

Light Co's plant operated by Leffel mining wheels gives 600 h. p. under a head of 90 feet. They supply incandescent 16 c. p. lamps at one cent per lamp per hour. The paper was a very interesting one.

The next paper read was by Mr. H. Ward Leonard, of New York, and was on "A Central Station Combining the Advantages of both Continuous and Alternating Currents." Mr. Leonard's paper shows great thought and careful study of the method of combining the advantages of continuous and alternating currents. He is a man prejudicial to neither system by recognizing the utility of both. He spoke of the high efficiency, reliability and safety of the three-wire system which is open to the direct current, and with which the alternating current suffers by comparison. On the other hand the first cost of the alternating current system is much less, making it a good system for new territory. He pointed out the want of combining the two systems into one common distribution, and showed the necessary conditions for such. In the daytime a continuous current must be supplied for power purposes, the outlying districts must be supplied with alternating current at night for lighting, one must not operate the alternating system under light load when its efficiency is low, and must be able to supply current throughout the twenty-four hours of the day. He gives a very neat description of a plan for meeting all these requirements. He recommends the use of converters large enough to supply a block of houses. He also pointed out another plan of operating storage batteries during the day when the load was light, and the alternating system during the night under a heavy load, as it is not profitable to use the converter system under a light load. The paper was altogether an interesting one and deserving of much praise. Then followed an animated discussion.

The closing paper was read by Mr. J. J. Burleigh, of the Camden Lighting and Heating Company, on "Uniformity in keeping Central Station Accounts." This paper is one which will be of value to Central Station managers. Mr. Burleigh shows how important it is for Central Stations to have one uniform method of keeping accounts, as the average cost of certain items of expense in one station often exceeds the average cost of the same items of expense in another. He shows that the operating accounts proper embrace the keeping of the original plant in good order. He urges the Convention to adopt some uniform classification of expenses to be recommended to central station men. He also gives some schedules for working accounts which will prove very useful. The discussion showed how necessary it was to have accounts kept systematically, and that no two stations kept their accounts alike. The meeting then adjourned.

#### FOURTH SESSION, Thursday, September 10th.

The first order of business of the fourth Session was the reading of telegrams from Norfolk, Va., and Augusta, Ga., with reference to the holding of the next Convention. The first paper read was by Capt. Eugene Griffin, on "Three years' development of Electric Railways." Mr. Griffin's paper was an interesting record of the remarkable three years' development of the Electrical Railways. He opened the paper by referring to the first record of an electric car, to

be found in the fourth verse of the second chapter of Nahum. But notwithstanding this the electric railway became a commercial success only in 1888. Previous to this time experimental cars only were run, except in the case of the East Cleveland Street Railway Company, which in 1884 ran an electric car on schedule trips over a mile of road. He went on to describe other roads run during exhibitions such as the one run at the Toronto Annual Exhibition in 1884. He spoke of the earnest work of Mr. Sprague in establishing an Electric road at Richmond, Va., in 1888. The practical working of this road induced Mr. Whitney and his brothers, directors of the West End Street Railway Co., of Boston, to adopt electricity in place of the cable system. He showed the marked growth in electric roads by giving the statistics of the number of roads, miles of tracks, etc. On January 1st, 1888, 13 roads, 48.25 miles of track and 95 cars, and on July 1st, 1891, 354 roads, 2893 miles of track, and 4513 motor cars, showing a marvellous increase. He also pointed out what a great moral agent the electrical railways are. The great increase of population in our large cities, means an increase of the tenement house system instead of the cottage system, which means an increase in crime and death-rate. The labourer must live so as to be within easy reach of his work. He can spare but a fraction of his time, but a fraction of his day's wages in going to and from his work. It is admirably shown how, allowing 30 minutes morning and evening going to and from his work, he is restricted to a radius of three miles and an area of  $28\frac{1}{2}$  square miles with the horse-cars, travelling at the rate of six miles per hour, while with electric cars going at nine miles per hour, slow for them, he has a radius of four and one-half miles and an area of  $63\frac{1}{2}$  square miles, within which to select a home. It will be seen then what a moral agent electricity is. He spoke of the comparatively few accidents by the electric roads in Boston. On the West End road 15 fatal accidents occurred in 1890, of which 10 were attributed to the horse-cars and five to the electric cars. He also spoke of the many enemies to which electric roads have been exposed, but also of the many that the now indispensable carriage and steam locomotive had to conquer before becoming a commercial success. He mentioned the Telephone Company as wanting to sue the electric roads for supposed infringement, when they used the ground return. (It would seem that the American Bell Telephone Co. wants the earth). He also showed the marked increase in the net earnings of the electric over the horse road, showing a gain of 80% per car mile in one case. He ended by speaking of the rapid demand for electrical securities as an evidence of the growth.

The discussion that followed showed how much the electric railways had benefited both the cities through which they ran, and the company that operated them. It showed that although the electric cars had been run in many instances on the same schedule as with horses, yet the increase of traffic showed how the people appreciated the fact that their own pleasure was not at the expense of that wonderful medium which man called life.

A telegram was then read to the effect that all the investigations that were being made to ascertain the extent of the electrical industries in this country by