Valby Station, a New Safety Plant in Copenhagen Local Railway Traffic

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During the war no electric safety installations were built in Denmark besides those which were already planned and ordered in 1940. The latest and most up-to-date one is Valby station which was put into service in September 1941, at the same time as the electrified local traffic of Copenhagen was extended to the Valby—Vanløse section.

The safety installation took the place of an older electric safety plant which had been in operation since 1911 and therefore was ripe for replacement.

The new electric safety plant was supplied by Signalbolaget, Stockholm, in conjunction with L M Ericsson A/S., Copenhagen, and Dansk Signal Industri A/S., Copenhagen. The installation is built up on the principle of standardization introduced by the Danish State Railways for the construction and diagrams of safety plants and it is the first of the new plants of this kind delivered by L M Ericsson.

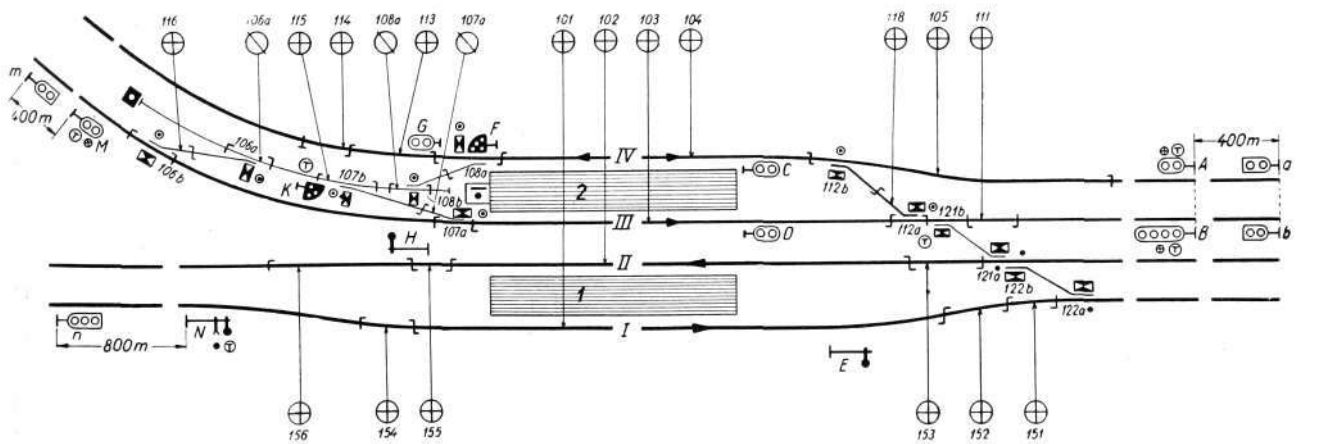
The plant is made with interlocking apparatus for electric operation and with mechanical connections between the levers, with track relays of enclosed design and other relays in the standard unenclosed design of the Danish State Railways. The track insulation is for the most part applied only in the passenger train tracks, which are used by the Danish State Railways at the smaller stations as train succession locking.

Fig. 1 X 7385
Track diagram

- Semaphore, main line entrance with »run-through» arm
- Semaphore, departure signal
- red / green / yellow / green — Daylight signal, main line entrance with »run-through» indication
- red / green — Daylight signal, main line entrance without »run-through» indication or departure
- green / yellow / green — Distant signal (»advanced»), flashing, three readings
- yellow / green — Distant signal, two readings
- Dwarf signal for shunting
- Track insulation with relay
- Track insulation with point locking magnet

Valby station is a busy suburban station in the Copenhagen local traffic, and, besides, there is considerable movement of passengers from the main line to the electric city line.

The station is provided with a turn-table and may thus be utilized also as departure station for the electric trains.



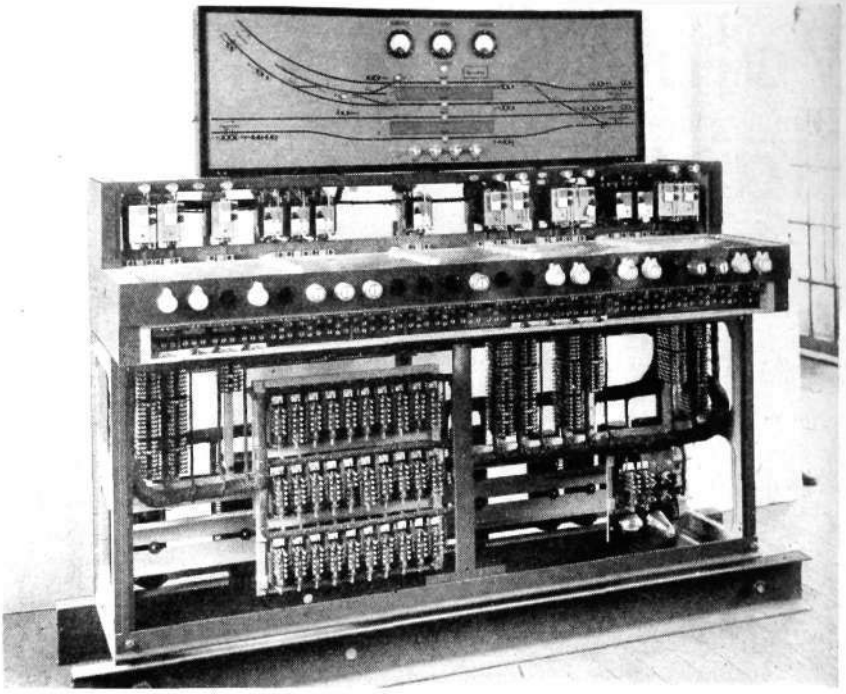


Fig. 2 X 6103
Interlocking apparatus (open) with track diagram above

In the local traffic, tracks III and IV, the station is used solely by electric trains running at intervals of 20 minutes. For main line traffic, tracks I and II, in addition to local trains for Roskilde, the station is used by all main line trains including express trains over the Copenhagen—Roskilde section, the most important line section in Denmark.

It is not the intention here to give any exhaustive description of the safety plant and its importance as this would take up too much space, and, besides, the safety plant is built on principles that are well known. The chief aim of this article is to describe certain special conditions with this safety plant as well as various new devices and constructions employed and certain details which will no doubt be of interest in connection with other plants.

As a general introduction there is shown in Fig. 1 a track diagram which illustrates the extent of the station, its signals etc. In view of the electric traction line network there are employed daylight signals for local traffic, signals for main line traffic being normally semaphores. In this case, however, the entrance signal at the east end of the station is also a daylight signal owing to the lay-out of the traction line which prevents good visibility with a semaphore. All points are electrically operated except in the emergency crossing which connects the local and the main line sections and in the crossing in the main line track where the points are locked by motor locks. To and from the return track at the west end of the station running takes place over special shunting roads, for which reason dwarf signals *F* and *K* are provided.

Construction

A modern safety plant at a station of moderate size is generally built up with through running track insulation so that supervision of the train tracks can be done by switching the lamps on a track diagram in the signal cabin. But owing to the simple traffic conditions, with practically no shunting, Valby station is not completely through-insulated; the train tracks are only provided with track insulation for the length of the platforms which, however, at the east end of the station stretches to the above track crossing, while track IV is through-insulated at the east end of the station owing to poor visibility from the signal cabin which is situated at the western end of platform 2.

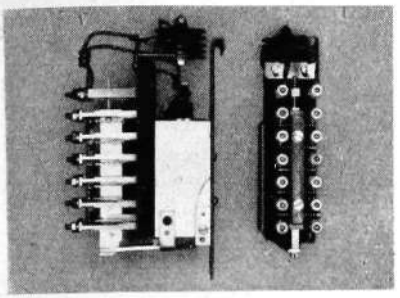


Fig. 3 X 4358
Interlocking apparatus relay with 6 contacts, for suspension on iron brackets in the interlocking apparatus or relay box (with adjoining rectifier)

The track insulation in the platform tracks is utilized as track succession locking, in order to obtain a guarantee that the preceding train has left the platform track when signal is given for the following train. In Fig. 2 may be seen the interlocking apparatus above which the station track diagram is set up. The station being, as stated, not completely through-insulated, there are on the track diagram lamps only for the insulated track sections with track relays (enclosed relays) and lamps for all signals. On the track diagram there are, in addition to instruments, a number of auxiliary press-buttons which are used for manipulating the above mentioned insulated track sections in case these are out of order; it is thus possible in any case to set the signals for the track concerned, naturally observing the special precautions for supervision of the track area in question. The interlocking apparatus is shown open at the factory when it is fully fitted.

In the interlocking apparatus there are fitted a number of interlocking apparatus relays (unenclosed relays according to the Danish State Railways' specifications, made by Dansk Signal Industri A/S), mainly releasing relays, while the majority of the interlocking apparatus relays are fitted in a separate box which will be referred to later. The relays are placed with the view to obtain the shortest possible drawing of lines. In Fig. 3 there may be seen an interlocking apparatus relay with a fitting for suspension on an iron bracket. Fig. 6 shows the interlocking apparatus, which has 24 panels, installed in the signal cabin. Behind it the relay box is shown.

In view of the electric line, which is fed with 1500 V direct current, the safety plant is made without earthing point, for the cable-installation in the lower room, special regulations are consequently applied, which will be referred to later.

The plant utilizes the new State Railway point machine, type DSB 1940, which has 3 fuses: Motor current fuse 10 A and 2 control current fuses of 0.3 and 0.7 A respectively, the last mentioned one being fitted on a special fuse strip in the interlocking apparatus together with the rectifier belonging to the point machine circuit. Point machines are of the type with built-in lock; the deflection of the point of blade is 150 mm (later experiments have led to the State Railways deciding to adapt a deflection of the point of blade of 160 mm).

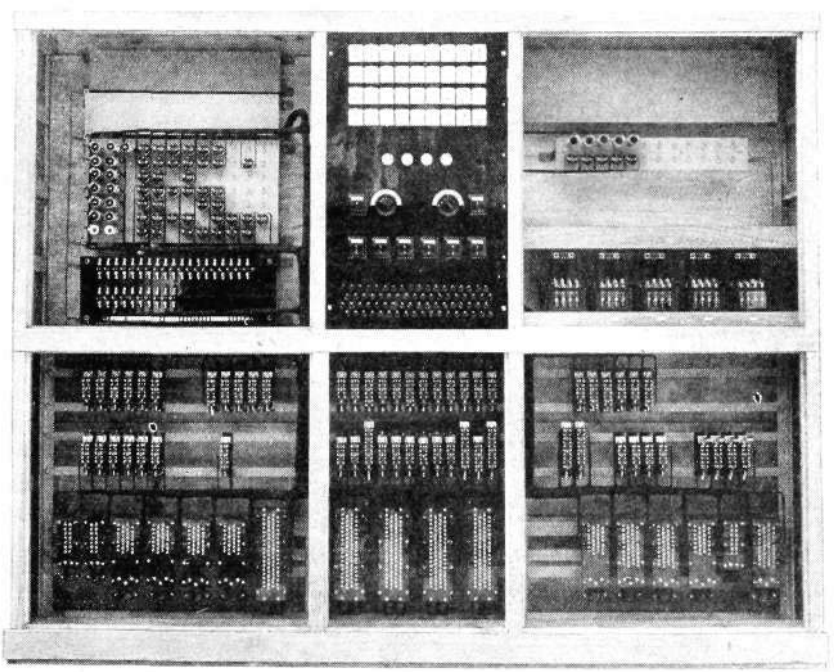


Fig. 4 X 6106
Relay box
(open); top left, resistance panel. In the lower room there are two rows with open relays, and below them terminal sleeves.

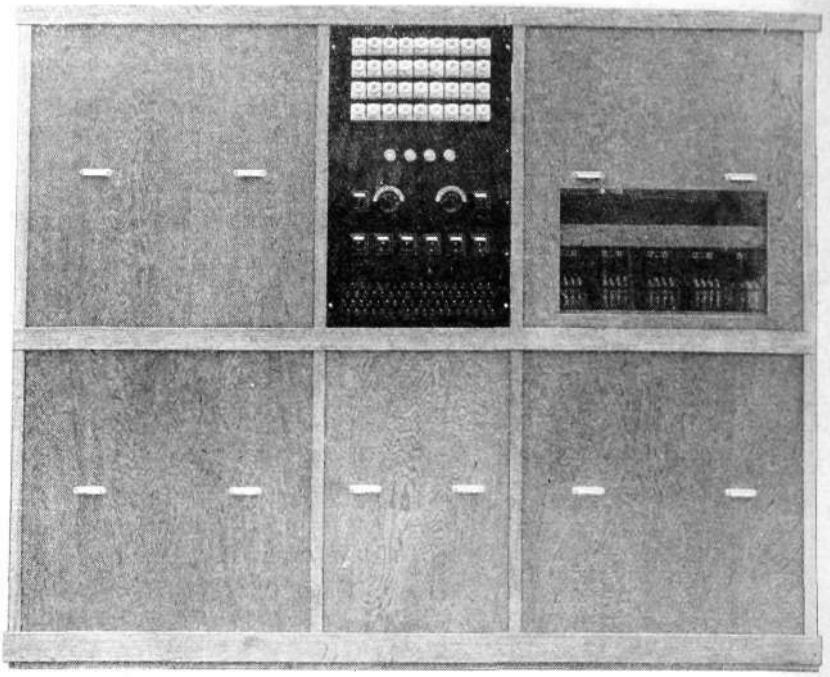


Fig. 5 X 6105
Relay box
closed; in the middle, distribution board, to the right, glass window behind which may be seen the enclosed track relays

Both double tracks are provided with manual line blocks, which, however, for the Valby—Vanløse section are not yet completed. The old block apparatus of the station have been used for this purpose.

Power Supply

The power plant consists of 2 motor batteries, 136 V, which are charged by way of a converter from the city mains (A.C.), whilst the control battery, 34 V, which is charged by way of a action buffer is charged by way of a dry cell rectifier connected to the mains. It should be observed that this power plant from the old safety installation has remained unchanged in essentials and is still housed in the same place in the cellar of the main building, though the machine room and the accumulator room have been brought up-to-date.

The power supply to daylight signals, track insulation and lighting is obtained from transformers fitted in a relay box behind the central apparatus in the signal cabin. In Fig. 4 the relay box may be seen partly opened. This photo was taken while the relay cabinet was in the factory ready assembled. The transformers, to be placed at the left hand side at the top, are not fitted in until the relay box is put up in the signal cabin. Below them resistances and knife fuses are fitted. To the right in the box are the track relays, which are D.C. relays with built-in rectifier. The lighting switchboard is fitted with swing panel in the middle section of the box. In the lower part of the box there are interlocking apparatus relays and terminal sleeves; among the terminal sleeves there may be seen in the middle a new type for 2 cables for use with intermediate cables. The relay box, constructed in light oak, looks very nice, see Fig. 4 which shows the smart exterior of the box. The interlocking apparatus is supplied ready cabled from the factory, this also applies (with the exceptions stated) to the relay box. All connections between the interlocking apparatus and the relay box are located in the intermediate cables referred to, which are paper-insulated with bare lead-sheath with 60 wires in each cable. In this manner the fitting of the interlocking apparatus on the spot is considerably facilitated.

New Details of Construction

Among the new details of construction in the plant there may be mentioned:

1. Auxiliary release of the train roads is brought about by a press-button fitted on a rod which operates contact sets on a board behind the field con-

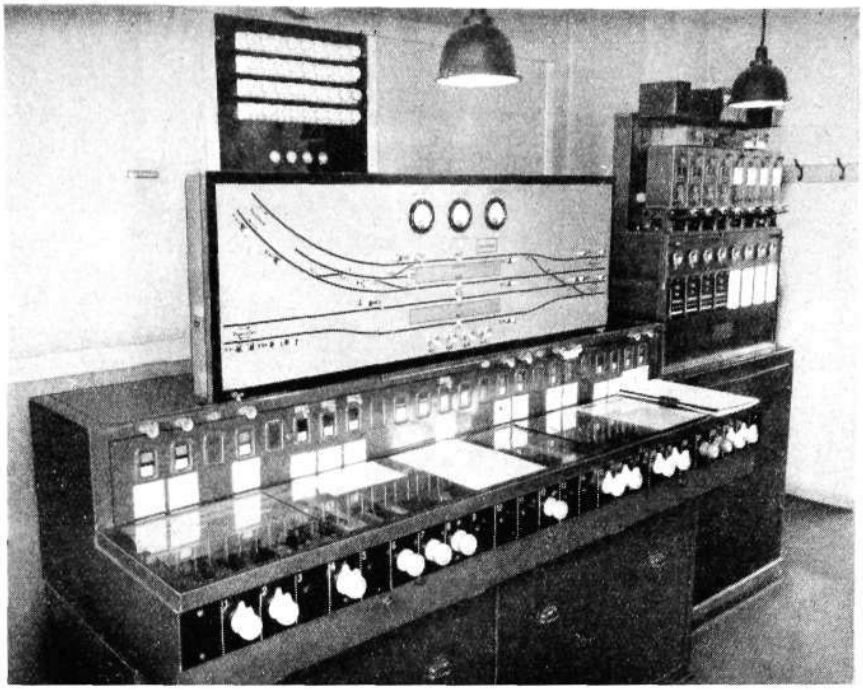


Fig. 6 X 6104
Signal cabin with interlocking apparatus and, behind, relay box; to the right, manual line blocking apparatus

cerned, above the track locking magnet contacts if any and on the same plane as these, see Fig. 7. The contacts are of the same type as those used in the unenclosed relays. The press-buttons themselves may be seen in Fig. 2 and 6 in the upper corner of the interlocking apparatus, above the board for the signal levers in question. In a previous construction of auxiliary contacts, where they were fitted above the magnet parts of the field, the contacts were often in the way when exchanging magnet coils.

2. Some of the point lock magnets are supplied with built-in rectifiers, so that A.C. may be used for the insulated sections for safety against untimely switching, for which purpose alone they may be used. In this way the special track relays are saved.

3. On the track diagram a train track pilot lamp is set up which lights up when release of the track has taken place. At the end of the diagram there is a switch, so that this lamp, if desired, may be replaced by the usual track control.

4. Wear plate for levers: As the paint — and field number — is always much worn at the handles of point and signal levers, efforts have been made in some plants to apply a wear plate of special material. Hansonit sheet (laminated pressed material) was first tried, with the engraved figures and divisions between the apparatus fields standing out white on black background. But this material, made from a kind of milk product, was too much affected by the temperature so that it cracked; it should be mentioned that the sheet was made in sections which spread over 16 fields. Later, trials were made with 2 mm Turbonit sheets in lengths covering 8 fields. This material which is not affected by the temperature stands very well. However, both with this material and with the Hansonit sheet the latch of the handle tends to make a score in the plate; therefore if such material is to be used, there should be left so much space around the shaft of the handle that these latches will be inside the hole.

5. Signboards: for point and signal levers the signboards are made of white Hansonit with engraved figures which stand out black on the white background. This has proved satisfactory and gives a clear and attractive effect.

At the terminal sleeves, below the terminal sheet iron boxes, a slanting wooden board on the floor has a black Hansonit plate with white figures fitted as signboard. The painting on the terminal sleeves, formely used, was often hidden by the cables led in.

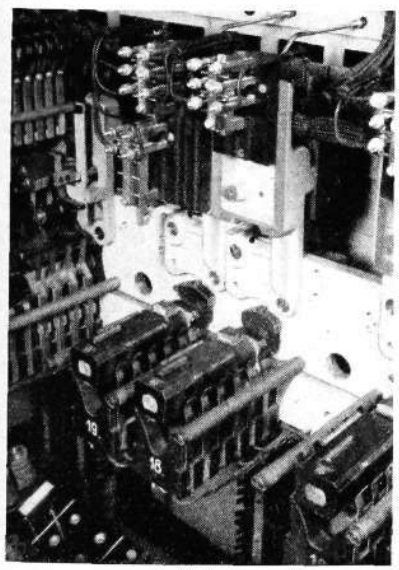


Fig. 7 X 4359
Back view of the shaft contact part of the signal levers

At handle 18, at the top, the contact group for emergency release is seen, at handle 19 there are, in addition, contacts which are controlled by a track locking magnet