

Selective Ringing Telephones in the Newcastle District, London and North-Eastern Railway

A description of recent applications of G.E.C. selective ringing telephone systems appeared in No. 2 of this Volume and contained an extract from a publication issued by the London and North-Eastern Railway to show the purposes of a Control Office and the function of the telephone system in the Darlington District. A similar office serves the Newcastle District and is linked to a large number of points along the various routes by means of G.E.C. selective ringing telephones.

As the county town of Northumberland and the centre of a shipbuilding and engineering area, Newcastle-upon-Tyne is one of the most important centres of the L.N.E.R. system. It is the control centre for routes, along most of which traffic is very heavy, extending westward across country to Carlisle, eastward to the coast, southward to the edge of the Darlington District, and as far north as Berwick-on-Tweed (Fig. 1).

The selective ringing telephone system recently installed comprises 203 waystation telephones linked by 11 circuits to the



Fig. 1.—Newcastle District; routes served by selective ringing telephones.

Control. Fig. 1 shows the routes and some of the waystations equipped with telephones. The circuit to Berwick serves 34 telephones in the course of its 67 route miles, whilst a circuit running west is first equipped at Prudhoe and serves 11 telephones before terminating at Haltwhistle. At this point it may automatically be coupled to code ringing lines to Alston and Carlisle. Coupling units are also installed at Hexham to serve the line to Reedsmouth, and at Alnmouth to link with the code-ringing circuit to Alnmouth.



Fig. 2.—Switching cabinet.

At Control, the selective ringing circuits terminate on small cabinets (Fig. 2) which are built into the desks illustrated in Fig. 3. The vertical panel of each cabinet carries signal lamps for the various circuits, whilst on the horizontal panel are fitted control keys together with a code-ringing key. The distribution of circuits over the cabinets is shown in Fig. 4, as also is the connexion between the Control operators, Deputy Chief Controller, Waggon Clerk and two small cordless switchboards, one each at Percy Main and South Blyth goods yards.

For efficient control the circuits are divided into three groups, each of which is multiplied over two cabinets, as shown in Fig. 4. At normal times an operator is on duty at each cabinet, and there are thus two controllers to each group. A controller may call any waystation under his supervision by throwing the key associated with the appropriate circuit and then dialling the wanted number. Any way-

station may call Control by throwing the calling key on the waystation telephone, the lamp associated with the calling circuit glows and the Control Officer may speak to the station after throwing the appropriate key. Should the matter discussed be settled between Control and waystation, normal circuit conditions are established when Control restores the key and depresses his pressel switch. Alternatively, Control may extend the call to the Deputy Chief Controller by throwing the key associated with the tie line to the latter's desk. Under this condition the *link engaged* lamp glows and affords supervision of the call.

Should Control wish to call a station on one of the code-ringing lines which may be linked to a selective ringing line, he throws the key of the selective ringing circuit, dials the coupling digit, which causes the coupler to link the lines, and then calls the wanted station by means of the *code ring* key on the cabinet.



Fig. 3.—Control room.

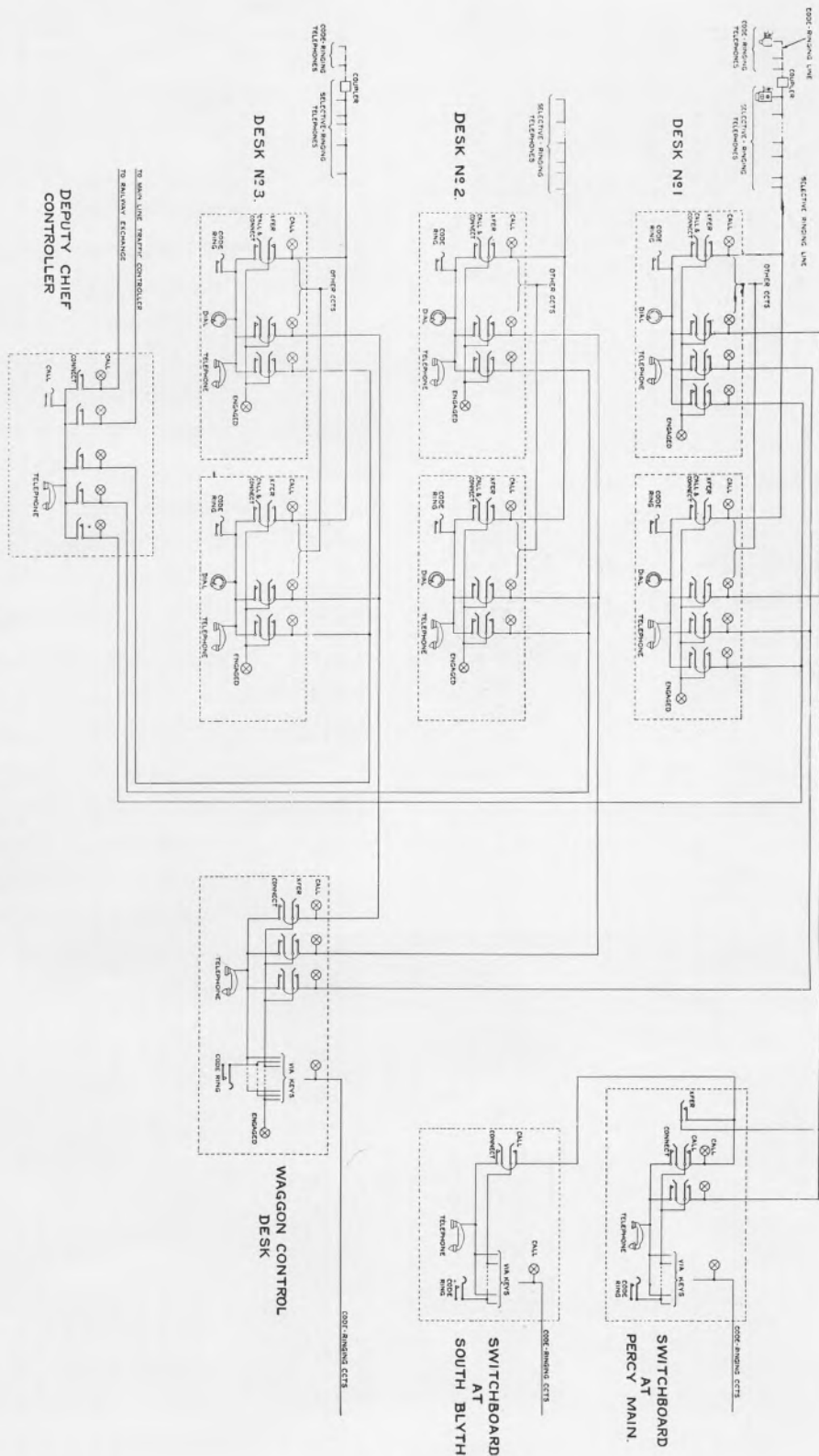


Fig. 4.—Distribution of circuits over desks.

On a call from such a station, depression of the coupling key on the telephone causes the coupler to link the lines, whereupon the lamp of the selective ringing circuit glows and the call proceeds exactly as if originated at a selective station.

In addition to controlling the selective ringing lines, the cabinets of one group are equipped for the control of a circuit to goods yards at Percy Main and South Blyth. These points serve as clearing houses for information to be passed at intervals to Control or, via the Control desk, to the Waggon Clerk.

As in the Darlington District, the selective ringing telephone system is reserved for the important communications relating to control of the District.

Apparatus.

The waystation telephones in the Newcastle area incorporate a 25-point unselector and *U*-link panel, and are designed for working from an 8-volt local

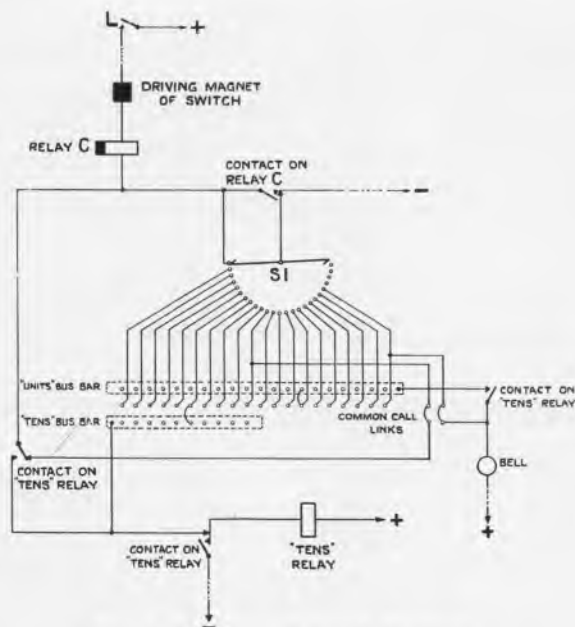


Fig. 6.—Portion of circuit diagram.

battery The opportunity may be taken here to refer in some detail to the circuit conditions which, through the agency of the *U*-link panel, enable a telephone to be allotted its number and also permit this number to be very simply changed at will. This feature was referred to in the previous article but considerations of space prevented detailed reference.

A polarised relay (L) in each telephone is bridged across the line and responds to impulses received. Contacts on this relay energise the driving magnet of the unselector (Fig. 6) over a circuit including home contact of wiper S1. The switch takes one step, its driving circuit being broken by the wiper but



Fig. 5.—Selective ringing telephone in signal cabin.

re-established for further stepping at operated contacts on relay C.

In the circuit shown, the station is allotted the number 68 and it is assumed that this station is being called.

In response to the first digit, the switch, in common with those in all other telephones on the line, takes six steps. At the end of impulsing on this first digit, a circuit is completed for the "tens" relay, via wiper S1 and a *U*-link inserted to connect the sixth socket to the "tens" bus bar. The "tens" relay thus operates. The second digit (8) is then received, the driving magnet being again energised. On the eighth (final) step a circuit is completed for the bell from wiper S1, *U*-link connecting the fourteenth socket to the "units" bus bar, and operated contact on "tens" relay. The station is thus called and the bell continues to ring until its circuit is broken at the hook-switch when the receiver is lifted, or the controller operates his pressel switch.

As already stated, switches in all telephones on a line take six steps on receipt of the first digit when station 68 is called, but only at stations in the *sixty* group, *i.e.*, 60 to 69, are links inserted to extend the circuits from the respective sixth contacts to operate the "tens" relays. All "tens" relays in the sixty group are therefore operated, whilst others are unaffected.

Since stepping on receipt of the second digit can be effected only if "tens" relay contact is operated, only the switches in the sixty group respond to the second digit. All in this group take a further eight steps, the respective wipers S1 then



Fig. 7.—Apparatus cabinet at Newcastle.

resting on contacts connected to the fourteenth sockets. Only at station 68 is a link inserted between this socket and the "units" busbar and thus this station alone is called. When the Controller hears a reply, he depresses the pressel key in his handset to release all line relays and restore switches to normal.

It will be seen that with the insertion of links in appropriate sockets a waystation telephone can be allotted any number and that should any change in the system require a change of number it is only necessary to change the position of the link.

The circuit of Fig. 6 also shows the conditions under which a common call can be made. If links are inserted as shown

in each telephone, all bells will ring when the common call number 00 is dialled.

For the group-call facility, by which a group of stations may be called simultaneously, links are inserted in each telephone in the group to correspond with the group call number

The apparatus at Control consists, in addition to the desks, of a group of ten transmitting units, line protectors and the line signalling and local circuit batteries. The function of a transmitting unit is to convert the loop impulses of the dial into reverse current impulses for accuracy in transmission, to smooth these impulses by removing the higher harmonics in order to prevent interference between adjacent circuits on the same pole line; to light the calling lamp in response to a signal from a waystation, to provide a leak circuit

whereby the current producing ringing tone, generated by the trembler bell of the called instrument, is fed to the Control telephone, and to break the circuit and provide an alarm (on the *circuit breaker* lamp on the control desk) if a short-circuit should occur across the line wires.

Each separate circuit is served by a transmitting unit, ten units being provided for eleven circuits at Newcastle since in one instance two circuits are operated together. The relays in each unit are mounted on plates, and above these plates in the cabinet shown in Fig. 7 are accommodated the smoothing chokes.

The line voltage, a function of line resistance and number of waystations, is derived from a storage battery of 100 volts, tapped at 50 volts for the apparatus circuits at Control, and trickle-charged from the mains.

