

Melbourne, and Sydney. The received tape was being gummed to the forms, and transmits were being sent from the Morse signals. Messages for local delivery were gummed to tape like the transmits, and were given to typewriters, who can reproduce them at the rate of fifty to sixty an hour. This was said to be of great assistance. The disposal of the tape in this manner hinders delay, and the transmits can be sent as well from the Morse tape as from written messages. This is in keeping with the experience in Britain. The gumming of the received tape is no more difficult than the gumming of the printed tape from Baudot, Creed, or the Murray automatic. Experience has shown that a man can gum slip coming at the rate of 250 to 300 average messages an hour, but this speed of reception is not usual. In the London Telegraph-office they do not gum the tape, but write it up at from twenty-five to thirty-five messages an hour. In Berlin Telegraph-office this copying of tape was seen being done at the rate of sixty to seventy messages an hour. A device had been arranged by which the tape was stretched before the typist, and on touching a key another length of tape was fed forward for typing. By this means the tape was easily handled at typewriter speed, as the typists did not watch the keyboard. Under the conditions prevailing in London it was found that gumming caused delay, as some messages were sent to various remote parts of the large office, and even on to a different floor, and would lie with others for a time before being transmitted. Any error then found obliged that the message be sent back for correction, which caused undue delay. By copying before distributing errors are detected early. An objection such as this does not apply to nearly the same extent in comparatively small offices.

On the London-Edinburgh circuits, at the Edinburgh end of which the "systematic Wheatstone" methods are employed, London uses Creed perforators and printers. This obviates the slow methods of writing-up referred to. About 2,800 messages a day are dealt with on these circuits. The use of this method enabled four circuits formerly in use to be closed, and cut out two repeater sets. It also reduced the delay upon the work. One day's work of eight hours on the Creed over two circuits was 1,720 messages, of which 1,170 passed over one circuit, or an average of 146 an hour. Three Gell perforators are used at each end.

Some of the newspapers have leased wires and work Wheatstone automatic between London and Manchester, about two hundred miles. These circuits are worked simplex at approximately two hundred words a minute. In the *Evening News* office they transmit to Manchester about forty thousand to fifty thousand words a night from 5 p.m. until 12.30 a.m. There are seven men at the London end, one in charge, four punching by manual method, and two using the Gell perforator. The manual punchers prepare tape without difficulty at twenty-five to thirty words a minute, and maintain that speed. It was particularly interesting to observe what could be done by that method. At Manchester there were eight men writing up. The *Manchester Guardian*, London, had eight men: five were manually perforating, and two were using the Gell perforator. One was attending to the transmitter. At Manchester there were eleven men writing. To ascertain the rate at which they were writing several of them were timed, and the speed was found to be twenty-five to thirty-two words a minute. At the *Daily News* office in Manchester there were seven writers, while at the London end there were four hand and two Gell perforators. Another couple of writers were required. The writers were timed, and the speed ranged from twenty-eight to forty words a minute. These newspaper offices at London and Manchester were visited with a view to confirming results that were said to be obtained, but that were difficult to accept without seeing for one's-self.

Some of the engineers of the British Post Office considered that the use of the "systematic Wheatstone" method would increase, and that it gave the best results; others were disposed to favour the Baudot system.

The Baudot is an old system, having been invented in France about thirty years ago, and it is most largely used in that country. Its principle is that several operators can use the same wire for transmitting messages practically simultaneously. A distributor is provided, with insulated segments arranged in circles or rings. Over these are revolved at a constant speed, either by a weight or small motor, brushes which wipe over the segments. At the receiving end there is a corresponding equipment. Provision is made for keeping the brushes in isochronism by correcting-currents sent twice every revolution. The brushes revolve about 180 times a minute. Each operator is provided with a keyboard which has five separate keys, so that positive or negative impulses may be sent to line. A signal called a "cadence" is given to each operator as an indication that the line is at that moment available for him, and he depresses his keys according to the letter that it is desired to send. A letter can be sent at every revolution of the brushes, so that thirty words a minute per operator is the maximum speed.

Baudot double, triple, quadruple, sextuple, have two, three, four, and six channels respectively. Sextuple is seldom used; quadruple is common. All of these can be duplexed. Quadruple simplex permits of 120 words a minute being passed over the line. At twenty words per message this gives ninety messages per channel: that is extreme. If fifty-five to sixty-five are got good work has been done. This system is very flexible, as all four channels can be used for sending from either end, or two can be sending and two receiving at each end, or three sending and one receiving. This is very convenient, as it admits of using the line for sending all in one direction and from either end. Quadruple will work on any circuit over which the Wheatstone automatic can be worked at ninety words a minute simplex. It would therefore work on all our circuits without the need of introducing repeaters. Tape is not used at the sending end, and at the receiving end it is gummed to message-forms and is ready for delivery as soon as it has been printed.

London works quadruple Baudot to Paris on four circuits, to Amsterdam on two, and to Lyons on one. Two channels of the Lyons circuit are used there, and two channels retransmit to Marseilles. These are through short cables across the Channel. Between London and Berlin a double duplex is worked through 250 knots of cable. Repeaters are used at each end of the cable. A quadruple Baudot set requires about two hours of a mechanic's time each day to maintain it in good working-order.