Interlocking Plant at Upsala C

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As far back as 1913 there was installed at Upsala an electric interlocking plant, up-to-date at the time, which has worked satisfactorily throughout the years. Naturally, however, it called for a numerous staff while in addition there were men for operating crossing gates at a large number of level crossings. Then when the line was electrified this caused the mechanical semaphores, of which there were a large number in the plant, and the scotch block signals on masts to be difficult to observe on account of the overhead line bridges and the overhead lines. For several reasons also it was considered advisable to exchange the old plant for a modern interlocking plant with light signals and track circuits, which moreover was a necessity to enable Upsala station to be connected to the automatic interlocking Stockholm—northwards.

The new interlocking plant with illuminated track diagram, relays, point machines, locking devices and dwarf signals was ordered from Signalbolaget, while the greater part of the cables was supplied by Sieverts Kabelverk. The work of installing was begun in the autumn of 1936 and was largely completed by the autumn of 1937. For various reasons, however, the plant was only put into operation in February 1938.

In the older installation the signal cabins numbered three and all the points requiring to be set for fixing a train road were centrally controlled from the signal cabins. The electrical station blocking and the track locking were dealt with by the train dispatcher. Single track section blocking with blocking apparatus was arranged to Upsala Norra and there was double-track section blocking southwards. In the new safety installation the three interlocking machines are united in one central interlocking machine housed in the same building that formerly occupied by interlocking machine II at the south end of the station area. The plant works as order interlocking machine, since signal to an incoming train is given without reference to the train dispatcher. With departing trains the train dispatcher gives bell signal to the cabin when the train is ready to leave, this to avoid the train roads being locked too soon in the event of lateness.

Fig. 1 X 5575
Dwarf signals in the station track area

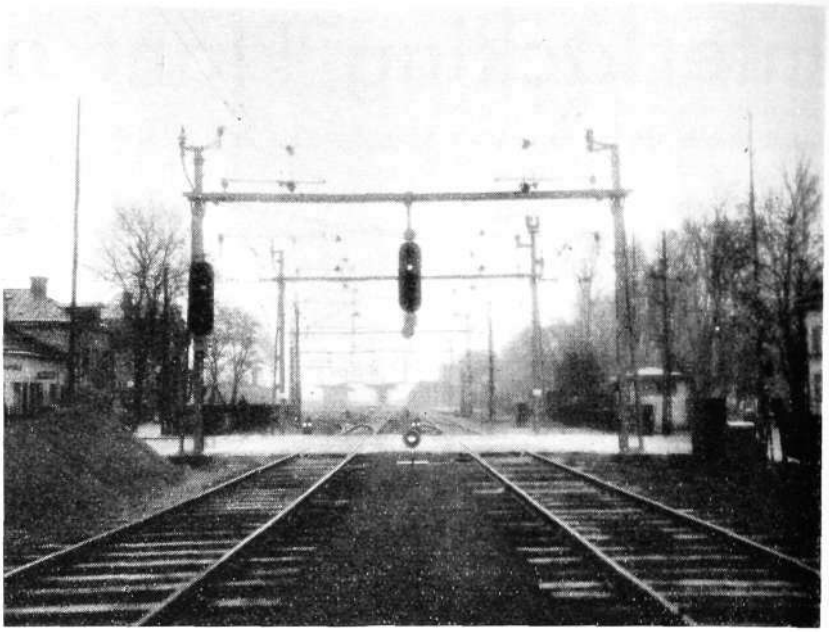


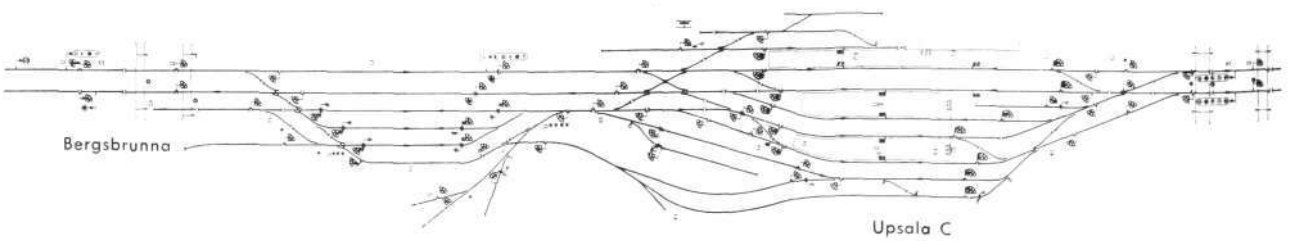
Fig. 2 X 5574
Entrance from north to Upsala C
with home signals, dwarf signals, caution signal and electrically operated gates for the level crossing

All shunting movements in the station area are directed from the signal cabin by means of dwarf signals, Fig. 1, while shunting on the ranger track is done by local switching devices for all the central switchable points. When the signal cabin gives permission for local switching, the dwarf signals concerned are set at »out of use». On the entrance or departure of a train on the ranger track the permission for local switching is withdrawn and the signal for the train is given by the interlocking plant.

All the train tracks are insulated, *i.e.*, formed into track circuits on which traffic is directed by dwarf signals. By means of the track circuits the giving of clear signal is prevented for tracks which are occupied by vehicles. The track circuits are also employed to prevent centrally switched points being switched from the interlocking machine when vehicles are in the track circuit. The dwarf signals which constitute home signals cannot be observed with sufficient clearness by rapidly approaching trains, but must be repeated by light signals set up on power line poles or in bridges, Fig. 2. For departure roads, indication that the train road is cleared is given by green light below the ordinary white in the innermost dwarf signal.

A modern electrical interlocking plant of the type used at Upsala is distinguished from older types of plant by the fact that in the latter only two train roads may be set by each signal lever. The interdependence with the

Fig. 3 X 7198
Track diagram at Upsala C



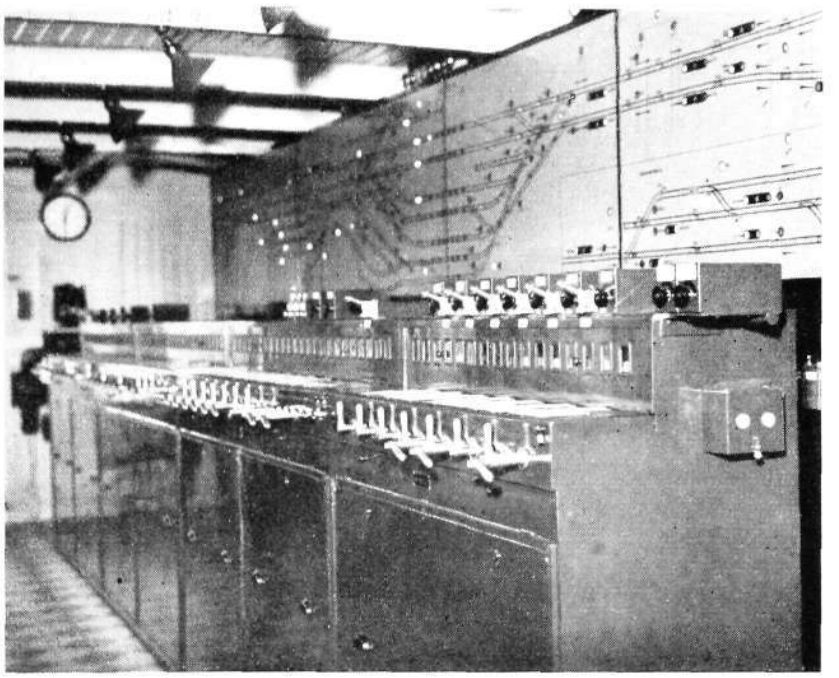
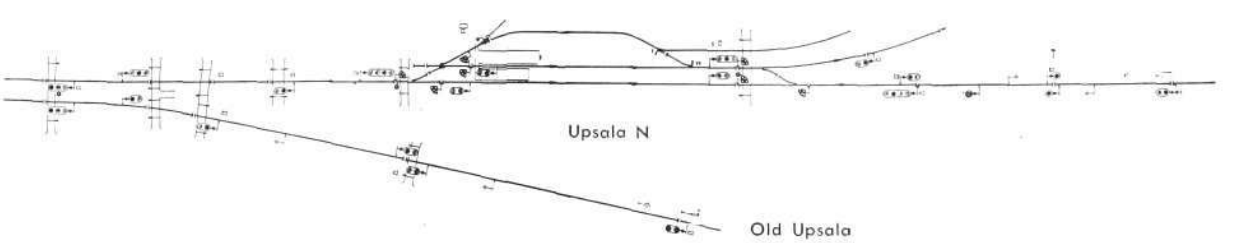


Fig. 4
Interlocking plant
with illuminated track diagram

X 5576

point levers is then obtained by means of mechanical guides which on throwing the signal lever are pushed to one side and by means of locking elements lock the point levers in plus or minus position. This mechanical interdependence is absent in a modern interlocking plant, being replaced by electrical locking. This means that it is possible with a single signal lever to give signal to all the train tracks on the station area where the track system allows of the train entering. When the signal lever is thrown, *e. g.*, to the right, there is obtained clear signal for the track for which the points are set, but only on condition that the train road is free of vehicles. The throwing of the lever to left gives clear signal for departure from the track from which the points at the moment are set. The signal cabin attendant therefore must take care that the points are set just to or from the track concerned. This is ensured by the train roads being mostly made up of several dwarf signal train roads, which must be set first. When finally the main lever is thrown, a special pilot lamp marks the tracks for which signal has been given.

The advantage with the modern interlocking plant is thus that a large number of train roads may be obtained without the interlocking plant being unreasonably cumbersome. Thus it is possible to have train roads out and in on all tracks in the station area to and from all lines, even for right-hand track traffic with double track lines, Fig. 3. This allows of a freedom of movement hitherto unimagined as regards employment of the station area for the entrance and departure of trains. A great advantage also is the direction of shunting work from the signal cabin by means of dwarf signals. In this way the points are locked at each shunting movement which appreciably increases the speed in shunting. If only one track circuit is free from vehicles the dwarf signal shows »caution», but if two track circuits are free the caution signal automatically changes to »clear», whereby the speed may be increased while safety is retained. The shunting movements at a passenger station are practically the same day



after day, so that the signal cabin staff has no difficulty in directing them. In the event of lateness or other interruptions, communication with the signal cabin is obtained by means of telephones in the track area.

Behind the interlocking machines there is an illuminated track diagram on which the track system is shown and each track circuit is marked by a lamp. All the signals also are repeated on the track diagram, so that it is possible to observe their positions at any moment, Fig. 4. The signal cabin staff can observe all movements over the station tracks on the plan and have therefore actually no need to follow the movements through the windows. The track diagram includes the Upsala ranger and station tracks, also the track system at Upsala Norra and intermediate line, as well as the line to Old Upsala. Points and signals at Upsala Norra are also operated from the central interlocking machine. Automatic block sectioning is arranged southwards to Bergsbrunna and northwards by single track via Upsala Norra up to Brunna station. On the single track the direction to be taken by trains is directed by the interlocking plant at Upsala C. This interlocking plant can also carry out train meetings at Upsala Norra where there is no train dispatcher.

A special feature of this interlocking plant is the large number of crossing gates across streets and roads in and outside Upsala, which are operated electrically from the signal cabin. The number of level crossings is no fewer than 13. All the gates are protected by light signals, which display »clear» only when the gates have been lowered. Immediately the last vehicle of a train has passed a level crossing the gates are raised automatically. On the track diagram at the interlocking plant there are pilot lamps for each level crossing, these indicating whether the gates are up or down and that the red lamps facing the road are burning when the gates are down. It has ben found that no trouble is experienced in operating all these gates centrally, and no accident has occurred up to now, despite the fact that there is no attendant at the street and road crossings.

It is obvious that a plant as described must involve a large capital outlay, in this case a total of about 550 000 kronor. This amount, however, will yield interest through the reduction in staff that could be done after the plant was completed, by the concentration of three interlocking plants into one, by the taking away of the train dispatcher from Upsala Norra, by dispensing with the attendants previously required for operating the various level crossing gates. The saving in cost of staff amounts to 36 000 kronor per year, while in addition there are the advantages described with the handling of the trains and the utilisation of the station tracks for the ever growing traffic.