

chester. The work being done was 1,400 as a maximum in seven hours and a half. On one side there were 40 forwarded, 50 received, and on the other 56 forwarded, 66 received, between noon and 1 p.m.—total 212, or an average of 53 per channel. The daily totals do not properly represent the work that can be done, as during some hours they are slack. During the hour 1 to 2 p.m. 159 was the total; during 2 to 3 p.m. only 69 were dealt with on all the channels. Different day's totals for seven hours and a half were 1,066, 1,108, 1,058, 1,141, 1,237, 1,240, 1,376.

The inventor looks upon the London-Manchester installation of his multiplex system as purely experimental, and would not recommend, at present, its adoption for our conditions, as he expects to be able to still further improve it as a result of this experimental working. By the end of this year he hoped to have it in all essential respects in standard form, so that he might make special tools for manufacturing it more cheaply than can be done now.

The Murray multiplex is like the Baudot, in that a distributor is employed to give each operator use of the line. The speed of the multiplex is forty words a minute, as compared with thirty words a minute on the Baudot. Each operator has a typewriter-keyboard, and perforates tape by depression of the keys. The tape goes through the transmitter at the forty-words rate, but the operator may work at sixty words or more a minute, and can thus time his messages. There is no skill required of the operator beyond being able to typewrite. Provision is made to prevent errors appearing at the receiving end. The operator can correct an error so that it does not appear on the page-printed sheet. The tape is fed into the transmitter by mechanism driven by a magnet which is operated at regular intervals. There is a "cadence" contact on the distributor which effects this. The tape is then taken up on an automatic tape-winder. The operator can stop and start the tape when he pleases, as there is a lever provided for that purpose which is locked until the right instant. He can also by perforating a special signal arrange that a perforator at the receiving end may be brought into operation to prepare a message for transmission on some other circuit there, a record being also printed at the receiving end. On the completion of the message the perforator is automatically cut off, only to be cut in again at any time the special signal is sent. The distributor-brushes are controlled by vibrating-reeds, and thereby kept in unison with each other. Before it was decided to prepare apparatus for the present experiment a six-months' trial of a more limited portion of the apparatus was made between Birmingham and London. Two girls were operating the keyboards. After about a month's experience they could punch forty to forty-five messages an hour, and after about three months they were able to perforate 100 messages an hour. The work passed over the circuit reached 100 messages an hour on several occasions, and 126 were done in one hour. It is desirable to keep in touch with the experiment now being made, as this apparatus gives promise of good results, and its first cost is not too great.

Manchester had also a couple of Creed instruments. These receive a message in the form of perforated tape at a speed ranging from 90 to 130 words a minute. This tape is then available either to be passed through a Wheatstone transmitter to reach other offices, or to be passed through a Creed printer, when the message will be recorded in roman characters on tape at a rate of about 100 to 115 words a minute. This tape is gummed to forms as it is printed, and the message is ready for delivery. On a circuit two Creed instruments and a Wheatstone receiver were connected in series, and all three were made to work simultaneously with satisfactory results at about 100 words a minute. The Creed is found to be invaluable here on frequent occasions at night. News messages often arrive for transmission to another office or offices at a late hour. Before the Creed was used the practice was to receive them by Wheatstone, write them up, then perforate them for retransmission. The Creed obviates all that labour and delay.

A great deal of Wheatstone automatic work is done in this office, the Gell perforator being used to some extent to prepare the tape.

There was nothing special at Liverpool calling for comment. At night this office is put through to five different points on the Continent through repeaters, and they use Hughes instruments.

The Murray automatic was not working in the London Telegraph-office during my stay, but it was seen working at the Murray workshops in the experimental room of the British Post Office, and in the telegraph-office, Berlin, where there were three sets in operation. This apparatus has been in use for some time, and on long lines, for which it is best suited, has given good results. The tape is the same as in Murray's multiplex system, and is prepared on similar typewriter perforators. It is, however, passed through the transmitter at a speed ranging from 100 to 180 words a minute. At the receiving end the signals are perforated on tape, and are an exact copy of the perforations at the sending end. The received tape is then passed through an automatic typewriter, by which the message is recorded in roman type in page form at a speed of 150 to 200 words a minute. The machine is strongly built to endure the strain of the high speed. The demonstration that was given at the Murray workshops was at a speed of 150 words a minute, and the record, of which a sample was taken, is clear and free from blemish. The apparatus will work duplex, and where repeaters are necessary the usual Wheatstone repeater is used. The claims for this system are that where a circuit is long—say, seven hundred to a thousand miles, and even more than this—and where there is a volume of business of from a thousand to two thousand messages a day, the work will be better and more quickly transmitted by this apparatus than by any other, including Wheatstone.

This system is in use between St. Petersburg and Omsk, a distance of 2,224 miles. The line is of iron, about 800 lb. a mile, and is divided by repeaters into four sections. The duplex speed with the Murray automatic is approximately sixty words a minute each way, and when Wheatstone working was employed the speed was from thirty to thirty-five words a minute each way. Where lines are only of moderate length, while it is desirable to increase the output of