

Edinburgh and Newcastle. The news division is in this gallery. A portion is set apart for the preparation of perforated slip for the Wheatstone system. A good deal of tape was seen being prepared by the manual method of using the three tapper keys. Tape is also prepared by the double pneumatic punchers. This is an arrangement by which two ordinary perforators are placed one above another in a suitable wooden receptacle. A supply of compressed air at a pressure of about two atmospheres is provided. The operator works three keys corresponding to dot, space, and dash. These keys release air to operate tappers which force down the perforator keys, and the movement of these causes the paper tape to be perforated just as in ordinary hand punching. The tapes are placed in revolving trays, and are so disposed that one tape, or any other number up to eight, may be perforated simultaneously. When not more than four tapes are required, the compressed air may be turned off either one of the perforators. Gell and Kotyra keyboard perforators are also operated in this room. Here also is to be seen the chronofor, an electro-magnet device, the movements of which are controlled by a weight-driven clock, which is adjusted to send currents through the electro-magnets at 10 a.m. and 1 p.m. daily. All the lines that have to be supplied with time from Greenwich come to this mechanism. Nominally the lines are connected through to their instruments. A short time before the hours for transmission of time a current passes from the clock, and in one movement the lines are disconnected from their instruments and connected to a system of relays from which a permanent current is put on the lines to all the offices. The actual time-signal from Greenwich is received on a relay which reverses the current. This reversal operates the various galvanometers, time-balls, and other arrangements throughout the country.

The test-board for this gallery has accommodation for 1,800 circuits. All line wires are connected to this board, and wires are taken thence to small test-tablets placed at the end of each table, and finally to the respective instruments. This facilitates testing, as inside and outside faults can be quickly distinguished. Most tables are large—their width is about 4 ft., while the length varies according to the position they occupy—but the instruments for several circuits are placed on one table. Partitions between instrument sets are not used. Sounders are placed in resonators.

In the Metropolitan Gallery the intercommunication switchboard is installed. This has accommodation for about forty operators, who are all women. About nine hundred circuits from various parts of the city and suburbs come to this board. The switchboard resembles that of a telephone exchange. Each position has several pairs of cords and plugs, each pair having a key so as to cut in the operator's telegraph set on any pair. All the lines are multiplexed at every position, and when any line is plugged into an engaged lamp lights at every position. Any out-station wanting London operates the key, which causes a flashing on the calling-lamp. The operator plugs in, and with the other plug connects away to a disengaged working set without speaking. When finished working, each depresses an indicator key, which gives the "Disconnect" signal to the operator at the switchboard. If an out-station requires another out-station, the operator on seeing the calling-lamp light plugs in and pulls over her key. This action changes an indicator at the out-station, so that he signals on his Morse the number required. The operator, with the other cord, completes the connection. When finished, the out-station presses the indicator, which gives the "Disconnect" signal to the operator. The electrical apparatus required to effect these various indications is not involved. By these means it is found unnecessary to place any battery at the out-stations, where polarized sounders are used. Large secondary batteries of 40 and 36 volts are provided at the central office. The possibility of connecting such a large number of out-stations together in the manner mentioned saves delay and obviates the need of providing instruments, floor-space, and staff for transmitting purposes. It is found that the work to and from these stations dealt with at the central office can be handled on about 270 sets of instruments. This gallery also accommodates about fifty double-plate sounders and fifteen quadruplex sets. Cord carriers are in use on the various floors. There are several distributing-tables, whence the telegrams are conveyed by hand to the different circuits. Five master clocks control eighty-three dials, which are 12 in., 24 in., and 36 in. in diameter. The mechanism of the dials is operated by impulses generated at half-minute intervals.

On the roof there is a workshop measuring 120 ft. by 17 ft. Accommodation is provided for about forty mechanics and boys, who are employed in the maintenance and repair of the apparatus in the galleries. Besides these about a dozen mechanics, who are experts in Hughes and Baudot apparatus, are located in a workshop adjoining. A number of linemen and construction hands are constantly engaged in removing faults and running new circuits. Altogether an engineering staff of fully a hundred persons is permanently employed.

The telegraph-offices at Manchester, Liverpool, and Dublin were visited. The work in these was mostly being done by the methods with which we are familiar in this country—viz., simplex, single- and double-current duplex, quadruplex, and Wheatstone. Dublin had a couple of Gell machines for the perforation of Wheatstone tape. They said they could work these perforating-machines at forty to fifty words a minute. They did not claim to be as skilled in their use as the staffs in the cities in England that were using them. The operators could perforate by the usual manual-tapper method at twenty to twenty-five words a minute. News messages received over the cable from London by Wheatstone are forked away by repeaters to both north and south. There were fifteen positions at which girls with telephones were seated for receiving telegrams from and despatching them to different parts of the city.

Manchester was working the new Murray multiplex apparatus, which had been installed on an underground circuit between that city and London. It was a double duplex, giving four channels, two sending and two receiving. This had been in operation only a short time. The man in charge of the set stated it was doing very well. It was said to be capable of dealing with a hundred messages per hour per channel. Owing to the staff's inexperience the result was a good deal below that number. There were nine men engaged, four at London and five at Man-