

scriber at that station wishes to make a call. Each telephone line has but one answering jack. They are placed in the lower part of the switchboard, a certain number before each operator, that number depending upon the use of the telephones, as each operator must answer all of the calls made by the subscribers whose answering jacks are placed directly in front of her. Some lines are used so frequently that but five or ten can be placed in a single operator's position, while other lines may be used so infrequently that more than one hundred can be placed in each position.

When any line lamp begins to glow, the operator promptly picks up a plug connected with any pair of cords, and inserts it in the answering jack corresponding to the lighted lamp. The flexible wires leading from the plug to its mate are also connected to a small switch called the ringing and listening key, located in a horizontal shelf between the operator and the vertical face of the switchboard. By moving the handle of this ringing and listening key, the operator is able to bring the wires leading from her own telephone set into contact with the wires leading from the plug and consequently into contact with the line wire of the subscriber making the call. The operator is then able to converse with the subscriber and ascertain his wishes.

Having received an order to connect his line with any other subscriber's line, the operator inserts the second plug of the pair into a spring jack connected with the called subscriber's line, and by another movement of the handle of the ringing and listening key, brings the line wire of the called subscriber into contact with wires leading from the ringing generator. The latter is a small dynamo, generating, alternating and pulsating electrical currents. The movement of the key just mentioned allows the current from this ringing generator to flow out over the called subscriber's line, the effect being to ring the bell associated with his telephone set, and summon him to the telephone.

The connection of the second plug with a spring jack of the called subscriber cannot be made with the answering jack of that second subscriber because that answering jack may be in a position a hundred feet away from the position in which the call is made. It is to meet this condition that the already mentioned inward or multiple branch of the subscribers' line is designed. This branch is connected to spring jacks exactly like the answering jacks except that they are arranged to occupy as little space as possible. They are all marked with the call number of the subscribers that they represent, and are arranged in numerical order, and are piled row above row in the vertical face of the board.

It is possible to bring multiple jacks representing about the thousand lines within the reach of an operator, and such a portion of the switchboard as contains one jack for each line connected with the office is called a section. Not more than three operators can work at a section of switchboard, and it is necessary to repeat the sections as often as the number of operators employed demands. Each section is a duplicate of every other, each subscriber's line being extended from the multiple jack in one section to the corresponding multiple jack in the next section, and so on throughout the entire length of the switchboard. This multiple feature of a telephone switchboard calls for a tremendous amount of material and labour in its assembly, a single switchboard, that of the Main office, Chicago, for example, containing over two hundred and seventy thousand jacks and over fourteen million feet of wire.

These descriptions may be sufficient to indicate that so far as the calling by subscribers is concerned the intensity of the work, the amount accomplished within a given space of time, or in other words, the speed of operating, will depend first upon the number of lines which an operator has running into her board and for which she is responsible, secondly, on the number of 'phones connecting with the exchange, which, of course, determines the number of possible connections that can be made, and thirdly, the extent to which the different 'phones are used by subscribers.

The amount of work which an operator performs in the way of answering calls

and making connections is described as her 'load.' This load will be increased or diminished, therefore, according as the number of lines connecting with a portion of the switchboard, the number of 'phones in an exchange, or the number of connections asked for during the day are increased or diminished.

#### Statistics Indicating Rate of Speed.

The evidence taken before the commission went to show that the lines for which each operator at the Main exchange in Toronto was responsible under the five-hour system numbered from 82 to 110, so distributed that each operator had a proportion of busy lines and lines less frequently in use; also that the numbers on the switchboard indicating the number of possible connections, any one of which might be called for ran up to 6,041, at the time the commission was holding its sittings in Toronto.

The statement given before the commission as to the average calling rate per hour at the Main exchange, Toronto, which affords the key to the intensity of the work varied somewhat.

Mr. Maw, who was regarded as the company's expert on this matter, stated that the average per hour during the busy part of the day was from 300 to 350 calls. Mr. C. T. Baldwin, the expert of the American Telephone and Telegraph Company, who was retained by the company to investigate the relative merits of the systems in Toronto and Montreal, said in his report of November 30, 1906, already quoted: 'The average number of calls per operator during the busy hour for the first four months of the year were for Montreal, 174.5, and for Toronto, 287.6, showing that the Toronto operators were handling some 113 calls more during the busy hour than they were in Montreal.'

The following statistics from the record sheets of the company give the number of calls per hour as recorded in the peg tests made at Toronto and Montreal, respectively, on Monday, December 10, 1906. The figures speak for themselves, both as to the actual calling rate per hour in each city, and as to the comparative rate of speed of operating in the two cities. These particular tables are chosen not as being in any way exceptional, but because it was to them that reference was made by the local manager and inspector of service in their evidence, and they may be taken as fairly typical.