error permissible is the one-thousandth part of an inch. Such extreme accuracy as this can only be obtained by the use of first class machines and skilled operators, combined with a searching system of examination of the finished parts.

A tour of inspection of the machining department at the Daimler Works is an impressive task and one which is full of interest both to the novice, who marvels at the intricacy of the various machines and processes, and, likewise, to the expert, who in his turn appreciates the accuracy and good work which is being produced.

Even before the raw material arrives at the machine shop, it has undergone careful examination at the hands of the expert laboratory staff. Samples have been analysed and tested so that there may be no doubt as to the perfect suitability and strength of the metal. Next, the special steels have undergone a lengthy heat treatment, which has the effect of relieving any strains which may have existed in the original material, and so of increasing the strength of the weakest parts. But all these interesting matters can well be dealt with in a future number of the *Bulletin;* at present we are only concerned with the material in its progress through the machine shop.

The large machine hall—once a cotton mill, and which, by its very size, is a source of wonder to visitors—is divided into a dozen sections, each in charge of a foreman, who is, in turn, directly controlled by the Superintendent of the Machining Section. These departments consist of the turning, capstan, crankshaft turning, automatic lathe, grinding, drilling, boring, milling, brass turning, tool grinding, tool making and inspection sections, this last being employed in the careful inspection of the finished articles, as distinct from the examiners attached to each of the other departments.

Any single one of the above-listed shops contains dozens of interesting machines, and the visitor who desires to witness the progress of the component parts right through the shops will find that several days would be well occupied in viewing the various processes, while to follow the separate parts of his particular car on their lengthy journey would require his presence at the works from early morn to late at night for a fortnight or more. Such enthusiasm is rarely encountered (fortunately for the manufacturers) and the visitor is usually content with a general survey, with a more detailed examination of a few of the special machines.

Right in the centre of the hall a batch of a dozen large semi-automatic lathes attracts attention. These machines—Coventry built, by the way—are admittedly superior to anything of the kind previously made. It is less than a year since they were designed and installed in the Daimler shops, but in the twelve months they have done a vast amount of work. All that is necessary, once the machine has been correctly set, is to feed in a blank, say, for

(1) Some of the Hobbing machines which cut the spiral gears.
(2) Turning eccentric shafts on a capstan lathe.
(3) Boring out a six-cylinder crankcase.
(4) A 15 h.p. crankshaft in a grinding machine.