

Long-distance wires are usually of 435 lb., 300 lb., and 173 lb. copper wire per mile. No. 10, 173 lb., is mostly loaded. It is intended shortly to load the No. 8 wires, as it has quite lately been demonstrated that this can be done. Electrolysis from stray electric current is troublesome, and special tests are made every three months while the usual precautions of bonding are taken.

West exchange was visited. There is a school of instruction in operation here. The dining-room, library, and retiring-room is comfortable and large, and is used by students and operators. In a separate room students were being given oral lessons or lectures explanatory of the switchboard, the jacks, special markings, and so on. In the school switchboard-room is an A board for twelve positions, a B board for five positions, and a small two-position board which represents the distant station. Every method of operation that exists in any of the exchanges is to be found here, and the students are exercised in the various manipulations. It takes about three weeks to train an operator. There were about eight learning at the time of my visit. There are about three thousand applicants a year. The previous month 140 students passed through the school, and 116 were rejected, or failed to come, or did not proceed for different reasons. Great care is taken in selecting girls, who must be from seventeen to twenty-five years of age, 5 ft. 2 in. and over in height. Graduates are preferred.

As showing how necessary it is to make a toll charge when special circumstances exist, although the community of interest between two such places may be great, the traffic engineer instanced the charge of 7½d. for three minutes and 2½d. for each extra minute's conversation between San Francisco and the Oaklands side of the harbour. During 1910 the toll talks outwards numbered 1,116,488, and the revenue was 186,944 dollars, or £38,946. The average revenue per call was 8½d. The work and revenue from Oaklands side was about the same, or a total of about £77,892 for the year. This revenue would have all been lost if no toll were charged, while the demand for talk would be much greater than now, and would compel the use of more cables, which are expensive to supply and maintain. Switchboards, office-room, and operators would all have been required in increased proportion at both sides. If these charges were not met by tolls they would have had to be made by an increase on the general annual subscription.

As giving some idea of the staff troubles, it was stated that for San Francisco alone 499 girls resigned during the year, 15 per cent. were discharged, including 7 per cent. dropped for various reasons after entry to the school. The total number of girls in the San Francisco exchanges is 1,132, and on the Oaklands side 750. There is usually one supervisor to every eight or ten switchboard operators. When everything is straightforward each operator is expected to be able to handle 275 calls an hour. Each such call is considered a unit. With B boards and 100 per cent. trunking this is reduced 52 per cent. Different classes of service, such as coin-collecting and party lines, reduce the speed of operating, and all have to be specially considered in allotting loads and determining the number of switchboard positions. Coin work is always slow, as the operator has to speak to the subscriber, direct him as to coins, listen or watch for them, and collect or reject them. Some coin machines require prepayment—that is, the nickel must be inserted before the exchange can be got. In other cases the exchange is called, and when the operator directs the coins are dropped in, and the operator listens for the sound of the gong or other distinctive noise.

Trunks are found to be held for local conversations about two minutes. Social conversations average four and a half minutes, and are much longer than business talks.

During 1910 the exchange subscribers increased from 61,000 to 74,000, an increase of, roughly, 23 per cent. They were made up of—private branch exchange, 32 per cent.; four-party, 30 per cent.; one-party or individual line, 30 per cent.; two-party, 8 per cent. This indicates the party-service and private-branch exchanges to be material features of the increase. Four-party lines, while taken, are not liked, and the company is striving to raise the class of service taken by subscribers all over its territory, which is very large. There are about 480,000 subscribers.

In San Francisco, with 72,500 stations, there were 423,000 local calls a day, or a calling-rate of 5.7, and with 74,000 stations there were 32,500 lines. For private-branch exchanges the subscribers wire their own buildings—*i.e.*, they make a private contract with outsiders to do so. There are about 700 of these where operators are kept, and they are served by about 2,400 trunks, having connected to them 17,400 stations.

For all exchanges of over 2,000 stations the business stations are 40 per cent. and the residence 60 per cent. of the total.

For long-distance conversations the rate is based on six-tenths of a cent. a mile air line for one minute's conversation, subsequent minutes each 20 per cent. of the first minute.

Errors in the San Francisco exchanges were over 5 per cent. at the beginning of 1910; these were attacked, and at the end of the year the percentage was reduced to 2.1. These consisted of such matters as wrong numbers, cut off prematurely, wrong busy test, wrong party line. Errors of this kind are really serious, and, as is seen, can be kept down with proper handling. 2 per cent. of errors is very low, and in exchanges that are considered as giving fair service these errors run as high as 10 per cent. Operators' irregularities, such as answering improperly, not using proper terms, and cutting into circuit needlessly, are endured up to 15 per cent. These have been reduced very considerably. That only sixteen letter complaints were received in a month from 78,000 stations is a testimony to the kind of service given.

From 10 p.m. to 7 a.m. there are only forty people in attendance in all the San Francisco exchanges.

The following table is interesting. In the school at West exchange during 1910,—

| | San Francisco. | Oaklands. |
|-------------------------------|----------------|-----------|
| Students accepted | 1,010 | 393 |
| Students not accepted | 1,311 | 315 |
| Students resigned | 145 | 78 |
| Students discharged | 184 | 30 |