

Recent Applications of the G.E.C. Selective Ringing Telephone System

SEVERAL extensive applications of G.E.C. selective ringing telephones have recently been made, at home and overseas. Those on the London and North Eastern Railway and the Southern Railway are described here as affording examples of four different sets of conditions all equally well met by the apparatus and principles described in Vol. 6, No. 3, 1936, of this Journal.

London & North Eastern Railway. Darlington District.

BELOW is given an extract from a publication issued by the London and North-Eastern Railway for the benefit of their staff when a new selective ringing telephone system was brought into service in the Darlington District. It shows the measures adopted to ensure smooth working and very clearly indicates the need for efficient telephone facilities.

“The Control Office acts in the name of the District Superintendent. . . The object of the Control is to promote the efficient working of the trains and traffic in the controlled area, and in emergency to provide a means of making prompt arrangements for the diversion of freight or passenger trains, or taking other steps that may be necessary according to circumstances.

“The Control is the point at which the train and traffic working of the area is focussed. It collects information from all parts of the area, keeps in touch with the running of trains, endeavours to prevent undue accumulation of traffic, and holds the balance fairly between one centre and another within the area. The Control, therefore, visualises the conditions throughout the whole area, and will assist the Outside Staff, who, necessarily can know the state of affairs only in their own immediate neighbourhood.

“The running of all trains in the controlled area is recorded on graph sheets in the Control, so that there may always be a correct representation of the occupation of the lines. This is essential for the successful operation of the Control and in order that the controllers may be able to give accurate information to the signalmen, yard staff and others, who require to know the position of trains from time to time. It is, therefore, imperative that train reports be given promptly and correctly”.

The control now centred at Darlington covers two areas originally operated separately — Darlington and Middlesbrough. For service in the Darlington area a selective ringing telephone system

was supplied by The General Electric Company in 1931, whilst the Middlesbrough area possessed its own selective ringing telephone system of an earlier type.

In view of the proximity of the two areas and the large volume of traffic between them, the Railway Company decided to combine the functions of the two Controls in one office at Darlington. The General Electric Company was entrusted with the supply of equipment for a control desk at Darlington from which the whole of the existing Middlesbrough circuits could be operated over a small number of trunks between the two centres. It should be noted that the Middlesbrough circuits themselves were not extended to Darlington but that selective apparatus was installed at Middlesbrough to enable any circuit to be selected at will for extension to Darlington over a trunk.

The equipment in the new Darlington Control office is illustrated in Fig. 1 and comprises the two-position desk originally in service and, adjacent to it and extending round the wall, a four-position desk serving the lines to Middlesbrough. A feature of this desk is the turret mounting of the dials and calling signals in order to give maximum desk space for record charts, papers, etc. In the foreground is the desk of the Deputy Chief Controller, to which calls may be switched from any of the six positions, as necessary



Fig. 1.—Control Room, Darlington.

From the first two positions radiate four circuits for which a total of 109 waystation telephones was initially supplied. The method of operation and the design of the equipment are substantially as already described in this Journal and need not be enlarged upon here.

The routes are shown in Fig. 2 and it will be seen that they penetrate well into the coal producing territory around Bishop Auckland. The new circuits linking Darlington with Middlesbrough are thus a modern form of that link between the mines and the outlet to the sea which first found notable expression in the famous Stockton and Darlington Railway, the first in the world.

Since the method of impulsing over the existing Middlesbrough circuits differed from the more straightforward method used in the Darlington area, a special impulse conversion unit was installed. This gave to the operators at the four-position desk the ability to call any connected waystation

in the Middlesbrough area by means of a dial, although the circuits were not originally designed for this simple means of calling.

A total of 225 way-stations can be selectively called from Control over 12 circuits serving various routes. A number of these stations is shown in Fig. 2. Six stations are equipped with coupling units in addition to the usual telephones in order that code-ringing lines terminating at these waystations may be coupled to the selective ringing lines to give Control access to the code-ringing stations. Coupling is effected automatically after the predetermined number allotted to any particular coupler is dialled and the Control operator may then call any station on the coupled lines by sending the appropriate code by means of his code-ringing key. Two couplers are installed at Kirkby Stephen, one to link with a code-ringing line to Penrith and the other to link with the line to Tebay. Middleton-in-Teesdale is linked to Control by means of a coupler at Barnard Castle, whilst Wearhead is similarly linked through Stanhope. The remaining two couplers are installed at Forcett Junction and Burnhill respectively and serve local omnibus circuits. By these six code-ringing lines 52 points are served, bringing the total directly accessible to Control up to 277.

The telephone system formed by the selective ringing lines and the omnibus



Fig. 2.—Routes served by Darlington Control.

extension circuits is the most important feature of the communication services in the District and instructions are given to the staff that it must be used only for strictly control matters, except in special circumstances.

This description of selective ringing telephones on the London & North Eastern Railway can best be concluded by reference to a paper read by Mr W. E. Green, Assistant District Superintendent, King's Cross, before the Institution of Railway Signal Engineers. Indebtedness is expressed to the author and the Institution for permission to publish the following extract:—

“Train-Working Records.

Another important function performed by Control, and a very distinct improvement on methods previously in operation, is the recording of train working, immediate ascertainment of causes of delay, and other similar information, which provides the District Superintendent with a check on current operations, and the necessary material for alteration or readjustment of the timetable with the

object of betterment of service or the improvement of punctuality. Before the institution of Control, all information relating to train working had to be obtained from the guards' journals, which were scrutinised hours, or even days, after the trains had run, by a staff of clerks in the District Superintendent's office. Letters were then sent out to points where delays had occurred, on the receipt of which local officials would exercise their ingenuity in attempting to blame somebody else, so that by the time all relevant—and irrelevant—reports had been collected from yard staffs, signalmen, guards and other interested parties, and had been passed backwards and forwards a few times for further remarks, days, or even weeks, might have elapsed since the inquiry was set afoot.

Nowadays, the working of the trains is logged as they are running. A card is provided for each train, ruled so as to show the booked and actual times at starting, terminating and intermediate key points, the requisite information (together with causes of delay) being given by the depots or signal-boxes concerned. The cards are usually designed so as to show a week's working, and also to include particulars concerning loading, the names of the train crew, engine numbers, and any other details necessary to produce a complete and accurate history. It may be argued that the outside staff are subjected to extraneous work in providing this information. This, however, is incorrect, as they are now no longer called upon to answer the voluminous and, in most

cases, futile correspondence concerning past events with which they were deluged in pre-control days. Thanks to the Signal and Telegraph Engineer, therefore, the District Superintendent has now only to walk into an adjacent office in order to ascertain what is transpiring throughout the division. A glance at the stock sheets and a few questions to the Deputy Chief Controller will assure him whether proper arrangements are in force for clearing traffic, a quick scrutiny of some of the train-recording cards will demonstrate whether adequate attention is being paid to train running, and the methods by which unsatisfactory cases are being dealt with.

Dealing with an Emergency

It is an almost dramatic experience to be a spectator in a control office, where the ordinary routine work is proceeding normally and smoothly, when suddenly one of the section controllers shouts out 'All roads blocked at box'. The elasticity of the organisation is at once apparent, for within a few moments preliminary arrangements will have been made to open signal-boxes if necessary on alternative routes, provide pilot crews for diverted trains, stop all important traffic clear of the obstruction, put aside slower trains and cancel others from adjoining depots, order out breakdown and other emergency equipment, and take all possible preliminary steps to isolate the affected stretch of line, and make preparations for assistance.

In pre-control days, the District Superintendent had really no accurate knowledge of the state of affairs until he reached the scene of the accident, by which time trains might be standing for some distance either side of the obstruction, thus complicating the work of clearance. It will be realised that, by proceeding to the scene of the accident, the Superintendent and other officials concerned virtually isolated themselves, and, as a result, knew very little of what was transpiring except in the immediate vicinity. Any instructions which it was necessary to transmit had to be put through the nearest signal-box, on a circuit—probably local—already congested with a multiplicity of messages arising from the mishap.

No description, however vivid, can possibly serve to contrast the makeshift arrangements of pre-control days with the efficient organisation which can be brought into immediate operation at the present time”

Southern Railway. Traffic Control.

In the two districts of the London and North Eastern Railway already referred to, as indeed, in the system as a whole, the industrial areas served give rise to traffic in merchandise and goods exceeding that carrying passengers. In the Darlington district, for example, the imperative need is for a means of control which will enable



Fig. 3.—Routes served by selective ringing telephones for traffic control, Southern Railway.

waggons to be placed at the disposal of collieries and then despatched with a minimum of delay. On the Southern Railway, however, outside London itself, there are no important industrial areas and whilst, in serving the ports on the South coast, a quantity of merchandise is carried, by far the majority of traffic consists of passenger trains. The agricultural produce of the southern counties is generally carried by the fast passenger services and thus, from a traffic point of view, does not constitute the equivalent of the goods of the north which on first thoughts it might seem to be. The difference between the type of traffic on the two railways is clearly reflected in published figures which show the ratio of passenger receipts to goods receipts to be rather more than one half in the case of the L. & N.E.R. but over three times in the case of the Southern Railway.

The Southern Railway met the problem of serving increasing numbers of suburban areas and a growing density of traffic by a progressive policy of which electrification was the principal feature. This policy led to further increases in traffic and then



Fig. 4.—Selective ringing telephones at Woking.

embraced additional steps to facilitate smooth working. Typical of these is the selective ringing telephone system which augments improved signalling on sections of the track from Waterloo—one to Feltham and the other to Woking (Fig. 3). The frequent service of trains requires the quick response to a telephone call in a signal box which is a feature of the selective ringing system but which cannot be assured if resort be made to code ringing.

With the differences in types of traffic already explained it is to be expected that the methods of control on the two railways will differ. The object of the system installed on the L. & N.E. Railway is to enable the Controller at Darlington always to be fully informed of the conditions so far as the movements of goods and mineral traffic are concerned throughout the areas, whereas the handling of passenger traffic entails an entirely different form of control. The control on the Southern Railway, exercised through special traffic offices in

the Divisional Headquarters, is mainly concerned in overcoming, at the earliest possible moment, any delay or disorganisation which might arise in connexion with the working of trains in exceptional circumstances.

The Waterloo-Feltham and Waterloo-Woking routes are served by separate circuits in which the stations along the line have automatic intercommunication with each other and administrative offices at Waterloo. On one circuit, telephones are installed at key signal boxes at Woking, Hampton Court Junction, Wimbledon and Clapham Junction, with three others at Waterloo, whilst the second circuit is equipped with telephones at Feltham (two), Twickenham, Barnes and Waterloo (four). The telephones are fitted with dials, a register being installed at Waterloo for each circuit. Into the register is dialled the wanted number, which is registered and then re-transmitted along the line to select the called telephone.



Fig. 5.—Registers at Waterloo.

Power Distribution Control.

With electrification now widespread around London and the south coast a large system of power distribution is found on the Southern Railway E.H.T. lines serve rectifier substations, remotely controlled and feeding the track at 650 volts. Electrification has recently been completed on the route to Portsmouth, via Woking and, as part of the undertaking, a telephone system was required to link the substations to the Control Rooms. The object of the system was not only to assist in the routine control of the power plant but also to provide a means whereby emergency conditions on the track requiring action on the part of the controlling staff could be made known to them as quickly as possible. It was therefore necessary to provide telephones at stations along the track in addition to those at substations, which resulted in the total number of instruments connected to one circuit reaching considerable proportions. Previous installations operating on the omnibus principle had produced complaints from staff and residents in the



Fig. 7.—Switchboard and automatic apparatus at Woking.

immediate neighbourhood of stations and sub-stations about unnecessary ringing of bells. Particularly during night hours, when calls are made in connexion with the closing down of the power system, is this ringing a cause of disturbance. With this fact in mind and also because rapidity and accuracy were essential, selective ringing telephones were adopted.



Fig. 6.—Routes served by selective ringing telephones for power control.

The selective ringing circuits are divided into two groups, controlled from Woking and Havant respectively (Fig. 6). Each group terminates on jacks on a floor-pattern switchboard (Fig. 7) provision being made for an ultimate of ten lines in the group.

From the switchboard at Woking radiate lines serving all stations, substations and track-paralleling huts on the routes to (a) Surbiton and

Staines, (b) Farnham, (c) Petersfield. In addition there is a circuit to Waterloo and London Bridge, serving administrative offices, and another used for through connexions to Havant. The initial equipment of selective lines is completed by two spare circuits, one of which is reserved for electrification extension to Reading. Also terminating on the board are ten C.B. lines local to Woking Control Room.



Fig. 8.—Selective ringing telephone on station platform.

To call any point on a selective ringing circuit, the operator depresses the appropriate *connect* key and then dials the wanted number. Two circuits may be joined by means of the plugs, as also may any two of the C.B. lines. Further, if required, the latter may be connected to the selective lines.

The automatic intercalling facility is provided and to give the operator control of the circuits when a call of this type is in progress a strip of cut-off keys is fitted at the top of the front equipment, depression of which isolates the register.

Not all the telephones are arranged for automatic intercommunication since calls from station platforms are made only to the Control Room. Telephones in the substations and paralleling huts are, however, fitted with dials in order that calls may quickly be made from one point to another.

Instruments on station platforms are fitted in wood cabinets in positions easily

accessible to station staff in case of emergency. These telephones are also used by patrolling track linemen for reporting to Woking or Havant. The linemen may also use telephones fitted outside substations and track paralleling huts, whilst for the use of staff visiting the plant, telephones are installed in the interior.

The Havant circuits and switchboard are similar to those at Woking, the points served being all stations, substations and huts on the routes to (a) Liss, (b) Portsmouth Harbour, (c) Bognor, Littlehampton and West Worthing, and (d) Epsom and Three Bridges. This last circuit is the longest on the system, covering 70 route miles, and linking a total of 65 telephones.

At Woking and Havant the line batteries have nominal voltages of 80 volts and 120 volts respectively, with separate 24 volt batteries supplying the manual switchboard circuits.