DISCUSSION ON "THE MAXIMUM DISTANCE TO WHICH POWER CAN BE ECONOMICALLY TRANSMITTED," AT PHILADELPHIA, PA., JANUARY 9, 1905.

WM. McCLELLAN: The chief value of the author's paper is its exposition of the methods used. So far as results are concerned, there will be widely differing opinions. The speaker believes that the author has been very liberal except in what might be called the factor of safety. Apparently, three circuits have been provided, each with one-third load capacity. If one of these nine wires should fail only two-thirds of the rated load could be carried. We have, however, plenty of reserve in the converters, etc. In a line projected some time ago there was one extra wire provided for emergencies. The provision in this respect does not seem quite consistent. On the other hand, one must remember that these conductors are of solid copper, one inch and a half in diameter, and not likely to get in trouble except in the land of cyclones.

One should naturally ask, does the paper settle anything definitively? It does tell us definitely that when we have our wire large enough to suit our economic conditions, it will be plenty large enough to suit our electrical conditions. When we heard of Professor Ryan's paper last February, we thought that we might have to increase our wires above economic diameters in order to prevent coronal loss, but we are sure now that we shall not have to do so.

At present there are so few cases where we shall have to transmit such large blocks of power over such distances that the speaker does not believe that the problem is of great interest to many men. A more interesting problem, and one that is becoming more and more prominent, is the combination and development of the many small water-powers in various localities. In many cases these are separately worth little, but taken together, and properly developed, they become dividend earners. Some time ago a commission was examining all the water-powers of New England for this very purpose. It seems almost certain that a great deal of our future transmission work will move in this direction; it will become a part of our future railroad development.

A. B. SRITZER: The speaker knows of one company installing some high-pressure apparatus where there are two cables to each station. Either cable is large enough to carry the station's full load, so that if one cable breaks down the load can still be carried with less than eight per cent. drop; the two wires working together will give one half this drop.

Most of the speaker's experience has been with underground transmission work; 13 200 volts is high enough for underground transmission. The insulation is 0.0219-in. paper around each conductor and 0.0219-in. paper over all. In the power house we use 0.375-in. rubber. We were using 0.3125-in. rubber but that is hardly sufficient. The paper is treated with compound; it

is three-conductor cable with 0.09375 inches of lead on the outside.

CARL HERING: The author bases his figures on the present cost of steam power in cities, but it seems to the speaker that there are prospects of reducing the cost of power from coal quite appreciably. Take the case of steam turbines, for instance. A few years ago very little was known about them; with continued improvements the steam turbine has progressed wonderfully. If further improvements are made in the future, electrical transmission of energy may not be as able to compete then as it is now. It seems to the speaker that there are so few cases where power would be transmitted to such enormous distances as 500 miles that each case must be figured out by itself, and that any such general laws are of little use.

H. A. FOSTER: The speaker believes he is correct in saying that the best steam turbine has not reduced the cost of steam power below the cost at full load of the best of reciprocating engines. Below full load the steam turbine has somewhat reduced the cost of steam power, but at any time a slight increase in the cost of coal will effect all the economies produced by such methods.

Most of us who have had to deal with electric light stations or railway power plants have the matter of the load factor before us all the time. With large water powers the speaker thinks the load-factor of little moment, because there are other loads that come on during the day, many of them that make the load factor nearly 90. A few years ago, at Niagara Falls, the load line could be drawn with a ruler. At that time the lighting load was hardly noticeable.