series of speed time curves such as are shown on chart 2, showing the effect on possible schedules of varying only the length of time at rest. The schedules shown are what can be obtained by operating at high efficiency, but leaving some flexibility. Average distance between stops has been taken at 528 ft., or 10 a mile. When the car is at rest 10 seconds each stop, a schedule of 8.6 m.p.h. can be maintained. With seven second stops, a speed of 9.3, and with four second stops, 10.1.

Here are evidently some possibilities, but the question of cost must not be lost sight of. If increased schedules entail increased costs, we will have to find a compromise which while benefitting the public in the way of better service, will not be a burden in the way of higher fares. The two large items of cost, directly affected by car operation, are power and platform labor. Power can be calculated, once the run characteristics are fixed, and platform labor is inversely proportional to schedule speed. Combining the two then, will give a very close index of the trend of running costs. We found that by decreasing the time of stop from 10 seconds to 4 seconds, the schedule could be increased from 8.6 to 10.1 m.p.h. Since no change in the motorman's performance is necessitated by the change in the time at rest, power per car mile will be the same in both cases. Under the conditions stated, power will cost 3.93c a car mile at 1c a k.w. hour. Platform labor at 45c an hour will cost at 8.6 m.p.h., 10.47c a car mile, and at 10.1 m.p.h. 8.91c, so the combined costs are 14.4c and 12.84c respectively. Coincident, therefore, with the marked increase in possible schedule speed that can be brought about by the assistance of the public, is an equally marked reduction in operating costs.

Number of Stops.—Building on this promising result, let us see what the remaining factor, viz.: number of stops, will do. Chart 4 was calculated for 528 ft. stops. Using the four second stop which we saw was of advantage to both public and company, chart 5 gives the results of lengthening out these stopping points, within practical limits.

Calculating from similar speed time curves, it is found that at 8 stops a mile, instead of 10, under equally efficient car handling, a speed of 11.2 m.p.h. can be reached, and at 6 stops a mile, 12.55. Figuring power and platform labor as before we see them to be:—at 10.1 m.p.h., 12.84c; at 11.2 m.p.h. 11.57c; and at 12.55 m.p.h. 10.2c. Charts 4 and 5 are drawn to the same scale, to show that reducing the number of stops is of far greater influence on possible schedules than even the time of stop, and we saw that time of stop had more influence than car equipment and handling.

Let us see if the increased distance between stops imposes any serious inconvenience. Ten stops a mile means 528 ft. between stops, or 176 ft. average walking distance, aside from cross street travel. At three miles an hour, this requires 30 seconds to walk. Six stops a mile means 880 ft. between stops, or 220 ft. average walking distance, requiring 50 seconds. Now by having our stops 880 ft. apart and obtaining co-operation for quick movement at stops, we saw that a schedule of 12.55 m.p.h. is possible, or let us say 12 m.p.h. Please remember that this is the only way by which a 12 mile service can be made.

Chart 6 gives some idea of what the différence between 8 mile service and 12 mile service means to the average street car riders. It is suggested that the average passenger walk 20 seconds farther. If he is going 2 miles, he can save five minutes or 300 seconds. If he is going 5 miles he can save 12 minutes; if 10 miles, 25 minutes. This for an extra walk of 20 seconds. The public in a city like Montreal take some 210,000,000 car rides a year. Assume the average ride at 2 miles. The annual saving of time to the public by 12 mile service, as against one of eight m.p.h. is 17,500,000 hours, or 2,000 years.

It is worth remembering that this saving to the public in general would be accompanied by a substantial reduction in operating costs, and also a marked saving in capital investment, since the same service can be maintained with 800 cars at 12 m.p.h. as with 1,200 cars at 8 m.p.h. Cars of a type suitable for heavy traffic in Canadian cities cannot be bought just now for less than \$20,000 each. Car house facilities, car house expense, etc., would of course be in proportion. It would seem, therefore, that in view of the prohibitive cost of equipment, during the present period of false values, it would be a sane policy to find ways and means to use existing equipment to better advantage, before we talk of undertaking capital expenditures to meet the growing demand for transportation.

It might well be asked, can the above reasoning be carried further. The an-swer is, very much further; but with the provision that the general public will have to realize, much more fully even than is necessary for the carrying out of the suggested changes, that street car traffic is by far the most important kind of city traffic and that nothing should stand in the way of improving it. With nonprotected tracks, and even well regulated vehicular traffic schedule, speeds higher than 12 m.p.h. begin to approach dangerous conditions, on account of the higher maximum speeds necessary. Provide a curb protected strip 6 or 8 in. high, for tracks, on certain streets reserved for express service, stops about 1,500 or 2,000 ft. apart, and protected crossings, and there is nothing to prevent a 20 mile schedule. The unthinking part of the public might regard this as a restriction on their right to wander all over the highway, but, in actual time, the gain would much more than offset imagined inconvenience. However, let us get the 12 mile service first.

The outstanding features to be remembered are:---

1. That higher schedule speeds are desirable from every point of view. They can be obtained without extra cost and without affecting safety of operation. 2. That higher speeds will result in an

 That higher speeds will result in an improved degree of comfort and frequency of service, because of less overcrowding and shorter headway between cars.
That speeds higher than those now

3. That speeds higher than those now prevailing depend almost entirely on reducing the number and time of stops, and that a decrease in the number of stops is of more importance than a decrease in the time of stops.

4. That convenience is only a relative factor. An extra walking distance of a few feet is of no real moment when compared with the outstanding advantage of quick transportation. One cannot have private taxi cab service at tramway fares, but there is no reason why the speed of taxi cab service cannot be approached.

5. That appreciably higher speeds cannot be obtained by any possible means within the control of operating companies. Improved service rests in the hands of the users of street cars. Questions of car design, motor equipment, routing of cars, etc., are all of some importance, but their effect on the quality of service is negligible, when compared with the possibilities of improvement along the lines suggested.

6. That the bogie of high cost cannot be used as an argument against faster service, because higher speeds in city transportation tend toward lower operating costs. 7. Higher speeds will result in a more

7. Higher speeds will result in a more efficient use of existing equipment, with the result of curtailing the demand for the non-essential production of rolling stock, in favor of the real necessity for greater production of essentials.

8. It may be stated that it is absolutely essential to investigate every possible means of increasing the efficiency of existing rolling stock, in order that we may partly offset the radical demands for increased wages.

The foregoing paper was read before the Engineering Institute of Canada recently.

Montreal Conductor Charged with Assault.—Alex. Despuis, a Montreal Tram-ways Co.'s conductor, with 20 years service, was charged before Judge Lancetot, at Montreal, recently, with assaulting three passengers with a switch lever. One of the passengers was so injured that he hed to be a the basengers was so injured that he had to be attended by a doctor. That the complainants were struck by the conductor with the switch lever was not denied, but the evidence showed that one of the complainants was drunk and was so conducting himself that a com-plaint was made to Despuis, who started to put him off the car. The other two men interfered and the three were so aggressive that the conductor, to defend himself, took up the switch lever, and one of the men, in endeavoring to take it from him was at the switch lever, and it from him, was struck in the face with The judge held that there had been it. The judge held that there had been no intention to injure any of the men; that the conductor had used no more violence than was necessary, and that it was his duty to preserve order and to protect was a second to protect women from insult on his car. The whole fault was that of the young man who, in his evidence, admitted he was so drunk he could not remember what happened. The case was dismissed.

Speed Limit in Montreal.-Police Constable M. Herscovitch brought an action in the Quebec Superior Court, May 10, against the Montreal Tramways Co. to recover \$15,000 for injuries to a minor son who was knocked down by an electric car on St. Lawrence. Peul a bet five car on St. Lawrence Boulevard about five years ago. The evidence showed that the average speed of the car was 8.60 miles an hour including stops, which was in contravention of the Out Polyays in contravention of the Quebec Railways Act, which prohibited tramway companies incorporated within the province running cars in excess of 6 miles an hour in unless the lines were properly fenced in, or unless the charter expressly provided that this are all in the charter expressly provided that this speed limit might be exceeded. The Montreal Tramways Co.'s new char the montreal Tramways Co.'s new char-ter authorizes it to run its cars at 10 miles an hour, subject to the Quebec Public Service Commission's approval. Advantage was not taken of this provi-sion, counsel for the pleintige stating that sion, counsel for the plaintiff stating that the sanction for the higher speed limit did not take affect 1920. The did not take effect until May 1, action was settled, judgment being given fo rplaintiff for \$2,000, thus obviating a legal decision on the legal decision on the point of law raised viz., whether the company was limited until May 1, 1920, to a speed of 6 miles an hour by the Quebec Railway Act.