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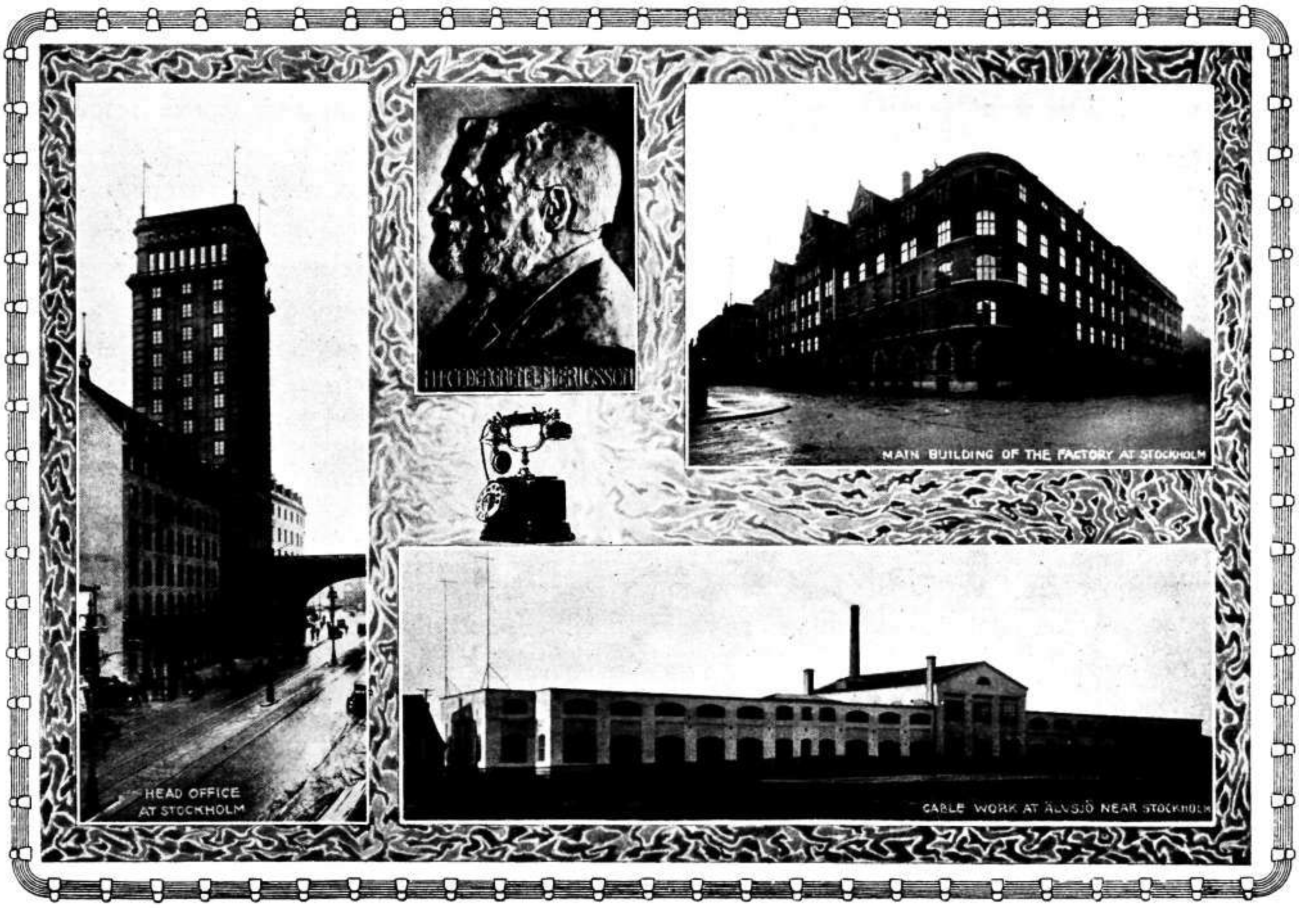

IN YEAR 1927 TELEFONAKTIEBOLAGET L. M. ERICSSON IS ENTERING THE SECOND HALFCENTURY OF ITS EXISTENCE.

ENGLISH EDITION

L. M. Ericsson

THE L. M. ERICSSON REVIEW

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JOURNAL OF

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To our readers and collaborators:

In support of our statement in the first number of The L. M. Ericsson Review for 1924 that the purpose of this journal was to spread information concerning the activities of this company and associated enterprises as well as to form a tie between these latter and the parent company, Telefonaktiebolaget L. M. Ericsson has decided to supplement "The L. M. Ericsson Review" with a new sheet which is to appear once a month under the name of the "Ericsson News", beginning with this year.

Consequently, The L. M. Ericsson Review will in the future contain articles of a more scientific and technical character bearing on the various activities of the Ericsson organization; also, it will take up subjects of like nature for discussion. On the other hand, new items concerning orders and deliveries of more vital interest as well as statistics and other data concerning the activities and development of the company and its various branches will be published in the "Ericsson News". Furthermore, this latter publication will contain various additional information of interest for this concern. More detailed information on this subject is given in the announcement in the first number of the "Ericsson News".

We will take pleasure in sending the "Ericsson News" without extra charge to all those who now receive "The L. M. Ericsson Review".

In order the better to serve its foreign interests, the company has found it necessary to publish "The L. M. Ericsson Review" not only in Swedish, English and Spanish, as heretofore, but also in French and German, beginning with the current year.

"The L. M. Ericsson Review" takes this opportunity to extend its most hearty thanks to all those who have evinced their interest for this publication by contributing articles to the same and expresses the hopes that the bond between the company and its several branches as well as with its many friends over the whole world, which The L. M. E. Review has proved to be, may be still further strengthened, and that contributions for the advancement of this common object may be received from wider and wider circles, within as well as outside of the concern.

R 598 Mustafa Kemal Pascha.
President of Turkey.

Swedish Telephones in Angora.

A short notice in Nos 5 & 6, Vol. II of this journal imparted the information that the Turkish Post Office Administration had placed an order with L. M. Ericsson for an automatic exchange of 1000 lines for the city of Angora. The completed plant was opened for service on September 11th 1926, the number of subscribers then being about 400. Since then the number of subscribers has increased so rapidly that all of the thousand lines are now subscribed for. As a result, the Post Office Department has taken steps towards increasing the capacity of this exchange from one thousand to two thousand lines.

The above figures on the growth of the net are a fair example of the well nigh American speed with which the city of Angora is growing, this development being characteristic not only for the telephone communications but for all other government activities as well.

Like most Turkish cities, Angora has very old traditions and is said to have been founded by king Midas in the 7th century B. C. Alexander the Great stopped here during one of his campaigns. During the year 25 B. C. Angora was conquered by the Romans, and a monument from the Roman era still remains in the ruins of the tempel of Augustus and Rome, in the vestibule of which the mural inscriptions give the financial accounts of the emperor Augustus. The Arabs conquered the city in 695 A. D. and in 806 it was pillaged by Harun-al-Rashid (Aaron the just), caliph of Bagdad. From the Arabs the city passed into the hands of the crusaders, and after passing through various vicissitudes was conquered by the Turks in 1360. In 1402 Tamerlane annihilated the Turkish forces, captured the sultan Bayazid I, and placed the city under Mongolian rule only to be retaken by the Turks some years later.

It is since Mustafa Kemal Pascha selected Angora in 1920 for the seat of the new government, however, that this city has come to be of any real importance. In 1923 Mustafa Kemal Pascha was elected president of the Turkish republic and to Angora was given the distinction of becoming the capital of the country. Much has been done since then to make Angora worthy of this elevated position. High up on a rocky elevation lies the oldest part of the city, surrounded by great walls built in part with material from the still older, now almost obliterated section of the city. Beneath it, on the plain, lies the new city, intersected by broad streets lined with modern buildings. Many new buildings for the various government departments may be seen, some finished, some still under construction, while several more have been planned for. The building activities are for the greater part concentrated in the outskirts of the city, in the vicinity of the railway station, where a large meadow is situated. Formerly, the marshy character of this area made it a veritable nest of malaria but it has now been drained and is being made into a park, thus effectually ridding the city of this dreaded fever. The most desirable location within this section of the city is occupied by the new, imposing building of the Grand National Assembly, the first one visible when going towards the city from the station. Close by is the new post office building in which the automatic telephone exchange is housed.

R 599 Ruins of the Roman Baths in Old Angora.

Not only the government, but also the City of Angora is carrying on extensive building operations. Thus, the municipality — aided by the government — has erected a modern flour mill and bakery which can produce 7000 loaves of bread per day, an ice plant which fills the requirements of the entire city and — 8 kms to the West of the city — an entire industrial centre with electric power plant, brickyards, limekilns, a cement factory and a woodwork factory.

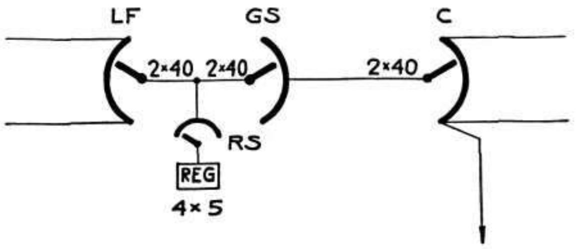
Between this industrial centre and the city lies the private estate of the chief executive. Here, with the aid of modern agricultural machinery, Mustafa Kemal Pascha has succeeded in cultivating a considerable area of previously useless soil. The excellent example thus set by Mustafa Kemal Pascha in breaking new ground and putting it under cultivation is but one of the many proofs of his indomitable energy and capacity for work.

On a height about five kilometres East of the city lies an extensive residence district in which is located the private residence of the president as well as the various foreign embassies and legations. Private building activities have increased considerably during the last years and many new private residences may be seen on every hand. The importance of Angora as the heart of Turkey will be still further accentuated with the completion of the railway leading East from Angora as well as of the projected line from Angora to the Black Sea.

R 600 New Quarters of the National Assembly.

When it was decided to modernize the telephone communications of Angora, the Post Office Administration was in favour of an L. B. system, and in 1924 L. M. Ericsson received an order for four L. B. switchboards with one position each and for a total capacity of 400 subscribers' lines. This equipment was delivered in Angora at the appointed time but was never put to use, because already at that time the authorities realized that, at the rate the city was developing and being modernized, it would never suffice, even if it was extended to its full capacity of 1200 lines.

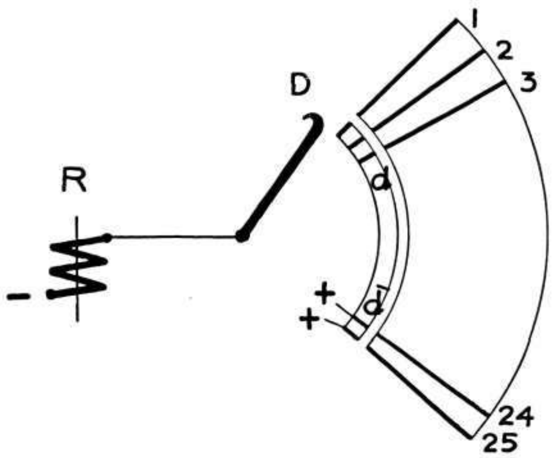
It was then that the director general of the postal department, Fahry Bey, an able and farsighted man who had devoted his best energies to the development of telephone communications in Turkey, decided that Angora should have the best and most modern telephone system obtainable. In May 1925 L. M. Ericsson was again invited to take up negotiations, these latter resulting in the signing of a contract calling for the delivery of a full automatic telephone exchange, including frames, racks, cables and line relays for 1000 subscribers' lines, and switching devices for 700 lines, besides 700 telephone instruments and a manual switchboard for fifty lines. The negotiations were carried on with Mr. Fahry Bey personally, all the details and technicalities of the contract being handled by Zeki Bey, technical chief of the Post Office administration. Captain Yngve Johnson, managing director of The Swedish Oriental Trading Co., — general agents in Turkey for the L. M. Ericsson Company — acted as representative for L. M. Ericsson. A few months after the signing of this contract, an order was placed for switching devices for 300 additional subscribers' lines. Thus, when the exchange was opened for traffic on September 11th, 1926 it was completely equipped for 1000 lines.



R 605 Fig. 1. Skeleton Diagram of the Automatic System in Angora.

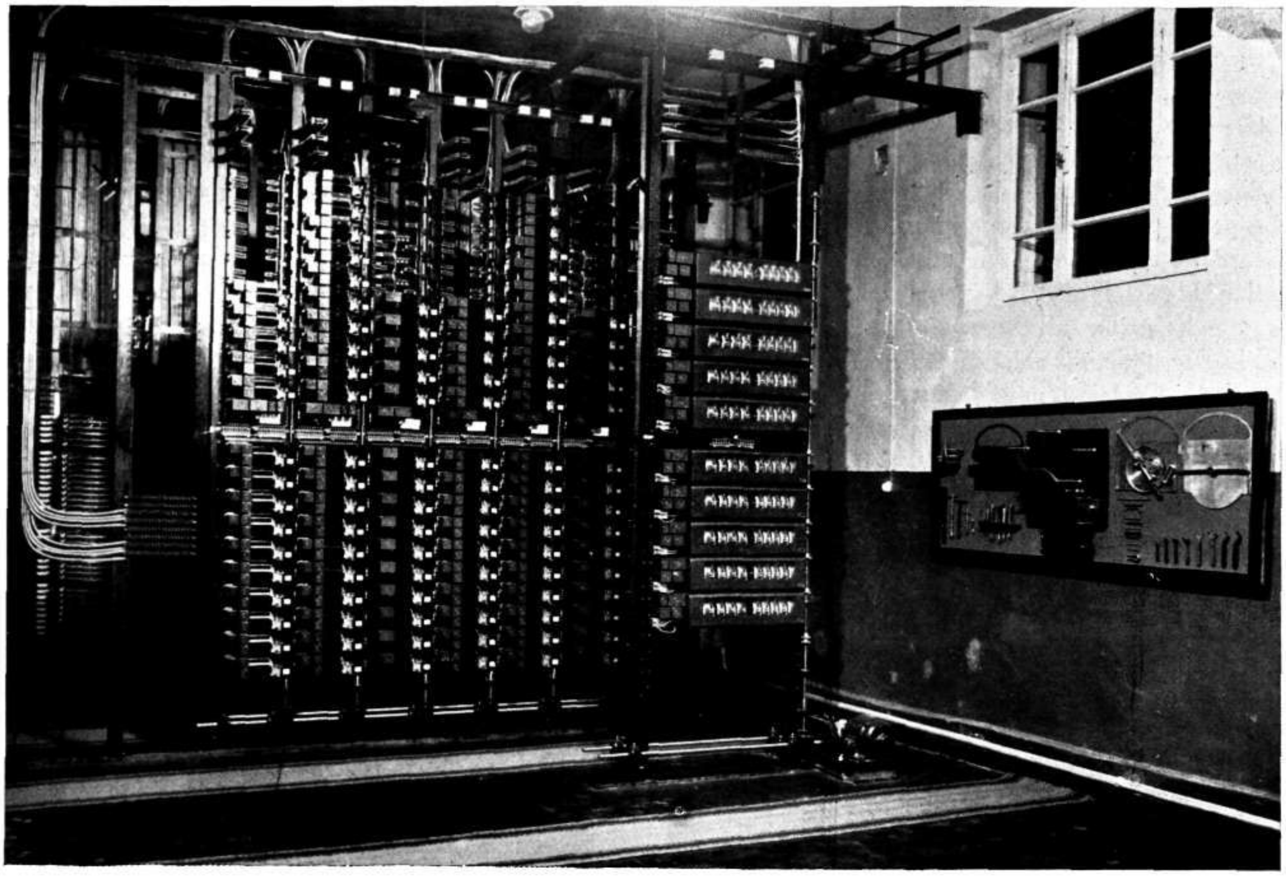
The automatic telephone exchange in Angora is built according to the Ericsson system with 4-digit numbers. Thus, when the entire number series is taken into use a capacity of 10,000 lines is reached. A skeleton diagram of the Angora exchange for 1000 lines is shown in Fig. 1. The figures denote the number of switching devices for which the racks are built and wired. The one five hundreds group contains only regular subscribers' lines, while the other five hundreds group, besides subscribers' lines, contains also a number of special lines and junction lines to and from the two manual sub-exchanges in Tehan-Kaya and Ketzi-Euren. The connectors in the latter group are arranged for mixed traffic, i. e. traffic to ordinary subscribers as well as to connections with two or more lines to a number. The principle on which these connectors function is shown in fig. 2.

The multiple frames in the connector rack are constructed with insulated contacts *d*. Multi-line connections are carried to certain multiple frames whose contacts *d* are connected to positive, the contacts *d* of the multiple frames with only ordinary subscribers' lines being insulated from positive. The connectors proper are furnished with a contact spring *D* in like manner with the line finders. This spring *D* is connected to a relay *R* whose function it is to connect up the connector so that it shall function as an ordinary connector or as a connector for multi-line connections (P. B. X. connector), depending on which position it has been set to by the rotary movement. If it is set opposite a multiple frame containing P. B. X. lines the relay *R* is energized over the spring *D* and the contact *d*, which latter is connected to positive. If the connector is set opposite a multiple frame with ordinary subscribers' lines, the relay *R* remains de-energized.

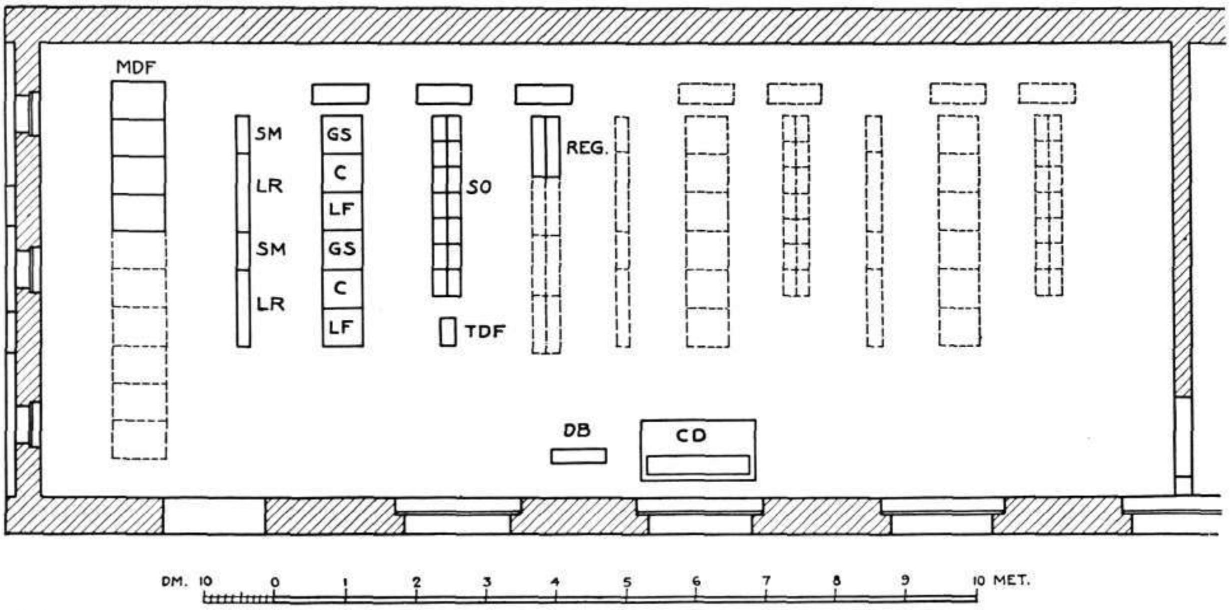


R 606 Fig. 2. Switching Relay for P. B. X. Connector.

When connecting up ordinary subscribers' lines the procedure is the same as for an ordinary connector. On the other hand, if the connector is directed towards a multiple frame with multi-line connections, the relay *R* energizes and switches over the connector so that it functions as a P. B. X. connector. The connecting up of the connector to the line wanted by the calling subscriber is controlled by the register, as usual, the connector stopping at the first line of this number. If this line is disengaged, the connection is made and the ringing signal given as usual. Should the first line be busy, however, the radial movement continues and the connector seeks out and connects up a disengaged line. If all the lines belonging to this number are busy, the connector stops on the last line and the sequence switch is set to the position from which a busy signal is sent out to the calling subscriber.



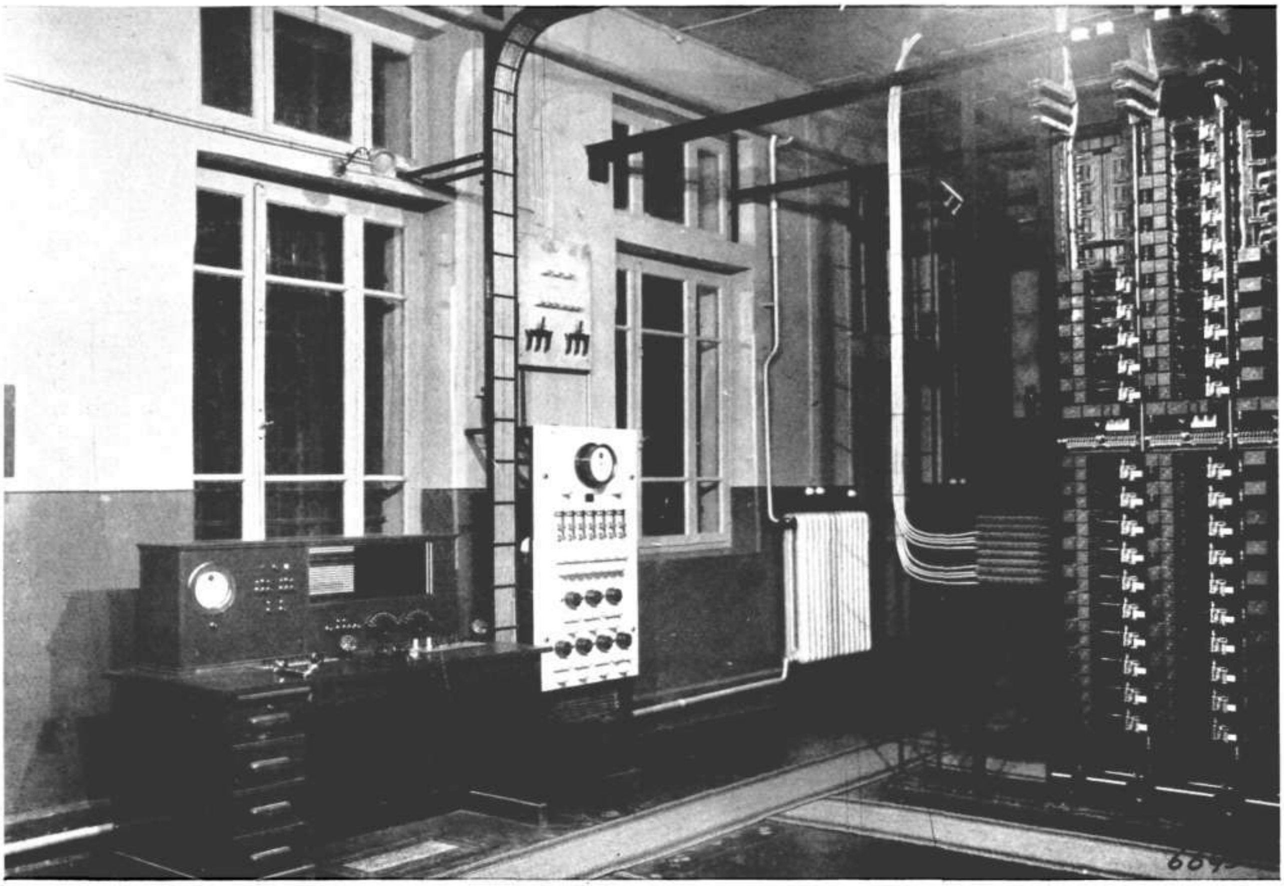
R 567 Fig. 3. The New Automatic Exchange in Angora.



R 607 Fig. 4. Location Plan of the Automatic Exchange.

The automatic exchange in Angora (see fig. 3) is housed in a wing of the new post office building. A location plan of the automatic room is shown in fig. 4. The exchange has been designed for an ultimate capacity of 3000 lines. The designations in fig. 4 have the following meanings:

MDF = main distributing frame
LR = line relay rack
SM = subscriber's meter rack



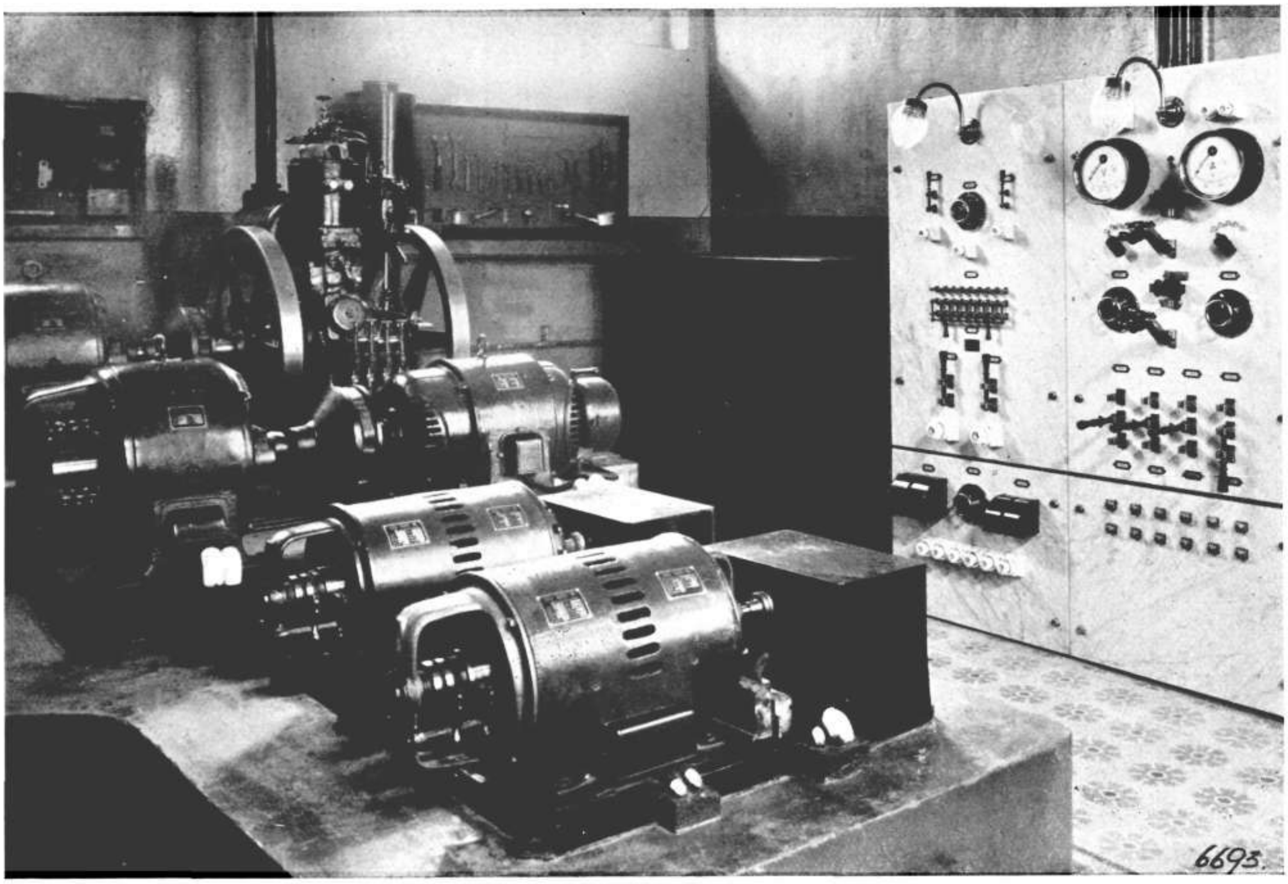
R 601 Fig. 5. Test Desk and Power Board.

LF = line finder rack
GS = group selector rack
C = connector rack
SO = sequence switch rack
REG = register rack
TDF = traffic distributing frame
DB = power distributing board
CD = test and control desk

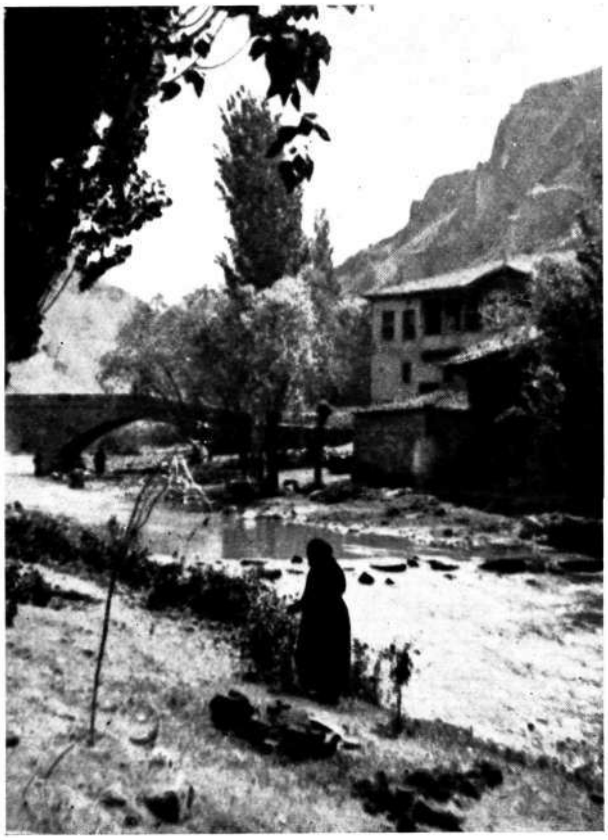
The principle of placing the group selector racks in the same row as the line finder and connector racks is practiced to advantage in exchanges of this size, especially if the exchange is to be equipped with individual subscribers' meters. A rack for 500 subscribers' meters is about equal in length to a selecetor rack, i. e. 550 mm., and can therefore fit in very nicely between two bays of line relays, opposite the group selectors in the row of selector racks.

Ample floor space is provided in the automatic room. Not counting the main distributing frame, the floor space amounts to $14 \times 6.5 = 91$ sq. metres. Since it is possible to extend each row of racks with additional bays corresponding to another 500 lines, one can easily install equipment for a total of 4500 lines, which gives 20 sq. metres of floor space for every 1000 lines. This figure is about normal for the Ericsson system.

The power plant consists of two storage batteries, each one for 24 volts and with a capacity of 850 amp. hours, two charging machines, two ringing machines and a power board. In fig. 6 — which shows the power plant — the two ringing machines are in the immediate foreground, followed by the two charging machines, the one with electric motor drive while the other is driven by an internal-combustion engine intended for use in case of emergency should the feed current from the city service net be cut off.



R 602 Fig. 6. Angora. The Power Plant.



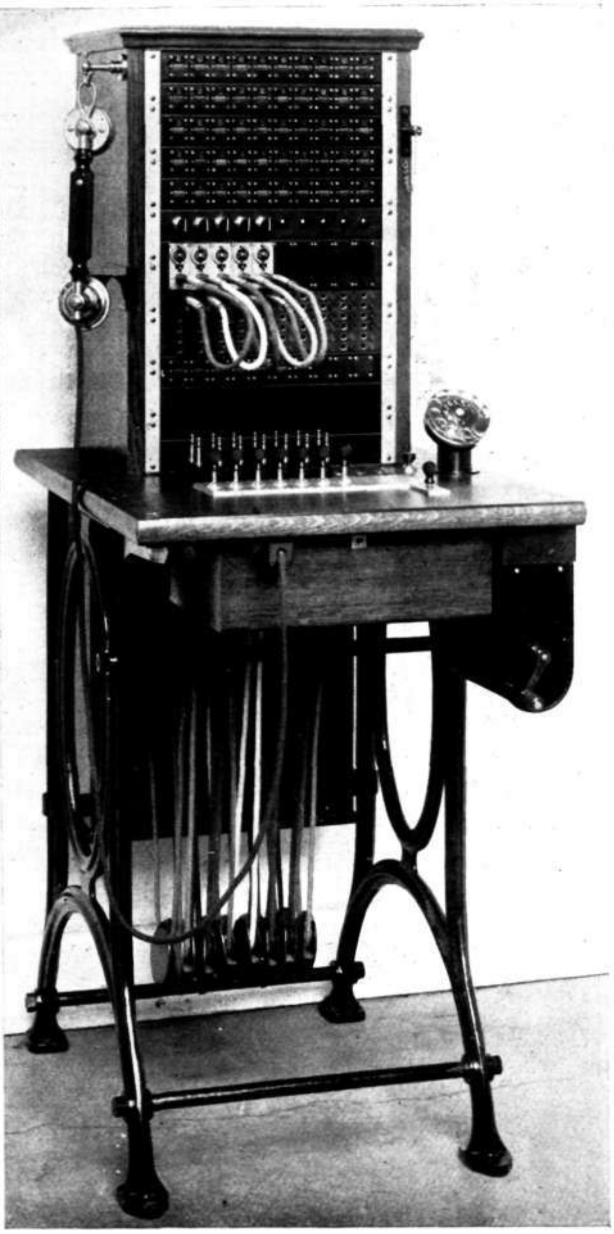
R 604 Angora. On the Banks of the River.

All of these machines are of Swedish manufacture. To the right may be seen the two-panelled power board. The left panel contains the instruments for the medium tension current (3 phase 380 volts main tension 50 cycles) and for the ringing machines, while the right panel contains instruments required for the charging and discharge of the storage batteries.

In addition to the automatic exchange, L. M. Ericsson has delivered two manual sub-exchanges, each one consisting of a C. B. switchboard for fifty subscribers' lines and five junction lines for junction traffic with the automatic exchange. Fig. 7 shows one of these boards executed in accordance with Ericsson's new standard type, the principle of construction with all indicators, keys and jacks in strips of five or ten units being one of its chief characteristics.

The erection, testing and putting in service of this plant was accomplished with native labour under the leadership of two expert erectors from Stockholm. Preparatory to taking up this work, two Turkish erectors were given the opportunity of going through a four months course of instruction at the Stockholm works. The extremely careful testing to which all the various parts are subjected before leaving the factory is responsible for the fact that the automatic exchange could be tested and connected up without the assistance of an engineer. As previously mentioned, the official acceptance took place on September 11th 1926 after one month's trial service, during which time the service was under the close observation of the Post Office officials.

The fact that the Angora automatic exchange is functioning to the entire satisfaction of the general public is amply corroborated by the following article, translated from the French original which appeared in »l'Echo de Turquie» for February 3rd of the current year.



R 603 Fig. 7. Manual C. B. Board for Tchan-Kaya.

»There is yet another thing, among so many others, which can give Stambul cause for envy of Angora, and that is the telephone. It gives simply wonderful service. There must certainly be a telephone god who is favourably inclined towards the telephones of our capital. No more nervous breakdowns or paroxysms of tears as when — in Stambul — you implore the young lady who is busy powdering her nose — 'en train de se graisser le museau', according to Molière's rather irreverent expression. No more controversies with this same young lady whom it no longer is necessary to treat with the respect due some supernatural being even though you get the wrong number, for this telephone is automatic. The directors of the Stambul telephone company should come here (i. e. to Angora) and study the manner in which an operating company, jealous of its good reputation, should treat its subscribers.»

G. C.

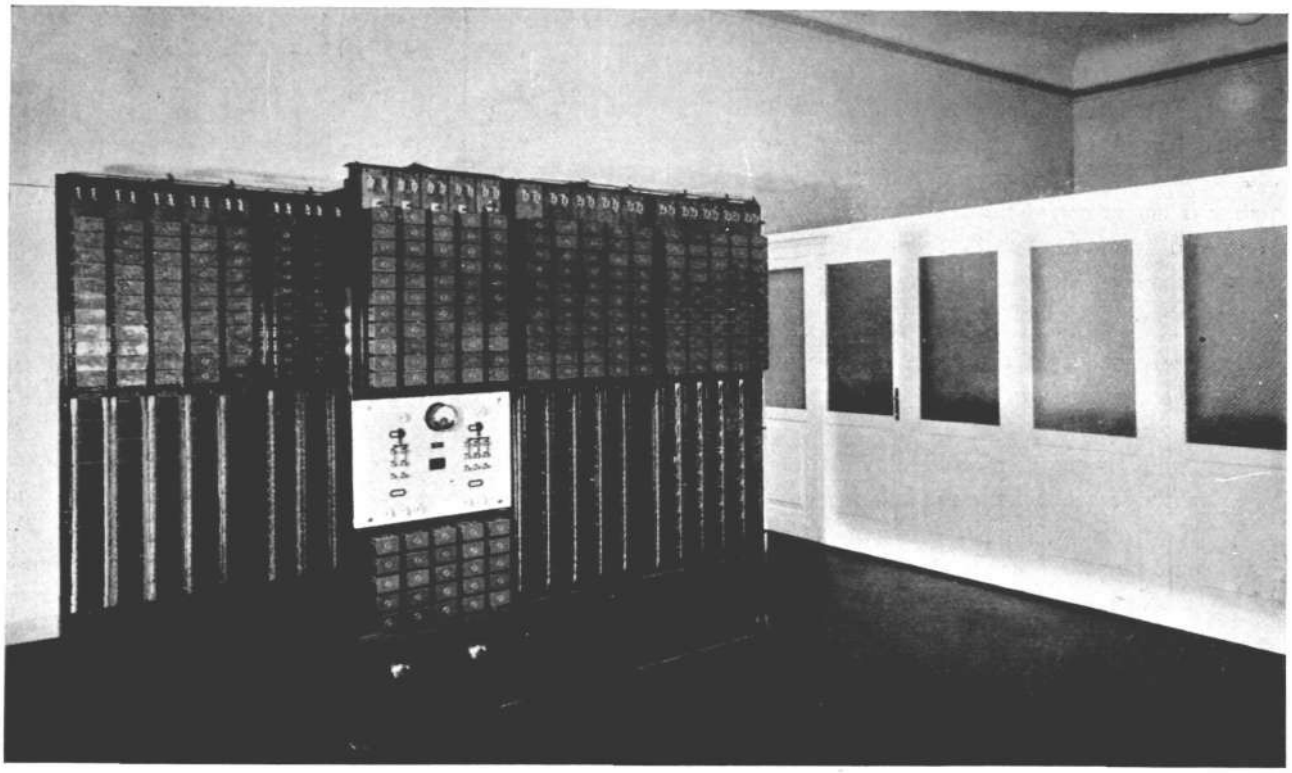
The Automatic Exchange in Forli, Italy.

The following lines concerning the inaugural ceremonies which took place at the opening of the Forli automatic telephone exchange are taken from the Rome newspaper »Lavoro d'Italia» for November 18th of last year.

> *»Yesterday (Nov. 17th, 1926) the telephone company Società Telefoni Italia Medio Orientale (Timo) celebrated the opening of the Forli new automatic telephone plant with a simple and appropriate ceremony.*
>
> *This event was greeted with extreme satisfaction by the citizens of Forli, who follow with enthusiasm the developments in the capital of our provins brought about by Benito Mussolini and his Fascist government».*

The above mentioned event is noteworthy insomuch that this is the first instance where an automatic switchboard of the OL 500 system has been installed in a city exchange. The OL 500 system, described in Nos 1 & 2, Vol. II, was originally designed for private branch exchanges, for which type of installation it still is imminently intended. However, the Forli plant proves the adaptability of this system for small public nets, the capacity of which does not exceed 500 subscribers.

The results obtained at Forli have been so satisfactory that the OL 500 system has been further improved upon with a view towards making it fully up-to-date for use in public nets. Thus, intermittent ringing has been introduced. One drawback with this system was that the number of simultaneous calls was restricted to twenty-five. The schematic uppbuilding of the system has now been completed in this respect, permitting an increase in the number of cord circuits to between forty to forty-five.



R 657

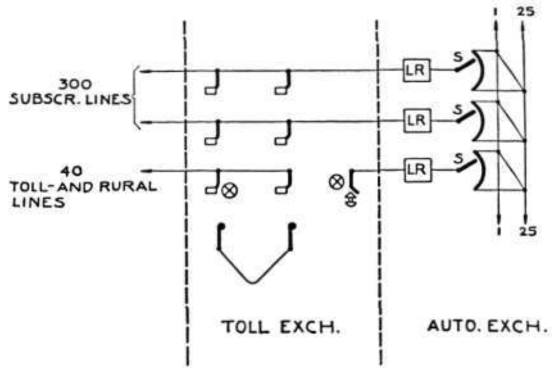
Fig. 1. The Automatic Exchange in Forli.

The Forli exchange is equipped for 300 subscribers' lines, the capacity of the main distributing frame being 500 lines. The power equipment is wholly of Italian manufacture and has been delivered through L. M. Ericsson's Italian subsidiary »Società Ericsson Italiana» in Genoa. Fig. 1 shows the automatic switchboards for 300 lines. The racks are erected in two rows, the front one containing equipment for 100 subscribers' lines, service equipment for twenty-five cord circuits, five registers, the necessary alarm devices and a power switchboard. The second row contains equipment for 200 subscribers' lines.

Within the near future, Forli will receive a new, modern toll exchange, also from the Ericsson works in Stockholm. This toll exchange will be equipped for twenty toll lines, twenty rural lines and necessary order wires, the initial equipment calling for three operators' positions, two of which will handle ten toll lines each, and the third one the twenty rural lines. The toll switchboards will be of an entirely new construction, designed especially for exchanges of this capacity.

Fig. 2 shows a skeleton diagram of the Forli plant. To the extreme right is the OL switchboard, each subscriber's line having its own line relay *LR* and cord circuit selector *S*. The subscribers' lines are multiplied through the toll boards. In this way the toll calls are kept clear of the automatic switchboards, the toll lines being connected up directly to the subscribers' multiple jacks. Only the order conversations pass through the automatic local exchange.

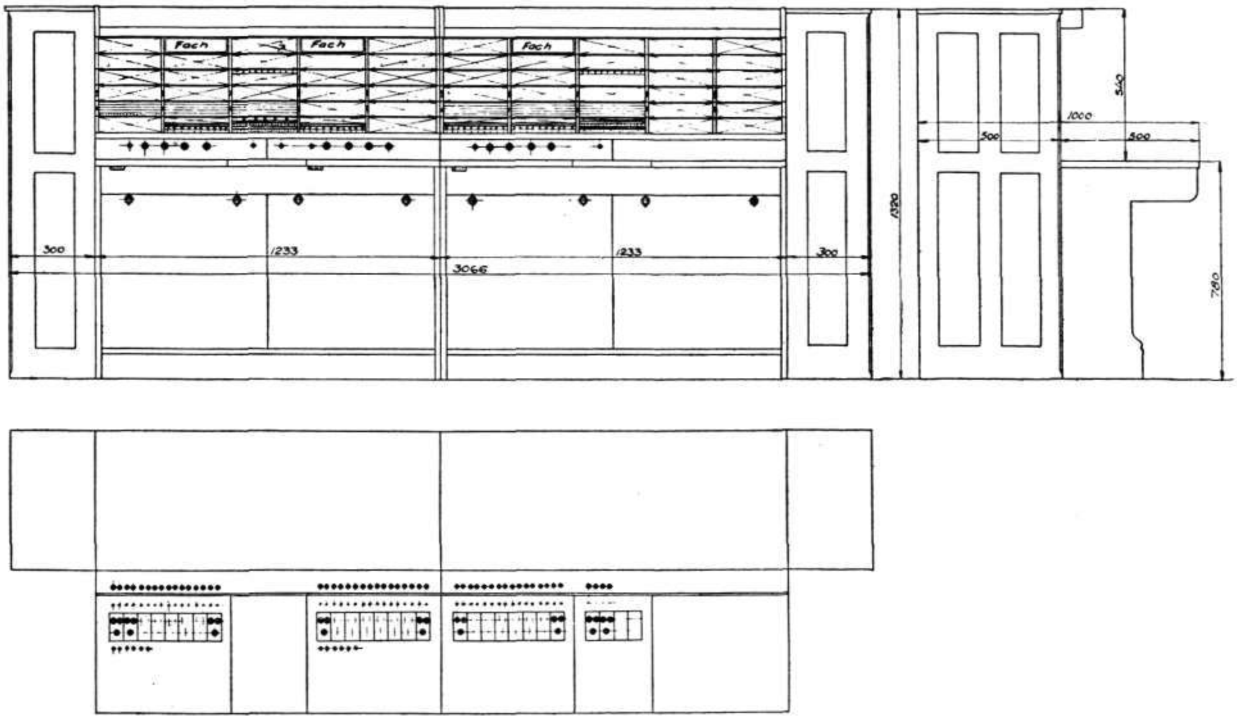
A drawing of the toll sections is shown in fig. 3. Each board has two positions, the last position being unequipped for the present.



R 656 Fig. 2. Skeleton Diagram of the Automatic and Toll Exchanges.

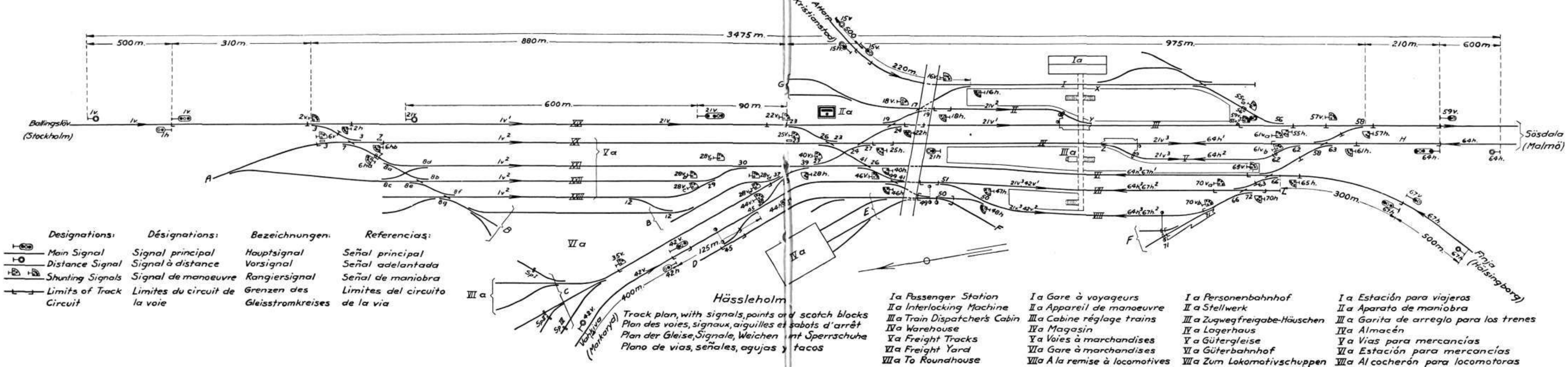
Forli is the capital of the fertil province of Romagna. It has a population of about 50,000 and can boast of many glorious anals of the past, in similarity with most of the provincial towns of central Italy. In the 13th century, Forli was a free city, sufficiently bold to take up war with such powerful enemies as Venice, Bologna, Florence, and even the pope. The city has some beautiful buildings, such as the St. Mercuriale cathedral and the City Hall, containing frescoes and other works of art of inestimable value.

G. G.



R 658 Fig. 3. Toll Board for Forli.

L.M.Ericsson



R 590 a

The Hässleholm Electric Interlocking Plant.

By Ivar Larsson, District Signal Engineer for the Swedish Govt. Railways.

At Hässleholm, one of Sweden's oldest railway junctions, private railways from Hälsingborg, Kristianstad and Veinge-Markaryd meet the government line Malmö—Stockholm. Already some years ago the growth of the traffic necessitated the rebuilding of the station yard. Since the available space did not permit of making the track yard sufficiently wide, its length had to be increased as well. This resulted in a railway yard of considerable length, as may be seen from the above plan, with a passenger station in front of the station building — adapted also for the dispatch of freight trains — and a freight station at the north end.

It was considered necessary to equip the new station with an interlocking plant partly to give the traffic necessary safety protection, partly to effect a reduction in the number of employees. The extreme length of the station excluded the use of anything but an electrical system. A preliminary project called for two interlocking machines, one for the south end and one for the middle portion and north end. However, an investigation showed that such a solution would not make possible the desired reduction in personnel. It was then found that one single interlocking machine would be sufficient if certain newly developed devices and arrangements were used. These devices are the so-called track circuits which, among other things, permit the control of the cleared or occupied condition of a track; the illuminated track plan, by means of which the movements of the trains on a track system — located at too great a distance from the interlocking machine to make direct surveillance possible — can be accurately followed; and lastly, the systematic use of track blocking signals, thereby enabling the interlocking to control switching operations even in distant sections of the station yard.

The interlocking machine is located in that portion of the yard where switching operations occur most frequently, this location being most suitable also for the supervision of the movements of the locomotives to and from the roundhouse.

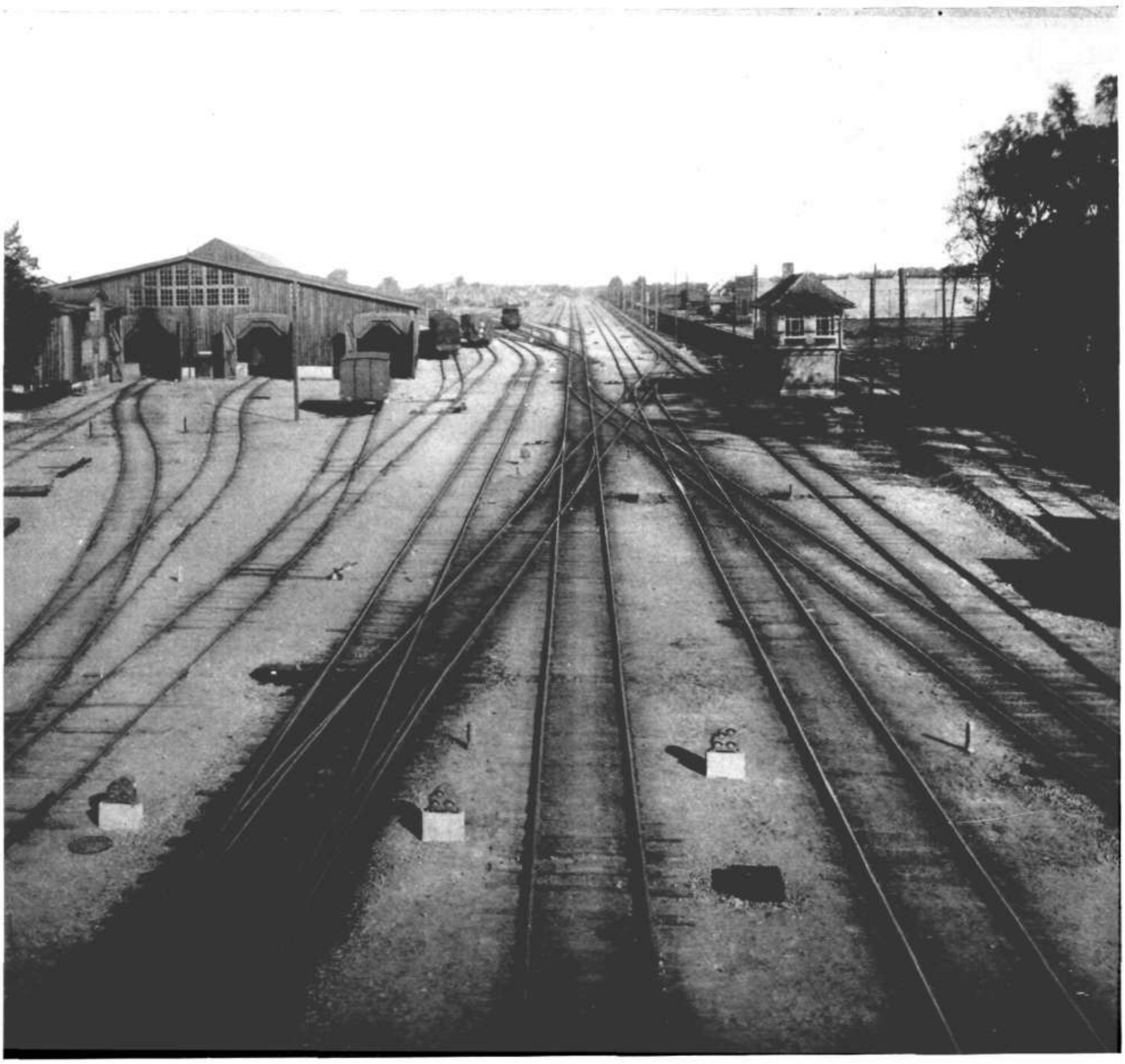
The track switches are divided up into three main groups: the south end, the middle portion and the north end of the station yard. These groups have been treated differently with respect to their relative positions to the interlocking machine as well as to the varying traffic conditions in the different parts of the station yard.

All the track switches in the south group are manoeuvred from the interlocking machine only. Different switch positions are required for the clearing of the different tracks, making a centralized points control absolutely necessary. Switching of freight trains does not occur in this end of the station yard, only shunting of passenger cars and locomotives. These latter movements, however, are entirely controlled by the distant interlocking machine which can give or refuse permission for certain train movements by means of skotch block signals. Signals of this type have been arranged in sufficient number to regulate all possible switching operations. When set to clear, these signals lock all switches in the cleared track; also track circuits are made use of for locking the points during shunting operations in this section of the track yard, thus preventing the accidental laying over of points under a moving train even though a skotch block signal be set to stop before the train has passed all the points. The track circuits are also used to control the clearance of switching tracks.

The middle points group lies so near the interlocking machine that it can easily be surveyed by the men in the signal cabin. This fact made it unnecessary to arrange track circuits for the entire group, the locking of certain more distant points having been found satisfactory. However, skotch block signals for all shunting operations have been provided here also. As long as such a signal is set to clear, all points under its control are locked, thereby safeguarding the traffic to a certain extent against the laying over of points under a passing train even during shunting operations. The degree of safety is not so large as with track circuits, however, for if a signal is set to stop before the entire train has passed all the points under its control, there is nothing to prevent a point being laid over under the moving train. It was not deemed necessary, however, to introduce track circuits here also; they were therefore omitted for reasons of economy. Varying switching operations as well as the making up of freight trains may take place in this section of the yard.

It was found possible to give the north points group a much simpler formation. Most of the trains pass through on main track no. XIX, only a few freight trains being admitted to the freight yard through this group of points. Since men are always required to take charge of the freight trains immediately upon their arrival, it was found sufficient to provide local manoeuvering and locking for the points. Only a small number of points were put under central control, viz., those that enter the main track running through this group, and those that require setting when switching to or from track XX — the second main track for a future double track line. This track has a steeper grade than the present main track, thus offering better starting conditions for north-bound freight trains from the passenger station.

The skotch block signals give the interlocking machine such complete control over all train movements within the station yard that it is possible to run the locomotives to and from the engine house without the aid of an engine pilot.



R 591 View of Station Yard with Signal Cabin at Right.

The number of shunting tracks which can be locked amounts to 128.

A comparatively large number of tracks have been provided, their use for different purposes being optional. From the Govt. Railway line northbound trains can be directed to any of the tracks IV to VII, and southbound trains to tracks II to V, VII and VIII in the passenger station yard and to any of the four freight yard tracks; while northbound freight trains can be directed to the freight yard over either of tracks IV to VII in the passenger station yard. For trains entering from private lines the choice is not so large, depending on the limitations of the track system. One of them, however, has an incoming track leading to three passenger station tracks while its freight trains can pass in directly to any of the four tracks in the freight yard. Both of the others have one and two incoming tracks respectively, freight trains being directed from these tracks to the freight yard by means of switching operations. Outgoing tracks have been provided to about the same extent as incoming tracks. The total number of track combinations amounts to twenty-six.

All the signals in this plant are arranged as light signals. The main signals are of the colour signal type, the skotch block signals being form signals.

The home signals in clear position show from one to three green lights. Since the number of incoming tracks passing certain signals sometimes exceeds the number of green lights, the track signalling system is not altogether complete, so that two or three green lights sometimes apply to several tracks.

The number of outgoing signals is restricted to one for all tracks leading towards the same line and, in addition, one starting signal for each of the main tracks III and IV (main line of the Govt. Ry.). Only these latter have been placed as has hitherto been costumary in Sweden, i. e. in front of the points group to be passed by the outgoing train. The others are set on a level with the home signals. As a result, it is not possible for the locomotive engineer to ascertain whether or not the right track is cleared by merely observing the starting signal, partly because it is placed so far out that it cannot be observed from the point of departure of the train, partly because it shows the same combination of lights for several tracks. However, the engineer can control the outgoing track to a certain extent by means of the skotch block signals which in Hässleholm are so arranged that they show clear by means of two lights on the same perpendicular for regular traffic tracks, and two lights, one above and to the left of the other, for shunting tracks. As a result the skotch block signals play the role of a sort of dwarf starting signals. Thus, the combination of skotch block signals which has been applied in Malmoe — discribed in Vol. III, Nos 1 & 2, page 6, of this journal — has not been duplicated in Hässleholm, neither is it needed, since switching operations occur to a much smaller extent. In cases where an outgoing track can be cleared to several lines from the same station track, it is impossible — by means of the skotch block signals — to ascertain whether the outgoing track leads towards the correct line, but mistakes are not possible since all outgoing tracks must be released by the station master before a signal can be set from the interlocking machine.

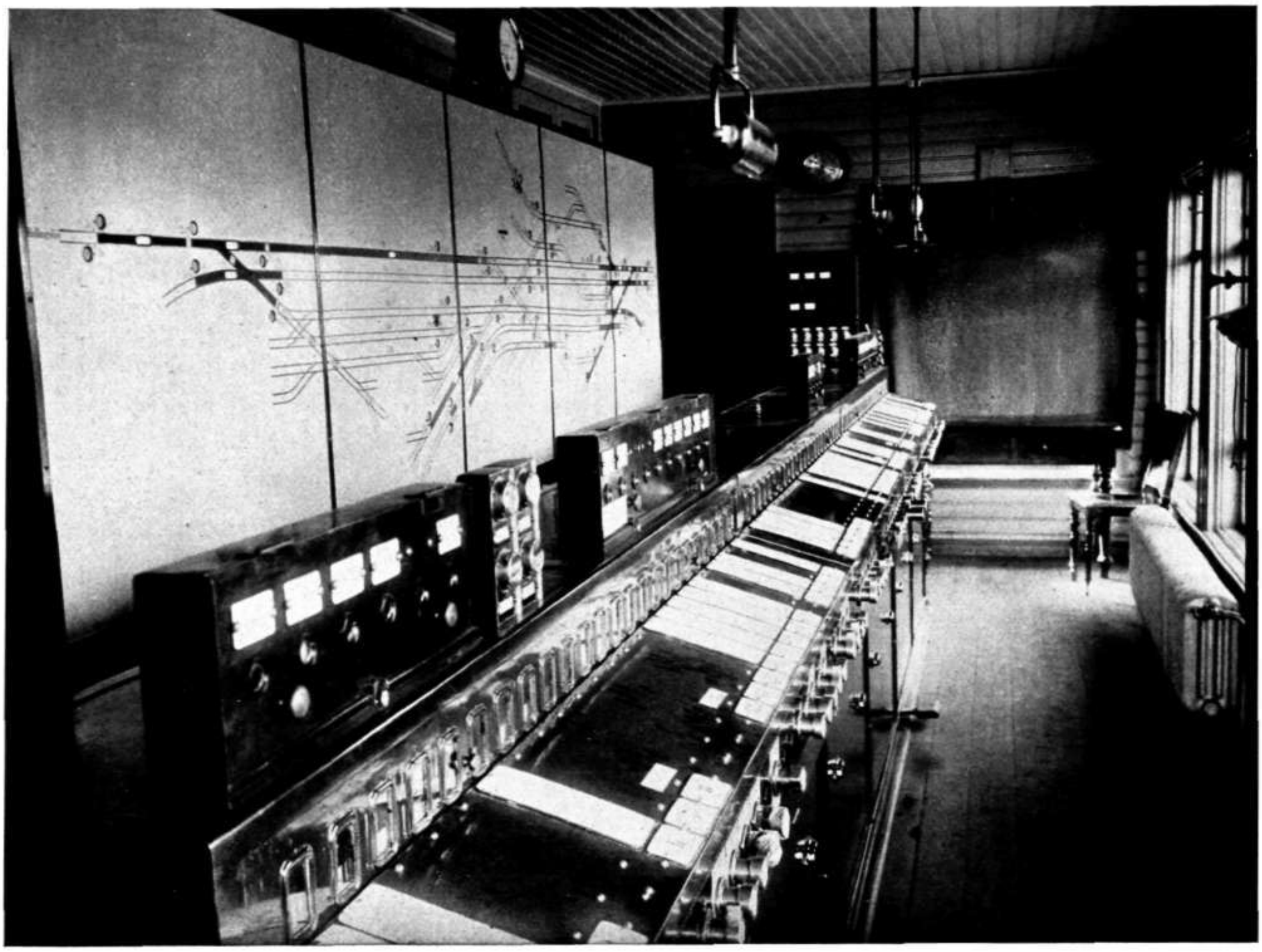
The signal cabin is built in two stories. In the first story are placed the power plant and storage batteries; here, also, is a repair shop and boiler room for the heating plant. The interlocking machine, with the illuminated track plan standing free behind it, is placed in the upper story, the longer wall being lined with relay cabinets.

The interlocking machine comprises thirty-two point locking levers and twenty-five signal levers, with fifteen extra levers for future needs. Forty-four points and skotch blocks and thirteen main signals can be manoeuvered from this machine, while forty-one skotch block signals and ten locally set points can be locked by means of the point locking levers. As far as the

R 593 The Signal Cabin.

track system will permit, two points are manoeuvered by the same lever, the points being connected in parallel and functioning simultaneously. The interlocking machine is of an entirely new construction and differs considerably from the former Ericsson type, one of its most prominent characteristics being the absence of a mechanical interlocking gear. All necessary combinations of control locking between the various levers are accomplished electrically by means of locking magnets which act directly on the levers. Control of the points is obtained by means of special A. C. relays mounted outside of the interlocking machine. The operating of the point levers is accomplished with two different motions — first, the knob is given a turn of 75°, which starts the motor or motors, after which the points must be completely laid over to their new position, in which they close a control circuit and lift the locking magnet, before the knob can be completely turned, this last motion closing the contacts which form a part of the signal circuit and others controlled by this lever. The two locking magnets of the point lever have more functions to fill than in the former style of interlocking machine, since they must firstly take over the function of the mechanical cross locking gear as concerns locking, made necessary by the positions of other levers, secondly, prevent the complete turning of a lever knob until the point is completely laid over and finaly retain its old function of providing — in co-operation, with an insulated rail — means of preventing premature setting of a point under a train or car. These new functions have made it necessary to increase the angle of rotation of the lever knob from 90° to 140°.

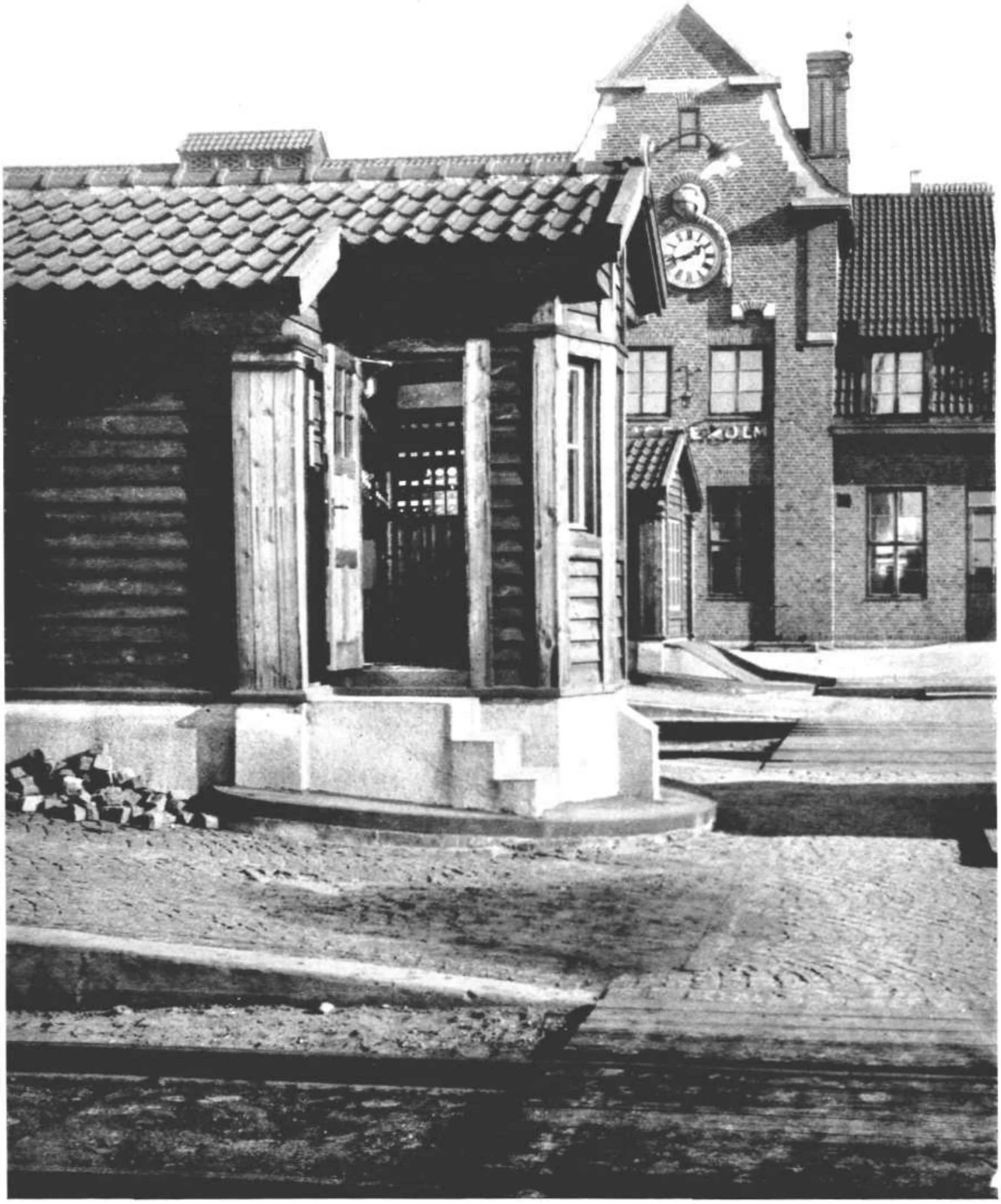
The construction of the signal levers is similar to that of the point levers. In similarity with the older type of signal lever, it is constructed for movement in two directions, each one with a 90° angle of rotation.



R 594 Interior View of Signal Cabin showing Interlocking Machine.

Special releasing relays with number plates have been arranged on the top of the interlocking machine. These are manoeuvred from special releasing devices in a dispatch shed, thus placing the outgoing and incoming tracks under the control of the train dispatcher. An engaged track is automatically locked by means of track locking, both incoming and outgoing tracks being released by the train itself.

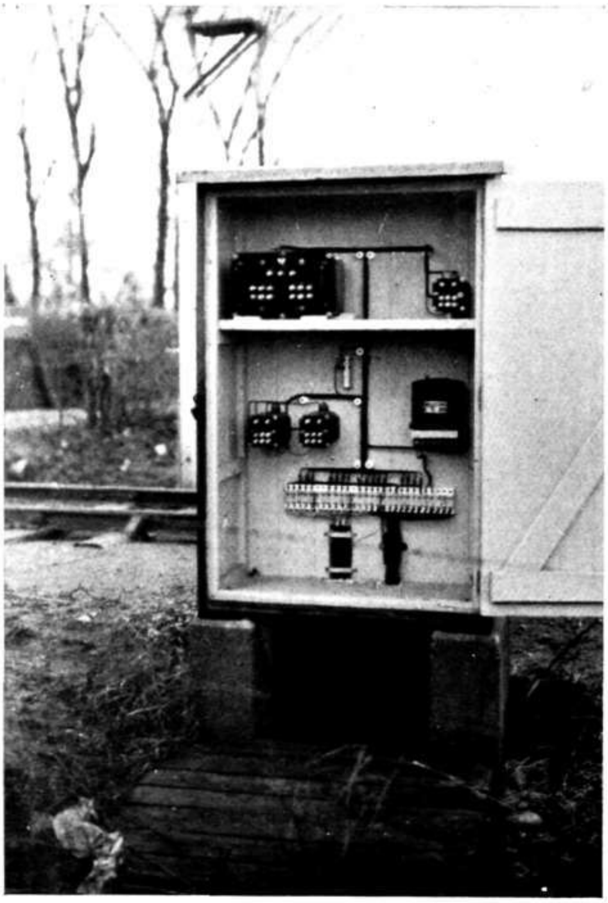
The illuminated track plan repeats all the main and skotch block signals, an engaged or free track, however, being indicated only for the south points group together with the tracks beyond the same, a small part of the north points group together with the main track on both sides of the same and the track leading to the locomotive shed. All repeating is done by means of lamps, different signal combinations being indicated by means of varycoloured lamps; a clear



R 596 Dispatch Shed with Station Building in Background.

track is indicated by means of a glowing lamp in the window belonging to this track section.

The releasing apparatus are placed in a special dispatch shed on the middle platform. Repeaters in



R 597 Transformer Cabinet.

the form of star indicators, giving the positions of the main signals, have been arranged in this cabin to enable the train dispatcher to ascertain whether or not the right track has been cleared.

Both alternating and direct current is used in the operation of this plant. The city service net supplies a 3-phase 50 cycle A. C. which is transformed down to 3 × 190 volts by means of a transformer placed within the station area. A feeder line runs from here to another transformer in the signal tower; from the secondary winding of this transformer is obtained a current of 3 × 190/110/55 volts. The tension of the lamps in the skotch block signals is 55 volts; in the main signals it is 12 volts, this latter tension being obtained by means of local transformers placed in the immediate vicinity of the signals. The track circuits are fed by an alternating current with a tension of about 2 volts between the rails, this current being transformed up to a tension of about 4.5 volts for feeding the track phase of the track relays in the signal cabin, the local phase being fed by a 110 volt current. Also the point control relays work with two phases, both of 110 volts. Direct current for actuating the switch motors as well as for signal relays, releasing relays, disengaging relays and locking magnets is obtained by means of a mercury-vapor rectifier for the motor current (about 130 volts) and two valve rectifiers for actuating the relays etc. (about 14 volts). Two Nife storage batteries have been provided for use in case of emergency, each one with a capacity of 60 amp. hours, another battery with a capacity of 100 amp. hours for the motor current, and still another consisting of 10 cells connected in series as buffer batteries for the relay actuating current. In case of a break in the city feeder circuit the entire plant can be run by means of a motordriven 3-phase 6.5 kw generator.

The installation of the plant was entrusted to Signalbolaget acting in the capacity of representative for L. M. Ericsson. Work was begun in the fall of 1925, the plant being ready for use in September 1926. Under present traffic conditions, not more than one man per shift is required to manoeuver the interlocking plant.

R 592 Home and Starting Signals.

Miss Constance Andersson 60 years.

On Nov. 22nd, 1891 Miss Constance Andersson entered the employ of the Ericsson concern — then known under the firm name of L. M. Ericsson & Co. — to that she is now able to look back over more than thirty-five years continuous service. Her unwonted energy and ability as well as a bright disposition spiced with both wit and humour have combined to give Miss Andersson a well-earned popularity. On January 22nd, Miss Andersson's 60th anniversary, she had the pleasure of receiving the hearty congratulations of department heads and comrades alike, their sentiments being interpreted by a member of the office force who had composed some humorous and appropriate verses for the occasion.

Vad åren sväva framåt i livets lätta dans
och högtidsdagar firas — i dag går du Constance
nu uppför långa backen till 60 årens skans
och ståndar se'n däruppe i all din ungdoms glans
och ger oss av den humor, som i ditt sinne fanns
och som du väl ju sköter vid varje leverans,
ty aldrig du förlorat din kända konvenans,
när som du slungar ut dina skarpa vitsars lans,
så att man paff kan bliva och falla uti trans,
för ingen kan ju veta var den träffar någonstans

men är repliken kraftig, som vore den en mans
och är den även saftig, så har du konvenans
att alltid söka ge den en fin och prydlig ans,
så ingen, som blir träffad, kan tappa bort sin sans;
och nu vi enligt vanan ha gått på vigilans
att få ihop som hyllning en gåva med substans —
fast inte någon villa, ty sådan sist ju vanns —
men blott ett litet minne, som köpts som det befanns,
och med detsamma följer nu denna reverans
i form utav en sirlig och hjärtelig romans,

som tolkar våra känslor för L. M. E:s CONSTANCE.

ANDERS LIGNELL,
superintendent of telephones,
Stockholm

R 660

Member of the International Consultativ Committee for Long Distance Telephone Communications

American and European Toll Traffic.

By A. Lignell, Superintendent of telephones, Stockholm.

In the matter of telephones, public opinion has generally conceded America to be the great, dominating country. Also, in comparison with European conditions, the local telephone traffic of America is exceedingly heavy — about 62 % of all the telephones in the world are to be found in the U. S. A. and no European city except Stockholm can compete with the foremost telephone cities of America with regard to the procentual number of telephone instruments.

According to the statistical information at the writer's disposal, the figures in January 1925 for the largest telephone centres were as follows:

	Population	Telephones per hundred inhabitants
San Francisco ..	675,000	29.9
Omaha	218,000	28.5
Washington	468,000	25.3
Chicago	2,967,000	25.0
Minneapolis	443,000	24.9
New York	6,059,000	21.7

The corresponding figures for Europe were:

Stockholm	380,565	28.2	XII.31.25
Copenhagen	750,000	15.9	
Oslo	265,000	13.9	
Gothenburg	231,007	12.5	XII.31.25
Frankfurt a/M. ..	456,000	10.7	
Hamburg-Altona .	1,236,000	10.3	
Berlin	3,948,000	9.9	

	Population	Telephones per hundred inhabitants
Paris	2,980,000	7.6
London	7,354,000	5.9
Manchester	1,655,000	3.6

I would seem but natural to assume that the toll traffic between American cities held the same gigantic proportions, and that Europe was distanced by America even in this respect.

Such is not the case, however. In quite a number of the countries of Europe it will be found that the domestic toll traffic has been fully equal and sometimes of considerably larger proportions since many years back, and international telephone traffic in Europe is increasing rapidly since the *Comité Consultatif International des Communications Téléphoniques à Grande Distance* began to operate.

Proof for this statement is found in some tables published in the January 1927 number of *Europäischer Fernsprechdienst.* The figures concerning America are reported to have been submitted by the American members of the International Bureau of Commerce.

A compendium of these tables is given on page 21, to which certain data concerning the Swedish toll traffic have been added for the sake of comparison. Also, the population of the different cities as well as the number of calls per inhabitant and year over the various lines have been included.

Toll Traffic between Cities within the United States of America, Germany and Sweden.

Traffic between	Population	Air-line distance in Km.	Rate for 3-minute period, gold francs	Rate in gold francs for same distance: According to C. C. T. rates	Rate in gold francs for same distance: in Germany	Rate in gold francs for same distance: in Sweden	Average number of weekday calls in both directions: 1920	Average number of weekday calls in both directions: 1925	Number of calls per inhabitant and year (week-days) 1925
New York... and	6.059.000								
San Francisco	675.000	4206	87: 45	27: 40	17: 25	—	7	14	—
Los Angeles	1.100.000	3987	82: 95	25: 60	16: 13	—	4	20	—
Denver	315.200	2648	55: 12	17: 80	11: 25	—	3	5	—
Havana	(international)	2120	72: 35	14: 80	9: 38	—	—	25	—
Miami.........	80.500	1760	36: 84	12: 40	7: 88	3: 47	—	43	—
St. Louis......	1.050.900	1418	29: 68	10: 60	6: 75	3: 47	36	68	—
Atlanta	301.000	1192	25: 18	8: 80	5: 63	3: 47	12	34	—
Chicago	2.967.000	1178	24: 65	8: 80	5: 63	3: 47	274	554	0.06
Detroit	1.461.900	787	16: 70	6: 40	4: 13	2: 78	88	256	0.05
Washington...	468.000	326	7: 16	4: —	2: 63	1: 25	693	879	0.6
Boston.........	1.727.200	304	6: 63	4: —	2: 63	1: 25	1655	2266	0.4
Philadelphia	1.968.700	128	2: 92	2: 80	1: 88	0: 69	5964	7950	1.2
Chicago ...... and	2.967.000								
Dallas	251.300	1 278	26: 77	9: 40	6: —	3: 47	4	10	—
Omaha	218.000	682	14: 58	5: 80	3: 75	2: 22	42	74	0.1
Pittsburg......	923.500	675	14: 31	5: 80	3: 75	2: 22	90	134	0.04
Minneapolis	443.000	560	11: 93	5: 90	3: 38	1: 81	149	231	0.2
Cleveland......	1.104.900	506	10: 87	5: 20	3: 38	1: 53	167	278	0.08
Berlin .... and	3.948.000							**1926**	
Königsberg...	275.000	520	—	—	3: 37	1: 53	—	330	0.4
Munich	672.000	500	—	—	3: —	1: 53	—	721	0.3
Düsseldorf ...	428.000	470	—	—	3: —	1: 53	—	762	0.5
Frankfurt a/M	456.000	420	—	—	3: —	1: 53	—	1288	0.8
Hamburg ...	1.236.000	260	—	—	2: 25	0: 97	—	2879	0.7
Hannover ...	412.000	260	—	—	2: 25	0: 97	—	1115	0.8
Stettin.........	250.000	120	—	—	1: 87	0: 69	—	1157	1.4

Traffic between	Population	Air-line distance in Km.	Rate for 3-minute period, gold francs	Average number of weekday calls in both directions: 1920	Average number of weekday calls in both directions: 1925	Average number of weekday calls in both directions: Percentage increase	Number of calls per inhabitant and year
Stockholm ... and	380.565						
Luleå	10.980	780	2: 78	54	84	55.6	2.3
Umeå	10.072	570	1: 81	56	137	144.6	4.1
Malmö	117.015	514	1: 53	556	806	45.0	2.1
Hälsingborg..	52.472	485	1: 53	292	352	20.5	2.0
Gothenburg	231.624	403	1: 25	1423	1727	21.4	2.2
Sundsvall ...	17.324	349	1: 25	348	462	32.8	8.0
Falun	13.592	196	0: 97	323	483	49.5	10.7
Linköping ...	29.181	174	0: 69	386	547	41.7	5.6
Örebro	36.471	162	0: 69	556	846	52.2	7.0
Gävle	39.502	158	0: 69	713	886	24.3	6.7
Norrköping...	60.454	136	0: 69	806	1077	33.6	5.3
Uppsala	30.435	65	0: 42	1894	2455	29.6	24.2

The above table gives ample evidence of the fact that the United States does not hold a top position in comparison with Germany and Sweden, as concerns toll traffic, except in the matter of tariff rates.

If the necessary statistical information had been available, this condition would no doubt have been found to exist with relation to several other European countries.

As has already been pointed out, the international telephone traffic in Europe is experiencing a notable development, the establishment of new lines of communication being an almost daily occurence, while the capacity of existing lines is being increased by the addition of new circuits.

The following figures are given to show that this traffic does not need to stand back for that of the United States in spite of differences in point of language and different executive administrations.

During the latter part of 1926 the following average numbers of conversation minutes and calls occurred per week-day:

	Conversation minutes	Calls
London—Amsterdam	1532	abt. 400
Paris—Berlin	832	» 200
Berlin—Amsterdam	1117	» 275
Germany—England [1]	1478	» 380
Holland—Switzerland [1]	480	» 120
Berlin—Prague		» 298
» —Vienna		» 346
» —Zurich		» 164
Stockholm—Berlin		» 122
» —Copenhagen		» 184
» —Oslo		» 182

Returning to the tables, we will find that the number of calls over the longer American lines with a lenght of 1400 to 4200 km. is of no great consequence, the maximum figure being 68 on the line New York—St. Louis and the minimum being 5 calls per day on the line New York—Denver. Lines of corresponding length have not yet been opened for international traffic in Europe, but when a number of direct lines of communication about 2000 km. in lenght are opened for traffic in the near future, it is safe to predict that the traffic on these lines will considerably exceed that of the American long distance lines, thanks to the very moderate European rates. For distances between 1400 km. and 128 km., this last being the shortest distance included in the table, the German as well as the Swedish toll traffic — the traffic between New York and Philadelphia being the only apparent exception — is larger than that of the U. S. A., especially if the widespread use of the telephone in America be taken into account.

[1]) New line.

Compare, for instance, the traffic between New York and Washington, a distance of 326 km., with the traffic between Stockholm and Gothenburg, an air-line distance of 403 km.

879 calls per week-day are exchanged between New York and Washington, with populations of 6 millions and 468,000 respectively, while between Stockholm and Gothenburg, with 380,565 and 231,624 inhabitants respectively, 1727 or almost the double are exchanged, but in the former case the rate amounts to 7.16 gold francs and in the latter to 1.25 gold francs.

Or compare the traffic Chicago—Minneapolis and Chicago—Cleveland — distances: 560 and 506 km., traffic: 231 and 278 calls per week-day respectively — with the traffic Stockholm—Malmö and Stockholm—Helsingborg — distances: 514 and 485 km., traffic: 806 and 352 calls per week-day respectively. The rates here amount to

Chicago—Minneapolis	11.93 gold francs
» —Cleveland	10.87 » »

while for

Stockholm—Malmö and Stockholm—Hälsingborg the rate for a 3-minute period does not exceed 1.53 gold francs.

The ratio between the toll traffic and the number of inhabitants is apparent from the figures given. For Sweden, these figures are much higher than for either America or Germany. The maximum figure for America is 1.2 week-day calls per inhabitant and year — and this for the record traffic between New York and Philadelphia — while the maximum for Germany is 1.4 on the line Stettin—Berlin, and for Sweden 10.7 on the line Falun—Stockholm. If we go below the distance limit of 120 kilometres given in the original table (for the line Berlin—Stettin) we will find that the traffic Uppsala—Stockholm with a distance of 65 kilometres and 2455 calls per week-day has 24.2 week-day calls per inhabitant and year. According to the table the minimum figures for Sweden are 2.0, for Germany 0.3 and for the United States 0.04.

The above shows what a beneficient influence the tariff and operating policies adopted by the Swedish Telegraph Administration have had on the development of telephone communications. It may be well to state that in Sweden the quality of the connections — even over the longest distances — has been of the very best.

To one who has made a study of toll traffic conditions, it is not at all surprising that the United States have not been able to maintain their position of leadership with reference to the toll telephone traffic.

Quite naturally, it is the American tariff system which prevents the development of the toll traffic with the same speed as the purely local traffic. As a result, increased demands have been made on the telegraph. Leaving the shortest distances out of consideration, we find that the American rates are 3 to 5 times greater than the German ones and 6 to 10 times higher than in Sweden.

And where can the cause for these conditions lie?

One apparent reason is that the American tariff system is based on very short waiting times, of equal length for all calls. To obtain this result, the number of circuits in each line of communication must be large enough to permit these short waiting times during the busy hour for all calls occurring during this time. The natural result is that this great number of circuits is very inefficiently utilised when traffic is low, a very small amount of traffic having to bear the interest and amortization on the excessive cost of installation. The development of the toll traffic in Europe as compared with America is the best proof of the advantages of the European tariff policy. Quick promotion of really urgent calls with right of precedence over other calls against a special express fee and reasonable waiting times for other calls is most certainely of greater value to the general public than an equal waiting time for all calls — either urgent or not — and the resulting excessively high rates. By degrees, as the new European international traffic routes are widened to meet the growing demands, and subscription and personal calls become more general in international traffic, this tariff policy will prove as popular for international traffic as it has already done for domestic traffic in quite a number of countries.

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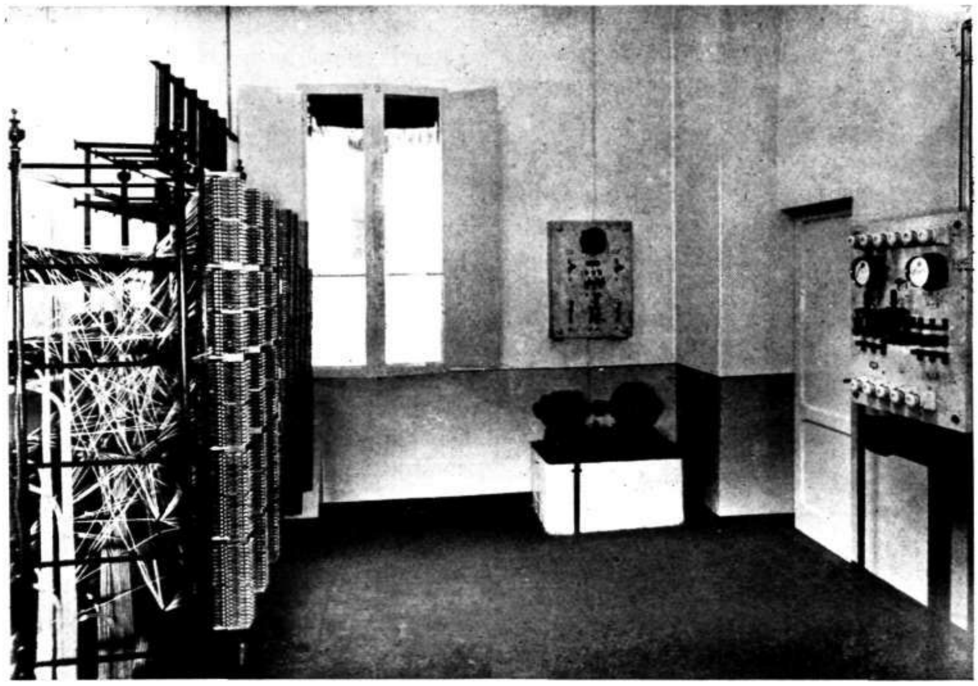
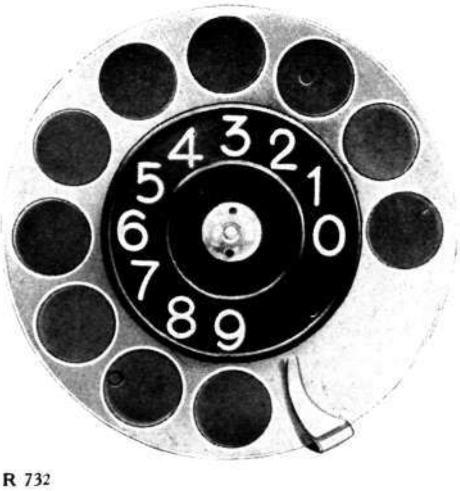


R 709 Main Distributing Frame and Power Plant, Forli Automatic Exchange.

Dial Type of Impulse Transmitters.

When calling a number over an automatic exchange, the subscriber himself makes certain manipulations with an impulse transmitter which cause the switching devices at the central exchange to be set to their proper positions. This setting of the switching devices is usually obtained through the transmission to the exchange of certain definite series of current impulses by the calling subscriber, although it is not always the impulses themselves that actuate the switches. In the first automatic exchange, however, the selector was directly actuated by current impulses which the calling subscriber transmitted by means of push button keys, as many keys being manipulated as there were digits in the desired number. The first impulse transmitter of this type had four push button keys which were manipulated in turn, one after the other. Each key had a separate line terminating at a special driving magnet in the automatic selector. This device, however, was considered altogether too complicated and it did not take long before it was replaced by another device consisting of only one key, with an intermediate switch at the exchange for the purpose of connecting up the different driving magnets.

It soon became evident, however, that mistakes in the number of impulses transmitted were all too easily made. As a result, a new type of transmitter was adopted, having the form of a dial and by means of which the correct number of impulses were automatically transmitted after it had been set to the positions corresponding to the separate digits of the desired number. A dial transmitter is rotated by hand a certain angle of a whole revolution — the length of the arc described depending on the number of impulses to be transmitted — after which it is released, a spring causing it to return with constant speed determined by a regulator to its normal position while sending out the desired number of impulses.



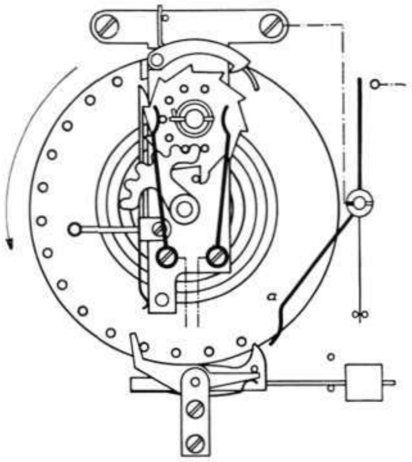
R 732

Actually, there are two different details of the dial mechanism that have been made the object of various inventions and modes of construction. The one is the device which prevents the sending out of impulses during the setting of the dial to the desired position, the other being the speed regulator. Also, in a few rare instances, attempts have been made to construct a device which would prevent all tampering with the dial during its impulse transmitting movement.

The speed regulator acts as a brake during the natural return movement of the dial, the principles adapted being those of mechanical friction brake, air friction brake, or pendulum of the clock pendulum type, used in clocks.

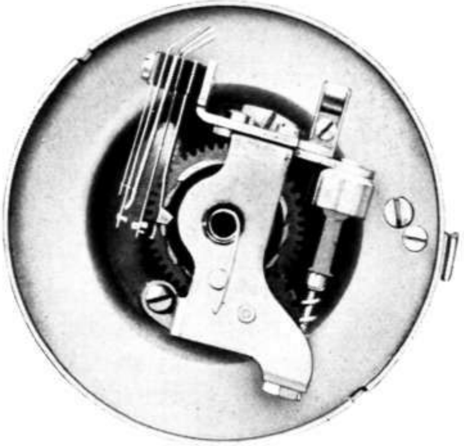
The first mentioned detail, i. e. for the prevention of impulse transmission during the setting of the dial, has, on the other hand, been the subject of numerous attempts on the part of inventors and designers to arrive at a satisfactory solution of this problem of construction.

The first — and also probably the most genial — solution of this problem is shown in fig. 1. In this construction the impulse wheel is provided with a number of pins fixed so that they stand out at right angles from the face of the wheel and so that they form an arc just inside the periphery of the wheel. An extension of the impulse contact spring is formed as an arm *a*, the extremity of which is spatulate shaped and bent at an angle. When the disc is actuated, the pins come in contact with the spatulate end of this arm and force it over to one side or the other, depending on the direction of the rotary movement. During the setting of the disc the arm is pushed over on the outside of the pins, causing the contact spring to move away from the point of contact; when the disc returns to its position of repose the end of the arm is



R 733 Fig. 1.

brought over to a position inside the arc of pins and the contact spring closes its contact each time the arm is pushed over by one of the passing pins, thus transmitting a number of current impulses equal to the number of pins that have passed. A number of diffe-



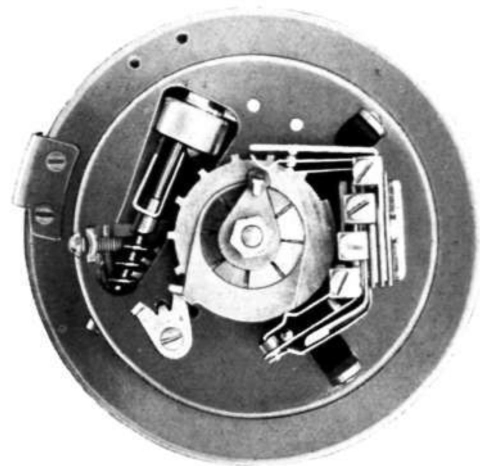
R 727 Fig. 2.

rent types of impulse wheels have since been constructed on this same principle with a view towards making them cheaper. Thus, they have often been made of pressed sheet metal with impulse teeth or pins placed at an angle, either in a radial or an axial direction. An impulse transmitter of this type is shown in fig. 2.

A very similar design is shown in fig. 3, the aforementioned arm being replaced by a pivoted tilting lever arm which moves away from the contact springs when the disc rotates in the one direction and actuates the springs when the disc rotates in the other direction, thus giving the desired number impulses.

R 726 Fig. 3.

A serious disadvantage with this type of construction is that the tilting lever can jam against the first impulse cam when the movement of the disc is reversed and it starts to return to normal. This can be avoided by fixing the pivot of the tilting lever to one of the impulse springs or to an intermediary spring, thus providing the tilting lever with a movable point of suspension.



R 730 Fig. 4.

In the impulse sending device shown in fig. 4, the transmission of impulses during the setting of the dial is prevented by means of a loose, protecting cam placed beside the impulse wheel and which is pressed against this latter by means of a spring. The movement of this cam is limited by two stops. The cam has the added function of preventing the transmission of impulses also during the first part of the return movement of the disc. This impulse transmitter has the advantage of an almost noiseless functioning during the setting as well as during the return movement.

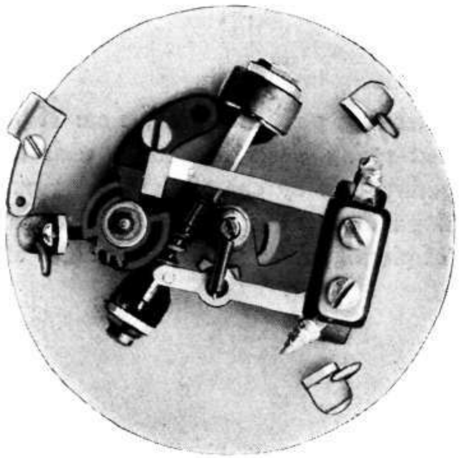
R 729 Fig. 5.

R 728 Fig. 6.

Fig. 5 shows an impulse transmitter which is an improvement of the foregoing although it functions on practically the same principle. The spring that presses the protecting cam against the impulse wheel also strives to give the cam a rotary motion in the same direction as the impulse wheel when its movement is reversed. This arrangement provides a certain guaranty for the immediate resetting of the cam to its new position.

All of the above mentioned impulse transmitters have one feature in common, i. e. the impulse wheel is attached to and follows all the movements of the perforated disc of the dial.

The impulse transmitters shown in figs. 6 and 7 are built on a different principle, the rotating movement of the impulse wheel being in one direction only. This construction permits the elimination of all devices for preventing the transmission of impulses during the setting of the dial, since the impulse wheel is at rest during this movement. Instead, it is necessary to equip the impulse wheel with a couple of locking devices, the one to prevent it from rotating during the setting of the dial, the other to lock it to the disc of the dial during the return movement of the latter.



R 731 Fig. 7.

Besides the above described impulse transmitters there are others of entirely different types. Since these are very seldom used, however, they will not be taken up for discussion.

Stockholm 1927. Kurt Lindberg, Boktryckeriaktiebolag.