

a slip. Tapes are destroyed at the end of the day. The received tape is mostly given to women to typewrite. They do not get through more than twenty to twenty-eight messages an hour. The methods of doing this work seemed to require improvement. The transmitters and receivers were motor-driven.

A modified Morse alphabet is used so as to meet the Wheatstone requirements. It was said that the Wheatstone working gave promise of being more suitable than the Barclay. All instruments were fitted on the tables here. It was noticed at San Francisco that the bulk of the instruments were mounted together on special stands, with shelves in tiers, so as to be under the control of special men. The operator's table had only a sounder and key. This method was found to be very satisfactory. The same arrangement as at San Francisco was also in New York so far as a large number of the circuits was concerned. Many circuits, however, had all the instruments on the tables.

There is quite a number of Barclay instruments working to different places, such as to Denver, Kansas City, St. Paul, St. Louis, Cincinnati, Louisville, Washington, Cleveland, Detroit, New York, Pittsburg, and Boston. The officer in charge of this section, who was working at a faulty set, informed me that they go wrong in all sorts of ways, and that it is the unexpected that is always happening. He said he liked them, but added, with a twinkle, that he was earning his living by them. It is found that by having a few spare sets on to which to change when anything goes wrong with the sets in-use good results are obtained. The mechanics are engaged upon them a great deal, so that the upkeep is considerable. On the other hand, it is claimed that skilled labour is dispensed with. Two girls at each end can attend to the transmitter and receiver, and two girls at each end can keep the transmitter supplied with tape. These girls are paid about 30 dollars, or £6 5s., a month, and it is not considered that the extra upkeep of the instruments amounts nearly to what is saved by working in this way. There is no third person in this office checking received tape at the Barclay, as was noticed at another office, where, however, there were only two circuits. One message only is perforated at a time, and it must be accurate. The speed is not high, and the circuit must be good. The instruments will duplex, and when the distances are long repeaters are used. I timed the messages frequently, and found the rate of transmission to range from thirty-four to forty-two words a minute. At 4 p.m. one day at the circuit from Detroit the received number was 541 and the forwarded 635. As this was eight hours, the average was sixty-seven and seventy-nine an hour over the circuit, but it was only an average of thirty-seven messages an hour a pair, as there were four persons at each end. On occasional days more is done, but generally if they dispose of five hundred to six hundred messages a day each way it is considered to be satisfactory. This agrees with what was seen elsewhere of the work done by this instrument.

On a balcony on the ninth floor there are three or four distributing-positions towards which messages come to be sent off in other directions. There is an arrangement of carrying-wires, a rope driven by a motor, and spring clips. The clips pick up messages and drop them also at predetermined points. There are pulleys, and the clips pass over these, alter direction, and turn through the ceiling to the operating-room on the next floor above. In one case messages are brought to a chute passing through the floor to a room below. The clip is opened by a projection just as it reaches the chute, and the message falling in is drawn to the floor below by the suction of a small fan at the bottom. These carriers, however, do not deliver to the different tables, but only to the ends of a section comprising two or three tables. Tables are not small as in our offices: they are about 4 ft. wide and 20 ft. to 24 ft. long. Several instruments are placed on them without any partitions between them. Operators at the different tables sit back to back with not much space between the backs of the chairs, and passages are so narrow it is not easy for two persons to pass. At each delivery section distributors (boys and girls) remove the arriving messages and place them at their respective instruments on the tables, and despatch those received at the instruments, so that they may quickly reach their proper circuit or be so placed that they will reach the despatch or the telephone room. At each table there are eight or nine persons seated on each side of it.

In other cases there are boys in the middle of the room attending to carriers that are propelled to the ends of the room, where there are also boys who remove the messages, replace others, and shoot the carrier to the middle again. Transfer between the two operating-rooms is effected by these rope carriers going up and down at three different places. The present system is old—it has been in operation since 1893—and is to be replaced. Two or three motors are used: one is $5\frac{1}{2}$ horse-power, another $\frac{1}{2}$ horse-power. The carrier is a metal spring fitted with fibre which runs between two wires, the carrier being taken forward by the motor-driven rope. The speed of the carrier is about 6 ft. or 8 ft. a second. There is also a system of vacuum pneumatic tubes for use to different rooms in the building and to some places outside.

The Postal Telegraph Company, of Chicago, have their operating-rooms on two floors about 65 ft. by 250 ft. There are about six hundred people working at one time. Cord carriers are used here for picking up and transferring messages. The carriers pass messages between the floors. Twenty-seven seconds are occupied by a carrier in going the full length of the room. Distributors dispose of the work from the distributing-points to the instruments and *vice versa*. The management aims at having only a five-minutes delay on telegraph work. There are pneumatic tubes for sending messages all over the building, and into the adjacent Board of Trade building. These operating-rooms provide fair space for operators and for those whose duties require them to move about.

The lead-covered rubber cables are brought up a well to the main frame, thence to a half amp. fuse and carbon lightning-arrester, thence to an intermediate frame where they can be cross-connected, and then on to the test-board. The test-board is of the same type as that already referred to, and men cut-in their instruments and test in the same manner. They have a large number of repeaters, the shelves for which extend about two-thirds across the room, and are