points to or supports such a theory. After inspecting the boulder bank and Mackay's bluffs, it appears to me that it was formed in a manner similar to the sand spits which, as a rule, are to be found at the entrance of the harbours on the New Zealand coasts. There is no question, to my mind, that the material forming the bank came from the vast slips which have fallen from the bluffs, and that the harder portions have been driven along by the rip of the heavy seas, which, in the past, have been probably more frequent and of longer duration than at present. The direction of the prevailing seas in Tasman bay is from N.N.W, magnetic, and the general trend of the boulder bank is, approximately, S S.W., so that the seas impinge upon it at an angle of about 45 degrees, but the resulting rip or deflected force would be in a direction towards S.S.W., which corresponds to the general line of the bank. In nearly all the bays on the New Zealand coasts sand spits will be found extending from one of the flanking bluffs to the entrance, which is usually close to, or hugging, the other, and in many cases the seas impinge more at right angles to the axis of the spit than occurs in the case under consideration. A very good example of the formation of a bank against what might appear to be the forces of the sea is to be found in the Farewell Spit, and a similar action to that taking place there has, I consider, formed the bank at Nelson."

Considerable interest has been aroused in the colony as to whether the cut will attain the object for which it was designed. Should it do so the benefit conferred upon Nelson and the travelling public will be inestimable.

THE DREDGE AT WORK, NELSON HARBOUR IMPROVEMENTS.

Rival Motive Powers.

One frequently hears the opinion given, and more often than not by persons innocent of motor experience, that the internal combustion engine has already relegated the steam engine to second place in commercial motoring. The fact that the petroleum spirit engine is first, and the rest nowhere, in the field of pleasure or touring cars, is largely accountable for this prevalent view. A genuine conviction on this subject is engendered, too, as regards even the most superficial observer of events, by the great preponderance of the newer method of deriving power which is found in the prime movers upon the popular motor omnibuses of today; and this last fact, more than all the rest put together, is calculated to boom the explosion motor at the expense of the steam engine. But it is early in the contest to accept present experience as indicating any finality in respect of the ultimate ratios between steam-propelled and petrol-engined vehicles. Further some account will have to be taken of accumulator propulsion, for example, the wide employment of secondary batteries in New York City, as the portative source of motive power for large observation cars, has already led to valuable improvements. We find that systematised methods of re-charging and suspending the boxes coupled with more careful supervision and examination, have resulted in a greatly increased life for the cells which, under such favourable treatment, retain eighty per cent. of their original capacity after twelve month's use. But the best results obtained to date in this direction exhibit costs for power which are much above those of either steam or internal combustion engines. The one other system which falls within the range of practical politics is that colloquially termed the "petrol-electric," in which an internal combustion engine is employed in conjunction with a dynamo and one or more electric motors. The huge and unwieldy proportions of the earlier petrol-electric chassis have gradually been replaced by more graceful and compact combinations, until we find a great city like Vienna on the point of condemning practically the whole of its municipal fire brigade horsed vehicles and arranging for the immediate adopton of petrol-electric vehicles. Given the absence of necessity for cells, which are now almost universally supplied as an essential part of any such system, we look upon the prospects of these vehicles as being exceptionally bright. We have before us the confidential details of a petrol-electric system from which all cells are eliminated, suitable and effective provision for starting being made without necessity for recourse to their aid. In this arrangement, one sees that the internal combustion engine is, indeed, supreme, and that the electric elements are made dependent upon and subsidiary to it.

Any examination into the relative merits of steam, petrol, accumulator or petrol-electric propulsion reveals the fact that each has its spheres of application. Where the guiding consideration is commercial efficiency, it is imperative that users should be ever on the alert to apply the system or systems best adapted to the demands of their customers and the circumstances of the particular routes to be covered. Accepting these conditions as sound, we can discover no evidence to support the somewhat wild claims that the petrol engine *per se* will become universal. Manufacturers themselves, better than any, know the difficulties which arise when petrol engines are mounted in frames carried on non-resilient tyres, and how the advantages of regular service and economy in tare weight are jeopardised by such ambition. It so happens that the specification for a double-deck omnibus approaches the limits which govern the successful use of the petrol engine, for when rubber tyres have to be discarded, and when a 40 or 50-h.p. engine has to be fitted in order to cope with the increased demands which are consequent upon steel tyres, greater tare, and heavier loads it is better to rely upon steam power as a rule. The exceptions are where difficulties over water and fuel supply outweigh the advantage of a more flexible engine and transmission. On the other hand, to quote one instance of many, steam may be preferable in certain parts of the world, however difficult it may be to obtain water, if a sand-laden atmosphere renders the essential draughts of air a source of scored cylinders. The fact that water provides a pure medium to work inside the engine must often cause a preference to be accorded it over the internal combustion engine which is dependent for its working upon an external medium as well as the fuel proper.

The petrol engine will prove best for loads below 3½ tons, but steam will have a material share within that range. For heavier loads, steam is superior. Accumulator propulsion will always be limited to charging centres but in the petrol electric system the greatest possibilities of development lie.

The German Quick-Step.

The alertness and receptivity of the Germans, writes Mr. J. H. Yoxall, M.P., in the *Magazine of Commerce*, do not arise from a better equipment of brains than the English, but from a better

MR. LESLIE H. REYNOLDS,

Engineer, Nelson Harbour Improvements.

equipment of education. Upon that topic I will only here say that, class for class, every class of the German population is better educated and better trained for its work than the corresponding class in this country.

I have mentioned the lavish expense and yet the buoyant confidence manifest in the new Germany; combine these with mental alertness and business and professional training, and you get the incentive and the activity needful to produce "push." Let me show, by one contrast with ourselves alone, *how* they push.

In the year 1904 no less than 3,848 commercial travellers representing German firms visited Switzerland on business, many of them three or four times in the course of the year. In the same year no more than 34 British commercial travellers visited Switzerland at all.

I think it all comes round to that; the German quick-step in trading, amassing money, distributing it evenly, and using it in splendid civic and pleasant private ways results, I think, from the German quick-step in education.

Canada's Industrial Future.

A GREAT expansion of commerce and a considerable growth of manufactures are being looked forward to by those who have Canada's best interests at heart, including, among others, the Hon. Clifford Sifton, ex-Minister of the Interior, who has lately been attempting to outline what will be the industrial history of that country within as short a time as the next five years. He prophesies a great commercial development, basing his opinion upon the completion of new railway systems, of an increase of from one to two millions in population, the opening up to development and trade of the northern regions, the perfecting of the system of waterways, and the strengthening of the corps of consular commercial agents aboard. Heartily we trust that this pleasing forecast will be completely realised. Undoubtedly this authority is right also when he emphasises the necessity that exists for improving the waterways. While great strides are, he admits, being made in the development of systems of transportations by land, Canadians, he considers, have not yet succeeded in making the outlet to the seaboard what it ought to be for the purposes of commerce. Canada is, he declares, and must continue to be, an exporting nation, and the channels of its exports must be the cheapest, freest, and most economical possible. It should be a national sentiment, he further urges, that the route of their commerce to the sea should be made as perfect as the latest developments of science would enable money to make it. He had said to his former colleagues, and would say to them again on every possible occasion, that one thing the people of Canada would justify them in doing was "the spending of sufficient money on the St. Lawrence to make it as safe as the ocean route to New York and Boston." If British engineers and machinists can give Canada any assistance in the great work of improving the St. Lawrence, which scheme is now engaging the attention of a Canadian Commission, they will be only too pleased to render what help they can. To perfect the water route, and especially to thoroughly equip the different ports on the great lakes, will mean large sums laid out upon machinery and plant of various kinds, some of which might, we should think, very well come from the Mother Country. And, even if Canada supplies her own requirements in this respect, there is another way in which English machinery interests will benefit, for does not the improvement of Canada's exporting facilities mean a larger export of wheat, and does not a larger export of Canadian wheat mean more work for British-made flour-mill machinery, wherewith to grind it into flour? Assuredly it does.