

Some Swedish Remote Control Installations for Railways

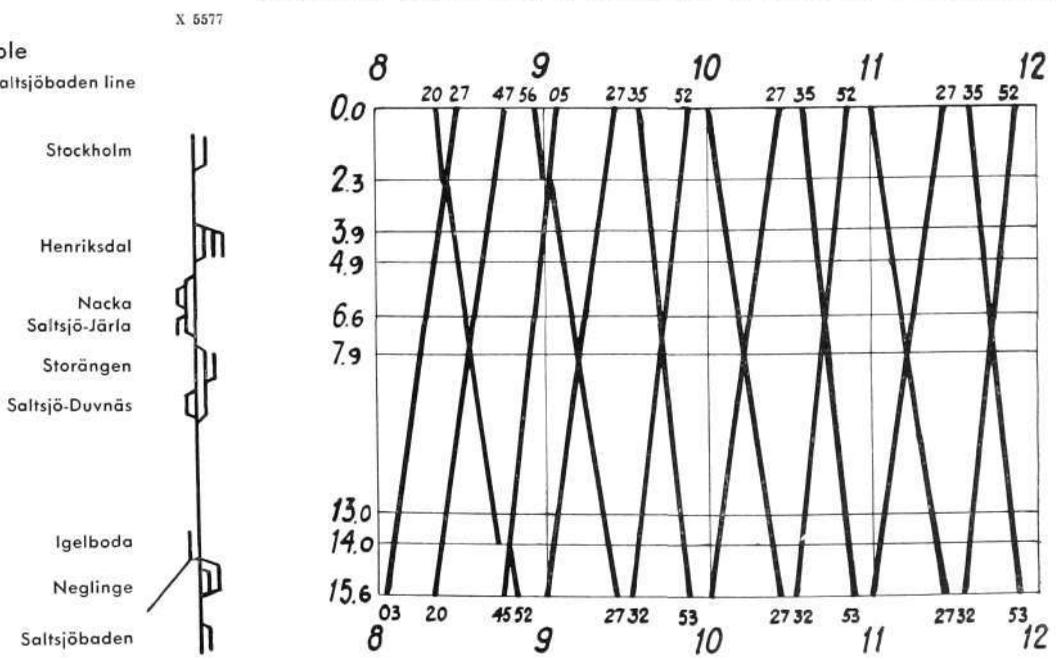
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Nothing is so instructive and interesting as to see how things are arranged by other countries in domains where problems are also encountered at home. Direct comparisons should, nevertheless, be avoided, since conditions — especially in the complicated machinery of railways — may differ widely in character and things small in themselves may be decisive in determining whether one innovation or another may be serviceable or applicable. Here will be given some impressions of a visit to Swedish railway control installations, previously published in Dansk Jernbaneblad, June 1939.

The Stockholm—Saltsjöbaden line in recent years has had a remote control installation which very much simplifies operation. The line is 15.5 km long and has electric traction with one train per hour in each direction, supplemented by further trains at the rush hours, namely in to Stockholm in the morning and return from Stockholm in the afternoon. As may be seen from the diagram time-table, Fig. 1, traffic is rather dense, it being observed that the trains depart at about the same times from the terminal stations. The line is single-track except between Nacka and Saltsjö-Järfa and between Storängen and Saltsjö-Duvnäs where the track is double. The section from Henriksdal to Neglinge, 11.7 km is operated by automatic interlocking and automatic raising and lowering of level-crossing barriers, and the whole section is remote controlled from a dispatching office at Neglinge, which as regards signals is partially operated by the automatic interlocking plant. The terminal stations, Stockholm and Saltsjöbaden, are both controlled locally.

Examination of tickets is done on the train and sale of tickets to passengers from the remote controlled stations likewise is done on the trains, in summer also at the newspaper and sweet stalls located at each station. This is possible because only 5 % of the sale of tickets on the line affects the unattended stations, the balance of 95 % taking place at Stockholm or Saltsjöbaden.

Fig. 1
Graphic time-table
for the Stockholm—Saltsjöbaden line



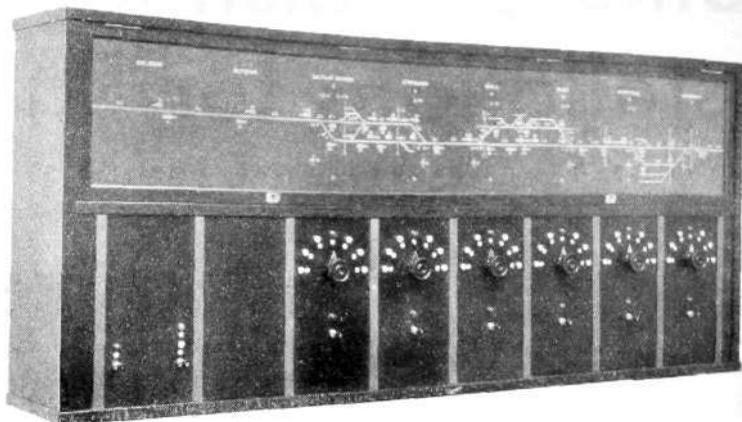


Fig. 2
Central panel
with illuminated track diagram and compartments with operating knobs for each CTL-station

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The dispatching office, from which the stations supervised by the centralised train dispatching system (CTL-system) are controlled is located at Neglinge, as already stated. The plant has been installed by Signalbolaget and consists of a central panel, Fig. 2, connected by telephone cable with one CTL-station installed at each of the stations Saltsjö-Duvnäs, Storängen, Saltsjö-Järfa and Nacka. A CTL-station consists of a series of relays, telephone selector type, etc., fitted in a cabinet and comprising an operating receiver and a control transmitter. In addition two CTL-stations are connected to the cable at Henriksdal where the number of appliances, barriers etc., to be operated by the CTL-system is too large to be served by a single CTL-station.

The central panel has an illuminated track diagram, showing all meeting tracks, double tracks, points, signals etc., and also a compartment with a knob for each CTL-station, six compartments in all, for transmitting the control signals given below. The progress of the train along the line is followed on the track diagram, by the darkening of the illuminated strip sections corresponding to the track intervals, and the positions of the points also appear on the diagram.

The operating receivers are in general adapted for the reception of the following seven order signals from the control panel at Neglinge, *viz.*:
train road a^I , entrance on the straight track,
train road a^{II} , entrance to the meeting track,
train road b , departure from the straight track,
train road c , departure from the meeting track,
permission for local operation of entrance points,
suspension of train road blocking for roads a^I , a^{II} , b or c ,
switching on the control transmitter, by which the transmitter at the station concerned starts up and repeats the position of the apparatus concerned, which repetition normally may be done when an order signal has been sent out and the order executed.

Each operating switch of the central panel has seven positions, each corresponding to one of the seven order signals. On throwing the switch into a certain position and pressing a button in the switch the appropriate order signal is transmitted by a series of impulses to the operating receiver of the CTL-station concerned, the receiver then attending to the execution of the order, whereupon the control transmitter of the station by emission of a number of impulses causes an indicator on the central panel track diagram to move as evidence that the order has been correctly carried out. When a train A , following the opening of the train road by the central panel, has run into a station where it is to meet, and the meeting train B is on the way, the central panel — even though against operations rules — may send the order signal »de-

parture for train *A*» but the departure signal shows »clear» only when train *B* has arrived and the track points have been moved. With irregular operation, changes of meeting tracks and so on the engine-driver runs *entirely* by signals and receives no notification of alteration of meeting tracks. The driver then becomes the dispatcher for the train and is responsible for the train's running.

The plant cost some 300,000 kronor and the central panel is operated by one man. The train dispatcher is the station-master at Neglinge. The advantage with such an installation, which in the years it has been in use has operated without any fault worth mentioning, is naturally of an economic nature in the first place.

In a space alongside the dispatching place at Neglinge there was installed on trial a recording instrument, a centralograph Fig. 3, which, control of the functioning of the track relays being desired, was connected provisionally with these, so that it recorded the occupation and clearing of the different insulated track sections. In this way there was obtained at once an automatically drawn graphical presentation of the actual situation, as the apparatus stamped in under the appropriate headings of a paper strip the time the track insulation corresponding to the heading was occupied. Such a recording instrument could be, *e. g.*, connected to the signals of a block section and made to register each time a block signal was set at »stop» after a train, thus causing diagrams to be drawn for supervision of the train running. A centralograph could also be of great use in supervising the train running on certain electrified sections during irregular traffic; on the other hand supervision of electrical running without variation during regular traffic would hardly be necessary.

Another typical example of remote control may be seen at Upsala. Here there is a fairly new and modern central panel, on the Signalbolaget system, with a single interlocking cabin for the whole station and this cabin serves all points, dwarf signals etc. at the station. The whole station is insulated throughout and all movements of trains and setting of signals are shown on the track diagram. There is automatic block working between Upsala and Stockholm (double track line). In addition to Upsala itself this cabin also serves Upsala N, a cross-over station situated 3 km to the north, which thus has no attendance for train dispatching, point changing, signalling etc. Finally from Upsala northwards there are no fewer than eleven level crossings and the barriers for these eleven roads are remote controlled likewise from the cabin at Upsala. It must not be supposed that it is a question of roads with little or no traffic; most of them are streets in Upsala town itself and fairly busy, while one of them even carries a tramway.

When the barriers are to be closed, a switch is thrown (each barrier has its own switch). At the barrier there lights up a red light in the direction of the road to stop the road traffic and a bell begins to ring, the barriers falling 20 seconds after. The procedure in setting signals is normally as follows:

The train road is set, the switches for the barriers are thrown and *immediately* afterwards the signal switch is thrown to »clear» position. The signal remains, however, at »stop» until the barriers are down, then going to »clear». This arrangement means considerable facility for the staff who can carry out the necessary operations at one time without any need to wait, *e. g.*, to be sure the barriers are down. As a further precaution for the level crossings there is set up at each side of the roadway a daylight signal displaying a red light to the track, which does *not* go out until the barrier is right down. This, therefore, is only a notification for the engine driver and the one light may well apply to a number of tracks. Immediately a train has passed a level crossing the barriers rise automatically, and then the switch at the dispatching cabin can be restored.

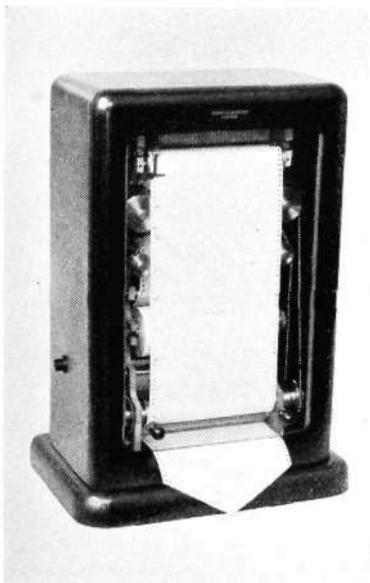


Fig. 3
Centralograph
for recording the running of trains

x 3952

This remote control plant, which may be said to be both comprehensive and bold in conception, has now been in service for about a year and during that time there has not been any kind of failure or drawback in the installation, nor has there been collision with the barriers or similar accident. It is obvious that such a plant requires to be *reliable* in operation, and this requirement too seems to have been met in the plant described. There is not any doubt that road-users display more caution at level crossings because of the fact that *it is realised* that the *only* signals are the light and sound signals and that it means a catastrophe if these are not strictly obeyed.

Stockholm has likewise only one central apparatus to deal with the whole of the large station area. There is automatic interlocking both northwards and southwards from Stockholm and all shunting is done by dwarf signals. Attendance in rush traffic is four men with a leader, at less busy times only two men and in the night one man only.

It is with feelings of admiration that you leave this post after having watched these men at work for a couple of hours. Switches are moved unceasingly, without it being possible to see the train movements that have been permitted by them — otherwise than on the illuminated track diagram. Hardly a word is exchanged, each one knows that when *that* movement comes to *that* point, then it must proceed to *that* shunting road and points and dwarf signals are set accordingly, while the track diagram is kept constantly under observation. It may happen that a loud-speaker at the train dispatcher's place makes an inquiry; it is a shunting foreman on the spot who is inquiring and the dispatcher answers in a microphone. It is not like a telephone call; it is like a chat between two persons in the same room and it is carried on rapidly and easily. Everything seems very complicated but it is naturally routine work in the highest sense and it demands thorough acquaintance with the track lay-out and the work.

Finally mention should be made of an arrangement for running on the right hand track (that is »wrong» track for the general direction of running) between Stockholm and Upsala. For this »wrong» running dwarf signals are provided applicable to this direction of running and the throwing of a switch in the central panel makes running on »wrong» track by signal possible without shunting in and out. It was stated that such running is employed not only when one track is unavailable because of accident, but also to a considerable extent when maintenance work is proceeding on the line.