Referring to the renewal and strengthening of the bridges, Sir Rivers pointed out that the directors have been able to distribute the £110,000 appropriated to the work between Montreal and Portland over four years instead of five, as originally proposed. It had not been found practicable to complete the work on the Southern division, but the estimated cost had been charged to revenue and the amount stood at the credit of the renewal of bridges account. This enabled the Co. to bring into use heavier and more powerful locomotives, thereby increasing the average number of cars per freight train from 22.1 cars in Dec., 1895, to 28.2 cars in the present half-year. The standard car is now of 30 tons capacity—of which there are a considerable number—as well as a number of 40-ton coal cars. In 1895 the heaviest engine and tender was only slightly over 47 tons, whereas the present standard freight engine and tender is 91 tons. Out of the funds set apart from revenue the reconstruction of the bridges on the section between Portland and Montreal—297 miles—has been completed, with a portion of the bridges on the Southern division, and £110,000 has been applied towards the reconstruction of the Victoria bridge, and a certain amount has been spent in improving and rebuilding the bridges on the section between Hamilton and Niagara Falls. On the sections between Montreal and Hamilton and Toronto and Sarnia a considerable outlay is required to bring them to a proper state. It is proposed to allocate during the next five years for this purpose a few thousand pounds less per annum than the average of the sums actually charged out of revenue for the bridges in the last four years, and there is, therefore, no reason why the weight of this expenditure should be unduly onerous. One-third of the sum to be charged would be allocated to the June half-year, and two-thirds to the Dec., or more profitable half-year. The lines to Midland and to North Bay will have to be dealt with more or less in the same way.

Another very important portion of the work of improvement was the double-tracking of those portions of the line upon which the traffic was most crowded and where greater facilities are required. He said "A portion of our system the double-tracking of which we consider it is most essential should be brought to completion with the utmost expedition is that from Montreal to Chicago, 840 miles. That distance may be properly divided into three sections—from Montreal to Toronto, 333 miles—from Toronto to Port Huron, through the Sarnia tunnel, 172 miles—from Port Huron to Chicago, which is our G.T. Western line, 335 miles. On the first section, from Montreal to Toronto, we have already an excellent double track for the first 270 miles from Montreal to Port Hope. From Port Hope to Whitby Jct., 33 miles, we have only a single track. From Whitby Jct. to Port Union we are on the point of accomplishing the completion of a double track for 12 miles. The remaining distance to Toronto, 18 miles, has already been double-tracked. Therefore, upon the important section from Montreal to Toronto there remains only a gap of 33 miles. On the section from Toronto to Sarnia and Port Huron, we have two separate lines, one the northern line, the old G.T. main line, passing through Georgetown and Stratford, 172 miles; and the lower or more southern road, through Hamilton and London, 2 or 3 miles longer than by the northern road. These two lines, proceeding from the same point to the same point, constitute to all intents and purposes a perfectly efficient double track. The way it is worked at the present time is this: The gradients of the northern line are less advantageous than those of the southern line, the old Great Western line. The consequence is that it is the practice of our officers to send the bulk of their eastbound freight traffic, which is the heaviest, by the lower road, and the return freight trains, which are much lighter, come back over the northern road; therefore, you see there is no necessity, under present circumstances, at all events, of contemplating the double-tracking of these lines which run through the peninsula of Ontario. Starting again on the other side of the St. Clair river from Port Huron to Chicago, with the means placed at our disposal under the reorganization of the G.T. Western road, we have taken in hand the double-tracking of that important portion of our system. 166 miles have already been completed, and 100 miles will be completed this year, leaving 60 or 70 miles to be finished in the early part of next year. Therefore upon the whole length of this 840 miles there only remains not taken in hand the 33 miles between Whitby Jct. and Port Hope; and your directors have come to the conclusion that no further time must be lost in taking up and accomplishing the conclusion of that work. The money which we have already spent in improving our line from Montreal to Toronto, cannot fructify to its full extent until you have a uniform double-track all along the lines, because the bad grades on the uncompleted portion fix the maximum load the engines can draw. We have therefore authorized our General Manager at once—and he strongly recommends this course to be pursued—to take the work in hand, and push it through, and he believes it can be done by the end of the year. Our position will then be that upon a most important portion of our system—the 840 miles I have been describing to you—we shall have a magnificent double-track the whole way. I may mention incidentally that the double-track between Niagara Falls and Hamilton will very shortly be finished."

In conclusion, Sir Rivers said: "We have begun the year under auspicious circumstances, from the fact that we have regained the services of that brilliant administrator, Mr. Hays—and I feel sure you will share the satisfaction of the board at his having returned to our Co. to continue the work which he conducted with such signal success for five years, beginning with 1896. I must also ask you to share the appreciation of the board of the services which have been rendered by Mr. Reeve during the period that Mr. Hays was not with us. Mr. Reeve came back to us when we were placed in circumstances of some perplexity and embarrassment. He most readily, and not without considerable inconvenience to himself, returned to us, and has put in one year of good work in our service. If we have gained something on the other side of the Atlantic, I am sorry to say that we have lost an old and faithful friend and servant on this side of the Atlantic. I allude to the retirement of our able and excellent secretary, Mr. Lindley, who has been connected with the Great Western Ry. of Canada and with the G.T.R. for very nearly half a century. He has given to the service of our Co. most assiduous and simple-minded devotion. Many of you know Mr. Lindley. Discreet, resourceful, of excellent judgment, and the most courteous of men, I consider him the very beau-ideal of what the secretary of a great company should be." Mr. Norman, the Assistant Secretary, who had completed 27 years in the Co.'s service, had succeeded Mr. Lindley.

The report and accounts for the half-year were adopted and the following dividends were authorized: 4% guaranteed stock, 2%; 1st preference stock, 2½%; 2nd preference stock, 4%.

The retiring directors, Sir C. Rivers Wilson, J. Price, G. Allen, and J. A Clutton-Brock, were re-elected.

The meeting closed with a vote of thanks to the directors.

## The Manufacture of Iron and Steel.

*By R. R. Neild, Mechanical Department C.P.R., Montreal.*

The following paper was read at the last meeting of the Canadian Railway Club in Montreal:—

The subject I have chosen for this paper is one which I hope will be of interest to all members of this Club. It is one which is so extensive that it will be impossible for me to treat it in detail with any one paper, but I have endeavoured to briefly outline portions of this important industry in the hope that it will be the means of causing the members to more fully study this important manufacture. I will not pretend to touch on the early history of the manufacture of iron, as this would be sufficient for a paper in itself.

Iron with respect to its useful properties occupies the first place among the metals. By far the strongest and at the same time one of the lightest, its applications in the arts of construction are much more numerous than those of any other metal. Being capable of assuming, according to the treatment which it undergoes, the forms of wrought iron, cast iron and steel, it is susceptible of the widest variations in its character. Extracted from its ores in the form of cast iron, it is melted with comparative facility and according to the mode of operating, in the foundry, may be made to yield castings which are easily filed and turned or may be rendered so hard that no tool is able to touch it. By judicious treatment with heat and atmospheric air the cast iron is converted into steel, the strongest and one of the hardest and most elastic of all materials, as well as the only one of which a magnetic needle can be made.

Continued a little further the joint action of heat and atmospheric air converts the steel into wrought iron, possessing great strength and toughness, yet soft enough to be turned, bored and punched with ease and especially when heated to be rolled and twisted into the most varied forms without cracking. With less disposition to melt under the action of heat than any other common metal, wrought iron is sufficiently softened at a bright red heat to be welded or joined to another piece in the most perfect manner. Scarcely a step of importance has ever been made in the industrial progress of any community to which some one of the three modifications of iron has not been indispensable. Possessed of so many qualities, iron is still the cheapest of all the metals since the ores from which it is extracted are scattered in profusion through the crust of the earth, and can be made to yield the metal in abundance by a moderate expenditure of time, labour and fuel. Iron in the metallic condition or native iron is very rarely found in nature. Nearly all the specimens which have been examined have been meteoric iron, occurring in masses of irregular form, which have descended upon the surface of the earth, but whence they are derived is at present only a matter of speculation, such masses have been found to contain 93% of metallic iron, always associated with nickel and sometimes with small quantities of phosphorous, sulphur and carbon. They vary much in size. Two masses of iron, supposed to be of meteoric origin, have been found on the coast of Greenland weighing respectively 21 tons and 9 tons. Iron is most commonly found in a state of chemical combination with oxygen or sulphur which disguise its metallic properties and convert it into earthy or stony masses. The magnetic iron ore is the most important ore on this continent, and the iron extracted from it is generally of excellent quality. Red hæmatite is found abundantly in England, and its variety is exceedingly pure and furnishes iron of the very best quality, but is very difficult to smelt alone in the English