

MOTOR VEHICLES IN RELATION TO MUNICIPAL SERVICE.

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(MEMBER).

IT was my privilege to address this Conference six years ago, at Birmingham, on the subject of "Some sanitary and allied advantages attending the introduction and use of Motor Vehicles." The Conference of 1898, doubtlessly weighing the inherent advantages of mechanical over animal power rather than any degree of excellence in the motor vehicles then obtainable, unanimously resolved—"That this conference of municipal engineers, assembled in connection with the Congress of The Sanitary Institute, this 28th day of September, 1898, is of opinion that the introduction and use of efficient motor vehicles should be encouraged by county, municipal, urban and other authorities, in view of the fact that the extended use of such vehicles would contribute to the general improvement of the sanitary condition of our streets and towns; and this meeting recommends that the Council of The Sanitary Institute make known this opinion as widely as possible." The resolution was moved by the author, seconded by Mr. John Price, City Engineer of Birmingham and supported by Mr. E. George Mawbey, Borough Engineer of Leicester. Since that occasion, enough has been done to improve the claims of all classes of motor vehicles to attention at the hands of public authorities, and to justify a further paper on the subject before members of The Sanitary Institute and delegates to the Congress.

Evidence of the rapid growth of automobilism is to be found in the number of registrations under the provisions of the 1903 Act. There are 212 registering authorities for the United Kingdom, to whom, on June 18th, I sent a circular letter and form. The complete returns are given in

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Appendix I. It is interesting to observe that official records show the most sanguine calculations to be largely below the actual numbers—viz., 18,340 cars, and 21,521 cycles. These figures do not include cars used by manufacturers or dealers who use general identification marks which cover more than one car each. The total number of licenses to drive is 53,169. All these figures are for Midsummer Day, 1904.

The dust problem is, admittedly, one for every user of the highway, but it should be the pre-eminent concern of the municipal or county surveyor. The Automobile Club have conducted some experiments which tend to demonstrate how dust-raising varies with the design and clearances of the motor car, but we have to face the fact that thousands of miles of roads yield enough dust to render the passage of ordinary cars an inconvenience to all in dry weather. The country to-day looks to the Highway Authorities for salvation in this matter, and above all to their executive officers. This aspect of highway maintenance affects the county and urban surveyor more than the municipal engineer, but I do not err in stating that no recent instances of their activity have given greater satisfaction to the general public than those where something effectual has been accomplished in the direction of fixing the dust. Prevention is better than cure, hence the growing conviction that the construction of dustless roads must form an important branch of work for the municipal, urban, or county engineer and surveyor. I submit the dust question to this Conference as one of the most pressing importance which arises out of automobile progress. The evidence that immediate steps of some kind should be taken is so clear that a resolution will be moved.

Motors for use in municipal work, as distinct from the general use of motors by members of the public, will require consideration by more than one committee. Not a few authorities have seen a return for the outlay on the purchase of a light car for their surveyor or engineer. The motor provides a ready means of inspecting outside work, particularly in urban and county areas, and such freedom of locomotion saves both time and money by enabling the officer to supervise in person without curtailment of his indoor hours or administrative work. A number of public bodies are now alive to the wisdom of facilitating the work of their engineers by the provision of a motor. In several cases the bicycle has given way to the motor bicycle, and that in turn to the motor car. A good two-cylinder car, to seat four, can be bought for under £300, and the running cost, with a youth at £1 a week, should not exceed £150 a year, for an average distance of 180 miles a week. The advantage of a four-seated car is that members of committees can make inspections, as is

so often necessary, with the minimum loss of time, and the tonneau can be removed for other purposes if desired.

I shall pass over the application of motor tower wagons in tackling overhead electric equipment, of which two examples occur in Appendix III., likewise the use of motors in fire brigade work, and, before taking the main subject, shall refer to motor omnibus services. The cost per car-mile, inclusive of depot expenses, repairs, depreciation, driver, conductor, stores, sundries, insurances, and supervision, will vary from 8d. to 9d. for a 16-passenger omnibus, and will be under 1s. for a double decker. The increase of width to 7' 6", and the higher speed of 12 miles an hour, which are permissible under the new regulations, render the prospects of the motor omnibus particularly attractive, both for complete services and for feeder purposes. Where the traffic stops are frequent, as in London, a hydraulic variable speed gear, with an infinity of ratios between the extremes instead of the usual three or four steps, is of value with the internal combustion engine which is in greater vogue than steam for this work.

Passing now to the heavier machines suitable for street watering, haulage of material, and for refuse removal, we find that the Liverpool Self-Propelled Traffic Association held further series of trials in 1899 and 1901, in regard to which comprehensive reports* were issued by the Judges. These trials were followed by what may be called a commercial experiment in road transport, to wit, The Road Carrying Company, Limited, for which undertaking myself and friends subscribed, privately, the sum of £20,000 in February, 1902. The operations in Lancashire, of which I was appointed General Manager, were with 14 wagons over a period of twelve months, and they furnish a concrete instance of user under the strict letter of the 1896 Act. Each machine steamed to the weighbridge and gave an actual tare of less than three tons including the boiler, fire-bars and ash-pan. It must suffice to say that commercial success was not to be commanded with this plant. The machines were subject to endless mechanical troubles, and were structurally inefficient to take an average load of six tons divided between their own platforms and the single trailers allowed by law, whilst the narrow tyres damaged the roads under some conditions. They had no margins to withstand the overloading and excessive overdriving which are practically inseparable from the work of a haulage company.

Their working, or, to be accurate, one should say their failure to work

* The 1901 report, 170 pp., with 80 illustrations, may be had from Messrs. Lloyd and Walker, Chartered Accountants, 5, Castle Street, Liverpool, price 10s. 6d. post free.

up to the necessities of the case, resulted in general break-down, both of motors and staff, and the vehicles were "laid off" ten months ago.

The company is maintained, occupying itself more profitably in other branches of motor work, with a view to renewed activities when fresh circumstances shall have rendered the scheme more feasible.

The Liverpool trials cost £3,000, and the haulage experiment £10,000, whilst the participating constructors probably spent £80,000 over the various designs, patterns, and vehicles from which no repeat building was done. All these efforts were merely means to an end, episodes in the struggle to move Parliament to grant more latitude to self-propelled traffic, yet it must not be overlooked that all this experience is available to-day for the benefit of those who decide to become users. Much else has been done in other directions, notwithstanding the serious disadvantages involved, under the partial emancipation of the 1896 Act, to advance heavy traffic possibilities in the United Kingdom, but the majority of vehicles built since January 1st, 1900, have been above the tare of three tons unladen. Such vehicles have really been on the streets, as light locomotives, entirely on sufferance, though no action has been pressed on the score of weight on account of the lack of clear definition in the Act. Separate returns furnished by 195 of the 212 registering authorities show a total of 843 motor cars "above two tons unladen," all of which may be regarded as goods vehicles, and at least 90 per cent. as steam-propelled. There are, after making a careful estimate for the remaining 17 authorities, whose books are less clearly kept, about 950 heavy motor vehicles at work in the United Kingdom. This is a solid argument to advance in support of the purchase of motors for heavy transport, as soon as the new regulations appear, because it means that a buyer now places his feet on the heads of so many pioneers who have pulled out the chestnuts.

I inquired of the Borough Engineers of 216 principal authorities by circular letter and form dated June 15th, with the results shown in appendix IV.

MR. C. H. COOPER (Wimbledon) said it appeared to him that they ought to be very careful about any resolution they proposed. They all knew, no matter what subject they were dealing with of a scientific nature, how very careful they ought to be in stating anything definite, and certainly he did not think such a body as they were ought to pass any resolution whatsoever on a matter of this sort. He had a copy of the proposed regulations of the Committee which had recently sat on this subject, and he must say he thought it a pity that Borough Surveyors were not brought more into touch with the matter than they had been.

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APPENDIX I.—*Abstract of Uses.*

How Employed.	Midsummer, 1904.		Estimated at Date.	
	Cars.	Cycles	Cars.	Cycles.
Private purposes	14,233	16,991	15,616	18,116
Business purposes	2,164	3,158	2,380	3,370
Private and Business	598	1,372	660	1,430
Heavy goods haulage	902	—	950	—
Public passenger service	443	—	470	—
Totals ..	18,340	21,521	20,076	22,916

SUMMARY.

ENGLAND.					Cars.		Cycles.		Totals.
County Councils (without Essex).					11,777	..	12,750	..	34,662
County Boroughs					4,050	..	5,541	..	11,325
Totals					15,827		18,291		45,987
WALES.									
County Councils					383	..	551		1,082
County Boroughs					93	..	203		378
Totals					476		754		1,460
SCOTLAND.									
County Councils					843	..	833	..	2,301
Registration & Licensing Burghs					530	..	419	..	1,335
Totals					1,373		1,252		3,636
IRELAND.									
County Councils					456	..	827	..	1,380
County Boroughs					208	..	397	..	706
Totals					664	..	1,224	..	2,086
Grand Totals—Midsummer, 1904									
Without Essex					18,340	..	21,521	..	53,169
Computed to Date—Estimated.									
United Kingdom					20,076	..	22,916	..	58,000

APPENDIX II.—*Return of Eastbourne Motor Omnibuses, April–Dec., 1903.*

DELIVERY DATES.—One in April, one in June, one end August, one in September = 4 Milnes-Daimler.

MILEAGE.—About 90 per day per 'bus run. Total to December 31st, 1903, 36,800. Roads chiefly macadam.

RECEIPTS.—£2,070 from 294,922 passengers carried; sundry, £204.

TOTAL COST.—£2,207, including management and wages, running and general repairs, repairs to machinery, repairs to vehicles and tools, tyres (£626), petrol, &c., compensation, printing, bell punches, insurance, licenses, uniforms, sundries, and sinking fund.

PETROL.—11½d. per gallon has been the average price. This is now reduced by 2d. per gallon.

TYRES.—Average over period = 4·09d. per car mile. Are now maintained by contract at 2d. per car mile.

COST PER CAR MILE.—14·39d. over the period. The results for the half-year ending June 30th, 1904, are not yet available.

Two Clarkson steam omnibuses and two more Milnes-Daimler omnibuses have been added since March.

APPENDIX III—Return of Motor Wagons

Authority.	Number Employed.	Maker.	Motive power.	Price.	Class of Work.	Economies per motor per annum.	Unfavourable comparison with horses in any work.
Metropolitan Borough Councils—				£			
Chelsea	5	1 Thornycroft 4 L. S. M. Co.	Steam	1 at 550 2 at 475 2 at 568	Cartage and watering	Yes	Yes
Hampstead	2	Thornycroft	"	750	Cartage and watering and refuse removal	Yes	Possibly in dusting
Kensington	1	"	—	—	—	—	—
Westminster	3	"	Steam	750	Dusting and watering	£100	—
County Boroughs—							
Blackburn	2	Lancs. Steam Motor Co.	"	550	Cartage	£186	Dur'g frost or snow
Bootle	2	Thornycroft	"	1 at 835 2 at 672	1. Brushing, 2. Refuse collecting and cartage	Not sufficiently long	in
Bournemouth	3	Do.	"	750	Watering & cartage	Slight	—
Burnley	1	Coulthard	"	600	Cartage	£80	—
Cardiff	2	Manns	"	500	Watering & cartage	Yes	No
Folkestone	1	Savage Bros.	"	575	Watering	33%*	No
Gateshead	1	Manns	"	480	Cartage	£208	—
Leeds (tramways) ...	1	Milnes-Daimler	Petrol 16 h.p.	745	Emergency & breakdown calls	—	No
Liverpool	6	Lancs. Steam Motor Co.	Steam	525	Refuse hauling	Slightly less than horses	On very short trips
Newcastle	1	Straker	"	600	Cartage	Not sufficient	exp
Norwich	1	Yorkshire	"	530	Cartage and watering	Yes	On slow loading & short runs
St. Helens (tramways)	1	Coulthard	"	451	Repairs and maintenance construction tramway	Yes	No
Reading	1	Fodens	"	565	General haulage: granite, gravel, road material	Yes	Yes
Other Authorities—							
London	2	Thornycroft	"	—	Scavenging & watering	Yes	No
Acton	1	"	"	760	Dust and sweeping and watering	—	—
Glasgow	1	Milnes-Daimler	Petrol	585	Conveying grain from docks to granary	—	Yes
Smethwick	1	Thornycroft	Steam	825	Hauling and watering	—	—

SUMMARY OF MANUFACTURE

Thornycroft ... 16 | L. S. M. Co. ... 12 | Milnes-Daimler ... 2 | Savage ... 1

use by Municipal Authorities.

Is there economy in dust and refuse collection and disposal?	Interchangeable bodies?	Cost of repairs per motor per annum.	Part most trouble.	Is speed stringently restricted?	Average load.	Maximum Load.	Average miles weekly.	Inclusive cost per annum. motor, &c.	
When standing about as dust-cart	No	Yes: on 3	£50 each, contract	Boilers	Not too rapid	Tons. 4.75	Tons. 5.0	Varies	£ —
—	Very slight	Yes	£80	Pistons	No	4.5	5.0	Varies	430
—	—	—	—	—	—	—	—	—	—
—	Yes	Yes	£150	Crank-shaft	Yes	2.0	3.0	200	489
—	Certainly	No	£41	Springs and boiler	Yes	4.75	5.0	140	192*
in use to	say	Yes	—	—	Yes	3.0	—	—	—
—	—	Yes	Too brief to say, but heavy	—	Yes	7 cu. yds. 700 galls.	—	Varies	—
—	—	No	£45	—	—	4.75	5.0	84	286
—	Yes	Yes	None up to now	None	In town	10.0 with 3 trailers	—	—	—
—	—	Yes	£25	—	—	—	—	—	—
—	Under consideration	No	£8 for nine months	Springs	No	4.5	5.0	80	242
—	—	No	Estimated £20	No fault	No	3.9	—	30 to 40	295
—	Slight	No	—	Axles, wheels, pumps, springs	Yes	4.0	4.0	200	—
ience to	reply	No	—	Adjustment radius rods	No	4.0	5.0	250	—
—	Not tried	Yes	First eight months heavy, since slight	Wheels	No	3.5	4.5	No return	No return
—	—	No	£51	Boiler	No	5.6 gr.	—	60	177
steep gradients uneven and soft surfaces	Not used on this work	No	—	Blind wheels	—	4.5	6.0	100	—
—	—	—	—	—	—	—	—	—	—
—	—	Yes	£115	Crank-shaft	Yes	3.5	4.0	—	624
Refuse collection	No	No	£125	Gear-box	No	2.25	3.25	90	—
—	—	Yes	—	—	—	3.75	4.0	—	—

MURERS REPRESENTED.

Coulthard ... 2 | Manns ... 3 | Straker ... 1 | Yorkshire ... 1 | Fodens ... 1 | Total ... 39

* Without depreciation.

MR. J. PHILLIPS (Wigan) said he would like the President to tell them how far they would be within their rights in passing the resolution which had been distributed. Personally he approved of it very heartily. They all wanted to see motors made more use of, and especially for town work. The town which he belonged to had heavy gradients, and it was cruelty to work the horses with the heavy loads they did, and he had long wished that motor traction could be more used for that work.

MR. H. H. HUMPHRIES (Erdington) said he supported Mr. Cooper's objection to the passing of the resolution. They might pass an abstract resolution to the effect that the dust required dealing with, but he felt they would disagree very much as to the best methods of reducing the nuisance. The resolution before them seemed to specify what should be done. As a matter of fact, the best material they could get to mix with tar to make the most satisfactory tar-paved road, was not the best material for wear. As they had so many different opinions on this point it would be objectionable to pass a resolution specifying what should be done. He saw no harm, however, in an abstract resolution.

THE PRESIDENT (Mr. W. Weaver) said he had been considering the point which Mr. Cooper had raised, and he certainly felt that, as municipal engineers, they should be very careful in advocating any particular method or material; but a general resolution such as he had now prepared, and which he was willing to move, would not be objectionable, and might lead to some good. He moved: "That this Conference of Engineers and Surveyors to county and other sanitary authorities is of opinion that the advent and increase of motor vehicles on public highways renders it imperative, in the interests of public health, that municipal, urban, and county authorities should adopt methods for the prevention of dust during dry weather on macadamized roads, and this meeting recommends the Council of The Sanitary Institute to make known this view as widely as possible." As to how it was to be done, they must leave that to the authorities. When he was giving evidence before the Special Committee, the result of which was the draft regulations, he touched upon this question. He referred to the fact that this country some few hundred years ago had no roads at all, and the entire merchandise and so on was carried about the country by pack-horses. Then wheeled vehicles came into use, and the people responsible for the roads at that time had to adapt the roads for the new methods of locomotion. Now they were getting on, and the horses were gradually disappearing and motor traction was taking their place. The roads would have to be altered and suited to the new methods of traction, and there was not the slightest doubt that the ingenuity of the engineers of the coming generation would be fully equal to making the alteration to meet the new needs of the community, the same as in the past they adapted the roads for the change from pack-horse to wheeled locomotion. He felt that they would be quite able to adapt the roads for motor carriages. At the same time they must

be careful not to officially advocate anyone's methods or material in bringing about any changes, and the resolution he had read would only have the effect of impressing on road authorities the necessity for taking into serious consideration the importance of doing away with the dust nuisance, which was now disastrous to the comfort of suburban residents. He felt that the points in the paper which more affected the municipal engineer, was first this dust question, and then the question as to how these heavy motor vehicles affected the several districts wherein they were engaged. The greatest nuisance which those of them who were engaged in metropolitan districts experienced was the noise, and the subject of noise had not been touched upon in the paper. He thought there should be stringent regulations against the employment of noisy, heavy traction engines going about in the quiet hours of the night, and preventing people getting any sleep. As to the conversion of the roads to motor traffic, it might interest some of his fellow surveyors if he referred to experiments he was making himself, in paving roads with refuse clinkers from their destructors. He got his Board the previous evening to pass his scheme of £6,000 for putting up a clinker house with the necessary machinery for making the blocks for paving the streets. He had made such blocks and had had them down for two years on an omnibus pull up, and he found that they had worn very little during that period. He proposed gradually converting all his macadamized roads into sanitarily paved roads by clinker blocks from the refuse, and he estimated a saving of £5,000 a year in road maintenance by so doing.

MR. STRANGE (Eastbourne) said he had no more figures before him than were supplied by Mr. Smith. All he could say was that the motor services in Eastbourne were highly appreciated by the inhabitants. The greatest difficulty was from the fact that they started the service before they were ready. There was a little local jealousy with the omnibus company, and the horse-omnibuses were all taken off the roads. In order to cope with the extraordinary traffic which took place in consequence of this, their service was put to such a strain that they were unable to get sufficient omnibuses to maintain the service as effectively as they should have. So far, however, as their experience went, they had not come upon the rates for a single penny, in relation to the motor service. The balance was a small one, but upon the right side. The great difficulty was the constant break down of the vehicles, but that could be obviated by having a sufficient number of omnibuses in hand so that in cases of emergency there was always one to take the place of another.

MR. BREACH (Eastbourne) said the greatest difficulty they had to deal with at the present time was that of the dust. Everyone knew that in dry weather there was an enormous amount of dust to be dealt with, and the great difficulty of the municipalities was to deal with it, and to do so without sufficient horses to horse the water carts. In wet weather they did not require the horses. In Eastbourne they found the difficulty, and to meet the difficulty and get the

work done, they made a practice of hiring. But here again a difficulty arose, as to arranging with contractors to supply horses in dry weather, for which they had no use when it rained, and consequently, when they had required so many horses for use in the water carts in the morning the contractors were unable to supply that number, and so many roads had to go unwatered. With reference to the material for the laying of dust, he knew that on an estate at Eastbourne they used a material known as Westrumite, but there was one objection to that, in the smell. In all health resorts, the more they did away with smells the better it was, and there was a certain unpleasant odour attached to this material, but so far as the actual laying of the dust was concerned it was a great improvement. He had seen a road watered with it in the morning, which had gone the rest of a hot day without anything more being needed. There was, however, the unpleasant odour, and that also was one of the difficulties they had to meet with regard to motor omnibuses. As to noise they were not much troubled with traction engines in the streets at night, but they had by-laws prohibiting traction engines going through certain streets at certain times of the day. They had, however, recently had complaints made as to the noise made by the motor omnibuses. They could never get anything to perfection, and there were always people ready to grumble at anything municipal authorities did. Taking one thing with another, he believed that the service of motor omnibuses being run at Eastbourne was gradually doing away with the idea of introducing tramways. They had differences of opinion as to whether there should be trams or motor omnibuses, and, so far as the inhabitants were concerned, they were coming round to the opinion that, at least at health resorts, the best mode of conveyance was not tramways, but motor vehicles.

THE PRESIDENT, in putting the resolution to the meeting, pointed out that it would be only an expression of opinion, and would have to go before the council to be confirmed.

MR. E. G. MAWBEX (Leicester), in seconding the resolution moved by the President, said it would be an informal vote, because it was not upon the programme. He felt they were all indebted to Mr. Shrapnell Smith for the enormous amount of trouble he must have taken in preparing the paper. The two main points which Mr. Smith raised were, first, that he wished to get rid of electric tramways. Well, Eastbourne might be all right, but there was a difference when they came to a large town like Leicester. In Leicester they had carried out an electric traction scheme, and it was strongly brought before the committee that they ought to consider whether motor omnibuses might not be the best thing. They did very carefully consider the question, but they came to the conclusion that as they would have to carry something like three or four times their population every week, which would eventually mean something like a million passengers, it would take a very large crowd of omnibuses to do this. He could quite realise that in a nice seaside town they might succeed with omnibuses, but he

was afraid the time had not come when they could adopt them in large towns, in preference to electric tramways. Mr. Breach had pointed out the difficulties of noise, dust, and smell which had to be got over. A reference had been made to motor cars for municipal engineers. Mr. Smith was very enthusiastic there again, and so was he, because he was president of the Leicestershire Automobile Club, and had driven a car at his own expense for the last three years. He was rather afraid, however, that Mr. Smith's figures as to maintenance were rather too low, in respect of a four-seated car, and they must be taken with a little caution. Mr. Smith was just as enthusiastic when he told them what it would cost to run motor wagons. They who had to advise these authorities must be very cautious not to commit themselves to figures, and then find their figures largely exceeded. He did not say that Mr. Smith was very wrong, but he thought he was on the doubtful side. As to the cost of motor wagons, they had gone into it at Leicester, and had come to the conclusion that it would not do to use motor wagons for dust collection because the distances to the refuse destructor were so short. What they did find on going into the matter was, that where they had a great deal of material to move—material for works, or where they were clearing destructors of clinkers, it would pay. They had about 80,000 tons of stuff to get up a hill, about 100 feet high, and two miles from the station, and there could be no doubt as to the advantage of having motor vehicles for that purpose. Again, where the distances were very long, where they had to cart clinkers and bring back gravel, he was certain that motor vehicles would pay thoroughly well. Personally, he was certainly in favour of them where there was a great deal of heavy work to do. With regard to the dust question there was no doubt that motor cars were a perfect nuisance under certain conditions. It was no good trying to do away with motor cars, because they had come to stop. He hoped that municipalities would, in the near future, provide surveyors with motor cars, because, especially where they had big districts to cover, it would pay to do so. In a paper he wrote for the *Motor Car Journal*, he pointed out the advantages they would be to surveyors, in the saving of time.

The resolution was then put to the meeting, and carried.

THE PRESIDENT said that his experience was exactly the same as Mr. Mawbey's with regard to the use of motor wagons for municipal purposes. If they had a lot of cartage to do and a heap of stuff to be moved away from one spot to another, motor cartage was much cheaper than horse cartage. With regard to the employment of motor wagons for the collection of house refuse, and the divergencies of opinion as to whether it was economical or not, it all depended upon how long they allowed the dust to accumulate in houses. If they had to pull up at forty houses and get a few baskets from each, motor wagons were out of the question; if on the other hand they allowed the dust to accumulate and were able to fill a wagon from a dozen houses in a street,

then motors would pay. But that system of allowing the dust to accumulate would not do in metropolitan districts. He did not know what they did in the country districts, but if a man had to go down a flight of steps and into the back garden to get half a basketful of stuff, and go to forty or fifty houses to fill a van, it would be a costly method of collection to have motor wagons. His advice to his brother surveyors was not to embark on motor vans unless they had a fitter's shop of their own where repairs could be done. If they had to send the motor to the makers to be put right, and they kept them for best part of a week, it meant a lot of trouble.

MR. E. SHRAPNELL SMITH (London), in reply to the various points raised in the discussion, said it was true that where the municipality had a fitter's shop it was an advantage, but if they looked at the returns they would see that some of the makers entered into maintenance contracts, and if that was done they of course had a guarantee of what their repairing bill was going to be. They would not be going into an uncertainty if they did this, for the makers took the risk. In the case of Folkestone, where the wagons were Savage Brothers', they entered into a maintenance contract for £25. He had entered into discussion with reference to this, and found it did not include the fitting of the parts, so that that was not a correct figure. In Chelsea they were maintained at £50 per annum by contract, and a fitter had to reside on Chelsea wharf. He understood that several manufacturers were prepared to enter into agreements with Corporations, taking all risks, for £75 a year. He thought if they pressed the point with makers they would get a satisfactory maintenance contract for £75 a year, and if they did not get a resident fitter for one machine, at least they would get in men who would be at their call at very short notice. It was perfectly true that he had not given the percentages of idle time, but he did not know where it could have been furnished, because motors were only newly introduced, and he did not think that all the authorities kept their records. He could not get fuller replies than he was furnished with. As to the question of omnibuses and tramways, he did not intend to convey the view that motor omnibuses were of universal application. He agreed that in large towns where there was a great traffic, electric traction from a central generating station would beat motor omnibuses with a self-contained generator; but he thought there were many cases of towns with a population up to 60,000, 70,000, or 100,000, especially if they were watering places like Eastbourne, where much was to be said in favour of motor omnibuses. If they could give an efficient service of omnibuses at half the capital cost it would satisfy the ratepayers, but figures showed that the cost per car mile of running motor omnibuses was more than for electric tramways. When he spoke of the cost of light cars he did not mean a car such as Mr. Mawbey had. He was much interested in reading Mr. Mawbey's article in the *Motor Car Journal*, and he said that his tyres cost him 2d. to 2½d. a mile. His tyres cost him only 1½d. a mile, and if they reduced that to under 1d. for the

car he had in mind, then he thought Mr. Mawbey would agree that his estimate was not so far wrong. The unfortunate thing about estimates was that one had a great tendency to state what could be done and what had been done where the management had been very careful and everything had been fortunate; but on the other hand it seemed unfair to take the worst conditions. Still, he agreed that the danger of estimating was that one stated what could be done, and in a large percentage of cases, owing to unforeseen circumstances, and bad drivers and bad luck, the estimates were largely exceeded. That might enter into the heavy traffic figures as well as the light traffic figures. They would see the diversity in the table he had referred to. One authority maintained at £40 a year and one at £150, and yet they were all motor vehicles and "much of a muchness" about them. Why there was such a divergence wanted a lengthy investigation to explain. In regard to the heavy lorries used for watering and other purposes, he was of opinion that experience had shown that for dust collecting where they had to wait about it was hopeless. If they got big loads and got a lot of men at work, and there was little delay, then there might be a little economy but not a large one. As to street watering, Mr. Bradley of Westminster estimated a saving by the use of motors of £300 a year. For watering in places like Eastbourne, where Mr. Breach had said there was a difficulty in getting horses, if they had a motor which they used partly for watering and partly to carry heavy paving materials or coal from the station to the gas or electricity works, there was a possibility of economy that way. He knew a wagon working between Preston station and the gas works, which were only half a mile away. It went right under the coal tip, took a load of coal, and went straight away to the gas works. It did 70 tons a day and the cost came out at 4d. per ton. The only other point was as to noise. He did not admit that motors were as noisy as traction engines. The Committee of the Local Government Board, before which the President and he himself gave evidence, had issued recommendations which would have the tendency to check that noise, because they would limit the weight per axle and the speed. So far there had been plenty of motor lorries on the streets with 11 or 12 tons on per axle, and the authorities had been so busy looking after light cars that they had not looked after the heavy ones. Now they would have six months to alter their cars. Personally he had no sympathy with those people who had been breaking the law, and taking advantage of those makers who had been adhering to the legal tare.

In addition, a paper was read by W. HILLMAN, entitled "Brief Notes on the Utilisation of Destructor Residuals." The following speakers took part in the discussion: The PRESIDENT (W. Weaver), E. G. MAWBEY (Leicester), DR. W. G. WILLOUGHBY (Eastbourne), MR. SMITH (Kettering), C. H. COOPER (Wimbledon), MR. BREACH (Eastbourne).