

nunciator drop in the telephone central office, it is necessary that the two wires are in actual contact. I have made no experiments in induction, but I think there would be much more induction from telegraph wires than ours, because the telegraph has a perpetual variation of the current, while the current from the street car system is as nearly regular as possible; the nearer perfect the flow is the less induction is experienced.

To Mr. Williams—I think Mr. Brown was somewhat mixed in his testimony yesterday. Metal is a better conductor than the earth, but I do not know what became of the current that went into the rail when I tested it with a galvanometer; can't say whether it left the rail and went into the earth or not.

R. M. JONES

testified—I got my first experience in electricity at the electric light works at Laramie, and later at Evanston. I have the contract to put in the car line here, and between the 4th and 10th of June I visited Omaha and St. Joseph to inspect the street car systems. At the latter place there are four Sprague car lines, the first having been put in about a year ago and the fourth has not yet been completed. I made an experiment in Laramie to test induction, and found that although I had put a copper telephone wire on the same pole and right among the electric light wires, there was not the slightest difficulty experienced; in fact, I never saw a telephone work better. In New York conduits of various electrical systems are often placed in one ditch, not over twenty inches wide, and the wires in any one system are not over one-quarter of an inch apart and no difficulty is experienced from induction, which cannot take place, I should say, outside of ten inches.

To Mr. Williams—Yes, I am acquainted with the system of telegraphing from running trains. Of course induction takes place at a greater distance, but that is purely an induction system. Currents generated by certain dynamos are steady, but the consumption is not regular; hence the unevenness. In the electric light system at Laramie I know of the wire being burned off, but it never affected the central office. In the New York conduits there is always a return wire to complete the circuit.

At this point an adjournment was taken till 10 a. m. July 16 when

R. B. CAMPBELL,

superintendent of the electric light works, testified—The electric light wires carry 1500 to 4000 volts; the line on the west side of East Temple Street, last winter, carried 4000 volts; there was only one side of a circuit there, and at first it interfered with the telephone, but this was remedied by putting in a return wire on the telephone; our works for Ogden are six miles up the canyon; the telephone wires up the canyon are strung on the electric light poles; with both the systems—of this city and Ogden—in operation, I have had frequent com-

munication with the works in Ogden Canyon, over the telephone; the electric light and telephone wires are parallel for three to four miles, about two or three feet apart; the Ogden electric light wire carries 1800 to 2400 volts; with the street car wire about ten feet from the telephone wire on First South Street, I would say there would be no interference; I was familiar with the electric system for street railroad in Denver; that was entirely different to the Sprague system, and would interfere with the telephone; there could be very little leakage from the feed wire of the street car system now being put in in Salt Lake; it is a copper wire, and copper and silver are the best conductors; the iron rail is a decidedly better conductor than the dry earth; the street railway, with the rail, has a complete circuit; the water pipes would make a good conductor; if both parties grounded to the water pipes, they would interfere; if one was in the moist earth and one in the water pipes, there would be no interference; the telephone lines and street car lines can be maintained in the relation they are now; there will be no induction; the Sprague and Thompson-Houston systems are practically the only successful systems, and they are on the same principle.

To Mr. Williams—The Dast system I consider a failure; we have four arc and two incandescent light circuits with the electric works; I think the rail would carry the current sent out over the street car feed wire; the grounding of the current is in the event of a breakage in the rail; I don't wonder that Mr. Lewis did not find any current in the rail when he went about it the way he did; there was a current there but he did not apply his instrument to find it; he did not make proper connection; I understood he did not have that object in view, but took the proper means to attain his object, which was to show there was no danger; in this city electric light wires parallel telephone wires for two blocks.

To Mr. Rawlins—Mr. Lewis' test demonstrated that there was no danger in touching the rail; I understood that to be his intention; if the telephone wire falls on the railway wire it will be burned because it is too small to carry the current; the instrument would sometimes be burned out; a building would not be fired that way; there is no danger to the user; it is the insulation that is burned; there is absolutely no danger; lightning will sometimes cause telephone annunciators to drop; induction would not cause such a thing, if the wires were only three inches apart; if the telephone wire has no grounding there would be no effect by contact.

To Mr. Williams—When the electric light wires came in contact with the telephone wire, the latter was burned, but the wooden box was not injured.

A. W. McCUNE

testified—I am a stockholder of the S. L. C. R. R. Co.; when east I visited various places to investigate the different systems of street car pro-

pulsion; have been east four times on that business; the Sprague system seemed to be a complete success; the Thompson-Houston system is also a success; both are practically the same; we got the Sprague plant cheapest; the difference is the Sprague has a feed wire, and the Thompson-Houston sends all its current through the trolley wire; I have traveled on the electric cars at twenty miles per hour; the Sprague system carries a little less voltage than the other, but neither will give a serious shock; I saw the telephone wires running parallel in a number of places; at the power-house a buzzing could be heard when the car was close, but it did not interfere with business; the buzzing is no greater than that caused by atmospheric influences in Montana; never heard that telephone communication would be seriously affected until it was alleged in this case; we will be ready to start by Aug. 1st; we have expended fully \$150,000 on the electric plant; a suspension will cause us that much loss, at least; our cars will run every 10 minutes, from the three railway depots to First South and the Twentieth Ward lines; we have to put our poles in centre of the street, as that is the city ordinance; to put them on the side would be a greater obstruction to the street, for there would be two lines, connected by wires; the trolley wire must go in the same position as it is now.

To Mr. Williams—We will have double lines most of the distance when we start; now have eight or nine miles of electric road altogether; our power house, engines and dynamos are larger than those in Omaha, or any other place in America; the telephone lines and street car trolley wires in Omaha run together a considerable distance.

To Mr. Rawlins—Our plant is large enough to supply our whole system and up to 80 miles; we proposed to the telephone company to put our wires on their poles, and Mr. Annett said he thought there was no objection; I went east, and when I came back Mr. Wallace said they would not allow it; he said he did not know the railway would hurt them, but he thought they would get an injunction against us anyway; the next I heard of was the suit.

To Mr. Williams—I first talked with Mr. Annett; a proposal was made in writing, but I could not say which party made it, as I was away; I first proposed to pay \$2.15 per pole for using them; Mr. Annett said that if the telephone company had to put in a return wire we ought to pay for it; he said the Edison system would not bother us, and we have the Edison dynamos; Mr. Wallace said he wanted an understanding, and I referred it to our lawyers, who said there was no ground for the telephone company wanting an injunction.

At the close of Mr. McCune's examination, court adjourned till the afternoon of Monday July 22, when the defense closed its side of the interesting case by introducing a number of articles published in electrical journals.