the chain does not. The chain drive possesses a great advantage over the gear drive while the car is coasting. On a test run between Athena and North Newark on the Erie Railroad, a distance of about 7 miles, a chain-driven car accelerated from 0 to 35 m.h.p. and maintained that speed on a practically constant grade of from ½ to 1 per cent. without the use of any current. An ordinary journal-bearing car will scarcely move on this grade without the application of power. The average current consumption of the Edison-Beach storage battery car is very low, in no case exceeding 60 watt-hours per ton mile. In a test made at Atlantic City at the time of the American Electric Railway Association Convention in October, 1910, one of these cars made thirty-six trips, aggregating 14.4 miles, with an average of six stops per mile and an average speed of 9 m.p.h. The average number of passengers carried was eighteen and the average consumption of current per ton mile was 54.2 watt-hours.

A double-truck car which was tested on the Greenwood Lake Division of the Erie Railroad between Forest Hill and Sterling Forest ran a total distance of 70.2 miles. The weight of the car, including passengers, was 16.53 tons and the maximum speed was 25 m.p.h., the schedule speed being 18 m.p.h. This line has a number of heavy grades, but the current consumption per ton mile averaged only 49.63 watt-hours. Another test made on the Erie Railroad between West Orange and Forest Hill at the same rate of speed showed a current consumption of 46.1 watt-hours per ton mile.

The Washington, Spa Springs & Gretta Railroad has had an Edison-Beach car in service for a number of months on a line which has grades as steep as 8 per cent. The battery car has averaged about 355 watt-hours per car mile and it has been found that one of these cars consumes only about one-fourth the current required for an ordinary trolley car.

It is of interest to note the long-distance runs which may be made by these cars on a single charge of the battery. The double-truck car previously mentioned has been run on a single charge from West Orange, N.J., via Jersey City to Middleton, N.Y., over the Erie Railroad as the second section of an express train. The same car was run on a single charge from Jersey City to Atlantic City, N. J., over the Central Railroad of New Jersey and the Reading Railroad, a total distance of 135 miles. Sufficient current was left in the battery upon arrival at Atlantic City to run about 40 miles more. This car can attain a speed of 25 m.p.h. on a level with full load and a speed of 16 m.p.h. on a 6 per cent. grade. It is equipped with four motors rated at 15 amp. and 200 volts and an Edison battery weighing 4,800 lb. On the single-truck cars carrying twenty-six passengers two motors rated at 30 amp. and 110 volts are used and the battery weighs 1,800 lb. The lower voltage used in the single-truck cars lessens motor and controller troubles.

As showing what can be done with one of these cars on a small road, the results of operation on the Salisbury & Spencer Railway, Concord, N. C., are of interest. The total cost of this road, which is 1½ miles long, was $20,000 and the net earnings of a single car are at the rate of $7,670, which is equivalent to more than 33 per cent. on the investment. The current for charging the battery of this car is purchased from the Southern Power Company at a price of 1¾ cents per kilowatt hour, measured on the alternating-current busbar. The car is operated by one man, passengers entering and departing by the front door. The following is a record of thirty days' operation:—

Number cash fares	19,733
Number ticket fares	243
Total	19,976
Total car miles	2687.5
Total kw.	5268
Kw. per mile	1.95
Total moneys received	$986.65
Operating expenses:	
Power at $1.75 per kw.	92.19
Conductors and motormen	232.94
Miscellaneous	22.39
Total expenses	$347.52
Net profit	639.13

CARBON BLOCKS FOR BLAST FURNACES.

Amongst the exhibits at a conversazione of the Cleveland Institute of Engineers were some Erkrath carbon blocks for lining the hearth, well and bosh of blast furnaces. These were exhibited by Messrs. Jarvis Bros., Limited, of Middlesbrough, and from the recently published "Transactions" of the Institute we take the following additional particulars: Molten iron at a high temperature holds carbon in solution, which deposits out when the metal is lowered in temperature (by contact with the cooled walls of the well) and forms a skin or layer of carbon, which ultimately protects the bricks from the action of the molten metal and slag. Over 100 of the most modern Continental blast furnaces have been lined with carbon blocks during the past eight years. The cost of carbon blocks per ton is practically twice that of firebrick, but the specific gravity being 1.25 compared with 1.9 for firebrick, the proportionate cost of a lining is not so great. This is not, however, a true basis for comparison, the cost per ton of iron produced being the only figure of importance. If a furnace produces as much iron in a fourth of the time as a similar furnace lasting four times as long, the cost of lining per ton of iron would be the same, but as the cost of lining forms a small part only of the total cost per ton, the other standing charges remaining approximately the same, the increased production reduces the total cost per ton. Of course, where an ironmaster is satisfied with a weekly output of a few hundred tons per furnace, firebrick will probably continue to answer the purpose. Apart from the question of being able to withstand hard driving successfully the advantages of the carbon block lining amongst others are claimed to be:—(a) The saving of the metal forming the "old horse," which will frequently pay the whole cost of lining the hearth and well. (b) The saving owing to less variation in the quality of the iron purchased due to the form of the furnace being maintained, it being probable that the quality going off is frequently due to the taper of the bosh becoming hollowed out by the action of slag and iron, so that fine material finding its way down the side of the furnace lodges there and accumulates, afterwards coming away with a rush into the well and spoiling the cast. (c) The saving due to the avoidance of "breaks away" from the well of the furnace. (d) The saving in time, labor and material when the furnace has to be re-lined, as a new shaft lining only will usually be required, the carbon bottom and well being permanent.

It is a question, however, whether these carbon blocks will not in some way affect the carbon reactions of the furnace, due to the great reducing activity of the element carbon.