of the caissons for the foundation, and in building the New York tower; he oversaw the placing of the cable wires, attended to the testing of the steel wires composing the cables, and of all the steel used in the superstructure, and originated the idea of using straight wire in the construction of cables, for which he secured a valuable patent. He also, as stated above, planned the system of cable traction in use on the bridge. The idea of making straight wire originated from the difficulty with the coils of wire which had a strong tendency to spring back into coil form after being straightened out. This tendency he corrected in a very simple manner. At the time of manufacture, instead of coiling the wire close to the dies, through which it is drawn, it is led out to a considerable distance before coiling, and the result is that when straightened out afterwards it will remain straight without any tendency to coil up again.

Colonel Paine became a member of the American Society of Civil Engineers May 12, 1875; he was a director of the society for the years beginning with November, 1876-1880, inclusive, and vice president from January 18, 1882 to January 21, 1885.

During the last few years Colonel Paine was engaged in numerous engineering enterprises. In submarine tunneling he was favorably known, having been engaged in 1874 as consulting engineer on the Hudson River tunnel which he assisted in locating, and in preparing plans for the use of compressed air in forwarding that work. He also assisted in arranging to resume work on the tunnel during the past year, and was retained as consulting engineer on that work.

He was also consulting engineer on the big tunnel now under construction under the Detroit river at Port Huron.

Early in 1877 Col. Paine was engaged to examine and report upon the safety of the cables and anchorage of the Niagara Suspension Bridge. This he did and after thorough tests pronounced the bridge just as sound and strong as it was when first opened for traffic twenty-two years before.

At the time of his death he was one of the leading and foremost engineers in cable railway construction in this country. He had also given a good deal of attention to electricity, and of late had frequently said, "He believed there was a grand future for electricity as a motive power." He became consulting engineer an the Tenth Avenue cable railway in New York in 1884, and later as constructing engineer built the One Hundred and Twenty-fifth Street cable road, and afterwards was engineer in charge of these lines, at which time he moved his family to New York. Since leaving this service in 1888, he has been engaged as consulting engineer on cable roads in Denver, Omaha and Kansas City.

In August 1889, he went to Cleveland, O., and during the last eighteen months he has been engaged in designing and building the Cleveland city cable railways, and this, as he often said, was the finest line that he ever built, but just as the last finishing touches were being put on and the cars running smoothly, death called him away.

Col. Paine was twice married. His wife and two daughters survive him, also two brothers and two sisters.

The very highest words of praise that can be uttered regarding our subject are found in the text from Nehemiah VII, 2, the same being the subject of a memorial sermon recently preached by his former pastor. "For he was a faithful man and feared God above many."

St. Louis Notes.

Statistics are always of interest, hence we gladly embrace the opportunity afforded us by the closing of the year 1890 to make some comparison between that and the preceding year's business of the St. Louis street railroads. The average annual increase for the last few years in the number of trips made and number of passengers carried by the St. Louis roads has been largely exceeded this year. In January, 1890, St. Louis had in the line of rapid transit four cable roads. It now has five cable, and eleven electric roads. Neither the new cable nor the electric lines has been in operation a year, two having started up only a few days ago, while several have only been running during the last quarter of the year, yet the big increase over last year's business is surprising.

In 1889 the seventeen railroads carried 58,918,169 passengers; in 1890, 68,105,561, an increase of 9,187,392. The number of trips made in 1889 was 4,107,554; in 1890, 4,213,518 an increase of 105,964. Many of the lines owe their increase of business to the introduction of rapid transit and if the records of each road be compared with those of the preceding quarter, the part electricity played in bringing out the large results is fully seen. The Lindell and Mound City lines were both started during the last three months and so great has been the increase that extra cars have been ordered. The People's cable is another road to adopt rapid transit, and as a result has increased the number of passengers carried by 1,756,561. The Union Depot line began the use of electricity as a motive power at about the same time and now shows an increase of 1,404,243 for the year.

Of course it cannot be argued that this increase is entirely due to the change of power, but it is much above the usual increase formerly enjoyed by these lines.

With the introduction of electricity on the Lindell Railway all the old patrons who had taken the cable roads in preference to the Lindell's horse cars came back, crowding all the cars during the morning trips and forcing the company to run one or more trailers.

With January three more roads began the use of new motive power. About January 1 the Southern started up its entire line by electricity. It uses the Thomson-Houston system. Its new motor cars are of the Stephenson make, and are all equipped with the Johnson life guard, designed by Mr. Tom L. Johnson. The guard has the appearance of an immense fire grate, and extends out from the motor car beneath the trail car. In this way it prevents the falling of anyone between the cars. It is placed so low that it in nowise interferes with the working of the car. It is the first time that a life guard of this nature has been used in St. Louis.

On about January 8 the first car of the Market Street electric line was run over the electric road. Since then four or five trains have been running regularly, and so soon as the men are broken in the number will be increased so as to cover the whole line. The Thomson-Houston system has also been adopted on this line. The J. G. Brill Co. built the cars, which are very elegant, being well fitted up and handsomely painted.

The third line to start up was the St. Louis (Broadway). On Monday, January 19, the first grip and trail cars were run over the entire road. Many of the prominent street railway men were present at the trial, and at eight o'clock P. M. grip car No. 1 started out loaded with the invited guests. Starting north from the No. 1 (north) power house, the grip took the fast rope up to the north end of the line. On the return trip, while passing the power house, the low-speed rope was caught and the trip down toward the centre of the city commenced—past power house No. 2 and on to the end of the line without a hitch or break. All along the line crowds had gathered to watch the first cable train introduce rapid transit to both the north and south ends of the city, and cheer after cheer went up as the gaily decorated train went by. On the train nothing but praise was to be heard at the success of this trial trip.

Manager McCulloch is certainly to be congratulated on the successful building of the cable. With the introduction of rapid transit (for the line runs at a ten and twelve mile rate) two portions of the city are made, by their easy access, much more valuable than heretofore.

The Bagnall line trolley crossing has been introduced on the Lindell railway and is giving good satisfaction.

W. H. B.

Columbus, Ohio, Notes.

The Columbus Consolidated St. Ry. Co. has recently awarded a contract to the Thomson-Houston Electric Co., of Boston, Mass., for the equipment of eleven and a half miles of their road. The line to be equipped is double track, and span wire construction will be used. The station, designed by J. A. McClure, will be proportioned to hold six McIntosh & Seymour compound condensing engines, three of 450 H. P., and three of 250 H. P. Each engine will be belted to two dynamos, so that there will be in all twelve dynamos. Six of these generators will be of 200 H. P. each, and six of 100 H. P. each.

The boilers will be furnished by the Babcock & Wilcox Co. The station will be erected by Messrs. Pierce & Thomas of New York City. The line equipment will be installed by Thomas Murray & Co. of New York City.

The contract calls for the equipment of twenty cars, and it is said that the new slow speed motors of the Thomson-Houston company, described in a different part of this issue, will be used throughout. The work on this line will be pushed right ahead, and it is expected that the cars will be running before long.