New Type of Interlocking Plant for the Swedish State Railways

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U.D.C. 656.257(485)

In February this year a new interlocking plant was put into operation at Stehag by the Swedish State Railways. Stehag is a station north of Eslöv on the line Stockholm—Malmö. Automatic line blocking has previously been arranged on the section Hässleholm—Malmö and the station now serves as a blocking section on this line.

The station is normally passed by some 40 through trains daily in addition to 20 stopping local trains and two local goods trains shunting at the station.

The equipment has been supplied by the LM Ericsson Signal Company whereas the planning and lay-out has been prepared by the Board of Management of the State Railways assisted by the Signal Company.

Electrical control plants operated by levers or handles are nowadays being superseded by relay systems controlled by press buttons or keys, enabling the introduction of certain automatic functions. This tendency is also apparent with regard to the interlocking machines. By incorporating the control keys for the points, track routes, signals &c on a schematic illuminated track diagram a very clear picture is obtained of the relationship between the control switches and the track lay-out.

The switches are of non-locking push button or lever type. The circuits are arranged for impulse operation.

In the interlocking machine for Stehag, Fig. 1, tracks and points are represented by oblong apertures illuminated with white light when the track is free from trains and with red light when the track is occupied. The signals are indicated in proceed position and stop position with a green and a red lamp respectively.

Fig. 2 shows the interlocking machine mounted on the signalman's working desk.

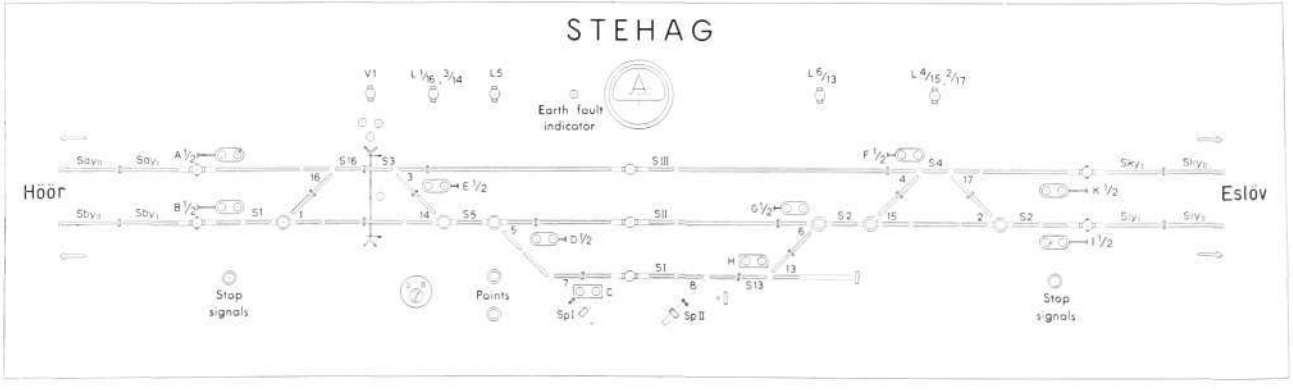

Fig. 1 X 7611

The track diagram

containing all control equipment and visual indications

Fig. 2 X 6605
The interlocking machine
mounted on the signalman's desk

Operation

Three buttons are used when operating a point: one selecting button placed in the track at the point together with plus and minus buttons common for all points and mounted at the bottom of the illuminated track diagram. When a point is to be operated the corresponding selecting button is pressed at the same time as a plus or a minus button. If the positive and the negative buttons are operated simultaneously when a selecting button is pressed, the movement of the point machine is halted. This facility must be available in winter time when packed snow may lodge between the point tongues and the running rails.

When a train route is to be set up, all appertaining points are operated to correct positions. Two keys are then operated one at the beginning and one at the end of the route. The train route established is indicated by a series of illuminated apertures showing white light, an illuminated ribbon. The keys mentioned above are mounted in the tracks on the diagram and may be operated both ways in line with the track. When setting up a train route the keys are operated in the direction of the train movement.

Point Operation

In an interlocking plant the equipment governing the operation and locking of the points is a very important factor. In a lever locking machine the point control, route locking and signal operation largely takes place over contacts on the levers, which are interlocked in the operated positions. In a relay system, these functions are carried out by the relays which are substituting the levers.

As mentioned above point operation is initiated by means of an impulse both in case of remote control from a signal box and in case of local push buttons at the point. A brief description will be given below of the point operation, see Fig. 3, showing the point in plus position.

On operation of the push buttons relay *Hj 1*— is operated by *V*— contacts breaking the SS-indication.

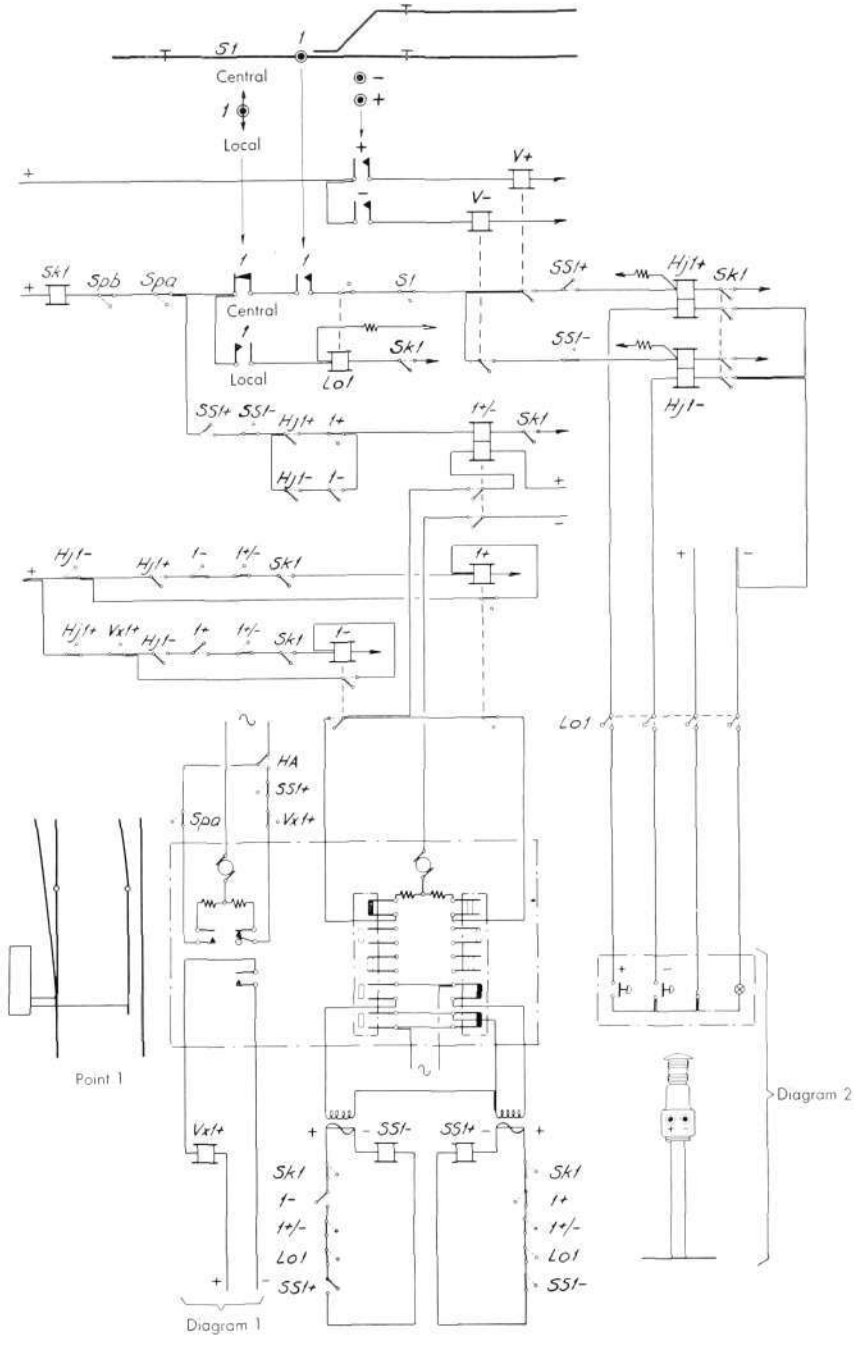

Fig. 3 X 6654

Circuit diagrams for a point

containing push buttons, control relays, point machine, point lock and local lever

Circuit 1: Operation and control of the point

2: Local operation

The impulse from the *Hj 1*— relay is stored in the relay *1*— which determines the direction of the point movement. Relay *1*— connects the motor relay 1 +/— closing the operating current for the motor.

The motor relay *1* +/— contains a holding coil, which on the operation of the relay is connected in series with the motor. The relay will consequently remain operated until the motor circuit is opened by the end position contact in the point machine. When the point machine has stopped and relay *1* +/— has released, the circuit to *SS 1*— is closed. The SS-relay consequently provides a continuous supervision of the point taking up a proper position.

Local point operation facility is obtained by the operation of a key. Relay *Lo1* is operated connecting current for relays *Hj 1*-- to local lever on the

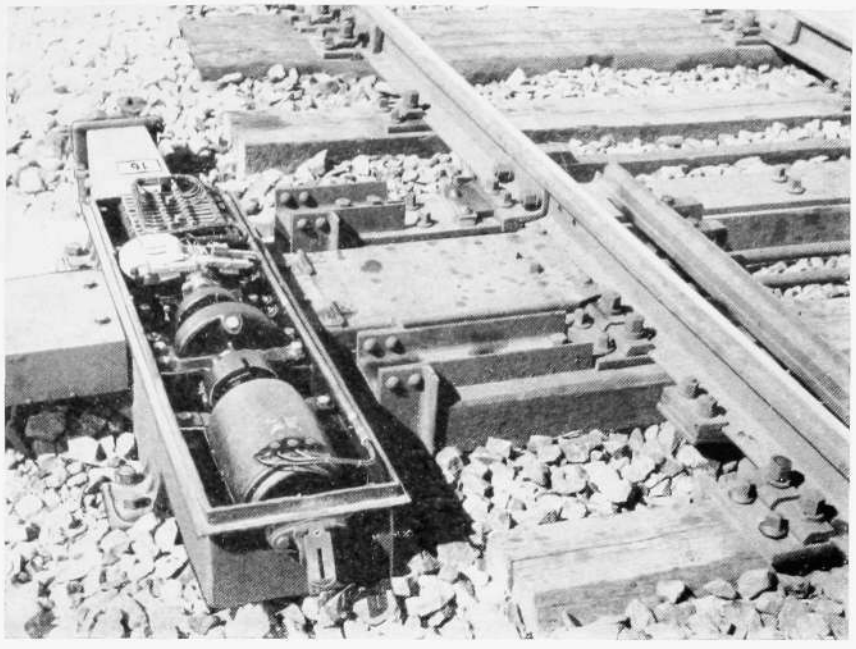

Fig. 4 X 6606

Point machine

provided with point lock. The point lock motor is visible at the far end of the equipment.

sidings. For this purpose relays *Hj 1--* are equipped with an additional coil. When local point operation is permissible a lamp is lighted above the local lever. This control has two push buttons from which initiating impulses may be transmitted for the operation of the point.

Point Locking

Owing to the increased train speeds it has been considered necessary to provide additional locking of the tongues for the points in the main tracks. This takes place by means of a motor driven point lock shown in Fig. 3, circuit 1, which is operated, when the signal is changed to proceed. This arrangement makes the point non-reversible for traffic coming in from an off-track as opposed to ordinary points.

Fig. 5 X 6607

Local lever

at the point. The lever contains a lower part with push buttons and on top a lantern fitting with drum lens. A yellow light in the lantern indicates that local point operation is permissible.

Fig. 6 X 6608
The home signals
are identical for the two tracks

Signalling

For home signals colour light signals are used as shown in Fig. 6. Distant signals are shown in Fig. 7.

As will follow from these illustrations the signals are identical in the same traffic direction for both tracks. The bottom light on the distant signals is a side track signal showing yellow continuous light with green flashing light in the distant signal when the train route is side tracked.

Main track exit signalling takes place by means of colour light signals. Shunting and traffic from side tracks are controlled by dwarf signals, see Fig. 8.

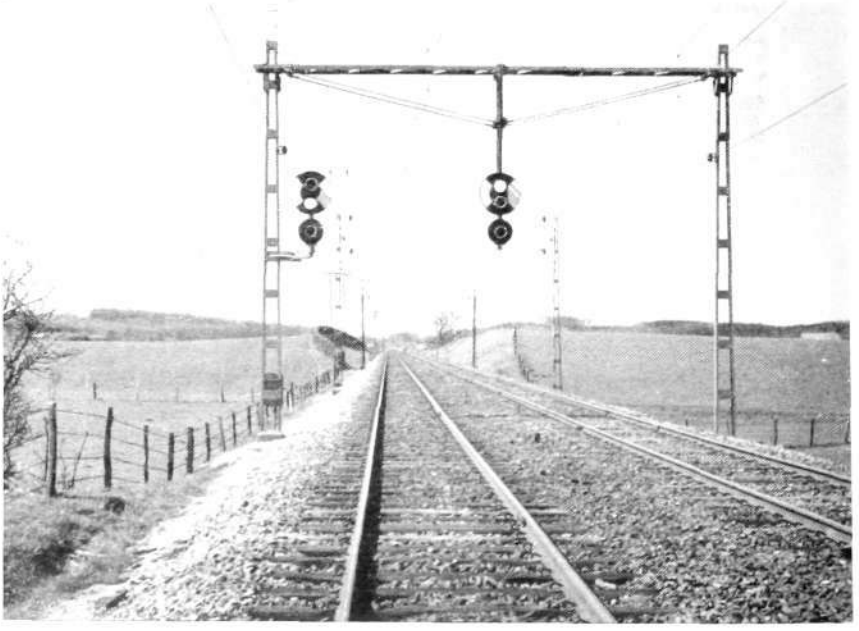

Fig. 7 X 6609
Electrical distant signals with side track light

Fig. 8 X 6610

Colour light signals

for exit from the two tracks. A dwarf signal is used for the side track with six apertures of which the two bottom lights are green.

Signal Operation

Fig. 10, circuit 1, shows a section of the track system including among other signals home signal *A*. The procedure for the operation is as follows.

If the points are in their correct positions for the track route (SS-conditions), relay *HA* operates, when signal keys a^1/a^2 and *IIIh* are pressed in the traffic direction. As the signal keys are non-locking the operated relay is held over own contact.

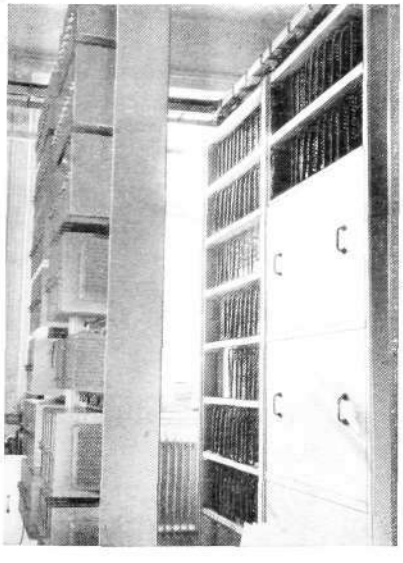

Fig. 9 X 4752

The plug-in relays

are arranged in four frames. The connections are carried out on the fixed terminal blocks. The relays can, therefore, be replaced very quickly.

Relay *HA* with track relays *S*-- and relay *Vx* for point locking set up a circuit to signal relay *A* 1/2 in Fig. 10, circuit 4, which relay in its turn operates signal *A* to proceed, circuit 5.

Relays *Sp*-- are introduced for the exclusion of hostile traffic routes. In the example shown in Fig. 10 circuit 3, *Spa* is released on the operation of relay *HA* and blocks in this position the operation of hostile signals. This blocking will not be cancelled until *Spa* reoperates when the train is entering track circuit *SIII* and *SII* respectively and has left track circuit *S 3* entirely.

Relay *Sta*, Fig. 10 circuit 7, is arranged to prepare the release of the traffic route taking place on the operation of *Spa*.

Relay *TA* controls the traffic route indication on the illuminated track diagram. The circuit for this relay is shown in Fig. 10, circuit 6.

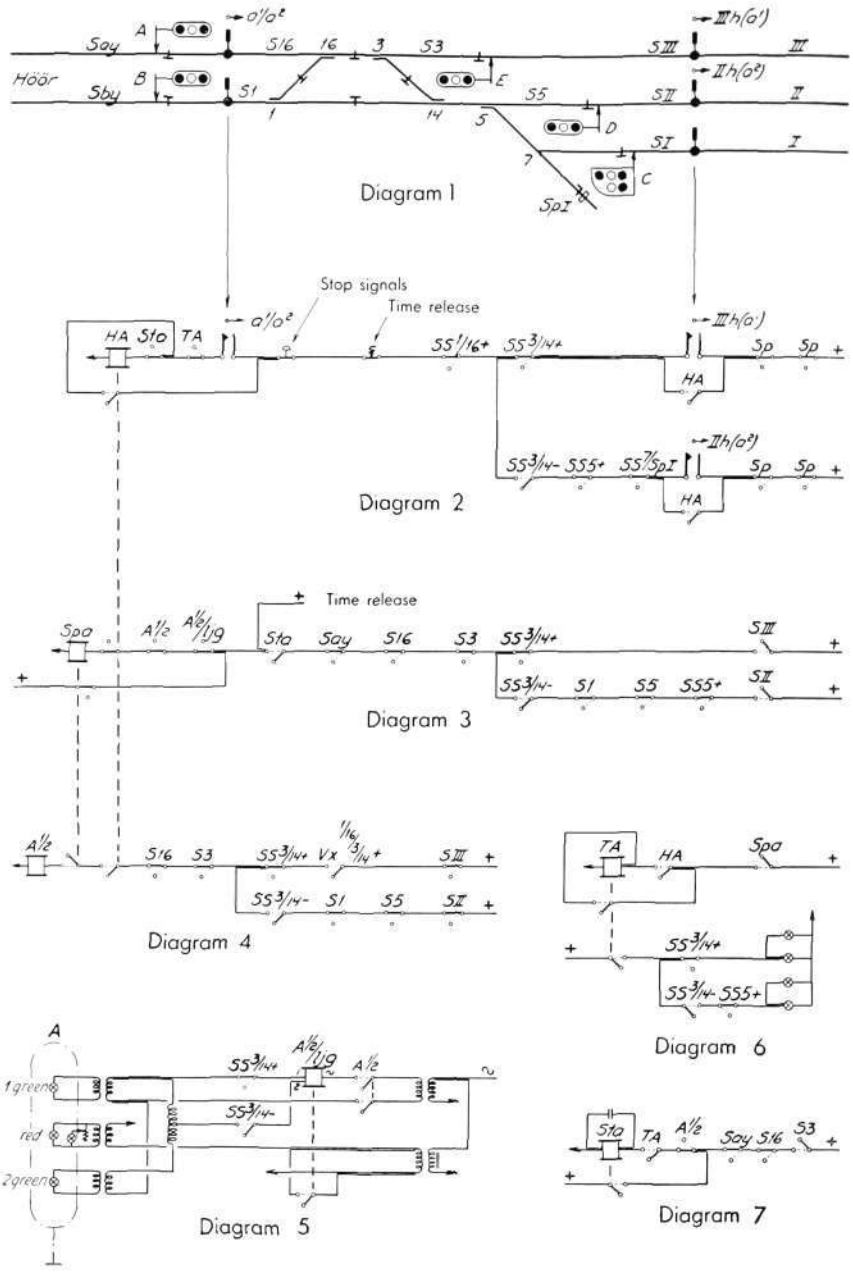

Fig. 10 X 6655

Circuit diagrams for signal operation

Circuit 1: Section of track diagram with traffic route keys
» 2: H-relay circuit controlled by traffic route keys
» 3: Blocking relay circuit
» 4: Signal relay circuit
» 5: Light signal circuit
» 6: Relay and indication lamps for traffic route
» 7: Relay circuit for release

Track Circuits

The track system is controlled by means of track circuits. The track relays consist of 2-phase motor relays operating on 75 c/s A.C.

The necessary power supply is obtained by the conversion of 50 cycles A.C. by means of the Signal Company frequency converter, which is built up without moving parts.

The relays used in the system are plug-in relays of the new type supplied by the Signal Company and which were described in Ericsson Review No. 4, 1950.