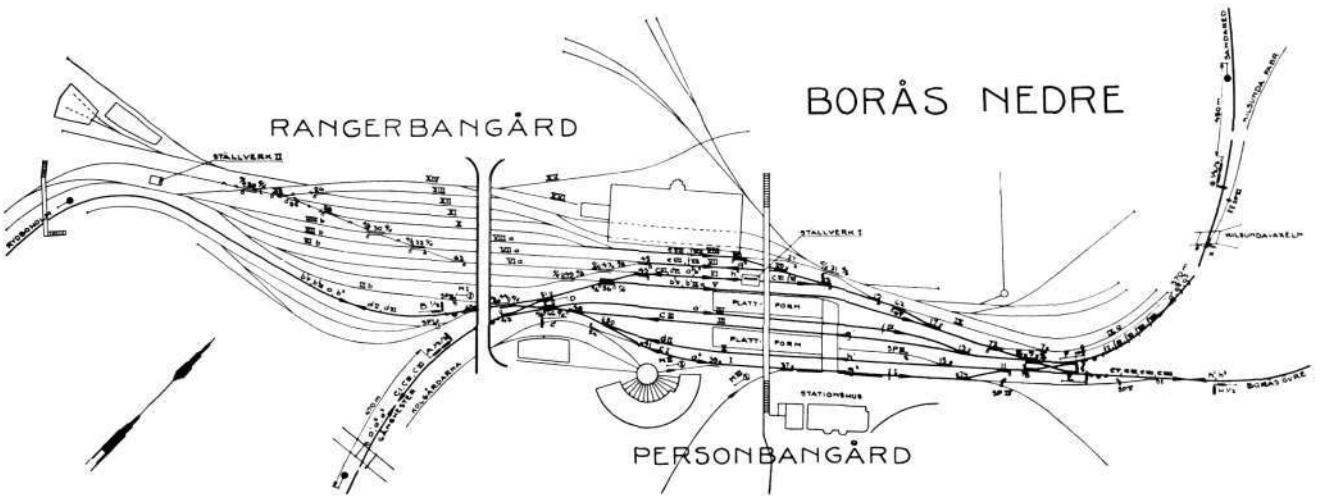


The Electric Interlocking Plant at the "Borås Lower" Station.

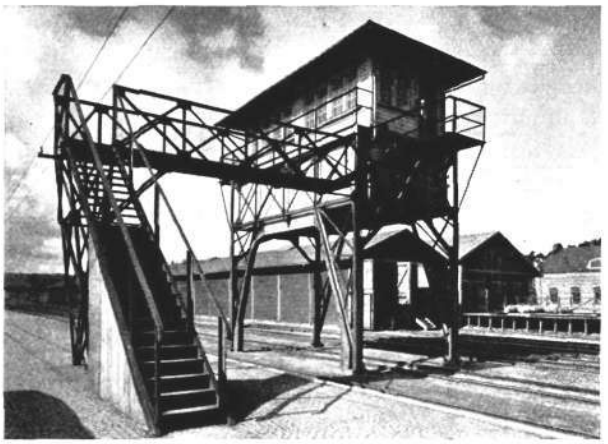
The city of Borås, in the Swedish province of Västergötland, has long been an important centre for the flourishing industries of the surrounding country. Three quarters of a century ago, when the small home industries or home slojd — as they are called in Sweden — were at their height, the roads were the only means of communication. Soon after, however, the larger industries began to make their appearance, and with them the railways.

At the present time we find Borås furnished with excellent railway communications. To the North we have the Borås—Herrljunga Railway; to the West, Gothenburg is reached by means of the Göteborg—Borås Railway, while the Varberg—Borås Railway runs in a southwesterly direction to the city of Varberg. The most recent, but by no means the least important, is the Borås—Alvesta Railway, towards the southeast. All of these railways terminate in the Borås Lower Station, thus making it a very important multiple junction. Two years ago, the great increase in traffic necessitated the rebuilding and enlarging of this station. The passenger station was furnished with wide platforms between tracks II and III and between tracks IV and V — see above track plan — and the shunting station was furnished with a double incline, thus simplifying the numerous switching operations occasioned by the interchanging of cars between the various railways.

The only satisfactory way of making efficient use of the station area and of handling incoming and outgoing traffic with perfect safety was by installing an interlocking plant, the choice lying between a mechanically or an electrically operated system. An electric plant was finally decided upon, after exhaustive investigations had proved this system to be the most suitable under the existing conditions.

Signalbolaget (The Signal Co.) was entrusted with the task of installing the plant, of which the electrical devices and cables were furnished by L. M. Ericsson, and the semaphores, skotch blocks and other mechanical details were furnished by the Avos Company of Örebro.

The plant comprises two interlocking machines, the one for the passenger station and the other for the double incline of the shunting station.



R 281 Fig. 1.

The Passenger Station.

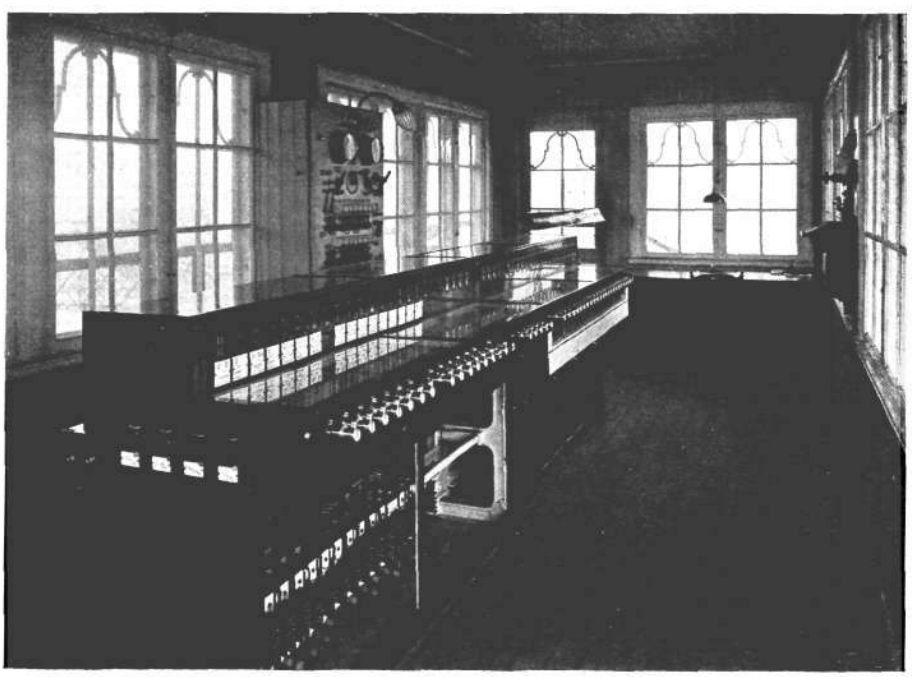
On account of the restricted space, it was found necessary to place the signal tower for the passenger station on a structural steel construction bridging track VI, as shown in fig. 1. The interlocking machine, shown in fig. 2, is 3.9 m. in length and is furnished with 16 signal levers, 21 point and skotch block levers, 6 point locking levers, 1 lever with control lock, and 1 crossing gate lever. 8 incoming and outgoing signals, 3 shunt signals, 30 points, 2 skotch blocks and 1 pair of crossing gates are controlled by the aid of the interlocking machine, while 10 points and 3 skotch blocks are directly locked and 1 point and 1 skotch block are locked by means of the lever with control lock, also by the aid of the interlocking machine.

The number of track combinations is 25, distributed over tracks I to VIII; tracks I to V being for passenger trains and tracks VI to VIII for freight trains. All of the tracks are blocked from the office of the station master, in which 25 block field instruments are placed. The station master gives the interlocking machine operator permission — by means of these block field instruments — to clear a certain track. The incoming or starting signals cannot be set from the interlocking machine without such permission having been given and not until all points released by the station master have been set.

The station master's office also contains track circuit locking with release for incoming trains. The circuit for an incoming track is automatically locked after the track is cleared and it is impossible to lay over any of the points in this track until the track circuit has been released by the station master after the train has arrived and has pulled up at the station.

Track circuit locking for outgoing tracks has also been arranged for. In this case, however, the track circuit is released by the outgoing train when its last axel passes a suitably placed insulated rail provided with a rail contact.

The incoming semaphores for two of the railways are three-armed ($A^1/_{2/3}$ and $I^1/_{2/3}$), and two-armed ($B^1/_2$ and $H^1/_2$) for the two others. Three of the incoming semaphores are furnished with distance signals. The starting semaphores



R 282 Fig. 2.

are one-armed, only one having been erected for each railway, i. e. semaphores *C* and *D* at the west end and *E* and *F* at the east end of the station. A great saving has thus been accomplished, as otherwise one semaphore would be required for each track from which a train starts, such a semaphore being two-armed for a track used by two railways. Any danger that a wrong outgoing track be cleard is entirely eliminated, however, as all tracks are blocked from the station master's office, as previously stated.

Those points which may be set from the interlocking machine are, generally speaking, such as are necessary for the clearing of the tracks; this latter can thus be conveniently accomplished from the signal tower. These points, however, may also be set locally, thus avoiding the necessity of constantly having a man stationed at the interlocking machine during switching operations. For this purpose, a system devised and patented by L. M. Ericsson's has come into use. The lever in the interlocking machine with which a certain point is controlled is furnished with a solenoid, this latter being connected to a pedal contact on the point in question. When the point is to be set, the pedal contact is actuated. This brings the solenoid in circuit and actuates the lever in exactly the same manner as if done by hand. A diagram of this arrangement is given in fig. 3, the solenoids being visible under the axel contacts shown in fig. 4, which gives a rear view of the interlocking machine with panels removed. After a track has been cleared, the point lever is locked in position by means of the cross locking gear and the circuit between the solenoid and the pedal contact is broken, thus giving a two-fold safeguard against the local setting of a point.

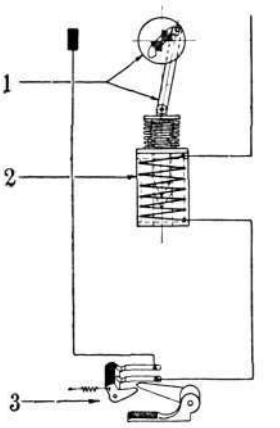


Fig. 3.

A point with skotch-block in the incoming track from Sandared, situated about 700 metres from the signal tower and leading to a factory side-track, is locked by means of the lever with control lock in the interlocking machine. When a train is to be directed onto this side-track, a point lock key is detached from the interlocking machine and brought along on the train for the unlocking of the point and skotch block leading to the side-track. When the train returns to the station, the point and skotch block are again locked, thereby releasing the key and leaving the point and skotch block locked in the correct position for through-traffic on the main track. The key is then returned to and inserted in the interlocking machine. As long as the key is removed from the interlocking machine, there is no possibility of setting signals to clear for incoming or outgoing trains to and from Sandared.

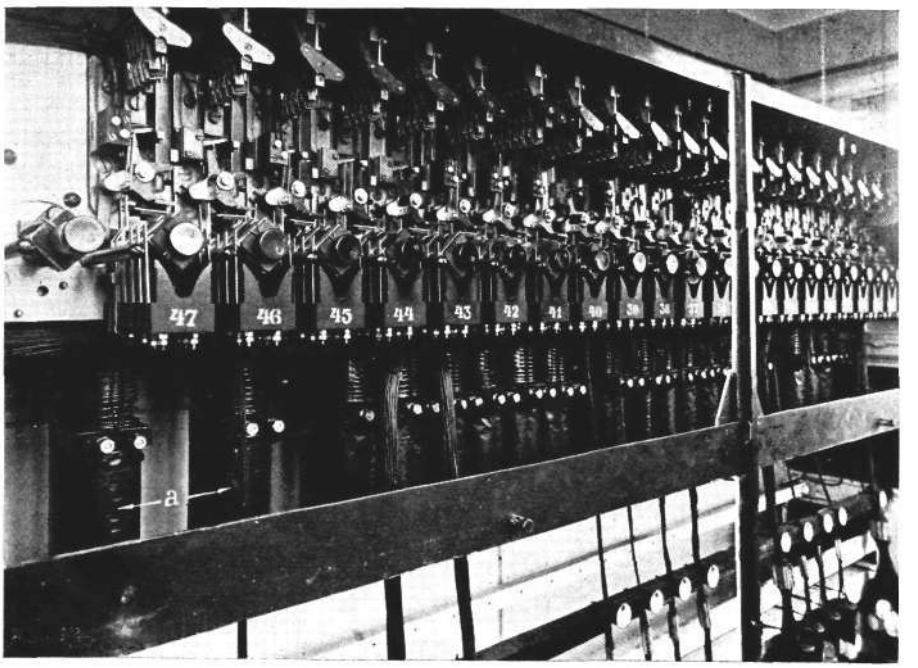
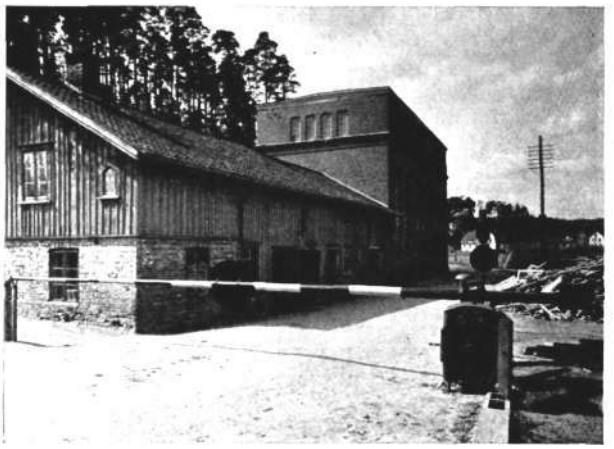


Fig. 4.

R 283



R 284 Fig. 5.

R 285 Fig. 6.

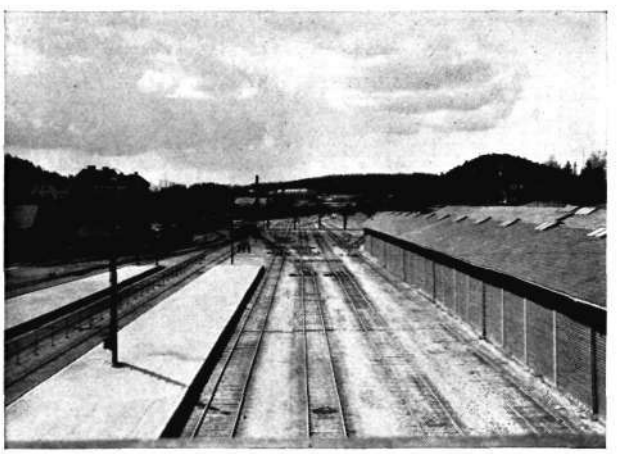
The crossing gates which are electrically controlled from the interlocking machine are placed at a grade crossing situated between the semaphore and the distance signal for the incoming track from Gånghester, about 600 metres from the interlocking machine. One of the gates with the electric driving mechanism is shown in fig. 5. The gates are constructed in accordance with the specifications contained in the Swedish statute-book, number 318, concerning warning signals and safety devices, etc. at grade railway crossings. The warning lanterns are furnished with electric lamps, control lamps being mounted in the interlocking machine. The lanterns are dark when the gates are up, but are put in circuit as soon as the gate lever in the interlocking machine is set for the lowering of the gates and the driving mechanism starts functioning.

The Shunting Station.

The interlocking machine for this station is of the smallest standard size — length 1.35 metres — and is placed in a low signal cabin, shown in fig. 6. It is mounted with 7 point levers for controlling the points in the double incline and two locking levers for the locking of two points. Also, the interlocking machine is equipped with 2 co-operating levers for commnnication with the interlocking machine at the passenger station, as it is necessary to lock some of the points controlled by the shunting interlocking machine when admitting trains from the East over passenger tracks VI and VII.

The points of the double incline have also been arranged for local setting by means of pedal contacts, as previously described. This arrangement has been resorted to so as to permit switching over these points without having to use the double incline and its interlocking machine, which is to advantage under certain circumstances.

The points controlled by the interlocking machine have been equipped with arrangements for preventing a too early setting of the same. This is accomplished by means of a locking magnet on the lever combined with an insulated rail at the point in question.



R 286 Fig. 7.

The Power Plant.

The electric current required for the interlocking plant is supplied by three Nife storage batteries, each with a capa-

city of 34 amp. hours. During the same day, one of the batteries supplies current of 130 volts' tension for the motors at the points and signals, a second battery supplies a 30-volt current for the relays, control magnets, electromagnetic clutches for the signal driving mechanisms, etc., while the third battery is being re-charged. On the following day the batteries are switched about so that 30-volt current is taken from the battery which furnished a 130-volt current on the preceding day, the 30-volt battery is being re-charged, while the freshly charged battery is used for supplying a 130-volt current. The batteries are thus switched about once every day, or oftener, if required. The batteries are charged from the public net — 220 V. A. C., 50 periods — by means of a transformer. The power plant is housed on a lower floor of the signal tower, the switch-board, however, being placed in the same room as the interlocking machine (see fig. 2).

E. G. W.

New Automatic Equipment for Stockholm and Gothenburg.

A contract for the furnishing and installation of equipment for a new full automatic telephone exchange in Stockholm has recently been signed between L. M. Ericsson and the Swedish Telegraph Administration. The order includes as well all necessary equipment for junction traffic with the existing manual exchanges. The new plant will be completely equipped for 20,000 lines from the very start, this number being the largest ever installed in any single full automatic exchange in Europe.

This exchange will include subscribers in the more central parts of the city, i. e. the oldest part of Stockholm — quaintly called »the city between the bridges» — and the lower »Norrmalm», thus replacing the old exchange for manual distribution — located near the wharf — which, at the time of its construction, was the first of its kind.

»North Vasa», the first automatic exchange to be built in Stockholm, was put in operation in February 1924, at which time it had a capacity of 5000 lines. This exchange is now being extended, whereby its capacity will be increased to 10,000 lines.

According to a statement made by Mr. Lignell of the Royal Telegraph Office it is the intention of this department to gradually introduce machine switching over the whole city of Stockholm, and it is estimated that this city will be giving automatic service to all of its 110,000 subscribers by 1935.

Next in order will be the Kungsholm exchange, with 15,000 lines, and later on four more exchanges.

In a coming issue, »The L. M. Ericsson Review» will publish some descriptive information concerning these installations and the junction traffic with the manual exchanges.

The Telegraph Administration has also decided to introduce automatic switching in Gothenburg and has contracted with L. M. Ericsson for the delivery of the necessary equipment for an automatic exchange of 12,000 lines, constituting the first stage in this work. The order also includes all necessary equipment for junction traffic with the existing manual exchanges.

The traffic from the automatic to the manual exchanges will be handled by special B-positions with call indicators. Incoming junction traffic to the automatic exchange is arranged in two different ways, depending on whether the call originates at a common battery or a magneto exchange. For C. B. exchange calls, the service is handled over semi-automatic B-positions while the junction lines from magneto exchanges terminate in manual positions with multiples for the automatic lines.

The Gothenburg automatic plant is intended for 115,000 lines of which 80,000 will have 5-digit numbers and 35,000 6-digit numbers.