

The B operators are raised on a dais about 1 ft. high to enable them to reach the top multiples easily. In certain classes of work A operators have to make out a ticket. A red light warns operators of the ticket feature. There are effective meter-keys where necessary; but ineffective meter-keys are not fitted anywhere. It was noticed that these operators, although well disciplined, often broke connections by pulling the cords instead of seizing the peg.

Observation circuits are kept active from 8 a.m. to 10 p.m., and on Sundays and holidays.

The hours of duty were shortened some time prior to my visit to New York. The actual duty at the switchboard of day and night operators has been altered from nine to eight hours, and of evening operators from eight to seven hours. For Sunday duty a day off was given during the week, and now a half-day's overtime is being given in addition.

The maximum-wage scale for evening operators was increased 4s. 2d. a week, and for night operators 8s. 4d. a week. Operators enter the schools at £1 0s. 10d. a week, and are transferred to offices at the same wages. Those for evening and night work on transfer get £1 5s. and £1 9s. 2d. per week. Salaries are increased on the merit system, taking into consideration attendance and deportment.

Day hours are 7 a.m. to 7 p.m. The evening force is liable to broken duties ranging from 9 a.m. to 10 p.m. Night operators work 10 p.m. to 7 a.m. The day and evening force actually work eight hours per day. They receive half an hour for lunch, and fifteen minutes' rest during the morning and evening. All central office employees of less than three years' service receive one week's vacation with pay. If of more than three years' service they receive two weeks' vacation with pay.

Several other exchanges were visited in New York City, amongst them Riverside and Morning-side, with about 7,000 lines each and 18,000 to 22,000 stations. These exchanges are similar to those already referred to. There is a large number of residence stations, and the calling-rate per station is low, so that each position has a large number of lines and stations allotted—200 to 250 lines and 570 to 600 stations. The neatness and cleanliness of everything were features that compelled notice everywhere.

A day was spent in the West Chester district, in the suburbs of New York, with the plant engineer of the New York Telephone Company, who gave me every facility for seeing several smaller exchanges and their aerial lines and cables. Three or four exchanges, of sizes varying from 1,000 to 2,400 lines, were looked at. All were found to be much on the same lines, and looked much simpler than the more involved central offices. The quality and style of the apparatus were similar in all. The buildings were all of brick, and every care was taken to assure the comfort of the employees.

It was seen that aerial lead-covered cable even up to 300 pairs was strung overhead. The spans are about  $1\frac{1}{2}$  to 2 chains long. These cables are mostly suspended by marline or by special metal rings, well galvanized, placed loosely on the bearer, and the cable drawn through them. These rings are not bound in any way and do not seem to move out of place. Wooden terminal boxes such as we use in New Zealand are employed where the larger cables are reduced to smaller ones to drop a number of pairs at any point.

The lead sheathing of these cables is from 100 to 125 mils. thick, and is mixed with 3 per cent. of tin, which is found to harden it and render it less liable to flatten on a short bend. Some of the underground work that is being undertaken in connection with the laying of cable between New York and Boston, about 250 miles, for telephone purposes, was seen. Earthenware multiple duct is used with about  $3\frac{1}{2}$ -in.-square opening. This is laid on about 3 in. of concrete, and about 3 in. of concrete is placed on top. If the walls of the trench are solid no concrete is placed on the sides, but if loose or friable the sides are also served with about 3 in. of concrete. The loading-coils are placed about every mile and a quarter. These coils are in strong metal cases like transformer cases. They are made watertight. In the manholes these cases are placed deep, and a false bottom put over them at about the usual manhole depth so as to facilitate the cable-jointing and general handling.

Some time was spent with different officers of the American Telephone and Telegraph Company and of the New York Telephone Company looking into and discussing various aspects of the telephone situation.

In New York the rates are most varied. In Manhattan and Bronx, which are message rate districts, the following rates prevail: For a direct line—600 calls free, £10 per annum;  $2\frac{1}{2}$ d. each additional message. Business or residence—1,800 calls free, £20 12s. 6d. per annum;  $2\frac{1}{2}$ d. each additional message. Two-party lines—600 calls free, £8 15s. per annum;  $2\frac{1}{2}$ d. each additional message. Business and residence—1,000 calls free, £12 10s. per annum;  $2\frac{1}{2}$ d. each additional message; 1,500 calls free, £16 5s. per annum;  $2\frac{1}{2}$ d. each additional message. Monthly payments are provided for. There are many other rates, such as extensions, short-term contracts, season contracts, interior systems, private-branch exchanges, farmers' lines, removals, leasings, &c., that it would take long to enumerate.

Manhattan has 12.5 telephones per 100 people, or 295,280 telephones. Bronx, adjoining Manhattan, has 3.6 telephones per 100 people, or 16,310 telephones. The population per telephone in each case is 8 and 27. The Bronx development is lower than that of New Zealand as a whole, which is approximately 1 telephone to 24 people.

The American Telephone and Telegraph Company's engineers during the last two years have devised means by which it has become practicable to load No. 8 or 435-lb.-to-the-mile copper wire. This improvement in the art has enabled circuits to be so arranged that conversations can take place between New York and Denver (about 2,034 miles) that are as good as could be obtained between New York and Chicago (950 miles) before the improvement was effected. This improvement has been brought about by the introduction into the circuits of Pupin coils, which, properly designed and inserted at suitable intervals in the circuits, by their inductance nullify the harmful effect of the distributed capacity of the wires themselves, thus rendering the circuit free from deleterious speech