

*Factories.*

The factories of most of the principal manufacturing companies were visited and found to be most interesting. It was noticed that some were not doing very much switchboard work, and that where magneto switchboards were being made they were of small size ranging up to three hundred numbers. It was also observed that several companies were taking up the manufacture of articles not pertaining in any way to telephone work, such as motor-car parts and post-office boxes. A laboratory was associated with the different factories where chemical analysis of materials was carried out on all kinds of materials to ensure that they were free from deleterious substances and in every way suitable for the uses to which they were to be put.

The chemical laboratory of the Western Electric Company, New York, was specially striking in those features. This company were having materials such as galvanized bolts and other line apparatus subjected to weather tests outside, and inside all sorts of weather and external conditions were being as far as possible artificially produced, and materials were being tried under them to determine how they were acted upon. Experiments with materials and made-up apparatus were continually in progress, and were also given a time test to ensure that results would be lasting.

In all factories much attention was being devoted to simplifying the parts of telephones by reducing the number of breakable parts and keeping prominently in view the desirability of maintenance being as little required as possible. Parts of complicated shape were pressed out by successive machine operations from single pieces of metal. The extent to which this is being carried both in America and Great Britain was surprising. Designs also are being produced so that defective parts may be easily and quickly removed and replaced by interchangeable apparatus. This applies not alone to telephones, but to kindred appliances, such as switchboards, relays, &c.

Several factories were visited at Liverpool, Manchester, Beeston, and about London. These compare favourably with corresponding works in the United States, the class of work and the manufactured articles showing a high standard of workmanship and finish. After seeing the various operations and processes to which telephone apparatus generally has to be subjected before the finished article is produced, and the number of persons employed in the production, one realizes that it is only by the application of the best machinery and methods that such suitable appliances as exist are available.

*Great Britain.*

In Great Britain the telephone is not nearly so extensively used as in the United States. The development has been almost entirely in the hands of the National Telephone Company, and it is only during recent years that the Government has been engaged in telephone work on any extensive scale, and that not in a general way throughout the country, except that toll or trunk traffic has been long controlled by the Government.

The City and Central Exchanges in London, which are in the one building, are good examples of telephone-exchange work. They are of Western Electric Company's manufacture, and have the general features of the switchboards of that company. The Central Exchange has the multiple of the subscribers' lines on the A and B boards, while the City has the multiple on the B boards only. They were designed to accommodate about fourteen thousand subscribers each. The test-room of the City Exchange is fireproof. Lead-covered cables are of 217 and 306 pairs. There is quite a large array of ironwork suitably arranged for supporting cables from the conduits to the main frame. Silk- and cotton-covered lead cable is used for leading to the frame. Jointing is made in the sub-basement; all joints lie horizontally, and are filled with compound under air-pressure. The main frame has the usual heat-coils and lightning-protectors and fuses. The batteries are of the chloride type, about 7,000 ampere hours' capacity. The charging-generators have an output of 1,000 amperes at 30 volts. The exchanges can be worked direct off the generators if necessary. A separate battery is supplied for meters. The ringing-machine gives 75 volts and about 2 amperes at 1,200 revolutions per minute. These carry "Busy back," "Don't answer," and tone tests for faulty lines. The intermediate frame relay-racks, meter-racks, and lamp-resistance racks are all large and strong, and designed for carrying about twenty thousand lines, and arrangements are made at one end of the intermediate frame to provide for cross-connecting between the frames of the two exchanges. Condensers and fuse-boards are suitably disposed. Everything is on a very large scale, and runways are large, strong, and well supported.

The switchboard of the City Exchange is of fireproof construction. The framework is of iron, and the woodwork of the front of the board is lined with metal, and also the doors at the back of the board. The key-shelves have the usual seventeen pairs of cords, meter-keys, order-wire keys, and supervisory lamps. The B boards have twenty-seven single cords and machine-ringing. The operating is done in the manner usual where large numbers of subscribers have to be handled and where there is a lot of trunking to other exchanges. About a hundred answering-jacks were allotted to each position, but at the intermediate frame this can be reduced if desired. The boards are nine-panel. Outgoing junctions are multiplied every six panels.

The City Exchange has about 130 employees, with 7,414 stations and 4,762 extensions. The Central Exchange has about 420 employees, with 24,151 stations and 13,862 extensions. There are six information-girls on each floor, one monitor to about every nine girls.

The New Avenue Exchange in Cree Church Street, for which the equipment has been supplied and erected by the Peel Connor Company, is the newest exchange of the British Post Office, and is a fine piece of work. The cables are 600 pairs, 10 lb. copper. These are divided below the floor of the main frame into three 200-pair silk-and-cotton-covered cable, and each 200-pair comes up in an iron pipe let through the floor opposite the vertical on the main frame to be served. There are sixty-eight of these 200-pair cables, or 13,600 pairs. Cables are all very neatly treated and led off to the different racks. Glass fuses are used on the main frame. Wires are not fanned in the usual way, but are led to the tabs of the vertical springs through wooden blocks bored and placed vertically. A new feature