

DISCUSSION.

Mr. Norman Selfe, in opening the discussion, said he regretted that he was not able now to come very often to the meetings, but he had been fully repaid that night. He thought the paper contained an immense amount of information. He did not know that he had ever listened to a more exhaustive paper on the author's subject. Mr. Boulton had taken lock, stock, and barrel into consideration, and it is full of matter from beginning to end. It gave him a great deal of pleasure to propose a most hearty vote of thanks to Mr. Boulton for bringing this very interesting subject before us. There were one or two things not quite clear to him; one was the reason for the blue smoke coming out of the exhaust pipe. The author mentioned that paraffin could not be obtained in the State. He did not know whether that was so now, but he (the speaker) made paraffin 40 years ago, and hundreds of tons of paraffin were shipped from here later. After he erected the kerosene works at Waterloo, refining works were started at Hartley Vale, and paraffin was made by hundreds of tons; they had special refrigerating machinery for the purpose. The only part that he could say he was familiar with in this matter, as a mechanic, was the change gear; the author described a hydraulic gear box with three engines of variable stroke. He had the pleasure of inspecting, some months ago, an invention which he thought was one of the most ingenious and clever devices for the purpose that he had ever seen. It was a variable gear box in which it was possible to have as many changes as were desired, with practically no loss by friction, and all worked by one pump. There

was a hydraulic piston disc acting against each wheel, and a small oil pump constantly running; an india-rubber bag on the steering wheel, by touching which you could put in any gear instantly. One drop of oil was sufficient. You just touched the bag and, by air pressure, closed a by-pass, and the oil acted; the hydraulic cylinders on the gear wheels had a very small stroke (about one-hundredth of an inch only). You put the pressure behind whichever one desired by an adjusting valve, a most simple thing—he marvelled at the simplicity of the whole.

It was a friction brake as well; he did not know if that was the same one as that referred to by the author.

There was another matter that had often struck him—that was, why did they make these motor cars with such small wheels, when it was evident that the wear and tear of a wheel of small diameter was so much greater than the larger one? It appeared that the movement was now to have larger wheels. These were only one or two points out of a most exhaustive subject that the author had gone into so fully. His paper would form a kind of vade-mecum for anyone who wanted to know where to start and where to leave off in studying the subject. He thought with Mr. Boulton that the poor old steam-engine was pretty well done with for that kind of work.

What appeared to him most unsatisfactory in this connection was the way of calculating the power. If the power was reckoned by the diameter of the cylinders without reference to the stroke, he did not see it would be anything more than guess-work. It would be interesting to know what was the weight of the best engine per developed horse-power, if we could get a horse-power for only one or two pounds' weight it would be a great advance. If the author could supply the particulars it would be interesting to know the weight of his engine,

the actual horse-power developed, and the weight of the fuel or measurement of petrol used per horse-power. This would then add very much to the value of the paper, but, even without it, it was full of information.

Mr. A. J. Arnott said it gave him a great deal of pleasure to second the vote of thanks for the able paper that the author had given. He quite agreed with the last speaker that, from the experience we had had of the various modes of operating the steam-driven 'buses, it was not so serviceable as the petrol motor. He was convinced that, for the rapid speed required, and for the constant stopping and starting, the petrol motor was much more serviceable. The question raised in reference to the hydraulic means of gearing reminded him also of the fact that he had the inspecting of a gear that was patented in Sydney, and consisted of a small oil pump which actuated the speed gearing. They braked the engine, and found that the pump occasioned a loss of something like 55 per cent. of power; so that not only was it intended as a brake, but they also observed that the speed of the motor car was very heavily taxed on the road. For that and other reasons, he believed that those who fathered the patent abandoned any further attempt, but he thought an improved apparatus was taken home.

He would like to refer to the proposal made by the author with regard to electrically-driven motor cars. He thought it would be an ideal system. A great deal of the gear would be eliminated, and the matter of control would be much easier. In fact, it would be a much simpler motor. We had all heard of Mr. Edison's battery, but he thought that we were waiting in vain. However, he did believe that a light accumulator would be patented some day soon, and that we would be able to charge it—or, if not to charge, to pull it out and put a fresh one in. The principal trouble would be in

placing charging stations in various parts of the country where the vehicles would be able to get a fresh charge. That was the principal objection as far as pleasure vehicles were concerned. But for commercial vehicles the position was different: they could be charged anywhere in Sydney, seeing that electricity was so extensively used.

In conclusion, he wished to express his thanks to the author for the way he had put the subject forward.

Mr. W. H. German said he had much pleasure in supporting the motion for a vote of thanks to Mr. Boulton for his very able paper. He had listened to it with a great amount of interest and pleasure. Mr. Boulton's remarks upon motors seemed to him to be particularly applicable to omnibuses; but, so far as Sydney was concerned, he was of the opinion that our Government have practically left no room for omnibuses by reason of the excellent service of trams.

Another matter that had occurred to him in connection with Mr. Selfe's review was that the poor old steam-engine had got to take a back seat, or words to that effect. He (the speaker) did not think so. If he was an engineer, he was a steam engineer. He must confess he had a natural inclination—perhaps through want of knowledge of internal combustion—for the steam-engine. If he read the table correctly, under the heading of "Steam Load" it said that, with the exception of the traction engine, it showed the cheapest price per one-ton mile, while it had apparently a very good range of action.

Altogether, this paper seemed to him to be so full of merit that he considered that it should not go without further discussion. Therefore he would suggest, with the consent of the proposer, that the discussion be adjourned

so that the paper might be more fully discussed on a future occasion. He had much pleasure in supporting the vote of thanks.

14TH OCTOBER, 1909.

ADJOURNED DISCUSSION.

The President read the following communications:—
Police Dept., Traffic Branch, Phillip and Hunter Sts.,
Sydney, 11th October, 1909.

Dear Mr. Boulton,

I have received your very interesting and informative paper on the "Commercial Motor Vehicle."

The matters dealt with, however, do not come within my official knowledge to any extent, and I regret that I am, therefore, unable to offer any criticisms or comments upon the subjects treated that would be of practical value.

I am a firm believer in the value for commercial purposes in this city of motor vehicles for conveyance of goods and merchandise; in fact, I think that they can be much more profitably and economically used for such a purpose than for passengers, such as taxi-cabs and omnibuses. The latter I consider quite out of the question, in the metropolis, on account of our excellent system of tramways.

If a petrol lorry or van can be worked in Sydney at anything approaching the cost per ton mile in England (Table 11), I think there should be a great demand for them here; but, unfortunately, for many reasons, the cost of working motor vehicles in Sydney is very considerably greater than in London. The question of drivers is one with which I am somewhat familiar. No difficulty is found in Sydney in getting active young

men with a knowledge of horse driving who want to drive motor vehicles, but they have absolutely no knowledge of motor driving or of machinery. If a good plan of systematic training could be introduced, it would materially assist in the proper regulation of this class of vehicle.—Yours faithfully,

A. EDWARD, Superintendent.

55 York Street, Sydney, 8th Sept., 1909.

Eric F. Boulton, Esq., Box 649, G.P.O.

Dear Sir,— I very much regret the inability to be present at the reading of your paper on "The Commercial Motor Vehicle," at the rooms of the Engineering Association of N.S.W.

I enclose herewith a few remarks regarding the worm gear, and I shall be much obliged if you will read them with your paper on Thursday evening.

Thanking you in anticipation, yours faithfully,

T. W. OSGOOD.

WORM GEARING AS APPLIED TO COMMERCIAL VEHICLES.

Until quite recently there was a prevalent but erroneous idea that the modulus of efficiency for this type of gearing was very low, in consequence of the excessive friction between the elements in contact.

This objection has been founded largely in prejudice, arising from traditional experience with imperfectly-designed mechanism, constructed with unsuitable materials. It is easily understood that excessive friction did take place under these conditions.

The action of worm gearing is similar to that of a screw, and gives to the parts in contact a sliding

motion, which may produce excessive friction, providing correct principles are ignored in the manufacture.

It has been found possible, by the leading experts in England, to make the worm pinion and wheel of such material, cut them at such an angle and pitch that, when mounted on ball bearings above suspicion, the friction between the two surfaces is even less than a spur gear, is absolutely silent, and it has the wearing properties of any other six gears known.

Worm gearing can claim another important advantage, viz., it admits of a greater reduction of ratio than is possible with any other type of gearing using reasonable-size gear wheels, and in consequence a direct drive can be obtained on the top speed with no gears in mesh, thereby greatly reducing the wear and expense of upkeep.

The President then called upon Mr. King to continue the discussion.

Mr. R. R. King said he was sure all joined with him in regretting Mr. German's absence, as we all expected he would have had something to say in connection with the paper. In seconding the adjournment of the discussion, it was not that he had anything definite in his mind at the time that he wanted to say, but rather with the hope of eliciting further remarks and information from others who had had experience with motors and motor vehicles for commercial purposes, passengers, and goods. There was no doubt such vehicles were daily coming more prominently into use in the British Isles and on the Continent, where, as stated by the author, "no business of any standing which could employ such machines is to-day without them." This could not be said so definitely of Australia as regarded vehicles for carrying goods, these being comparatively few, although there were many businesses where such vehicles could be profitably employed. If we considered

the number of delivery vans and lorries drawn by horses, used by warehouses alone for the conveyance of their goods, and that the cost was something like 9d. per ton mile, there was a wide field for commercial motor vehicles for the carrying of goods, both light and heavy, for, with the degree of perfection to which the present-day motor vehicle had attained, and the comparatively low cost of running, it was evident that a marked saving would be effected by their adoption. Of the three types (electric, oil, and steam), it was evident that for fast passenger and light goods service, where weight of motor was a consideration, that the petrol motor was the best; but for vehicles carrying heavy goods, and slow travellers, and where weight of motor was not a vital factor, steam-driven vehicles could be run very profitably. This was borne in mind in Table No. II.

The weight not being all-important, larger bearing surfaces could be arranged for, and many details would commend the steam engine. The valve gear would not be so liable to get out of order, and any slight derangement would not constitute a complete stoppage, although it would, no doubt, do so in the oil motor. Altogether, there would be fewer risks with the steam engine of a total break-down. He was sure that, for the heavy traffic of loads of three to four tons, the steam-engine would give far better results than petrol, and that the cost of running would be cheaper for heavy loads and slow travelling.

A question was raised at the last meeting by Mr. Norman Selfe as to the cost and weight per B.H.P. The weight per B.H.P. of marine motors was, no doubt, considerably more than the weight per B.H.P. of the lighter road motor. It might be useful, therefore, to know the weight per B.H.P. of various road motors.

Another question raised at our last meeting was in reference to the formula for the H.P. The length of the

stroke was not brought into the formula; one would naturally think it would be. He would like to have this explained more fully.

Mr. A. J. Arnot said it had occurred to him that the question of horse-power required for these commercial vehicles and 'buses was of considerable importance.

Statistics showed that the motors employed in the London streets, which were comparatively level, were from 35 to 40 H.P.; consequently a very much larger power would be required to run similar motors in Sydney and suburbs, owing to the hilly nature of the roads.

The author referred to other types of transmission, but did not give any particulars of the electrically-driven vehicles, which he (the speaker) understood had, so far, not been a success. He had not gone into the question very thoroughly, and, therefore, would like Mr. Boulton to tell us what had been done in this direction. The system of driving a dynamo by small petrol engine, using the current to drive a motor, geared direct to the driving shaft, was an ideal one, and gave the greatest flexibility, the system of control being perfect; the loss in transmission should not exceed 25 per cent. This would do away entirely with the gear box, and, considering the ease with which such a system might be operated, it could only be concluded that its failure was owing to the complication necessary.

The author stated that we must have accumulators that could be charged in a few minutes before we could have a satisfactory electrical vehicle operated by accumulators. Surely this was not so. Why not have a system of changing the accumulators, such as they had on electric cars which carried accumulators? There was no time to charge them in the car, but the car was run to a shed; the exhausted accumulators are taken out and a fresh set put in in about two minutes.

He had looked into the question of cost per car mile

given by Mr. Boulton, and compared this with the results that were obtained with the electric services of London, Bremen, Reading, and Leith, and found the cost per car mile, taking into consideration the actual driving costs, but not including depreciation and managerial expenses, to be as follows:—In Reading, 2.17d. per car mile; in Leith, 2.39d. per car mile; and the total expenses per car mile, including everything, were 4.6d. and 4.8d. respectively. These figures were in connection with electric tram-cars operated in the ordinary way, such as we had in Sydney. Compared with the motor omnibuses, you would notice that the comparison was much in favour of the tram-car system; so that if the service was anything like a big one he could not see anything in favor of the motor 'buses, as compared with electric tramways. Of course, in London the City Corporation prohibited the use of the electric tram-car in the city, but permitted motor 'buses. (One must distinguish between the City and the County of London.)

It was a fact, however, that they would not allow tram-cars in the city. If they did, he did not think the motor omnibuses would last one year in large cities where they were being run; the cost, as he had shown, was 50 per cent. less than with motor 'buses.

He had only cited two instances, but there were fifty in which the total cost of the electric tramway was under 7d. per car mile.

Mr. Russell Sinclair said that the paper had given him much pleasure, but he thought that the author had made a mistake in turning down the steam-engine so quickly, as he considered that a little more might have been said about the steam lorry, as it was, in his opinion, coming to the front—and, he thought, with good reason.

From what he had lately read of comparisons between steam and petrol, the tendency seemed to be the simplifying of the gear box. The author referred to this as the bug-bear of the car. If this could be elimin-