

main office when they are of too high or too low voltage, and thus enable the main exchange to cut in or out counter E.M.F. cells as may be required. This is done by simply stepping a connector and rotating it to different contact plates in the banks to which the necessary lines are attached. Supervision of every subscriber's line can be obtained in the same way. Testing can be done. In fact, complete supervision is exercised from the main office. This, too, is done not through direct trunks to the sub-office, but through a branch office where wires are picked up to the sub-exchange. This keeps the wiring at a minimum. While in the exchange we saw and heard the switches completing calls put in by subscribers. This exchange is visited by a switchman once or twice a week. There is no special expense, as the car passes the door.

Referring to the main exchange, it was stated that a short time prior to my visit the general manager had not been inside the switch-room for four months, and had not during a month received a single complaint.

Some inquiries were made by me of persons who had both manual and automatic telephones, and in nearly all cases the automatic was preferred—speed and secrecy were the features approved of. The rates are: Business—36 dollars, or £7 10s., for one mile, and 8s. 4d. per quarter of a mile; residence—24 dollars, or £5, all over the area; party lines—residence, 20 dollars, or £4 3s. 4d., all over. There are only 200 party lines in the whole of the exchanges. Business party lines are not given. This company does not solicit business. This exchange pays 8 per cent. The Bell Company has two exchanges here with about 9,000 telephones. They have a large number of party lines.

Holland, forty miles distant, is a small place of about 5,000 inhabitants, and has 800 automatic telephones. The exchange is in charge of a man who gets 65 dollars, or about £13 11s., a month. He also attends to trouble, and is much out-of-doors, so a young woman is employed who takes care of the switch-room. She sits at the wire-chief's desk and looks after complaints, gives information, &c. If there is anything she cannot do she makes a note for the chief to attend to it on his return. She always knows where the chief is so that he may be called if anything requiring his return to the office should arise, which has been found to seldom occur. There are two other men—one at 55 dollars, £11 9s. 2d.; one at 30 dollars, £6 5s. The girl gets 25 dollars, £5 4s. 2d. This is working an exchange of 800 subscribers for 2,100 dollars, or £437 10s., a year.

It was stated in connection with Grand Rapids automatic exchanges that the staff there except one man got all its experience in those exchanges. Mr. Fisher, now of the Automatic Electric Company, Chicago, had only been in Grand Rapids Exchange one week when he was given charge of switches for 1,000 lines, and he had never been in an automatic exchange before that.

At Manchester, Iowa, there is a small automatic installation of 375 lines, for which they charge 24 dollars (£5) business and 15 dollars (£3 2s. 6d.) residence. They run quite satisfactorily, and never had a man there who had been in any other automatic exchange or works. They have operated their own plant from the beginning.

From the preceding particulars of Grand Rapids it will be seen that it is not an ideal or up-to-date automatic exchange, as it is equipped in a manner that would not be adopted in such exchanges to-day, is worked with local batteries instead of common battery, and has an excess of open aerial wire. Notwithstanding these features, which, however, are being gradually corrected, it is giving service that is satisfactory, economical, and producing dividends at a rate that must be admitted to be moderate.

The thought that naturally flows from this, and that is supported by the class of service being given by similar apparatus at other places, such as Columbus, Dayton, and Los Angeles, is that if automatic apparatus of eight or nine years ago bears the comparison that has been indicated with the improved automatic development of to-day, and that which has largely taken place during these last two or three years, how equally likely it is that ten years hence the apparatus of to-day will be rendering service comparing not unfavourably with the best then obtainable.

The toll rates at Grand Rapids are 5d. for twelve miles and 5d. for each additional twelve miles up to sixty miles, thereafter 2½d. for about each six miles. Toll lines are phantomed and composited and leased for telegraph purposes at about £4 a mile.

Columbus (population 180,000) has 13,600 telephones on about 11,000 lines. The telephones are mostly automatic. The toll lines here are phantomed, composited, and leased for telegraph purposes at rates ranging from £1 to £4 a mile. There are telegraph repeaters and accumulators to supply current for telegraph purposes. Some of the toll lines can be worked manually or automatically. The toll board is made up of 2 farmers' sections, 2 pay-station sections, 4 recording sections, 23 toll sections, and 1 chief operator's board detached. There is also a switching section. There are several special classes of service here which cannot be referred to, as they would take long to explain. For the 10 automatic exchanges in the city there are 32 men for switching-work, 14 for attending to trouble outside and at the subscriber's telephone, and 2 others, one of whom has a buggy and the other a bicycle.

A particularly noticeable feature was the number of quite young men, really lads, who were about the switch-room. On commenting on this to the superintendent he said they liked to train their own men, and that now they had an unusual number of apprentices as they expected to lose some of their best men to Chicago, where automatics were rapidly coming to the front, and they wanted to be prepared. They have what serves as a school of instruction for their young men. No special mechanical skill is required, and they find young men soon become useful. They do not consider a man a switch-attendant until he is so qualified that they pay him 55 dollars, or £11 9s. 2d., a month. It would be more economical to have a certain number of good switchmen, but men have to be trained so that contingencies may be met.

There are 6 information positions, 2 complaint positions, and 3 record clerks tabulating fault tickets. Special care is taken with faults. A special book is kept so that it may be seen at a glance over a period of a year or two what trouble each subscriber has had. This is of great assistance. This record was examined. It was seen that in five months 100 subscribers had 124 troubles; another 100, 91