## The



## L.M.Ericsson

# Revicu 

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IMPULSE MACHINE.

# Automatic Voting. 

The idea of using automatic electrical devices for voting purposes is by no means new. Already before the Great War a system for automatic voting had been worked out at L. M. Ericsson's Petrograd works for the Russian Duma. For some unknown reason, however, this system was never put in practice. At the beginning of this year tenders were requested for a similar installation for 200 voters for the use of the Finnish Parliament in Helsingfors. In the Swedish Parliament, a resolution to adopt division or open voting was passed in February of this year, and it has been suggested that automatic voting devices be introduced here as well.

Quite a number of inventors and designers have attempted to solve the problem of automatic voting. In connection with the requests sent out by the Finnish Parliament, which have reached the Stockholm works through the offices of the Finnish subsidiary company this problem has become actual for L. M. Ericsson, and the description of arrangements for automatic voting which is hereby presented to the readers of the „L. M. E. Review is based in principle on the proposed scheme submitted in answer to this request. It must be regarded as a decided advantage that the proposed system
has been based entirely on the use of existing details of construction, the reliability of which has already been established.

A circuit diagram for an automatic voting device for open voting is shown in fig. 1, only the three first positions - 1,2 and 3 - being shown. Each position is equipped with two keys, the one for the Ayes or Yes votes and the other for the Noes. If the voter desires to neutralize his vote, both keys are depressed. The keys are not furnished with any manner of locking device, but return to normal when released. Each position is equipped with 3 relays, i. e. a counting relay $R R$, a relay $I R$, actuated by means of the Ayes key, and a relay $N R$ actuated by means of the Noes key. In addition, position 1 has a fourth relay $F R$ whose function is to prevent duplication of votes. All of these relays are mounted on a relay rack.
All the positions have a common impulse machine, consisting of an electric motor (not shown in figure) which drives the two impulse discs $K_{1}$ and $K_{2}$. The impulse disc $K_{1}$ actuates its two contact devices $a$ and $b$ so that contact $a$ is closed slightly longer than during the first half-revolution of $K_{1}$, and contact $b$ slightly longer than during the second half-revolution. Thus
both contacts are simultaneously closed during a very short period.

The impulse disc $K_{2}$ closes and breaks its contact $c$ twice during one revolution. The first closing takes place while contact $a$ is closed and the second while $b$ is closed. The time during which contact $c$ is closed is much shorter than for contacts $a$ and $b$, however.
struction as the standard Ericsson subscribers' meter for telephone exchanges, with the exception, however, that they are furnished with an arrangement for restoring to normal after having been read. Special arrangements with panels on which the total numbers of votes are indicated by means of illuminated numerals - clearly visible to the entire assembly - can also be furnished.


The function of the registers or vote meters is to sum up the total number of votes cast. They are four in number, i. e. one for summing up the Ayes, one for the Noes, one for the Neutral votes, and lastly a control meter which sums up the number of positions from which no vote has been given. By means of this last meter an absolutely reliable check on the correct functioning of the system is obtained, since the sum of the registered totals must always be equal to the number of positions for which the system is built. The meters can be of the same con-

The upper part of fig. 1 represents a lamp indicator with two lamps - one for Ayes and one for Noes - for each position. The Ayes and Noes lamps are furnished with lenses of different colours, for instance white for the Ayes and red for the Noes. The actual appearance of such a lamp indicator is shown in fig. 2. The numbers denote the different positions.

The chairman controls the voting device by means of 4 switches.

The closing of switch $A$ connects positive to the position keys so that relays $I R$
and $N R$ energize when these keys are depressed.

The closing of switch $B$ connects positive for the locking of relays $I R$ and $N R$.


The closing of switch $C$ starts the impulse machine and connects positive to its contacts $a, b$ and $c$. A holding circuit for the relay $F R$ of the first position is also simultaneously closed.

The closing of switch $D$ connects up the lamps on the lamp indicator.

These switches $A, B, C$ and $D$ are given the form of simple push buttons with mechanical locking, i. e. they remain in their depressed positions until again raised by hand. Since these keys, however, are not able to withstand the tension used in the various circuits, intermediate relays are used for closing these circuits, these relays, in turn, being actuated by means of the keys.

The function of the counting relays $R R$ is to close the circuit for the counting impulses sent out over contact $c$ of the cam disc $K_{2}$. The switching process is as follows.

When switch $C$ in the chairman's position is closed, the impulse machine is started in the manner already stated. The counting relay $R R_{1}$ of the first position is energized simultaneously with the closing of contact $a$. A moment later the impulse contact $K_{2} c$ is closed and a first counting impulse is sent out over contact $R R_{1} c$. When the cam disc $K_{1}$ has rotated almost one
half revolution, its contact $b$ is also closed, resulting in the energizing of relays $F R$ and $R R_{2}$ through the closing of the circuit for $F R$ over $R R_{1} a$, and for $R R_{2}$ over $R R_{1} b$. Relay $R R_{2}$ is held to negative directly over its contact $a$, making it independent of relay $R R_{1}$. Relay $F R$ is held over its contact $b$ and the switch $C$. $F R$, which remains energized until switch $C$ is restored to normal, breaks the circuit for $R R_{1}$ so that this relay cannot be again energized. A moment after the energizing of relay $R R_{2}$, a second counting impulse is sent out over $K_{2} c$ and $R R_{2} c$. When the cam disc $K_{1}$ has again rotated almost one half revolution, its contact $a$ is again closed, causing the counting relay $R R_{3}$ of the third position to be energized over contact $b$ of realy $R R_{2} . R R_{3}$ is held over its contact $a$ thus remaining energized after the de-energizing of $R R_{2}$, which takes place when contact $K_{1} b$ is broken a moment after the energizing of $R R_{3}$. A third counting impulse is now sent out over $K_{2} c$ and contact $c$ of relay $R R_{3}$.

When the cam disc $K_{1}$ has again rotated almost one half revolution, the counting relay of the fourth position is energized, a fourth counting impulse being sent out, etc. This continues until the counting relays of all the positions have been actuated once. The speed of the impulse machine as well as the adjustment of the relays are balanced so as to give each counting impulse a length of abt. ${ }^{1 / 3}$ second, with $1 / \mathrm{s} \mathrm{sec}$. intervals. Thus, with a device for


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200 positions, about $\frac{2 \times 200}{5}=80 \mathrm{sec}$. (1 minute
20 sec .) is required for all the members to vote.
A counting impulse - sent out over contact $c$
of an energized relay $R R$ - can be directed over 4 different circuits. For a vote with the Ayes, relay $I R$ of the position is energized. The impulse is led over the contacts $I R c$ and $N R d$
members who so desire have cast their votes, the chairman restores the switch $A$ to normal. It is now impossible for any voter to change a vote already made, as the current which actuates and actuates the Ayes meter, this latter registering one vote. If the Noes relay $N R$ is energized, the impulse is led over the contacts $I R b$ and $N R c$, actuating the Noes meter. If the voter desires to remain neutral he depresses both keys and the Neutral meter is actuated over contacts $I R c$ and $N R e$. Finally, if no vote whatever is returned from the position, the Control meter is actuated over contacts $I R b$ and $N R b$.

If desired, the positions can be equipped with three keys instead of two, i. e. one for the Ayes, one for the Noes and one for Neutral. In such a case, the Neutral key is wired so as to actuate both position relays when depressed.

The procedure when voting with the aid of the above device is as follows:

The chairman closes switches $A$ and $B$ and requests the members of the assembly to cast their votes. Each voter votes in the position

which has been assigned to him and where his voting keys are placed by depressing the desired key for a short moment.
After having convinced himself that all the


Fig. 5.
the relays $I R$ and $N R$ over the voting keys is broken in $A$.

The counting of the votes now takes place by closing switch $C$. The counting relays $R R$ are now brought into function, transmitting their impulses over the relays $I R$ and $N R$. These relays divide the impulses into 4 categories, which are separately registered by the fcur meters.

When the automatic device has completed its function, the chairman is apprized of this fact by a lamp which is made to glow by the energizing of an extra relay, this latter being energized over the relay $R R$ of the last position. A diagram of this circuit is shown in fig. 3, which shows the counting relays $R R_{199}$ and $R R_{200}$ of the last two positions together with the extra relay $L R$ in the last position. This relay $L R$ is energized simultaneously with $R R_{200}$ and is held over its own contact and the switch $C$ at the chairman's position. The lamp $L$ glows. The switch $C$ can now be restored to normal, stopping the impulse machine. The extra relays of the first and last positions de-energize and the lamp $L$ ceases to glow.

The closing of switch $D$ brings the lamp indicator in circuit and its lamps indicate the outcome of the voting. The various vote totals may
be read on the meters, and their sum shall be equal to the total number of positions.

When switch $B$ is restored to normal, all the relays $I R$ and $N R$ de-energize and the indicator lamps cease to glow. Switch $D$ is also restored to normal and the meters again point to 0 .

The above described device is an automatic voting machine of the most simple form for open voting. It is necessary, however, to figure with cases where special conditions or requirements call for the solving of other problems. Descriptions of certain other arrangements for which a necessity may arise are given here below.

## Automatic recording of votes.

Three Morse recorders are connected in parallel with the Ayes, Noes and Neutral meters, all

three recorders having one common tape, the appearance of which is shown in fig. 4. The feeding device for this tape is actuated by the same motor that drives the impulse machine, a perfectly synchronized tape feed in relation to the impulse transmission being obtained by means of perforations along both edges of the tape similar to those which occur on cinema films. The projecting teeth of the feeding wheel engage these perforations. A strip of tape 1 cm . long is allotted to each position and furnished with the number of the corresponding position. The three recorders function simultaneously with the meters when the tape is fed forward synchronously with the impulse transmitting during the voting proceedings and a record of how the various positions have voted is automatically made. This record tape, which for 200 positions
has a length of 200 centimetres, is referred to when the list of voting members is being made out later on.

An automatic record may also be obtained by making a photographic reproduction of a lamp indicator similar to the one hereinbefore described, but of much smaller dimensions. The size of such an indicator for 200 positions is not more than abt. $220 \times 265 \mathrm{~mm}$. This indicator is equipped with lamps of the type in general use at telephone exchanges, so-called switchboard lamps. Each lamp is masked so that a clear, sharp outline is obtained. All of the lamps are white, but the Ayes lamps are distinguished from the Noes lamps by means of black crosses painted on a

pane of glass which covers the whole front of the indicator.

A sheet of photographic printing paper is placed in a printing frame and secured in front of the indicator. This paper is exposed when the lamps glow and is developed and fixed in the usual manner, giving a picture of the lamp indicator with round black spots showing against a white background wherever lamps have been lit. The lamps for the Ayes are distinguished from those for the Noes by means of white crosses over the black circles.

The print is placed under a transparent chart, ruled into squares and numbered to correspond with the marking of the positions on the indicator, after which the results are easily read. One might also use printing paper ruled and numbered in advance, in which case ink or co-
lours which will not disappear in the developing or fixing baths must be used.

The main advantage of the photographic record is its convenient size. The necessary arrangements are also much cheaper than those required for printing with Morse recorders. One disadvantage, however, is that the photographic print requires developing, fixing, washing and drying before a finished record is obtained. The printed tape record, on the other hand, is immediately ready for use.
The advantage of using one of the above described automatic recording systems is easily understood. It is not at all necessary for the secretary to make out a list of the voting members during the proceedings and with the aid of the lamp indicator, but this may be done at the time which best suits him.

Indicator with illuminated numerals for giving vote totals.
An indicator chart on which the voting results are shown by means of illuminated figures is mounted in the assembly room. Three special electrical switching devices for lighting the various lamp combinations are connected in parallel with the meters for the A yes, the Noes and the Neutral votes, the principle of the circuits being shown in fig. 5. $V_{1}$, $V_{10}$ and $V_{100}$ are three selectors, each with 10 positions. Each of the selectors $V_{1}$ and $V_{10}$ are furnished with three rows of contacts, while the selector $V_{100}$ has only one row. Each position contact in row $A$ is connected to a relay $R_{1}$ to $R_{0}$. This holds good for the two selectors $V_{1}$ and $V_{10}$ only, $V_{100}$ having only as many relays as
correspond to the hundreds digits. Thus if the device is for 300 positions, only 3 relays are connected to the positions 1,2 and 3 . Relays $R_{1}$ to $R_{0}$ are for the connecting up of the lamp combinations which form the numbers.

The selector magnet $V_{1}$ is parallelled with the vote meter, $O$ being the normal position for all the selectors. The device functions in the following manner:

When the counting impulses are sent out and registered by the vote meters, the selector magnets $V_{1}$ will also be actuated. The selector whose electromagnet is thus parallelled with the meter for the counting of the Ayes, therefore, will be stepped forward one step for each of the Ayes counted. In positions 7,8 and 9 relay $V R_{1}$ is connected up. The circuit for $V R_{1}$ is again broken in the position 0 , but this relay is so slow to de-energize that the electro-magnet $V_{10}$ has time to energize and step the selector $V_{10}$ forward one step each time the selector $V_{1}$ passes its 0 position, i. e. for each ten votes counted. Selector $V_{10}$ is furnished with a device similar to the one on $V_{1}$, for stepping selector $V_{100}$ forward one step for each one hundred votes counted. When the vote counting is completed the selectors $V_{100}, V_{10}$ und $V_{1}$ stand in the respective positions corresponding to the hundreds, tens and units digits in the total. The lamp combinations forming the vote total are now connected up over relays $R_{t}$ to $R_{0}$. There are three such combinations, i. e. one for the hundreds digit, one for the tens digit, and one for the units digit

One lamp combination is composed of 8 lamps furnished with special reflectors and placed in the positions shown in fig. 6. All figures from 1 to $O$ can be obtained out of such a combination by the lighting of different lamps. The reflectors screen the light and give it its proper contour. These contours are softened by placing a pane of frosted glass in front of the whole device, giving the figures a more natural appearance.

Fig. 7, lastly, shows how the lamps are connected up over relays $R_{\mathrm{t}}$ to $R_{0}$.

The selectors $V$ are automatically restored to their 0 positions when, after the voting is finished, the chairman switches off the current.

## Device for voting with ballots.

In such cases where ballots are used, the above described devices must be modified to a certain extent. The lamp indicator, showing how each position has voted, is naturally eliminated, as is also the case with the Morse recorders for automatic recording of votes.

At that time, when ballots were still used in the Swedish Parliament, the casting vote was determined in the following manner.

After all the voters had placed their folded ballots in the ballot box, one of these ballots was withdrawn, sealed and laid aside. If, at the count, the Ayes and Noes were found to be of equal number, the sealed ballot was opened and its vote constituted the casting vote. With an unequal number of votes, the sealed ballot was left unopened.
The withdrawing of a casting vote can also be automatically arranged, a schematic circuit diagram for such an arrangement being shown in fig. 8. The chairman's position is equipped with two control switches $E$ and $F$ and two lamps. $B R_{1}$ and $B R_{2}$ are two relays for cutting out an Ayes or a Noes impulse, and are connected in parallel with the corresponding vote meters. $L R_{1}$ and $L R_{2}$ are two relays for connecting up the two lamps in the chairman's position, and $S T R$ is a starting relay. This relay is connected to the contact of the cam disc $K_{3}$, which is on the same shaft as the cam
discs $K_{1}$ and $K_{2}$ and rotates synchronously with these. $K_{3}$ is adjusted so that its contact is closed when the contact of $K_{2}$ is broken, and vice versa. This arrangement functions in the following manner:
Switch $E$ is depressed by the chairman at an arbitrary moment during the counting of the votes. The relay $S T R$ is energized in the same moment as the contact of the cam disc $K_{3}$ is closed, i. e. during a pause in the impulse transmission from $K_{2}$. Relay STR holds itself over its contact $b$ and remains energized until the chairman restores the switch $E$ to normal after the count has been completed. The contact $S T R a$ is now broken and the relay is no longer influenced by the impulses transmitted by $K_{3}$. Relay $S T R$ connects negative to relays $B R_{1}$, $B R_{2}, L R_{1}$ and $L R_{2}$. The first counting impulse sent out by $K_{2}$ after the energizing of $S T R$ will actuate one of the relays $B R_{1}$ or $B R_{2}$, depending on whether it is an Ayes or a Noes impulse. Let us suppose that it is an Ayes impulse. Relay $B R_{1}$ energizes over contact $S T R d$ and attracts its armature, remaining energized over its own contact $b$. Contact $B R_{1} a$ is broken, disconnecting the meter for the Ayes. On account of the speed with which this relay works, the counting meter does not have sufficient time to start functioning.

Simultaneously with the energizing of $B R_{1}$, relay $L R_{1}$ is energized over the contacts $B R_{1} c$ and $S T R e$ and is held over its contact $c$. Contacts $L R_{1} a$ and $b$ are broken, preventing further energizing of relays $B R_{1}$ and $B R_{2}$.

At the end of the counting impulse relay $B R_{1}$ is again de-energized, and it is then impossible for either this relay or for relay $B R_{2}$ to energize again since positive has been disconnected by relay $L R_{1}$.

Relay $L R_{1}$ remains energized until the chairman restores the switch $E$ to normal. This relay, therefore, has cut out an Ayes vote from the reckoning and registered it, having performed the same manoeuvre as when a ballot is removed from the ballot box and laid aside.

If it is a Noes impulse, the same manoeuvre as above described will be performed by relays
$B R_{2}$ and $L R_{2}$ when $S T R$ is energized. This will cause one of the Noes to be cut out of the reckoning. It is absolutely impossible for the person controlling the connecting in of this device to influence the result in one way or the other but chance is the only determining factor, as is the case with the withdrawing of a written ballot.
If the Ayes and Noes are equal in number, the chairman throws the switch $F$, causing either the Ayes or the Noes lamp to glow, depending on which vote has been cut out. All the relays deenergize when $E$ is restored to its normal position.

## Consumption of power.

Power for relays, lamps, the impulse machine and the vote meters is furnished by a 24 -volt storage battery. A voting device for 200 positions requires about 1.5 ampère hours for one complete voting, the maximum consumption amounting to about 18 ampères. These figures are based on the assumption that all positions take part in the voting and that the voting relays $I R$ and $N R$ and the indicator lamps are in circuit for an average of 5 minutes.
A battery with a capacity of say 30 ampère hours, therefore, will last for 20 votings without having to be recharged. If D. C. is available, the battery can easily be recharged with the aid of resistance lamps. If the public net is A. C. a motor-generator or pole changer will be required. Recharging of the battery by means of either D. C. or A. C. can take place while the voting proceedings are going on without the slightest inconvenience.

## Requirements.

To be absolutely reliable an automatic voting device must satisfy very exacting demands. It must be easy to maintain, must function speedily and accurately and be self-controlling.
As is evident from the above description, its operation is the most simple imaginable. The person who leads the proceedings need only request the members to vote. After the voting is finished, all he need do is to operate the switches in their correct order. After that, the functioning of the system is entirely automatic, the only thing necessary being to read off the results on the meters and to restore the switches to normal.

For the purpose of obtaining the highest possible factor of safety, all heavily stressed contacts are of a very sturdy construction. The contact devices of the impulse machine are of the same construction as those used in telephone exchanges where the stresses are much greater than in the present case. The impulse machines being the only moving parts in the system, wear has been reduced to a minimum. Speed is one of the main requirements in automatic voting devices and in this respect the above described device undoubtedly fills all reasonable demands.

Automatic control is taken care of by the control meter. With the use of a lamp indicator, double control is obtained, as the number of glowing lamps must be equal to the sum of the totals shown by the meters for the Ayes, the Noes, and the Neutral votes.
G. $G$.

## The Calcutta Telephone Exchanges.

The complete telephone plant of the city of Calcutta consists of four exchanges, and the L. M. E. Review has had the pleasure of receiving a number of photographs - reproduced herewith - from two of the newest ones. The exchanges are all built according to the common battery system with automatic periodic ringing, and are operated by the Bengal Telephone Corporation.

These exchanges are

The Main Exchange, giving service to 8000 subscribers and built by two English companies;
Burra Bazar, with a total capacity of about 5000 ค 250
 lines, the present equipment being for 3600 lines. This exchange is equipped with 12 local switchboards, each board with 3 positions, and 6 positions for junction traffic. Each Iccal operator, therefore, does not need to handle more than 100 lines, which must be regarded as a very low figure;

The South Exchange, with a capacity of 3600 lines, the present equipment being for only 1600 lines.

These last two exchanges are equipped almost entirely with material furnished by L. M. Ericsson in Stockholm. In addition, material from the old magneto exchange - delivered by L. M. Ericsson
in 1905 - has also been used. Only the frame work of the switchboards and the jackstrips of this old exchange have been utilized, however. The jackstrips, strangely enough, were found to be perfectly serviceable after having been only slightly altered so as to fit in with the new system;
Howrah, with approximately 1000 lines, and situated in the oldest section of Calcutta (the Hindu town). Thisexchange was delivered in 1912 for junction traffic with the abovementioned magneto exchange, but was rebuilt according to the common battery system in connection with the building of the Burra Bazar and South Exchanges.

The operating company has taken a serious interest in the junction traffic between these four exchanges, the various arrangements having been very carefully planned so as to make this service as efficient and speedy as possible.

The fundamental principle for the junction traffic is that all orders for junction lines are made over special order wires. Furthermore, the junction lines are furnished with automatic ringing sent out from the receiving exchange. Thus, the ringing current is never carried over a junction line but is sent out directly over the desired

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R 180
The Main Distributing Frame, Burra Bazar.
subscriber's line. Lastly, the connecting is accomplished so that even if the operator should make a wrong switching operation, no disturbing signals will result therefrom.

A connection between a subscriberat theexchange A and another subscriber at the exchange $B$ is accomplished in the following manner.

After having received the desired number from the calling subscriber in the usual manner, the A-operator calls the operator at the exchange $B$ over an order wire and re-


R 182
The Operating Room, South Exchange.


R 251
The Line Relay Rack, Burra Bazar.
peats the number. The B -operator then gives the number of an idle junction line, and immediately plugs in the called subscriber's line if it is idle. A ringing signal is then sent out from the Bposition as soon as the A -operator has plugged in the junction line. This signal is periodic and does not cease until the called subscriber has answered, regardless of whether this latter answers during a signal or during the interval between two signals.

If, on the other hand, the called
subscriber is busy, the B-operator gives a » busy back signal by plugging in a line which causes the periodic glowing of the clearing lamp of the A-operator's ringing cord. Thus, the A-operator need not wait for information as to whether the called line is idle or not, thereby increasing the speed of the service. Simultaneously with the flashing of the busy back lamp, a busy tone is sent out to the calling subscriber. When the A-operator disconnects, the clearing lamp of the B-cord glows in the usual manner, after which the B-operator also disconnects.
The following extra features form apart of the switching operation. A ringing signal is not sent out over the B-cord until the A-operator has introduced her plug. Should the latter make a mistake and introduce the plug into a wrong junction line, the clearing lamp of this junction line will glow. It is then possible


R 184 The Main Distributing Frame and Line Relay Rack, South Exchange.
ringing cord glows as soon as this cord is plugged into the junction line jack, regardless of when the B-operator plugs in, and does not cease to glow until the called subscriber answers at the B -exchange.

If the $B$-subscriber neglects to replace his microtelephone at the end of the conversation, and the A-operator becomes aware that a pair of cords is occupied for too long a time with only one clearing signal on the answering cord and therefore takes down the connection, the ringoff lamp of the B-cord will nevertheless be made to glow.

As a result of the foregoing, it is possible for the B-operator - when the number of an idle junction line is requested - to give the number of a line standing with a clearing signal, and, after having received the new number, she can move the plug directly over to the new line.
The climate of Calcutta is unusually damp, especially during the rainy season. It has been claimed to be even more trying, in this respect, than that of Java, depending on the great difference between the day and night temperatures. Also, the telephone material has been manufactured with due regard to the requirements of such severe climatic conditions.

As previously mentioned, the plant for the

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recently completed exchanges has been furnished by L. M. Ericsson in Stockholm, the construction work having been done by the Telephone

Corporation, which has also put the exchanges in operation. Also, the entire wiring of the switchboards has been done in Calcutta.

## The Madrid Exhibition of Telephone and Kindred Appliances.

$\mathrm{A}^{\mathrm{H}}$n exhibition of electric material and apparatus was held in Madrid during the month of December 1924, the exhibits consisting chiefly of telephone and radio material.
L. M. Ericsson's were represented by their general agent in Spain, Casa de R. Prado, as well as by their newly formed subsidiary company, Compañia Aspañola de Telefonos Ericsson S. A.
Telephone material, including instruments,
switchboards and a full automatic telephone exchange, as well as radio material - component parts, valve sets and crystal sets - were demonstrated at the Ericsson stand, a view of which is herewith reproduced. A complete time control plant was also exhibited.

The exhibition could boast a very large attendance and the automatic exchange, in particular - which was connected up and in full working order - attracted an unusual amount of interest.


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## $\mathcal{L}$ M.Ericsson

The New Poland.

AN ECONOMIC SURVEY.

$\mathrm{A}^{\prime}$the close of the Great War of 1914-1918, the ancient state of Poland was born anew out of the ruins of a few of the participating countries. In its declaration of independence, this country has finally seen its century-old efforts for the unity and independence of Poland - dreamed of by generation after generation - crowned with success.
Present day Poland covers an area of 386,634 square kilometres, ranking sixth among the countries of Europe. Although its area is smaller than that of Sweden, its population is about five times as large. According to the latest statistics, the population amounts to almost 30 million inhabitants. This population, however, is not very evenly distributed, the western and southwestern parts of the country,knownasGreater Poland, being much


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open and unprotected towards both the East and the West; only towards the South do we find a natural protection provided by the Carpathian mountains.
In point of language, the population of the country may be classified as follows:
20.7 millions, or 69 \% of the entire population, are Poles;
4 millions, chiefly in the southern and southeastern parts of the country, are Ruthenians;
1.5 millions in the East are White Russians,
1.5 millions in the West are Germans.
In addition, about 2.5 million jews are scattered over the whole country, the greater part of them living in Congressional Poland and Galicia. Some Lithuanians and Greater Russians are also to be found, but they constitute only a very small part of the whole population.

Modern Poland is a republic with a president as the chief executive. He is elected by both the sejmen and senate in common. From an administrative point of view the country is divided into 16 wodjewodstwo (provinces) which are subdivided into
prowiaty (counties), these latter being composed of gminny, or parishes. The capital is Warsaw with about 1 million inhabitants, $27 \%$ of which are jews. The city next in size is Lodz, an important industrial centre with about half a million inhabitants. Other large cities are Lwow (the old Lemberg), Wilno, Poznan, Cracow, Lublin and Bialistok

The fact that the different parts of the country belonged to several different governments before the Great War is responsible for the varying educational systems. Galicia was best circumstanced under the old rule, having had official Polish schools for very many years. The German possessions were also very well off, although all instruction in the Polish language was strictly prohibited. The degree of education was lowest in Congressional Poland where $60 \%$ of the population could neither read not write.

The new republic has had great difficulties to overcome on account of this great difference in the educational standard. Serious efforts have been made during the last years, however, for the raising of this standard. Enforced school attendance has been introduced so that during the school year 1920-21 the country's 26,100 public schools had a total attendance of about 4 million pupils. The lack of necessary space is acutely felt, however, several schools being used for separate forenoon and afternoon sessions. Also, the staff of teachers is inadequate. The higher education is taken care of by 780 both private and public high schools and a number of schools for special branches of education, such as technical, business, agricultural, art and industrial
schools. Poland has six universities, two engineering colleges, one mining college, one agricultural college, a dental college, a veterinary college, an academy of art, a normal school etc., etc.

The means of communication have given the authorities even greater difficulties to overcome than the educational problem. It is true that the republic took possession of a very widespread railway net, but its condition - after all the years of warfare - was more or less deplorable. After having repaired and rebuilt all the tracks, bridges and station buildings which had been destroyed, the government concentrated its efforts on procuring thenecessary rolling stock. The building of several new lines has been planned, construction work having been started on a number of them. The total length of all the railways now owned by the Polish Government amounts to 16,650 kilometres. Although these railways were operated at a considerable loss during the first years of Poland's independence, their financial status has now been considerably improved.

The very same conditions existed within the fields of telegraphy and telephony, these means of communication being also in a very poor condition when the present administration came into power. The toll lines had been repeatedly altered to satisfy the demands of the various occupying armies and were therefore far from adequate for the efficient service required in times of peace. The local nets, again, were either wilfully put out of commission or else in a deplorable condition for want of necessary care and maintenance. The country has now about 20,000 kilometres of toll
lines. The number of telephones amounts at the present time to about 109,000 , of which 45,000 are connected to the nets of the Polish telephone company, Polska Akcyjna Spółka Telefonyczna.

The highways in the western and southern portions of the country are in comparatively good condition, the eastern provinces leaving much to be desired even in this respect.
The least developed of all the means of communication, however, are the waterways, depending mostly on their shallowness and the abundance of sand which necessitates a systematic and radical regulating of the same. So far, only the Weichsel (Wisla) is in part furnished with canals.
The present government was forced, at the very outset, to combat severe financial difficulties. The country was desolate, the inhabitants on the verge of financial ruin, and the state treasury was empty. The various monetary mediums in circulation throughout the country - German, Austrian and Russian paper money, together with the "Polish mark» introduced by the Germans in 1915 - were all practically worthless, and a development of the country's finances on an unsound basis, therefore, was only to be expected. The expenses for the war against the bolshevists in 1920 drained the government treasury and it was found impossible to put a stop to the inflation of the stock market, the financial situation being brought to a crisis in the fall of 1923. The present secretary of the treasury, WI. Grabski, finally succeeded in bringing order out of chaos, chiefly by exacting the payment of the governments claims, such as taxes in arrears, custom duties, etc., and by stabilizing the monetary value, the gold franc being adopted as the standard.

This economical reorganization was introduced without delay, efficient methods for the collection of taxes being adopted and energetically applied. The printing of bank notes could be discontinued already on the lst of February 1924, the financial reorganization having been begun in December 1923. According to a decree of January 20th 1924, the zloty (gulden) was adopted as the standard monetary unit, the zloty being divided into 100 grosch. ( $\$ 1=5.18$ zloty).

An emissary bank, Bank Polski, standing under government control, was organized, its joint capital of 100 million zloty being fully subscribed in a comparatively short time. The banking law requires that $30 \%$ of the outstanding bank notes shall be covered by gold or gilt edged foreign securities and the balance by promissory notes or mortgage bonds. The security in gold has been much greater, however, amounting in October 1924 to $72 \%$, and to 52.89 \% at the end of the same year, the amount of currency and bank notes in circulation being 674 million zloty. At the end of its first year, the bank will probably be able to pay a dividend of $12 \%$. The usual bank rate for Poland is $10 \%$, with $12 \%$ for loans against colatteral and $8 \%$ for discounting foreign bills. The rates charged by private banks are almost the double.

The crisis brought about by the financial reform has naturally left its mark on the economic life of Poland, although probably to a lesser degree than in other countries. The present conditions seem promising, although it may be too early to make a definite statement in this direction. As last years crops were below the average, the outcome of the present crops are expected to play an important role. A decided improvement,
however, is already noticeable in certain industries, one of the most important causes being the repeal of the eight-hour law within the metal industries and the mining districts of Kattowicz and Sosnowicz. This repeal, which is to be enforced for six months, will undoubtedly be of great importance for these industries in their efforts to meet foreign competition.
The plans for sanitation include the raising of a 50 million dollar loan, for which negotiations with the United States are now being carried on. The fact that the assumed revenue for 1924 was $10 \%$ less than the actual revenue, while the expenditures did not overrun the calculated total, may be taken as proof that the countries finances have now been stabilized.

Thus, in the budget for 1924 , the expenditures amounted to $1,852,327,000$ zloty, while the revenue was $1,547,714,000$ zloty.

Thefinancial year, however, showed the following results: total expenditures, 1,629,276,000 zloty, and total income $1,703,158,000$ zloty, showing that the government revenue has exceeded the expenditures.

The national debt at the beginning of 1924 amounted to 1.74 billion gold francs, 0.23 billions being placed within the country. The remainder - 1.51 billions - is in the hands of foreign creditors, the largest one being the United States of America. The debts to this latter are in the form of credit given for food supplies during the years 1919 to 1921, before the country had resumed its normal agricultural activities after the war. Next in order is France, which has advanced considerable credit for financing the military defense of the country.

The national debt amounts to approximately


R 253

80 gold francs per inhabitant, which cannot be considered exhorbitant when compared with that of other countries.

Among the financial operations of the government may be mentioned the following: the raising of a loan in Italy of 400 million lire, for which the tobacco monopoly was given as security, and the leasing of the match monopoly to the Swedish match trust, for which the government received an immediate sum of 25 million zloty in addition to the regular yearly payments.

The commercial statistics for 1923 show an export surplus, but conditions were not quite so favourable during the past year, partly on account of the increased purchasing power, and partly on account of the failure of the crops, Poland's agricultural products constituting the main articles of export. Other importantarticles of export are lumber and wood products, coal, petroleum and petroleum products.

Necessary articles of import are cotton for the textile mills of Lodz, rich ores, coke, machinery, telephone material, electric cables, optical instruments, tools and food products, especially colonial produce.

Almost 50 : of the total area of the country had been under cultivation before the war and about $60 \%$ of the population are farmers, proving beyond a doubt that agriculture is the most important means of livelyhood. (About $14 \%$ follow industrial occupations, while trade and commerce cannot claim more than about $8 \%$ ). These figures have naturally suffered a decrease during the war, but at least $92 \%$ of the pre-war area is again being cultivated. Also, the live stock experienced a decided deterioration, both from qualitative and quantitative points of view. A
decided improvement could be noted already in 1921, however, an improvement which has been steadily growing during the last three years.

Lumbering is of very great importance for Poland from a financial point of view, more than $23 \%$ of the total area of the country being covered with forests, chiefly in the eastern and southern parts. The government is the largest forest owner, $31 \%$ of all the forests being in its possession. The wood-products industries are of equal importance; 23 million cu. metres of lumber and finished products are produced each year by 1400 saw mills with a total of 2000 saw-frames, 200 planing and joining mills, 4 wood-pulp factories and 17 match factories. 1.8 million cu. metres of finished and 2.1 million cu. metres of unfinished wood products with a total value of 133 million gold francs were exported by Poland in 1923.

It may be mentioned in this connection that the sejmen has decided to pass a new land reform law. As such a step


R 254
Iron-works in the Sosnowicz Coal District.

An area 400 km . in length and 20 km . wide on the northern slope of the East Carpathians is exceedingly rich in petroleum but has not yet been exploited to any great extent. The wells already drilled have given a very abundant yield. The yearly production amounts to about 7 million tons, this entire amount being refined within the country. Only the refined products, such as benzin, kerosene or coal oil, gazoline, paraffin and oils are exported, the country's own consumption amounting to about one half of the total production. Natural gas is also of the utmost importance for the country, about 400 million cu . metres being consumed annually for heating and lighting purposes. These districts also contain layers of mineral wax, yielding abt. 800 tons per year. Not less than 22,000 workers are employed in these various industries.
The iron ore resources of Poland are estimated at 1.5 billion tons, about 500,000 tons being mined yearly. Zinc and lead ores are also of great importance, and about after a great deal of careful planning it may well be understood that the present government has taken all possible precautions in the solving of this problem.

In addition to the aforementioned wood-working industry, several other industries may well be expected to thrive and flourish on account of the rich natural resources of the country, such as coal, lignite, ores, petroleum and salt. The coal fields of Polish Schleswig cover an area of $4,000 \mathrm{sq} . \mathrm{km}$. and are estimated at 50 billion tons, the yield being 36.5 million tons per year for coal and 200,000 tons for lignite. The yearly coke production amounts to 1.5 million tons. The coal mining industry alone employes 230,000 workers. 120,000 workers are employed in the mining and metallurgical industries.

Another branch of the mining industry is the extensive and century-old salt mining in Galicia. The mines of Wieliczka - many of them with shafts almost 300 metres in depth - are especially well known. The yearly production amounts to about 300,000 tons.
The farming industry of Poland is also able to make good use of large quantities of a natural soil fertiliser termed kainit (yearly production abt. 60,000 tons) of which large deposits are to be found in the northwestern Carpathians.

Among other industries for which the necessary raw material is obtainable within the country may be mentioned 14 cement factories whose
output during 1923 amounted to 5 million bbls., 81 glass factories employing 12,000 workers and exporting $35 \%$ of their total production, and stone quarries (marble from Kielce and granite).
The above gives a vivid idea of the great possibilities which exist for the development of the industries of Poland, especially when considering the fact that only a small percentage of the country's rich natural resources has as yet been developed.
A large amount of farming produce is consumed by the country's 76 sugar refineries. Sugar beets are cultivated over an area of 141,000 hektars, sufficient for a yearly production of 375,000 tons of sugar, 12,000 tons being exported.
The extensive textile industries, on the other hand, must purchase the necessary cotton from other countries. In 1914 the 1,166 textile factories
within Congressional Poland employed a force of 150,000 workers. The factories in other parts of the country numbered 260 , with about 13,000 workers. Most of these factories were destroyed during the war, but already in 1923500 mills giving employment to 135,000 workers were again in operation. 129 of these factories produced articles of cotton, 246 produced articles of wool, and 67 were dyeing establishments. The production amounted to 24,000 tons of woollen goods, 72,000 tons of cotton goods and 1,600 tons of linen goods.

The quality of Poland's textile products is second to none, wherefore they are well able to take up competition with goods of other manufacture and are constantly acquiering new markets.

## CRYSTAL RECEIVER



TYPE PF 100 28 A MOST ATTRACTIVE AND EXTREMELY EFFICIENT SET FOR THE BROADCAST BAND

## Swedish Telephone Activities in Poland.

Athe result of an international competition held by the Russian Government in 1901, the Cedergren Telephone Company of Sweden was successfull in obtaining the concession for the operation of the telephone net of Warsaw and surrounding districts. This public competition consisted of two separate contests, the first one being solely for the purpose of determining the technical and economic ability of the various competitors. Those who were fully able to meet the rigorous requirements of this first contest were then permitted to take part in the second one, carried out on the basis of minutely specified stipulations for the operation of the net, the determining factor being the lowest average yearly subscription rate for a subscriber's set connected directly to the main exchange. The Swedish concern submitted a bid of 69 rubels (abt. 131 Swed. cr.) for the yearly subscription rate, and was successful in obtaining the concession for a term of eighteen years. According to the contract an agreement with the Russian Government was to be arrived at three years before the expiration of the concession, whereby the Government should either take over the net or prolong the concession.

Should it be found impossible to arrive at an agreement, the net should remain in the possession of the operating company, this latter being then required to remove all of its plant.

The Telephone net of Warsaw - previously owned by the International Bell Telephone Company and built according to the local battery system - was very small and the equipment in poor condition at the time the Cedergren company tock charge of it. The Swedish company, however, built an entirely new and modern plant according to the common battery system, at the completion of which the net expanded with surprising alacrity so that in 1914, at the outbreak of the Great war, the number of subscribers amounted to 33,000 . In 1915, at the occupation of Warsaw by the German army, all private telephone traffic was inhibited, this state of affairs being enforced - in spite of the company's protests - during the whole time of occupation, i. e. until the end of 1918. The telephone net was used by the German military authorities for military purposes only. As soon as the Germans had evacuated the territory, the Cedergren company again took possession of its property and resumed opera-
tions to as great an extent as was then possible. It was then ascertained that the Germans had removed all bronze wire from the net, thereby putting a great number of subscribers' lines out of commission. A large amount of other equipment had also been carried away during the German occupation.

The first Polish administration, which was socialistic, remained in power for such a short time that negotiations were never taken up with the same. This was done with the following Paderewski administration, however, but did not lead to any result as it, also, remained but for a short time.


R 259
Map of Poland.
(The zones operated by the new Telephone company are indicated by shaded circles.)

The Great war and the ensuing occupation of territory had prevented all negotiations with the government concerning the fate of the telephone net at the expiration of the concession. Thus, the company's position as against the new Polish Government was such that it owned and operated an extensive and valuable telephone plant in the city of Warsaw without having the necessary concession therefore.

Under Wito's administration, former chief engineer Tolodsku of the St. Petersburg telephone net was appointed Postmaster General, but remained in office for only a short time. His successor Steslowicz retained this office during the remainder of Wito's administration as well as under the following one, led by Ponikowski. Steslowicz was very desirous of coming to terms with the Swedish company, although he very
naturally did his utmost to promote the interests of his country at the same time. Representatives, not only from the Postal Department, but also from the Treasury Department, the Department of Commerce, the Office of Works, the Attorney General and the magistrate of Warsaw took part in the lengthy proceedings which now followed, the Swedish company being forced to accept as a basis for the negotiations the fact that the existing financial conditions in Poland did not permit the taking over of the telephone net on the basis of a cash settlement. The only solution was to obtain a new concession, whereby the company through its own efforts might receive interest on and pay off the invested capital. The terms stipulated by the Postal authorities for the granting of such a concession, however, included the rebuilding and operation of the telephone nets in Lodz, Lemberg, Lublin, Bialystok, the petroleum district of Boryslaw and the coal fields of Sosnowicz, these nets having been destroyed during the war. Also, the government wanted to be a stockholder in the enterprise.

An agreement was finally arrived at whereby a new Polish company was formed in which one half of the stock and the technical and administrative leadership was retained by the Swedish company, a substantial interest being obtained by the government. The telephone net of Warsaw was then sold to this company by the Cedergren Telephone Company, government bonds redeemable after 25 years being received in payment therefore. The joint capital of the new company was paid up in the following manner: the abovementioned telephone nets valued at approximately $3,000,000$ Swedish crowns were handed over to the company by the government, the Cedergren company contributing the necessary capital - amounting to abt. 3,500,000 crowns - for the rebuilding of the same. In addition, about 500,000 crowns were invested in the enterprise by private Polish interests, thus bringing the joint capital up to abt. $7,000,000$ Swed. crowns, or $10,000,000$ Polish zloty. The Polish company obtained a concession for a period of 25 years, at the expiration of which the government shall redeem all shares not in
its possession at a rate of $110 \%$. The government may take over these shares sooner, if it so desires, but at a somewhat higher rate.

The appraisal of the Warsaw net was a very difficult proposition, not less than four consecutive commissions having taken part therein. The evaluation of the net was also made the subject of public discussion in the Polish press.

The solution finally arrived at in regard to the Polish telephone problem has shown itself to be very expedient and to bring good results. Private initiative has thereby come by its rights, an economically sound administration with moderate subscription rates having been established. On the other hand, the government has secured effective control over the company's activities together with a share in the profits.

The new Polish company, which is called Polska Akcyjna Spółka Telefoniczna, took up its activities on July 1st 1922.

The number of telephone instruments connected up with the various nets was
on December 31st 1922
38,964
» » 1923 . . . . 40, 4037
. , $1924 \ldots \ldots 45,321$
and these nets are now experiencing a rapid growth.

The populations of the principal cities in the various zones of operation at the beginning of the current year were as follows:
Warsaw . . 981,176 inh. Tustanowicz 13,299 inh.
Lodz . . . 451,813 » Sosnowicz . 86,698 »
Pabjanice . . 29,699 » Dabrowa . . 39,840 *
Zgierz . . . . 21,116 》 Zawiercie . . 28,708 *
Bialystok . . 76,971 » Bedzin . . . 28,076 »
Lemberg . . 219,193 » Czeladz . . . 17,260 »
Drohobycz . 26,733 * Lublin . . . . 94,498 *
Boryslaw . . 16,346 \%
A most satisfactory cooperation with the Polish authorities and with the government representatives in the board of directors of the company has been established. The new company has fulfilled all its obligations towards the Swedish company, whose activities have been taken over by Allmänna Telefonaktiebolaget L. M. Ericsson after the liquidation of the Cedergren Telephone Company.

Wtz.

## The L. M. Ericsson Cable Works at Älvsjö, Stockholm.

The manufacture of cables and similar products was not taken up by the L. M. Ericsson company and included among its activities until at a comparatively recent date.
sary to devise some means whereby such material could again be obtained at reasonable prices.

The equipping of the cable works took a much longer time than had been anticipated, as the


R 237
Fig. 1. Cable Manufacture.

In 1916 Aktiebolaget Stockholmstelefon, a subsidiary concern of Allmänna Telefonaktiebolaget L. M. Ericsson, began to make plans for the erection of a cable factory for the main purpose of supplying the great quantities of cable and telephone cords required by this company, A.-B. Stockholmstelefon being at that time owners of the fast growing private telephone net in Stockholm and outlying districts. The Great War, together with the insufficient production of existing cable factories, was responsible for such an unheard-of rise in prices that it became neces-
firms which were to supply the necessary machinery were unable to make deliveries within a reasonable time. Also, it was found impossible to obtain professional men of sufficient competency in the manufacture of this kind of material. For this reason, the company itself was forced to make the necessary machinery and to select men out of its own force and train them for this kind of work. Naturally, a great many obstacles had to be overcome and mistakes were unavoidable in the beginning. On the other hand, the problem in hand had to be

$R: 38$
Fig. 2. The Cable Works
studied in the most thorough manner possible, whereby an invaluable experience in the manufacture and operation of cable machines was obtained. Later on, when severe competition necessitated the manufacture of high class and yet low priced products, this experience proved to be most useful.

In 1918 Aktiebolaget Stockholmstelefon sold its telephone net to the Royal Swedish Telegraph Office. The number of subscribers in this net amounted by this time to 110,000 . After the sale of its telephone net, Aktiebolaget Stockholmstelefon continued its activities under the name of Allmänna Industriaktiebolaget H. T. Cedergren, and some time


R 240 Fig. 4. Paper and Cotton covering Machines.
thereafter was merged into the head concern, whereby the cable works with their various


R 246 manufactures became a part of L. M. Ericsson's activities.

The cable works are located in Älvsjö, one of Stockholm's suburbs, lying on the Southern Trunk Railway. The estate of Långbro, with an area of about 430 acres and lying in the immediate proximity of the cable works, is owned by the company, and affords ample room for a prac- tically unlimited expansion of the works, for homes for the employees, etc.

The community of Älvsjö, whose population amounts to about 10,000 inhabitants, has also a


R 241 Fig. 5. Manufacture of Rubber Insulated Wire.


R 239
few smaller industries, but the cable works is its only really important manufacturing concern.

The works have successively taken up the manufacture of different lines of products belonging to the class of insulated electric conductors. A start was made with telephone and bell wire for indoor use and cotton insulated cable for indoor plant. Later on, the manufacture of dry core lead covered cable, switchboard cords, receiver cords, rubber insulated wire, enamelled wire and silk insulated wire was taken up. During latter years, duplex cable for long distance lines as well as for indoor plant has been manufactured.

Fig. 6. Another View of the Works.


R 247 Fig. 7. Manufacture of Enamelled Wire.

This type of cable, which must pass very severe tests for capacity and line resistance, has given excellent results.

The first of the factory's products were put on the market in 1918. The sales during this year amounted to 441,053 Swedish Crowns. The corresponding figure for 1919 was $2,833,884 \mathrm{Cr}$., for 1920 1,806,970 Cr., for 1921 1,370,150 Cr., for 1922 1,511,951 Cr., for 1923 $1,627,246 \mathrm{Cr}$. and for 1924 $2,295,058 \mathrm{Cr}$. These figures, however, are not altogether comparable on account of the successive decrease in prices for wire and cable products. The financial crisis which occured after the Great


R 242
Fig. 8. Cord Manufacture.


R 243 Fig. 9. Manufacture of Tinsel Cord and Silk Insulated Wire.

War was responsible for a marked decrease in consumption, and the ensuing sharp competition forced prices down to a minimum. Also, the fall in prices of raw material played a very important part. As a matter of fact, the present prices amount to only about $20 \%$ of those of 1918, $25 \%$ of those of 1919 , and so forth. A true comparison of the output during various


R 244 Fig. 10. The Mechanical Laboratory.
years, therefore, can only be arrived at by reduction to the price level of 1924. Such a reduction has been made in the table here below, which also gives the total length of wire and cable manufactured each year, the average number of employees (including officials, engineers and foremen), and the average value of production per employee during each year.

| Year | Value of material manufactured and sold, reduced to the 1924 price level | Total length of wire and cable manufactured | Average number of employees | Average value of production per employee <br> Swed. Crowns |
| :---: | :---: | :---: | :---: | :---: |
|  | ved. Crowns | Metr |  |  |
| 1918 | 88,211. | 8,000,000 | 70 | 1,2 |
| 1919 | 780,471. - | 30,459,976 | 202 | 3,8 |
| 1920 | 686,648. - | 30,512,353 | 159 | 4,3 |
| 1921 | 1,027,613. | 32,845,674 | 121 | 8,4 |
| 1922 | 1,436,354. - | 65,533,223 | 140 | 10,250. |
| 1923 | 1,562,156. - | 88,895,997 | 160 | 9,770. |
| 1924 | 2,295,058. | 138,982,574 | 160 | 13,800. |

A decrease in sales occured in 1920, chiefly due to a strike which lasted from the beginning of the year until March 8th.

The most interesting information in this table is undoubtedly that given in the last column, which shows the successive increase in efficiency. While the value of material produced per employee in 1918 did not amount to more than


R 245 Fig. 11. The Electrical Laboratory.
1,260.- Crowns, in 1924 it had increased to practically eleven times this amount.

An increase in efficiency and a consequent lowering of prices were not the only aims of the company, however. Steady efforts have also been made to raise the quality of the finished products, this being the only sure means of acquiring and holding new markets. For this purpose the company has installed chemical, mechanical and electrical laboratories for the scientific testing of raw materials as well as of the finished product.

The products of the Ericsson cable works are now being shipped to nearly all parts of the world. A very large part of this production, amounting in 1924 to $25 \%$ of the entire output, is consumed by the L. M. Ericsson works in Stockholm.
G. $O$.

CONTENTS OF THIS NUMBER: Automatic Voting. - The Calcutta Telephone Exchanges. - The Madrid Exhibition of Telephone and Kindred Appliances. - The New Poland. An economic survey. - Swedish Telephone Activities in Poland. - The L. M. Ericsson Cable Works at Älvsjö, Stockholm.


[^1]
[^0]:    R 225
    The L. M. Ericsson Stand at the Madrid Exhibition 1924.

[^1]:    Tryckt hos Allmänna Telefon-A.-B. L. M. Ericsson, Stockholm 1925.

