

At the fifth level the shaft is automatically rotated horizontally, and the wipers pass along the bank terminals until one is found that is idle, when the shaft stops. From this position a trunk goes to a second selector in a 10,000 group, and the movement of the first selector has taken place simultaneously with the formation of the impulses by the dial in its backward movement to its normal position. The next movement of the dial 8 will step up the second selector to the eighth level, where it will rotate along that level to find an idle trunk leading to a third selector in the "thousands" groups. The next dial-movement 7 will step up the third selector to the seventh level, where it will rotate as the other switches did to find an idle trunk leading to the connector in the "hundreds" groups. The next dial-movement 6 will step up the connector to the sixth level, but the connector differs from the selectors in that it will not rotate along the level automatically. To make it rotate it is necessary to move the dial, and as the next figure of the number, which is 3, is pulled, the connector moves to the third horizontal terminal on the sixth level, and connection is now made from the calling to the wanted subscriber. As soon as this connection is completed, ringing begins automatically, and continues until the subscriber being rung takes his receiver off the hook, when the ringing is by that act cut off. In older types still in operation in some places it was necessary for the calling party to press a button to ring. When automatic ringing is being done the calling party hears that the bell is being rung. If the called subscriber is "engaged" when a connection is being sought, a "Busy" signal will be heard by the calling party. The selectors may be in different exchanges. When the conversation is completed the calling party can disassemble the connection immediately and put in another connection at once. If a mistake has been made in calling, and it is detected before the call is completed, it is necessary only to depress the switch-hook an instant and call again. It can be arranged if necessary, although it is not generally found necessary, to give what is called "back release"—that is to connect up so that the party called can free himself from the calling party.

It would lead to complication to explain how "banks" are multiplied, and how by suitable arrangement of Keith line-switches used as primary and secondary switches the percentage of first selectors to the total subscribers' lines can be reduced. Provision is, however, made for these features, and for party lines, metering, coin service, and private branch exchange service entirely automatic if desired.

For numbers that have been given up, those of persons out of town, or for any numbers that for any reason are temporarily out of use, connections are arranged so that any calls to them will arrive at an "information" table, where an operator will confer with the calling party.

Alarm signals are provided, so that switchmen can promptly and with little difficulty ascertain what part of the mechanism calls for attention.

It is sometimes objected against full automatic that the dial cannot be worked in the dark. It can be worked in the dark, but not easily. That objection has been closely inquired into, and is found not to be of much consequence. The operating companies find that it is extremely rare to get any complaint on that score, or that it affects in any way their getting subscribers. "Long distance" is 0, easily found on the dial in the dark. Calls going in on that number either meet an attendant, or the office-arrangements are such that a bell is rung so that some person can be reached who can give information. "Information," or "Police," can be given numbers easily found in the dark, such as 1111. It is only on special and unusual occasions such a difficulty could possibly arise.

It is also objected that malicious calls may be made and that they cannot be traced. This is to some extent correct. But, again, the operating companies do not find this troublesome, and it is not any more serious than in manual systems. In large manual systems where connections are effected by "order-wire" from A operators to B operators it has been found practically impossible to trace connections. The best answer to these objections is that where the automatic system is in operation they are found to be purely theoretical.

Another question that arises is, Do the people where automatic is in use like it, and have they any dislike to having to operate the dial? In Los Angeles, Grand Rapids, and Columbus inquiry was made by me of persons who had both the automatic and manual telephones, and in nearly every case the automatic service was much preferred. The result of the introduction of full automatic at Munich has been referred to earlier. The users are quite satisfied.

At Chicago the Automatic Electric Company showed me probably two or three hundred letters that had been received in response to inquiry by that company of the kind of service that was being got from automatics. These letters were not sent to picked persons, but a certain number of names under each letter of the alphabet in the directory were taken, and a circular sent to all. A copy of the circular letter and of the analysis of the replies is in my possession. A large number of the replies were read by me, and fully 70 per cent. were favourable to automatics.

A point that occurs also is, Can we get men to take care efficiently of such equipment? The conclusion that must be drawn from the class of man employed at this work in the States and from the way in which they are recruited is that our young men are just as intelligent and apt as those by whom this work is being effectively performed. Any man who could comprehend and attend to manual common-battery switchboard requirements could engage equally well in automatic-switch work. At first, as the time would be short, our policy would require to be to specially and quickly train a few good men, and bring along others also, but less speedily. These well-trained men would keep installations going with the assistance of others, and time would be available then for the more leisurely training of some already partially trained and of others coming on.

The Auto-manual System of the North Electric Company.

This is a semi-automatic system manufactured by the North Electric Company, Cleveland. The system was devised by Mr. E. E. Clement, of Washington. The first installation was made at Ashtabula Harbour, about sixty miles from Cleveland, by the Ashtabula Telephone Company, for 500 lines, 460 of which were in operation at the time of my visit.