THE AUTOMOTOR
AND
HORSELESS VEHICLE JOURNAL

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

Circulates amongst Makers and Users of Motor-Cars, Cycles, etc., in the United Kingdom, the Colonies and the Continent.

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CONTENTS.

VIEWS ON AUTOMOBILISM.

By SIR DAVID SALOMONS, Bart., President S.P.T.A., &c.

AUTOMOBILISM, moto-carism, or by whatever name the revived movement may be called, though its scent is not as sweet as the proverbial rose, is making slow but sure progress in this country. It is well known that the public in general has been waiting for startling discoveries, combined with a great fall in the present cost of self-propelled vehicles, but neither of these boons has been realised, nor is there in sight the slightest probability of their being granted. The cost of the carriage itself will remain the same, according to its character, as that of one intended to be drawn by horses. The machinery necessary for the power, of whatever kind, must necessarily be higher in price than similar machinery to be used for stationary purposes in a workshop, because there must be the additional gearing between the motor and the carriage wheels. A small increase in the general cost is also present, for the reason that the frame and wheels of the carriage have to be made more substantial in consequence of the extra weight to be carried.

The saying "cheap and nasty" is more than true in the case of self-propelled vehicles. Indeed it would be true to say "cheap and broken bones." When the demand increases, and these carriages can be made in great quantities at a time, the purchaser will probably find that the main result will be rather to give a better carriage for the same money than a fall in price, although prices will no doubt drop to a slight extent. As bearing out this opinion, a good instance may be given by quoting the factory of Messrs. de Dion and Bouton, whose moto-tricycles approach perfection. From the admirable organisation which exists in their factory, improvement after improvement has been added to the vehicle without raising its price. It is doubtful whether any factory in this country can be found better organised than the one in question.

Opinion in England appears to be divided as to the reason why the movement has made more rapid strides in France than it has over here. Those who know our neighbours well have no difficulty in ascribing the true reasons. Firstly, horses are not regarded in the light of personal friends as they are in England. The riders and drivers for actual pleasure bear but a very small percentage to the total population, and the *lovers* of the horse are almost nil. Secondly, although the most elaborate decrees exist in regard to self-propelled traffic, not one of the ordinances is enforced till an accident occurs. About 14 miles an hour is the limit of speed, and yet 30 and 35 miles per hour is the everyday speed outside towns, and has come to be regarded as legally permissible. Thirdly, although the limit of weight is supposed to be enforced, yet for all intents and purposes no such limit is imposed, and vehicles to carry heavy weights can be constructed more cheaply under such conditions. The whole of the heavy omnibuses and other heavy vehicles made by the firm of Messrs. de Dion and Bouton, as well as those of other companies, far exceed the legal limit of this country. It is doubtful whether the de Dion steam omnibuses could be constructed within the 3-ton limit of England, on the lines upon which they are at present made. Lastly, the men who have taken up the horseless carriage movement as a sport are the counterpart of those who in England go in for horses.

It is very difficult to convince the sportsman that there is any sport in a self-propelled carriage, yet if such an individual could be induced to enter into the matter in a practical manner he would find that a new sport is open to him. In order to prove this it becomes necessary to define what sport is, and the following definition may not be strictly accurate, but is at least a fair view of the matter:—"Sport is a pastime wherein skill combined with exercise and a slight amount of danger enters." It might be even added, though many would take objection, that no sport is true sport unless the individual partaking of it endangers to a certain extent the lives of others.

No one who is not a complete master of the art of driving a self-propelled carriage has the slightest idea how fascinating the pastime is. He must, in the first place, be a good mechanic, and according to the attention which he has devoted to his machine so will be the

results, assuming always that the carriage is well made. When travelling at great speed, the utmost care must be taken, as well as skill employed, to avoid accidents. The sensation of travelling at a great pace, creating a cool wind on a calm and sultry day, produces an extraordinary effect on those who undergo the operation. The sensation, indeed, is unlike all others to which we are accustomed. It is nearer akin to flying. By the rule of contrary, man cannot fly, but is anxious to do so, whereas possibly the swift flying bird would "give its eyes" to be able to walk on earth at four miles an hour.

The law forbids rapid speeds in England at the present time, but it is, however, quite conceivable that before another century has elapsed and the nation has become accustomed to seeing moto-carriages in all directions, greater speeds will be allowed, according to the experience gained. The progress in regard to vehicles for heavy traffic in England has been much hampered by the law limiting the weight to 3 tons. It was, however, a very salutary limit in the early stages of the movement, since it had the effect of disarming all opposition to the Bill when it was before Parliament. If users are prepared to pay the price, the 3-ton limit is no detriment, and may in the end prove a great boon to England, by bringing to the front some ingenious designer who will enable manufacturers to place on the market wagons, vans, omnibuses, and other vehicles for heavy loads at reasonable prices, which will compare most favourably with similar vehicles built abroad, weighing, in many instances, double the limit of weight in question. If this can be effected, which no reasonable man will doubt, and ample evidence exists to prove it can be done, English vehicles will replace foreign ones throughout the world, because we shall start on new lines and work upon them, whereas abroad, all experience has been gained, and all machinery and designs arranged for producing the heavier types.

To many careful observers, the following remark is one of the commonest:—"There are too many levers and complications in moto-carriages, and they must be made in future with no more complications than the horse-drawn vehicle." It must be remembered that when driving a horse, the well-trained animal stops and starts more by word of mouth than by the exertion of muscular force on the part of the driver, and at other times the horse will stop and start automatically, and go at a speed proportionate to the obstacles in front. The horse observes the nature of the road as it goes along, if hard, if muddy, if rough, and whatever may be the condition of the road's surface the horse will automatically adapt his step to the nature of the case. Again, he acts as a brake when going down hill, and in the event of the carriage stopping when going up hill. To put the matter shortly, the horse is an automatic machine, and performs nearly all that is required by the driver without an effort on his part.

All these virtues can never be found in a piece of machinery. It may therefore be considered that, no matter how perfect the motor and its accessories may be, the following devices must always be present under the hand of the driver: the steering gear, a handle of some kind for increasing or diminishing the motive power, and in many cases another handle for altering the gearing, a brake must also be present, and another brake or catch of some kind to prevent the carriage running backwards on a hill in the event of the motor coming to rest from any accidental cause. This latter might be regarded as an unnecessary adjunct if perfection could be obtained; and it may be said that in the case of a railway locomotive no such appliance is necessary, but there is a difference between a railway train and a road-car. If by any chance a railway train started on a backward journey, the brakes are sufficient to hold the train before it had proceeded many feet; but with the road-car, if the brake were applied in the same manner, even assuming there were nothing behind the carriage to be run into, it would be practically impossible to restart the carriage on its uphill journey, as it would have to start with the brake applied.

The driver of the horseless carriage knows too well how he must moderate the speeds according to the nature of the roads. One of the most difficult conditions with which he has to deal is that of travelling on a dry road and suddenly coming on a short piece covered with mud. Unless he happens to be driving in the centre, *i.e.*, the crown of the road, such a patch of mud would throw the carriage entirely out of its course, placing the vehicle obliquely to its correct direction, so that there is a danger of the carriage rushing across the road into the fence or whatever may be on the other side, and smashing the vehicle. In fact the driver must have his attention entirely confined to his subject, and be ready to do anything necessary in any emergency. When we consider how few accidents have occurred, and that the majority of these have been due to carelessness or foolhardiness, volumes are spoken for the safety of the new vehicle.

When financial combinations recognise how fatal it is to their interest to impede progress by unworthy tactics, a lesson which has been taught with a vengeance in the last two years, then will the movement not only take root, but those who have embarked their money derive advantage. There are rare instances where monopolists have become wealthy, and in the present instance a monopoly is impossible, and any attempt to set one up would be idle on the part of directors, and merely act to the disadvantage of their shareholders.

In all that has been said and done in regard to the self-propelled traffic movement, for and against various systems, the power required on roads, and in a vast number of other directions, one important circumstance has been overlooked. This factor in the movement is of no small importance to humanity. The factor has no reference to the cheapening of the necessaries of life or other advantages closely connected with such a change, for it is well known that the first step is not the lower cost of produce to the general consumer, but the enriching of the middleman. The great advantage which the nation will derive when motor traffic becomes general is the creation of a more intelligent set of men. It is truly remarkable to find gentlemen who had no notion of mechanics, who would as soon soil their fingers as scrub a floor, and whose sole amusement consisted in walking the ball-room and flattering the ladies, develop into fair mechanics, capable of making repairs to their carriages as well as driving them, becoming respectable members of society and intelligent beings, instead of dressed-up dolls with undeveloped brains.

When a man of education places side by side a "plough-boy lout" and some man whom England recognises as one of her greatest sons, it seems inconceivable to believe that the two belong to the same species; yet we are all taught from our earliest days that such is the case. All schoolboys take a delight in reading the books written by Smiles, which deal so largely with England's great men who have risen from the lowest ranks. We are, therefore, led to believe that the only difference between the "plough-boy" and the great man is that of brain development, and if the moto-vehicle movement can help towards this end in any degree, small or great, it must of necessity be an advantage to England.

THE SUPPLY OF MOTO-CAR SPIRIT OR PETROL.

(By GEO. HERBERT LITTLE, C.E., author of "The Marine Transport of Petroleum," "The Transport of Petroleum in Bulk in Tropical Waters," &c.)

THE principal extension of automobilism in Great Britain, as is the case in France, is in the direction of the employment of light vehicles. Under this general designation many types are included, ranging from the family carriage to the private cab, and from the parcel-delivery van to the tradesman's cart. A type which, however, bids fair to become exceedingly popular is that known as the moto-cycle, motette, or voiturette. These latter can now be procured at such moderate prices as to place the acquisition of one well within the means of most ordinary well-to-do people. Nearly all these types of light vehicles derive their motive power from the energy developed by the explosion of a mixture of petroleum vapour and air in a suitable motor. The petroleum used for this purpose is either that known as "heavy oil" (ordinary burning lamp oil—kerosene) or mineral spirit improperly termed "light oil." Very few vehicles are, however, propelled by "heavy oil" motors, owing to the difficulty of effectually vaporising the oil without decomposition; the latter involves a deposit of carbon upon the valves and passages, and this adversely affects the working of the motor.

The great majority of these vehicles use those products of petroleum included under the latter title, because this can be vaporised and its energy utilised in motors of comparatively simple design, and without the disadvantages attending the use of heavy oil, and hence the future development of automobilism is largely dependent upon the facilities that are given for a proper supply of this light oil, variously called moto-car spirit and petrol.

Were the disadvantages attending the use of heavy oil (ordinary burning petroleum) eliminated the question of supply would not

arise, as this oil can be obtained at every village. In order to appreciate the causes which make it so difficult, at present, to obtain moto-car spirit at various inland and remote places, a few remarks on its physical nature and properties may be useful alike to the automobilist and the retailer.

"Light" oil, "Mineral spirit," "Moto-car spirit," "Petrol," in Great Britain; "Moto naphtha," "Moto essence," "Oleonaphtha," "Automobiline," and "Stelline," on the Continent, are fanciful names somewhat loosely applied to one or the other of that group of hydrocarbons obtained by the distillation of petroleum, known as the naphtha series, and most of which are eminently suitable for use in motors. The commercially more important of these liquids are:—

	sp. gr.
Gasoline	·650
Moto-car spirit	·680
Benzoline	·700
Benzine	·730

Of these the moto-car spirit, ·680 sp. gr., is the most suitable for use in motors, and a grade for this purpose, known as "Pratt's Moto-car Spirit," is specially prepared by the Anglo-American Oil Company. Benzoline is largely used for this purpose, but it is objectionable on account of the smell given off when the motor is not in perfect working order. With Pratt's moto-car spirit there is no smell, but its price is somewhat higher than that of benzoline. In the choice of a mineral spirit for use in a moto-vehicle the state of the weather must not be disregarded. In summer or in dry weather benzoline may be used, but in winter or in damp weather, when the dry and wet bulbs of the thermometer are nearly alike, the purer spirit will be found much more satisfactory. All these grades of mineral spirit are exceedingly volatile and inflammable. On exposure to air they quickly evaporate, and in a confined space a mixture of vapour and air is formed possessing great explosive properties. It may be remarked *en passant* that the greatest explosive energy is developed when the proportions by volume of liquid to air are as 1 to 5,000.* This mixture of vapour and air is very heavy, about two and a half times as heavy as air; it therefore sinks as low as possible, and hence places in which mineral spirits are stored should be ventilated from the bottom. Although in the hands of ignorant persons the use and handling of these liquids is unquestionably attended with serious risk,† we must remember that so far as moto-vehicles are concerned this risk would hardly ever obtain, because the very elementary precautions to be observed are so well understood. Indeed, mineral spirit is like ordinary coal gas or gunpowder, in that it requires a certain amount of intelligence for its safe handling.

The difficulty in obtaining moto-car spirit in most places is due to the very stringent legal enactments surrounding its carriage and storage, and to the high rates for carriage charged by the railway companies. As regards the former, the retailer may not store more than 40 gallons at one time, nor may the user. This does not involve any particular hardship to the individual automobilist, as the quantity is reasonably sufficient, seeing that with a 4 H.P. motor in good order it enables him to travel a distance of nearly 640 miles. The railway companies, however, regard all inflammable liquids with positive dislike and discourage the traffic in them, or, rather, exaggerate the alleged risk attending their transit, so as to afford them a specious pretext for levying a special rate. How onerous are these charges may be gathered from the following instances:—The minimum rate is 5*s.*, that is, to send a 5-gallon can of mineral spirit by rail either 10 or 100 miles costs this for carriage. The rate between London and Coventry is 31*s.* 4*d.* per ton, and all quantities less than 1 ton are charged as though they were 1 ton, that is, to send one barrel of spirit this distance costs just as much as to send six.‡ Obviously, if instead of this consignment being contained in six barrels it were contained in iron cases or drums, each holding 5 gallons, the risk of danger would be enormously diminished; but the rate is just the same for a ton lot, whether it be contained in six barrels or in 48 iron drums.

Similarly the rate from Liverpool to Leeds is 20*s.* 5*d.* per ton. The reason for their charging lots under 1 ton as 1 ton is that mineral spirit must be stowed by itself, and hence a small lot requires a truck to itself. There are, we admit, sound practical reasons for separating inflammable liquids from other classes of goods. The former need not, therefore, cost more for carriage than the latter, as they could be conveyed at special times, as is the practice on many American railways. By adopting this plan the risk of danger consequent upon conveying them in the same train with other goods would be obviated. Our contention is that spirits of all kinds are unduly discriminated against as compared with other goods equally liable to be ignited by accident or design. Take, for instance, cotton—one of the most easily ignited and fiercely combustible substances carried, and which has been the cause of the loss of many million pounds' worth of ships and warehouses. Yet the rate on cotton from Liverpool to Manchester is about 6*s.* 6*d.* per ton.

We do not, however, think that railway rates on anything will be much reduced under existing conditions, for reasons which we stated in our last issue.§ The canals in some districts offer many advantages for the transport of such goods as mineral spirit, while in others recourse might be had to horse-drawn vehicles for the purpose of conveying, either in barrels or in tanks, larger quantities than are permitted to be carried on a light locomotive. This question of the transport of mineral spirit will require to be carefully attended to by the Automobile Club, and concessions obtained from the railway and canal companies by the systematic blocking of all future Bills promoted by those interests. This, however, is a matter of future discussion, and may be referred to with more propriety when the Locomotives on Highways Act is amended, which will probably be done within a few Sessions.

In the meantime, owing to the growth of automobilism and the limitation imposed upon dealers in the matter of the quantity of mineral spirit allowed to be stored, it is necessary that there shall be an efficient system of distribution, so that in every town there will be a number of agents holding among them sufficient moto-car spirit to meet all ordinary requirements. We understand that that great corporation, the Anglo-American Oil Company, Limited, has decided to make the distribution of moto-car spirit a part of their present business, and, with their existing magnificent organisation, there can be no doubt but that they will enable automobilists to obtain moto-car spirit at every considerable village in the country and at the least cost. Arrangements have been made to hold large stocks of their specially deodorised spirit at the principal seaports where they have already depôts, such as London, Liverpool, Bristol, Dublin, Belfast, Hull, &c. From these ports the spirit is despatched throughout the country. In iron drums, for the present, it will be sent from London only. Each drum, holding 5 gallons, is put in a wooden case, and the whole makes a remarkably safe and strong package, which will stand an enormous amount of rough handling. We have seen such cases in the filled condition thrown up in the air and allowed to fall on a paved floor. It makes one tired to do this before a leak occurs. In the London district the distributing centre is at Abbey Mills, Stratford, E., where a large plant has been put down to deal with the distribution of mineral spirit of all grades in a manner that will satisfy not alone the reasonable requirements of safety, but also those of prejudice, because there is no doubt that an ignorant prejudice, only natural and to be expected, is responsible for the general attitude towards petroleum manifested by county councillors and others after that type of legislator.

That a very large business is to be done in the supply and distribution of mineral spirit is beyond question. In France this business is of very considerable magnitude, and it is carried on with practically perfect immunity from disaster. There is no reason why a similar degree of safety should not attend the distribution of moto-car spirit in Great Britain. In THE AUTOMOTOR we have from time to time published lists of the names of persons in various parts of the country from whom this spirit can be obtained. We are now enabled to give a much more extended list comprising some of the agents of the Anglo-American Company. It will thus be seen that the scheme for efficient distribution is fairly complete. It only remains for automobilists to exert themselves with their local representatives with a view of ameliorating the conditions under which petroleum and mineral spirit are conveyed and stored. Owing to the onerous nature of these at present a new industry which affords another means of employment to thousands of mechanics does not make the progress it otherwise should.

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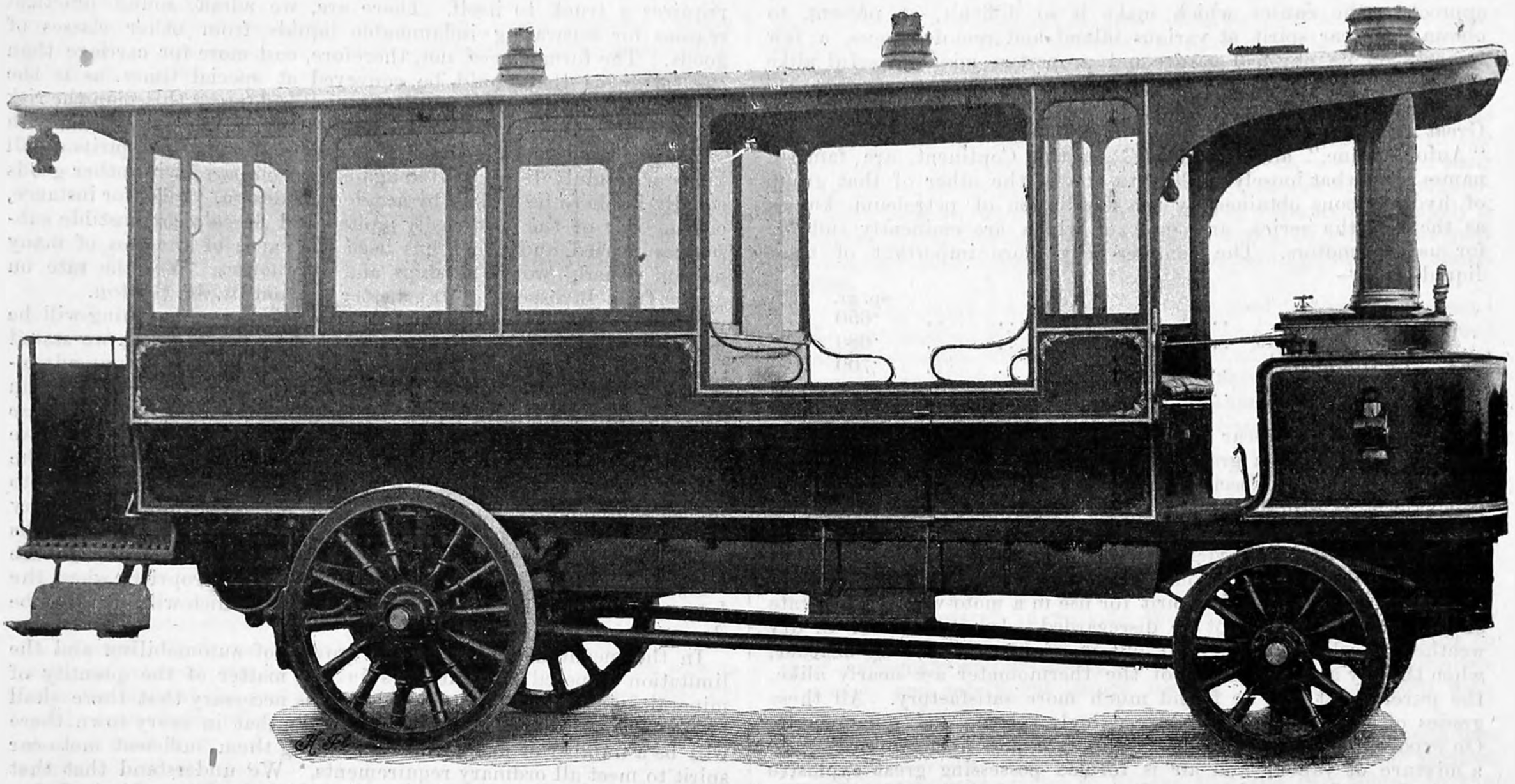
* Dr. Dupré.

† *Vide* THE AUTOMOTOR for July, 1898, pp. 404 *et seq.*

‡ The barrels each contain 40 gallons, and, taking the specific gravity as being ·7, the weight of the contained liquid is 280 lbs., allowing 75 lbs. as the weight of the barrel, the gross weight is 355 lbs., or six barrels go to the ton.

§ *Vide* THE AUTOMOTOR for October, on the Transport of Goods in Lancashire, p. 31.

MM. DE DION ET BOUTON have opened a well furnished sale room for their vehicles and accessories. It is situated in l'Avenue de Grand Armée.

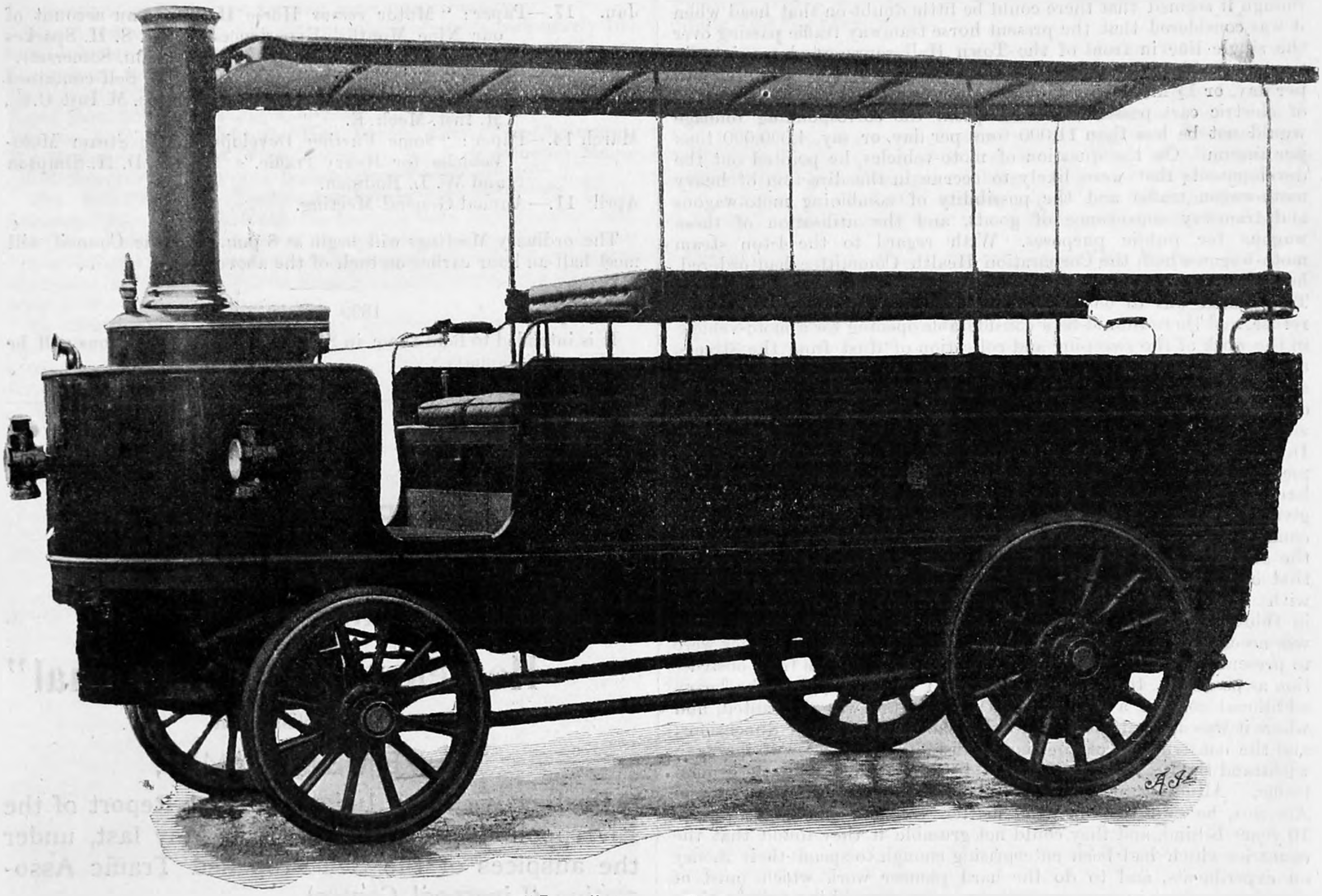


"LIFU" STEAM OMNIBUS.

"LIFU" STEAM VAN.

NEW STEAM MOTO-VEHICLES BY THE "LIFU" COMPANY.

MESSRS. THE LIQUID FUEL ENGINEERING COMPANY, of Cowes, have recently completed three vehicles of their now well-known type, and of which the following is a description :—The first is an omnibus, built for M. Bailly, of Belgium ; total length over-all, 21 feet 10 inches ; rear compartment seats 12 people, the middle compartment eight, and there is ample room on the front, or driver's, seat for two more, in addition to the driver, making a total of 22 passengers and the driver. This vehicle weighs, unladen, about 50 cwt., and is capable of travelling at a speed of 12 miles per hour, and of climbing grades of 1 in 10 fully loaded at a speed of four miles per hour. It is fitted with the new "Lifu" water tubular boiler of the vertical type, designed specially for moto-vehicles, and with a set of 25 I.H.P. horizontal compound condensing engines. This vehicle is the first one supplied out of six on order.



"LIFU" STEAM WAGONETTE.

Messrs. Smith and Son's Steam Van.—This has been built to the order of Messrs. Julius Harvey and Co., of 11, Queen Victoria Street, London, E.C., for Messrs. W. H. Smith and Son ; it is designed to carry 2 tons of goods at a speed of 10 to 12 miles per hour, and is capable of climbing grades of 1 in 10 fully loaded. It is fitted with exactly the same type of machinery as described above. Both of these vehicles are also fitted with the Liquid Fuel Company's patent wheels, which have been designed by the manager, Mr. House, to meet the requirements of the great stresses they receive while running on the highways. It has a clear space of 208 cubic feet for goods and parcels, and is 8 feet 6 inches long, 4 feet 9 inches wide, and 5 feet 2 inches high.

Wagonette.—This was built as a stock vehicle, and is intended to carry 14 passengers, in addition to the driver. It has also the same type of machinery as fitted to the vehicles described above ; is capable of a speed of 25 miles per hour, and of climbing grades of no less than 1 in 7, with its full complement of passengers. The top, as seen in the illustration, is detachable by removing six nuts at the end of upright stanchions, and is only put on as a temporary protection against the weather. This vehicle has been subjected to extremely severe tests throughout Scotland, and has at the present time run considerably over 3,000 miles without any apparent wear in any parts. Its weight is about 45 cwt.

The system of gearing used in all of these vehicles has already been described in former issues of THE AUTOMOTOR.

MOTO-VEHICLES AND ELECTRIC TRAMWAYS.

By J. A. BRODIE, Esq., Wh. Sc., M.I.C.E., M.S.P.T.A.

THE inaugural meeting of the 25th session of the Liverpool Engineering Society was held on the 2nd inst., at the Royal Institution, Colquitt Street. The newly-elected president, Mr. John A. Brodie, the city engineer of Liverpool, took the chair and delivered his inaugural address. In this he dealt with some of the more important questions relative to the local transport of goods and passengers, and gave a short history of the rise and progress of traffic inland from Liverpool. Reviewing the various methods suggested for the improvement of the goods traffic from the docks and warehouses of Liverpool to the mills and factories of Lancashire, he particularly referred to the recommendations contained in the report of the committee formed by the Liverpool Chamber of Commerce with regard to the construction of a goods railway to Manchester, and while expressing his general approval of these recommendations he doubted whether a railway pure and simple would be likely to meet the requirements, and he believed for short distances the principle of the plateway would ultimately come to the front. There could be no doubt whatever, he said, that the actual cost of conveying goods from station to station by steam-power on railway metals

was an exceedingly small amount compared with the charges made for such services in this district, and it was well known that coal, for example, could be carried, and leave a fair profit, at a cost of ½*d.* per ton-mile of goods, and that included the return of the empty vehicles. If Liverpool really grasped the great importance of the issue at stake the matter of the few hundred thousand pounds required for the construction of a metal way would not be allowed to handicap the progress of the trade of the port of Liverpool and of Lancashire. In that connection, the proposed new tramway link between the existing tramways at Prescot and the Liverpool Corporation tramway lines in the neighbourhood of Old Swan was not without interest, as if carried out it would form a practically continuous line of electric tramways from the Landing Stage, through Prescot and St. Helens, to the colliery district of Haydock, a distance of 15½ miles; and if that line were authorised there could be little doubt that important extensions on the Lancashire side would follow in the near future. Such a line would go far to prove whether heavy goods traffic could be safely and conveniently conveyed over ordinary tramway lines in public streets, though it seemed that there could be little doubt on that head when it was considered that the present horse tramway traffic passing over the single line in front of the Town Hall represented a weight in tramway vehicles and passengers alone of approximately 4,000 tons per day, or 1½ million tons per annum, and that if the same number of electric cars passed the same point the corresponding tonnage would not be less than 11,000 tons per day, or, say, 4,000,000 tons per annum. On the question of moto-vehicles, he pointed out the developments that were likely to accrue in the direction of heavy moto-wagon traffic and the possibility of combining moto-wagons and tramway conveyance of goods, and the utilisation of these wagons for public purposes. With regard to the 4-ton steam moto-wagon which the Corporation Health Committee had ordered, he said that it would most likely be delivered during next week. The vehicle was to be utilised in connection with the carrying of refuse, and there should be a considerable opening for a moto-vehicle in the work of the sweeping and collection of dust from the streets, and for street watering. From preliminininary investigation, he was satisfied that where the length of cartage exceeded two miles, the cost of conveyance, including all proper charges, would come considerably below the cost of horse cartage under existing conditions. In dealing with the tramways question, and the various forms of mechanical traction, he said that the surface-contact system could hardly yet be considered to be beyond the experimental stage, though giving considerable promise. Comparing the overhead trolley and conduit systems, he remarked that there could be no question of the superiority of the first-named, from any point of view except that of appearance. One could not help feeling some sympathy with those who objected to the presence of overhead wires in thoroughfares in the centres of the large towns where space was necessarily already sufficiently restricted, and which, if they were to present the best appearance, should be kept as free from obstruction as possible. It was in such cases, if anywhere, that the heavy additional cost of a well-constructed conduit was warranted, and where it was decided upon, the design should be of ample dimensions, and the construction of the most substantial character, if it was to withstand the heavy strains likely to be thrown upon it by the general traffic. Alluding to the progress of electric tramway traction in America, he said that in that matter England had lagged quite 10 years behind, and they could not grumble if they found that the countries which had been enterprising enough to spend their money on experiments, and to do the hard pioneer work which must of necessity be done in any new industry, now stepped in to equip their lines with material which could not be obtained at home in sufficient quantity to meet requirements. On the motion of Mr. Farren, the late president, seconded by Mr. S. B. Cottrell, a vote of thanks was accorded Mr. Brodie for his address.

THE SELF-PROPELLED TRAFFIC ASSOCIATION (LIVERPOOL).

President .. .. THE EARL OF DERBY, K.G., G.C.B.
Hon. Sec. .. .. E. SHRAPNELL SMITH, Esq.

Third Session.—1898-99.

PROGRAMME OF PROCEEDINGS.

1898.
Nov. 23.—Opening Meeting: Presentation of the Judges' Report on the Trials of Moto-Vehicles for Heavy Traffic (in the Arts Theatre, University College). Lord Derby will receive the guests in the Library at 7.30, immediately prior to the Meeting.
Dec. 13.—Discussion: The Judges' Report on the 1898 Trials and the Conditions for the 1899 Trials.
1899.
Jan. 17.—Paper: "Motor *versus* Horse Haulage: an account of our Nine Months' Experiences." Mr. S. H. Sparkes (Messrs Fox Bros. (Limited), Wellington, Somerset).
Feb. 14.—Paper: "The Application of Steam to Self-contained Road Vehicles." Mr. W. Norris, Assoc. M. Inst. C.E., M. Inst. Mech. E.
March 14.—Paper: "Some Further Developments in Steam Moto-Vehicles for Heavy Traffic." Messrs. D. H. Simpson and W. L. Bodman.
April 11.—Annual General Meeting.

The ordinary Meetings will begin at 8 p.m., and the Council will meet half-an-hour earlier on each of the above dates.

1899 *Trials.*

It is intended to hold these in September. The conditions will be published in January.

THE AUTOMOBILE CLUB OF GREAT BRITAIN AND IRELAND

(With which is incorporated the Self-Propelled Traffic Association).

Emancipation Dinner.

THE Automobile Club, which was founded at the end of last year, entertained at the Savoy Hotel, on the 14th instant, the Right Hon. G. Shaw-Lefevre, Sir Hugh Owen K.C.B. (Permanent Secretary of the Local Government Board), Mr. Hardinge Cunynghame, C.B. (Home Office), Mr. Clare Leigh, M.P., Mr. J. W. Swan (the President of the Institution of Electrical Engineers), Mr. A. Ross (Chief Engineer of the Great Northern Railway), Mr. J. A. McNaught (of Worcester), Mr. Geo. J. Jacobs, and several members of the Automobile Club de France, at a dinner held in commemoration of the completion of the second year since the Light Locomotives on Highways Act first came into operation.

The Automobile Club, the 400 members of which own nearly 100 moto-vehicles, has amongst its founders the Earls of Galloway, Shrewsbury, and Carnarvon, Viscount Templetown, Lord Suffield, the Lord Justice Clerk of Scotland, Right Hon. Sir Bernhard Samuelson, Right Hon. Sir Richard Paget, General Sir Arthur Ellis, Mr. Roger Wallace, Q.C. (Chairman), the Hon. Evelyn Ellis (Vice-Chairman), Mr. Frederick R. Simms (Vice-Chairman), Mr. C. Harrington Moore (Hon. Secretary), Mr. Frank Butler (Hon. Treasurer), &c.

The Self-Propelled Traffic Association, of which Sir David Salomons, Bart., was president, has recently been incorporated with the Club, which has no interest in any patents, companies, or firms, but is founded for purposes precisely similar to those of the highly successful Automobile Club de France, namely, the general advancement of the automobile movement.

In addition to the guests already mentioned there were present the following members of the Automobile Club de France as the guests of Sir David Salomons, Bart.:—Messieurs Cambier, Ernest Cuénod, C. Labouré, Peugeot, and G. Sencier.

Mr. Roger Wallace, Q.C., occupied the chair, and was supported by Rt. Hon. Lord Suffield, K.C.B., Hon. Somers Somerset, Mr. Frederick R. Simms (Vice-Chairman), Mr. C. Harrington Moore (the Hon. Secretary), Mr. Frank H. Butler (Hon. Treasurer), and the following members and guests introduced by them:—Captain the Hon. Cecil Duncombe, Mr. W. Worby Beaumont (President of the Society of Engineers), Professor C. Vernon Boys, F.R.S., Mr. J. T. Hopwood, J.P., Mr. Alfred Jones, J.P., Mr. Edmund Macrory, Q.C., Mr. Boverton Redwood, F.R.S.E., the Hon. C. S. Rolls, Mr. Alexander Siemens, F.R.S., Mr. Paris Singer, Capt. H. Moriarty, R.N., C.B., Capt. G. D. Sampson, J.P., R. Ackerley, W. Hacker Arnold, S. F. Beevor, W. C. Bersey, Alfred F. Bird, Bertram Blount, H. Percy Boulnois, A. J. Boult, Frank Briggs, C. G. Bromfield, J. Brown (Belfast), T. B. Browne, James Burn, E. A. Cade, Herbert Capel, E. Bicker-Caarten, T. Clarkson, Clift, Jas. Cockburn, C. Cordingley, W. J. Crampton, R. E. B. Crompton, Claude Crompton, A. T. Crawford, Leslie Couper, W. H. Crosweller, W. L. Darbishire, J.P., Chas. Davis, Bryan Donkin, Dyrenforth (Chicago), S. F. Edge, H. Edmunds, W. R. Edwards, T. R. B. Elliot, Ed. Erskine, T. W. Staplee Firth, Samuel Fleming, W. E. L. Gaine, J. Grahame White, H. Gluck, Cecil Grimshawe, John Harper, Julius Harvey, H. Heatly, Killingworth Hedges, Charles Heyermans, Percy Holyoake, H. B. Horton, H. M. Horton, H. A. House, Fernside Irving, W. H. Ketto, H. W. Kolle, Alfred Ledger, Dr. Lehwess, W. J. Leonard, Washington Lyon, J. W. Lyon, A. E. Mavor, J. McManus, P. McManus, — McManus, Percy Melvill, H. Messenger, Miller (Chicago), Percy W. Northey, C. Oppermann, T. C. Parkinson, J. W. Parr, Robert Phillips, Harold Power, Vernon Pugh, S. R. Roget, Lyons Sampson, Sennett, E. R. Shipton (Secretary Cyclists' Touring Club), E. Shrapnell Smith, Stanley Spooner, J. K. Starley, A. O. Stopes, A. Thompson, G. E. Thompson, J. Thornton, C. Thornton, G. H. Thrupp, Tinne, H. Wade, Arthur J. Walter, Louis H. Walter, E. J. White, Capt. Woodroffe, and C. Johnson (Secretary).

Baron de Zuylen de Nyevelt, the President of the Automobile Club de France, had promised to be present, but unfortunately he has had to go to Italy. He wrote to the Chairman of the London Club (Mr. Roger Wallace, Q.C.):—

"Je suis désolé qu'un voyage en Italie que je dois faire à cette époque me prive du plaisir d'assister à votre belle manifestation, au cours de laquelle j'aurais été cependant heureux d'applaudir au succès de l'Automobile Club de Grande Bretagne.

"Je tiens toutefois à m'associer à la fête que vous donnez et à vous exprimer de loin les vœux ardents que je forme pour l'extension de la locomotion nouvelle en Angleterre et pour la prospérité de la grande association qui a tant fait en faveur de cette industrie.

"J'applaudis des deux mains à la fusion des deux Clubs—Automobile Club et Self-Propelled Traffic Association, et je suis persuadé qu'en réunissant leurs efforts elles arriveront à faire triompher nos idées."

Comte François van der Straten, the President, and Comte L. van den Steen de Jehay, the President of the Administrative Committee of the Automobile Club de Belgique, write in similar terms.

The Earl of Dudley, Parliamentary Secretary of the Board of Trade, in expressing regret that a previous engagement prevents his attending the dinner, states that "he has much sympathy with the objects of the Club and is a great believer in the future utility of automobiles both for passenger and goods traffic."

Mr. Francis J. S. Hopwood, C.B., C.M.G. (Assistant Secretary Board of Trade), in stating that an official engagement prevented his dining with the Club, wrote:—

"As Railway Secretary to the Board of Trade, I am naturally deeply interested in good transportation of all kinds, and your Club is bent upon catering for the most convenient form of movement of the future. Fresh from a tour in Canada and the United States, I am full of electric traction and of our own shortcomings. It is probably true that it is too late to hope to educate local authorities in the advantages of large systems of electric traction, and, if this is so, the future is with you in the development of an industry in which France has taken a distinguished initiative."

After an excellent dinner the CHAIRMAN (Mr. Wallace, Q.C.), in submitting the toast of "The Prince and Princess of Wales," remarked that their Royal Highnesses had always supported every form of progress. Automobilism, the most recent industry, he believed, had to a certain extent been patronised by the Prince. He was told that His Royal Highness was an expert driver of a Daimler car. They hoped that at no distant date, when the Club had become a more flourishing and substantial organisation, they might ask the Prince of Wales to become their president. Rising again a few minutes later to propose "Continued Success to the Automobile Club of France," he said when one saw so many members of the French Automobile Club present he could not dismiss the toast without saying a few words in support thereof. When they found among foreign races something which they desired to emulate they were not ashamed to give them the credit for it, and to call their Club by the name of the Automobile Club. It was due to France to say that that country had set an example in the development of this industry from the very fact that its Automobile Club numbered nearly 2,000 members and had a very large income. If it were necessary to add anything further he might refer them to a work of Zola's, in which the writer pointed out the wonderful effect the bicycle and automobilism had had upon the French nation. There was no doubt that movement and the exercise of energy brought health to the body and to the mind, and he was quite sure that this new development would have a great effect upon the French people. Indeed, one now found that in almost every household there was practical engineering. He had no doubt that the example which had been set would be followed by this country, and that at no distant date the Automobile Club here would be as great a success as that of France. Anyone who had been to France and seen the recent exhibition knew how thoroughly well the engineering work had been done there. He hoped England might soon succeed to the same extent.

M. PEUGEOT, a member of the Committee of the Automobile Club of France, who was very cordially received, acknowledged the toast. He considered it, he said, to be his duty to endeavour to answer in the English language the very nice speech of the Chairman. He was sorry that the President of the French Automobile Club was absent, because he would have made a better reply to the Chairman's observations than he (the speaker) could make. They in France were happy to see that an Automobile Club had been established in England, and he hoped it would be as successful as that to which he belonged. He considered England to be the native country of mechanics and machinery, and certainly moto-cars ought to become more popular in this country than in any other. In conclusion the speaker said he would drink to the prosperity of the Automobile Club of Great Britain and Ireland.

"Success to mechanically-propelled road traffic," was given by the CHAIRMAN. At the outset he expressed regret at the absence of Sir

David Salomons, Bart., who was to have been one of the responders to the toast, but said he was glad to announce that Mr. A. L. Jones, J.P., of Liverpool, who was a distinguished member of the original Self-Propelled Traffic Association, had consented to allow his name to be coupled with the toast. He (the Chairman) would have preferred to see some other gentleman in the chair, but the Committee insisted upon his taking the position for one reason, which was to welcome for the first time among them the members of the Self-Propelled Traffic Association. That Association was an older organisation than the Automobile Club; but they were now one. The Automobile Club, with which was incorporated the Self-Propelled Traffic Association, included in its membership all those who were interested in automobilism, with one exception. The Automobile Club was unlike the Motor Car Club, inasmuch as it would have nothing to do with finance. It was formed with the object of advancing this mechanical industry, and of giving certain social facilities to the members. The companies, perhaps, attached more importance to their inventions than they were justified in doing in the end. Let them see that the price they put upon their inventions was not too high, and let them weigh over the results. If they could only separate from the actual cash that was paid into the concern the problematical benefits, he thought the public would be saved from a great deal of loss. He would now leave the point of company promoting, although he was bound to refer to it because of the peculiar effect it had upon this industry. It had been said that there being so many forms of energy, there ought to be a good deal of ill-feeling among the members of such a Club as that under whose auspices they were then assembled, but in all the runs and meets they had held there had been shown the most cordial relationship between the members. Referring to the various means of light, the learned counsel declared that there were now more candles sold and used in Great Britain than ever, so that competition always did good. One knew that the introduction of automobilism would have no effect upon the breed of horses, except in the respect that it would be sure to improve them when all the menial work and the heavy traffic to which some of the poor animals were found to submit were taken away. They were there to celebrate the growth of an infant of two years of age, which had had rather a checkered career, and which had been brought up on petro. It was a very nervous infant; there was a great deal of electricity about it. This child had also been subjected to whooping cough, and he was afraid that its whoops would be chronic; and what was worse, it had terribly shaking and shivering fits. It suffered from the fever, and the temperature got too high. But he believed that it would still continue to thrive and overcome its drawbacks. Now, the worst thing said about this infant was that it was a beautiful infant. One had seen beautiful babies who turned out very ugly in after life, and one had also seen babies who were not so promising in their infancy, but who really turned out to be very beautiful in later life. Now, he thought this would prove to be the case with the Automobile Club; it was not at present a very beautiful child. In conclusion, the Chairman said he should just like to say that those who would respond to the toast were gentlemen who had had a great deal to do with the movement. Mr. Shaw-Lefevre was the first to frame the Locomotives on Highways Act, which afterwards became law, and had it not been for his co-operation he (the speaker) was quite certain the Bill would not have passed so readily. Then Mr. A. L. Jones would speak on the matter from the point of view of heavy traffic and its connection with Liverpool.

Mr. SHAW-LEFEVRE said he was glad to take part in what might be considered to be the second anniversary of the automobile cause. He was afraid the chairman had done him more than justice in attributing to him an Act of legislation passed two years ago. It was quite true that when he was at the head of the Local Government Board four years ago he came to the conclusion that England had fallen very much behind in this respect, and that he determined to do his very best to alter such a state of things. His successor in office, Mr. Chaplin, took up the measure when he left the Local Government Board, and carried it through the House of Commons. To Mr. Chaplin, therefore, was due the credit of the success which had ensued. Looking back two years, the progress made had not been altogether quite so great as he (the hon. member) had hoped for. He had looked forward to the disappearance of horses within three or four years at the outside after the passing of the Act mentioned, and to seeing London covered with moto-cars. Eventually the public would suddenly awaken to the enormous advance in automobilism. The automobile cause would then receive an enormous impetus. In spite of what he had said, very considerable progress had been made, and that in the heavy traffic. With regard to the lighter traffic, for the moment petroleum carried the day, and certainly for rural traffic that was the only direction in which they could hope at present to see much progress made. He believed the ultimate solution of the question lay in the direction of electricity. England had fallen very much behind in the advocation of electricity traffic. However, the day was not far distant—he would give it five or, perhaps, ten years—when they would see the horses disappearing from the streets of London, when the automobile cause would reach a far greater level than it had at present reached, and when they would see moto-cars running in all directions, and they might look forward to a rapidly advancing industry for the benefit of mankind.

Mr. ALFRED L. JONES, J.P., next replied to the toast. He humorously remarked that in Liverpool they did not know who the father of this child—the Automobile Club—was, but they nevertheless recognised the London organisation as the parent body. He was glad to be able to announce that they had that day come to a sort of understanding by which the names of the Liverpool Society and the London parent Society were to be amalgamated. In Liverpool they believed there was an enormous future for the heavy vehicles, and if the self-propelled traffic was to be a success then we should have a revolution throughout the country. To make money manufacturers should turn their attention to heavy traffic. The moto-wagon for country use would prove of inestimable advantage. As an example, he stated that at Liverpool alone 30,000 tons of goods were carted away from the docks daily at an average cost of 8*s*. to 10*s*. With a moto-wagon the cost would only be from 2*s*. to 3*s*. The result was obvious—it meant the saving of millions. He begged the inventive geniuses at table to set to work and devise some suitable vehicle. Next September they hoped to hold an exhibition, trusting, of course, to attract not only members from the London Society, but also from America and France.

Mr. ALEXANDER SIEMENS, F.R.S., toasted "The Visitors," for whom Sir HUGH OWEN, K.C.B., responded, saying, in reference to the regulations of the Local Government Board, that they received much consideration, and it was the desire of the Board to impose no restrictions that could be avoided, having regard to the interests of machinery traffic on the one hand and the interests of the general public on the other. So far as they could form an opinion, the regulations were working satisfactorily. Members of that Club could render very great assistance by inter-communication as to means of construction and in many other ways.

M. CUÉNOD also acknowledged the compliment.

Lord SUFFIELD proposed the last toast—"The President," who, he declared, had done an incalculable amount of good both for the Club and automobilism in general. He thanked the French representatives for their invitation to English automobilists to visit France.

In reply, Mr. WALLACE observed that the success of the Club was due to those who helped to form it, to Mr. Simms and others, and to the indefatigable efforts of the Secretary, Mr. C. Johnson. The fact of Lord Suffield giving the toast showed that there was no ill-feeling between the owners of the horses and the Automobile Club. Their friends assembled around those festive tables had extended invitations to the Club, which they were only too pleased to accept. He had, however, another invitation to announce. It was one issued by the Secretary of the Liverpool branch, of which Lord Derby was the president. Any of that company would be welcomed on the 23rd instant, at the University College, Liverpool, when the report of the trials would be presented. He (the learned counsel) was sure that those who knew what had been done in Liverpool, even if they were not able to be present, would be thankful for the invitation that had been accorded to them.

THE MOTOR CAR CLUB.

THE third annual meet of moto-vehicles in connection with this Club was held on Monday, the 14th inst., and was from every point of view an excellent success. No less than 87 vehicles actually took part in the function, which consisted of a processional run from the Hôtel Métropole to Sheen House (Richmond). A luncheon there, moto-cycle races afterwards, then a run back to London, concluding with a dinner in the evening. The weather was all that could be desired, but the roads, so well known to Londoners, were in many places slippery. Notwithstanding this and the very crowded state of the streets incidental to Mondays no accidents or collisions occurred. Long before the time of departure from the Hôtel Métropole the streets leading to that rendezvous were thronged by the public, who

evinced the liveliest interest in the proceedings without, however, the display of any of that ribald vulgarity which has hitherto greeted previous assemblages of moto-vehicles. Excellent arrangements had been made by the executive of the Motor Car Club to ensure the proper marshalling of the vehicles and the comfort of the passengers, of which all the vehicles carried a full complement.

As regards the vehicles, these were, with one or two exceptions, of that type, with its various modifications, devoted to light traffic, nearly all the fashionable varieties being well represented. With regard to the motors, the majority of the vehicles were propelled by the Daimler motor, but the Benz was well represented. Electricity was represented by several of the now familiar London cabs, and a new vehicle by Messrs. Clift and Arnold, and which is a most excellent one, and of which we shall have more to say on a future occasion. Steam had one solitary representative, an omnibus on the Weidknecht system; the running of this vehicle was not, however, so satisfactory as could have been wished.

The following is a list of the various vehicles that took part in the meet:—

DAIMLER COMPANY.—4 wagonettes, 7 Werner bicycles, 3 phaetons, 1 jaunting car, 1 10-seated bus, and Mr. Instone's victoria. Dr. Bruce Porter also brought his new Daimler bus (also convertible into a wagonette) from Windsor.

MOTOR MANUFACTURING COMPANY (Daimlers).—5 wagonettes, 1 phaeton, 2 Iveagh phaetons, and 4 dogcarts.

LONDON MOTOR VAN AND WAGON COMPANY (Daimlers).—2 wagonettes, 2 char-à-bancs.

In addition there were the following Daimler-built vehicles:—"Present Times," a licensed cab, No. 6,859 (German Daimler), and one other German Daimler carriage; the Steam Omnibus Company sending their new Daimler bus built to carry 26 passengers, or, including the driver and conductor, 28.

12 De Dion and Bouton tricycles, 1 De Dion quadricycle, 1 Humber moto-tricycle, 3 Bollée tricycles, 1 Panhard and Levassor phaeton, 1 Panhard and Levassor omnibus.

The Hon. C. S. Rolls also made some splendid time again with his new Panhard and Levassor two-seated phaeton.

13 Benz's, 3 of which belonged to the Middlesex Motor Car Company, of Willesden Green, and 1 to the International Motor Car Company, of Kilburn; 1 handsome Peugeot phaeton, the property of Mr. W. J. H. Smith, of West Kensington; 7 electric cabs, 1 electric quadricycle, and the Clift-Arnold electric victoria.

Mr. Moore, of Kew, a member of the Sheen House Club, had invited Dr. Lehwess, &c., of the Automobile Association, and they brought to the Club their Mors touring car, Mors dogcart, a Cambier wagonette, a Lynx dogcart, and their Orient Express carriage, Mr. Moore driving up in his new Mors dogcart.

The spectacle of so many vehicles aroused great interest on the part of the public, and the route was in many places densely crowded. The police made excellent traffic arrangements, and it was not a little through these, and the great skill shown by the drivers in the manipulation of the various moto-vehicles—and, let us add, the vastly superior manœuvring powers that a moto-vehicle has over a horse-drawn one—that the very successful day's run was due; the procession going and coming was, in fact, a liberal education to Londoners. The speed that the vehicles could develop in places where the roads were clear, the ease with which a comparatively high speed could be maintained, even in crowded streets, and the superiority in manœuvring power seemed to impress the police and the public most favourably. Even that most ultra-conservative, the London bus driver, ceased to pipe and jeer, and had to acknowledge that the days of the cart-horse were numbered.

A start from the Hôtel Métropole was made soon after 11.30 a.m. All the vehicles got away in excellent order, the procession being viâ Whitehall, Pall Mall, St. James's, on to Knightsbridge, Hammersmith Bridge, and Barnes Common, to Sheen House. Of course, there were considerable variations in speed observable among so many vehicles even of the same type, and the arrival at Sheen House was in a somewhat straggling order. The road was for the most part excellent, barring a piece of new macadam just before Sheen House. The road here consisted of unrolled flints, and a few of the vehicles found some little difficulty in negotiating it. The railway bridge at Barnes also caused some little tribulation to the weaker vehicles, but those of more recent build experienced no trouble whatever.

Arrived at Sheen House the vehicles were arranged in rows and inspected. Afterwards an excellent luncheon was partaken of, about 280 sitting down, when an adjournment was made to the racing track.

The races, which commenced at 2.30, were as follows:—

One Mile Moto-cyclette Race, won by Mr. O. Bush in 2 m. 51$\frac{3}{5}$ s., Mr. G. Holland being second, and Mr. Taylor third; all three riding Werner bicycles.

One Mile Tube Ignition Tricycle Race, won by Mr. E. A. Gorton in 2 m. 15$\frac{1}{5}$ s., Mr. C. Jarrott being second, Mr. W. Whittaker third, and Mr. A. Clay fourth.

One Mile Electric Ignition Tricycle Race, won by Mr. S. F. Edge in 2 m. 12$\frac{4}{5}$ s., Mr. C. Jarrott second, and Mr. C. G. Wridgway third.

Two Miles Moto-cycle Championship, won by Mr. S. F. Edge in 4 m. 18$\frac{1}{5}$ s., Mr. E. A. Gorton being second with only $\frac{1}{5}$ s. to the bad, and Mr. J. W. Stocks third. The cars employed in the three latter races were De Dion and Bouton tricycles.

At the conclusion of these a return to town was made at 4 p.m., the Hôtel Métropole being reached at 4.45, the members of the Club and their friends concluding the celebrations of the day with their customary dinner.

THE TRANSPORT OF GOODS IN LANCASHIRE.

(*Continued from p.* 32.)

(2) MR. CALTHROP'S LURRY PLATFORM CARRIER RAILWAY.

MR. CALTHROP proposed in the first place that either the Liverpool Docks line of railway should be modified so as to admit of light railway rolling stock being run on them, viz., by the introduction of a third rail between the other two, thereby creating a 2 feet 6 inch gauge, or that a new light railway should be laid down along the docks, and on the city streets, to be continued in the country, either upon the highways or upon a special road to Manchester, and the other towns intended to be reached. Mr. Calthrop was of opinion that, should it be considered necessary to make a special road for the railway, alignments could be found which would render the construction of a tunnel between Liverpool and Manchester unnecessary.

The Lurry Platform Carrier.—Mr. Calthrop originally designed the Lurry Platform Carrier described in detail in the digest of his scheme. This car was planned for a light or narrow gauge railway. It was designed to carry a lurry loaded with goods to that point on a railway nearest to the destination of the goods, where it was to be dismounted and drawn to its destination by horse-power. The lurry carrier would weigh 4 tons, and the lurry 2 tons, and these together would carry a load of 10 tons of goods. It was suggested that small locomotives should be used for traction purposes between the terminal yards in Liverpool and Manchester, &c., and horse traction at the extremities of the line. Mr. Calthrop stated that a horse could pull five times greater weight on rails than on setts; an advantage which applies equally to traction on a plateway. By a system of lurry carriers the usual operation of loading and unloading goods at two stations, and the expense involved in both operations, viz., railway "service terminals," would be saved. Mr. Calthrop also urged that the lower cost at which a light railway could be made, furnished with rolling stock and maintained, as compared with an ordinary railway, would enable considerable reduction to be made in the conveyance rates now ruling.

Against these proposals the following objections were made:—

At first sight, the suggestion that the streets and highways should be used for goods traffic seemed more feasible than it appeared later.

On close examination into the conditions of traffic as they exist in the cities and towns of Lancashire, and seeing the narrowness of British country highways, even in the vicinity of large towns, as compared with those of India, where light railways are successfully operated, and of America, where a certain amount of railway traffic passes through towns and suburban streets, the impracticability of Mr. Calthrop's suggestion for adoption here became fully apparent. Further, it appeared improbable that municipal and county authorities would consent to the working of light railways on the public roads under their jurisdiction. It therefore remained to be considered whether the scheme would be worth the acquisition of land for the making of a fully equipped light railway, and in connection with this matter another great difficulty was seen to arise.

Any order of the Light Railway Commission for authorising a railway is provisional, and must be confirmed by the Board of Trade. The Board of Trade must consider any order submitted to

them for confirmation with reference to several matters, one of them being any objection lodged with the Board in accordance with the provisions of the Light Railways Act, 1896. It is further provided that "if the Board of Trade are of opinion that by reason of the magnitude of the proposed undertaking, or of the effect thereof on the undertaking of any railway company existing at the time, &c., &c., the proposal of the promoters ought to be submitted to Parliament, the Board shall not confirm the order." Light railways for England were, in fact, not proposed with a view to their becoming rivals of the existing great railways of the country, but for the purpose of affording facilities to undeveloped districts not served already by a railway, and as feeders to existing trunk railway lines. It was seen, therefore, that any Light Railway Bill having for its object the compulsory purchase of land for the purpose of constructing a light railway between Liverpool and Manchester as a rival to the existing companies would be strenuously and persistently opposed by the representatives of the companies already possessed of that traffic which it was the object of the promoters of the new light railway to secure in whole or in part. This alone constituted a leading objection to the alternative Calthrop Light Railway Scheme—viz., as a specially constructed line—as it was felt it might be years before such a scheme could be carried through, whereas the object of the Committee was to find, if possible, a quicker remedy for the disabilities laboured under by Liverpool.

The Committee had, however, the following additional objections to make :—

1. The difference between the cost of land for a light railway and for one of ordinary gauge, taking into account their respective capacities for traffic, is not enough to result in much economy in rates.

2. The capacity of a light railway, devoted entirely to the carriage of goods, might be sufficient for a considerable amount of the traffic of the port, but it would not suffice for the whole, and a divided traffic could not be carried as economically as the whole traffic. This division of traffic has, in fact, been considered in the past an important element in the maintenance of high railway rates in this district.

THE LURRY PLATFORM CARRIER ADAPTED TO ORDINARY RAILWAYS.

As the result of a conference held with railway managers it may be desirable to quote the words used by Mr. Harrison, of the London and North-Western Railway Company, in respect to the matter. They are as follows :—

> As to conveying the goods upon the loaded vehicles placed upon a railway vehicle, that is perfectly practicable, because it is done every day in the case of furniture vans, traction engines, and other things on their own wheels. It is more or less a question of carriage when they (the objects or goods) are placed on our vehicles or railway trucks on their own wheels. We charge, of course, on the gross weight; therefore, though the system may be practicable, the desirability of it is a totally different question—whether it would be economy or not with the additional dead-weight that is to be carried. Here that dead-weight is 2½ or 3 tons, added to a load (of goods) of 3 or 4 tons—that is, an increase of something like 70 per cent. of the weight upon which carriage is to be paid; and I must say I fail to see how at any practical rate of working the companies are to make a reduction in the charges, the additional weight having to be paid for.

(*To be continued.*)

British Motor Syndicate *v.* Universal Motor Carriage and Cycle Company.—It was expected that Mr. Justice Stirling, sitting in the Lord Chancellor's Court, on the morning of the 15th instant, would give judgment in this action. Mr. Walter and Mr. Shaw having spoken on behalf of the plaintiffs and the defendants respectively, his Lordship said he should like to see the engines before giving judgment, and asked where they could be seen. Counsel replied, "In the Euston Road." Mr. Justice Stirling said that was not far away, and that he thought he could get as far. Thereupon a discussion ensued as to the date and time suitable for both parties as well as his Lordship. Ultimately the afternoon of Friday, November 25th, was agreed upon, Mr. Shaw remarking that both engines should be there for his Lordship to inspect.

CLACTON MOTOR CAR COMPANY'S MANAGER CHARGED WITH ARSON.

AT Clacton Police Court, on the 10th inst., before John Smith, Esq., Henry Johnson, of the Clacton Motor Car Company, was charged with setting fire to two moto-cars at Clacton.

Police-constable Banks said that at a quarter to nine on the previous evening he went to the moto-car station in Pallister Road, Clacton, and found the place, in which the small moto-car was kept, on fire. There were a number of rags lying about burning. The large shed was on fire, and there were loose pieces of wood on the floor. Water was thrown over the flames, and witness then saw smoke coming from the paint shed and, on searching, found pieces of oily rag burning there. He also discovered the prisoner under a bench, among some other cars. He pulled him out, and the prisoner said, "Oh, it's all up now!" Witness searched him, and found the twisted link of string now produced. It had been burning, and pieces of it stretched from the paint shed into the large shed, and there was a piece attached to the small moto-car, and another piece was attached to the chamber containing the petrol oil on the large car. Before being charged the string appeared to have been all in one piece. Witness also found a candle close to the end of the string, and a match-box, lying near the prisoner. In prisoner's pocket was found some string of the same kind as that found on the premises. Witness said that while they were in the shed prisoner handed over some string out of his pocket, and offered to give up everything he had.

At the police station the prisoner made a statement to Mr. Nunn, which was as follows :—"I was in London to-day to see a gentleman who owed me £250, which he has neglected to pay for weeks and weeks. It was promised faithfully to me for last Thursday, but he did not pay. On seeing him to-day, as he could not pay me then, I begged him to give me £5, but he refused. I said, 'I am in extremes, and cannot wait any longer.' The thought of making away with myself then came upon me. I returned to Clacton by the 3.25 train from Liverpool Street, and about nine o'clock I made an attempt to blow the moto-cars up with myself also. I had a bundle of string, which I saturated with oil, and connected it with the cars. I lit a match to light a candle, and the air, being saturated with the spirit, went off spontaneously. I saw a flame, and crouched among the oil and paint with the hope of being blown up."

It was stated in evidence that had the string become ignited the flames would have reached the oil tanks attached to the cars, and there would have been a fearful explosion.

The prisoner was committed for trial.

Twenty Miles an Hour.—Robert Moffat Ford, of Red Lion Square, appeared at Bow Street to a summons on the 14th inst., charging him with driving a moto-cycle furiously. Police-sergeant 40 E deposed that on October 31st he saw the defendant driving a moto-cycle along Endell Street at the rate of about 20 miles an hour. Two schools were breaking up at the time, and the children were in a position of great danger. Defendant: Did I not seem to have control over the machine?—You did not attempt to stop it. But were you not struck with the control I had over the machine?—No, I was never struck in that way, and I don't want to be in any other way. Sir James Vaughan said that it was a monstrous thing for the defendant to drive a machine at the rate mentioned. It was important for the safety of the public that a stop should be put to this kind of thing, and defendant would be fined 20*s.* and costs. If the offence was repeated the penalty would be doubled.

The Automobile Club and the Liverpool Self-Propelled Traffic Association.—We understand that a working arrangement has now been practically arrived at between the Automobile Club and the Liverpool Centre of the Self-Propelled Traffic Association. The prime question was that of title, which has been satisfactorily arranged in such a manner as not in any way to prejudice either the London, Liverpool, or any other centre of this organisation which may be formed. The official title of the amalgamated bodies will remain the same as recently agreed upon, whilst the title which the Liverpool centre will use, and which will be formally submitted to that body for adoption, will be, The Liverpool Self-Propelled Traffic Association. Headquarters: The Automobile Club of Great Britain and Ireland, with which is incorporated the Self-Propelled Traffic Association, 4, Whitehall Court, London, S.W.

LES POIDS LOURDS CONCOURS.

BEFORE describing the performances of the vehicles which took part in the concours at Versailles between October 6th and the 12th we must correct a regrettable error made in our former account. In mentioning some reasons which had operated to prevent British manufacturers from competing we stated that the weight to be carried on each vehicle was limited to 1 ton. That this was obviously erroneous needs no demonstration. We should have said that each vehicle had to carry a minimum weight of 1 ton—a very different thing. In order to facilitate a proper comprehension of the performances of the vehicles we reproduce the following descriptive table from our last issue :—

Official number and description.	Motive power.	Manufacturers.
No. 1. Parcel van ..	Petrol	Panhard et Levassor.
„ 2. Omnibus	„	Rozer Mazurier.
„ 3. Parcel van ..	Electricity ..	Mildé et Cie.
„ 4. „ „ ..	„ ..	Cie. Françaises de Voitures Electromobiles.
„ 5. Omnibus, 20 seats	Steam, 30 H.P...	De Dion et Bouton.
„ 6. Wagonette, 24 seats	„ „ ..	„ „
„ 7. Lurry	„ „ ..	„ „
„ 8. Tractor	„ „ ..	„ „
„ 9. Lurry	Steam	Valentin Passey.
„ 10. „	Petrol	De Dietrich.
„ 11. „	„	„
„ 12. Parcel van ..	„	„
„ 13. „ „ ..	Electricity ..	Cie. Générale de Transports Automobiles.
„ 14. Van (passengers or goods).	Steam, 6 H.P. ..	Leyland Co., per Automobile Assoc.
„ 15. Lurry	Steam, 12 H.P...	Leyland Co., per Automobile Assoc.
„ 16. Fire-engine ..	Petrol	Cambier et Cie.
„ 17. Lurry	„	„ „
„ 18. Omnibus	Steam, 15 H.P... (liquid fuel).	Société Serpollet.
„ 19. Van	Electricity ..	Krieger.

For the purposes of description, however, we shall arrange the vehicles in three groups, viz., those propelled by petrol, steam, and electricity. Dealing with the first group, No. 1 (Fig. 1) is a parcel van, by MM. Panhard and Levassor, and similar to those already supplied by them to many business houses in Paris. This one has, however, a more powerful motor, it being of 8 H.P., and has four cylinders. Many important improvements have been introduced in the minor details of the mechanism as the result of the experience of the builders. The feed of "mixture" is automatic, and is of any desired richness. The lubrication is also automatic, while the arrangement of the burners has been improved. The reciprocating parts are balanced, rendering the motor very smooth in its running. This vehicle carried 2,205 lbs. of dead weight.

*Table of Routes, Distances, and Times.**

No. 1.

		Distance.	Times.
October 6.	Route C. ..	40·9 miles.	6 hrs. 10 min.
„ 7.	„ B. ..	27·9 „	3 „ 47 „
„ 8.	„ A. ..	24·8 „	2 „ 42 „
„ 10.	„ C. ..	40·9 „	5 „ 45 „
„ 11.	„ B. ..	27·9 „	4 „ 8 „
„ 12.	„ A. ..	24·8 „	2 „ 33 „

No. 2 (Fig. 2) is an omnibus having seats for 12 persons inside. The motor is a horizontal three-cylinder one of about 9½ H.P. This motor possesses some novel features; the middle cylinder is much larger than the others, its action being, we understand, as follows :—It receives the exhaust gas from the other two cylinders and also a quantity of air, this is expanded by the heat of the exhaust, and an impulse imparted to the piston; on the completion of the stroke the exhaust valve opens and a part of the mixture of hot air and gas is expelled, a part remaining which is compressed to be mixed again with the exhaust from the other two cylinders. The action is somewhat analagous to that which goes on in an ordinary compound steam-engine. Whether there is any theoretical advantage in the method we cannot say, as we do not, with the scanty information before us, quite follow the thermo-dynamics of the cycle of operations. Doubtless the principle is sound, or MM. Rozer Mazurier would not have applied it. We hope to describe this motor more fully in a future issue. Five speeds are provided, but the change speed gear is rather noisy. The motor, however, runs remarkably free from vibration. The steering gear on the trials proved weak and defective. The mechanism apparently enabled a small force on the wheels to exercise a greater one on the steering handle with the result that on several occasions the driver lost all control of the vehicle, and on one occasion a very dangerous accident was very narrowly averted. The vehicle "took charge" and mounted the side walk; the route

FIG. 1 (No. 1).—PANHARD AND LEVASSOR VAN (Petrol).

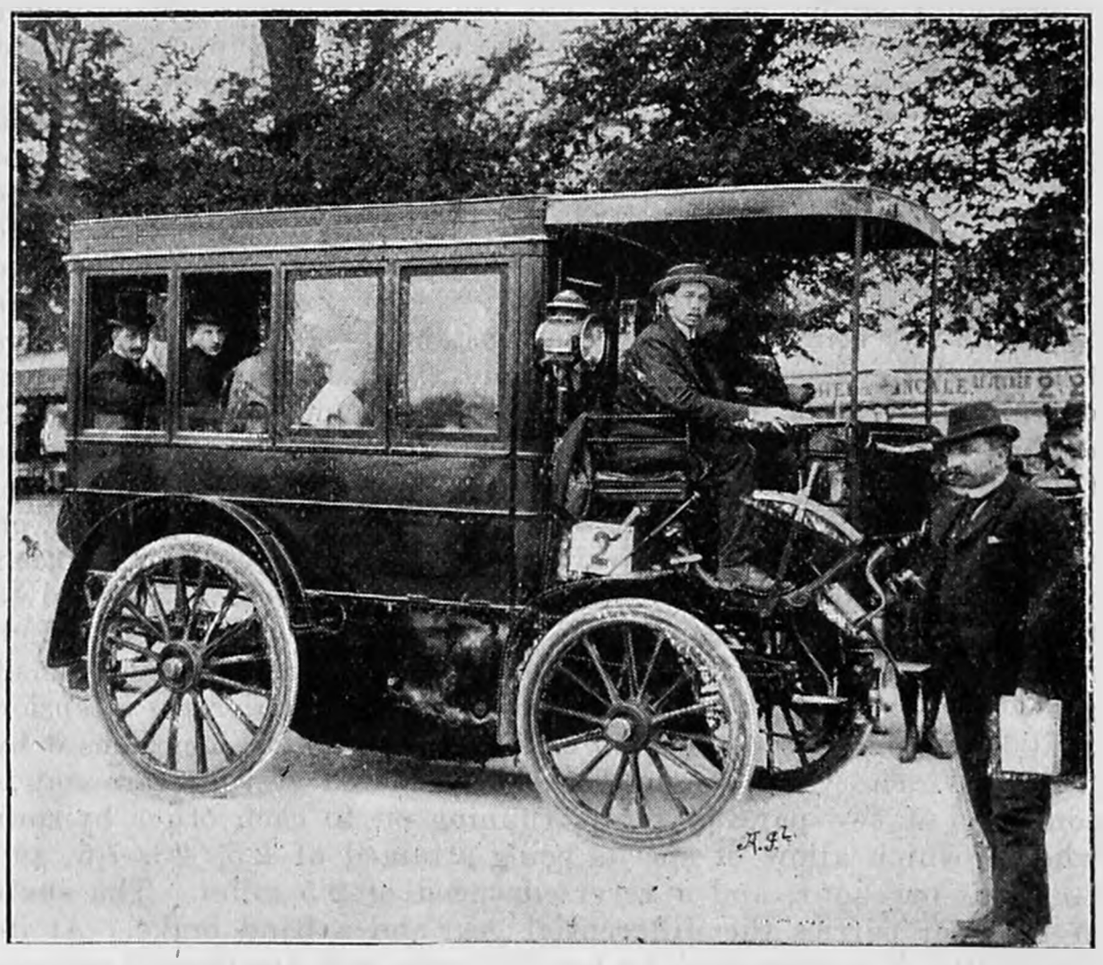


FIG. 2 (No. 2).—ROZER MAZURIER OMNIBUS (Petrol).

* The times mentioned in this and following tables are gross times, and include the intervals for stopping at the discretion of the official observer, and also those for meals, &c.

at the place was on a very high embankment. Fortunately the driver stopped the motor and braked the wheels just near the edge. This vehicle otherwise performed well, and completed four routes. On the fifth day, while descending a hill, the brakes were applied, but the vehicle skidded and turned partially round, doubtless owing to the defective steering gear, and then capsized. The passengers were much shaken, and one, M. Boyer-Guillon, the commissaire, and who is a well-known engineer, had his collar-bone broken. During the trials this vehicle carried 12 persons, their luggage, and 1,320 lbs. of dead weight, the weight of the vehicle itself being 4,400 lbs.

Table of Routes, Distances, and Times.

				Distance.	Times.
October	6.	Route C.	..	40·9 miles.	8 hrs. 34 min.
,,	7.	,, B.	..	27·9 ,,	6 ,, 3 ,,
,,	8.	,, A.	..	24·8 ,,	5 ,, 49 ,,
,,	10.	,, C.	..	40·9 ,,	9 ,, 30 ,,
,,	11.	,, —	..	Accident.	
,,	12.	,, —	..	,,	

No. 10 is a lurry built by MM. De Dietrich et Cie., on the Amédée Bollée system. This vehicle in its general design is practically a duplicate of that which ran in last year's concours, except that the present one is fitted with a more powerful motor, viz., one of 9½ H.P. The platform is also roofed over. This is a very necessary improvement, seeing that the vehicle is intended for service in the French Soudan. It can carry 12 persons with their baggage, the total weight being 2,205 lbs. in all. This vehicle went through its trials most admirably, without any accident.

MM. De Dietrich had also entered Nos. 11 and 12, but at the last minute the latter was withdrawn. No. 11 (Fig. 3) is a lurry similar in all respects to No. 10, save that it is intended for goods, of which it can carry 1 ton or a little more. It is fitted in the front with a cab for shelter to the driver. This vehicle is also intended for the Soudan in conjunction with No. 10, and, in view of the very onerous nature of this service, a somewhat more detailed description of the mechanism will be of interest.

Both vehicles consist essentially of a steel framework resting on springs supported by the axles. Below the frame and between the front wheels, which are used for steering, is placed the petroleum motor, developing 9·5 H.P. on the brake. Above is the seat for the driver, who has all the levers for driving and changing speed, &c., immediately under his hand. The transmitting gear is fixed under the frame, between the rear wheels. The load is supported almost entirely by the driving wheels. The body of the vehicle is very low down, in order to facilitate loading. Under the seat are placed three reservoirs, containing 123 pints of water, 55 pints of spirit of 710° sp. gr., and 9 pints of oil. The wheel base is 6·56 feet. The width of the vehicle is 4·85 feet, and the length 10·75 feet. The motor has two horizontal cylinders with water jackets, and the vaporised water escapes as a visible exhaust. A float and a valve keep the water in the jacket at a constant level. The water enters the jacket by force of gravity, without the use of a pump. Incandescent ignition is used. The motor, crank, and piston-rods are all enclosed in a case bolted on to the under-frame. The motor makes 650 revs. per minute, and there is an impulse at every revolution. A governor is also provided. The crank-shaft carries a pulley, on which runs a belt half its width. This belt passes over another pulley of the same diameter at the rear of the vehicle, parallel to the crank-shaft, and also carries a loose pulley. This belt, which runs at a uniform speed, is employed to put the motor in and out of gear, and runs at about 33 feet per second. It undergoes a tension of 106 lbs., and this, after running about 2,500 miles, lengthens it by ·78 inch. The variable speed gear is situated at the rear, and is composed of two parallel shafts running on to each other by spur wheels, which allow of speeds being attained of 2·5, 4·3, 7·5, and 10 miles per hour, and a reversed speed of 2·5 miles. The shaft at the rear carries the differential gear and a band brake. At its extremities it is connected by bevelled rods with the driving wheels, to which are fixed toothed wheels for this purpose, and, as the rods are jointed, they readily yield to the movements of the springs, and the effort on the driving wheels is fairly constant. The whole of the gear is protected from the dust by means of a case of sheet iron, which may be easily removed when it is necessary to inspect or lubricate the gear. All the levers are arranged compactly under the hands of the driver, and the mechanism is so devised that the motor is automatically thrown out of gear when the brake is applied or the speed changed. Besides the brake band there is a powerful brake on the tyres, which is operated by hand. The principal parts are made of hardened steel, and the bearings are of phosphor-bronze. They are all made to template. According to the tests, the consumption of petroleum spirit of 700° to 710° is about 1 pint per mile, and of water about 2½ pints per mile. Enough supplies can be carried for a run of 80 miles. The commercial speed is from 5 to 5½ miles per hour.

FIG. 3 (No. 11).—DE DIETRICH LURRY (Petrol).

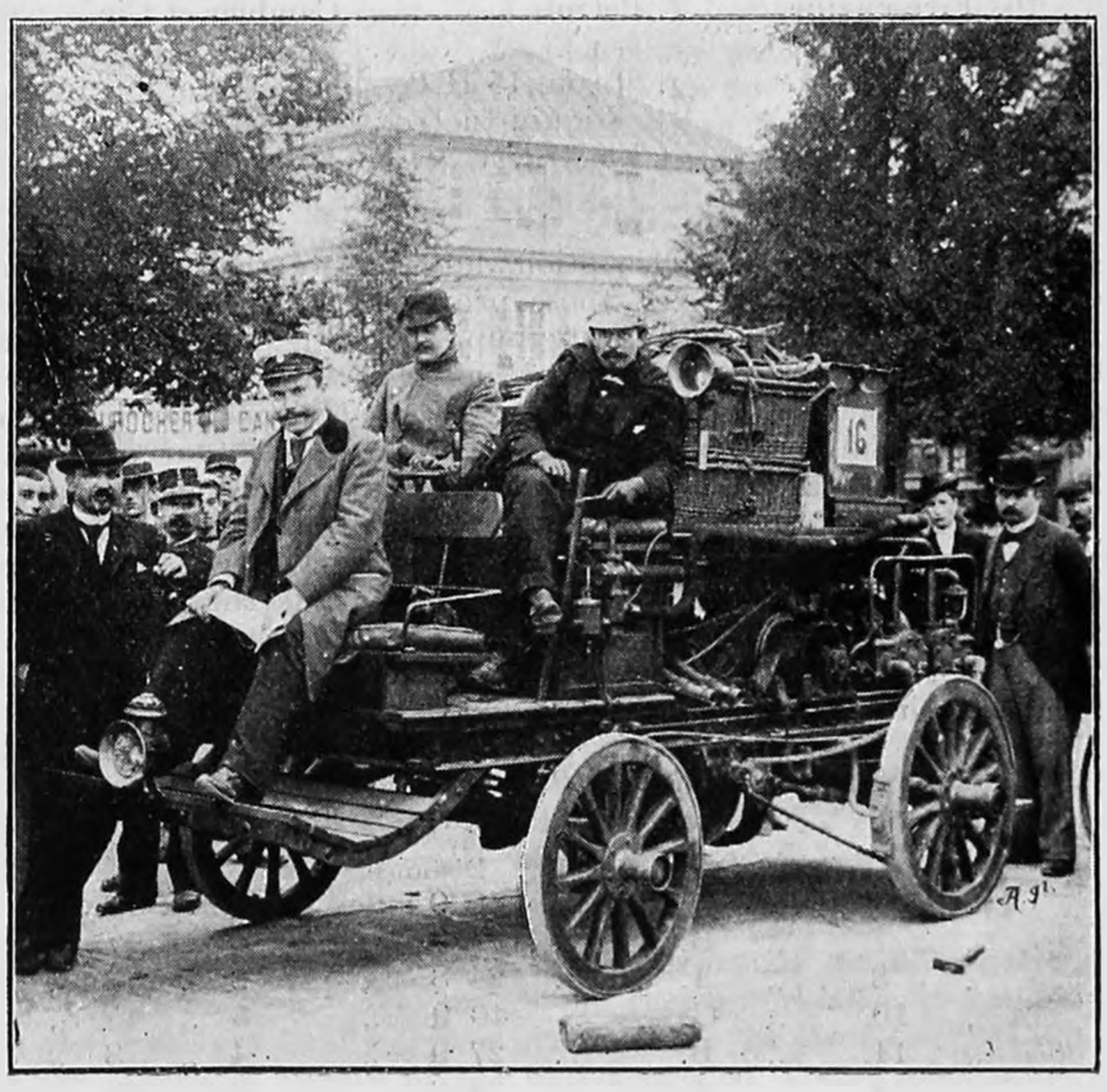


FIG. 4 (No. 16).—CAMBIER ET CIE. FIRE-ENGINE (Petrol).

This employment of petro-moto-vehicles in West Africa by our French friends is extremely interesting, not only from the technical and commercial points of view, but also from the fact that one of the principal supporters of the automobile movement in Great Britain, viz., Mr. Alfred Jones, J.P., is so largely interested in West Africa and its development. It was mainly through this gentleman's efforts

that the Lagos Railway was prospected and undertaken. If the French experiment is successful, which we sincerely trust will be the case, we may expect an opening up of the whole West African country, from Senegal to Lagos, in a much shorter time than will be the case if railways alone are relied upon. The total distance to be traversed by the moto-vehicles of M. Dubois is at present limited to a journey of 240 miles from Badorembé, the present Senegal Railway terminus, to Konlikoro, a point from which the navigation of the Niger can be attempted. Should the present expedition be successful in demonstrating the feasibility of the employment of moto-vehicles ten others will be sent out in charge of two European engineers. The drivers of the present vehicles will be Soudanese.'

No. 16 (Fig. 4) was a petro-moto-vehicle intended as a fire-engine. It was built by M. Cambier, of Lille, who has brought this class of vehicle to a point of considerable excellence, with, however, room for improvement. This vehicle has a motor of 20 H.P., and it weighs 2,400 lbs. No. 17 was a petro-moto-lorry, also entered by M. Cambier. Neither of these vehicles attempted more than the trials on the first two days and were then withdrawn.

The steam group comprised eight vehicles; Nos. 5, 6, 7, and 8 were built by MM. De Dion et Bouton, and represented their larger types. The machinery and general arrangement in all is much the same as that of the vehicle entered in last year's concours and then known as No. 14. The present vehicles have, however, motors of 30 H.P.

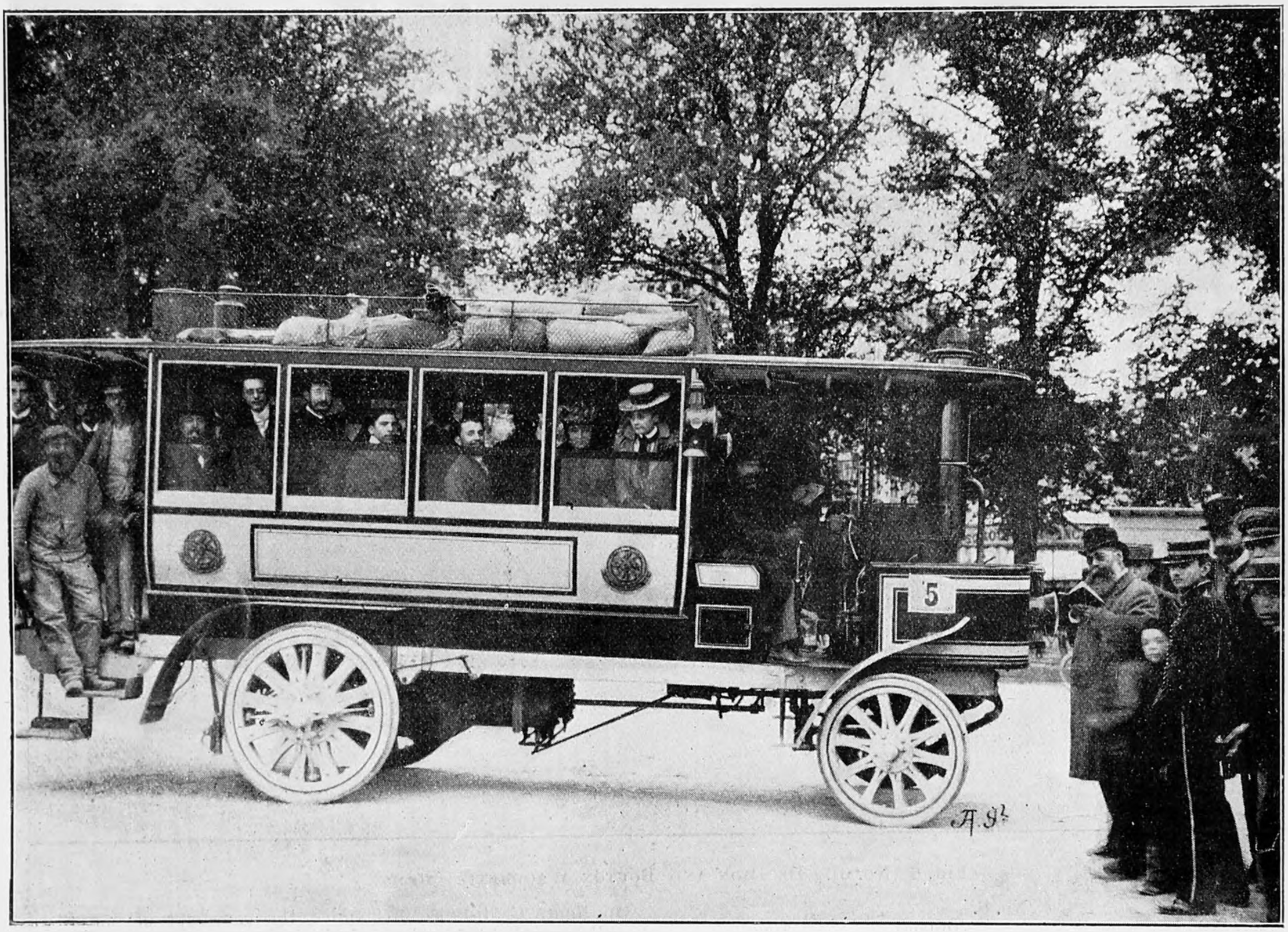


Fig. 5 (No. 5).—De Dion and Bouton Omnibus (Steam).

Table of Routes, Distances, and Times.

No. 10.

			Distance.	Time.
October 6.	Route B.	..	27·9 miles.	7 hrs. 12 min.
„ 7.	„ A.	..	24·8 „	3 „ 35 „
„ 8.	„ C.	..	40·9 „	7 „ 35 „
„ 10.	„ B.	..	27·9 „	5 „ 12 „
„ 11.	„ A.	..	24·8 „	6 „ 56 „
„ 12.	„ C.	..	40·9 „	3 „ 48 „

No. 11.

October 6.	Route B.	..	27·9 miles.	5 hrs. 22 min.
„ 7.	„ A.	..	24·8 „	3 „ 25 „
„ 8.	„ C.	..	40·9 „	8 „ 23 „
„ 10.	„ B.	..	27·9 „	5 „ 12 „
„ 11.	„ C.	..	40·9 „	6 „ 32 „
„ 12.	„ A.	..	27·9 „	3 „ 54 „

No. 5 (Fig. 5) is an omnibus which can carry 24 passengers, a conductor, and driver.

No. 6 (Fig. 6) is a char-à-banc and carries the same number.

No. 7 (Fig. 7) is a steam lurry weighing 5 tons and carrying 3 tons. No. 8 is a steam lurry or van hauling another vehicle. We have no suitable word for this combination. The French call it a Remorquer-Porteur, which we suggest might be rendered "Steam cargo tug and lurry." This extraordinary vehicle, No. 8, hauled a load of 10 tons, 3 tons being on the tug and 7 tons on the lurry. Its performance was not, however, satisfactory, and it took no less than 15½ hours to accomplish Route A, 25 miles, on the 7th. On the following day it was under repair, but on the 10th it accomplished the same distance in 9 hours 10 minutes. It was then withdrawn from the competition.

The following table gives the performances of the De Dion et Bouton vehicles:—

Table of Routes, Distances, and Times.

No. 5.

			Distance.		Time.	
October	6.	Route B.	.. 27·9	miles.	7 hrs.	14 min.
,,	7.	,, A.	.. 24·8	,,	3 ,,	9 ,,
,,	8.	,, C.	.. 40·9	,,	7 ,,	13 ,,
,,	10.	,, B.	.. 27·9	,,	3 ,,	36 ,,
,,	11.	,, A.	.. 40·0	,,	2 ,,	55 ,,
,,	12.	,, C.	.. 40·9	,,	5 ,,	44 ,,

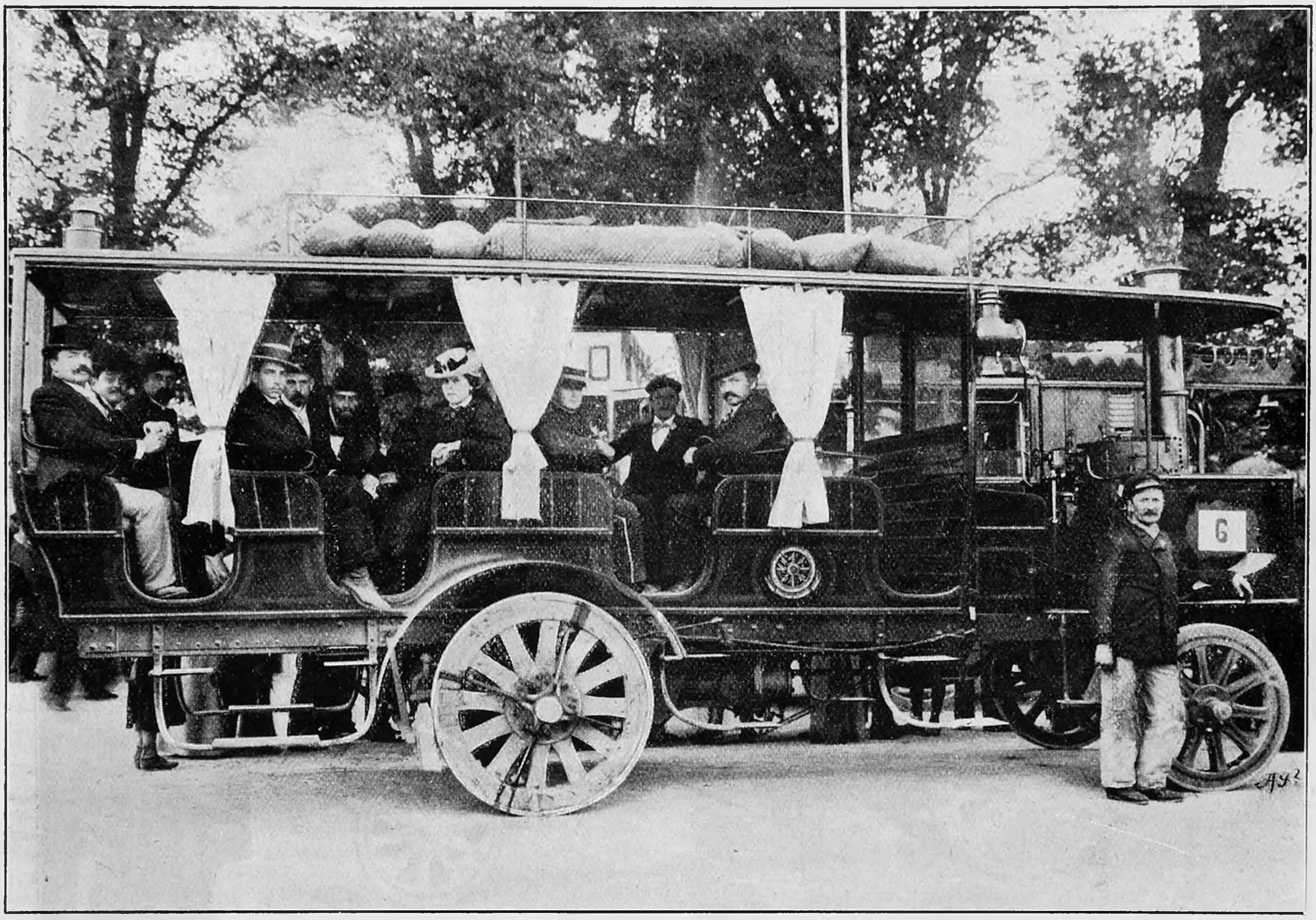


FIG. 6 (No. 6).—DE DION AND BOUTON WAGONETTE (Steam).

No. 6.

			Distance.		Time.	
October	6.	Route C.	.. 40·9	miles.	7 hrs.	19 min.
,,	7.	,, B.	.. 27·9	,,	3 ,,	59 ,,
,,	8.	,, A.	.. 24·8	,,	3 ,,	18 ,,
,,	10.	,, C.	.. 40·9	,,	3 ,,	58 ,,
,,	11.	,, B.	.. 27·9	,,	3 ,,	32 ,,
,,	12.	,, A.	.. 24·8	,,	3 ,,	30 ,,

No. 7.

October	6.	Route C.	.. 40·9	miles.	Accident.	
,,	7.	,, B.	.. 27·9	,,	6 hrs.	0 min.
,,	8.	,, A.	.. 24·8	,,	5 ,,	41 ,,
,,	10.	,, C.	.. 40·9	,,	7 ,,	22 ,,
,,	11.	,, B.	.. 27·9	,,	5 ,,	47 ,,
,,	12.	,, A.	.. 24·8	,,	5 ,,	19 ,,

The Automobile Association, of London, as representing the Lancashire Steam Motor Company, of Leyland, entered two vehicles built by the latter Company. These were Nos. 14 and 15 (Figs. 8 and 9), the former of 6 and the latter of 12 H.P. Owing to delays at the Douane these vehicles did not arrive in time for the first day's run. The performances of these vehicles were disappointing in view of the previous excellent record of the Leyland firm. It is said that the mechanism of the vehicles had become strained in shipment; this is of course possible. No. 14 was stated to weigh in working order 1½ tons, and to have carried a total weight of 1,650 lbs. It ran four out of the six journeys, and on the whole performed well. There were a few mishaps to the oil burner, caused by vibration due to the rough roads. The following consumption tests are extremely interesting; we, however, give them with reservation:—

On Route C, distance 40·9 miles, the consumpt of water was 40 gallons, and 8·125 gallons of oil (kerosine). This works out at 9·7 lbs. of water per mile, and 1·59 lbs. of kerosine per mile. In the evaporation tests steam was raised to 200 lbs. per square inch in 13 minutes, and the water evaporated in an hour was 145 lbs., with an expenditure of 1·687 gallons of kerosine. This gives an evaporation of 10·74 lbs. of water per pound or pint of oil *—an exceedingly good result, considering the small size of the boiler. If these figures are reliable Messrs. the Leyland Company have achieved a distinct success in the burning of liquid fuel. Of course we are aware that in locomotive and marine boilers an evaporation of 16 lbs. of water per pound of oil is a common performance, but this is obtained in fairly large boilers. Messrs. the Leyland Company's boiler in No. 14 has, we believe, not more than 70 square feet of heating surface, and such a high evaporation as they have obtained points to careful design in the boiler resulting in very effective heating surface. The good result obtained in this boiler was also obtained in the vehicle, No. 15, which had a larger boiler. In this case 3·39 gallons

* The kerosine is taken as being of sp. gr. ·8, therefore 1 pint weighs 1 lb.—ED.

of kerosine evaporated 28·875 gallons of water, or 1 lb. kerosine evaporated 10·72 lbs. of water. Owing to the derangement of the machinery No. 15 did not conclude the programme.

Table of Routes, Distances, and Times.

No. 14.

				Distance.	Times.
October	6.	Route —	..	Not arrived.	
,,	7.	,, A.	..	24·8 miles.	6 hrs. 6 min.
,,	8.	,, C.	..	Accident.	—
,,	10.	,, A.	..	24·8 miles.	6 hrs. 8 min.
,,	11.	,, C.	..	40·9 ,,	8 ,, 2 ,,
,,	12.	,, B.	..	27·9 ,,	5 ,, 47 ,,

40·9 miles, was :—Water, 158 gallons, and of petroleum, stated to be "crude oil,"* 22½ gallons. This works out at 38·6 lbs. of water and 4·95 lbs. of petroleum. In the evaporation tests steam was raised from all cold in 35 minutes to the normal working pressure, and 1 litre of oil was said to have evaporated 13·7 litres of water; in other words, 1 lb. of crude oil evaporated 15·15 lbs. of water per hour—a striking testimony of the high evaporative power of the flashing boiler. This advantage is, however, discounted by its great weight. In the one described by us in December, 1897, this weight was 6,336 lbs., or nearly 3 tons. This great weight would, of course, be quite inadmissible in Great Britain. M. Serpollet estimates that the expenditure of heavy oil is 1·3 litres per kilometre. A litre costs 7 centimes.

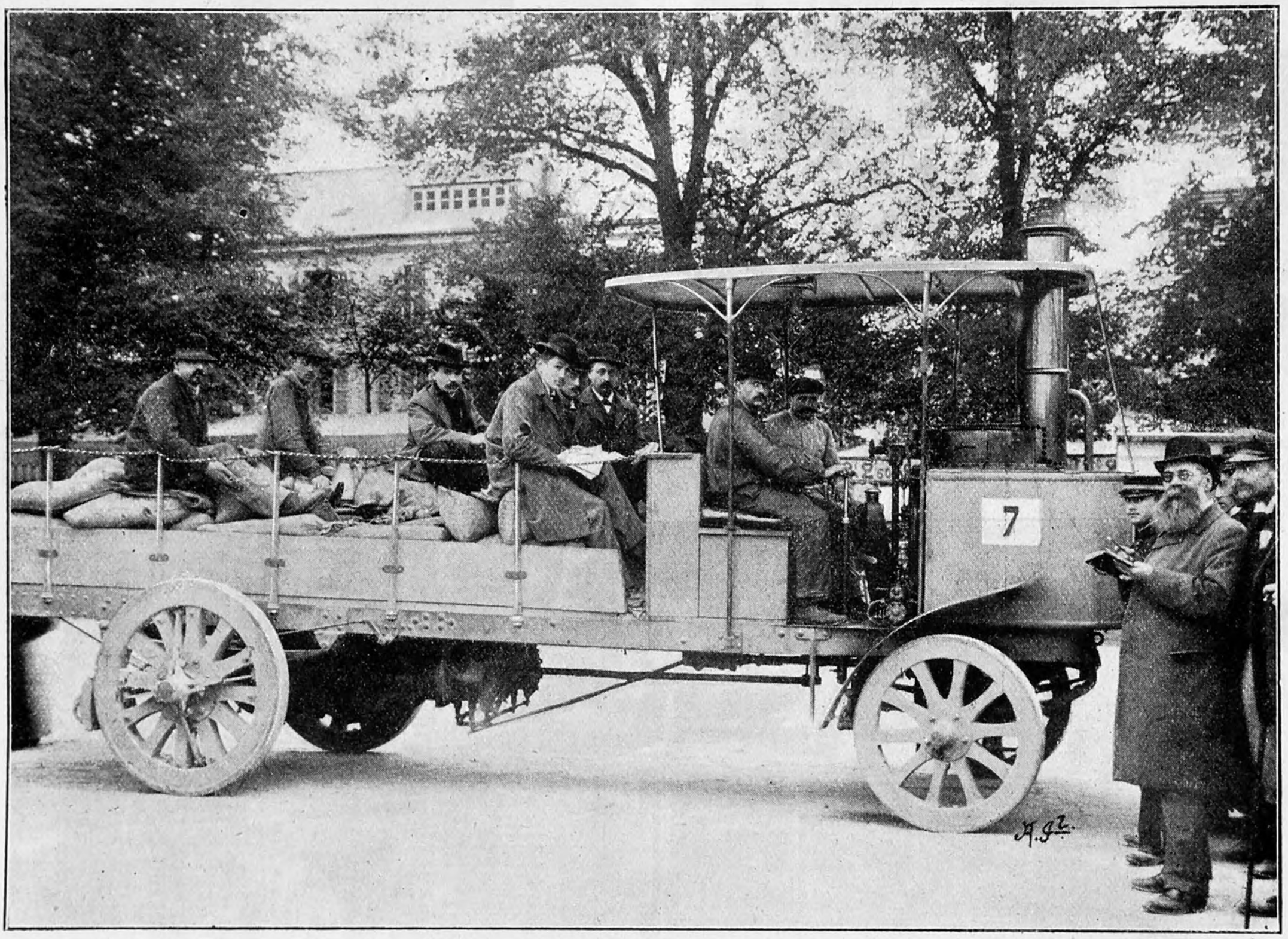


FIG. 7 (No. 7).—DE DION AND BOUTON LURRY (Steam).

The Serpollet system of moto-vehicle, of which but little has been heard of late, was represented by No. 18 (Fig. 10). This was a large and rather cumbrous-looking omnibus, having baggage accommodation on the roof. The vehicle has a boiler constructed on the well-known flash system, as modified by M. Serpollet, and has a heating surface of 80·7 square feet. It is fired by liquid fuel, the burner being that illustrated and described by us in THE AUTOMOTOR for January, 1898, the tank containing the supply of petroleum (22 gallons) being situated under the rear of the vehicle. The machinery consists of a pair of simple high-pressure engines, 7·087″ × 5·906″ stroke, developing 15 H.P., and driving by speed gearing a second motion shaft, upon which are mounted the chain driving gear, differential gear, &c. A full description of this machinery will be found in THE AUTOMOTOR for December, 1897. The weight of the vehicle in working order was 5½ tons, and it carried 16 passengers, a conductor, and driver, and 660 lbs. of dead weight. During the trials it ran, we understand, remarkably well.

The consumption of water and oil as determined on Route C,

Table of Routes, Distances, and Times.

No. 18.

				Distance.	Times.
October	6.	Route A.	..	24·8 miles.	3 hrs. 47 min.
,,	7.	,, C.	..	40·9 ,,	7 ,, 58 ,,
,,	8.	,, B.	..	27·9 ,,	3 ,, 15 ,,
,,	10.	,, A.	..	24·8 ,,	3 ,, 2 ,,
,,	11.	,, C.	..	40·9 ,,	7 ,, 52 ,,
,,	12.	,, B.	..	27·9 ,,	4 ,, 13 ,,

Before leaving this account of the steam moto-vehicles an interesting comparison can be made between the two burning liquid fuel, viz., the Leyland, No. 14, and the Serpollet, No. 18.

Taking the moving weight of the former at 2·24 tons, and that of

* The sp. gr. of this is taken at ·9.

the latter at 7·0 tons, the ton-miles are 91·6 and 286·3 respectively: the consumpt of water and oil per ton-mile is then :—

Leyland, 4·316 lbs. water; ·709 lb. kerosine.
Serpollet, 5·520 lbs. water; ·707 lb. crude oil.

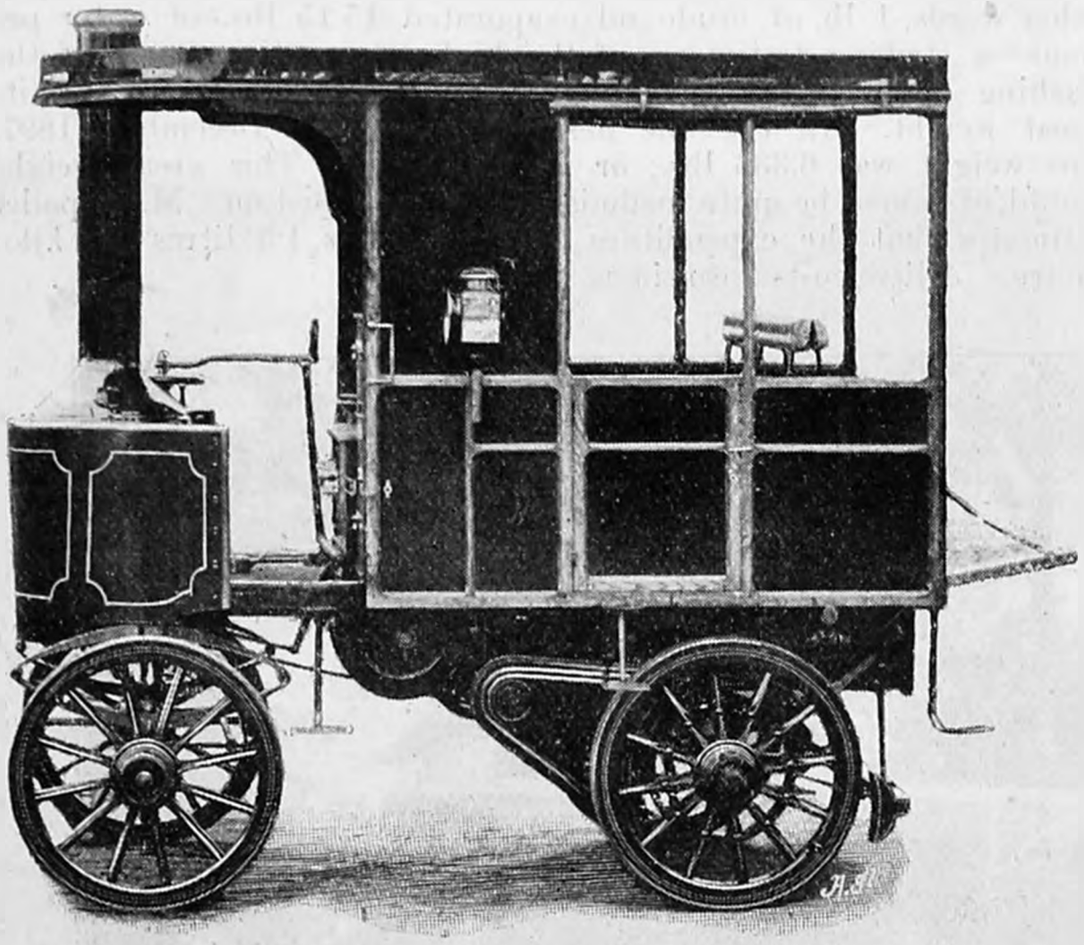


FIG. 8 (No. 14).—LEYLAND COMPANY'S VAN (Steam).

It is worthy of remark that in the Liverpool trials the consumpt of kerosine in the Leyland, No. 5, was ·57 lb. per ton-mile of moving weight, and of water 4·7 lbs.

Of the electro-moto-vehicles entered at the concours it is unnecessary to speak at length, as their presence at the trials was little more than an attempt to see what such vehicles could do in the shape of long journeys over a difficult country, with no charging stations *en route*.

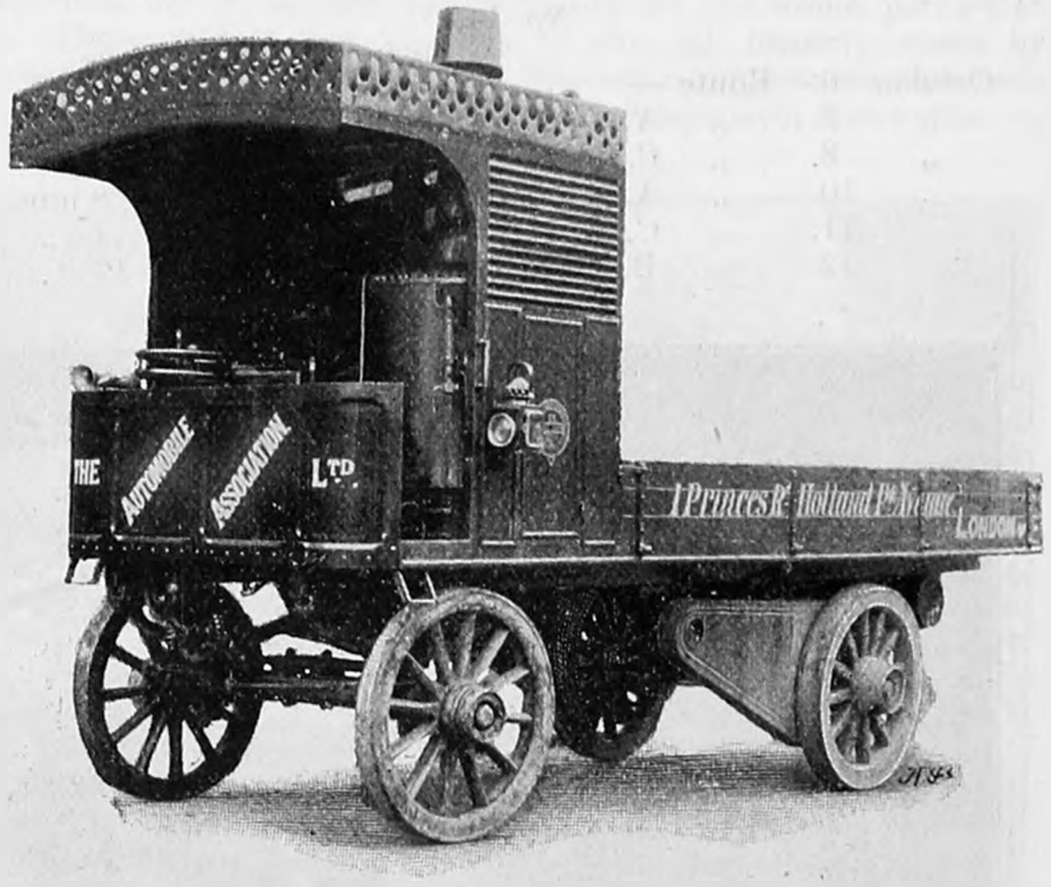


FIG. 9 (No. 15).—LEYLAND COMPANY'S LURRY (Steam).

No. 3 (Fig. 11) is a delivery van by C. Milde et Cie. Concerning this vehicle we are enabled to give some particulars. It is designed to carry 1,320 lbs. of goods, or, including the driver and porter, 1,650 lbs.; its length is 9·84 feet; breadth, 6·07 feet; wheel base, 5·08 feet; the gauge being 4·59 feet; the diameter of the driving

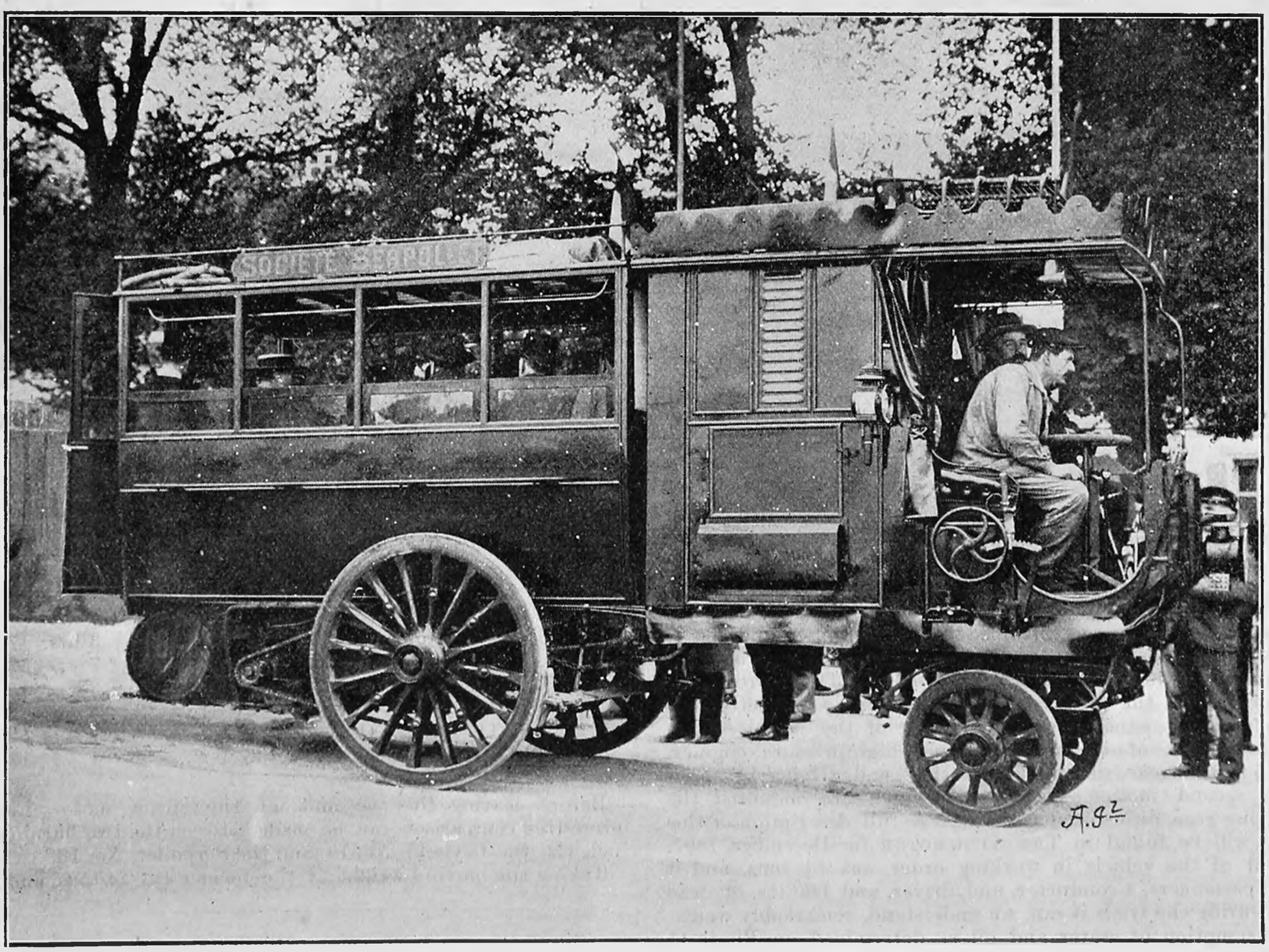


FIG. 10 (No. 18).—SERPOLLET OMNIBUS (Steam).

wheel 2·95 feet. The weight of the vehicle empty is 4,840 lbs., of which 2,926 lbs. is on the drivers, and is that available for adhesion. The motive power is derived from a battery of 40 elements, arranged in four groups of 10 each. Each element weighs 38·5 lbs., and the total weight of the battery is 1,540 lbs. The capacity of the battery is 145 ampère hours at the normal rate of discharge of 36 ampères; this gives a speed of nine miles per hour on the level for four hours. The distance the vehicle can travel is from 24 to 36 miles according

FIG. 11 (No. 3).—MILDÉ VAN (Electric).

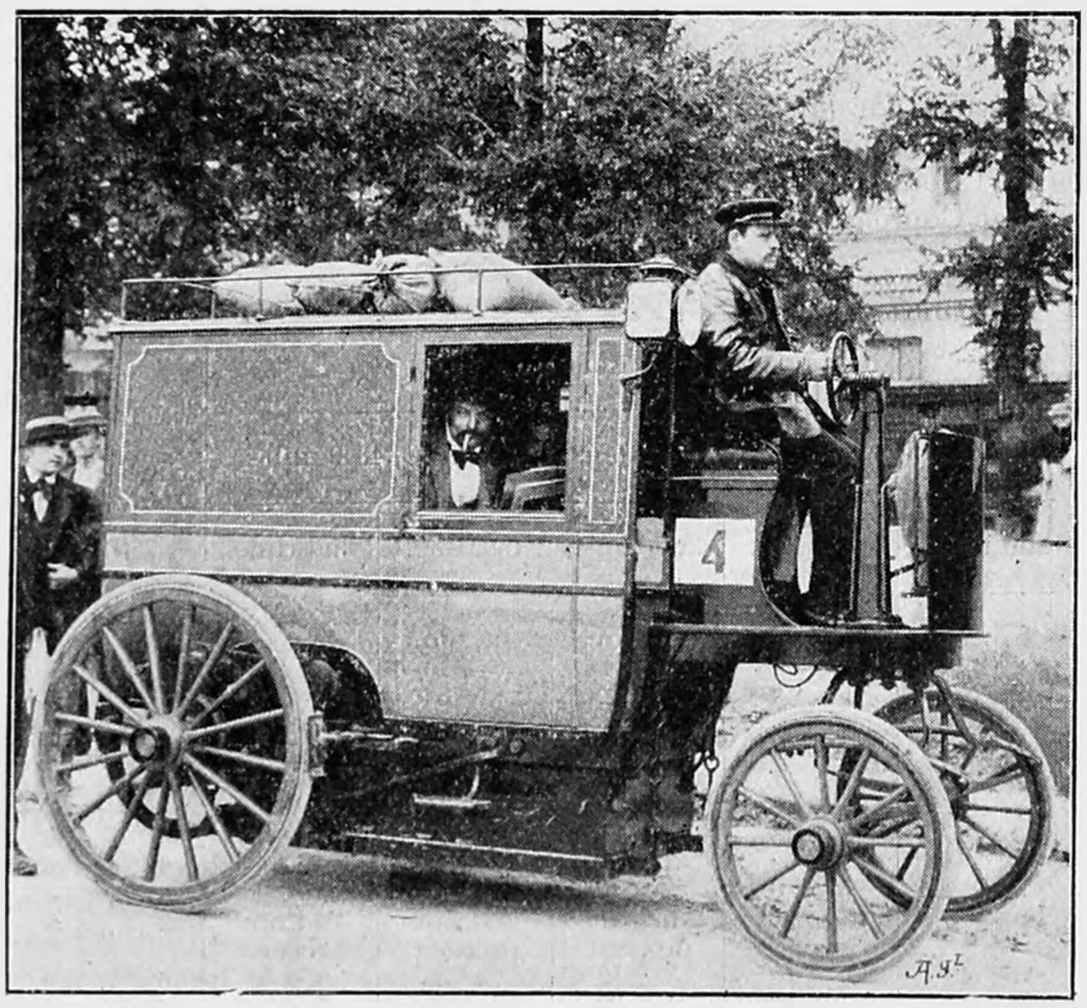


FIG. 12 (No. 4).—CIE. FRANÇAISES VAN (Electric).

to the gradient and the state of the roads. The motor is of the Postel-Vivay type, having four poles. It is series wound, and has a normal output of 30 ampères at an E.M.F. of 76 volts at 2,300 revs. per minute. The armature spindle transmits the power by spur gearing to an intermediate shaft upon which is the differential gear. On the ends of this shaft are two pinions which transmit the power to the rear wheels by chains in the usual way. The velocity ratio of driving (wheel) shaft to the intermediate shaft is 1 to 5, and that of the intermediate shaft to the armature spindle is 1 to 6. Hence the final velocity ratio is 1 to 30. Six speeds are obtainable. This vehicle would undoubtedly have given a good account of itself, but owing to faulty arrangements the batteries were joined up to the charging mains in the reverse order, with the result that they polarised and became practically useless. This vehicle succeeded in traversing one route, escorted by a portable engine fitted with a dynamo (*see* Fig. 15). It was thus enabled to get recharged and complete its

FIG. 13 (No. 13).—CIE. GÉNÉRALE VAN (Electric).

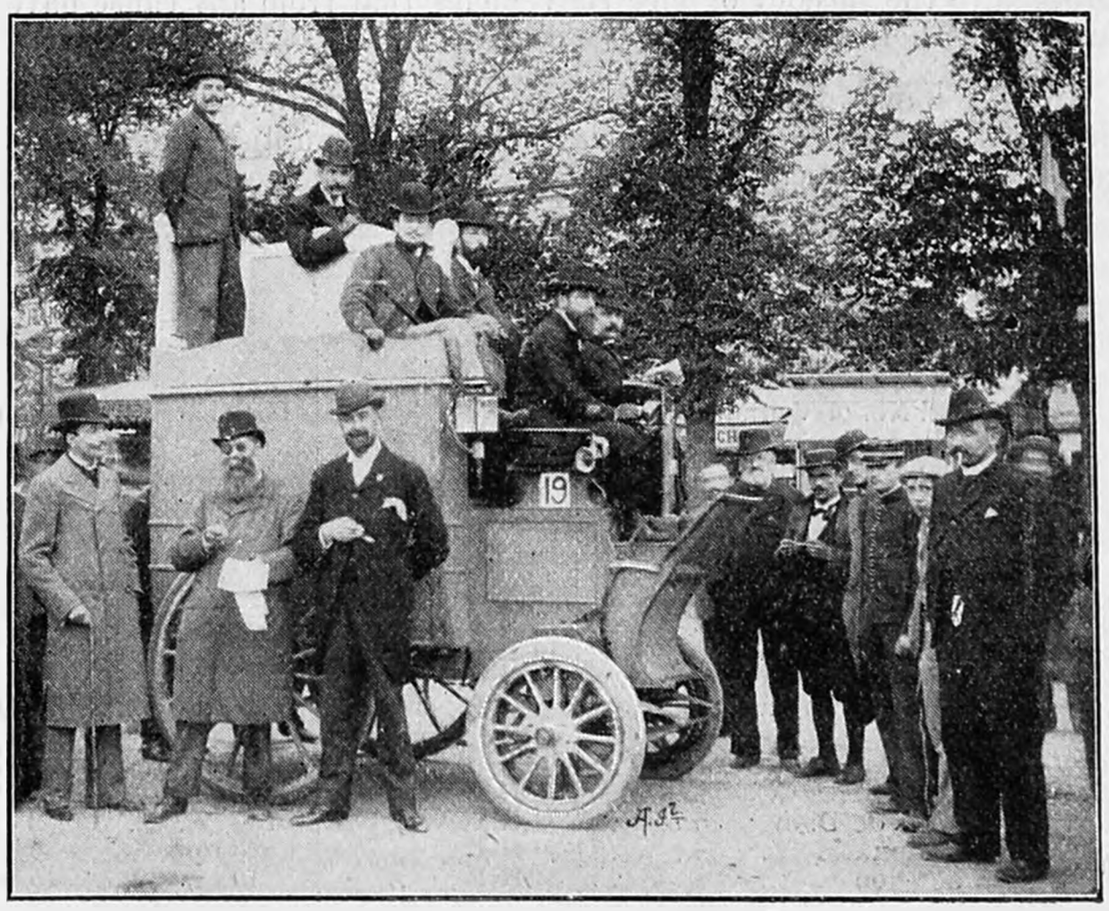


FIG. 14 (No. 19).—KRIEGER VAN (Electric).

journey. Had it not been for this precaution it would have had to be ignominiously towed home.

No. 4 (Fig. 12) was a parcel van upon the Bersey system, but fitted with Fulmen accumulators, as were all the three electric vehicles. This vehicle ran, we understand, very well indeed, accomplishing five out of the six routes. The weight of the vehicle was 5,500 lbs., of which 1,320 lbs. were absorbed by the battery. On Route A, 24·8 miles, the consumption of energy was six kilowatt-hours, the average consumption of current being 24 ampères at an E.M.F. of 85–86 volts.

No. 13 (Fig. 13) was also a parcel van, on the Jenatzy system. It weighed in running order 9,900 lbs., in which was included 2,640 lbs. of battery and 3,300 lbs. of dead weight and four passengers. This vehicle accomplished all the routes without any hitch. On C Route, 40·9 miles, the vehicle attained a speed of 7·2 to 7·8 miles per hour on the level with a current of 28 to 30 ampères; on the gradients the speed fell to 4·2 miles per hour, while the current rose to 70 ampères. M. Jenatzy estimates that the cost of the current for Route C, 40·9 miles, was 4·50 to 5 francs.

No. 19 (Fig. 14) was a Krieger delivery van. It did not arrive in time to complete the routes, but accomplished three of them very satisfactorily.

M. the Baron de Zuylen rendered very effective service with his portable steam dynamo (Fig. 15). This vehicle has a Serpollet

FIG. 15.—SERPOLLET PORTABLE STEAM DYNAMO.

boiler and motor. It is intended for use in country districts to proceed to the succour of electric vehicles that from any cause have exhausted their charge.

In the above description we have been only able to give the principal features of the vehicles. We shall publish the judges' report in due course.

IMPORTANT TO OWNERS AND DRIVERS OF PETRO-MOTO-VEHICLES.

THE great hindrance to the more extensive employment of petro-moto-vehicles in country districts has hitherto been largely due to the difficulty of obtaining petrol, owing to the nature of this spirit, the legal limitations as to storage, and the disinclination on the part of railway companies to carry it—matters which we fully discuss in a special article in our present issue. It is only by concerted effort on the part of all interested that a copious and regular supply can be assured. We have from time to time published lists of those dealers in various towns who stock petrol, but obviously we cannot expect shopkeepers and others to render themselves liable to official inspection and its attending annoyances unless they see their way to profitable business, and hence, if owners of moto-vehicles wish to overcome this difficulty in the supply of petrol, they must co-operate with the shopkeepers of their district. As will be seen, the Anglo-American Oil Company have appointed agents all over the country for the sale of petrol, and in our present issue we publish a list of the houses and residences of these agents amongst others. Readers interested will do well to have this list by them, so that before entering a town they can satisfy themselves whether they can refill their tank. At present the user of a petro-moto-vehicle has to map out his route beforehand and to order the petrol in advance, and generally to rely upon some friendly hotel-keeper to act as consignee of it till it is required. The system now inaugurated by the Anglo-American Company should shortly render the supply of petrol a matter of as much certainty as the supply of any other commodity. The user of a petro-moto-vehicle will now be able to vary his journey as he desires without any anxiety as to whether "that can of petrol has arrived," and also without having to carry in his vehicle more than a sufficient quantity to take him to the next town. For long journeys it would be advisable to ascertain from THE AUTOMOTOR list the names of the local agents and advise them by post-card; these agents, all of whom are properly licensed, would then act accordingly. In the meantime we must remind automobilists that the success of this scheme largely, if not entirely, depends upon them. They must encourage the local dealer as much as possible, and make it worth his while to always have a stock of petrol on hand.

SOME new foreign Companies:—La Société de Manufacture Belge des Velos Automobiles, Liege; capital, £4,000. MM. Goyet et Legros, Neuilly; capital, £3,600. The Erie Cycle and Motor Carriage Company, Anderson, Ind., U.S.A.; capital, £5,000.

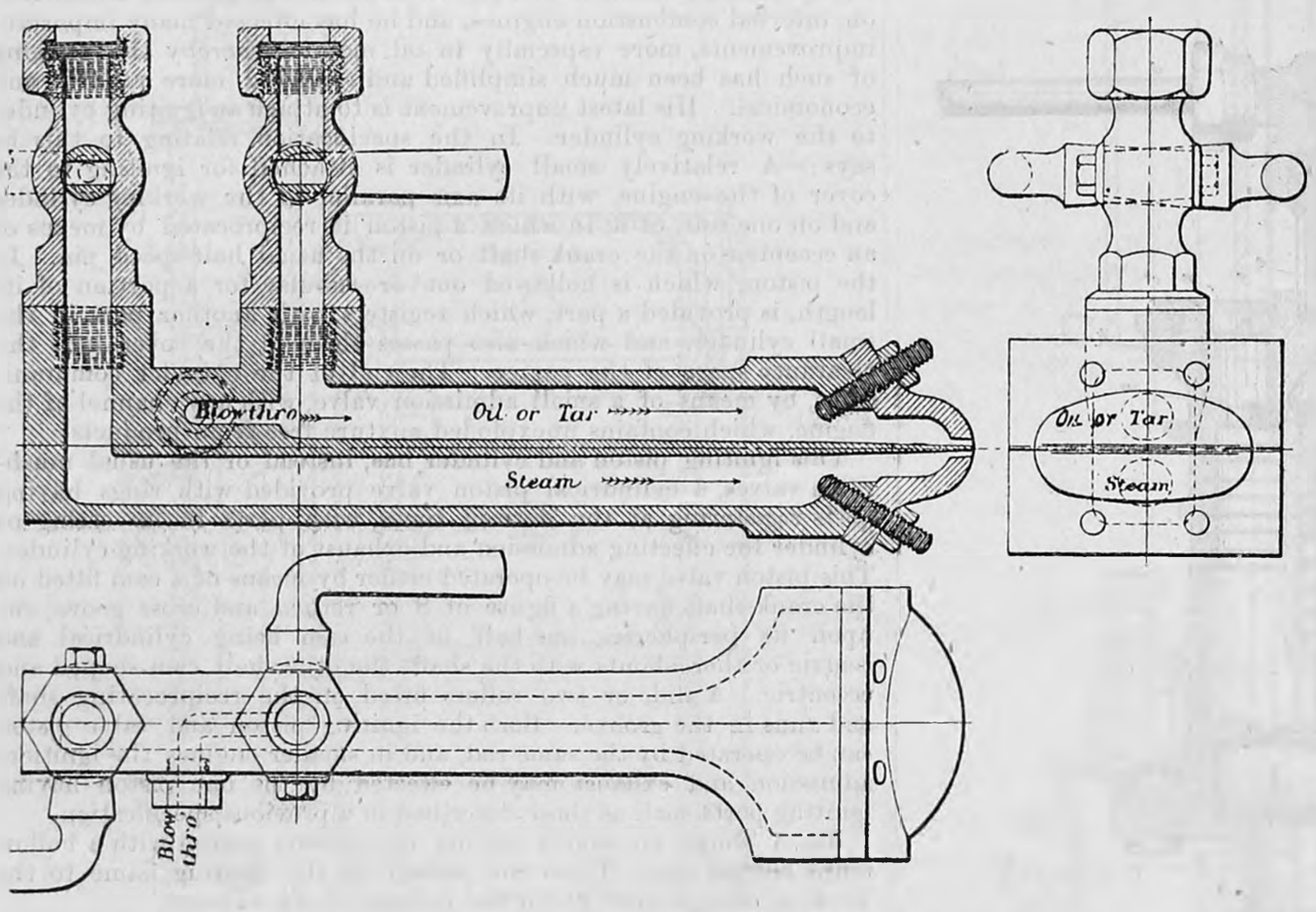
RESUME OF THE CONCOURS.

Official No. of Vehicles.	Power of the Motor.	Load carried.	Time taken on each Route.						Number of times routes traversed.
			Route A, 24·8 miles.		Route B, 27·9 miles.		Route C, 40·9 miles.		
			1st time.	2nd time.	1st time.	2nd time.	1st time.	2nd time.	
			h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	
1. Voiture Panhard	8-H.P., petrol	1 ton	2 42	2 33	3 47	4 8	6 10	5 45	6 out of 6.
2. Omnibus Roser	10-H.P., ,,	12 passengers	5 49	did not proceed	6 3	returned	8 34	9 30	4 ,, 6.
3. Voiture Mildé	4-H.P., electric	1,650 lbs.	disabled	5 39	disabled	disabled	disabled	did not proceed	1 ,, 6.
4. Voiture Electro-Mobile Co. ...	5-H.P., ,,	,,	3 35	8 17	8 3	9 6	—	9 12	5 ,, 6.
5. Omnibus de Dion	30-H.P., steam	20 passengers	3 9	2 55	3 48	3 36	7 13	5 44	6 ,, 6.
6. Char-à-bancs de Dion	30-H.P., ,,	24 ,,	3 18	3 30	3 59	3 32	7 19	5 58	6 ,, 6.
7. Lurry de Dion...	30-H.P., ,,	3 tons	5 41	5 19	6 0	5 47	11 33	7 22	6 ,, 6.
8. Tractor de Dion	53-H.P., ,,	10 ,,	15 36	9 10	disabled	did not proceed	did not proceed	did not proceed	2 ,, 5.
10. Lurry Dietrich	9-H.P., petrol	1 ton	3 35	3 48	6 15	5 12	7 35	6 56	6 ,, 6.
11. ,, ,, ...	9-H.P., ,,	1 ,,	3 25	3 54	7 12	4 29	8 23	6 32	6 ,, 6.
13. Voiture Jenatzy	6-H.P., electric	3,300 lbs.	4 23	4 28	8 0	8 35	8 23	9 5	6 ,, 6.
14. Voiture Leyland	6-H.P., steam	1,650 ,,	6 6	6 8	did not proceed	5 47	disabled	8 2	4 ,, 5.
15. Lurry ,, ...	10-H.P., ,,	2,640 ,,	disabled	did not proceed	did not proceed	did not proceed	did not proceed	abandoned	
16. Fire-engine Cambier...	8-H.P., petrol	2,200 ,,	8 26	did not proceed	9 14	—	8 58	did not proceed	3 ,, 4.
17. Lurry Cambier	8-H.P., ,,	1 ton	6 30	did not proceed	did not proceed	did not proceed	did not proceed	did not proceed	1 ,, 1.
18. Omnibus Serpollet	15-H.P., steam	15 passengers	3 47	3 2	4 15	4 13	7 58	7 52	6 ,, 6.
19. Voiture Krieger	4-H.P., electric	1,100 lbs.	5 46	did not proceed	7 15	did not proceed	9 10	did not proceed	3 ,, 3.

THE FAIRFIELD LIQUID FUEL BURNER.

THE Fairfield Shipbuilding Company have been conducting a series of experiments and trials with various forms of liquid fuel burners suitable for use with heavy oils such as astaki (petroleum refuse), tar oil, &c., and have finally adopted that form shown in the accompanying illustrations, in which Fig. 1 is a sectional elevation, Fig. 2 a plan, and Fig. 3 an end elevation. It will be seen that the burner is extremely simple in design, the principle adopted being the same as in the Artemeff burner.* It consists of a tube having a long narrow orifice and a diaphragm. If indeed one places their tongue just between the lips leaving a space of about a millimetre above and below and imagines that oil flows out on one side of the tongue and steam on the other, we have as good a resemblance to the most efficient burners of this class as we can desire.

It will be seen that the burner is easily cleaned, the mouthpiece being detachable and held in place by screwed studs, while a jet of steam can also be sent through it. As the oil used is tar oil it is necessary to keep this in a sufficiently liquid state so as to permit it to flow easily, this is effected by means of a steam coil placed in the supply tank. With less viscous oils and in a milder climate than



that prevailing on the Clyde in winter time it would not be necessary to heat the oil. It will be noticed that this burner requires steam to pulverise the oil, as is the case in Holden's well known burner. This is the great hindrance to the employment of this class of burner in moto-vehicles and small vessels, as the consumption of steam becomes a serious matter. For locomotives and in situations where this is not such a consideration this form of burner gives excellent results. This burner has been applied for some time to one of the ordinary boilers working the hydraulic machinery in the shipbuilding works of the Fairfield Company, and a comparison has been made as to the difference in cost of working with tar *versus* coal. In the latter case, including firemen's attendance, the cost works out at £7 18*s*. 6*d*. per week for double shift, and, taking the same time with the refuse tar as fuel, the cost works out at £5 19*s*.; thus showing a considerable saving. The only difficulty in the way of using the liquid fuel is that it is necessary to raise a certain amount of steam on the boiler so as to get the steam jet. The weight of coal used for 116½ hours is 15 tons, and the amount of tar used for the same period is under 9 tons. This comparative cost is for coal at 10*s*. per ton, while the tar is assumed at 5*s*. per 100 gallons. If we take tar oil as having a specific gravity of 1·1, 100 gallons will weigh 1,100 lbs., and hence 1 ton will cost 10·19*s*.

* *Vide* THE AUTOMOTOR, July, 1897.

MESSRS. ROOTS & VENABLES' PETRO-MOTO-VEHICLE CONSUMPTION TRIAL.

MESSRS. ROOTS AND VENABLES are, so far as we know, the only firm of moto-vehicle manufacturers who have successfully overcome the difficulties attending the use of ordinary petroleum oil in motors intended for the propulsion of vehicles. The great advantage of such motors is the cheapness of the oil and the facility with which it can be obtained. So far the public have not had many opportunities of judging of the performances of moto-vehicles using ordinary burning oil. Messrs. Roots and Venables entered one such vehicle for the Birmingham trials, and we, in common with others, were much disappointed that, owing to an unfortunate accident, this vehicle was unable to compete. Not a few people would practically encourage the automobile industry by purchasing moto-vehicles using ordinary burning oil were they assured that such vehicles were as reliable and as perfect as regards their motors as those vehicles using spirit. The Birmingham trials, it was hoped, would have afforded the required demonstration, which will now have to be delayed till the next trials held by the S.P.T.A. in conjunction with the Automobile Club. In the meantime, Messrs. Roots and Venables have completed for the well-known firm of Messrs. Peek, Frean, and Co. a moto-vehicle, which has lately undergone some trials with the most satisfactory results, and recently a trial was made to determine the consumption of oil. The vehicle is an ordinary van, capable of carrying about three-quarters of a ton as an average load. It is carried on a steel framing, to which is attached the motor and gearing. The motor is placed in front, and gears in much the usual way, with a countershaft having phosphor bronze pinions, the motion of the shaft being communicated to the rear, the driving, wheels by chains. All the gear is of very high-class workmanship, and the general design and arrangement exceedingly good. While being easily accessible the gear is not too visible. In fact, at a little distance it differs but little from an ordinary tradesman's covered van.

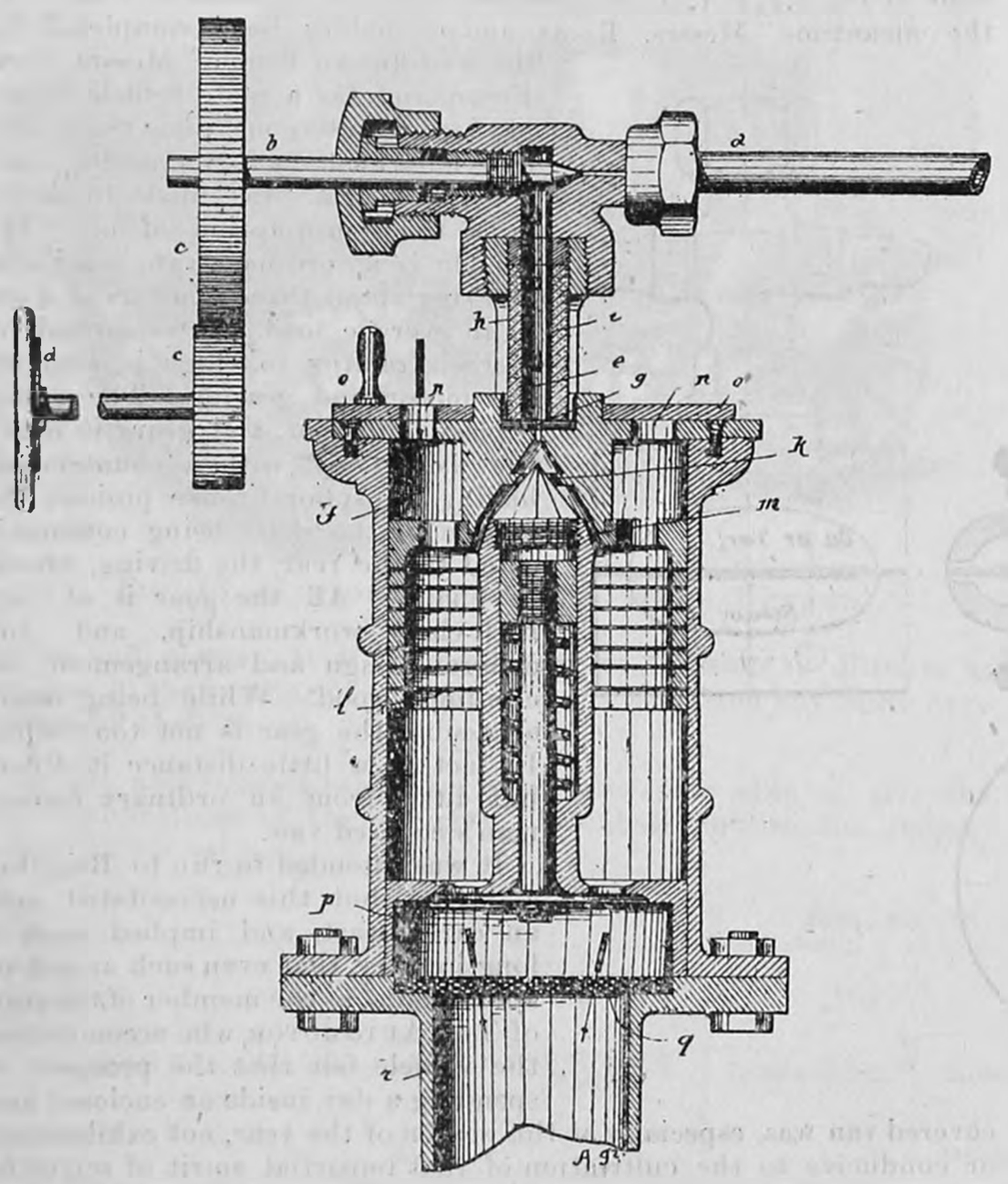
It was intended to run to Brighton and back, but this necessitated such an early start, and implied such a long journey, that even such an ardent automobilist as the member of the staff of THE AUTOMOTOR who accompanied the vehicle felt that the prospect of spending a day inside an enclosed and covered van was, especially at this season of the year, not exhilarating or conducive to the cultivation of that impartial spirit of scientific criticism which is so essential when matters relating to automobilism are concerned. Ultimately it was decided to proceed as far as Handcross.

The load consisted of 10 cwt. of iron ballast, stores, tools, and four persons, in all about 1,500 lbs. A start was made from Messrs. Roots and Venables' works in the Westminster Bridge Road at 6.45 a.m. on the 15th ult. Croydon Town Hall was passed 67 minutes later, Crawley being reached at 10.24 a.m., where a halt was made for half an hour. Proceeding, Handcross Hill was reached at 11.39 a.m. Here an unfortunate delay occurred through a bolt having worked out and dropped on the road. This was, however, remedied, and a start homeward begun at 12.43 p.m., the run home being accomplished in 4 hours 10 minutes without a stop. At the end of the run all the bearings were found quite cool, and the machinery in perfect order. The distance traversed on the Brighton road was 70 miles. The consumption of petroleum was 51 pints, or nearly ·73 pint per mile, and the cost, at 4½*d*. per gallon, 2*s*. 4¾*d*. In addition about three-quarters of a pint of lubricating oil was used, making the total cost of running 2*s*. 7*d*., or ·44*d*. per mile. This is lower than the best result so far obtained in any class of petro-moto-vehicle. The whole performance of the vehicle was most satisfactory, and it is with pleasure that we are able to state that Messrs. Roots and

Venables have solved a most difficult problem, viz., the perfect combustion of ordinary petroleum in such small motors as are necessarily fitted to vehicles.

THE LUCAS CARBURATOR.

JUST now the improvement of that important adjunct to spirit motors, the carburator, is receiving a good deal of attention at the hands of inventors. A very practical one, and one which seems to us to proceed on the right lines, is that of M. Lucas, and of which we give a vertical section. The carburator, or mixer, consists of a cylindrical chamber, having a connection on its lower end to the cylinder of the motor, and fitted with a spring-controlled piston, *p*, and valve, *k*; on the upper part is a perforated cover, *n*, upon which is a sliding circular baffle-plate, *o*; thus the holes in the cover can be opened or closed to any desired extent for the admission of air. The upper central spindle, *h*, is hollow and forms the feed-pipe, *e*,



for the spirit; at its upper end is a needle-valve, *b*, operated either by hand or by gearing from the motor. Within the cylinder are a series of plates, *l*, also perforated with small holes, while just below the piston-valve is a fine wire gauge, *q*.

The action of the carburator is as follows:—Petrol spirit comes through the pipe, *a*, and on opening the needle-valve, *b*, flows down, in very minute drops, the central tube, *e*, the quantity of spirit so admitted being regulated by the valve. The spirit cannot then enter the carburator as the passage, *g*, is closed by the pointed head of the spindle, *k*, which is held up to its seat by the spring. The lower part of the carburator is in communication with the cylinder of the motor, and on the suction stroke of the latter the piston, *p*, of the carburator is sucked down with its spindle and opens valve, *k*, the spirit runs through the passages, *m*, and falls upon the perforated plates, *l*. At the same time air rushes into the partial vacuum in the chamber through the ports, *n*, and through the perforated plates, *l*, and hence becomes intimately mixed with the spirit. This explosive mixture of air and spirit passes or is sucked through *q*, and thence to the cylinder of the motor, where it is ignited and, of course, produces an explosion, the pressure thus generated depending upon the proportions of air and spirit in the mixture. As will be gathered, these can be regulated to any desired degree, and hence the "richness of the mixture." The fault we find with this, as with all carburators we have yet seen, is that no account is taken of the condition of the air admitted to form the mixture. The efficiency of the explosion, or rather the completeness of the explosion and the pressure generated, are largely influenced by the state of the atmosphere; if this is damp, then aqueous particles are introduced and premature explosions are liable to occur. Damp air, in fact, has the same effect in the cylinders of an internal combustion motor as it does in a gun chamber—it modifies the nature of the explosive charge. What is required in these carburators—at least for those used in Great Britain—is an attachment which will effectually dry the air as it enters. Much could be said on this matter of the influence of humidity upon the working of internal combustion motors; for the present we leave it.

THE ROOTS' IGNITION APPARATUS.

MR. JAMES ROOTS, of Messrs. Roots and Venables, of Westminster Bridge Road, London, is well known as one of the greatest authorities on internal combustion engines, and he has effected many important improvements, more especially in oil motors, whereby the working of such has been much simplified and rendered more reliable and economical. His latest improvement is to attach an igniting cylinder to the working cylinder. In the specification relating to this he says:—A relatively small cylinder is attached for igniting to the cover of the engine, with its axis parallel to the working cylinder and on one side of it, in which a piston is reciprocated by means of an eccentric on the crank-shaft or on the usual half-speed pin. In the piston, which is hollowed out or tubular for a portion of its length, is provided a port, which registers with another port in the small cylinder, and which also passes through the cover into the clearance space of the engine. The end of the cylinder communicates, by means of a small admission valve, with any channel of the engine, which contains unexploded mixture free from products.

This igniting piston and cylinder has, instead of the usual mushroom valves, a cylindrical piston valve provided with rings having ports registering at the desired times, with ports in its casing or cylinder for effecting admission and exhaust of the working cylinder. This piston valve may be operated either by means of a cam fitted on the crank-shaft having a figure of 8 or return and cross goove cut upon its peripheries, one-half of the cam being cylindrical and centric or thereabouts with the shaft, the other half cam-shaped and eccentric. A slide or two rollers fitted on the reciprocating shaft end runs in the groove. Both the igniting piston and valve piston can be operated by the same rod, and in smaller engines the ignition, admission, and exhaust may be effected by the one piston having igniting ports such as those described in a previous specification.

Fig. 1 shows an engine having its igniting piston with a hollow trunk having ports (1) for the passage of the igniting flame to the working charge, and (2) for the passage of the exhaust.

Fig. 2 is an engine upon the one revolution cycle with an igniting piston and cylinder.

Fig. 3 shows a modification without a hollow trunk igniting piston.

A is the working cylinder, B the working piston, C the ignition and valve cylinder, D the ignition and valve piston, E the admission valve, F the exhaust port, G the port in the piston, D, registering with F, H the port registering with the port, I, leading to the working cylinder. J indicates the position (not rightly shown in this section) of the ignition tube which may be used at starting, especially in an oil engine. K indicates the position of the vaporiser in an oil engine or ignition tube casing in a gas engine, and K^1 the port leading to the admission valve from the vaporiser, or in the case of a gas engine from the gas inlet pipe, or gas valve.

In Fig. 1, ignition of the working charge in the main cylinder, A, has just taken place through the port, I, and the piston, B, moves outward on the working stroke. The piston, D, also moves outward until the exhaust port, F, is opened by the piston bringing its port, G, opposite F. The working cylinder is then exhausted through the port, F; immediately on the closing of port, F, by the piston, D, the suction commences through the valve, E, the piston, B, drawing in a charge of oil vapour and air or air and gas by the port. I, to the working cylinder. The two pistons then move inward compressing the charge, and upon the closing of the port, I, the piston, D, compresses the charge remaining in the ignition cylinder to a high degree of compression, preferably sufficient to ignite it without the

assistance of any external heat. In either a gas or oil engine, but particularly in the latter, it may not be desirable to do this at starting; in either case it would require a higher compression when cold to ignite the charge than after a few ignitions had occurred to heat the surrounding metal. For starting the engine, therefore, an ignition tube, J, is provided, the position of which is indicated in Figs. 1, 2, and 3. After the cylinder is hot, the flame heating the ignition tube is turned out, and the charge is ignited by compression in the hollow tubular piston in Figs. 1 and 2, and in the ends of the cylinder, C, in Fig. 3, between the admission valve, E, and the piston, D. In Fig. 1, as the valve-shaft, P, makes one revolution for every two revolutions of the crank-shaft, Q, therefore the piston, D, makes one stroke for every two strokes of the piston, B. In Figs. 1 and 2 ignition takes place in the cylinder, C, and within the hollow tubular piston, D, just prior to highest compression therein; on the port, H, opening to the port, I, the flame passes through and ignites the working charge in the cylinder, A. The ignition piston continues to operate in Fig. 1, as before described.

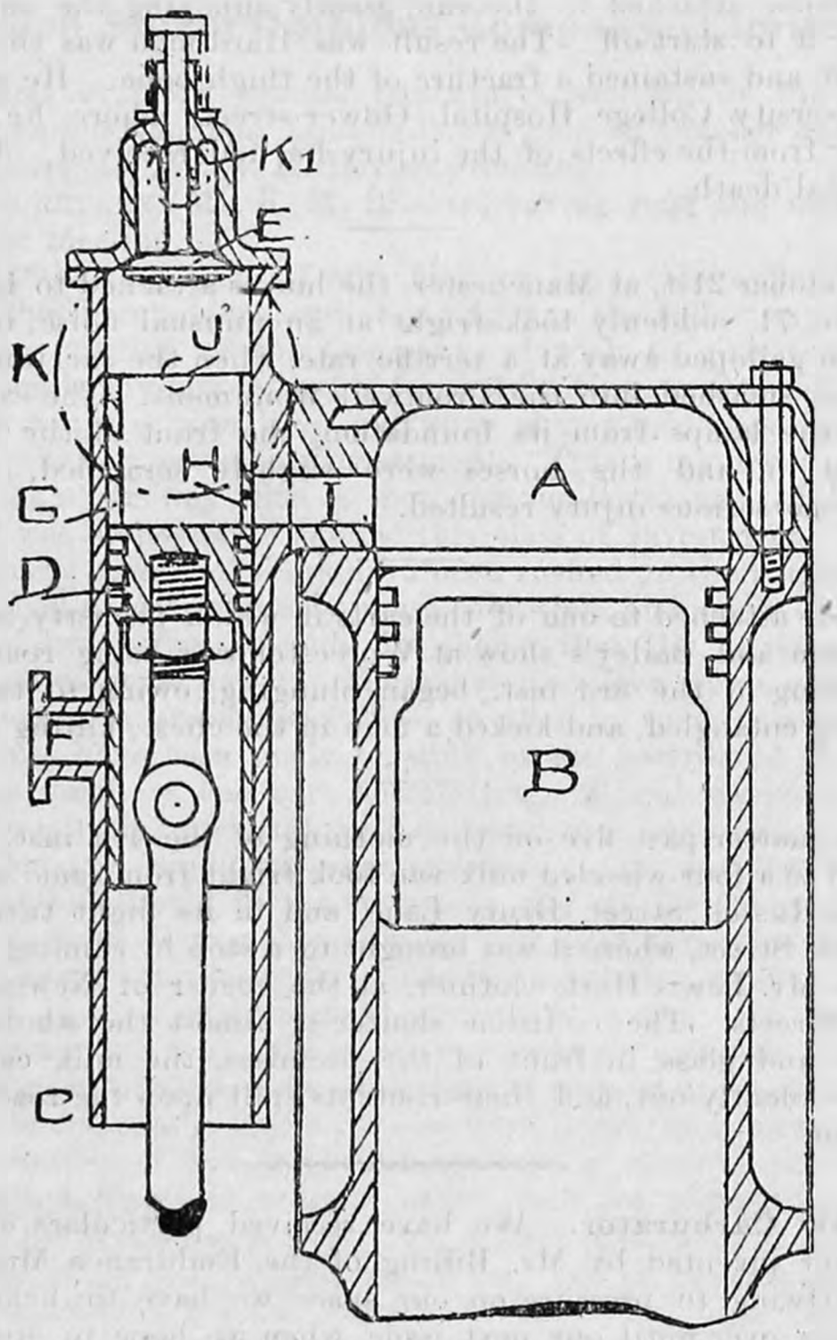


FIG. 1.

In Fig. 2 is shown the arrangement of piston for ignition only when not used as a valve for controlling the exhaust, and when applied to an engine having an impulse every revolution and firing at every outstroke, when the governor does not cut out. The exhaust port, shown in dotted lines, is in the working cylinder wall, at F.

In this case the piston, D, moves almost synchronously with the piston, B, and the piston rod of the one may be operated by the piston rod of the other in any suitable manner instead of being connected to the disc crank pin, as both pistons make the same number of strokes. On the opposite or crank side of the piston, B, in this engine in the usual well-known manner air is drawn into the crank chamber (not shown), compressed therein and delivered by a connecting pipe through the valve, E, to the cylinder, C, and through the port, I, to the working cylinder, A. In the case of an oil-engine the air may be first passed through a closed vaporiser in the position indicated at K (Fig. 2), surrounding the ignition tube, thence to the port indicated at K^1, leading to the valve, E.

On the return of the piston, D (Fig. 2), the charge remaining in the cylinder, C, is compressed to a high degree of compression sufficient to ignite it, and when the port, H, registers with the port, I, at the highest compression, the flame passes from the cylinder, C, to the cylinder, A.

In Figs. 1 and 3 the engine is arranged to work upon the ordinary

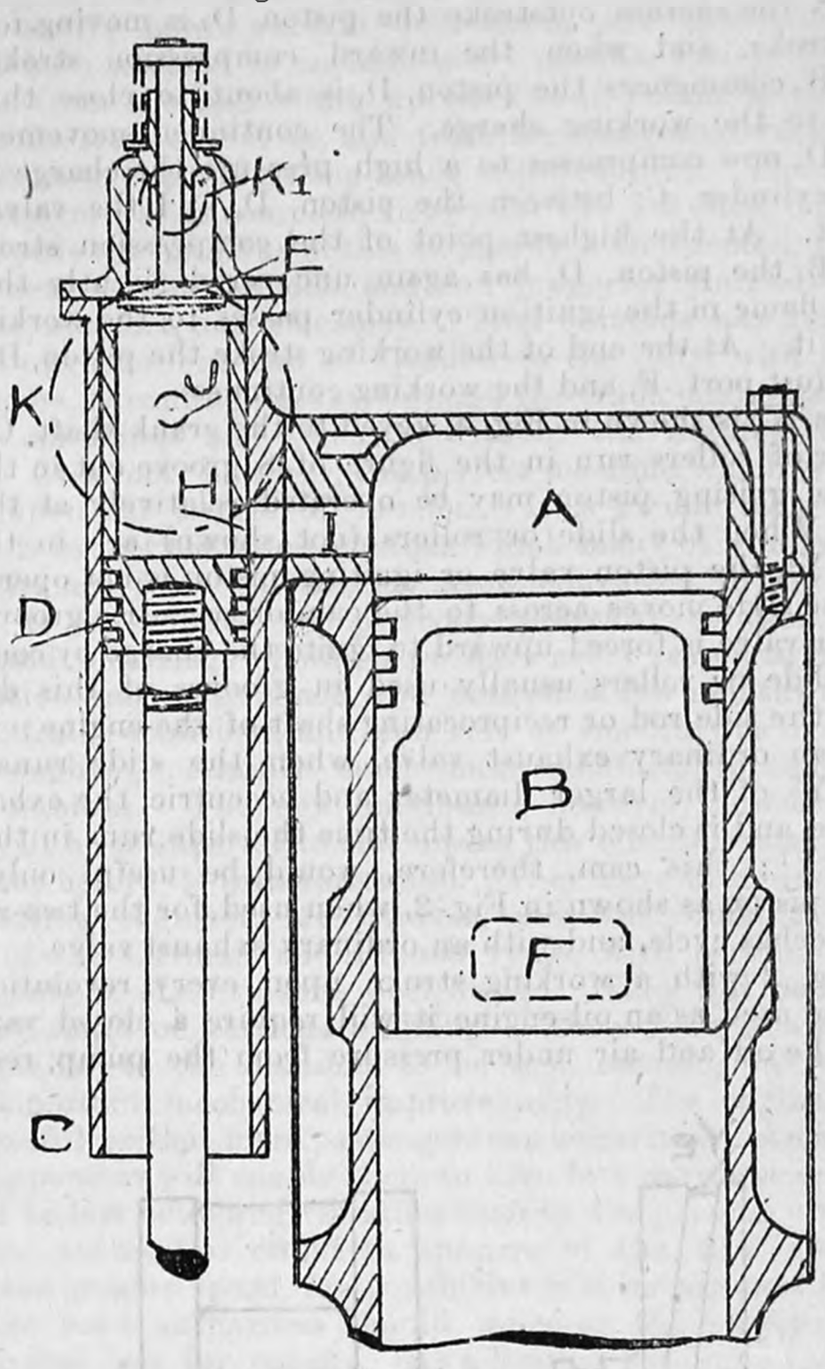


FIG. 2.

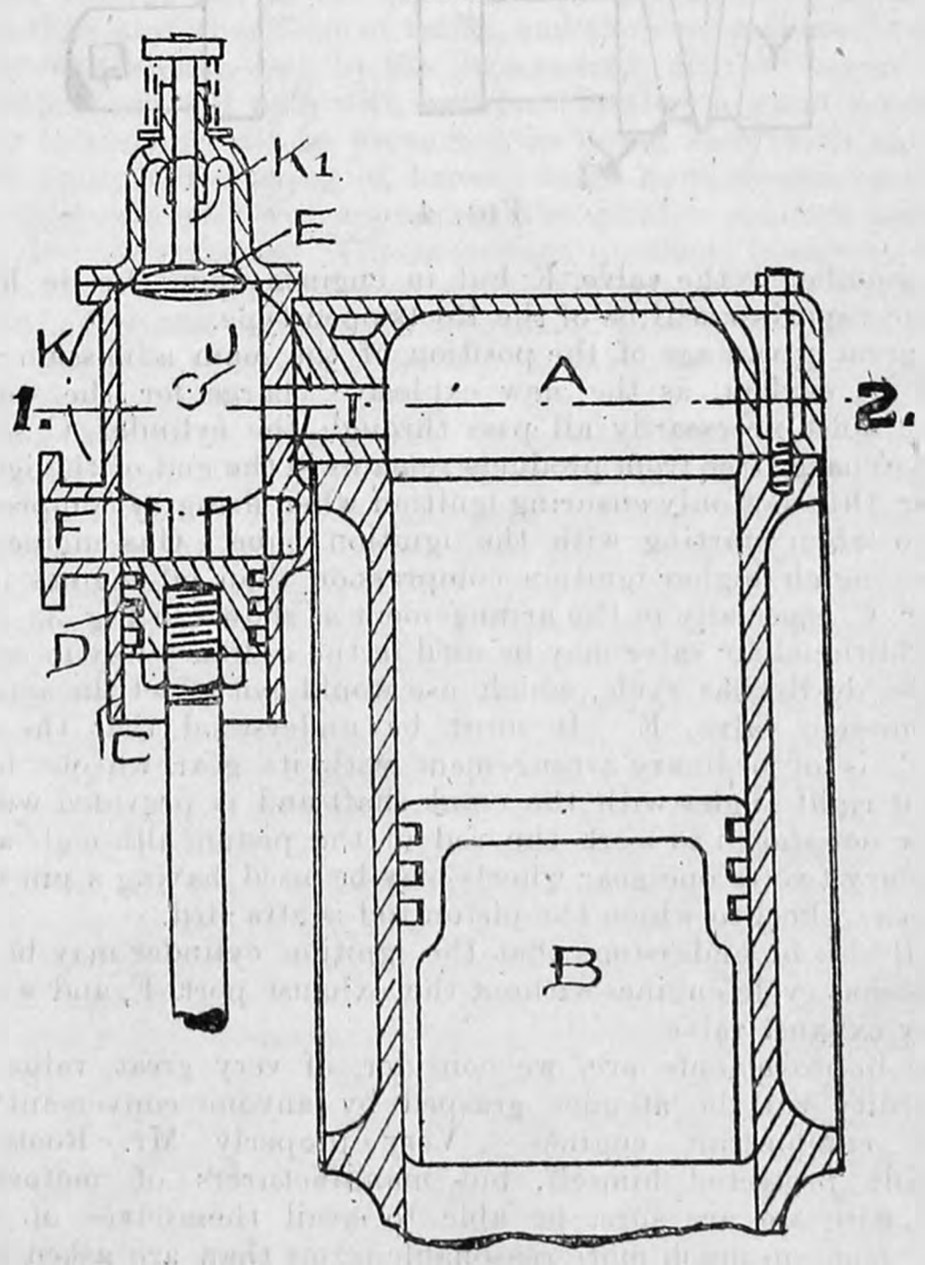


FIG. 3.

or de Rochas cycle. In Fig. 3 the working piston, B, is shown shortly after the commencement of the exhaust instroke with the

exhaust port, F, open, both pistons continue their inward stroke, so that when the working piston, B, has reached the end of the instroke the port, F, will be covered by the piston, D. While the piston, B, performs the suction outstroke the piston, D, is moving forward on the instroke, and when the inward compression stroke of the piston, B, commences the piston, D, is about to close the port, I, leading to the working charge. The continued movement of the piston, D, now compresses to a high pressure the charge remaining in the cylinder, C, between the piston, D, and the valve, E, and ignites it. At the highest point of the compression stroke of the piston, B, the piston, D, has again uncovered slightly the port, I, and the flame in the ignition cylinder passes to the working charge igniting it. At the end of the working stroke the piston, D, uncovers the exhaust port, F, and the working continues.

A cam, Y, is shown in Fig. 4, keyed to the crank-shaft, Q. A slide or a pair of rollers run in the figure of 8 groove cut in the cam, so that the igniting piston may be operated relatively at the desired times. When the slide or rollers (not shown) are in the centric groove, Y^1, the piston valve or igniting piston is not operated; but when the slide moves across to the cam or eccentric groove, Y^2, the piston or valve is forced upward to ignite the charge by compression.

The slide or rollers usually used in grooves of this description operate the side-rod or reciprocating shaft of the engine; in engines having an ordinary exhaust valve, when the slide runs into the groove, Y^2, of the larger diameter and eccentric, the exhaust valve is opened and is closed during the time the slide runs in the smaller groove, Y^1; this cam, therefore, would be useful only for the ignition piston as shown in Fig. 2, when used for the two-revolution or De Rochas cycle, and with an ordinary exhaust valve.

In Fig. 2 with a working stroke upon every revolution if the engine be used as an oil-engine it will require a closed vaporiser to convey the oil and air under pressure from the pump, reservoir, or

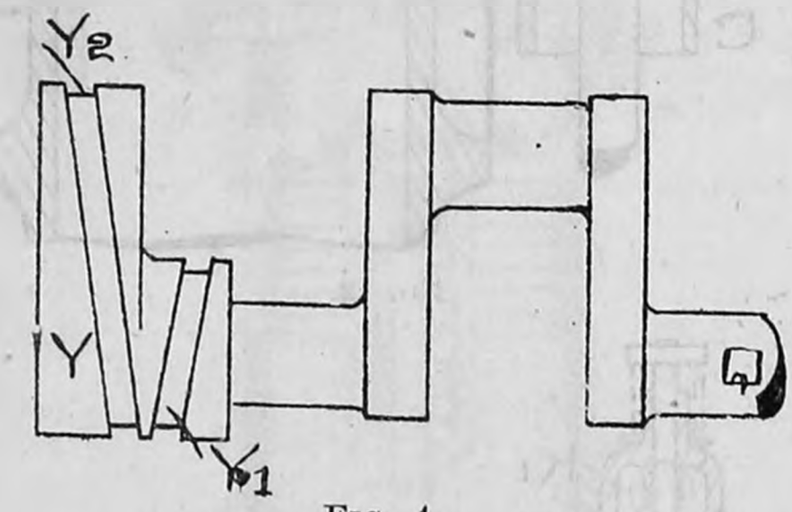


FIG. 4.

crank chamber to the valve, E, but in engines upon the de Rochas cycle the vaporiser will be of the Roots open type.

The great advantage of the position of the main admission valve, E, will be evident, as the new explosive charge for the working cylinder must necessarily all pass through the cylinder, C, so that explosive charge free from products remains in the end of the ignition cylinder, thus not only ensuring ignition when firing by compression, but also when starting with the ignition tube. Gas-engines will require a much higher ignition compression than oil-engines in the cylinder, C, especially in the arrangement as shown in Fig. 3.

An additional air valve may be used in the ordinary way in engines upon the de Rochas cycle, which use would not affect the action of the admission valve, E. It must be understood that the short shaft, P, is of ordinary arrangement with its gear wheels, but is placed at right angles with the crank-shaft and is provided with an eccentric not shown to work the rod of the piston, although a pair of ordinary two to one gear wheels may be used having a pin in the larger gear wheel to which the piston rod is attached.

It will also be understood that the ignition cylinder may be used in de Rochas cycle engines without the exhaust port, F, and with an ordinary exhaust valve.

These improvements are, we consider, of very great value, and their utility will be at once grasped by anyone conversant with internal combustion engines. Very properly Mr. Roots has thoroughly protected himself, but manufacturers of motors for vehicles will, we are sure, be able to avail themselves of these improvements on much more reasonable terms than are asked for in the case of other so-called "master patents."

ACCIDENTS AVOIDABLE BY USING MOTO-VEHICLES.

ON October 13th, an inquest was held at the Paddington Coroner's Court concerning the death of Sarah Packer, 59, widow, of 188, Cambridge Road, Kilburn, who died from injuries received through being run over by a coal van, the horses attached to which bolted from fright at the flashing of a searchlight advertisement in connection with a butcher's shop at 8, Malvern Road, Kilburn. Verdict—accidental death.

At St. Pancras on October 14th, Dr. G. D. Thomas held an inquest with reference to the death of George Hardiman, 42, costermonger, of 24, Chapel Grove, Somers Town. While on Thursday morning, the 22nd ult., the deceased was standing on the tail-board of a van at Covent Garden Market, unloading fruit baskets, a fly fastened on to the horse attached to the van, greatly annoying the animal, and causing it to start off. The result was Hardiman was thrown into the road, and sustained a fracture of the thigh bone. He was taken to University College Hospital, Gower-street, where he died on Monday from the effects of the injury he had received. Verdict—accidental death.

On October 21st, at Manchester, the horses attached to Longsight tram No. 71 suddenly took fright at an unusual noise, reared up and then galloped away at a terrific rate, when the car jumped the lines and smashed into the Cromwell Monument. The car tore up one of the lamps from its foundation, the front of the tram was smashed in, and the horses were slightly scratched, although happily no serious injury resulted.

A horse attached to one of the carts in which property belonging to Barnum and Bailey's show at Worcester was being removed on the evening of the 3rd inst., began plunging, owing to the traces becoming entangled, and kicked a man in the chest, killing him.

At a quarter-past five on the morning of the 4th inst., a horse attached to a four-wheeled milk van took fright from some unknown cause in Russell Street, Drury Lane, and in its flight turned into Newcastle Street, where it was brought to a stop by running into the shop of Mr. Lewis Hart, clothier, at the corner of Newcastle and Wych Streets. The collision shattered almost the whole of the shutters and glass in front of the premises, the milk cans being thrown violently out, and their contents spilt upon the roadway and pavement.

A New Carburator.—We have received particulars of a new carburator invented by Mr. Billing, of the Endurance Motor Company. Owing to pressure on our space we have to hold further particulars over until our next issue, when we hope to give details and drawing.

New Portable Testing Battery.—Messrs. Niblett and Sutherland, of 61, Chandos Street, W.C., have brought out a new portable testing battery. It is claimed that this storage battery can readily be charged from any continuous current electric light circuit, and will retain its charge for a long period. The discharging E.M.F., which may be either the full voltage of the battery or half that amount, as desired, is steadily maintained. The internal resistance of the battery being low, high rates of discharge may be taken from it.

Glew's New Moto-car Tyre.—We understand Mr. Glew has invented a new tyre suitable for moto-vehicles, in which by the introduction of a key he claims to entirely do away with the necessity of welding, the danger of breakages thereby being also avoided. By this system the two points of the outer tyre are held together by the key, which also localises the tyre and prevents the possibility of any creeping. It also does away with the difficulty in reference to brake power, as with his new tyre Mr. Glew guarantees that any power that may be necessary can be applied, even in the case of omnibuses and the heaviest description of vans or motors.

DOINGS OF PUBLIC COMPANIES.

Caledonian Motor Car and Cycle Company (Limited).

THE directors' report, which was presented at the third ordinary meeting held in Aberdeen on October 21st, states that the net profits from all sources, with balance from last year, from October 1st, 1897, till September 30th, 1898, amount to £461 17*s.* 9½*d.*; depreciation on plant, machinery, and fittings being 10 per cent. off the prime cost of plant at date written off, £69 9*s.* 0½*d.*, leaving a balance for division of £392 8*s.* 9*d.* This sum the directors propose to deal with as follows:—To pay a dividend of 10 per cent. (free of income tax) on the paid-up capital of the Company, £241 9*s.*; to pay directors' and auditors' fees, £38 8*s.*; carry forward to next year the sum of £112 11*s.* 9*d.*

London Steam Omnibus Company (Limited).

THE first ordinary general (statutory) meeting of the London Steam Omnibus Company (Limited) was held on October 31st, at the Hôtel Métropole, Mr. E. H. Bayley presiding.

The SECRETARY (Mr. R. M. Blaikie) having read the notice convening the meeting,

The CHAIRMAN said: I am glad to have this opportunity of meeting the shareholders, and of giving you the fullest explanations as to the position of the Company. I wish to give you all the information in my power, and if favoured with your attention I hope to satisfy you that you have put your money into a perfectly safe and exceptionally promising investment. This is my first connection in any shape or way with a moto-car undertaking. Like many others, I was prepossessed against this class of investment. I think that in many cases moto-cars have been rushed on the market before the principal defects—namely, noise, vibration, and smell—have been overcome, and before it could be shown that the working was as economical as horse power. There has also been gross mismanagement, creating a strong prejudice, so that in some cases moto-car investments have been made to stink in the nostrils of the public almost as much as the cars themselves. When, therefore, I was invited to join this undertaking I determined in my mind only to do so provided two conditions were satisfied. One was that the proposed omnibus should be mechanically efficient for its purpose and cheaper to work than a horse-drawn bus, and the other condition was that everything connected with the formation of the Company should be open, straightforward, and above board. On this latter point so much has been said in the papers lately as to the position of directors generally that I think it right at once to state, although it may not be necessary, that I for one have never, in connection with the directorship of this or any other company, received the slightest consideration, direct or indirect, other than the remuneration published in the articles of association. I have paid cash for my shares, like every other shareholder, and I may say in passing that, with further experience, I think so well of this present undertaking that I intend to considerably increase my holding. Every clause and sentence in the prospectus was carefully considered and verified by the directors, and our solicitor Mr. Crisp, whose name is a sufficient guarantee for legal correctness, stated to the board that he had never bestowed more care or pains upon any prospectus than he had in verifying every statement in our prospectus. I think, therefore, I may say, without fear of contradiction, that there has been no concealment or inaccuracy in the prospectus, and that everything has been above board. Now, with regard to the important point of the omnibus itself—the goose that is to lay the golden eggs—I can speak with the utmost confidence. It happens that in the moto-car industry France and Germany are some years in advance of this country. They have succeeded in bringing some of their machines into fairly practical shape, so before agreeing to join this concern I took the trouble to go to the Continent to inspect for my own satisfaction the most successful types of steam and petroleum motors. Although I saw no omnibus at all suitable for London, I was completely convinced that by utilising the best features of certain French and German vehicles, a moto-omnibus could be designed that would be perfectly adapted to the London traffic. There are two types of moto-vehicles which competitive trials have shown over and over again to be far superior to every other—one is the German Daimler petroleum machine, and the other is the French De Dion steam car engine, and these are the two types which your Company has acquired from the British Motor Company the sole right to use for omnibuses in this country. The latest public competition took place last week near Paris, and 17 vehicles competed, representing all the three kinds of motive power—steam, petroleum, and electricity. The route had been selected to include every possible variety of surface and traffic, from the stiff climb up the Coeur Volant to the dilapidated granite setts of Sevres, and from the congested traffic at the gates of Paris to the undulating roads of the country. The result of the competition was a complete victory for the De Dion omnibus—in other words the omnibus of this Company. Gentlemen, you have seen the new omnibus outside, and can judge for yourselves of its appearance, comfort, and efficiency. That omnibus has during the past week run from one end of London to the other with a load of 30 passengers, threading its way through the traffic and outstripping all other omnibuses and tramcars without the slightest hitch or difficulty. It is not, however, the perfect machine which we intend to place upon the streets of London. It is in one sense a makeshift. It is in fact the same omnibus which many of you rode in a few months ago from the Marble Arch, converted to the London pattern. It is, however, a perfectly practical solution of the problem, and a carriage of which we have every reason to be proud. The vibration and noise which you noticed a few months ago have been practically abolished, and you ride as smoothly as in a gentleman's brougham, certainly much more comfortably than in an ordinary omnibus. The new omnibuses, however, now being constructed will be as superior to this one as this omnibus is superior to what it was before its transformation. They have been designed by our consulting engineer, Mr. Straker, and will combine the best features of the German and French types, with certain valuable improvements of Mr. Straker's own design. They will be an international triumph of carriage building. Their general appearance will be similar to the omnibus to be seen outside, but they will possess important mechanical improvements. The engine will be more powerful, so that more passengers can be carried. An improved steering apparatus will enable them to turn in a narrower space, and there will be less noise and vibration than in the present omnibuses. The police authorities ought to approve of the new system, as, owing to the greater speed, fewer vehicles will be required to do the work. The road authorities should welcome the change, as the roads will cost less for repairs. As a leading borough engineer has recently pointed out in his report, omnibuses do more harm to the streets than any other form of traffic, and the wear and tear is caused, not by the wheels, but by the hammering of the horses' hoofs. Philanthropists will note with satisfaction that a great amount of cruelty to animals will be prevented by doing away with the incessant stopping and starting of heavily-laden horse-drawn omnibuses. The public generally will appreciate the greater comfort and speed of the new conveyances. The important question, however, for the consideration of this meeting of shareholders is, will the system pay? Can this admirable omnibus be worked at a lower cost than a horse-drawn bus so as to ensure a profit? I shall be happy to give you the figures so that you can judge for yourselves. The board of this Company has no directors with ornamental titles, but it includes three individuals—Mr. Hall, Mr. Mace, and myself—who have had experience second to none in managing omnibus companies and who can claim to be authorities. We have gone most carefully into the details, and have estimated the weekly cost of working horse-omnibuses at £15 8*s.* 4*d.* each. I should not be afraid to make a sporting offer of £1,000 to anyone who will discover a mistake in our estimate. Mr. Straker has gone equally carefully into the cost of working moto-omnibuses, and estimates the weekly cost at £9 7*s.* 8*d.* each. If, therefore, an ordinary omnibus carrying 26 passengers, and costing £15 8*s.* 4*d.* per week, can earn a dividend of 10 per cent., it should be an easy calculation to ascertain what the dividend should be on a moto-omnibus carrying 30 passengers and costing only £9 7*s.* 8*d.* per week, provided the management in both cases is equally good. I admit that the price payable to the British Motor Company for the patent rights is very large, but it is these patent rights that enable us to work at the lower cost and thus make the larger profit, and which give us a monopoly in this omnibus. Viewed in this light, the price, large as it is, will not appear so excessive. Judging from the numerous inquiries coming in from provincial towns, there will clearly be a great demand for our omnibus, and when we have satisfied our own requirements a profitable business will be done in supplying the provinces. Before ordering any considerable number of omnibuses we intend to wait for the completion and testing of the two petroleum and two steam omnibuses now being built in accordance with Mr. Straker's designs, and in the light of the experience then gained we shall

decide on the final type and place possibly 50 on the streets as a commencement. In the meantime your capital is substantially intact, less the amount that has had to be paid for the patent rights. We think that this cautious policy is sounder than to have expended the whole capital at once on omnibuses and possibly discover afterwards some mistake that might have easily been avoided. The chairman concluded by inviting questions or remarks from shareholders.

Mr. DOUGHTY asked whether any difficulty was anticipated in obtaining licenses from the authorities to run the Company's omnibuses on the streets. He had had some connection with steam cars running in North London, and there was some difficulty experienced in the matter there.

A SHAREHOLDER said the chairman had mentioned the fact that Mr. Crisp, the solicitor, held an interest in the Company. He wished to know what was the amount of that gentleman's holding.

Mr. BUSK desired to be informed where the Company's capital of £140,000 had been invested, and what interest it produced.

Mr. LANE asked whether proceedings were being taken against the Company by dissatisfied shareholders, or people who had applied for shares, and further, what number of shares was applied for.

A SHAREHOLDER inquired when the share certificates would be issued.

The SECRETARY: In about a fortnight's time.

In reply to these and other questions, the CHAIRMAN stated that Mr. Nesbit was secretary at the outset, whereas Mr. Blaikie now held that office. As to whether the police would grant the necessary licenses, the Company were very careful in designing the new omnibus, to comply in every detail with the police requirements and the Act of Parliament. The omnibus to which he had referred in his speech, and which, as he had said, was the German omnibus which ran some months ago from the Marble Arch, did not comply with those requirements in every detail, so that they could not put that one on the streets. For one thing, it was a little too wide. The police would have no ground whatever for refusing to license the new omnibuses, which would be greatly to the comfort and convenience of the public. With reference to the solicitor, he had never said that Mr. Crisp was a shareholder, and he had yet to learn that a Company could compel its solicitor always to take shares in it. Whether Mr. Crisp held any shares in this Company or not, he did not know. No doubt, like everyone else, he would be very glad to get some later on if he had none now. Regarding the investment of the Company's capital, nothing like the sum named—£140,000—had been called up. That amount, or more than that, had been allotted, but only the application and allotment money had yet been called up, and that was a comparatively small amount. The money had been placed on deposit at the London and Westminster Bank; he could not tell exactly the rate of interest that it was bearing. He could give no promise as to when the Company would commence running omnibuses. They had as yet only ordered two steam and two petroleum omnibuses; as soon, however, as they had been tested, they would order the full number and place them on the street. The different parts of the vehicle came from different places—some from France, some from Germany, and some from various towns in this country, and it was impossible to state when every part would arrive. He could not state exactly what their omnibuses would cost. Of course, when they were able to give an order for a large number they would be able to cut down the price to the lowest possible point. In making an experimental omnibus they could not do this. Approximately, the price might be £800, but if they compared with this the price of an ordinary omnibus—some £150—they must add to that figure the cost of the 12 horses which would be required to work it, the necessary harness, &c. He did not know of any proceedings against the Company.

A SHAREHOLDER asked whether the Company would run electric omnibuses as well as oil and steam ones.

The CHAIRMAN: We have had nothing to do with electricity, so far.

A SHAREHOLDER: Were all the shares you proposed to issue applied for?

The CHAIRMAN: Not the whole amount. 14,800 shares of £10 each were allotted.

Colonel HARRIS, in moving a vote of thanks to the chairman and directors, expressed his satisfaction with the statement which had been made by the chairman.

The motion was seconded by Mr. COLLINS, and unanimously agreed to.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles.]

Anglesey Motor Bus Company (Limited).—Registered by A. H. Atkins, Bouverie Street, E.C.; capital £1,400, in £10 shares. Object, to carry on in all or any of their respective branches the businesses of engineers—electrical, mechanical, civil, and marine; as ironfounders, ironmongers, &c.

Arsenal Motor Company (Limited).—Registered by J. T. Bennett, Priory Park, St. Albans; capital £100, in £1 shares. Object, to carry on the business of moto-cycle and moto-carriage manufacturers and builders. Registered office: Priory Park Villa, Priory Park, London Road, St. Albans.

Eclipse Tyre and Rim Company (Limited).—Registered by Waterlow Brothers and Layton, Birchin Lane, E.C.; capital £16,000, in £1 shares. Object, to acquire certain patents from Timothy Shepherd, and to carry on the business of tyre, rim, valve, and cycle accessory manufacturers, cycle and component manufacturers, motor manufacturers, metal tube manufacturers, engineers, wire drawers, &c.

Forward Engineering Company (Limited).—Registered by Waterlow Brothers and Layton, Birchin Lane, E.C.; capital £50,000, in £5 shares. Object, to adopt an agreement between the Birmingham Trust (Limited) of the one part, and this Company of the other part, for the acquisition of the business of gas-engine builders as now carried on by T. B. Barker and Co., and generally to carry on in all or any of their respective branches the businesses of founders, rollers, builders, and letters to hire of engines, carriages, wagons, and vehicles of every description; to carry on in Great Britain or elsewhere the businesses of factors of and dealers in gas, steam, oil, and electric engines and motors of every description; as mechanical, hydraulic, electric, and general engineers, &c. The first directors are L. W. Hodson, F. B. Barker, and J. D. Garrett.

Hewetson's (Limited).—Registered by Stanley and Co., 45, Ludgate Hill, E.C; capital £25,000, in £1 shares. Object, to adopt an agreement with Henry Hewetson and Walter Arnold, and to construct, purchase, equip, maintain, work, sell, and deal with bicycles, moto-cycles, carriages, vans, wagons, and vehicles of all kinds. Henry Hewetson is the managing director. Registered office: 77, Oxford Street, W.

Motor Patent Fuel Company (Limited),—Registered by P. E. Vanderpump and Co., 5, Philpot Lane, E.C.; capital £20,000, in £10 shares. Object, to enter into an agreement with F. Bonalli and Co., and to carry on business as manufacturers of and dealers in patent fuels.

National Carriage Wheel (Parent Syndicate) (Limited).—Registered by Waterlow and Sons (Limited), London Wall, E.C.; capital £30,000, in £1 shares. Object, to enter into an agreement with S. Richardson, R. Price, and A. Smallwood; to acquire certain undescribed patents, and to carry on the general business of wheelwrights, coachbuilders, &c.

Robertson Brothers and Co. (Limited).—Registered by Waterlow Brothers and Layton, Birchin Lane, E.C.; capital £1,000, in £1 shares. Object, to carry on business as cycle manufacturers and dealers, rubber manufacturers, moto-car and perambulator builders and dealers, &c, and the component parts of and accessories thereto.

Smith, Simpson, and Co. (Limited).—Capital £2,000, in £1 shares; to carry on the business of smelters, iron and steel manufacturers, manufacturers of machinery, moto-cars, &c. The first directors are Joseph F. Simpson (managing director) and Harold Smith. Registered office: 49, Deansgate, Manchester.

Smith, Parfrey, and Co. (Limited).—Registered by Gadsden and Co., 28, Bedford Row, W.C.; capital £250,000, in £5 shares. Objects, to adopt an agreement between T. V. Smith and this Company for the acquisition as a going concern of the business of wheelwrights, &c., carried on under the style of Smith, Parfrey, and Co., at 141, Buckingham Palace Road, S.W., and at St. Peter's Place, Birmingham, with all or any of the assets, liabilities, &c.; to develop and turn to account the same; and to carry on the general

business of wheelwrights, locomotive, cart, and wagon builders, &c. The first directors are :—T. V. Smith, R. W. M. Walker, R. Bearcroft, and G. F. White. Registered office: 141, Buckingham Palace Road, S.W.

South African Express Syndicate (Limited).—Registered by H. W. Christmas, 42A, Bloomsbury Square, W.C.; capital £5,000, in £100 shares. Object, to adopt an agreement with E. Liebmann, and to carry on the business of moto-car, omnibus, and wagon proprietors, and carriers of passengers and goods.

NOTES OF THE MONTH.

THE Dunlop Company have announced their intention of adopting moto-cycles for pacing.

THE Glasgow Corporation is considering the advisability of purchasing a motor dust cart.

IN France during last year 73 miles of new electric tramway roads was laid. Of the different systems now in vogue, 180 lines are on the overhead trolley system, eight have underground conduits, and 13 are worked on the accumulator system.

OUR suggestion recently made that funeral hearses would be more fittingly propelled by being mounted on a moto-vehicle is, we are glad to say, likely to be carried out by more than one firm. One newspaper, referring to it, says, "Educated and sensitive people are not expected to patronise the new departure." Why not, pray? Is there anything particularly delicate or refined about a pair of black stallions!

IT is said that a Coventry moto-vehicle company will run several of their vehicles at Eastbourne next season in competition with the char-à-bancs. The management of one of the leading hotels intend to replace their pair-horse bus by a moto-vehicle. It seems quite evident that these horseless carriages have come to stay. Their advent will not be welcome to the cab-drivers, who have been complaining that they have been having a dull time of late. At present the horses in Eastbourne and the neighbourhood have not become used to the cars, but happily no accidents have been recorded so far.

A NEW service of moto-vehicles has recently commenced to run in opposition to the tramway company buses between Granton and Leith. There are two on the road, starting every 10 minutes from each end. The fare is only twopence for three miles, and the passengers speak highly of the ease and comfort of travelling. The new line appears to be well patronised. It may be mentioned that about half a mile to the west of Granton a large moto-vehicle factory is in course of erection, and already about 60 hands are busily employed in getting machinery in order and everything ready for a start at no distant date.

A RECENT issue of the *Irish Homestead* contains an article by Mr. Arthur S. Lough, of Killeshandra, in which two proposals are made for the use of moto-vehicles as an adjunct to the co-operative creamery system. The first proposal is to substitute a "Travelling Auxiliary," *i.e.*, a moto-vehicle, equipped with separating plant, for the system of fixed auxiliary separating stations in the neighbourhood of the central creamery. By so doing it is calculated that a great economy can be effected in the initial and working expenses. Still more feasible is Mr. Lough's second proposal. Mr. Lough estimates that by this means butter can be carried from Killeshandra to Dundalk for 8*s.* 6*d.* per ton, as against 16*s.* 8*d.*, the minimum railway charge. The importance of this suggestion for combating the railway monopoly is not confined to the dairying industry, but affects every industry in the country.

A GOOD deal is being made in certain quarters of some "experiments in vaporisation" made or being made in Australia by a Mr. Sutton. We are unable to obtain any exact information as to the nature of these experiments, but we may say that a good deal of petroleum is vaporised in England, and there are even some people, like Professor B. Redwood, who know a little about the subject. In the meantime, a contemporary gives the comforting intelligence that Mr. Sutton "has got, at any rate, to the experimental stage, and uses crude petroleum of over 900 density, which, so far as present results go, is found to leave no residuum in the cylinders, and exhausts silently and without smell. Furthermore, our correspondent claims that he uses less than half the quantity an ordinary spirit-engine employs, and the 6 H.P. motor with which he is now at work will, he hopes, be perfected for public description and inspection in a few weeks' time."

WE are particularly interested in the success of motors using heavy oil, and if Mr. Sutton has achieved these results he will have succeeded in solving a problem that has been the study of engineers and chemists for a good many years. We should, however, be less disposed to question the success of Mr. Sutton in this direction did we have the facts before us.

THERE are evidently still some of our Continental friends who, not unnaturally in the light of certain recent events, look upon England as a happy hunting ground for obtaining the wherewithal to exploit new departures. The following communication recently received from Berlin by a well-known City gentleman is unique in more respects than one :—

"I take the liberty to inquire you if you are in the position to communicate me financiels on your place which will engage with Capital to an electric Omnibus Company in London for London *without rails*, without gas, without benzin, petroleum, or other; *only* by electric accumulatores inside and with what an sum every will engage by the Company and what are your conditions for it. Please to reply.

"Yours Truly

"———

"Self understanding if the interested persons have the conviction that the matter is good and solid."

SCHWEINFURT, in Bavaria, is, says *The Engineer*, the seat of the largest firm in Europe for making steel balls for bicycle bearings. The two factories they own there produce annually 2,000,000 gross, with 600 men working 10 hours a day. Since 1896 a fierce competition has sprung up in this trade owing to the large profits made by the firm in question, as will be seen from the following figures :—The factories for making steel balls in Germany increased from five in 1896 to 25 in 1897, and the production rose from 1,500,000 to 4,500,000 gross. The factories in France increased in the same time from four to 14, and the production from 300,000 to 500,000 gross. Those in England increased from four to seven factories, and the production from 250,000 to 500,000 gross. The weekly hours of labour are 60, 66, and 52 in Germany, France, and England respectively. Lately, too, the United States has exported steel balls to Germany, as well as to England, which has seriously affected Germany's export in these commodities to England, and owing to the over-production prices have fallen by 65 per cent., while materials and labour, &c., have risen by 38 to 42 per cent. since 1896. At present 95 per cent. of the steel balls are used for bicycles, so the future of the trade depends greatly on their utilisation for other mechanical purposes and machinery. The "Automatic" Steel Ball Company at Schweinfurt exported £7,000 worth of steel balls to England in 1897.

The Society of Model Engineers.—Under the foregoing title a new Society has been formed, having for its objects the discussion of matters relating to the construction and working of model engines, dynamos, motors, steam and electric launches, tools, and small mechanical and electrical apparatus generally. The first meeting took place on November 2nd, at the Memorial Hall, Farringdon Street, E.C., Mr. Percival Marshall, A.I. Mech. E., presiding over a gathering of about 50 members and friends. A number of interesting models were exhibited on this occasion, including some small locomotives, a model gas engine, a small high-speed vertical engine, and a variety of model dynamos and motors, several of the latter being shown at work. The annual subscription to the Society is 10*s.* 6*d.*, and the Secretary, Mr. H. Sanderson, The Mount, Ealing, W., to whom applications for membership should be addressed.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month, and be addressed to THE EDITOR OF "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL," 62, *St. Martin's Lane, London, W.C. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.*

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

NOVEMBER 15TH, 1898.

DIARY OF FORTHCOMING EVENTS.

Notices to be included under this heading should reach the Office not later than the 12th of each month.

1898.	
Nov. 18 to 26..	Stanley Show of Cycles, Moto-Carriages, &c. Royal Agricultural Hall, Islington.
1899.	
April	Trial of Accumulators in Paris applicable to Mechanical Traction, organised by the Automobile Club of France.
May	Mid-European Motor Car Club, International Exhibition, Berlin.
June 1.. ..	Competition of Cabs (Paris) Suitable for Suburban Service. Organised by the Automobile Club of France.
October ..	Les Poids Lourds, Paris. Organised by the Automobile Club of France.
1899	Race from Paris to St. Petersburg (or Vienna), under the auspices of the Automobile Club of France.
"	Moto-Car Exhibition at Tunbridge Wells.
"	Heavy Moto-Vehicle Competition at Liverpool.
1900	Paris International Exhibition — Great Display of Automotor Vehicles and Allied Trades.
1901	Glasgow International Exhibition, including Automobile Section.

ANSWERS TO CORRESPONDENTS.

J. M. (Twickenham).—The Gas Engine and Power Company, of New York, make a speciality of naphtha launches. Their agents on this side are Messrs. Yarrow and Co., of Poplar, E.

HENRI MAURICE (Paris).—Thanks for your letter and for your sentiments, which we reciprocate. We have notified your wishes to some manufacturing firm, who will doubtless communicate with you.

D. T. (Edinburgh).—(*a*) All the back numbers ordered have been posted to you, together with cover. (*b*) The De Dion and Bouton patents are protected for Great Britain, and we believe are vested primarily in the British Motor Company, 40, Holborn Viaduct. (*c*) Judgment has not yet been given. It will duly appear when pronounced.

W. W. (Brighton).—(*a*) The address is Hydro-Kinetic Engineering Syndicate, 6, Corporation Street, Birmingham, and 239, Dashwood House, London, E.C. (*b*) Try the London Motor Van and Wagon Company (Limited), of 86, Chiswell Street, E.C.

C. T. C. (Leamington).—Thanks for your letter to hand. A description of Tangye's automatic variable gear will be found in the July (1898) number, p. 420.

H. O. C. (Chelmsford).—The address of the *Mechanical Engineer* Pocket Calculator is 31, Whitworth Street, Manchester.

W. L. S. (Charlbury).—Thanks for your letter and enclosure. The addresses of the Hydro-Kinetic Engineering Syndicate and of the Pocket Calculator are both given above.

F. R. E. B. (Taunton).—The address you require you will find above. We have forwarded your cheque, and 1899 POCKET-BOOK shall be sent you immediately upon publication.

T. W. (Broad Street, Birmingham).—(*a*) The address is Mitteleuropaischer Motorwagen Verein, Universitatsstrasse No. 1, Berlin, N.W. (*b*) Write Messrs. Roots and Venables, 100, Westminster Bridge Road, S.E. (*c*) Regret impossible to supply Nos. 1 or 12, Vol. I, except in bound volume form, one guinea net.

M. I. MECH. E. (Oxford Street). Your communication is couched in such unnecessarily strong language as to preclude our publishing it. You are, however, in error in your first statement; no such advertisement as that to which you refer has appeared in our pages. We have no knowledge of the promotion of any such scheme as that to which you refer. All companies that may be formed dealing with automobilism—no matter by whom projected—will be dealt with in that spirit of impartial criticism which has always characterised this journal. As regards "gatherings," we are strongly of opinion that all functions having for their object the assemblage of moto-vehicles are, if under proper auspices, to be encouraged, as tending to popularise the industry and remove those prejudices which still obtain among a large section of the public.

LES POIDS LOURDS.

No one can peruse the account of these trials with an unbiassed mind without arriving at the conclusion that the time is not far off when horse traffic will be practically eliminated, not only from the streets of our cities, but also from the country roads. When the history of automobilism on common roads comes to be written, it will be found that no public body has contributed to this very desirable consummation more than the French Automobile Club and the many talented French engineers associated with it, either as manufacturers or as designers. Indeed, in this connection and regarding automobilism as a part of and indicative of civilisation, it must be confessed that France is much ahead of us, as indeed she is in so many matters of art and applied science. With all our much-boasted and overrated mechanical national genius (Does it really exist?), at the Liverpool trials we could produce but four representative vehicles, whereas at the late French trials no less than 19 were actually on the ground, and most of these went through what

cannot but be admitted as a most severe ordeal successfully. Compared with the trials that other assemblages of mechanical parts are expected to undergo—such as torpedo boats—the tests imposed at Liverpool and at Versailles are searching enough, but not, we think, unduly so. They, if successfully undergone, ensure a large factor of safety, and this is a great considèration. As we have before pointed out, the conditions under which moto-vehicles are required on the Continent are not the same as those obtaining with us. In France there is not such an extensive railway system as we have, and hence automobilism on common roads affords an excellent and cheap means of effecting communication between country towns and villages. This has had the effect of inducing constructors to pay more attention to the moto-omnibus. With us, on the other hand, we can reach most points by rail or tramcar, and no one except he be a very enthusiastic automobilist will wish to see the reign of the road omnibus, even if propelled by mechanical means, unduly prolonged. We rather look to automobilism as a means of escaping from or lessening railway rates; but here comes in the anomaly, which we strive with all our might to encumber our most heroic efforts: we want to carry heavy goods, and so we only authorise the use of a light vehicle. Our more enlightened and more logical neighbours across the Channel have also their anomalies in automobilism, but these are mainly bureaucratic in character, and while the law is kind and encouraging to constructors it is terribly severe upon those who venture to conduct an automobile without the necessary authorisation of fitness which includes, *inter alia*, a certificate of birth. We may smile at this, but the French may well laugh at us with our 3-ton limit.

Les Poids Lourds but emphasised the lessons already taught by last year's trials at Versailles and those obtained this year at Liverpool and Birmingham. A good margin of power is essential in all heavy vehicles. In the De Dion omnibuses 30 H.P. is now provided as against 25 H.P. in last year's models, while in the De Dion articulated motor goods tug no less than 52 H.P. was available. This may appear very large, but, as a matter of fact, it is exactly that required to propel a vehicle weighing 15 tons at a speed of four miles per hour up a 10 per cent. grade having a road resistance of 100 lbs. per ton, allowing 25 per cent. for losses in power transmission. We see that in this case the engine would have to indicate 65 H.P. To propel a total load of 5 tons at the same speed and under the same conditions of road and grade will require 21½ I.H.P.—a fact that shows at once how hopeless it is to attempt to propel vehicles carrying anything over a ton or a ton and a half either by petroleum spirit, petroleum oil, or electrical motors. As regards this last we are assuming that the energy is derived from batteries of secondary cells. It is interesting to note that in the various steam vehicles three kinds of fuel were used; MM. De Dion et Bouton employ coke, the Leyland vehicle used kerosine, and the Serpollet vehicle crude petroleum, or, as we rather think it is, that petroleum product known as "distillate"—that is, the petroleum after the more volatile products have been removed, but which still contains many less volatile compounds. No doubt MM. De Dion et Bouton adhere to coke for good reasons, and in this respect they do so in good company, as both M. Scotte and Messrs. Thornycroft use solid fuel. Coke did not appear as an ideal fuel at Liverpool or Versailles, but at both places the success of liquid fuel was most pronounced. Whether the system of using crude oil according to M. Serpollet is superior to that adopted by Mr. Spurrier we are unable to say, but the point is of little interest to our readers, seeing that neither "crude" nor "distillate" can be obtained in Great Britain, but kerosine can be purchased in every village.

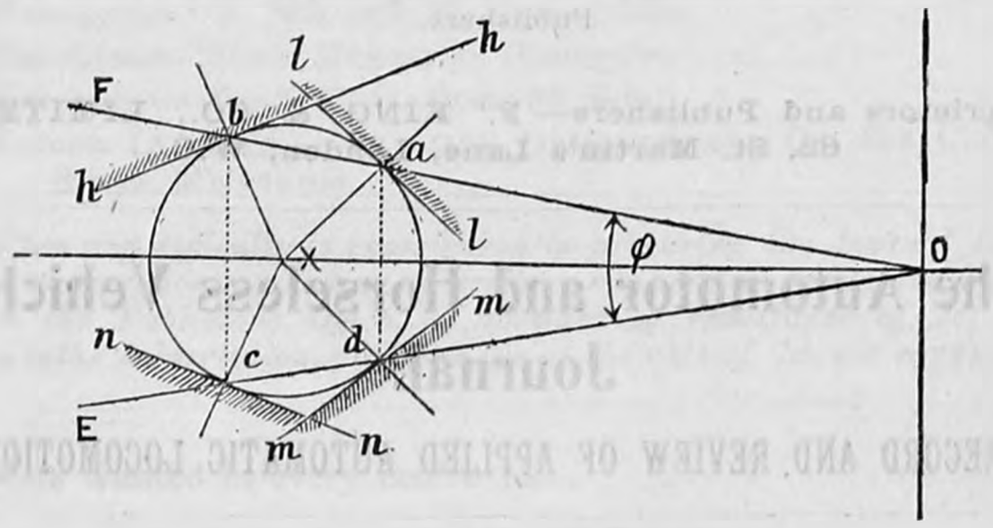
Bearing in mind our previous remarks about horse-power it will be seen that motors which cannot develop more than 15 H.P. are really useless in connection with the transport of loads exceeding a couple of tons on country roads. The petroleum spirit vehicles at Les Poids Lourds were more powerful than those of last year, but their power was strictly limited. The most successful were the De Dietrich lorries; these had motors of 9½ H.P., and the weight moved was 1 ton. Such vehicles could be, however, most profitably employed in such well-paved and level cities as London for loads up to 2 tons. Before dismissing the subject of these excellent examples of petro-moto-vehicles, we must offer our congratulations to M. F. Dubois and those associated with him for his enterprise and self-reliance in boldly selecting automobiles for his journeys in West Africa. He has conferred a distinction on the industry in so doing, and we must ever regard him as the apostle of automobilism in Africa.

The performances of the electrically-propelled vehicles do not, we think, call for any comment beyond that we think it rather a pity they were entered for the competition. Electricity, certainly, has its field in automobilism, but it is not, we submit, in the direction of replacing the carrier's van.

In the mechanical features of the various vehicles considerable improvement was noticeable in many ways. The coachbuilder with his crude blacksmith methods was less in evidence, although constructors on both sides of the Channel still cling to them in some respects but with disastrous results. Their driving wheels are still made of wood but inordinately heavy; material is piled up in them with the idea of gaining strength—a wholly unscientific way of proceeding. Of course such clumsy wheels as were seen at Liverpool and at Les Poids Lourds gave trouble and plenty of it. Another thing, too, is that bearings are usually too short and not sufficiently flexible, hence heating ensues and the bearing "seizes." Not a few instances of this occurred. We repeat again that constructors cannot do better than follow railway practice in their designs, of course within well understood limits. In conclusion we must congratulate the French Automobile Club, M. Forestier, and his colleagues on the success of Les Poids Lourds.

BALL BEARINGS.

BALL bearings form one of those mechanical appliances largely used by those who have little mechanical knowledge, and hence many erroneous ideas concerning their action and method of application are rife. In cycles and in moto-vehicles ball bearings are extensively used, but the correct principles involved in fitting them are in many cases ignored, with the result that this eminently labour-saving device is not so satisfactory as it should and might be. The conditions for the proper fitting of ball bearings are stated in the following article, which we take from the *Electrical Review*:—



"A properly constructed ball bearing should be laid out on the lines of a cone bearing. Thus if o be the centre of revolution, draw OF, OE, at equal angles, cutting the ball at points *a*, *b*, *c*, *d*. Then will the cone, *a*, *b*, *c*, *d*, be the equivalent cone which would run truly on surfaces, FO and EO, and to get true rolling results with ball bearings instead of cones there must be drawn tangents to these four points, viz., the tangents, *hh*, *ll*, *mm*, *nn*. Then will these tangents represent the surfaces of the cones in which the ball will roll truly without grinding, the length of path rolled on being exactly proportioned to the spherical sections through the contact points. Thus the line, *ad*, bears the same ratio to the line, *bc*, as does the radius of revolution, o*a*, to the radius, o*b*. We have hatched the lines showing the bearing cones to render our diagram more clear. The dimensions of the angle, ϕ, relative to the ball determine the shape of the bearing surfaces. When OE and OF become tangents to the balls, these roll on one section only and would be extruded by the pressure. With a flat angle, ϕ, the bearing cones become acute, as may at once be seen by a rough sketch. It is doubtful if the angle at the apex of the bearing cones, that is, between the tangents, *ll* and *hh*, should be less than 90°. At smaller angles the destructive effects of the balls is intensified, and the speed of rotation of the balls is much increased by reason of their rolling on a smaller circle. Even when used for rectilinearly moving pieces, we would prefer the surfaces to be slightly coned in order to secure two bearing circles. Between two flat surfaces the balls can only run on one circle. Cones, however flat, give two paths on the ball, and only half the load on any one point. Balls must not run in a curved groove, for then they grind all over their area of contact.

"The narrowness of path in a ball bearing demands that pressures shall not be too heavy, and, for heavy machinery, cones and cylinders which substitute lines for points, secure a practical advantage, though

if materials were quite unyielding, balls would touch on mathematical points, and would have exactly the same bearing surface as cylinders where theoretical area of contact is a line or the trace of a mathematical point, and, therefore, no greater than a point. The smallest amount of yield in materials of construction puts, however, quite a different complexion on affairs, and makes a cylinder bearing superior to a ball bearing where loads are heavy."

HORSE-POWER, GRADIENT, WEIGHT, AND ADHESION.

A CORRESPONDENT draws our attention to a letter that appeared in a recent issue of a contemporary, in which the writer of the letter states that "it appears to him that the horse-power of an autocar is as yet an unsolved problem. For instance, a certain type of Bollée, weighing about 2 cwt., but say that it weighs 3 cwt., is represented as having 3 H.P. This gives 1 H.P. for every hundredweight. But a Daimler carriage weighing about a ton is represented as having only 4 H.P., *i.e.*, $\frac{1}{5}$ H.P. for every hundredweight. Yet this type of vehicle has made the journey from John-o'-Groat's to Land's End without mishap, and no doubt must have encountered some stiff gradients *en route*." Therefore it appears to the writer that the former machine (with so much extra power relative to weight) should be able to romp up almost any hill with hardly any decrease of speed.

As he points out, he has not seen it stated anywhere that the Bollée claims precedence over the Daimler as a hill climber. The matter appears, says he, inexplicable, as it does to our own correspondent, who asks us for an explanation. As not a few automobilists to our knowledge entertain, to say the least, rather vague and inexact notions on the relations existing between power, speed, weight, and adhesion, we willingly take this opportunity of throwing some light on the question.

First, then, let us say that the power necessary to propel any vehicle admits of as accurate determination as we please, *providing all the conditions are known.* It is for this latter purpose that in France, as in England, great expense is incurred by the various associations interested in automobilism in the collection and dissemination of accurate data. For instance let us refer to the very excellent trials of moto-vehicles conducted under the auspices of the Royal Agricultural Society, by Professor Unwin, F.R.S., and his colleagues, Messrs. Webb and Bryan Donkin. These trials, which are pretty fully recorded in the last issue of THE AUTOMOTOR, are of the very greatest interest to the designer of moto-vehicles as they are replete with the most valuable data. Of course, to the amateur they are merely a mass of figures of somewhat doubtful value, and he wonders how on earth they were obtained and, being obtained, what they are for. They, in fact, enable us to solve such problems as are contained in the letter which forms the *raison d'être* of this article, and which to so many are "inexplicable." In THE AUTOMOTOR POCKET-BOOK we have given the dynamical formula for calculating horse-power. It is :—

$$\text{B.H.P.} = \frac{(R \cos \alpha \pm 2240 \sin \alpha)\ W\ v}{375}$$

Where R is the resistance in lbs. per ton,
α is the angle of gradient,
W is the weight of the vehicle in tons, and
v is the speed in miles per hour.

Referring now to THE AUTOMOTOR for October, p. 4, we have data obtained for the Daimler, Leyland, and Chiswick vehicles.

Taking the former as an example, we have—

W = 2·49 tons.
R = 126·8, or 50·9 lbs. per ton.
v = 7·8 miles per hour.

Our formula then stands—

$$\text{Brake or actual horse-power} = \frac{(50{\cdot}9 \cos \alpha + 2240 \sin \alpha)\ W\ v}{375}$$

As the road is level cos α = 1 and sin α = 0. Running out these figures, we find that the brake horse-power is 2·64, which is that found at the trials. The resistance, R = 126·8, is, it will be seen, $\frac{2{\cdot}49 \times 2240}{126{\cdot}8} = 44$, or $\frac{1}{44}$ part of the weight; or, again, is practically 51 lbs. per ton of moving weight. As the judges say regarding this resistance, the chief part of the power expended is used in overcoming the vehicle friction and the machinery friction. We thus see that in this particular instance practically 2¾ H.P. is required to produce a speed of over 7¾ miles per hour on the level. Now, the Daimler is a light vehicle. Using the data as obtained for the Chiswick vehicle, which is nearly three times the weight of the Daimler, we find that running on the same road and under the same circumstances, using the formula as before, to produce a speed of 6·2 miles per hour 8·2 H.P. is required, and that the resistance is $\frac{1}{31}$ part of the moving load. This seems to show, we may remark by the way, that the friction caused by slide valves eccentric gear in steam motors, &c., is more than that caused by spur wheel reduction gear in spirit motors, and hence we would urge steam-motor makers to employ special valve gear, such as Joy's, in connection with piston valves, and spirit-motor makers to perfect their spur gearing, which is usually not as well designed as it might be; especially is this the case in light vehicles such as motettes, &c., the teeth being usually merely slotted out of the solid without any regard to form.

Considering now the question of gradient, which in the examples given is 1 in 12 or 4° 46′ = a rise of 440 feet per mile, we see that while ascending this gradient the resistance in the case of the Daimler rises to 592 lbs., or nearly 4¾ times that on the level, while the actual horse-power required to give a speed of 3·9 miles per hour, or half the mean, on the long course is not less than 11 H.P., or more than 4½ times that on the level. As will be seen the actual effective horse-power of the Daimler on this gradient was but 6·16, which suffices for a speed of but two miles per hour, quite sufficient for practical work seeing that such gradients are exceptional. Similarly the Chiswick van, to ascend this gradient at half its mean trial speed, viz., at 3·1 miles per hour, would require to develop 25·3 B.H.P., whereas it could only develop 14·72, which gives a speed of 1·7 miles per hour, also quite sufficient for the purpose. These examples serve excellently to illustrate the influence of gradient and resistance.

We now can briefly consider "the inexplicable" phenomenon referred to by our correspondent, which may be thus stated—How is it that a light Bollée having a large ratio of power to weight is inferior as a hill climber to a Daimler having a much smaller ratio? Taking the Bollée as weighing ·15 ton and having a maximum of 3 H.P., the ratio is 20 to 1, while in the Daimler, using the figures given in the early part of the article, the ratio is but 2·47 to 1.

When the driving wheel of a moto-vehicle is put in motion on a flat surface, whether it advances or whether it rotates without advancing depends upon the weight or pressure, P, that the wheel exerts upon the surface, the frictional resistance between the arc of the periphery of the wheel and the surface depending upon the nature of the two surfaces, called the coefficient of friction (expressed as a fraction of the pressure and usually denoted by μ) and the resistance, R, offered by the load that the wheel has to haul. The wheel will advance so long as the latter is less than the quantity P μ, which is termed the adhesion. If P μ is greater than the tangential effort exerted at the periphery of the wheel, the wheel will stop; this occurs as when the wheels of a railway carriage skid; in this case P is exerted by the brake-blocks, and the tangential effort may be considered for our purpose to be caused by the rail. If the resistance of the load is greater than P μ, the wheel revolves without advancing. This occurs frequently with locomotives just when starting. Enough energy is, however, developed to overcome the inertia of the load, and μ is increased by sanding the rails. In any vehicle such as we are considering P cannot be made to equal the weight of the vehicle; nor can we in any given case alter μ, except for a temporary purpose. We can, however, use two or four wheels as drivers. In most moto-vehicles two wheels are thus used. Taking the case of the Daimler as above, let us assume that three-fifths of the total weight is on drivers, and that μ = ·5. The total weight available for adhesion is 1,680 lbs., or $\frac{1}{3{\cdot}3}$ of the total weight.

Turning now to the Bollée, we see that only one wheel is used for driving, and assuming that it carries one-third of the load, and using a value of μ as before, we find that the weight available for adhesion is 56 lbs., or one-sixth of the weight of the vehicle. In other words, the Daimler is twice as good a hill-climber as the Bollée. It will be observed that power *per se* does not affect the question directly. A large power is put into the single drivers of express locomotives to haul light trains at high speed. To haul heavy trains at high speed four wheels coupled are used, the power being the same in both cases; but in the latter the weight is increased and distributed over the four wheels; there is thus twice the adhesion, *i.e.*, twice the drawbar pull, than in a single coupled.

The practical lesson is, then, that in moto-vehicles, to ensure good hill-climbing qualities, as much weight as possible within certain limits must be put on the drivers. It is the neglect of this which constitutes the cardinal defect in the design of moto-tricycles, motettes, &c.; one driver is used, and the weight is badly distributed, the amount available for adhesion being too small, and hence on steep gradients they stop, although possessing ample power.

G. H. L.

ELECTRICABS.

ONE of the points touched upon in the presidential address delivered before the Northern Society of Electrical Engineers by Mr. J. S. Raworth related to the employment of electricabs in the streets of London. The president stated that the number of electricabs has largely increased, and that they appear to work very well, whilst at the same time general satisfaction is afforded to the passengers. No one would venture to contradict this statement, which, however, does not go far enough. Many of the cabs have been in operation for over a year, and the time seems to have arrived when some data on the practical working of the cabs would be of considerable value to electrical engineers and to the shareholders in the Company. Though referred to for some years before the arrival of the electricab, the electric omnibus has not yet made its appearance, but if some definite figures were forthcoming concerning the former, we should probably, says the *Mechanical World*, soon be able to calculate when the latter may be expected. The promoters of the electricab—among whom, we believe, Mr. Bersey is the most prominent—would render a great service by publishing authentic details on the subject, and if this is not done soon the inference will not be far to seek. We do not wish to draw any such conclusion, but the long period during which the cabs have been in service renders it desirable that the fate of the electricab should be known at no distant date.

[We publish the above expression of opinion from our contemporary, as it indicates that generally entertained by a good many electrical automobilists. The information referred to is, of course, bound to come out sooner or later. We believe the cost of maintenance is not less than 2*s*. per day per cab; but the exact figures are withheld for very obvious reasons. More exact and valuable data will be gained by following the accounts of the Paris cab trials. These trials are being held under the auspices of the French Automobile Club, and have a scientific value, which any data published by the London Electrical Cab Company would lack. The French Automobile Club has arranged to hold a competition especially devoted to storage batteries, and we may expect that much valuable information as to the life and cost of maintenance of these when used in actual service will soon be forthcoming.—ED.]

JOHN MACADAM.

JOHN MACADAM, the inventor of the system of road-making which bears his name, was a road trustee in Ayrshire, where his estate was. Just a century ago he had to deal with the state of the roads. At his own expense, and in face of much prejudice, Macadam began a long course of experiments, and he continued them at Falmouth. In the year of Waterloo he became surveyor of roads at Bristol, and he had his great opportunity. In a few years, by his writings, and still more by his works, he had demonstrated his process. To do this he had travelled 30,000 miles on English roads, and spent £5,000 of his own money. In 1823 Parliament recognised his unselfish labours and granted him £10,000, of which all but £2,000 was a mere indemnity, but the national seal was set upon his invention in 1827 by his appointment as Surveyor-General of Roads. Gradually the civilised world adopted his system, which consisted chiefly in thorough drainage and carefully-prepared materials, the bed being formed of broken stone. Telford improved on some of his arrangements, but Macadam's is the chief merit in reforming our roads. His achievements made possible that network of mail coaches which, before it was superseded by the existing network of railroads, was as marvellous in its day. He seems, too, to have been a man of great character. He died in 1836 at the age of 80.

Since Macadam's time our roads have, if anything, deteriorated through the laxity and supineness of county councils and other parochial bodies.

Progress of "The Automotor and Horseless Vehicle Journal."—The progress of a newspaper in its early stages is not unlike that of a child, and is watched with much the same solicitude as is bestowed upon one's first-born, while its career is, up to the point of vanishing youth, of general interest to its many friends and supporters. After that period is passed, it either pursues a career of dignified utility, combined not infrequently with an advertising connection which brings into the coffers of its proprietors an abundant supply of, from the ethical point of view, doubtless filthy but most agreeable lucre; or it suffers from incipient consumption and expires at an untimely age, mourned by none so sincerely as its proprietors, who have, with touching simplicity and confidence, "put money in it." THE AUTOMOTOR is, as our readers know, hardly yet out of its literary bibs and tuckers, but already it, as ladies sometimes say of precocious offspring, "takes a deal of notice" and is "getting on quite nicely," as a few statistics will show. The normal size of this JOURNAL is 36 pages of literary matter, while as for pages devoted to advertising, we are willing to add any number without increasing the cost of the JOURNAL. In the first half of Vol. I the average number of pages devoted to automobilism was 36·5, and to advertising (not including the covers) 2·3. In the second half the figures were 41·7 and 4·0 respectively, the mean for the whole volume being 39·1 and 3·1. The JOURNAL was of its normal size on two occasions only, it was less than normal on three occasions, while the normal length was exceeded on no less than seven occasions. In all, 40 extra pages, or, including the special June number, 49 extra pages, of literary matter were given, practically making 13 numbers for Vol. I. Coming to Vol. II, which ended with the September number, we find that in the first half of the volume the average amount of space devoted to the literary aspects of automobilism was 39·1 pages, while the average number of pages devoted to advertisement purposes was six. In the second half of the volume the figures were 42 and 12 respectively, the mean values being 40·5 and 9. The JOURNAL was of normal size as regards literature on one occasion, less than normal on four occasions, and more than normal on seven occasions, the total amount of extra literary matter being no less than 55 pages, thus making Vol. II to consist of 13½ numbers of normal extent. These figures prove two things—the growth of the moto-vehicle industry, and the growth of—we trust we may say so without offence—its principal literary and technical representative. The two really are correlative, or rather should be, and in the case of THE AUTOMOTOR this relation unquestionably obtains, and it will be our business to see that it is maintained and strengthened to, we believe, the advantage of our readers and ourselves. We, of course, do not pretend to run this JOURNAL for purely ethical motives, and hence our position is all the more a faithful index of that of the industry.

A Much-needed Protest.—At Woodford recently a horse attached to a trap shied at the passage of a triplet cycle, with the result that it collided with another horse and trap proceeding in the opposite direction, and also ran amuck among some cyclists, several of the latter being injured and one killed. This occurrence naturally happened on a Sunday morning, when, given fine weather, the main roads of every large town literally swarm with cyclists and that description of vehicle designated as a "trap," much affected and usually driven by costermongers and publicans, who seem to regard the possession of a "trap" as not only indicative of those sporting proclivities without which it is impossible to be either a true costermonger or a genuine publican but also as a badge of respectability and as evidence of prosperity. A certain section of this class scorn anything like moderate speed, but proceed as though they were practising for a trotting match. These "traps," driven as they usually are on Sundays at a very high speed, constitute a public danger and nuisance. The police are extremely lax in dealing with these vehicles; indeed it would seem, judging from what anyone can observe on any Sunday in the environs of London, that horse-drawn vehicles generally have a license to go as fast as their drivers can make them. We quite endorse the remarks made by Mr. Othen, of the National Cyclists' Union, at the inquest held in connection with the case referred to, to the effect "that the police should take particular notice of the pace that these light traps were driven. Cyclists were pulled up very sharply, and he was sure that it was only fair to act in the same way with the drivers of these traps."

LAW REPORTS.

Everard *v.* **Higgs.**—Before Mr. Justice Wright and a jury, on October 28th, the case was heard of Everard *v.* Higgs. This was an action brought by Mr. Frederick Edward Everard, an electrical engineer, against Mr. John Limbrey Higgs, a solicitor, to recover £60 in respect of certain shares which the plaintiff said he had transferred to a third party at the defendant's request. It appeared that the plaintiff purchased a patent for an electrical accumulator and formed a company, entitled the I. E. S. Accumulator Company, to work the patent. The plaintiff had 100 shares in the Company, and in March, 1896, the plaintiff said the defendant came to him and informed him that he had arranged to sell 10,000 or 20,000 shares, and that he had not that number in his possession. He asked the plaintiff to transfer his 100 shares, and promised to pay him the amount realised by their sale when he received the money. The plaintiff transferred his shares, and subsequently heard that there had been a pooling arrangement. He asked the defendant for the money which the shares had realised, and the defendant alleged that the plaintiff was a member of the pool, and would have to take his share of the pooling arrangement, which would entitle him to 66 vendors' shares, 17 out of 5,000 new shares purchased out of the proceeds of the pool, and £1 13*s.* 4*d.* in cash Eventually the plaintiff agreed to accept this; but the defendant failed to take any steps to transfer the shares until after proceedings for the winding-up of the Company had been instituted. He now submitted that he was entitled to stand by his original arrangement with the defendant that he should receive the price realised by the sale of the shares, which was 12*s.* each. The defence was one of accord and satisfaction. It was said by the defendant that he offered, and that the plaintiff agreed to accept, the vendors' shares and the new shares in satisfaction of his claim. These shares had been tendered, but had not been accepted by the plaintiff. Mr. G. A. Scott was counsel for the plaintiff, while Mr. Bartley Denniss represented the defendant. In the result the jury found a verdict for the plaintiff, assessing the amount to which he was entitled at £50. Judgment for plaintiff accordingly, with costs. On the application of defendant's counsel his Lordship granted a stay of execution for 10 days, with a view to an appeal.

British Motor Company *v.* **Universal Carriage and Cycle Company.**—In this action Mr. Justice Stirling last term directed that a certain experiment should be made. Mr. Moulton, Q.C., on the 3rd inst., informed his lordship, on behalf of the plaintiffs, that the experiment had been made, and his clients were anxious to bring on the case again. Mr. Shaw, for the defendants, said that their engineer had also made an engine which complied with his lordship's directions. His lordship said he would inspect both; and the action would be set down in the next witness action list.

Lang *v.* **Scottish Motor Omnibus and Car Company.**—The action in the Edinburgh Court of Session was settled on October 26th, in which Alexander Lang, Larkhall, sued the Scottish Motor Omnibus and Car Company (Limited), 66, Cadzow Street, Hamilton, for £1,000 damages for personal injuries, the pursuer having on December 23rd, 1897, while a passenger in one of the defenders' moto-cars from Larkhall to Hamilton, been thrown out near High Merryton farm-steading by the sudden capsizing of the car. The pursuer has accepted £75 in full of his expenses and claim.

Great Horseless Carriage Company (Limited) *v.* **Flanagan.**—In the Dublin Court of Queen's Bench, on October 26th, Mr. Joseph M'Auley (instructed by Mr. Thomas Maguire, solicitor, Belfast) stated that this was a motion for leave to file a pleading by way of rejoinder to the plaintiff's reply. The action was brought to recover £212, amount due for calls on shares held by the defendant, who resides in Belfast. The defence alleged that the prospectus on which the plaintiff was induced to become a shareholder was materially false, fraudulent, and misleading. The reply alleged that the Company had been wound up, and that the defendant was not entitled to rely on the prospectus. It was to answer this that the defendant wished to file a rejoinder. After some discussion the motion was adjourned until the 3rd inst., when Mr. Justice Johnson asked if there was any precedent for such a plea, or how could a contributory challenge the whole proceedings for fraud. Mr. M'Auley said the facts spoke for themselves. The Company had been floated with a capital of £250,000, of which £100,000 was offered to the public. No business was done and there were no auditors, and yet the Company went into voluntary liquidation. The MacDermot, Q.C., and Mr. P. L. Smith, who appeared for the plaintiff Company, resisted the application as untenable, and submitted that when a Company went into liquidation it practically ceased to exist, and the contributory could not set up fraud in an action against the liquidator. It was immaterial whether the liquidation was compulsory or voluntary, and, even if there were fraud, the shareholders were bound. The defendant could, if so advised, bring an action for fraud, but the proposed rejoinder was bad in law. Besides the facts were known to the defendant before he repudiated them. Mr. Justice Johnson gave power to amend the defence, in which he said the point could be raised, costs to be costs in the cause.

Oglesby v. Yorkshire Motor Car Company.—At the York County Court, on October 31st, before Judge Templer, an action was brought by Isaac Oglesby, coal dealer, Long Close Lane, against the Yorkshire Motor Car Company (Limited), Bradford. The plaintiff claimed the sum of £15 odd, damages alleged to have been sustained by him in consequence of a servant of the defendants having improperly used a moto-car on April 7th. It was alleged that whilst the plaintiff's coal cart was standing in Fishergate, defendants' moto-car came at an excessive speed and caught one of the back wheels, causing damage to both the horse and vehicle. The horse bolted and knocked down a gas lamp, for the repair of which plaintiff had to pay the Gas Company. For the defence it was alleged that no collision took place, and that the accident was the result of plaintiff's horse bolting. His Honour gave a verdict for the defendants, with costs.

Damages for Negligence.—At Leighton Buzzard County Court on the 20th ult., the case of Foster *v.* Grimshaw was decided. The plaintiff claimed £50 as damages for personal injury sustained as alleged, in consequence of the defendant having, on March 8th last, negligently driven a moto-vehicle through the streets of Leighton Buzzard. He alleged that owing to the sudden appearance, round a sharp corner, of defendant's vehicle, driven at a rapid rate, two horses attached to a van in which plaintiff and others were seated were frightened and threw out the occupants of the van, severely injuring the plaintiff. The jury ultimately found a verdict for plaintiff for the amount claimed and costs.

Police Court Proceedings.

Charge of Perjury.—At Bow Street Police Court, John Limbrey Higgs, of Delahay Street, Westminster, appeared to a summons on October 24th, charging him with committing perjury during his examination in May last, at Bankruptcy Buildings, in respect to the I. E. S. Accumulator Company. Mr. Horace Avory and Mr. G. A. Scott supported the summons; Mr. Bartley Denniss defended. Mr. Avory said that the defendant, who appeared during recent years to have been engaged in company promoting, was charged here with having committed wilful and corrupt perjury in his examination in respect to the affairs of the I. E. S. Accumulator Company, in swearing that a mortgage deed, secured to a Mr. John Walton, for £1,200, dated May 9th, 1894, had been paid off and satisfied prior to August, 1895. This mortgage related to a license to work a particular patent in electrical accumulators, known as the Theryc-Oblasser accumulator, which it was intended to have fitted to electrical cabs and other moto-vehicles. In December, 1893, the defendant agreed to purchase this license for £2,000, and in the following January promoted a company, known as the Universal Electrical Lighting Company, to obtain the purchase-money and work the patent. Only £1,200 was subscribed to this Company, however, and the defendant accordingly mortgaged this license to Mr. Walton for a second £1,200. The license was not assigned to the Company, but in June, 1895, the defendant entered into an agreement with a Mr. Mann, as trustee for a new Company, to buy this license for £2,000. This Company was duly formed under the name of the I. E. S. Accumulator Company, with the defendant and his father-in-law as two of the directors. The purchase of this patent did not appear on the prospectus, but at a board meeting on July 26th, 1895, at which the defendant was present, the directors agreed to acquire the patent, and to pay the defendant £2,000 for it, and

this sum was actually paid to him by several cheques in 1896. In 1897 the Company got into difficulties, and in October of that year called an extraordinary general meeting to consider the voluntary winding-up of the Company. Some of the shareholders opposed this motion, saying that certain practices had come to their knowledge which required fuller investigation, but the voting power of the directors was sufficient to get the motion carried. However, in March, 1898, an order was obtained for the examination of the defendant and other directors in respect of this Company, and then he, having been obliged to admit the mortgage of 1894, in order to justify his subsequent sale of the license, swore that the mortgage was paid off before August, 1895. As a matter of fact, the mortgage was never paid off until October, 1897, when the defendant found the money because he was moving to have a receiving order against him rescinded, and to satisfy the registrar that he had paid all his debts he had to produce this mortgage and the receipt, dated October, 1897, so that he had made two conflicting statements, and condemned himself out of his own mouth. At this point the hearing was adjourned, Mr. Denniss saying that he should be prepared to prove that the defendant never had received the £2,000 purchase money for this patent from the Company.

A Petty Prosecution.—On the 20th ult., before the Walsall magistrates, Ernest Robins, manager of the Remington Typewriter Company, was summoned for causing an obstruction in Park Street by allowing a moto-car to remain thereon on October 3rd. The evidence showed that, as one witness put it, "something went wrong with the works," and the car ceased to run, with the result that some 150 people gathered round, obstructing the roadway. Defendant told the officer who interposed that he was "waiting for a spark." Mr. W. F. Hall, who appeared for the defendant, stated that there had been a temporary disarrangement of the gear. It was not the fault of defendant that a crowd congregated; it was due, he said, to the "inordinate curiosity of the Walsall people, who assembled on the slightest pretext." Defendant, who was called, stated that the accumulator of his moto-car would not work, and he sent to the Walsall Electrical Company for a new one. He maintained that he had as much right to use his moto-car as to use a trap. The magistrates took a lenient view of the case. They accepted the explanation that there had been a breakdown, and the case was dismissed.

Excessive Speed.—At the Southampton Police Court, on the 14th ult., George Schenley was summoned for driving a moto-vehicle in Portsmouth Road, Bursledon, at an excessive speed, namely, at a speed of about 24 miles an hour. Defendant pleaded guilty, and a police-officer spoke to measuring a distance of 770 yards, which was traversed in 64 seconds. It was admitted that the defendant had proper control of the car, but it was said that it had gone 30 yards before it could be stopped. Defendant said he could not admit that he was going 24 miles an hour, though he knew he was going too fast. He was under the impression that he was allowed to travel at the rate of 14 miles an hour, whereas it was only 12. He had travelled 3,000 miles in his moto-vehicle without having any complaint made against him, and at a speed of 30 miles an hour he could pull up within 15 yards. There was a lot of prejudice against moto-vehicles. Sir O'Bryen Hoare said it was very dangerous to the public for moto-vehicles to be driven at such a great rate of speed. The defendant might have run into a child or anyone else while proceeding down hill as he was doing. He would be fined £2, and 7*s.* costs, and he (Sir O'Bryen Hoare) hoped that this would be a caution to the owners of other moto-vehicles.

Alleged Theft from the New Beeston Company's Motor Works.—The Coventry city magistrates, on the 5th inst., had again to deal with a case of alleged theft from the New Beeston Motor Company's Works, Quinton. Edwin Perks, fitter, of No. 5, Stoney Stanton Road, was charged with stealing gunmetal castings and parts of a motor of the same material, together with other articles appertaining to the manufacture of motors, of the value of £10, the property of the Company. The managing director (Councillor S. Gorton) said he went on October 31st to prisoner's house with Detective-inspector Imber, and there found the parts in question which Perks was accused of stealing. Neither the prisoner nor any other individual possessed authority to take parts of motors or anything else of that character from the Company's works. Mr. Maddocks, who defended, addressed the bench on behalf of Perks, and called as a witness, William Allen Taylor, the British Motor Company's works manager, and formerly employed at the New Beeston Works, who said that Perks was a foreman under him, and that Mr. Gorton had given him permission to try experiments at home, and allowed him to take thither the parts required for the purpose. The Bench committed Perks for trial at the assizes, bail being allowed.

Bankruptcy Court.

THE BANKRUPTCY ACTS, 1883 AND 1890.

RECEIVING ORDERS.

Crawford, Middleton, and Martin, Arthur Francis, 37, New Oxford Street, engineers—October 10th, High Court of Justice in Bankruptcy.

A SITTING was held in the Bankruptcy Court on October 26th, before Mr. Registrar Giffard, for the public examination of J. Condict, company promoter and director, of Broad Street House, E.C. The debtor applied to pass upon accounts showing total liabilities £31,314, of which £8,814 are unsecured, and assets of uncertain value. He stated, under examination, that for many years prior to 1890 he carried on business in the United States as an engineer and contractor, but in that year he came to London with a capital of £20,000, and became engaged in the promotion of companies. He acquired an interest in the London Electric Omnibus Company (Limited), and other companies. He had provided over £10,000, most of which was his own money, in connection with the two companies, and the value of his interest in one of them was £36,000. Creditors treated as partly secured held shares to the nominal value of £52,126 in the Electric Omnibus Company (Limited). His failure was chiefly due to the heavy depreciation in the value of his shares. The examination was concluded.

Easton, Anderson, and Goolden.—On October 28th, in the case of Wilson *v.* Easton, Anderson, and Goolden, Limited, Mr. Justice Romer appointed a receiver and manager of the defendant company, on the application of a debenture-holder who held stock to the amount of £69,000 out of an issue of £180,000 debentures. It was stated by Mr. R. Neville, Q.C., who appeared for the plaintiff, that the Company was in a difficult position, mainly in consequence of an arrangement for purchase by the Hooley Syndicate having fallen through. Leave was given to the receiver to borrow £7,500 to carry on the business.

REVIEWS OF BOOKS.

"Gas and Petroleum Engines." Translated from the French of HENRY DE GRAFFIGNY, and Edited by A. G. ELLIOTT, B.Sc. (London: Whittaker and Co., Paternoster Square, 1898.) Price 2*s.* 6*d.*

THIS is not a work that can be recommended to the student of heat motors, but the attendant on or driver of such will find it useful enough, and will gain a considerable amount of information without being required to indulge in any mathematics. The history of and working principles of the oil and gas engine are concisely explained, and existing types of motors somewhat too briefly described; of course, the less said about some motors the better, but one, at least, of the more efficient modern motors should, we think, be not only fully described but illustrated with a working drawing. A good deal is said about petroleum engines, and the better known types, such as the Capitaine, Ragot, and Crossley, are very properly selected as the best types using ordinary lamp-oil. Not much is said about what are generally termed spirit or light oil motors, but which the author calls carburetted air-engines. Among those accorded a very short description are the Tenting, Daimler, and De Dion types, but it is, we think, impossible to do justice to the points in each in a few lines. The author says nothing about indicating or making brake horse-power tests, nor does he make more than the merest mention of such important things as carburators; while calculations as to design, trenching as they do

upon the dreaded mathematics, are entirely absent. A reporter for a newspaper would find this work useful as the information is correct but superficial.

The Gazette of the Cyclists' Touring Club for November is before us, and we have derived considerable pleasure in perusing it. We have not hitherto entertained a high opinion of literature relating to cycles, as it has always seemed to us to fit that description applied by a distinguished literary authority to a well-known London morning paper: "Written by office boys for office boys." *The Gazette*, however, is a distinctly high class production, and reflects the greatest credit upon its able editor, Mr. E. R. Shipton, the well-known Secretary of the C.T.C. Of course a large portion of *The Gazette* is devoted to recording the proceedings of members of the C.T.C., but there is much excellent literary matter. Professor C. V. Boys, F.R.S., contributes a really excellent article on "Lamp Lighting and Sunset," and explains the astronomical phenomena which underlies the question. When we brought out THE AUTOMOTOR POCKET-BOOK last year, we incorporated tables showing how to find the time of sunrise and sunset for any particular latitude and declination. Some novices in automobilism questioned their utility, but, as we foresaw, the time when lamps on cycles and moto-vehicles are lit is often a most vital matter in collision cases, as not a few cyclists have found out. A few minutes makes all the difference between being either on the right or wrong side of the law. There is a good article on "Acetylene Lamps" by C. W. Brown, and readers will find many useful hints in it. The rights of cyclists on the railway are ably discussed, evidently by a gentleman of the long robe. "A Handbook of the Bicycle" is the commencement of a series of articles under this heading. It is positively refreshing to come across a writer on cycling who understands the mechanical principles of construction. Mr. Sharp's article is instructive and well written; it may be perused with equal advantage by users of moto-cycles, many of whom entertain the most amazing ideas of power and mechanism. Much other good matter will be found in the C.T.C. *Gazette*.

Cassier's Magazine.—The November number is not as interesting as usual, at least not to our readers, the articles being mainly on those branches of engineering having but little in common with automobilism. There is, however, an excellent biographical sketch of Sir W. Arrol, the builder of the Forth Bridge. "Pneumatic Grain Elevators" is a subject that Mr. F. Duckham, of the Millwall Docks, London, has made particularly his own, and he is probably the greatest living authority on it. "Mechanical Draught for Steam Boilers," by Mr. W. Snow, may be read with advantage by those who design steam moto-vehicles. The conclusions of the writer are:—"Briefly summarised, mechanical draught is capable of reducing the avoidable losses, of decreasing the first cost of a steam generating plant, and of reducing the fuel expense. In addition, it presents certain marked conveniences in the matter of installation and operation. In these days, when every step in the process of steam generating and utilisation is being scrutinised in the attempt to reduce the cost by even a single cent., the opportunity presented by the employment of mechanical draught cannot be and is not overlooked. The economical necessity was not so imperative when Rankine and Clark, long ago, pointed to its marked advantages; and the future was but dimly discerned when, only 15 years ago, Seaton referred to the chimney as a rough-and-ready, but exceedingly wasteful, way of inducing the air to flow into furnaces with sufficient velocity to cause the fuel to burn, and prophesied that it would some day be superseded by more scientific and economical apparatus. What these men foresaw, we to-day realise. Mechanical draught now stands so well established in the engineering world as to lead a noted engineer to remark that 'the building of tall chimneys to secure draught simply advertises the owner's lack of familiarity with modern improvements, or his want of confidence in results easily demonstrated.'" Two useful articles are "Compressed Air on Warships," by Engineer T. W. Kinkaid, U.S.N., and "The Distilling Ship 'Iris' for the United States Fleet," by Engineer W. W. White, U.S.N.

CATALOGUES.

MESSRS. TOLCH and Co. send us an excellently got up catalogue of their petroleum motors. These are made in various sizes, from 1 to 60 B.H.P., and are either vertical or horizontal. They use ordinary kerosine as a source of energy, and hence are largely fitted in shops, small factories, yachts, and launches in which petroleum spirit motors are for various reasons deemed less suitable. All these motors are constructed under the "Capitaine" patents, and are distinguished for correct design and good construction; they are also remarkably cheap. We are pleased to note that Mr. Tolch is taking up the moto-vehicle industry in addition to his yacht and launch business. His address is the Boat Yard, Fulham, S.W.

MESSRS. J. BAGSHAW and SONS, of Batley, Yorkshire, make many specialities used by automobilists, such as friction clutches, pulleys, shafting, journals, and the like. All these are fully illustrated and described in their latest catalogue. Many useful rules, &c., are also given.

THE EBBW VALE STEEL COMPANY are noted makers of springs for railway locomotives and railway stock generally. In their catalogue the various varieties of springs made by them are illustrated and described.

FOREIGN NOTES.

OUR contemporary *Le Velo* announces that several electric coupés destined for St. Petersburg are being constructed at Paris.

A COMPANY has just been formed at Augsberg, Germany, with a capital of £75,000, to be known as Die Allgemeine Gesellschaft fur Dieselmotoren, to acquire and exploit the patent rights in the Diesel motor. Messrs. Krupp and Co., of Essen, are interested in the new Company.

NANCY has adopted steam automobile fire-engines in place of the old method. Now, instead of pushing their machine with infinite labour the firemen take an easy ride, and are carried quickly to the scene of the disaster, thus saving most precious time and husbanding strength and effort.

L'Automobile Rivista della Locomozione Meccanica ed Industrie Affini is the latest addition to automobile periodicals. It is to be issued for the first time on November 16th at Turin, Italy, with Messrs. A. Faccioli and C. Goria-Gatti as Editors. It will be published fortnightly.

ABOUT 30 electric vehicles, modelled after the style of the one now running, No. 16,000, will be delivered before the end of the year from the manufacturers, Jenatzy, at Boulogne. Two hundred of these carriages have been ordered and are to be made with two bodies, one for winter and the other for summer.

A FRENCH automobilist lately wished to send by train his petrocycle and a small vehicle towed by it, or, as it is generally termed, a voiturette remorquer. The railway officials persisted in regarding the vehicles as a tramway, and charged for a short distance the freight of 265 francs. Needless to say, legal proceedings have ensued.

WE hear that H.I.M. the Empress of Russia has, like some other Royal personages, become a convert to automobilism, and has just received a very handsome brake of 6 H.P. from MM. Panhard et Levassor. On the frozen rivers, lakes, and plains of Russia automobilism must be a truly delightful pastime, as an extremely high speed can be attained with small power. Under such conditions automobilism will, we think, make the droski driving appear a very tame pastime.

AN offshoot of the French Automobile Club, and established under its patronage, is the Aéro Club, for the study of aerial navigation. The principal promoters are MM. Archdeacon de Santos-Dumont, Ducasse, Ballif, Emmanuel Aimé, A. de Lucenski, Hérard, De Contades, Flamecy, Baron de Beville, &c., while the office of President is occupied by M. le Comte de Dion, who, it may be hoped, will do for aeronautics what he has so admirably accomplished for automobilism on land. Already a programme of events has been arranged and ascents made under the auspices of the Club,

THE second automobile *fiacre* has appeared in Paris, bearing the number 16,030. It is a petroleum brake with four places, Panhard and Levassor, 6 H.P., and provisioned for a run of 180 kilometres.

THE Paris-Amsterdam race begins to bear fruit. The Administration of Posts in Holland has been struck by the advantages offered by the use of automobiles in the transport of letters, and has succeeded in obtaining a commencing capital of 21,000 francs for automobile trials in 1899. Although Holland is so furrowed with canals, its roads are yet most favourable for the development of automobilism.

LAST week was seen a sight in Paris which is only too common. A heavy truck loaded with an enormous mass of iron weighing 6,090 kilogrammes, and drawn by three horses, could not mount the slope in the Rue d'Hautpoul. A Scotte traction engine happened to be passing, and in a very few moments the horses were unharnessed, a rope attached to the truck, and the tractor drew the whole load with the greatest ease to its destination.

THIS illustration refers to a petrol spirit moto-cab, built for La Société l'Automobile by MM. Panhard et Levassor, and which

has just started plying for hire in Paris. It is numbered 16,030, and is fitted with a 6 H.P. motor, and can carry six persons, including the driver.

THE Paris-Petersburg tour seems to hang fire among the members of the French Automobile Club. Such a journey is much too long to be undertaken even in the most comfortable vehicle, while to do it against time seems to us an undertaking quite beyond the consideration of reasonable and sober-minded men, but one which will no doubt appeal forcibly to those who find joy and comfort in discomfort and privation, so long as these are associated with wheels.

THE Automobile Club of France has made another successful record. Everyone knows that exhibitions in general cost their organisers far more money than they bring in. Such, however, has not been the case with the Exhibition at the Tuileries organised by the Automobile Club. The chairman of the committee of the A.C.F. has, in fact, announced that the profits of the Exhibition at the Tuileries amounted to 50,101·15 francs. This sum has been put aside in anticipation to cover the expenses of the organisation of the Paris-Amsterdam race, which expenses have amounted to 55,000 francs. This shows that the Automobile Club does things well.

DIJON has its Automobile Club, and it has already recruited about 30 members among the drivers of the greatest renown in that region. Following the example of its elder brother at Paris, it intends losing no time to serve with utility the cause of automobilism. One of its first tasks has been to organise a grand trial for next year. The initiative and activity of the founders of this Club, amongst whom we can name MM. De Felletans, Fournière, and St. Chesnay, make us hope for other departures equally instructive and interesting.

AT Ghent next year there will be held an industrial exhibition from June to September. A leading feature will be a competition of moto-tractor fire-engines held in conjunction with the Belgian Fire Brigade Federation. The competition will be divided into two sections :—(1) For tractors capable of hauling a useful load of from 2½ to 5 tons, and (2) for loads not exceeding 2½ tons, both at a maximum speed of 20 kilos. (12½ miles per hour) on the level, and 4 kilos. (2½ miles) on gradients of 8 per cent. Particulars of the competition may be obtained from the secretary of the exhibition at 4, Rue de l'Academie, Ghent.

DRIVERS and conductors of autocars in France have to go through a course of regular training before the Compagnie Générale des Voitures will entrust them with their vehicles in the streets of Paris. This school is established at Aubervilliers, and consists of a course six miles in length, in which every possible curve and gradient, and even different kinds of pavement, are represented. Such impediments as pedestrians who will not get out of the way, and dogs who dart suddenly from the pavement into the roadway, are provided at this school for the purpose of training drivers in the art of steering an autocar through a maze of traffic.

FOLLOWING the precedent set by the French Army, the Military Technical Committee of the Austrian Army is testing the practicability of automobiles for the service. Trials have already been made with a Daimler petroleum automobile for heavy loads, and on the results of these experiments will depend the eventual introduction of this new method of locomotion for the entire army. It has been found that in a transport train proceeding along a road the space occupied by the column is one-fifth less than if horses were to be employed, while, though the initial cost is greater than for draught by horses, in the long run there is a great saving. A moto-wagon equivalent to 10 horses costs only 4*d*. an hour to work, and covers the ground much quicker, as halts are rendered superfluous. Moreover, the new automobiles will, it is believed, be equally practicable for the conveyance of commissariat as for moving heavy fortress cannon into position.

ANOTHER of those shocking accidents with moto-vehicles and resulting in loss of life has lately occurred, this time in Algiers. On Friday, the 21st ult., M. Valentin, of the Bank of Algiers, proceeded with his family and a friend for a drive in a moto-vehicle, said to be of English manufacture. A hill was descended at a rapid speed ; at the foot it was necessary to make a sharp turn—the road is at this point cut in the side of the hill and is protected by a parapet from a ravine below. M. Valentin was unable to check the speed, and the inevitable happened. The vehicle, in virtue of its kinetic energy, dashed over the parapet into the ravine, which is here about 20 feet deep. The result was deplorable ; Madame Valentin was killed on the spot, and a young lady died from her injuries while being carried to the nearest house. The rest of the party were all seriously injured. The vehicle was, of course, a complete wreck. Here we have again an instance of the dangerous association of high speed and insufficient or defective brake power ; whether, in addition, there was bad management, we of course, cannot say.

Automobile Club de France.—At the meeting of the 19th ult., it was decided to hold a *concours d'accumulateurs* applicable to mechanical traction upon rails in the month of April next, and a committee will be formed to deal with this question. On June 1st next there will be a competition of cabs suitable for suburban service in Paris. The vehicles will be limited to *voitures de place*, and small vehicles generally, carrying a load of not less than 100 lbs., and which are intended for one person, and also delivering vans carrying 1,600 lbs. In October next Les Poids Lourds competition will be repeated.

THE MODERN MOTO-VEHICLE AND ITS FUTURE.*

THE lecturer commenced by stating that the present interest in the subject of moto-vehicles was a somewhat sudden revival of a question which attracted much attention some 60 or 70 years ago. At that time self-propelled vehicles upon roads had attained a practical and apparently, for a time, even a commercial success, a regular line of about nine "locomotive steam-carriages" (as they were called), for instance, running for five months on the Paddington Road in the year 1836, about which time there were at least 20 steam-carriages running in or near London.

Although it must not be forgotten that the heavy traction engine has, if slowly, yet steadily and gradually made its way for agricultural and other purposes since that day, yet mechanical locomotion on roads for passengers and light goods' traffic—or, indeed, for heavy traffic at any reasonable speed—may be said to have been generally recognised as a failure and a practical impossibility until the last few years. It is only useful to inquire into the causes of this so far as it will help us to form a sound opinion as to the probability of any permanent results attending the present revival of interest in the question.

The chief reason which was advanced by believers in moto-vehicles for their failure at that time was that of hostile legislation procured by opposing interest, chiefly by coach proprietors, and all classes having an interest in the old lines of coaches. There is no doubt that this was partly the case, and the recent legislation, which has rendered legal a fairly high speed in streets and roads for moto-vehicles, has removed a great obstruction to their practical development.

If this were the only cause of the present position of moto-vehicles to-day, or, let us say, of its position until the last two or three years, we should have every reason for doubting the possibilities of self-propelled traffic and cause for regarding the subject, as most of us have been no doubt inclined to do, as a revival of the obsolete. A careful study of the subject, however, reveals the fact that the subject of moto-vehicles is one which is passing through exactly the same stages as every other invention of any importance, and that while the same causes have not only acted to retard its progress, there are similar reasons for considering that those causes will be entirely and satisfactorily removed.

The three conditions for the success of an invention of this kind are:—1. General demand on the part of the public. 2. The growth and development of mechanical appliances and collateral inventions, making possible the cheap and satisfactory construction of the new invention. 3. The special and continued application of skilful inventors, with the sole object of attaining the object in view. But little was said concerning the first and second of these, except to point out that at the time when the moto-vehicle was first introduced the successful progress of the railway system for a time not only supplied but overtook the needs of transport felt at that time by the civilised community. The enormous and ever-growing demand for rapid transportation (one of the most astonishing features of the present age) has, however, no doubt been one great reason for bringing the subject to the front. The extent to which this demand is felt is most clearly evident from the universal adoption of the bicycle, which has now become a recognised and established means of locomotion, not merely for pleasure, but a most important adjunct to the work of a man of business and the professional man, while the lecturer has found, in visiting the military barracks at Chatham, that practically the whole of the officers employed the cycle as a means of locomotion; whereas a few years ago it was not considered consistent with discipline to appear on a bicycle in uniform, the officers now declare it is impossible to carry out their work without it.

Here in Liverpool the matter of transportation is probably the most important question of the day, and in the morning papers you will see in the opening address of the city engineer of Liverpool, before the Engineering Society, a strong point is made of the fact that Liverpool, contrasted with other cities, is far behind the proportion of its population carried in its tramways and systems of conveyance. At the present day, however, the general demand is being urgently felt, not only for passenger traffic, but for the conveyance of heavy goods, a point to which allusion was made at the conclusion of the lecture.

Again, with regard to the second point there is no doubt that hitherto the comparative inefficiency of the appliances for producing engines, boilers, and machinery suitable for the purpose of moto-vehicles, and the consequent trouble and difficulty involved in manufacture, repairs, and maintenance of the vehicles, as well as the weight and general clumsiness of the machinery itself, not to say the frequent breakdowns, is responsible for the failure of the moto-vehicle.

The lecture to a large extent dealt with the third point, viz., the special features of the moto-car which are slowly but surely being developed, and here it was pointed out that the modern bicycle has taken 25 years to develop, while 50 years at least were required to perfect railway locomotion, while in steamships, in which we in this city are so much interested, it was thought that the "Britannic" was perfect in every respect, whereas the process in development and improvements has been continuous ever since that date, and we are probably as far from perfection or finality to-day than we were 50 years ago. The lecturer devoted himself to pointing out how satisfactorily the various features of the problem of the moto-vehicle are being solved, that the problem is entirely different from the construction of an ordinary carriage on the one hand, or the locomotive on the other.

The matters studied in detail from this point of view were the frame and steering wheels, the motive power and motors, the gearing for transmission of power and changes of speed.

The lecturer then paid a tribute to those citizens who had inaugurated the trials last summer of heavy vehicles, which were by far the most important which had taken place, the forthcoming report which is about to be issued being a bulky and well illustrated volume of 120 pages, which it is hoped will enable conclusions of great practical importance to be drawn.

He finally concluded as follows:—These trials had proved conclusively that even allowing a large and almost extravagant rate of depreciation, and balancing in the most careful manner every item of expenditure, it was evident that the heavy moto-vehicles exhibited could compare successfully with the railways between this city and Manchester in point of cost, while taking into account the actual number of hours required for goods to be conveyed from the Liverpool Docks and Manchester warehouses, or in the reverse direction, moto-vehicles could deliver such goods in considerably less than half the time.

The vehicles which competed at Liverpool, it is true, suffered from trivial defects due to the imperfect design of the wheels, slight accidents to the boilers, engines, &c., all of which were rapidly repaired during the trials, which defects, considering the novelty in the designs, were small and insignificant compared with the defects which at a corresponding period of introduction had been found in the machinery of railways and steamships.

As to the light moto-vehicles, a large number of which were in Liverpool at the time, it may be said that that type of moto-car had been brought to a complete practical shape, and in the hands of a competent driver it would maintain at a good speed a run over a distance of 70 or 80 miles at the full speed of 12 miles allowed by law, and it was only a question of time and further improvements in automatic appliances, so as to make even the services of a skilled attendant unnecessary when there was little doubt that they would come into general use both for purposes of business and pleasure.

* Excerpt from lecture delivered in the Rotunda Hall, Liverpool, on November 3rd, by Prof. HELE-SHAW, LL.D., M.S.P.T.A., &c.

Photographs of Moto-Vehicles.—The value of these would be much enhanced if builders and owners, when the vehicles are "being taken" or "exposed," would eliminate the human form—divine, no doubt, but sadly out of place in this connection. Or if the value of the photograph is supposed to be enhanced by the presence of persons seated in or upon the vehicle it should be labelled "Photograph of moto-vehicle *and* Messrs. So-and-So." Of course we are only dealing with those photographs taken to illustrate the general design of a vehicle, and we need hardly say that the most beautiful human faces, even when seen under tall or felt hats, add nothing to the mechanical features of the vehicle. We frequently are requested to publish photographs that are simply ruined, from our point of view, because some salient feature of the construction is hidden behind the divine form of some one connected with it. The technical value of the photograph of a machine is not, we repeat, increased because a man is incorporated in the picture. We trust builders of moto-vehicles will bear this in mind when having photographs taken for publication in our pages. One or two very good examples of our contention will be found in the present number.

MARTYN'S STEAM MOTO-OMNIBUS.

WE have pleasure in herewith presenting to the notice of our readers a photograph and a scale drawing of a steam moto-omnibus recently constructed by David Martyn and Co. (Limited), of Hebburn-on-Tyne.

Considering the mechanical difficulties to be met with, Martyn's No. I may be said to be not only original and artistic in design, but also, doubtless, a practical solution of a task beset with many obstacles engendered by our Locomotives on Highways Act. This omnibus is constructed to carry 30 passengers and a moderate amount of baggage. The temporary awning cannot be said to add to the appearance of it, but a more presentable cover is now being

MARTYN'S STEAM MOTO-OMNIBUS.

fitted. The over-all length is 18 feet, and extreme width 6 feet 3½ inches, and the total weight unladen is 2 tons 19 cwts. 2 qrs., which is very considerably below that of the French steam carriages of to-day. The weight laden with supplies for a 12-mile run, and reckoning 30 passengers at 10 stone each, is 5 tons 9 cwt.

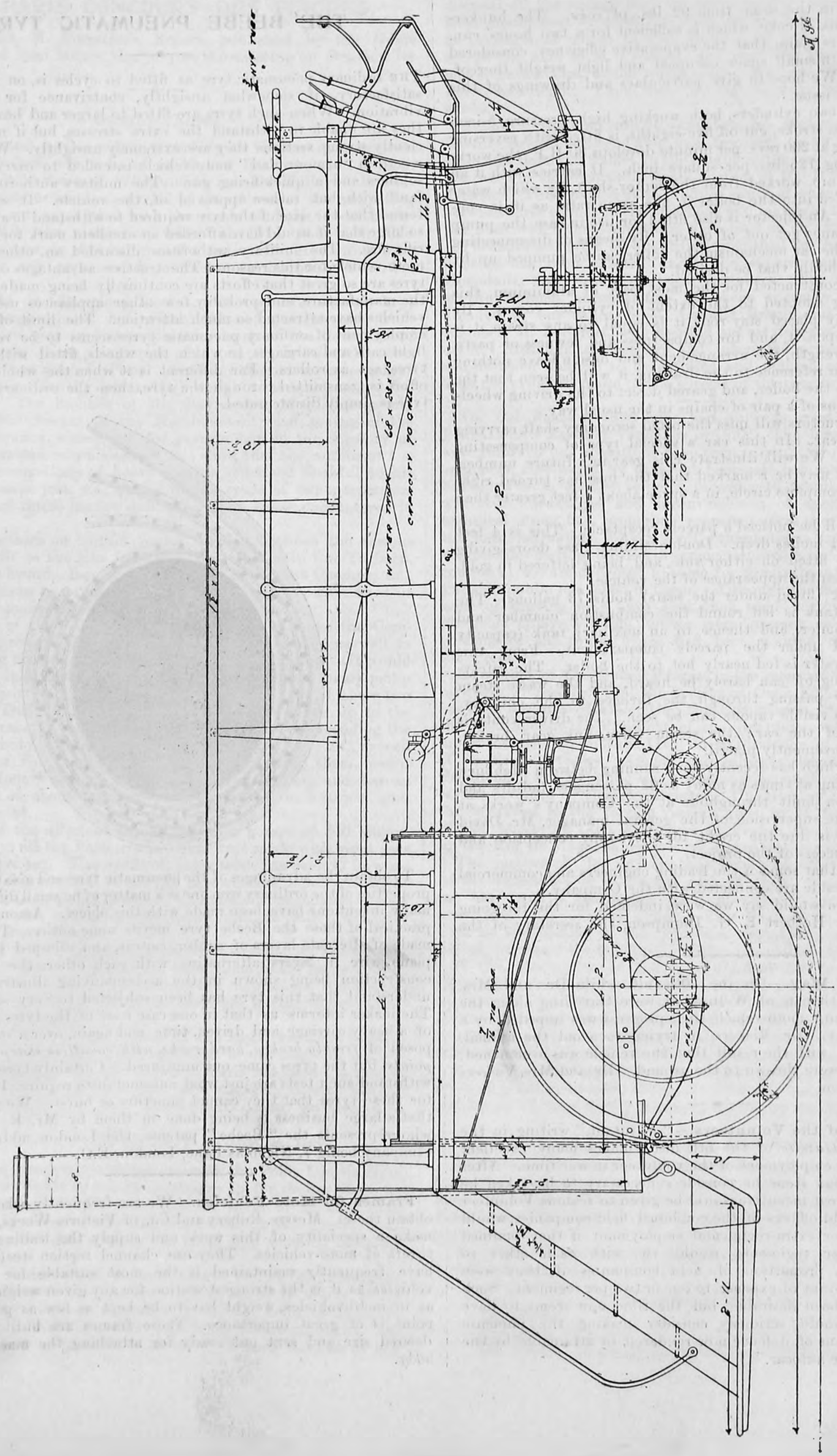
An especial feature about this car is the method of hanging the motor, boiler, and bunkers, &c., upon separate springs upon the main axle carrying the driving wheels, thereby allowing a comparatively light set of springs to be used for the car itself. The result of this very desirable arrangement is that it is very comfortable to ride upon, and further, no vibration from the motor is perceptible to the passengers. Except through the mediumship of the main axle only, the motor, boiler, &c., have not connections to the car, and by the release of one or two bolts can be wheeled out upon the driving wheels from under the car in a few minutes.

Special attention is drawn to the adhesive qualities of the vehicle. The entire weight of the engine, boiler, &c., as before mentioned, is borne by the axle carrying the driving wheels, and, as will be seen by a reference to the drawing, the bulk of the weight of the omnibus itself, and consequently of its load, bears on this main axle, which, by the way, is made of a very heavy section.

An ample exemplification of these qualities of adhesion was afforded on a run from Hebburn to Sunderland on the 26th ult., a distance of 10¼ miles each way. The outward journey was performed in 1 hour 40 minutes, including stoppages, and although the roads were somewhat heavy, owing to recent rains, the car travelled in good style; climbing Boldon Bank without a hitch of any sort, having on board at the time 18 adult passengers. The gradient of this hill is about 1 in 12, and when it is borne in mind that the bus driving-wheels are about 4 feet diameter, and no slow speed or intermediate gear is used, and the ratio of gearing from the motor-shaft to the driving wheels is 1 to 5, the severity of the test is manifest. Although the bank was soft and greasy it was impossible to detect any slipping.

On the return journey, in order to test the efficiency of the brakes, on approaching Boldon Bank, the invitation was given to bystanders to join the company already on board, making the load up to about 50 adult passengers. On descending the hill at a speed of approximately six miles an hour, and using the powerful band brakes acting on motor flywheels, the car was stopped practically instantaneously, while with the ordinary common shoe brake acting on the periphery of the driving wheels, owing to the high percentage of leverage, the car could be stopped at any point of the hill with ease.

The design and general construction of the boiler in this car is, we believe, a novelty to the engineering faculty. It is of the horizontal diagonal multitubular type, and is fired by coke; the heating surface being 109 square feet. This boiler evaporates 495 lbs. of water per hour, fed with water *at a temperature of*



Martyn's Steam Moto-Omnibus.

52° *F.*, burning in the same time 92 lbs. of *coke*. The bunkers provide for 200 lbs. of coke, which is sufficient for a two hours' run. The manufacturers claim that the evaporative efficiency, considered in conjunction with small space occupied and light weight thereof, is phenomenal. We hope to give particulars and drawings of this boiler in an early issue.

The motor has two cylinders, both working high pressure, 5-inch diameter × 7-inch stroke, cut off five-eighths, is fitted with reversing links, and running at 260 revs. per minute develops 30 H.P., the working pressure being 125 lbs. per square inch. It carries with it an ordinary force pump, worked from the motor-shaft, by which water is automatically fed into the boiler in the same ratio as it is converted to steam. An injector is also fitted for use in case the pump should by any chance get out of order. By means of disconnecting the motor from the car mechanism the boiler can be pumped up by the force pump, should that be desired.

The motor is constructed for the most part of aluminium, this metal even being adopted to the extent of cylinder covers. By means of carefully placed stay-rods it is equal to any strain it is possible to put upon it, and for compactness and fewness of parts, combined with strength, the arrangement and design leave nothing to be desired. On reference to the drawing, it will be seen that the motor is bolted to the boiler, and geared direct to the driving wheels of the car by means of a pair of chains in the usual way.

Moto-car constructors will miss the usual secondary shaft carrying the differential gear. In this car a special type of compensating gear is adopted. We will illustrate this gear in a future number. As to steering, it may be remarked that the bus has turned right round, making a complete circle, in a space about 3 feet greater than its own length.

In the photo will be noticed a parcels receptacle. This is 4 feet long and 1 foot 9½ inches deep. Double sliding glass doors giving access thereto are fitted on either side, and, being lettered in gold enhance and lighten the appearance of the vehicle.

The water tank (fitted under the seats) holds 73 gallons. The water from this tank is led round the combustion chamber and furnace of the boiler, and thence to an auxiliary tank (capacity 10 gallons) fitted under the parcels compartment. From this smaller tank the water is fed nearly hot to the boiler. The safety-valve when blowing off can barely be heard, and the waste steam is superheated by passing through the furnace to the chimney. When running no visible vapour can be seen. The driver controls every movement of the car; the steam valve, link gear, brakes, &c., being very conveniently placed.

This omnibus, which has recently been running between Hebburn and Jarrow carrying at times as many as 62 passengers (adults and children), has been built throughout at the Company's works at Hebburn under the supervision of the general manager, Mr. David Martyn, to whom is due the credit for the happy conception and finally the great success of the project.

We may remark that some of the leading engineers and commercial gentlemen on Tyneside are connected with the Company.

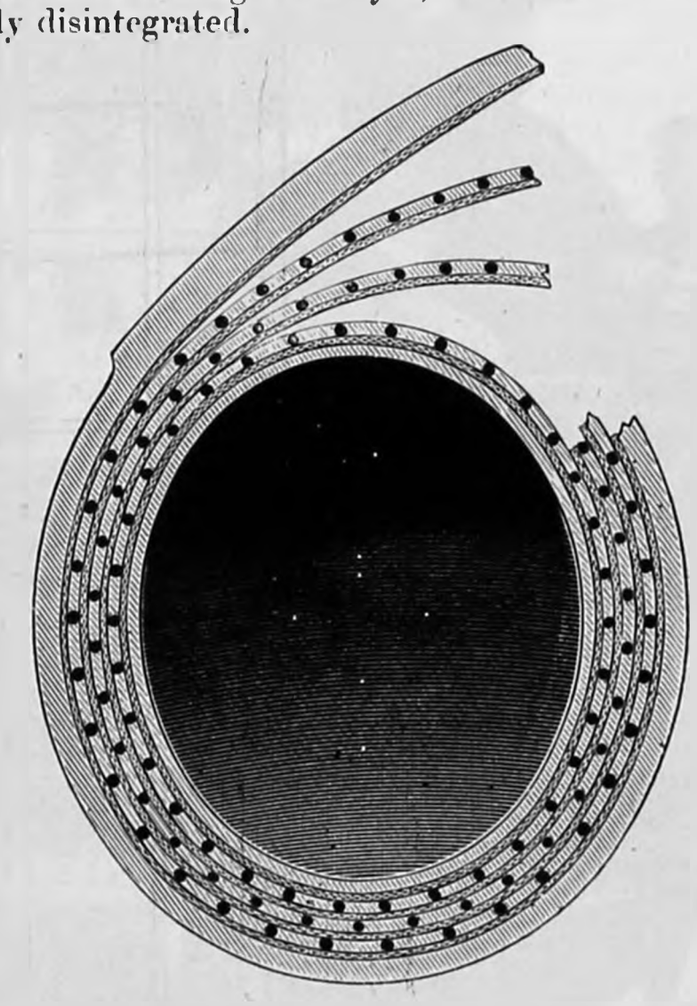
In conclusion we would say we were indebted for the foregoing particulars to Mr. Herbert E. G. Thompson, the secretary of the Company.

A Pig in the Way.—On the 20th ult. while Dr. and Mrs. Vickers and a gentleman, of Wellington, were travelling along the Shrewsbury Road in a moto-vehicle their progress was impeded by a pig in the roadway. Dr. Vickers, in trying to avoid the animal, made a sharp turn, with the result that the vehicle was overturned, and the occupants were thrown to the ground. Dr. and Mrs. Vickers were severely shaken.

Improvement of the Volunteers.—"Adjutant," writing in the *Army and Navy Gazette* of the 5th inst., makes many excellent suggestions for the employment of the volunteer in war time. After detailing the various steps he conside s necessary to be taken he continues:—"A great incentive would be given to zealous Volunteer officers, who, as field officers of the combined field companies, would have an opening for extra-regimental employment if they qualified for it. Volunteer regiments would vie with each other to have the greatest proportion of field companies if they were not limited, on account of expense, to one or two per regiment. Such a plan has always been desirable, but the time now seems to have come when we should seriously consider making the immense increase to our means of defence now rendered so attainable by the developments of the autocar."

THE BEEBE PNEUMATIC TYRE.

THE ordinary pneumatic tyre as fitted to cycles is, on the whole, a satisfactory, if somewhat unsightly, contrivance for diminishing vibration. When such tyres are fitted to larger and heavier vehicles they are unable to withstand the extra stresses, but if made of sufficiently strong sections they are extremely unsightly. We remember a certain "armour-clad" moto-vehicle intended to carry a couple of soldiers and a quick-firing gun. The military authorities found no fault with, but rather approved of, the vehicle. It was, however, found that the size of the tyre required to withstand heavy work was so large that it would have afforded an excellent mark for the enemy's rifle fire. The military authorities discarded an otherwise useful moto-vehicle for this reason. The tractive advantages of pneumatic tyres are so great that efforts are continually being made to improve the manufacture, and probably few other appliances used in moto-vehicles have attracted so much attention. The limit of the useful employment of ordinary pneumatic tyres seems to be reached with light cabs and carriages, in which the wheels, fitted with pneumatic tyres, act as rollers. Far different is it when the whole propulsive effort is transmitted through the tyre, then the ordinary pneumatic tyre is simply disintegrated.



To obtain the advantages of the pneumatic tyre and also the tractive properties of the ordinary iron one is a matter of no small difficulty, and many inventions have been made with this object. Among the more practical of these the Beebe tyre merits some notice. This tyre is made of alternate layers of rubber, canvas, and crimped steel spring piano wire in layers alternating with each other, the method of construction being shown in the accompanying illustration. We understand that this tyre has been subjected to very severe tests. The maker informs us that in one case a set of the tyres was placed on a heavy carriage and driven, time and again, over a surface composed of *freshly broken, hard rocks, with countless sharp edges and points*, but the tyres came out uninjured. Certainly tyres that will withstand such tests are just what automobilists require. It is claimed for these tyres that they cannot puncture or burst. We understand that a large business is being done in them by Mr. R. Hattersley, who represents the "Beebe" patents, the London address of the Company being 7, Nicholas Lane, London, E.C.

Frames for Moto-Vehicles.—We are frequently asked where to obtain these. Messrs. Rubery and Co., of Victoria Works, Darlaston, make a speciality of this work, and supply the leading manufacturers of moto-vehicles. They use channel section steel, which we have frequently maintained is the most suitable for frames of vehicles as it is the strongest section for any given weight. Where, as in moto-vehicles, weight has to be kept as low as possible this point is of great importance. These frames are built up to any desired size and sent out ready for attaching the machinery and body.

THE PARIS CONCOURS DES FIACRES.

[Excerpts from M. Forestier's Report, published by the *Génie Civil*, and read before the jury at the meeting on October 1st 1898.]

GENERAL NOTES.

THE experimental service which, according to the first arrangement, was to last 15 days, was reduced to 12, and finally to nine days, in consequence of the feast of Whitsuntide and the Tuileries Exhibition. On the other hand, as several of the drivers of the competing vehicles were not acquainted with the roads of Paris it was necessary to abolish the itineraries, which M. Bixio had been kind enough to prepare, as they comprised a series of routes which were too short for any experienced conductor to maintain a normal speed on.

M. le Comte de Chasseloup-Laubat, who was unfortunately kept at home through illness, but which did not prevent him from taking an active part in the preparatory work of the Commission, wished to study three itineraries of about 36 miles each, comprising the longest roads in Paris. Although these itineraries might be easier to follow for the drivers they were not more convenient for the vehicles. The inclines of the Raynouard, Magdebourg, and Lepic roads, the descent of the Menilmontant road, paving of the Boulevard Serurier, which will for ever remain in the memory of the competitors and commissioners, &c., show that the author of the itineraries of competitors of heavy weights remained faithful to his idea, which was so just, viz., to give to the trials of our competitors the sanction of much harder difficulties than those encountered in practice.

The obstructions on certain routes divided between the various itineraries, such as the Rue Lafayette, Rue du Rivoli, Rue Turbogo, the large boulevards. Rue d'Aboukir, Rue des Petits Champs, &c., rendered it useless to impose stoppages and startings either fixed or in advance or made at word of command.

The results of the run ought to have sufficed to make the Commissioners appreciate the power of the motor in starting as well as to substantiate the efficacy of the brakes and steering gear. It would be, moreover, imprudent to launch out in Paris a great many moto-vehicles at a relatively rapid speed without being sure of these two last points. The first day of the competition was given up to the trial of the brake of each carriage in ascending and descending the Tuileries declivity, which has an average fall of 6 per cent., as well as to a trial of the power of the motors, in making them mount the hill of Mont Valerien, which is 1,950 yards long and has an average grade of about 8·20 per cent., amounting to 8·80 per cent. at a certain point.

To judge of the effect of the vibration in a race of 540 kiloms. = 324 miles on all the Paris roads, trials were made with great care on June 11th, *et seq.* The result of these trials has been to increase minutely the consumption of energy in electrical moto-vehicles of different kinds, in stopping places on an excellent macadamised road recently laid down alongside the Seine, and on fairly defective metals beside Mont Valerien.

With regard to facility and correctness in steering no special trial has seemed necessary, other than to enter them in the large hall of the Levallois Works, kindly placed at the disposal of the French Automobile Club by M. Clement, the carriages having to turn twice abruptly at a right angle.

To conclude with the organisation of the races, we ought to say a word as to the reasons that have conduced to our adopting a depôt of which the distance from the centre of Paris has been the subject of much criticism; 26 carriages had been engaged, 14 with electric and 12 with petroleum motors. They would occupy an area of at least—

$$26 \times 3 \times 4 = 312 \text{ sq. metres} = 3{,}340 \text{ sq. feet.}$$

Furthermore, it was not sufficient, as with the Poids Lourds races, to have a covered depôt to put the carriages in for shelter, &c.; for the electric carriages it was necessary for them to be near some electric works, in order to refurnish each evening the electric consumption during the day, so as to put them into working order for the next day.

The districts beside which we were able to find sufficient stopping places did not furnish the necessary energy—that is to say, about 150 kilowatts per hour—at the time when the vehicles ought to recharge their accumulators, about four hours before midnight. On the contrary, close to quarters such as St. Ouen's we had at our disposal all the energy that we could possibly want; but it was a local shelter that we needed as well. In short, being obliged to run 26 carriages, of which 14 were electric, we were only too happy to accept the offer of M. Clement, and used the hall of his immense and splendid construction works on the Michelot Quay at Levallois-Perret as a depôt. Even there we had to make temporary electric works.

Thanks to the kind care of our colleagues, Messrs. Hospitalier and Camille Brault, we were able in a few days to set up, with Messrs. Beau and Bertrand Taillet, in the neighbouring outbuildings a factory composed of three portable steam-engines of 100 H.P., working three dynamos. This enabled us to produce easily, at a tension of 110 volts, between three o'clock in the afternoon and midnight the 115 kilowatts per hour which the competitors have used on an average.

The authentication of quantities furnished to the different competitors has been effected under the superintendence of Messrs. Hospitalier and Girault, electrical engineers. The regular charging of the Fulmen accumulators has been specially supervised and directed by our colleague M. Camille Brault and the Company's engineer, M. Bertifort, who assisted at this delicate operation every night. Although competitors and interested principals, their zeal and devotion deserve to be extolled and pointed out, as they have been the principal cause of the success of the concours.

The Cab Races of 1898 have had quite as great a success as the Poids Lourds Races at Versailles in 1897. The foreign visitors who have followed our operations have been very numerous. The French engineers, nominated by different transport companies or societies, have driven in all the vehicles, in order to familiarise themselves with the advantages and inconveniences of each system. The technical Press had numerous representatives there; while as for the local journalists, we can hardly thank them sufficiently for the articles they have published in connection with the working of the concours; we are indebted to them for the lively interest which the Parisian public has taken in them. Although the distance and early hour of starting may have kept back some curious folk from the Michelot Quay, a large number were present at the interesting portions of the route, which had been pointed out to them by the Press.

As a proof of the general interest in the races of electric traction carriages we recollect that the Society of Civil Engineers in France has been desirous of associating the Commission du Concours with the great honour the President of the Republic conferred by assisting at the meeting on June 11th, on the occasion of the celebration of its fifth birthday. Among the subjects discussed before the President of the Republic was a summary account of the marvellous results obtained by electric carriages. On Monday, June 13th, after the breakfast to the foreign visitors, given by M. Loreau, President of the Society of Civil Engineers in France, the competitors went up the Rue de Magdebourg at a good pace in their carriages.

The success of electric cabs was amply manifest to the visitors. At the same time, we would not wish to assert that the petroleum cab has, from a mechanical point of view, to give place to the new-comer—the electric motor. The Peugeot coupé, which has kept up the honour of the petroleum motor well in the races, has, indeed, increased the reputation of the house that constructed it.

If the programme of the concours had not forbidden in this report all comparisons between different competitors we would explain, with proofs, that if the electric carriage was better adapted for the requirements of large companies as well as for public requirements, the petro-moto-cab is the only one that permits of a solitary driver throwing himself into the Parisian arena of traffic.

It is, then, with regret that we have to go back to electric cabs in place of petro-moto-cabs, which, after having been registered to the number of 12, were finally represented only by the Peugeot coupé.

CLASSIFICATION OF CARRIAGES.

Of 21 vehicles entered only 14 were present at the concours to fulfil their obligations in a more or less intermittent manner, and seven only accomplished the tests and successfully overcame the difficulties. The official report naturally deals only with these latter.

According to Art. 4 on the programme the vehicles were classed in different categories:—

1. *Carriages to Seat Two.*

(*a*) Closed.
(*b*) Open, with hood.
(*c*) Capable of being opened or closed instantaneously.

2. *Carriages to Seat Four.*

(*a*) Closed, with space for luggage.
(*b*) Open, with hood.

3. *Carriages to Seat Six.*

Closed, with spa e for luggage (1,320 lbs.).

Owing to the requirements of the programme we have adopted the following order for the different carriages at the concours :—

1st Category.—Moto-vehicles, the power of which is transmitted by means of a gear carriage permitting a mechanical arrangement of speed, a differential and chains.

Petroleum—Coupé, No. 12 (Peugeot).
Electricity—Coupé, No. 13 (Jenatzy).

2nd Category.—Moto-vehicles, whose power is transmitted by means of unchangeable gear, with a differential and chains, and where the variation of the speed is obtained by a corresponding variation of the speed of the motor.

Electricity—Landau, No. 23 (Jeanteaud).
„ Cab, No. 25 (Jeanteaud).

3rd Category.—Moto-vehicles, with two motors, one for each driving wheel, by means of which the motor-axle is in direct relation to the play of the unvarying gear, and where the variation of the speed of each driving wheel is obtained by a corresponding variation to the speed of its motor.

Electricity—Coupé, No. 1 (Krieger).
„ Victoria, No. 3 (Krieger).
„ Coupé, with passage, No. 16 (Krieger).

Some people have expressed regret that certain competitors had neglected the type of light carriage to seat two; such a vehicle is indispensable to a business man, who, during the morning, may have to visit several manufacturers, whose works are frequently at opposite parts of Paris.

Above all for the electric carriage, obliged to carry a relatively considerable weight of accumulators, it seems necessary to try and reduce the weight as much as possible, instead of having in view the satisfying of less important requirements.

Cabs to seat four are much wanted, with a space capable of carrying 880 lbs., but it is none the less indispensable to have a cab to seat two, carrying 310 lbs. plus the useful load. In any case, the carriage to seat four, closed, without luggage space, seems defective.

These considerations have induced us to state the weights of accumulators which the competitors had thought fit to adopt :—

		Weight of accumulators.	Weight when empty.	Weight when loaded.
No. 25	lbs.	880	2,794	2,948
„ 23	„	990	3,344	3,652
„ 1	„	990	2,992	3,608
„ 16	„	990	3,014	4,070
„ 13	„	1,188	3,828	4,136

Thus for the Coupé No. 12, petroleum motor, there is only—

		Weight of motor.	Weight empty.	Weight when loaded.
No. 12	lbs.	141	2,376	2,992

However, one light electric carriage appeared in the races, the Drowski, belonging to M. Jeanteaud, the weights of which were—

		Weight of accumulators.	Weight empty.	Weight when loaded.
No. 26	lbs.	770	2,090	2,398

We much regret that accidents due to steering (and perhaps also to the conductor) have not permitted this carriage to run in all the races.

We must remember in this connection that the coupé, to seat two, of the Compagnie Générale des Voitures weighs, with its driver, 1,164 lbs., and the milord, with its driver, 1,100 lbs. Thus the horse has to exercise a tractive effort of from 46 to 57 lbs., whether the carriage is empty or loaded, whilst the data furnished by the concours has revealed to us, for certain carriages, considerably higher figures of traction.

NET COST—NATURE AND DURATION OF WORK.

The programme announced that the carriages should be able to do 36 miles every day of 16 hours, but for the accommodation of commissioners this distance was run as quickly as possible. In fact, the run was effected with three halting places, at a distance of about 12 miles from each other—half-an-hour's rest at the two first, and a halt of an hour at the two last for breakfast.

The consumption stipulated for during the run did not correspond with the reality of cab service. In fact, these only work effectively for a few hours out of the 16 that they spend on the public streets.

The duration of the time for the carriage to be out is 16 hours.

* The number of miles traversed is 39 or 40.

Work effected in 10 rechargings.

Medium duration of a charge during a run is 20 minutes.

The medium duration of a charge per hour is about 1 hour 10 minutes.

The 10 charges per day are divided in four runs and six recharges per hour.

The 16 working hours are divided in :—

1 h. 20 m. for four runs of 20 minutes on an average.
7 h. for six rechargings per hour of 1 h. 10 m. on an average.
5 h. 10 m. in *maraude*,† and 2 h. 30 m. for meals.

Working speed is :—

In a run of 4 minutes per kilom., or 15 kiloms. per hour = 9 miles per hour.
Per hour, of 6 minutes per kilom., or 10 kiloms. per hour = 6 miles per hour.
In *maraude*, from 15 minutes per kilom., or 4 kiloms. per hour = $2\frac{1}{2}$ miles per hour.

The run of 65 kiloms. is divided thus :—

20 kiloms. for four runs, at 15 kiloms. per hour.
25 „ six rechargings per hour, at 10 kiloms. per hour.
20 „ in *maraude*, at 4 kiloms. per hour.

The working of 15 kiloms. per hour represents 30·76 per 100 of the total working.

The working of 10 kiloms. per hour represents 37·53 per 100 of the total working.

The working of 10 kiloms. per hour represents 31·69 per 100 of the total working.

We admit then that the work is divided in the following manner :—

45 kiloms. at a service speed or 15 kiloms. per hour on an average.
5 „ „ „ or 10 „ „ „
20 „ of *maraude* „ of 6 „ „ „

One of the greatest advantages that mechanical traction offers to the owners of hackney carriages will certainly be that of permitting them to have their shelters or depôts outside the precincts of Paris, where the ground is much cheaper and the town dues less high. If that is done it seems as if the unproductive runs should be increased to 2·5 kiloms. in the morning and 2 kiloms. in the evening, but the relay stations will be suppressed; from that time the total journey will probably remain the same. On the other hand, with the system of short runs of 0·60 franc and 0·80 franc, there is room to hope that the time of automotor carriages will be better utilised, that is to say, that their conductors will have less going and coming to do than with looking for clients at 1·50 francs.

We estimate that the working will be divided in the following manner :—

45 kiloms. at a service speed, or 15 kiloms. per hour on an average.
5 „ „ „ or 10 „ „ „
20 „ at a *maraude* „ of 6 „ „ „

For electric motors this hypothesis will be sufficient to determine the consumption of energy, as this consumption is nil during the stoppages.

For petroleum motors it will be necessary to make another calculation. Indeed, if it is certain that the burners must never be extinguished saving during meal times one is less certain as to the practical quantity for the motor. Should it run empty or can it be stopped whilst the cab is at the station?

As is the actual custom with cabs, the carriage must advance at the same rate as the one that precedes it. If they wish to avoid the recriminations of other drivers who are not in favour of automotors, the conductor of a like cab should keep his motor going whilst he is at the station, or to make up his mind to push his carriage by hand.

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* We have rendered these estimates literally. Their exact meaning is somewhat obscure in places.—ED.

† At a walking pace.—ED.

In order to calculate the daily net cost of an automotor cab (petroleum) we think it necessary to take into consideration :—

1st. That the burners remain alight 10 hours whilst on the public roads; 18 hours from morning to midnight, at least 13 hours, deducting half-an-hour for meals.
2nd. That the motor is empty at least half the time that it remains at the station, and that the consumption *en maraude* will be the same as running empty, be it five hours.
3rd. That it will be extinguished while the conductor is at meals.
4th. That the motor will run with a full complement, lasting 8 h. 40 m., that is to say, during the time necessary to effect :—

Forty-five kiloms. at a speed of 15 kiloms. per hour, in four runs of at least 20 minutes each, and in seven hours, utilised by the clients in making business or other calls, with more or less prolonged stoppages, in about 8 h. 20 m.

Five kiloms., to get from the depôt to the working point and *vice versâ*, about 20 minutes.

Also to calculate the net daily cost of an electricab, it is necessary to take into consideration :—

1st. That the motor runs with a full complement during the time necessary to cover 45 kiloms., in four runs of 20 minutes each at least, and in seven-hour charges, in about 8 h. 20 m.
2nd. That the motor runs with a corresponding consumption at a speed of 6 kiloms. in 5 h. 10 m., looking out for clients in the frequented parts.
3rd. That the motor runs at a speed of 10 kiloms., so as to get from the depôt to the centre of its operations and *vice versâ* in the evening, in effecting 5 kiloms.
4th. That the motor will remain inactive during the rest of the time.

We had thought that we would only have to consider the net cost per day of a cab, as the greater number of vehicles are let out by the day to drivers, and the tariff remains the same however many fares they get within certain limits. However, as it has been brought to our notice that it is more and more a question of small distances below the tariff, we thought it better to ascertain the net cost of the vehicle per kilom. This figure can easily be obtained from the preceding one by dividing it by the number of kiloms. (45) supposed capable of being covered during a day.

We will work the net cost per kilom. over and above—that is to say, of a kilom. of which, admitting all the expenses are paid by the charges already made, the indivisible expenditure has only to be calculated with the energy consumed.

CONSUMPTION OF ENERGY.

The elements necessary for the calculation of the actual consumption of energy in the practical terms we are about to mention are the result of the following verifications made during the concours :—

1. *Petroleum.*—On the morning before the departure of the No. 12 coupé the level of the petroleum was verified in the tank placed under the driver's seat. At the entrance to the depôt a commissioner noted the quantity of petroleum that it was necessary to pour into the tank to obtain the authenticated level before starting. We had thus the consumption of the motor during use, as during the two stoppages the motor was also stopped. In order to determine the quantity of petroleum consumed by the burners, from which the tank was distinct, two trials were made on June 8th at the depôt. We thus verified what the burners consumed per hour.

The same day the motor was run for two hours empty. Its consumption, carefully noted by Commissioner Bardy, proved that it would be necessary to reckon the expense of the empty run to the station.

2. *Electricity.*—Besides the very interesting statement of the energy consumed during the trials at different speeds on the level and on a gradient it has been shown by the perusal of ampèremetres and voltmetres, with which each carriage in the trials was furnished, that each day a very exact account could be kept of the energy furnished to each carriage per day.

Evidently this daily consumption, taken by itself, did not amount to much. Indeed, the total quantity of electric energy contained in the accumulators of each carriage was not known on its arrival at the trials. On the other hand, on certain days different causes have impeded the means of making up each evening the quantity of energy consumed in the accumulators. Only the total amount of all the quantities furnished can give a correct account, but only on the condition that each day the tests were pretty nearly identical, but it was not so every day.

On June 1st and 11th the trials did not resemble those of the intermediate days. On the other hand, on June 10th, experiments were tried with certain vehicles to establish the total number of kilometres which would permit of the total energy contained in their accumulators being rigorously made use of. Some returned rather late to the depôt as they had not been quite able to restore the energy consumed during these trials to their accumulators. Under these circumstances it is estimated that in order to obtain a correct idea of the consumption of electric energy of different vehicles it is only necessary to consider the energy furnished on June 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, and 9th.

We are able to arrive at the actual consumption of each carriage per kilom. corresponding with the service speed. The necessary elements in the calculation of the consumption of energy at a walking pace, and during the journey to and from the depôt in the middle of the working and *vice versâ*, will be arrived at by the Commissioners during the trials of different speeds on the level. Nevertheless, the calculation of the consumption of energy, corresponding with these particulars of cab service, assumes a certain hypothesis. We have, on the one part, the quantity of electricity consumed on the level per carriage per kilometre, after the perusal of the ampèremetres and voltmetres by the Commissioners during the trials. We notice also that there exists between these two quantities a ratio that varies with each carriage. It depends evidently on the output of the accumulators and motor, and also on the manner in which the conductor manages his combinations, in a manner so as to avoid a useless expenditure of current at starting, or give to his vehicle a speed corresponding with the maximum of yield when on declivities. In order to deduct the verified consumption for different speeds during the trials on the level the supply of electric energy, corresponding with the same service speeds, we conclude that it is sufficient to multiply the first by the ratio mentioned above. For the approximate valuation of the energy used at a walking pace and the slow pace at which the carriage returns to its depôt, we believe that this supposition is admissible.

Maintenance.—The consumption of energy and the maintenance of an automotor carriage are not the actual expenses that have to be taken into account. The net cost of the journey comprises also the maintenance of pneumatic tyres, the motor, the accumulators, and vehicle.

Pneumatic tyres appear indispensable to an automotor carriage, whether petroleum or electric, not only for the comfort of passengers but for the good working and preservation of the motor and accumulators. Indeed, one cannot reckon less than 2 francs per day of service for maintenance.

There is ground for distinguishing between petroleum motors (that is to say, a movement alternating with explosion) and electric ones (that is to say, a rotatory movement which is nearly uniform). In the first all the parts get worn much quicker than with the second. For all that, the exact particulars on the subject of daily expenses fail to give the normal maintenance, that is to say, the replacing of portions worn by the regular play of the parts.

In taking literally the figures pointed out in the account rendered of the trials of petroleum delivery carriages belonging to the Grands Magasins du Louvre and du Printemps, these expenses would be very high; but if we take into account that they comprise the improvements exacted by the Service des Mines, we hope that after some trial of service they will not cost more than 3 francs per day. For electric motors we do not think that the expenses can be higher than 1 franc per day, as the expense of maintaining electric motors is well known to be approximately about 20 per cent. of their cost price. The electricab motor, with all its transmissions, will not cost 1,000 francs when such motors are constructed by hundreds at a time. The cost of maintenance, according to the experiences of tramways, would be 200 francs per annum. We will bring it up to 365 francs, however, in order to take into account that in spite of pneumatics the vibrations are always stronger in cabs, and also that at the beginning at least the motor costs more than 1,000 francs.

For electricabs the maintenance of the accumulators must be taken into account, which comprises the renewal of worn plates, which varies according to make and rule of service.

The experience of electric tramways in the interior of Paris (where the aerial conductor is forbidden and accumulators are obliged to be used) is now sufficiently extended to enable cost of their maintenance to be pretty well arrived at, but these accumulators, with a leaden base, are too heavy to be used by cabs. For these

where rapidity of charging is not indispensable, accumulators of large capacity are needed, under a relatively light weight. To this day the oxygen accumulators are the only ones fulfilling these requirements.

Experience has not yet pronounced on this, and nothing can be said as to the exact cost of the maintenance of such accumulators used in hackney coaches in a town like Paris.

A price of 2·50 francs has been quoted for the maintenance of accumulators of electricabs in London; but these accumulators seem to be a little heavy, and not to have a sufficient capacity. We base our calculations on the proposals made by different competitors, at the rate of 4 francs per charge, and for 450 kilogrammes, = 990 lbs., weight of accumulators (genre Fulmen).

SUNDRY EXPENSES.

Evidently these expenses do not represent the whole cost of a cab in service in Paris. By way of proof, it is only necessary to recall each yearly report of the administrative council of the Compagnie Générale des Voitures à Paris, which is sent out to the shareholders.

From that one can see that the actual net daily cost of a cab by animal traction can, after modification of certain figures by reason of the special conditions of this Company, be fixed at :—

	Francs.
Expenses of administration and sundries	0·82
Accidents and damage	0·34
Rent of depôts and maintenance of buildings ..	1·02
Staff, grooms, washers, &c.	0·94
Dryers	5·37
Taxes and duties	2·42
Horses*	5·68
Rolling stock, tools, &c.	2·67
	29·26

Amongst these expenses a certain number remain constant and others vary a little.

The 5·68 francs for horses, corresponding with 3½ H.P. per cab, are done away with or replaced by consumption of energy and maintenance of accumulators. The 2·67 francs of the rolling stock will be sensibly increased, as the maintenance of the body and wheels, amounting to 2 francs, will have to be added to the maintenance of pneumatic tyres, about 2 francs, and that of the motors and transmissions, for which we must reckon 3 francs with the petroleum and 1·50 francs with the electric motor.

Nature of Expenses.

—	Horse.		Petrol (spirit).		Electricity.	
	frs.	frs.	frs.	frs.	frs.	frs.
Administration, &c. ..	0·82		0·82		0·82	
Accidents and damage	0·34	3·58	0·34	3·16	0·34	3·16
Taxes and duties ..	2·42		2·00		2·00	
Rent of depôts and buildings	1·02	1·02	0·30	0·30	0·51	0·51
Drivers ..	5·37		5·37		5·37	
Grooms and washers..	0·94	6·31	0·34	5·71	0·44	5·81
Vehicle ..	2·67	2·67	2·0		2·00	
Tyres (pneumatic)	—	—	2·0	7·00	2·00	5·00
Motor and transmitting gear .. .	—	—	3·0		1·00	
		13·58				14·48
Maintenance of accumulators	—	—	—	—	4·00	4·00
Energy	5·68	5·68	—	—	—	—
		19 26		16·38		18·48

Calculation of Net Cost.—To sum up, it is estimated that a net cost of a cab by mechanical traction (petroleum and electricity) can be fixed comparatively with that of a cab by animal traction (*see* above table).

* This evidently includes cost of forage.—ED.

If the data obtained at trials will permit of determining, at least approximately, the quantity of energy consumed per day per carriage, or per carriage per kilometre, will the special terms on which the provisional factory was worked furnish us with any particulars of its net cost? Happily for this question, data abound.

We adopt the price of 0·12 franc per kilowatt-hour furnished to the accumulators that the Compagnie Générale des Voitures à Paris hope to obtain in the works that they have established for putting on the road 1,000 electricabs.

This net cost, decidedly inferior to that of the different sectors supplied by electricity, as with tramways, cannot be obtained, but only if each carriage disposes of sufficient batteries of accumulators, so that one can be in use while the other is being charged, under the unvarying conditions and the continued production of electricity, which alone will assure an economical run of the works.

This latter consideration corroborates what we have said on the absolute necessity of having, from the point of view of the washing and cleaning of the carriage, accumulators that can be easily and economically removed.

These general notes on vehicles, from the report of M. Forestier, may here be concluded, although the report itself contains much additional information.

UNIVERSAL LIGHTS FOR VEHICLES.

THREE more counties—London, Somersetshire, and Essex—have adopted the principle of universal lights, and in course of time, it may be hoped, the remaining few will be compelled by the force of public opinion to fall in line with the majority. If object-lessons were needed they could be found in the accidents, some fatal, that have lately been recorded in the counties where no lights bye-laws are in force. There is danger enough at night, says the C.T.C. *Gazette*, even in the enlightened counties, for in Surrey itself a rider was killed last month through colliding with a pony that was tethered to a trap. A case of this kind seems impossible to cope with. The idea of illuminating an animal may seem comical enough, but there was no humour in the situation for the man who is now in his grave, and if it is only possible to warn riders against timber and other inanimate projections, the practice of towing horses in the dark might reasonably be forbidden as a violation of the spirit of a law intended to conserve the public safety. In the unenlightened counties, of course, the risks are more imminent and manifold, every cart or carriage on the road at night being a possible cause of disaster, save in those cases where the drivers may have voluntarily affixed a lighted lamp. It daily becomes more difficult to justify the agriculturalist opposition to a much-needed reform.

We quite endorse our contemporary's views The contention in favour of one system of lights for the whole country is eminently sound and logical. These are precisely the reasons why it would be so difficult to legalise such a system. This reform will come in time, but so long as our county councils, local boards, and municipal bodies in general are manned by persons who are generally hopelessly prejudiced, reforms are simply not within the range of practical politics. It has taken something like a quarter of a century to bring street noises and street organs in London within the regulations of the police, and that in an incomplete and unsatisfactory manner. There are district councils and other local bodies by the score in England that stedfastly refuse to have anything to do with water supply and sewage schemes because of the increase of rates. Is it then likely that members of such bodies will agree to a bye-law or regulation that adds to their legal liabilities as owners or drivers of horse-drawn vehicles, and to the expense of working such vehicles? We think not. Nothing but an Act of Parliament will effect this. The whole law relating to vehicles might well be consolidated. It has taken nearly 50 years to consolidate the law relating to nautical moto-vehicles, why should we think that less time will be taken to place our inchoate law of land vehicles on a satisfactory basis?

On the Choice of a Moto-Vehicle.—In response to several inquiries, chiefly from medical and other professional men residing in the country, an article on this subject is in the course of preparation, and will appear in our next issue.

!" CUANDO escribe, refiérese Al "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL."

CORRESPONDENCE.

*** *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

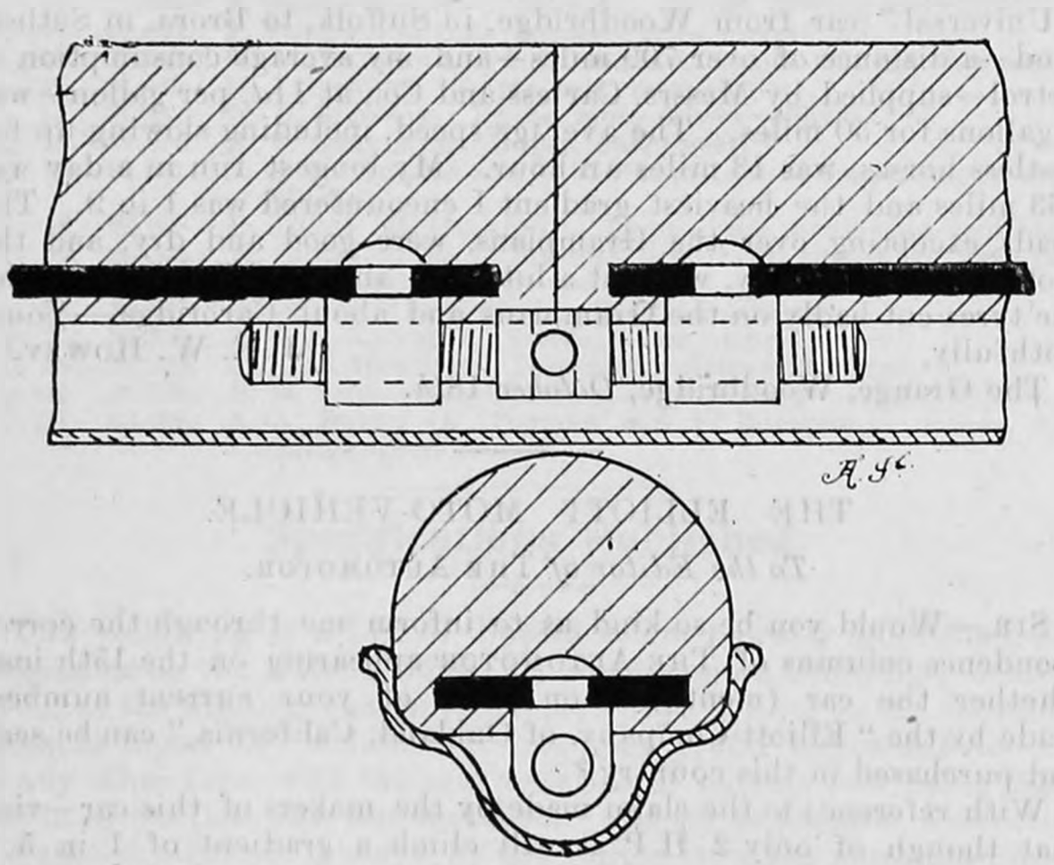
*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

*** *Correspondents are particularly requested to write on one side of the paper* ONLY, *to place the subject of their letters as a headline at the top of the sheet, and their names and addresses at the foot. Attention to these matters saves much time and ensures the insertion of the letter.*

MOTO-CAR TYRES.

To the Editor of THE AUTOMOTOR.

SIR,—With reference to the above I herewith enclose you a sketch of the system of attaching tyres to the rim used by Messrs. Reynolds and May, who constructed the Phantom bicycle. I rode one of these machines for years previous to 1874. The tyres were vulcanised on a steel ribbon, not quite meeting at the ends of the rubber, and two nuts were fixed to the steel ribbon near the joint



of the tyre (as shown), which were drawn together with a right and left handed screw.

For some time it was a mystery to me how this tyre was joined as the joint was picked up so tight, but one day, after years of riding, the right and left handed screw gave way, and it was only then I discovered how it was fastened, and after putting in a new screw the tyre lasted for a long time. My sketch makes this arrangement perfectly clear, and I think that if a tyre like this were made and put on the market it would have a great future for moto-cars.

Another system of fixing tyres which is now forgotten was used by Otto, in which a spiral wire was run through the tyres, and the ends of the wire, being spiral, could be screwed one into the other and stretched over the rim with a special apparatus.—Yours faithfully,

CHAS. T. CROWDEN.

Motor Works, Leamington, *October 22nd.*

UNPATENTED INVENTIONS AT EXHIBITIONS.

To the Editor of THE AUTOMOTOR.

SIR,—It has been publicly announced that the Board of Trade has granted the usual certificate for the Stanley Show, protecting unpatented inventions. In the interests of exhibitors, we think a few remarks in explanation are desirable, especially as they also apply to the National Show, and many other industrial exhibitions.

The protection is for the purpose of enabling a valid patent or registration to be afterwards obtained for the invention. Many people are still unaware of the fact that an invention, in order to be validly patentable or registerable, must (in ordinary cases) not have been exhibited, or used in public, or described in a published work before the date of application for the patent or registration. If it has been so published, then any patent or registration taken out afterwards will be invalid in law, and easily liable to revocation.

But it is not sufficient merely to know that the exhibition has been certified by the Board of Trade. Inventors are, in fact, *not protected* at all, unless they give prescribed notice beforehand to the Comptroller of Patents of their intention to exhibit. The form of notice must be filed *before* exhibiting the invention or design, and be accompanied by a short description. After this, the inventor may exhibit his invention and publish any description of it during the continuance of the exhibition, and will then be able to apply for a patent (or protection) or registration within six months of the opening of the exhibition, but not later.

It may be remarked, as a point of some interest, that an inventor can, by the above process, obtain first six months' and then nine months' protection, or a term of 15 months' protection before proceeding with the full patent.

Apologising for the length of this letter.—We are, yours faithfully,

STANLEY, POPPLEWELL, AND CO.,
Chartered Patent Agents.

London, *October 21st.*

A CORRECTION.

To the Editor of THE AUTOMOTOR.

SIR,—My attention has just been drawn to your remarks in a review of the "Transactions of the Liverpool Engineering Society," in which Mr. W. White is mentioned as having quoted some of my figures on the weight of mechanical road vehicles for heavy loads.

Both the quotations to which you refer are, as you suspect, extremely inaccurate. If your readers will refer to p. 107 of THE AUTOMOTOR of December, 1897, they will find what I said correctly reported, namely, amongst other things, that a moto-wagon to carry a 10-ton load would weigh at least 14 tons with its full load, *i.e.*, 3½ tons per wheel.

In the same report are other remarks to which I might direct the attention of those interested.—I am, yours faithfully,

W. WORBY BEAUMONT.

[We have communicated with the secretary of the Liverpool Engineering Society, drawing his attention to the above, as we think that such a serious error may have a prejudicial effect on the industry unless corrected.—ED.]

THE PRICE OF PETROL IN FRANCE.

To the Editor of THE AUTOMOTOR.

SIR,—What are the prices of petrol in France? I understand they are much higher than in England. Yet automobilism is much more common there than here.—Yours faithfully, M.I.C.E.

Great George Street, S.W., *October 29th.*

[The price of petrol in France varies according to the distance of the locality from the refineries, which are mainly situated in the north. In Paris, stelline and oleonaphtha cost 0·40 franc per litre, or 1*s.* 5*d.* per gallon; moto naphtha per bidon of 10 litres costs 3·60 francs, or 1*s.* 5*d.* per gallon; the highest price being 1*s.* 9¼*d.* per gallon, which is that obtaining in the more remote districts. The latest quotation we have for moto naphtha at Paris is 32·50 francs per hectolitre, or 1*s.* 2*d.* per gallon. At Marseilles, American naphtha is 50·0 francs per hectolitre, or 1*s.* 9½d. per gallon. Allowance of 1*s.* 2*d.* per empty 10-litre bidon is made on return. These prices are ex depôt, and the franc is taken at 9½*d.* See special article on "Supply of Petrol" in current issue.—ED.]

SPEED OF MOTO-CYCLES.

To the Editor of THE AUTOMOTOR.

SIR,—What is the greatest speed ever attained by a moto-car? Is it possible to go, say, 20 miles an hour on an ordinary country road with one? Are pneumatic tyres essential for a high rate of speed? Is petrol dangerous? I am told that it is. What is a fair price for a good moto-cycle? I, as you will gather from my profession, am frequently required to travel long distances, and very often the cost of the journey is not compensated by the fee one receives. Most of my professional brethren advocate moto-cars,

but then the expense is so great. Are they really cheaper to work than gigs or carriages? It is difficult to obtain reliable information on this matter. One of our local jobmasters assures me that only wealthy people can afford moto-cars, and that it is necessary to engage a skilled engineer as driver. Apologising for asking so many questions.—I am, Sir, yours faithfully, F.R.C.S.

[The greatest speed attained so far by a moto-vehicle is 32 miles per hour (*vide* paper by M. Périssé in the present issue). M. Jamin, in the Paris-Dieppe Races of 1897, maintained a speed of 24·5 miles per hour (*vide* THE AUTOMOTOR, August, 1897). It is quite possible to go at 20 miles per hour on ordinary good country roads. Pneumatic tyres are not essential for speed, but advisable for comfort. The Automobile Association supply moto-cycles from 70 guineas. Petrol is not dangerous, provided that it is used with a due regard to its physical properties. The other questions we answer in a special article in the present issue.—ED.]

A RUN WITH THE HON. C. S. ROLLS.

To the Editor of THE AUTOMOTOR.

SIR,—As I had the honour of accompanying the Hon. C. S. Rolls on his moto-car from London to Maidstone in the Autumn Tour of the Automobile Club, I have pleasure in sending you the following account of the run, with the hope that the same will be of use to you:—

Mr. Rolls's car was a 6 H.P. Panhard and Levassor Daimler, the motor of which ran more silently and with less vibration than any English Daimler moto-car I have ever ridden in; and upon my mentioning this, Mr. Rolls remarked that it surprised most people over here, who thought there was "only the Coventry Daimler."

The car is geared for about 25 miles per hour, and this can be increased downhill by putting the accelerator into action, by which means the governor springs of the motor are so tightened as to practically put no limit on the speed.

A very efficient water-cooler is provided, consisting of a number of about 1-inch tubes fitted with aluminium flanges or "fins," and upon arriving at Maidstone this apparatus was only just warm, although but a small quantity of water is carried.

The car was built to take a detachable back seat for two persons and a leather hood, but these Mr. Rolls had left behind, as he anticipated a few "fast" cars on the run, which he said would mean a "rather thick time."

Mr. Rolls started almost last from the Club, at about 1.45 p.m., and, making as good a speed as possible through the traffic, caught up the two Club wagonettes at Tulse Hill (although they had had a start of about 15 minutes), and went on by the Crystal Palace to Southend ("not on Sea"), and then to Bromley, where we arrived at 2.45, having covered the first 13 miles in one hour.

We could then make a better speed, and very shortly had passed Farnborough, between which town and Riverhead we went through some beautiful country, and in running down some of the hills with the accelerator in action, the car must have attained a speed of nearly 30 miles per hour, but down one hill we suddenly came to a very sharp turn, and I thought we should never get round.

I was sitting on the footboard to keep a little out of the draught, and when I saw the corner we had to take I "jammed" the accelerator out of gear and hung on.

Mr. Rolls put the motor out of gear and applied the brake, and although we were travelling at about 25 miles an hour, Mr. Rolls took the car round safely, but it is doubtful whether any but an experienced hand, well acquainted with the car, could have done so.

I then breathed again.

We ran into Riverhead at 3.30, having covered 12 miles from Bromley in 45 minutes, and after climbing up the hill, continued on to Maidstone at even a greater speed, at one time covering a mile in 2 minutes 15 seconds, and arrived at our destination—the first out of about nine cars—at 4.25, completing the last 17½ miles in 55 minutes.

In conclusion, I can only add praises on the excellence of Mr. Rolls's driving, and the comfort and quietness of his moto-car in general, but after this run and a short run on a Daimler "twin" at 32 miles per hour, I am afraid I have acquired a fair appetite for high speed "motoring." Apologising for trespassing so far, I remain yours faithfully, H. M. S.

P.S.—I have since seen Mr. Rolls, and hear that he was first *everywhere*.

THE CONSUMPTION OF PETROL.

To the Editor of THE AUTOMOTOR.

SIR,—Your correspondents may be interested to know that I drove one of our 15 B.H.P. wagonettes from Llandudno to Shrewsbury, a distance of 80 miles, on September 20th, and that the amount of spirit consumed was 5½ gallons, or very nearly 15 miles for a gallon.—Yours faithfully, A. C. CRAGG, Sec. and Managing Director, The Motor Touring Co. (Ltd.).

P.S.—The running time was 6 hours 35 minutes.

[We are always obliged for careful statements affecting consumption. The above information would be more valuable if the weight of the vehicle loaded were given. For the benefit of other users and to facilitate comparison the above information should be thus stated:—

Weight of loaded vehicle	
Mean speed—miles per hour	12·16
Consumpt—pints per hour	6·68
„ „ per mile	0·55—ED.]

To the Editor of THE AUTOMOTOR.

SIR,—In reference to a letter from the Falkirk District Motor Company, *re* consumption of petrol, last July I ran a Daimler motor "Universal" car from Woodbridge, in Suffolk, to Brora, in Sutherland—a distance of over 700 miles—and my average consumption of petrol—supplied by Messrs. Carless and Co., at 11*d.* per gallon—was 2 gallons for 50 miles. The average speed, including slowing-up for restless horses, was 13 miles an hour. My longest run in a day was 163 miles and the heaviest gradient I encountered was 1 in 9. The roads, excepting over the Grampians, were good and dry, and the motor ran splendidly, without a hitch of any kind beyond getting the tyres cut badly on the Grampians and about Carbridge.—Yours faithfully, J. E. W. HOWEY.

The Grange, Woodbridge, *October* 18*th*.

THE ELLIOTT MOTO-VEHICLE.

To the Editor of THE AUTOMOTOR.

SIR,—Would you be so kind as to inform me through the correspondence columns of THE AUTOMOTOR appearing on the 15th inst. whether the car (mentioned on p. 21 of your current number) made by the "Elliott Company, of Oakland, California," can be seen and purchased in this country?

With reference to the claim made by the makers of this car—viz., that though of only 2 H.P. it will climb a gradient of 1 in 5, I was at first sight very sceptical, but I found on calculating that with two passengers weighing together 300 lbs. (giving a total weight of 1,000 lbs.) the resistance due to gradient would be only 200 lbs, which at three miles per hour would require 1⅗ H.P. to overcome it, thus leaving ⅖ H.P. to overcome friction, while on a perfectly level road at the maximum speed mentioned—15 miles per hour—2 H.P. would be just sufficient to overcome this amount of friction. Thus there is no reason why 2 H.P. should not suffice to drive the car as stated These facts appear to me to bear out to a great extent your very true remarks in one of your numbers that the horse-power claimed by many makers for their motors is misleading. If a maker would state at what speed his cars—loaded with passengers weighing a stated number of pounds—could climb a stated maximum gradient (*e.g.*, 1 in 5), and also their maximum speed on a perfectly level road with the same load, he would give far more information than the maker who states that his car is of "such and such a horse-power, and will carry so many passengers."—Yours truly, E. RIDGWAY BRIDSON.

Wolvercote, Heaton, Bolton-le-Moors.

[The paragraph in question was taken from an American exchange. So far as we know the Elliott Company have no representative on this side. Your better plan would be to communicate with them direct. We are glad you appreciate our remarks on horse-power.—ED.]

Personal.—Messrs. Starley Bros. and Westwood, of Birmingham, advise us that Mr. F. Walker has been appointed their representative for fittings, accessories, forks, &c., for Notts, Leicester, Manchester, Oldham, and the North of England generally.

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1898.

Oct.	3.	20,763.	J. K. STARLEY. Impts. relg. moto-cycles.
,,	3.	20,765.	H. AUSTIN. Fixing motors to cycles and gearing same to crank axles.
,,	3.	20,811.	J. PENDER. Driving and controlling mechanism of motors.
,,	3.	20,816.	W. RENNIE. Impts. self-propelled vehicles.
,,	3.	20,818.	H. SPURRIER. Brake and steering apparatus.
,,	5.	21,004.	W. H. WAND. Impts. machinery for moto-cars.
,,	6.	21,086.	H. G. C. THOFERN. Impts. relg. moto-vehicles.
,,	7.	21,131.	E. TAYLOR. Joining cycle and moto-car frames.
,,	7.	21,132.	E. TAYLOR. Joining cycle, &c., frames without brazing.
,,	7.	21,155.	J. P. JUVENET (E. M. D. de Siblas). Impts. electrically-propelled vehicles.
,,	8.	21,222.	W. CORNELIS. Reversing gear for moto-cars, &c.
,,	10.	21,283.	R. E. PHILLIPS. Impts. driving gear.
,,	12.	21,423.	J. G. INSHAW. Construction of steam moto-vans, &c.
,,	12.	21,434.	W. ALEXANDER and A. HENDERSON. Chain gear.
,,	14.	21,600.	F. GRACE and W. C. MARTIN. Impts. driving mechanism.
,,	14.	21,654.	J. VREUGDENHILL. Impts. cycles, motors, &c.
,,	14.	21,685.	W. H. BARKER and J. LANGCAKE. Impts. transmitting power.
,,	14.	21,685.	H. J. LAWSON. Impts. relg. moto-cycles.
,,	15.	21,693.	W. E. SIMPSON. Impts. moto-driven vehicles.
,,	18.	21,880.	F. V. BARTLETT. Impts. chain gear.
,,	18.	21,931.	F. R. MCMULLIN and C. T. HILDEHANDT. Impts. motor road-vehicles.
,,	19.	22,005.	C. JUNGE (M. Crawford). Impts. relg. motor road-vehicles.
,,	24.	22,298.	W. SIMPSON, W. L. BODMAN, and D. H. SIMPSON. New construction of moto-driven vehicle.
,,	24.	22,297.	W. SIMPSON and others. Starting devices.
,,	25.	22,385.	J. G. A. KITCHEN. Impts. steam moto-vehicles.
,,	28.	22,668.	J. T. M. HIRCOCK. Impts. eccentrics and straps.
,,	29.	22,729.	B. M. THWAITE. Electrical propulsion of cars, &c.
,,	31.	22,886.	A. J. BOULT (A. Tocquet and P. Bucheron). Impts. relg. change speed devices.

Specifications Published.

THE following is a List of Specifications recently published, and obtainable at the Patent Office, 25, Southampton Buildings, London, W.C., at the uniform charge of 8*d.* per copy. Owing to the enormous pressure upon our columns it has been found impossible to deal in any other form with the accumulation of patents now being taken out in connection with automobilism. As far as possible, a selection for special mention is made by the Editor from the more prominent inventions:—

Applied for during 1897.

19,642. G. C. DYMOND (A. Meyer, Cannstatt, Wurtemburg, Germany). Process for attaining a very high ignition temperature in hydro-carbon engines.

22,364. T. CLARKSON and others, Deverell Street, Great Dover Street, London. Oil or similar burners.

24,469. H. RENOLD, Green Lane, Manchester. Pitch chains.

20,749. R. LANZONE and E. LANZONE, 132, Nassau Street, New York, U.S.A. Rotary engines.

20,761. J. ROOTS, 100, Westminster Bridge Road, S.E. Internal combustion engines.

20,880. C. M. IRONMONGER, Hillside, Lea Road, Wolverhampton. Rotary engines.

21,702. S. STRAKER, 139, Cannon Street, London. Driving and reversing gear.

19,698. C. M. JOHNSON, 22 and 23, Laurence Pountney Lane, London, E.C. Motor road vehicles.

19,936. J. P. O'DONNELL (P. A. T. de Bouilhac, Bourzac). Moto-cars.

20,236. J. F. SHAW and J. H. SHAW, 2, Elvey Street, Newton Heath, Manchester. Lubricating and method of supplying in regular quantities combustible liquids for driving purposes.

22,060. F. I. GIBBS and W. WRIGHT, 70, Lower Hurst Street, Birmingham. Hubs and frames.

22,276. H. W. HANDCOCK and A. H. DYKES, 5, Victoria Street, London, S.W. Electrical propulsion of barges and boats on canals and rivers.

14,910. Electric Motors. H. W. Headland, The Firs, High Road, Leyton, Essex. June 19th, 1897.

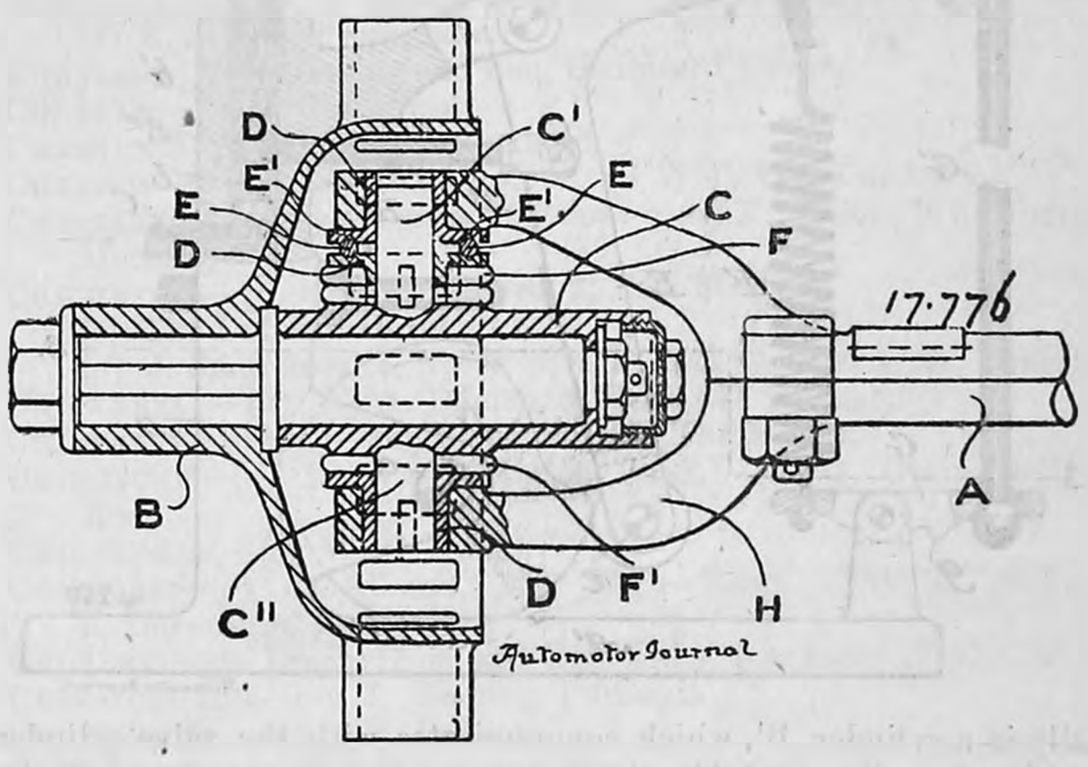
Relates to such electric motors in which the field magnets and the armature rotate against each other, both driving the same shaft. The armature is fixed on the shaft and the field magnets are applied to a casing or frame rotating freely on the shaft. On the casing is fixed a bevel or skew wheel rim, and on the shaft is fixed a bevel or skew wheel; between the two a spindle is provided fitted with two bevel or skew pinions, which gear respectively with the aforesaid wheel on the field magnet casing and with the wheel on the motor shaft; the inner end of this pinion spindle works in a bearing or standard wherein the motor shaft turns. The motor shaft may be vertical, horizontal, or slanting, and the power may either be taken off that shaft or off the pinion spindle.

17,776. Wheels for Mechanically-Propelled Carriages. E. J. Clubbe and A. W. Southey, 16, Elm Street, Gray's Inn Road, W.C. July 29th, 1897.

Relates to improvements in the form of centrally pivoted steering wheels, shown in Letters Patent No. 14,284/96.

The wheel spindle is preferably keyed into an outer extension of the hub of the wheel, thus allowing the wheel to be as readily removed as an ordinary carriage wheel, by taking off the cap and nuts in the usual manner.

The end of the main axle arm is provided with an eye, in which a turning plate is fitted, or the turning plate may be made in one with the axle arm, the upper pivot of the box is fitted concentrically in this turning plate, and is free to move telescopically in it. The



turning plate if necessary may be provided with a ball race, in which anti-friction balls work to reduce the friction of turning.

Below the turning plate is provided an elastic spring or cushion on which the lower half of the turning plate is supported in order to relieve the pivoting point from shocks by permitting the pivots of the box to play telescopically in their bearings.

In order to hold the box and turning plate rigidly a second axle arm is provided which is bolted to the main axle arm forming a forked end, this second axle arm is provided with an eye in which the lower pivot of the box turns. A second spring may if required be fitted between the lower axle-arm and the pivoted box.

The above-mentioned spring device may be used in connection with the other wheels of the carriage, the steering pivot in this case not being used.

28,262. Moto-Vehicles. H. H. Lake. Communicated by Olds Motor Vehicle Company, 210, River Street, Lasing, Michigan, U.S.A. November 30th, 1897.

Relates to that type of moto-carriage in which the motive power is produced by a gasoline motor.

The invention provides for a light and strong frame, of which the engine and the rear shaft of the vehicle are the component members and upon which the body is supported by springs.

It further provides a simple transmission gear, which directly transmits the motion from the engine-shaft, arranged transversely of the carriage, to the rear axle, and which provides for three

different speed-gears under the easy and prompt control of a single lever, giving the necessary changes of speed required for the different purposes of level roads and hills and for starting and backing, all so arranged that it is not possible to pass from one rate of speed to the other without the wheels being entirely thrown out of gear before a new speed is given, while at the same time motion is transmitted without shock.

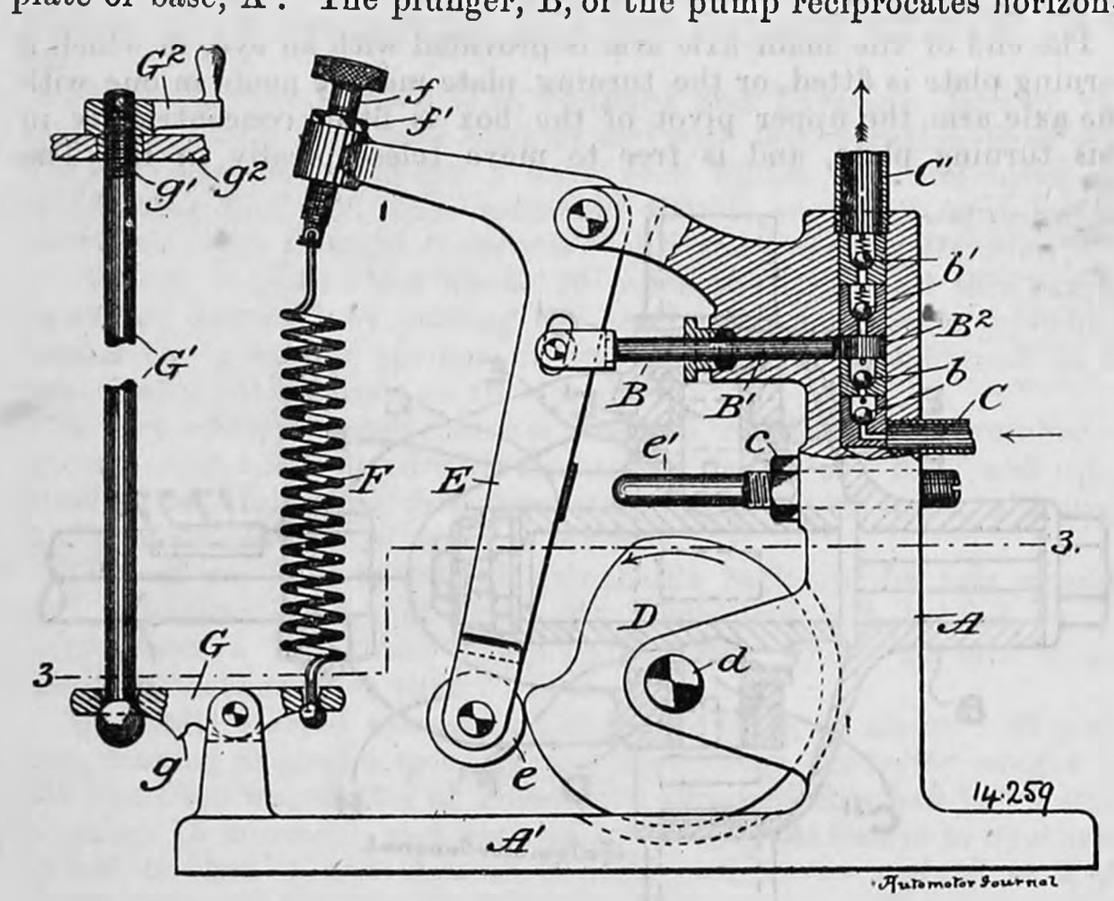
The invention also embraces simple steering-gear and other specific improvements of the parts.

14,259. Explosion Engines. P. M. Justice. Communicated by the Pope Manufacturing Company, Hartford, Connecticut, U.S.A. June 28th, 1898.

Relates in general to explosion engines of that class in which the fluid which forms the basis of the explosive mixture is fed to the explosion chamber of the engine in proper quantity for each successive charge, and more especially to the means for supplying the fluid and for regulating the supply with the ultimate object of regulating the speed and power of the engine.

The figure is a side elevation, partly in vertical section, of the feeding and governing devices.

The pump by which the fluid is fed to the explosion chamber or cylinder of the engine, in rear of the piston, is represented as formed in and supported by the upright or standard, A, erected upon a bed plate or base, A^1. The plunger, B, of the pump reciprocates horizon-



tally in a cylinder, B^1, which communicates with the valve cylinder or chamber, B^2. Suitable check valves, *b* and b^1, are placed in the latter to ensure the forward movement of the fluid, and the supply pipe, C, and delivery pipe, C^1, are connected to the valve cylinder or chamber. The main actuator, D, is a cam of proper configuration which may be driven by a shaft, *d*, and gears, d^1, d^2, from the main engine shaft, D^1. For transmitting power from the main actuator, D, to the plunger, B, a lever, E, is used to which the plunger, B, is connected and which itself may bear upon the actuator, D, through the medium of a roller, *e*. A spring, F, is applied to the transmitter, E, in such a manner as to cause the latter to bear normally against the periphery of the actuator or cam, D, throughout its entire rotation and being connected to the transmitter by an adjusting screw, *f*, so that the tension of the spring can be varied, a check nut, f^1, being applied to the screw, *f*, to retain it in adjusted position. A stop screw, e^1, and check nut, *c*, may be provided to limit the throw of the lever, E, and consequently the throw of the plunger, B, in one direction.

For placing the governor mechanism under the control of the engineer or operator, the spring, F, is connected to one end of a rocking lever, G, the other end of which is connected to a controlling shaft, G^1. The latter is provided with a screw-threaded portion, g^1, to which is applied a crank handle, G^2, having its hub threaded and bearing upon a plate, g^2, through which said controlling shaft passes, so that by rotation of said crank the tension of the spring, F, can be varied at will. The rocking lever, G, may be provided with a stop, *g*, so that the controlling shaft or rod, G^1, may be detached and the tension of the spring, F, be regulated by the adjusting screw, *f*, alone. A modification is described.

PETROL STORES, REPAIRERS, AND STORAGE OF MOTO-VEHICLES.

THE following list comprises the information already given in past issues and in THE AUTOMOTOR POCKET-BOOK, with additional particulars obtained since.

It must be understood that we do not vouch for the complete accuracy of the information or the competency of the repairing firms mentioned, but it is hoped that our readers will assist in the composition of a complete and reliable list by sending us, from time to time, corrections in and additions to the matter following:—

References.

(*a*) Moto-Car Spirit or Petrol. (*b*) Repairs. (*c*) Accommodation for storing Moto-vehicles. (*d*) Hold Moto-Car Spirit License; will stock when requested and as demand grows. (*i*) Ironmonger. (*o*) Oil Merchant. (*) Authorised Agents of Messrs Carless, Capel, and Leonard.

ENGLAND AND WALES.

ABBEY WOOD (Kent)—(*a*) J. Smart and Co.
ABERDARE—(*d*) T. Davies.
ABERYSTWYTH—(*d*) M. H. Davis and Son, Bridge Street.
ABINGDON—(*d*) Brind, Gillingham, and Co., 30, Ock Street.
ACTON—(*d*) W. Trussler, 21, Bollo Bridge Road. (*d*) F. Margetts, 50, Church Road.
ADDISCOMBE—(*d*) A. E. Isaacs, 56, Lower Addiscombe Road.
ALDERSHOT—(*d*, *i*) B. Cullen.
ALFORD—(*d*) J. Stones.
ALRESFORD—(*c*) Crown Hotel.
ALTON—(*a*, *i*, *) Hetherington and Son.
(*c*) Swan Hotel.
(*d*, *i*) H. J. T. Smith. (*d*) Cox and Co., Normandy Street.
AMPTHILL—(*d*) Coleman and Co.
ANDOVER—(*a*, *i*, *) T. Lynn.
(*d*) C. E. Bennett, 3, London Street.
APPLEDORE—(*d*) Avery and Son.
ARDINGLEY—(*d*) H. Sayers and Sons.
ARUNDEL—(*d*, *i*) A. Pain, High Street.
ASHBOURNE—(*d*) Wooddisse and Desborough, Market Place. (*d*) J. Osborne.
ASHBURTON—(*d*) W. Distin. (*d*) H. Wills.
ASHBY-DE-LA-ZOUCHE—(*d*) J. and E. Ison and Son. (*d*) H. and E. Bullen.
ASHFORD (Kent)—(*a*, *) J. Broad, 24, Park Street.
(*d*) Jno. Williamson, 5, High Street. (*d*, *i*) J. and W. Bugler, 35, High Street.
ASHTON-UNDER-LYNE—(*d*) W. Bostock and Sons, Burlington Street.
ASTON CLINTON—(*d*) H. A. Piper.
AXMINSTER—(*d*) J. Smyth. (*d*) W. J. Enticott. (*d*) F. Otton.
BAGSHOT—(*d*, *o*) F. C. Norman.
BALDOCK—(*d*) J. Redhouse, Hitchin Street.
BALHAM—(*d*) Battershill, Cavendish Road. (*d*) Cole Bros., Balham High Road.
BANBURY—(*d*, *i*) S. and E. Hood, 33, Bridge Street. (*d*) G. J. Robins, 16, Market Place. (*d*) Mawle and Son, 63, High Street. (*d*) Broughton and Wilkes, 37, Market Place.
BANGOR—(*d*) Jos. Hughes and Co., High Street. (*d*) W. Francis Williams, High Street.
BARKING—(*d*) T. Pelling, 21, Broadway.
BARNARD CASTLE—(*d*) Joshua Burn and Son, Horse Market.
BARNET—(*d*) G. Salmon, 130, High Street, High Barnet. (*d*) G. Salmon, 5, Market Place, New Barnet.
BARNSLEY—(*d*) Lowrance and Sons.
BARNSTAPLE—(*d*) Mrs. Williams. (*d*) J. E. Staples. (*d*) Mrs. J. Lake. (*d*) J. P. Kiell and Son. (*d*) Hunt and Son. (*d*) W. Mortimer.
BASINGSTOKE—(*a*, *i*, *) Julian and Sons.
(*d*) J. Schofield, Bunyan Place.
BASSINGHAM (Lincs.)—(*d*) J. W. Enderby.
BATH—(*a*) J. Colmer (Ltd.), Union Street.
(*d*) John Stone, Westgate Buildings. (*d*) Tom Stone, Weymouth Street. (*d*) James Thomas, Walcot Street.
BATLEY—(*d*) J. Kendall.
BATTLE—(*d*, *i*) W. J. Edwards, 75, High Street. (*d*, *o*) J. Mercer, High Street.

BAWTRY—(*d*) Jackson and Sons.
BEACONSFIELD—(*d*) Spencer and Redhead.
BEAMINSTER—(*d*) A. V. Pine. (*d*) A. and E. Toleman.
BEDFORD—(*a*, *b*, *c*) E. Pears Caporn, 48, Prebend Street.
(*d*) D. Dillon, Dane Street.
BEESTON (Notts)—(*a*) J. H. Ball.
BELPER—(*d*) Calvert and Sons. (*d*) Geo. Slater.
BENENDEN—(*d*) C. B. Butcher.
BERE REGIS—(*d*) S. E. Bemister.
BERKELEY—(*d*) P. Clark.
BETCHWORTH—(*d*) C. Harman, Church Street.
BEVERLEY—(*d*) Briggs and Powell.
BEXHILL-ON-SEA—(*d*) C. Wickens, P. O., Sidley Green.
BICESTER—(*d*, *i*) King and Son. (*d*) Palmer Bros., Sheep Street.
BIDEFORD—(*d*) R. C. Vincent. (*d*) W. Blake. (*d*) N. B. Northam.
BIGGLESWADE—(*a*) Dan Albone, Ivel Works. (*a*, *i*) Morton and Kinman.
BILLERICAY—(*d*) S. Harrington, High Street.
BIRCHINGTON-ON-SEA—(*a*) G. Cousins, cycle agent.
(*d*) E. Bushbridge, Stores, The Green.
BIRKENHEAD—(*d*) P. Morris and Co., Corporation Road.
BIRMINGHAM—(*a*) Accles (Ltd.). (*a*) E. Shufflebotham and Co., Rotten Park Street, Ichnield Port. (*a*) Francis Williams, 281, Broad Street.
(*c*) The Char-a-banc.
(*d*) J. Gilman and Sons, Stafford Street. (*d*) S. Thornley (Ltd.), Snow Hill and Gosta Green.
BISHOP'S CASTLE—(*d*, *i*) A. Greenhouse.
BLACKBURN—(*d*) J. Booth and Co., Darwen Street. (*d*) R. Jephson, 12, Fleming Street.
BLACKPOOL—(*a*, *b*) Blackpool Motor Car Co. (Ltd.) The Kiosk, Talbot Square. (*a*, *b*, *) A. W. Goodall, 78, 80, and 82, Gorton Street.
BLANDFORD—(*d*, *i*) Heizman, jun., 3, Salisbury Street. (*d*) J. W. Blandford, Salisbury Street. (*d*) Lindsay and Darymple.
BODMIN—(*d*) R. H. Cardell.
BOGNOR—(*d*) J. Smurthwaite, Lyon Street.
BOLTON—(*d*) T. Moscrop and Co. (Ltd.), Folds Road.
BOSCOMBE—(*d*) H. Smith, Palmerston Road.
BOSTON—(*d*) Grimble and Kent.
BOSTON SPA—(*d*) A. Cole.
BOURNEMOUTH—(*d*) Williamson and Son, Stores, Arcade. (*d*) J. Rogers and Co., 27, Triangle. (*d*) W. Haydon, Lansdowne.
BOVEY TRACEY—(*d*) P. W. Peters.
BOWERS GIFFORD—(*d*) M. T. Reddington.
BRACKNELL—(*d*) T. Laurence and Son.
BRADFORD—(*a*, *b*) Yorkshire Motor-Car Co. (Ltd.), Albert Buildings. (*d*) W. A. Matthews.
BRAINTREE—(*d*, *i*) R. W. Barton. (*d*, *i*) Bloomfield and Son. (*d*, *i*) Crittall and Winterton.
BRAMLEY—(*d*) Langrish and Son.
BRENTFORD—(*d*) Box and Co., 120, High Street. (*d*) Wild Bros., High Street.
BRENTWOOD—(*d*) R. P. Guest, High Street. (*d*, *i*) H. Paul and Son, High Street. (*d*) Wright Bros., Warley Road.
BRIDGNORTH—(*d*) Deighton and Smith. (*d*) Jos. Weavers.
BRIDGWATER—(*a*) H. Curver, cycle agent.
(*d*) Gregory and Co., High Street. (*d*) Hickman and Son (Ltd.). (*d*) Halson and Son. (*d*) Thompson Bros.
BRIDLINGTON—(*d*) R. Gatenby.
BRIDPORT—(*d*) H. N. Cox and Son. (*d*) J. Ralls.
BRIGG—(*d*) G. H. Gibson.
BRIGHTON—(*a*, *b*, *c*) Brighton Cycle and Motor Co. (Ltd.), 9, Marine Parade.
(*d*) G. F. Tullett, 3, Cheapside. (*d*) J. Evershed and Son, 36, Easton Road.
BRINKLEY—(*d*) Commercial Store Company.
BRISTOL—(*a*) Colthurst and Harding.
(*d*) T. Harris and Son, Wine Street and Thomas Street. (*d*) Fisher's Caude Co., Temple Street. (*d*) W. H. Hawker, Quay. (*d*) F. C. Prentice, Clifton.
BROMSGROVE—(*d*, *i*) G. Brown. (*d*, *i*) John T. Taylor.
BROOKLAND—(*d*) C. Claydon.
BRUTON—(*d*) W. P. Buckley.
BUCKFASTLEIGH—(*d*) W. Heft.
BUCKHURST HILL—(*d*) Wilson, Queen's Road. (*d*) C. Street, Queen's Road.
BURGESS HILL—(*d*) F. Hoadley, Prospect Place.
BURNHAM—(*d*) A. Newman, High Street. (*d*) J. Watts, chemist.
BURNLEY—(*d*) J. A. Barlow, Westgate. (*d*) Francis and Co., Manchester Road.
BURSLEM—(*a*) G. T. Heath, 200, Moorland Road.
(*d*, *i*) Wardle Bros., Waterloo Street. (*d*) J. Shields, Newcastle Street.
BURTON—(*d*) F. Hallam, High St. (*d*) B. Morgan, Derby St.
BURY—(*d*) J. Hill and Son.
BURY ST. EDMUND'S—(*a*) S. C. Smith and Co., 21, Cornhill.
BUSH HILL PARK—(*d*) J. Atkinson, 2, Harman Road. (*d*) Strange 4, Avenue.
CAISTOR—(*d*) G. Winter.
CALLINGTON—(*d*) Brendon Bros.
CAMBERLEY (York Town)—(*d*, *i*) Lunn Bros.
CAMBORNE—(*d*) W. J. H. Tyack.
CAMBRIDGE—(*a*) Fredk. Swann, Quay Side, Bridge Street.
(*c*) Lion Hotel.
CANNING TOWN—(*d*) J. Cuthbert, 303, Barking Road.
CANTERBURY—(*a*, *i*, *) Court Bros., Butchery Lane.
CARDIFF—(*d*) T. Thomas and Sons.
CARDIGAN—(*d*) T. M. Daniel.
CARLISLE—(*d*) Fletcher Ritson.
CARMARTHEN—(*d*) T. Davies.
CARNARVON—(*d*) E. Hughes and Co.
CASTLEFORD—(*d*) C. Varley.
CATERHAM—(*d*) A. Rice.
CHAGFORD—(*d*) J. Bowden.
CHALFONT ST. GILES—(*d*) C. R. Marchant.
CHARD—(*d*) G. Gawler. (*d*) A. E. Norrington.
CHARLTON—(*d*) Beale and Son, Charlton Road.
CHATHAM—(*d*) Tribe and Lamb, 211, High Street.
CHELMSFORD—(*d*) J. Tomlinson, Tyndal Square.
CHELTENHAM—(*d*, *i*) Norton and Co. (*d*) A. Husty, High Street.
(*d*) R. Strang, Promenade.
CHERTSEY—(*d*) Herring and Son, Guildford Street.
CHESHAM—(*d*, *i*) C. Collins.
CHESHUNT—(*d*) C. and A. Blaxland.
CHESTER—(*d*) Cheers and Hopley. (*d*, *i*) T. Wood and Son.
CHESTERFIELD—(*d*) Greaves and Son. (*d*) T. Elliot, Whittington Moor.
CHICHESTER—(*a*, *i*, *) A. Ballard, 7, East Street.
(*c*) The Dolphin Hotel.
(*d*) J. Smurthwaite, North Street. (*d*) C. Chevis, St. Pancras.
CHICKERELL—(*d*) W. A. Damen, 3, Howard's Terrace.
CHIEVELEY (Berks.)—(*c*) J. W. Pocock, The Mount.
CHINGFORD—(*d*) D. Ward, Station Road. (*d*) G. Olson, Station Road.
CHIPPENHAM—(*d*) W. C. King.
CHISWICK—(*d*) J. Allman, 153, High Road. (*d*) M. Coates, 5, Devonshire Road.
CHORLEY—(*d*) Leach, Sons, and Co. (Ltd.), Blackacre Works.
CHRISTCHURCH—(*d*) J. Keeping, Purewell.
CHULMLEIGH—(*d*) S. R. Babbage.
CIRENCESTER—(*d*) A. H. Buncombe.
CLATFORD—(*d*) E. Redman, Lower Clatford.
CLAY CROSS—(*d*) F. Kenning, New Street.
CLOPHILL (Luton)—(*d*) H. Daniels.
COALVILLE—(*d*) J. Porter and Son, Station Road.
COLCHESTER (*a*, *)—Kent, Blaxill, and Co., 104, High Street.
(*d*) G. W. Lee, Osbourne Street.
COLLINGHAM—(*d*) T. Kemp.
COLNE—(*d*) A. Hartley, Market Street. (*d*) T. A. Hirst and Co., Market Street. (*d*) Wilkins and Son.
COLYTON—(*d*) W. Board. (*d*) R. H. and J. Follett.
COVENTRY—(*a*) Beeston Motor Co. (Ltd.), Little Park Street.
(*a*) Coventry Motor Co. (Ltd.), Fleet Street. (*a*) Endurance Motor Co., Gosford Street. (*a*) Motor Manufacturing Co. (Ltd.), Motor Mills.
(*a*, *b*) Daimler Motor Co. (Ltd.), Motor Mills.
(*d*) J. Astley and Sons (Ltd.), Broadgate.
COWES, East (I.W.)—Liquid Fuel Engineering Co.
West (I.W.)—(*a*) White and Sons, Vectis Works.
CRAIGHALL (Bedale)—(*d*, *o*) J. G. Barrett.
CREDITON—(*d*) S. Sobey. (*d*) J. C. Hoskin. (*d*) W. Ley.
CREWE—(*d*) E. Booth, Chester Bridge.
CROUCH END—(*d*) Harvey Bros., The Broadway.
CROWLE—(*d*) D. Croft.
CROYDON—(*a*) Greengrass and Docking, 62, Dingwall Road.
(*a*, *b*) C. A. Miles, Onward Cycle Works, 423, Brighton Road.
(*d*) Hammond and Hussey, High St. (*d*) G. M. Smith.

CULLOMPTON—(*d*) Mrs. Strong. (*d*) Mrs. Purchase. (*d*) Mrs. Lane. (*d*) J. Reynolds. (*d*) F. Peters.
DARTMOUTH—(*d*) H. Andrews.
DARWEN—(*d*) Jas. Grime, 315, Bolton Road.
DAWLEY—(*d*) H. S. Jones.
DEAL—(*d*) C. W. Dixon, 75, Middle Street.
DEPTFORD—(*d*) Kibble and Co. (Ltd.).
DERBY—(*a*) G. Wallis, Alaska Works, Monk Street.
(*d*) Blunt and Evans, Market Place. (*d*) Geo. Bennett, Irongate.
DEVIZES—(*d*) W. H. Burt. (*d*) A. G. Richards, Sidmouth Street.
DEVONPORT—(*d*) E. Gould and Co. (*d*) D. Sale. (*d*) H. M. Williams. (*d*) R. W. Stephens.
DEWSBURY—(*d*) J. Day, Savile Town.
DISS—(*d*, *i*) J. Aldrich and Co., Market Place. (*d*) Gostling and Son, Market Hill.
DOLGELLAN—(*d*, *i*) T. H. Roberts.
DONCASTER—(*d*) Howorth and Parkin.
DORCHESTER—(*d*) Foster and Hughes, 64, High Street, E.
DORKING—(*a*, *) C. J. Pierson and Co., 22, High Street. (*a*) Stone and Turner, 98, High Street (benzoline). (*a*) White Horse Hotel.
(*d*) C. J. Pearson and Co., 93, High Street. (*d*) F. W. Floyd, 5, High Street. (*d*) T. Dixon, Westcott.
DOUGLAS—(*d*) M. Hampton, South Quay.
DOVER—(*a*, *i*) Matthew Pepper, High Street.
(*d*) T. and F. Wright, Cannon Street.
DOWNHAM—(*d*) R. S. Bennett.
DRIFFIELD—(*d*) Taylor and Son.
DULVERTOWN—(*d*) B. Bayley. (*d*) W. G. Roberts.
DUNCHURCH—(*c*) The Dun Cow Hotel.
DUNMOW—(*d*) A. Dennis, High Street.
DUNSTABLE—(*a*, *i*, *) W. H. Brown. (*a*) The Sugar Loaf Hotel.
(*a*, *c*) Saracen's Head Hotel.
(*d*) W. Love. (*d*) W. Francis, High Street. (*d*) H. Brown, South Street.
DURSLEY—(*d*) E. Maque.
EALING—(*d*) H. Maltby and Co., 26, Broadway.
EASINGWOLD—(*d*) J. C. Bannister.
EASTBOURNE—(*a*) A. J. Feur, Pevensey Road.
(*d*) H. Marchant and Son, Old Town.
EAST DEREHAM—(*d*) R. J. Hubbard.
EAST DULWICH—(*d*) Page, 285, Crystal Palace Road.
EAST GRINSTEAD—(*a*) Bridgland Bros., London Road.
(*b*, *c*) Rice Bros., 29, London Road.
(*d*) A. and C. Bridgland, 33, London-road. (*d*) W. H. Dixon. (*d*) Martin, High Street.
EAST PECKHAM—(*d*) W. Arnold and Sons.
EDGWARE—(*a*) Lee's Stores, High Street.
EDMONTON—(*d*) Snelling and Co., Fore Street. (*d*) G. F. Good, Fore Street.
EGHAM—(*d*) A. Beadle, High Street.
ELLESMERE—(*d*, *i*) T. Coffin.
ELY—(*d*) S. C. Gotobed.
ENFIELD HIGHWAY—(*d*) H. King. (*d*) A. F. Smith.
ENFIELD TOWN—(*d*) F. F. Smith and Son, The Town. (*d*) H. L. Girling, Baker Street.
EPPING—(*a*, *) Wm. Cottis and Sons' Ironworks.
EPSOM—(*d*) Greengrass and Co.
(*d*) R. Norman, High Street.
EPWORTH—(*d*) D. Aldam.
EXETER—(*a*) Knapman and Co., 206 and 207, High Street.
EXMOUTH—(*d*) Cole Bros. (*d*) S. Tucker. (*d*) S. C. Carter.
EYE—(*d*, *i*) S. E. Bloxsome.
EYNSHAM—(*d*) H. A. Howe.
FAIRFORD—(*d*) F. Baldwin.
FAREHAM—(*a*, *i*, *) H. Clark.
FARINGDON—(*d*) Liddiard and Son.
FARNHAM (Surrey)—(*a*, *) M. and J. Tily, Castle Street.
(*b*) G. Elliot, West Street.
(*c*) The Station Hotel.
FAVERSHAM—(*d*) W. Tritton, Town Wharf. (*d*) G. Thurston Clarke, 113, West Street.
FELIXSTOWE—(*d*) L. French, Victoria Parade. (*d*, *i*) J. M. Wade and Co.
FENNY STRATFORD—(*c*) The Swan Hotel.
FENTON—(*d*) S. Massey, Market Street.
FILEY—(*d*) Ross and Son.
FISHGUARD—(*d*) W. R. Eynon.
FOLKESTONE—(*a*, *) Wm. Francis, 66, High Street.
(*d*) W. H. Stiles, Blackbull Road.
FORDINGBRIDGE—(*d*, *i*) W. F. Alexander.
FOREST GATE—(*d*) W. Newport, 73, Upton Lane.
FOREST HILL—(*d*) H. Bendy, Dartmouth Road.
FORREY—(*d*) G. Hawke and Son.
FOULMERE (near Royston)—(*d*) Jackson and Sons.
FRAMFIELD—(*d*) G. Pannett.
FROME—(*d*) Wm. Coombs. (*d*) Jackson and Son.
GAINSBOROUGH—(*a*) Heinle and Co., 50 and 168, Trinity Street.
(*d*) W. Jackson.
GILLINGHAM—(*d*) W. Slade and Son.
GLASTONBURY—(*d*) J. G. Nicholson. (*d*) W. H. Murch.
GLOUCESTER—(*a*) S. J. Moreland and Sons.
GODALMING—(*d*) G. Jones, 76, High Street.
GOOLE—(*d*) T. G. Bevan.
GRANTHAM—(*d*) Martin and Fitt.
GREAT BADDOW—(*d*) J. Liddiard.
GREAT MALVERN—(*a*, *b*) C. Sautler and Co., Colonnade.
GREAT YARMOUTH—(*a*) J. Leach, Market Place.
GREENWICH—(*d*) S. D. Poynter, Greenwich Road.
GRIMSBY—(*d*) J. W. Davis and Son.
GROOMBRIDGE—(*d*) S. and F. Killick.
GUILDFORD—(*a*, *) R. Shillingford and Co., 135, High Street.
(*a*, *b*) Lawes and Co., Bridge Street.
(*b*) Dickenson and Burne, Churchacre Works, Leapale Lane.
(*c*) White Lion Hotel; White Hart Hotel.
(*d*) Jas. Angell, Woodbridge Road. (*d*) G. Siggers, High Street. (*d*) Carling, Gill, and Carling (Ltd.), High Street.
GUNNERSBURY—(*d*) J. W. Pimblett, 541, High Road.
HADFIELD—(*d*) W. Hampshire, Station Road. (*d*) W. Richardson, Station Road.
HALIFAX—(*d*) C. Mirchell, 17, Woolshops.
HALSTEAD—(*d*) G. Portway and Son.
HANLEY—(*a*) W. Baker (Ltd.), New Street. (*a*) A. Chew and Co. (*d*) J. C. Walley, Broad Street. (*d*) J. H. Heap, Piccadilly.
HANWELL—(*d*) G. Matthews, High St. (*d*) G. Smith, Boston Rd.
HAREWOOD (Leeds)—(*d*) Scott and Son.
HARLESDEN—(*d*) S. Boatfield, 130, High Street.
HARLINGTON—(*d*) W. Redrup.
HARLOW—(*d*, *i*) J. Coleman.
HARTFIELD—(*d*) S. and F. Killick.
HARWICH—(*d*) C. J. Bevan, chemist.
HASLINGDEN—(*d*) J. H Anderton, Deardengate.
HATHERLEIGH—(*d*) J. Strong. (*d*) Friend and Son.
HAVERFORDWEST—(*d*) T. Moore.
HAVERHILL—(*d*) G. Tuffin.
HAYES—(*d*, *i*) Hewens and Son.
HAYLE—(*d*) J. and F. Poole.
HEATHFIELD—(*d*) S. Daws, Firlands Common.
HECKINGTON—(*d*) M. C. Sumners.
HELMSLEY—(*d*) J. R. Trenman.
HELSTON—(*d*) Lanyon and Son.
HENDON—(*d*) Smart and Son, Post Office, Brent Street.
HENFIELD—(*d*) G. T. Musson.
HEREFORD—(*d*, *i*) E. C. Woollard.
HERTFORD—(*a*, *) J. Cooper and Sons, 13, Maidenhead Street.
(*b*) Hale's Cycle Depôt, London Road. (*b*) Wackett's Cycle Depôt, St. Andrew Street.
(*c*) Dunsdale Arms; Salisbury Arms; Plough Inn.
HEYWOOD—(*d*) F. Hazlett.
HIGHBRIDGE—(*d*) John Tyler.
HILLINGDON—(*d*) Sweet and Co.
HINCKLEY—(*d*) C. Parsons, Market Place.
HINDRINGHAM—(*d*) J. Hall.
HITCHIN—(*d*) T. Brooker, Station Road.
HOCKLEY—(*d*) Hockley Chemical Co., Great Hampton Street.
HOLSWORTHY—(*d*) T. Recs. (*d*) J. Lisle.
HOLT—(*d*) C. T. Baker.
HOLYBOURNE—(*d*) M. Piggott, The Stores.
HONITON—(*d*) J. March.
HORNCASTLE—(*d*) Kemp and Son.
HORNDON—(*d*) R. Tyrrell and Son.
HORNSEA—(*d*) Loten Bros.
HORNSEY—(*d*) J. Welsh, 430, Hornsey Road. (*d*) J. Salmon and Son, 17, High Street.
HORSHAM—(*d*) James Knight, 37, Gladstone Road. (*d*, *i*) J. Laughton and Son. (*d*) Lintott and Son, 10, Carfax.
HOUNSLOW—(*d*) S. Gilbert, 119, High Street.

HOVE (Battle)—(*d*) E. and S. Dodson.
HOWDEN—(*d*) T. Spyvey. (*d*) King and Co. (Ltd.).
HULL—(*d*) H. Dalton. (*d*) S. P Wood.
HUNGERFORD—(*d*) R. R. Earle.
HUNTINGDON—(*a*, *) R. W. Cater and Sons, 95, High Street.
(*d*) Ridgley and Co., 112, High Street.
HURSTPIERPOINT—(*d*) G. Masters.
ILFORD—(*d*) G. W. Barnes, High Road.
ILFRACOMBE—(*d*) F. W. Gent-Reed. (*d*) W. Pile.
ILKESTON—(*d*) W. Merry.
ILMINSTER—(*d*) T. and E. Perry.
INGATESTONE—(*d*, *i*) P. Green.
ISLEWORTH—(*d*) Platt's Stores, 141, High Street. (*d*) F. Statham, 187, High Street. (*d*) J. Taylor, 1, The Pavement, South Street.
IVYBRIDGE—(*d*) G. Smallbridge.
JARVIS BROOK, CROWBORO'—(*d*) J. Booker.
KEIGHLEY—(*d*) A. Almond, Low St. (*d*) Summerscales and Co.
KELVEDON—(*d*) J. Mihill, Kelvedon Hatch.
KENDAL—(*d*) M. Bu ton, Stricklandgate. (*d*) Severs and Bateso , Stricklandgate.
KENILWORTH—(*d*) W. Riley, High Street.
KESWICK—(*d*) T. W. Townley.
KEW—(*d*) Walker, late Stephens, Sandycombe Road.
KIDSGROVE—(*d*) J. Tansley, Market Street.
KINGSBRIDGE—(*d*) J. H. Lidstone. (*d*) J. Donovan.
KINGSTON-ON-THAMES—(*a*) Daimler Co., c/o A. Burgoine, boat builder. (*a*) Lewis and Co., London Road.
(*d*) Bright, London Street. (*d*) R. Brock, 90, Richmond Road.
KIRBYMOORSIDE—(*d*) G. Peacock.
KNARESBORO'—(*d*) J. W. Mason.
LANCASTER—(*d*) Fenton and Co., Market Street.
LANDPORT—(*a*, *) Wm. Smith, 316, Commercial Road.
(*b*) J. E. Whittle, 41, Kingston Road.
(*d*) Timothy White and Co.
LANGPORT—(*d*) C. B. Atyed.
LAUNCESTON—(*d*) A. G. Wenmoth. (*d*) T. Jollow. (*d*) W. Cook and Sons. (*d*) J. Baker. (*d*) J. Provit. (*d*) J. T. Gillbard.
LEAMINGTON—(*a*, *) Sleath's (Ltd.), Clement Street.
(*a*, *b*) A. Valentine, Croxton House.
(*d*) G. J. Barr, Park Street. (*d*) Arthur Barr, Lansdowne St.
LEATHERHEAD—(*d*, *i*) A. B. Dearle.
LEDBURY—(*d*, *i*) C. W. Stephens.
LEE—(*d*) R. W. Gillett, High Road.
LEEDS—(*a*) J. Askham and Sons. (*a*) Lenchters, Mill Hill.
(*d*) Clay and Co. (*d*) G. Exley and Sons.
LEICESTER—(*d*) M. Carnall and Sons, Haymarket. (*d*) J. W. Neal, Belgrave Gate.
LEIGHTON BUZZARD—(*a*, *i*) S. Cooper.
(*d*) I. Bantom, Birds' Hill, Heath Reach.
LEISTON—(*d*) W. Titlow.
LEOMINSTER—(*d*, *i*) Bellow and Son. (*d*) Alexander and Duncan.
LEWES—(*a*, *o*, *) J. Broad and Sons.
(*d*) T. Vinall, 33A, High Street.
LEWISHAM—(*d*) O. Smith, High Street.
LEYTONSTONE—(*d*) P. Guthrie, 819, High Road.
LICHFIELD—(*d*) J. J. Perkins, Tamworth Street.
LINCOLN—(*a*) Clarke's Crank and Forge Co.
(*d*) Battle, Son, and Maltby.
LINDFIELD—(*d*) G. Masters, High Street.
LINGFIELD—(*d*) E. R. Beer.
LISKEARD—(*d*) J. Parsons.
LITTLEBOROUGH—(*d*) S. Hall.
LITTLEHAMPTON—(*a*, *i*) Ockenden Bros., High Street.
LIVERPOOL—(*a*) Simpson, Maclardy, & Co., 29, South Castle Street.
(*b*, *c*) Francis Mulliner, 61, Great Charlotte Street. J. Hope and Co.
(*d*) R. R. Minton and Co., Cheapside. (*d*) Jordan and Co., Great Homer Street. (*d*) B. Phillips, Byrom Street. (*d*) Cornforth and Boustead, Crown Street.
LLANDUDNO—(*a*, *c*) Motor Touring Co., Bodafon Hall and Back Jubilee Street.
LLANELLY—(*d*) H. Wilkins.
LONDON—
Baker Street—(*d*) Goodenough, 20, New Quebec Street.
Barnsbury—(*d*) Judd, 16, Half Moon Street.
Battersea—(*a*) S. Bowley & Son, Wellington Works.
,, (*d*) W. Bishop, Battersea Park Road.
,, (*d*) Holland, Northcote Road.
,, (*d*) C. Tinniswood, 4, Commercial Bdgs., Lavender Hill.

LONDON—
Bayswater—(*d*) Evan Davies, Moscow Road, Queen's Road.
Bethnal Green Road, 176—(*d*) Eickhoff Bros.
Bermondsey—(*d*) A. Wheeler, 246, Southwark Park Road.
Bishopsgate—(*a*) Gas Lighting Improvement Company (Ltd.), 18, Devonshire Street, Bishopsgate (Wholesale); Abbey Mills, Bow; Manhatten Wharf, Silvertown.
Bond Street, W.—(*b*, *c*) Mulliner and Co., 28, Brook Street.
Brixton—(*d*) Heritage and Co., Brixton Hill.
,, Road, S.W., 59—(*a*) Southern Motor Car Co.
Brompton—(*d*) J. Wilkins and Son, 55, Fulham Road.
Bryanston Square—(*d*) Allum, 16, Upper Dorset Street.
Caledonian Road, 98—(*d*) R. Wallington.
Camden Town—(*d*) C. Creamer, 9, King Street.
,, (*d*) Stringer, 32, Evershott Street.
Chelsea—(*d*) W. Harvey, 2, Dartry Road.
,, (*d*) A. Simmonds, 1A, Godfrey Street, Cale Street.
Clapham—(*d*) R. Hopkins, 37, Clapham Park Road.
Clerkenwell—(*d*) Johnson, 7, Great Bath Street.
Copenhagen Street, 127 and 129—(*d*) Hubbard and Co.
,, ,, 91—(*d*) Drake.
Custom House—(*d*) Livett and Son, Tidal Basin, Victoria Docks.
Dalston Lane, 68—(*d*) C. Eltham.
Drury Lane, 176—(*d*) Bray.
,, ,, 153—(*d*) T. Wills.
East Dulwich—(*a*, *) King Motor Car Co., 23, Oakhurst Grove.
Edgware Road—(*d*) Harvey, 53, Crawford Street.
,, ,, (*d*) Buckmaster, 73 and 89, Crawford Street.
,, ,, 209—(*d*) Harrison.
Euston—(*d*) Bendy, 34, Seymour Street.
,, (*d*) Bacon, 20, Melton Street.
,, (*d*) Kitchen, 60, Chalton Street.
,, Road—(*d*) E. Dennis, 16, Carburton Street.
Exmouth Street, 15 and 66—(*d*) Lee.
Fulham—(*d*) A. Stammers, 613, Fulham Road.
,, (*d*) C. Lovett, 124, Wandsworth Bridge Road.
,, (*d*) A. Simmonds, 265, North End Road.
,, (*d*) A. Muhn, 32, High Street.
Gray's Inn Road, 99—(*d*) Newton.
Hackney Wick—(*a*) Carless, Capel, and Leonard, Hope Chemical Works.
Hammersmith—(*d*) R. Taylor, 99, King Street.
,, (*d*) F. Creak, 327, King Street.
Hampstead—(*d*) H. Newland, 40, High Street.
Harrow Road, 406—(*d*) T. Gwyer.
,, ,, (*d*) G. Holmes, Kensal Rise.
Holborn—(*d*) E. J. Page, 89 and 90, Leather Lane.
,, (*d*) Levy and Sons, 17, Great Queen Street.
,, (*d*) E. Living, 5, Red Lion Street.
Holloway—(*d*) L. Passmore, 112, Seven Sisters Road.
,, Road, 668—(*d*) A. Allen.
,, ,, 230—(*d*) G. Brown.
Hoxton—(*d*) G. Irwin, 29, Brunswick Place, City Road.
Islington—(*d*) Davies and Evans, 77, Chapel Street.
Kennington—(*d*) Cherrington, New Street.
Kensington—(*c*) J. Rorke, Holland Park Road.
Kentish Town—(*d*) H. Herrant, 1, Prince of Wales' Crescent.
Kilburn—(*d*) Cooper Bros., 93, High Road.
King's Cross—(*d*) J. Dorset, 194, Liverpool Road.
,, Road, 153—(*d*) Batley and Co.
,, ,, 84—(*d*) Dicksee.
Lambeth—(*d*) F. Stearne, 163, Lambeth Walk.
Lisson Grove—(*d*) Anderson and Co., 48, Church Street.
Long Acre, 93—(*a*) Motor Car Company.
Marble Arch—(*d*) Coxall, 26 and 28, Seymour Place.
Marchmont Street, 20—(*d*) Lodge.
Notting Hill—(*d*) Andrews, Kensal Road.
,, (*d*) J. E. Pemble, 7, St. Anne's Road.
,, (*d*) Woodward, High Street.
Old Ford—(*d*) C. Denny, 114, Green Street.
Oxford Street—(*d*) Anderson and Co., 7, Candover Road.
,, (*d*) Oulds Bros., 3, Oxford Market.
Paddington—(*d*) J. Boatfield, 73, Fernhead Road.
Pentonville—(*d*) Newton, 9, Upper Baker Street.
Pimlico—(*d*) G. Bute, 18, Sussex Street.
,, (*d*) Oulds Bros., 12, Brewer Street.
Primrose Hill—(*d*) S. Wilkes, 47, St. George's Road.
Regent's Park—(*b*) Motor Development Corporation (Ltd.), St. George's Square.

LONDON—
Shaftesbury Avenue—(*b*) Daimler Motor Co. (Ltd.).
„ „ (*d*) Evans, 28, Sherwood Street.
Shepherd's Bush—(*d*) May and Son, 245, Goldhawk Road.
„ „ (*d*) Wilks and Wythe, 73, Askew Road.
Sloane Square—(*c*) Wm. Ashton, 235, Pavilion Road.
Soho—(*d*) J. Whiting, 37, Frith Street.
„ (*d*) C. W. Austine, 35, Brewer Street.
Southwark—(*d*) G. M. Smith, 104, Southwark Street.
„ (*d*) Livett and Co., High Street, Borough.
„ (*d*) F. W. Smith, 21, Blackfriars Road.
St. James', S.W.—(*c*) F. H. Collins, 263, Duke Street.
„ „ (*c*) Smith and Co., Mason's Yard, Duke Street.
St. Luke's—(*d*) J. Weed, 139, Whitecross Street.
Stoke Newington Road, 115B—(*d*) H. A. Lovell.
Walworth—(*d*) Rushton, 68, East Street.
„ (*d*) A. Boulden, 160, Old Kent Road.
„ Road, 308—(*d*) W. E. Bull.
Wandsworth—(*d*) J. Gibbs and Co., 124, High Street.
„ Road, 222—(*d*) Wilkinson and Son.
Westminster—(*d*) G. W. Odell, Chapter Street.
West Brompton—(*d*) G. Smith Dent, 62, Richmond Road.
West Kensington—(*d*) T. Sturman, 128, North End Road.
„ „ (*d*) Percival's Stores, 20 and 22, North End Rd.
Whitechapel—(*d*) A. Taylor and Son, 32-34, Commercial Street.
LOSTWITHIEL—(*d*) Roskelley and Son.
LOUGHBOROUGH JUNCTION—(*d*) Leach Bros., 37, Loughborough Rd.
LOUGHTON—(*d*) Ambrose and Son, High Road.
LOUTH—(*d*) Cartwright and Pickering.
LOWER EDMONTON—(*d*) C. J. Henry, Hertford Road. (*d*) A. Windard, The Green.
LOWER TOOTING—(*d*) Downing and Ernst, High Road.
LOW MOOR (Bradford)—(*d*) E. and B. Briggs.
LOXWOOD—(*d*) J. and E. Elliott.
LUDLOW—(*d*, *i*) H. Richards and Son. (*d*) A. W. Packer, Old St.
LUTTERWORTH—(*d*) E. Lavender.
LYME REGIS—(*d*) J. G. Rendall. (*d*) A. H. Burge.
LYMINGTON—(*d*) G. F. Saul, 90, High Street.
LYNDHURST—(*a*, *) J. Haynes, New Forest Cycle Depôt.
(*c*) Crown Hotel.
LYNN—(*d*) G. J. Curtis.
MACCLESFIELD—(*d*) T. Savage, Market Place.
MAIDENHEAD—(*a*, *) Thompson and Walton, chemists.
(*d*) C. Smith, 13, Cornwallis Road.
MAIDSTONE—(*a*, *) E. Allcorn, 30, Stone Street.
(*d*) Sergeant and Parks, 58, Week Street. (*d*) E. Allcorn and Co., 30, Stone Street.
MALDON—(*d*) Orttewell and Sons, High Street. (*d*) J. E. Cornwell, 11, Spital Road.
MALMESBURY—(*d*) J. E. Ponting.
MALTON—(*d*) T. Leefe.
MALVERN—(*a*) Coventry Cycle Motor Co.
(*d*, *i*) A. Sparkes. (*d*, *i*) Page Bros.
MANCHESTER—(*a*) M. Wells and Co., Hardman Street Oil Works.
(*a*) Geddes Bros., 79, Piccadilly. (*a*) J. Heywood and Co., Turner Street, Cornbrook.
(*c*) The Denmark Hotel, Chorlton.
(*d*) Jos. Brooks and Co. (Ltd.), Shudehill. (*d*) Baxendale and Co., Miller Street.
MANSFIELD—(*d*) Benj. Adams.
MARGATE—(*d*, *i*) R. Jewhurst, Cliftonville. (*d*, *i*) T. Bentley and Co., 31, High Street. (*d*) Coles and Co., High Street.
MARKET DRAYTON—(*d*, *i*) W. Talbot. (*d*, *i*) F. Gouldbourne.
MARKET HARBOROUGH—(*a*, *i*) S. Kitchen.
(*d*) S. Perkins, Mill Hill Road.
MARKET RASEN—(*d*) W. B. Jevons.
MARLBOROUGH—(*d*) Dale and Son.
MARYPORT—(*d*) J. M. Smith, High Street.
MELKSHAM—(*d*) S. T. Bigwood.
MELTON MOWBRAY—(*d*) Sharman and Ladbury, Sherrad Street.
MEON (East)—(*d*) T. A. Adams.
(West)—(*d*) F. R. Cole.
MERTHYR—(*d*, *i*) S. Sandbrook.
MERTON—(*d*) H. P. Smith, 57, High Street.
MIDDLETON—(*d*) J. Partington, Taylor Street.
MILTON (Sittingbourne)—(*d*) J. S. Budds.
MINEHEAD—(*d*) W. Farr.
MISSENDEN, GREAT—(*d*) L. B. Bedford. (*d*) F. Longman.
MOLD—(*d*, *i*) W. P. Jones.
MOLESEY—(*d*) Nell, Walton Road.
NAILSWORTH—(*d*) E. Benjamin and Co. (*d*) L. Price.
NANTWICH—(*d*) F. Ankers, Hospital Street.
NAYLAND (Colchester)—(*d*) W. Hatton.
NEATH—(*d*) Hopkin Jones.
NEWARK—(*d*) Taylor and Son.
NEW BROMPTON—(*d*) B. Bennett, 20, Jeffrey Street.
NEW BUCKENHAM (*d*) J. Ribbons.
NEWBURY—(*d*) F. Woodward, Eastfield. (*d*) H. T. Bendy, 15, Bartholomew Street. (*d*) J. J. Davies and Son, 62-63, Northbrook Street. (*d*) H. Davis. (*d*) Hickman, Son, and Co.
NEWCASTLE-ON-TYNE—(*a*) Rowland Barnett & Co., 41, Dean Street.
NEWCASTLE (Staffs.)—(*d*) Geo. Holland, Market Square. (*d*) David Lees, Merrial Street.
NEW CROSS ROAD—(*d*) Brigland and Co.
NEWMARKET—(*a*, *i*) Golding and Co.
NEWPORT (Mon.)—(*a*) C. D. Phillips, Emlyn Works.
(*d*, *i*) A. C. Arnold and Co.
NEWPORT (Salop)—(*d*) Parton and Hayward. (*d*, *i*) J. Smith.
NEW ROMNEY—(*d*) T. Gravett.
NEW SOUTHGATE—(*d*) J. Lucas, High Street. (*d*) Tisshaw, The Parade.
NEWTON ABBOT—(*d*) J. Stephens. (*d*) H. and S. Beare. (*d*) T. H. Haynes.
NEWTOWN (Mont.)—(*d*, *i*) Francis and Co.
NORBITON—(*d*) Walters, Cambridge Grove Road.
NORMANTON—(*d*) W. H. Wilkinson.
NORTHAMPTON—(*a*, *i*, *) Johnson and Wright, Gold Street.
(*a*, *b*, *c*, *) A. F. Mulliner, 79, Bridge Street.
(*d*) E. Bush, The Mounts.
NORTH TAWTON—(*d*) T. G. Manning and Son.
NORTH WALSHAM—(*d*) F. Randall (Ltd.).
NORWICH—(*a*) H. W. Egerton, Esq., The Rectory.
(*c*) Maid's Head.
(*d*) G. Base, Pitt Street.
NORWOOD—(*d*) Vincent and Son, 441, Norwood Road.
NOTTINGHAM—(*d*) W. Haynes. (*d*) W. H. Hughes.
NUNEATON—(*d*) C. Parsons, Market Place.
NUTFIELD—(*d*) J. Mitchell, Post Office.
ODIHAM—(*d*, *i*) H. Knight, High Street.
OKEHAMPTON—(*d*) J. Wright.
OLDHAM—(*d*) J. Mannock, Abbey Hill Road. (*d*) H. Bates, George Street.
OLD SOUTHGATE—(*d*) Lee, Chase Road. (*d*) Burrows, Post Office.
OLNEY—(*d*) J. G. Hawley, 20, High Street.
ONGAR—(*d*) G. T. Snelling, High Street.
ORE (near Hastings)—(*d*) E. E. Trinder, 3, London Road.
OSWESTRY—(*d*, *i*) J. Minshall and Co. (*d*, *i*) W. H. Lacon and Co.
OTLEY—(*d*) W. E. Turner and Co. (Ltd.).
OTTERY ST. MARY—(*d*) F. Marker. (*d*) Vincent Bros. (*d*) G. Cawley.
OUNDLE—(*d*) H. Storey, Market Place.
OVERTON—(*d*) J. Hide and Son.
OXFORD—(*a*) Oxford Cycle Co., 68, St. Giles'.
(*a*, *b*, *i*, *) Ralph Foord, 19, Queen's Street.
PAIGNTON—(*d*) J. Thomas and Son.
PECKHAM—(*d*) Hancock, 241, Rye Lane. (*d*) Cheshire, 116, Lugard Road.
PEMBURY—(*d*) Farrant and Son.
PENGE—(*d*) Brockington's Stores, Anerley Road.
PENRITH—(*d*, *i*) T. Altham. (*d*, *i*) Geo. Irving.
PENZANCE—(*d*) T. H. Roberts. (*d*) S. R. Taylor and Sons. (*d*) T. H. Stewart.
PETERBOROUGH—(*a*, *) Sturton and Sons, chemists.
PETERSFIELD—(*a*, *i*, *) B. Jones, The Square. (*a*) Coulthard and Co., Cooper Road.
(*d*, *i*) Mrs. E. Prior, High Street.
PETWORTH—(*d*) Otway and Fuller, Market Square.
PEWSEY—(*d*) Whatley and Son.
PICKERING—(*d*) E. Dinsley.
PLUCKLEY—(*d*) W. Sutton, Pluckley Thorne, Ashford, Kent.
PLYMOUTH—(*a*) Spooner and Co., Bedford Street.
(*d*) G. Norris. (*d*) J. Nankwell. (*d*) Damprey and Co.
(*d*) Widger, Son, and Co. (*d*) Stevens and Co.
POCKLINGTON—G. Brigham.
PONDERS END—(*d*) W. Lant, High Street. (*d*) H. T. Orme, High Street.
PONTEFRACT—(*d*) C. England.
PONTYPRIDD—(*a*) Morris Bros., cycle works.

POOLE—(*d*, *i*) Bayley and Sons. (*d*) C. Cluett, East Street. (*d*) Boone and Giblett, High Street.
POPLAR—(*d*) Eaton's Stores, 220, East India Dock Road. (*d*) W. J. Cook, 117, Grundy Street.
PORTLAND—(*d*) W. H. Score, Unicorn Stores. (*d*) J. Beer, jun., Easton Square.
PORTLAND—(*d*) E. Comben.
POTTON—(*d*, *i*) G. Tysoe and Son.
PRESTON—(*c*) Walmsley and Co., Guildhall Street.
(*d*) T. Parkinson, Church Street. (*d*) W. Parkinson, 265, North Road.
PRINCES RISBORO'—(*d*) H. Ridley, Market Place.
PUDDLETOWN—(*d*) G. H. Stephens.
PULBOROUGH—(*d*) Baker Bros., Storrington.
RADCLIFFE—(*d*) Jos. Taylor and Co. (Ltd.).
RAMSBOTTOM—(*d*) J. Morton, Bolton Street.
READING—(*a*, *) J. H. Fuller, 22, Minister Street. (*a*) Speedwell Electrical and Motor Car Company, 83, Oxford Street.
(*d*) B. Collins.
REDBOURNE—(*a*) Saracen's Head.
REDDITCH—(*a*) Enfield Cycle Co.
REDHILL—(*a*, *i*) Marriage and Co.
REEFHAM—(*a*) W. Wright, plumber (benzine). (*a*) Franklin, tinman (benzine). (*a*, *i*) Gibbs and Son (petroleum).
(*c*) Page's Inn; Black Lion Hotel.
REIGATE—(*a*, *i*) Marriage and Co.
RETFORD—(*d*) Wilmhurst and Walker.
RHYL—Motor Touring Co., c/o Connah and Co., cycle manufacturers.
RICHMOND—(*d*) Reynolds and Co., George Street.
RICHMOND HILL—(*a*) Beard's Cycle Stores.
RINGMER—(*d*) W. G. Bradford.
RINGWOOD—(*c*) White Hart Hotel.
(*d*, *i*) W. Chilvers.
RIPLEY—(*d*) T. Lucas.
RIPON—(*d*) H. Clark's Executors.
RIVERHEAD—(*d*, *o*) T. Emery.
ROCHDALE—(*d*) T. W. Mercer, Oldham Road. (*d*) T. H. Williams and Co., Yorkshire Street.
ROCHESTER—(*d*) R. Lane and Son, Eastgate.
ROMFORD—(*d*) Poel and Co., North Street.
ROTHERHAM—(*d*) J. Foster, Effingham Street. (*d*) C. Wright, 180, Wellgate.
ROTHERHITHE—(*d*) A. Thornton, 229, Lower Road.
RUGBY—(*d*) Miller and Co., High Street.
RUSHLAKE GREEN—(*d*) W. Oxley.
RUTHIN—(*d*, *i*) Gittens and Beach.
RYE—(*d*, *o*) G. Pellett, High Street. (*d*, *i*) A. and W. Stocks.
RYDE (I.W.)—(*a*, *) G. Turner, 134, High Street.
SAFFRON WALDEN—(*a*, *) Robson and Sons, Freshwell Street.
(*d*) A. Titchmarsh, King Street. (*d*) T. Nunn and Son, Cross Street.
SALFORD—(*a*) Kitchen Cycle Accessories Co.
SALISBURY—(*d*) R. E. Hardy and Son.
SALTASH—(*d*) Mrs. Burns. (*d*) Miss A. Bevan.
SAMPFORD PEVERILL—(*d*) F. W. Tandevin.
SANDBACK—(*d*, *i*) R. Lunt. (*d*) J. Frost.
SANDOWN—(*d*) H. Diffey, Wickes Road.
SCARBOROUGH—(*a*) Walker and Hutton.
(*d*) J. M. Crosby (Ltd.).
SCUBTHORPE—(*d*) P. Kemp.
SEACOMBE—(*d*) Basnett and Co., Brighton Street.
SEATON (Cumberland)—(*d*) Thompson and Wallace.
SEATON—(*d*) S. Gage and Co.
SELBY—(*d*) P. Watson.
SELLINDGE—(*d*) T. Sharwood and Son.
SETTLE—(*d*, *i*) W. Dawson. (*d*, *i*) W. Morphet.
SEVENOAKS—(*a*) G. Humphrey, 166, High Street.
(*c*) The Station Hotel.
(*d*) T. Emery and Son.
SHAFTESBURY—(*d*) S. W. Digby.
SHEFFIELD—(*d*) J. T. Dobb and Son, West Bar. (*d*) C. A. George, Fargate.
SHELF (near Halifax)—(*d*) J. Barraclough's executors.
SHEPHERDSWELL—(*d*) Coppen and Son.
SHEPTON MALLET—(*d*) R. Allen.
SHERBORNE—(*d*) Harden and Trevett. (*d*) W. H. Pasley.
SHIERE—(*d*) Surrey Trading Co.
SHIFNAL—(*d*) Lloyd and Higgins.
SHOREHAM—(*c*) The Railway Hotel.
(*d*) J. W. Patching, High Street. (*d*) H. Paine, 5, High Street.
SHREWSBURY—(*d*) Lewis and Froggatt. (*d*) Shuker and Son.
SIDMOUTH—(*d*) E. T. Sellok. (*d*) F. M. Gliddon.
SILVERTON—(*d*) R. Perratt.
SIPSON—(*d*) Fletcher.
SITTINGBOURNE—(*a*, *i*, *) A. Panteney.
(*d*) E. Bennett, High Street. (*d*) H. Panteney, 21, East Street.
SLEAFORD—(*d*) W. Spyvee.
SMARDEN—(*d*) C. and F. Buss.
SOUTHALL—(*d*) Bennett and Son, The Green.
SOUTHAMPTON—(*a*) Summers and Payne, Belvedere. (*a*, *o*) Dibden (benzoline).
(*a*, *b*) Hendy and Co., East Street.
(*c*) Royal Hotel, High Street.
(*d*) Timothy White and Co. (Ltd.).
SOUTHEND—(*d*) W. Elam and Son.
SOUTH OCKENDEN—(*d*, *i*) J. Bishop. (*d*) T. A. Collis, West Street.
(*d*) H. T. Bruce.
SOUTHPORT—(*a*, *c*) Motor Touring Co.
(*d*) Geo. Ball, 75, Lord Street.
SOUTHSEA—(*a*, *b*, *c*, *) S. Rose and Co., Castle Road.
(*b*) Penning, King's Road.
SOUTHWELL—(*d*) R. S. Stanley.
SPALDING—(*a*) Shadford and Co.
(*d*) Donington and Co.
SPETTISBURY (Blandford)—(*d*) R. Hunt.
SPILSBY—(*d*) L. S. Dodds.
SPOFFORTH—(*d*) H. Tinker.
STAFFORD—(*d*) J. and H. A. Averill, 10, Market Square. (*d*) Fowke and Son, Market Square.
ST. ALBANS—(*a*, *) R. Norman, Victoria Road.
(*d*) C. A. Sharp, Bernard Street.
STALHAM—(*d*) J. Burton.
STAMFORD—(*d*) T. S. Duncombe, 5, High Street. (*d*) S. Robinson, 10, St. Mary Street. (*d*) J. W. Willcocks, St. Mary Street.
STAMFORD HILL—(*d*) Keyte and Son. (*d*) E. Biffen.
STANMORE (Middlesex)—(*c*) Crown Inn.
ST. AUSTELL—(*d*) G. Hawke and Son. (*d*) T. Mann. (*d*) F. A. Stocker.
ST. COLOMB—(*d*) C. Hawke.
STEVENAGE—(*d*) J. Silk, High Street.
STEYNING—(*d*) J. Johnson and Son.
ST. HELENS—(*d*) J. Cotton, Church Street. (*d*) W. J. Williams, Bridge Street.
ST. IVES—(*a*, *) Turner and Sons, chemists, Market Hill.
ST. IVES—(*d*) Best and Sons.
ST. MARGARET'S-ON-THAMES—(*c*) St. Margaret's Hotel.
ST. MARY CHURCH—(*d*) H. W. Coysh. (*d*) R. T. Willis.
ST. NEOTS—(*d*) J. Bingham, High Street.
STOCKPORT—(*d*) F. Williamson, Waterloo Road. (*d*) J. D. Raynes, Heaton Lane.
STONEHOUSE—(*d*) S. Rawkins.
STOWMARKET—(*d*) G. J. Gostling, Ipswich Street. (*d*) Simpson and Son, chemists.
STRATFORD—(*d*) Stratford Co-operative and Industrial Society, Maryland Street. (*d*) M. E. Culley, 60, Martin St.
STRATFORD-ON-AVON—(*d*, *i*) Newland and Hidolph. (*d*, *i*) A. Lacey. (*d*) G. T. Beesley, 40, Sheep Street.
STRATTON—(*d*) J. Banbury.
STROOD—(*d*) G. Hoar and Sons. (*d*) J. Collis, High Street.
STROUD—(*d*) Chew and Sons.
STROUD GREEN—(*d*) Clifford, Hawes, and Co. (Ltd), 95, Stroud Green Road, N.
SUDBURY—(*d*) E. Mann and Co.
SUNDERLAND—(*d*) Avenue Paint Works Company, Garrison Field.
SUNNINGDALE—(*d*) W. E. Kington.
SURBITON—(*d*) J. Williams, P.O. Surbiton Hill. (*d*) J. Lane, 22, Brighton Road.
SUTTON—(*d*) Roots and Co., 181, High Street.
SWAFFHAM—(*d*) Plowright and Son.
SWANSEA—(*d*) A. Eaton and Co.
SWINDON—(*d*) W. E. Bromley. (*d*) G. Long, Wellington Place.
SYDENHAM—(*d*) Robinson, 85, Wells Road.
TADCASTER—(*d*) J. C. Allen.
TAUNTON—(*d*) Buckland and Son. (*d*) Fisher and Sons. (*d*) Clatworthy and Sons.
TAVISTOCK—(*d*) G. Dunn. (*d*) W. E. Baker.

TEDDINGTON—(*c*) The Horse and Groom Hotel.
(*d*) W. J. Honey, Broad Street.
TEIGNMOUTH—(*d*) J. J. O. Evans.
TENTERDEN—(*d*) Apps and Sons, East Cross.
TETBURY—(*d*) G. Barnes, Long Street.
THAME—(*d*) W. Horton. (*d*, *i*) G. Green. (*d*) W. Barefoot, Cross Keys.
THETFORD—(*d*) Brown and Colby.
THIRSK—(*d*) Clark and Co., Market Place. (*d*) G. Ayre and Son. (*d*, *i*) R. S. Purdie.
THORNE—(*d*) J. Rayner.
THORNTON DALE—(*d*) T. Wardill.
THRAPSTON (Northants)—(*d*, *i*) A. Saunderson.
TIPTON—(*d*) S. Hipkins, High Street, Prince's End.
TIVERTON—(*d*) H. J. Lane. (*d*) John Goss.
TODMORDEN—(*d*) J. C. Stevenson, The Strand.
TONBRIDGE—(*a*, *o*, *) Wightwick and Sons.
(*d*) Case and Barnes, High Street.
TOPSHAM—(*d*) T. and H. Gubb.
TORQUAY—(*a*) Wm. Radcliff, St. Heliers.
(*d*) M. A. Haynes. (*d*) J. C. Parker and Sons.
TORRINGTON—(*d*) J. F. Friend.
TOTNES—(*d*) E. Distin and Sons.
TOTTENHAM—(*d*) G. L. Wilson and Co., High Road. (*d*) E. J. Lower, St. Loys Road.
TOWCESTER—(*a*, *) Victor Ashby, Park Road.
TROWBRIDGE—(*d*) G. Roberts.
TRURO—(*d*) Bullen Bros. (*d*) Mallen and Son. (*d*) W. Middleton.
TUNBRIDGE WELLS—(*a*) J. Willmot, 16, High Street.
(*c*) Royal Kentish Hotel; Castle Hotel.
(*d*) E. E. Kempsell, 161, Camden Road. (*d*) F. Kember, 2, George Street.
TUNSTALL—(*d*) J. H. Piggott, Brewery Sreet. (*d*, *i*) Hopkins, High Street.
TWICKENHAM—(*c*) The King's Head Hotel.
(*d*) J. Auton, Hampton Road.
UCKFIELD—(*a*) W. Flint.
(*d*) Bannister and Son, Newtown. (*d*, *i*) W. Flint.
UPTON PARK and EAST HAM—(*d*) T. J. Coake, 1, Milton Terrace, Red Post Lane, Upton.
UTTOXETER—(*d*) Uttoxeter Agricultural Society.
UXBRIDGE—(*c*) J. Caswell, Chequer's Yard.
(*d*) H. Knight, 17, High Street. (*d*) J., Leno, 26-28, Windsor Street.
WADEBRIDGE—(*d*) Mallett and Son. (*d*) F. and J. Martyn.
WAINFLEET—(*d*) R. B. Huggins.
WAKEFIELD—(*a*, *b*) Whitehead's Autocycle Co. (Ltd.), Cross Square.
(*d*) G. Savile.
WALSALL—(*d*) G. Elliott and Son, Park Street.
WALSINGHAM—(*d*) R. Howell.
WALTHAM—(*d*) O. S. Clark, Supply Stores.
WANTAGE—(*d*) A. J. Belcher, Market Place. (*d*, *i*) Kent and Son.
WAREHAM—(*d*) Randall and Son.
WARMINSTER—(*d*) S. L. Corder.
WARRINGTON—(*a*) Caldwell's (Ltd.)
(*d*) Davies, Lyme Street.
WATFORD—(*a*) W. Featherley, 43, High Street.
WATTON—(*d*) L. A. Vincent.
WELLINGTON—(*d*) J. Baker, jun. (*d*) W. F. Masters. (*d*) J. Quick. (*d*) T. Giles. (*d*, *i*) Davies and Wilcox. (*d*) Kynaston Bros. and Jervis.
WELLS—(*d*) Barnes and Son.
WEM—(*d*) Kynaston Bros. and Jervis.
WEST CROYDON—(*d*) C. J. Egleton, 2, London Road.
WEST DRAYTON—(*d*) H. Wyatt.
WESTERHAM—(*d*) H. Bird, Market Place.
WEST GREEN—(*d*) P. Buck, West Green Road. (*d*) H. Horwell.
WEST KIRBY—(*d*, *i*) G. Wooliscroft.
WESTON-SUPER-MARE—(*a*) W. Appleton, cycle agent. (*a*) Day and Co.
(*d*) J. P. Curtis.
WETHERBY—(*d*) T. Thornton.
WEYBRIDGE—(*a*) Pedley and White, The Quadrant.
(*d*) S. Brown and Son, High Street.
WEYMOUTH—(*a*) Whitehead Torpedo Works.
(*d*) Pearce and Herbert. (*d*) T. Cox, 2, Osborn Terrace. (*d*) Gregory and Son, St. James Street. (*d*) Franklin Bros.
WHITBY—(*d*) Nicholson and Son.
WHITCHURCH—(*d*, *i*) W. H. Smith and Co.
WHITEHAVEN—(*d*) Whittle and Son, Roper Street.
WICKFORD—(*d*) Jas. Gigney, saddler, &c.
WIGAN—(*d*) R. Burland and Sons. (*d*) J. Johnson, chemist.
WIGSTON MAGNA—(*d*) T. H. Glen and Co., 49, Bell Street.
WIGTON—(*a*) T. J. Hayton, 37, High Street.
WILLESDEN—(*d*) H. Durrand, 218, High Road.
WIMBLEDON—(*d*) C. K. Butcher, 15, Hartfield Road.
WINCANTON—(*d*) T. Shewin.
WINCHESTER—(*a*) H. W. Frampton, 1, Jewry Street.
(*b*) Dean and Smith, Upper Brook Street.
(*c*) Gaudy and Sons, coachbuilders, Parchment Street; Royal Hotel; George Hotel.
WINCHMORE HILL—(*d*) Ironsides' Stores.
WINDSOR—(*a*, *) W. H. Brooks and Sons, 28, Peascod Street.
WINSFORD—(*d*, *i*) T. B. Hulse and Co.
WINSLOW—(*d*, *i*) G. A. Midgley.
WINTERTON—(*d*) E. Chapman and Son.
WISBORO' GREEN (Billingshurst)—(*d*) E. Shoosmith.
WITHERIDGE—(*d*) G. H. Pullen.
WITNEY—(*d*, *i*) H. Long, High Street. (*d*, *o*) R. Lankshear. (*d*) Leigh and Son.
WIVELISCOMBE—(*d*) Richards Bros.
WOKING—(*c*) Station Hotel.
WOKINGHAM—(*d*) E. A. Hussey, Market Place. (*d*) Herring and Son, general stores. (*d*) W. H. Howard, Broad Street.
WOLVERHAMPTON—(*d*) W. Share, Salop Street.
WOODBRIDGE—(*a*) R. H. Rowland, The Thoroughfare.
WOOD GREEN—(*d*) N. Salmon, High Road. (*d*) Warrington, Jolly Butcher's Hill.
WOODSTOCK—(*d*) W. C. Brotherton and Co.
WOOL—(*d*) W. Lock.
WOOLWICH—(*d*) Thornton, Hare Street.
WORCESTER—(*d*) Mann and Son (Ltd.), 50, High Street. (*d*) A. Gibson, St. John's.
WORKSOP—(*d*) H. P. Forrest.
WORTHING—(*a*) Thos. Page, 3, South Street.
(*d*) Potter and Bailey, 9, High Street.
WOTTON-UNDER-EDGE—(*d*) Hewitt and Maque.
WREXHAM—(*d*) Francis and Co.
WROTHAM—(*d*) W. J. Coleman.
YARMOUTH—(*a*) J. Leach.
(*d*) H. E. Kerridge.
YORK—(*d*) Dresser, Folkard, and Co.
YEOVIL—(*d*) T. B. Potter.

SCOTLAND.

BRIDGE OF ALLAN—(*c*) Royal Hotel.
EDINBURGH—(*d*) Finlayson and Stewart, Regent Arch.
GREENOCK—(*a*) Greenock Foundry Co. (*a*) Macalester and Type. (*a*) Thos. Orr, East Blackhall Street. (*a*) J. and H. M. Paterson, 32, Eldon Street. (*a*) Paul Jones and Sons, East Bay, Greenock Road.
HAMILTON—(*a*) J. and C. Stirling.
(*b*) Stirling's Motor Carriages (Ltd.).
KELSO—(*a*, *b*) Hogarth and Sons, Shedden Park Works.
(*c*) Hall's Livery Stables.
LEITH—(*d*) Graham Yool and Co. (*d*) A. and M. Reid, Commercial Street.
SANDBACH—(*a*) Alex. Robertson.
STIRLING—(*a*, *i*) Graham and Morton. (*a*, *i*) Virtue and Fergusson.
(*b*) G. Thomson, coachbuilder.
(*c*) Golden Lion Hotel; Station Hotel.

IRELAND.

BELFAST—(*a*) J. and J. Haslett, North Street.
WEXFORD—(*a*) Wm. Armstrong.
(*b*) Philip Pierce and Co., Mill Road Ironworks. (*b*) Wm. Doyle, Selskar Ironworks.