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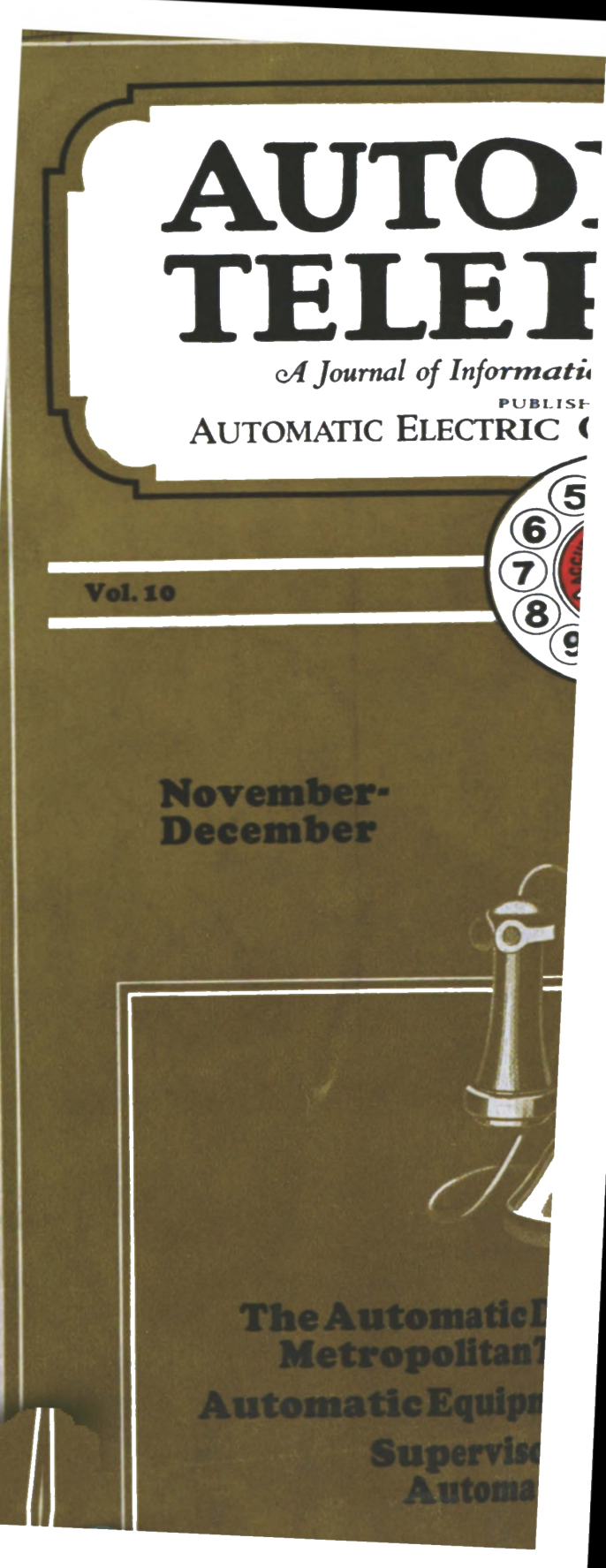

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MATIC PHONE

the Telephone Profession

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PANY, CHICAGO, U.S.A.

No. 11-12

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Signals for
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THE ST. MARY'S TELEPHONE COMPANY
ST. MARY'S, OHIO

Sept. 13, 1922.

Automatic Electric Co.,
Chicago, Ill.

Dear Sirs:

Our city has enjoyed the Strowger Automatic telephone service for the past twenty years and the original installation is still in use. Our rural subscribers are served by manual equipment. We are at present in the midst of a battle with them, arising from our inability to furnish service at a reduction in the present rate, and we believe the only hope of a satisfactory adjustment lies in the installation of Rural Automatic telephones.

In my judgment there could be no greater testimonial than this for the Strowger Automatic Telephone Equipment.

Very truly yours,

R. K. JUDY.

The Automatic Director in Strowger Metropolitan Telephone Systems

Announcing the Director, a New Strowger Equipment Unit for Use With the Strowger Automatic Telephone System in Metropolitan Areas, and Providing the Highest Efficiency and Greatest Flexibility in Meeting All Traffic and Service Requirements of Large Metropolitan Systems

THROUGH the joint efforts of the research and development staffs of Automatic Electric Company of Chicago, and the Automatic Telephone Manufacturing Company, Limited, of Liverpool, a new unit of automatic equipment, known as the Director, is now available. The Director, an assembly which consists of several pieces of standard Strowger apparatus, provides features which are sometimes very desirable in large and complex metropolitan exchange areas.

The advent of the Director is but another achievement of the engineering staffs of these pioneer organizations who are constantly expanding the Strowger system, not only to meet the ever increasing requirements of world telephone service in an economical and adequate manner, but also to anticipate the conditions imposed on telephone equipment by the most exacting specifications.

A complete and detailed exposition of the purpose and usefulness of the Director would necessarily involve a very highly technical discussion. Here, however, only the very general aspects of its application will be considered, leaving the more technical phases to be covered elsewhere.

For economic and engineering reasons, the application of automatic operation to large metropolitan areas invariably involves a transition period, which may extend over several years. During this period it is necessary to provide means for handling four general classes of calls, i. e., manual to manual, manual to automatic, automatic to manual, and automatic to automatic.

The Director unit has distinct spheres of usefulness in increasing the flexibility and efficiency of operation in all four of these classes, and it is believed that for the purpose of this article a brief description of its application in the last named class (full automatic) will give an adequate idea of its adaptability.

In large metropolitan areas it seems desirable to identify each subscriber's station by means of an office name and four digits. To dial the desired station, it is the plan to "spell" the first two or three letters of the office name by successive turns of the dial, which "spelling" would be followed by the four significant digits of the called station's designation. It is apparent, therefore, that the dial must be marked with letters in addition to the digits.

Two arrangements of dial lettering are shown in figures 1 and 2. Figure 1 shows an arrangement that has been in use for some little time. With either plan, it takes the subscriber somewhat longer to locate letters than to locate numerals, but there seems to be no such difference in finding time between the two forms of lettering.

So far, the use of the plan in figure 1 has demonstrated that while the spelling scheme is feasible, great care must be exercised in the selection of office names to avoid the possibility of confusion resulting from the subscribers' lack of familiarity with the spelling of any of the office names chosen.

It has also been demonstrated that many subscribers do not differentiate between the letter "I" (corresponding to the numeral 4 in figure 1) and the numeral "1"; or between the letter "O" (corresponding to the numeral 6 in figure 1) and the numeral "0." This difficulty is accentuated by a practice, common to cities where arrangements are made for automatic numbering, of prefixing 0's to the one, two and three digit numbers (all subscribers' numbers must have four digits), and instructing the manual subscribers as follows: "For Monroe 0032, ask operator for Monroe oh-oh-three-two," instead of "naught-naught-three-two." Under such circumstances it is inconsistent to expect such subscribers, when they use the dial, to differentiate properly.

The arrangement of letters shown in figure 2 overcomes this difficulty. It will be seen that, in this case, the subscriber need not differentiate.

In metropolitan areas it is sometimes desirable to retain certain existing office names that have some geographic or historic significance. In order that this may

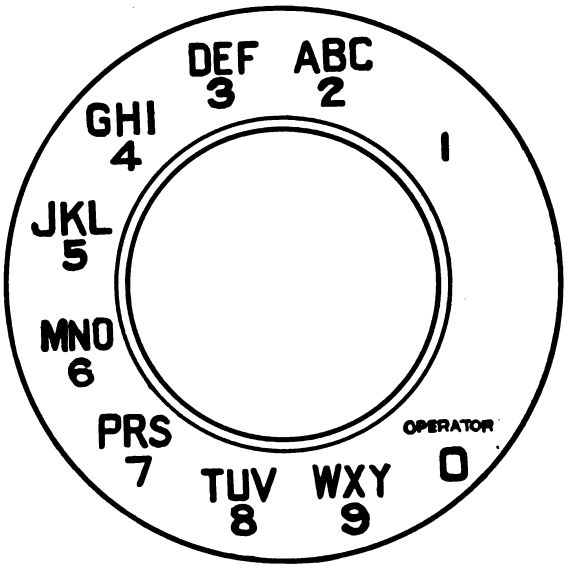


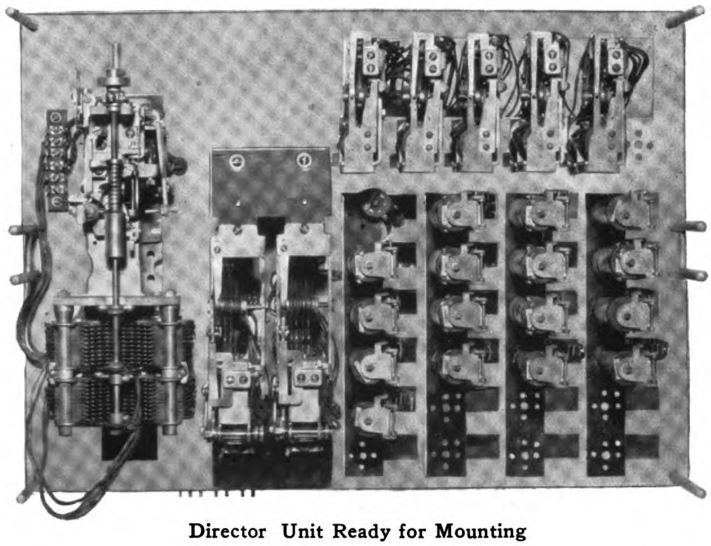
Figure 1

NOTE: For the convenience of those who are interested in the Director and its application to the service and traffic requirements of metropolitan areas, demonstration laboratories have been established at Chicago and London, where complete demonstrations of this system may be made by appointment.

be done without regard to the established trunk routes, it is necessary to dissociate the numbering scheme and the trunking scheme.

This can be accomplished by means of the Director, since arrangements are provided to register the impulses corresponding to the two or three letters of the office name, together with the significant digits of the call number, and to send out other impulses of such number and combination as are required to direct the call, link by link, over the proper trunk routes, to the terminating office; and there to operate the selectors and connectors as required to establish connection with the number dialed.

The Director is attached to the circuit only during the setting up of the connection. When the connection has been established the Director is cut out of the circuit; leaving only the equipment in circuit that is in circuit in standard Strowger exchanges.



Director Unit Ready for Mounting

The Director equipment can be added to existing two-wire Strowger installations of the later types, any time it may become desirable to dissociate the numbering scheme from the trunking scheme.

DIRECTOR FUNCTIONS

As shown in figure 3, a Director-equipped Strowger Metropolitan System consists of primary and secondary line switches; one or more groups of office selectors; thousands selectors, hundreds selectors, and connectors. It will be noted that between the secondary line switch and the first office selector, there is an equipment group containing a director-selector switch, which in a three letter office code system responds to the first pull of the dial and selects one of a group of Directors. The second and third pulls of the dial are registered on a switch in the Director.

Suppose the letters dialed are MAI for the office name MAIn. If the arrangement in figure 2 were used, this would have a numerical equivalent of 521. Upon the first pull of the dial, the director selector switch would step to the 5th level, and select a non-busy Director on this level. The Director would then register 21 in response to the second and third pulls of the dial. The numerical registers in the Director respond to the subsequent pulls of the dial and register the thousands, hundreds, tens and units of the particular call number. An additional register is used in cases where a party line designation is required for "jack per line" party line service.

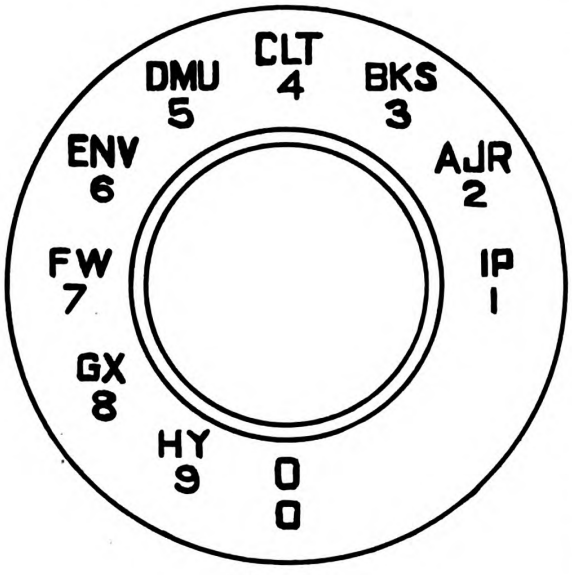


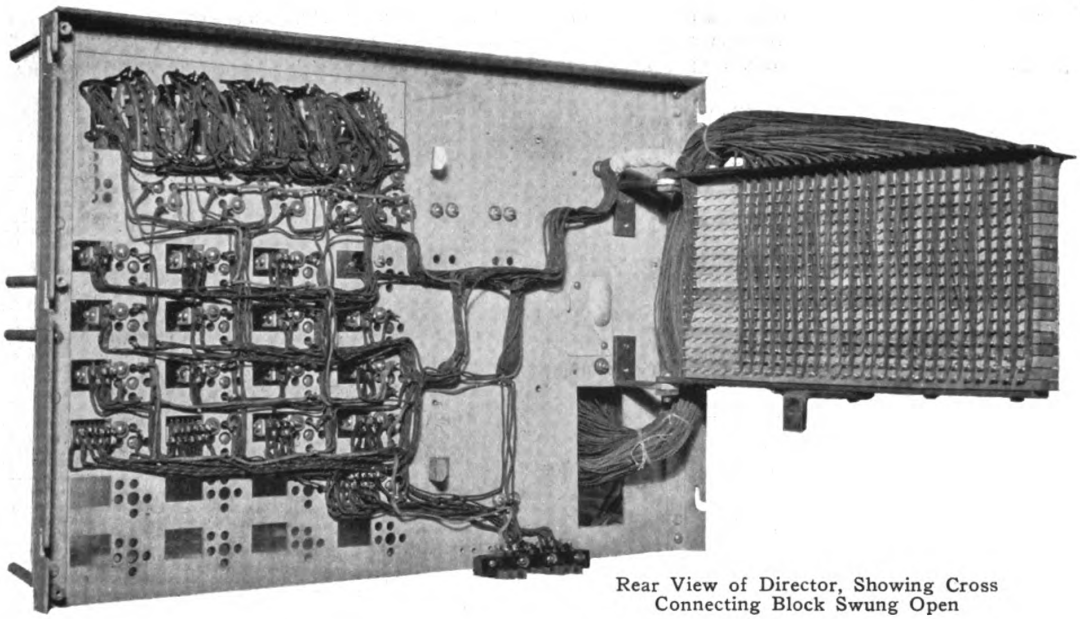
Figure 2

SEARCHING TIME

The relation between the calling office and the called office is determined by a consideration of the trunk routes. A suitable train of office selectors is provided in each office through which the trunk route passes, so that the call may be set up link by link through intermediate or tandem offices. The various links correspond to different selector levels, so that it is easy to see what impulses must be sent to build up the connection link by link from one office to another, and therefore what the relation must be between the letters corresponding to the office code dialed, and the impulses to be sent out by the Director.

The plurality of wipers of the Director digit switch are brought into circuit successively and cause series of impulses to be sent out in a certain sequence, as determined by the cross connections of the several bank contacts. A terminal block is provided in the Director so these cross connections can be altered with a minimum of effort.

For example, suppose to reach the MAIn office it is necessary to set up four links represented by the respective digits 1473. The four contacts of position 21 in the banks of the Director reached from the 5th level of the director selector, would be successively cross connected to points 1-4-7-3 on the terminal block. As soon as the office code has been registered, the sender control co-ordinates the first wiper of the Director digit switch with contact 1 in the sender bank and one impulse is transmitted. The sender control then steps to the next position and co-ordinates the second wiper of the Director digit switch with contact 4 in the sender bank, and four impulses are transmitted. The remaining impulses 7 and 3 are successively transmitted in a similar way. The sender control then advances one



Rear View of Director, Showing Cross Connecting Block Swung Open

point and co-ordinates the contacts of respective numerical digit registers, and sends out corresponding impulses.

In case only two links are required to reach the terminating office, say 1-4, the first and second contacts of position 21 would be connected to points 1-4 on the terminal block, and the other contacts of position 21 would be connected to special points on the terminal block and would cause the sender control switch to advance to the position to send the significant digits of the call number.

The Director has one hundred sets of bank contacts, and when used with the non-digit type director-selector, has mechanical facilities for 100 two-letter office designations. When used with the digit type director-selector, it has facilities for 1000 three-letter office designations.

With the types of dial lettering shown in figures 1 and 2, it is not possible to use the full 100 two-letter designations or the full 1000 three-letter designations referred to above, both on account of unpronounceable combinations of letters representing the different numerals and on account of numerical conflict of different office names.

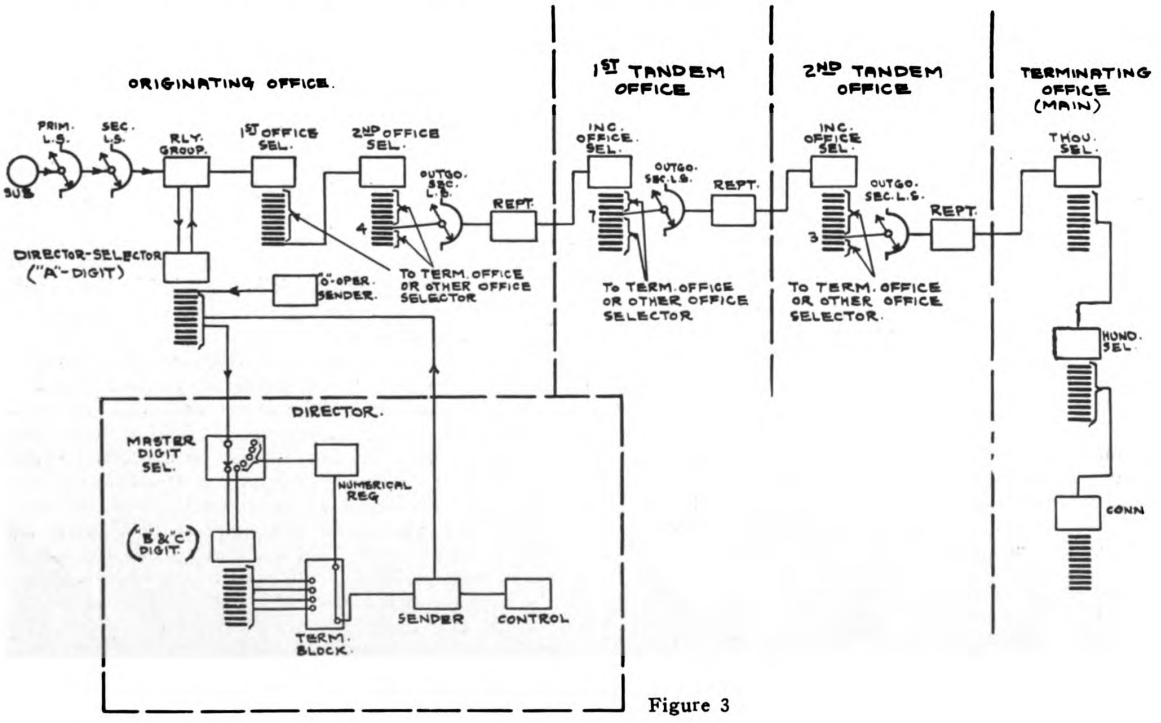


Figure 3

In spite of these limitations, the requirements of even the largest possible metropolitan areas may be easily taken care of by the use of three-letter office designations.

From the preceding it can be seen that either a two or three digit office code can be arranged to direct calls over one, two, three or four links to reach the terminating office, and it is felt that such provision will be adequate for most cases. By adding another set of wipers and a contact bank to the digit switch in the Director, provision can be made for six links.

Automatic Electric Company's Multi-Office Demonstration Laboratory

As soon as the registration of the office code has been completed the Director begins sending the series of impulses and if, in the meantime, any of the numerical digits have been registered these will be sent in turn. After the entire call has thus been sent the Director is instantly cut out of the circuit and made available for another call.

If, when a Director has been seized there is a lapse of time greater than some predetermined interval, say thirty seconds, the Director is cut out of circuit and made available for another call. Provision can be made so that, in case of an abnormally delayed call, that part of the connection which has already been set up, will be released, and the call will be automatically routed to a monitoring operator, after which the Director will be released and made available for another call.

The equipment group forming the Director is assembled on a demountable base much in the manner of Strowger selector and connector switches. A complete Director occupies approximately the space required by four selectors. Each Director has its own simple cross connecting block which has been previously mentioned, thus permitting changes being made in the numbering or routing without interference of service.

CROSS CONNECTIONS

The Director sends the various series of impulses at a predetermined rate and allows ample time between digits for the selectors to search over the maximum of ten trunks. This searching time will not exceed one-third of a second. There is, therefore, no need for revertive control to allow the selector to pick a trunk before the Director sends its next series of impulses. Where the speed of searching is slow or the field to be searched is large, revertive control is necessary, otherwise ample time would have to be allowed for the maximum searching time over the entire field and this would then penalize all other calls. The Strowger system, however, having only a small field can allow a short uniform searching time and avoid the complications of revertive control.

TANDEM TRUNKING

In large metropolitan areas it is not efficient to have direct trunks from every office in the network to every other office. In manual practice tandem trunking switchboards, located at certain trunking centers, are used to take advantage of the efficiency offered by large groups of common trunks, but since this requires an additional operator at the tandem point there is an increase in cost of operation and a greater chance for errors; the plan therefore has its limitations. However, with the use of the Director and its ability to set up any required number of links to reach the terminating office, it is possible to use the tandem trunking principle to its utmost, being governed entirely by considerations of plant economies, without regard to traffic and operating complications that would have to be considered under manual conditions. On account of the cross connecting facilities in the Director, tandem trunking can be arranged at any time and changed from time to time as required.

SUMMARY

With the use of the Director the Strowger Metropolitan System offers the following important features:

1st: The system uses no new or untried apparatus. The Director consists of standard parts combined in new ways.

2nd: Due to an improvement in the arrangement of the letters on the dial, many subscriber errors are avoided.

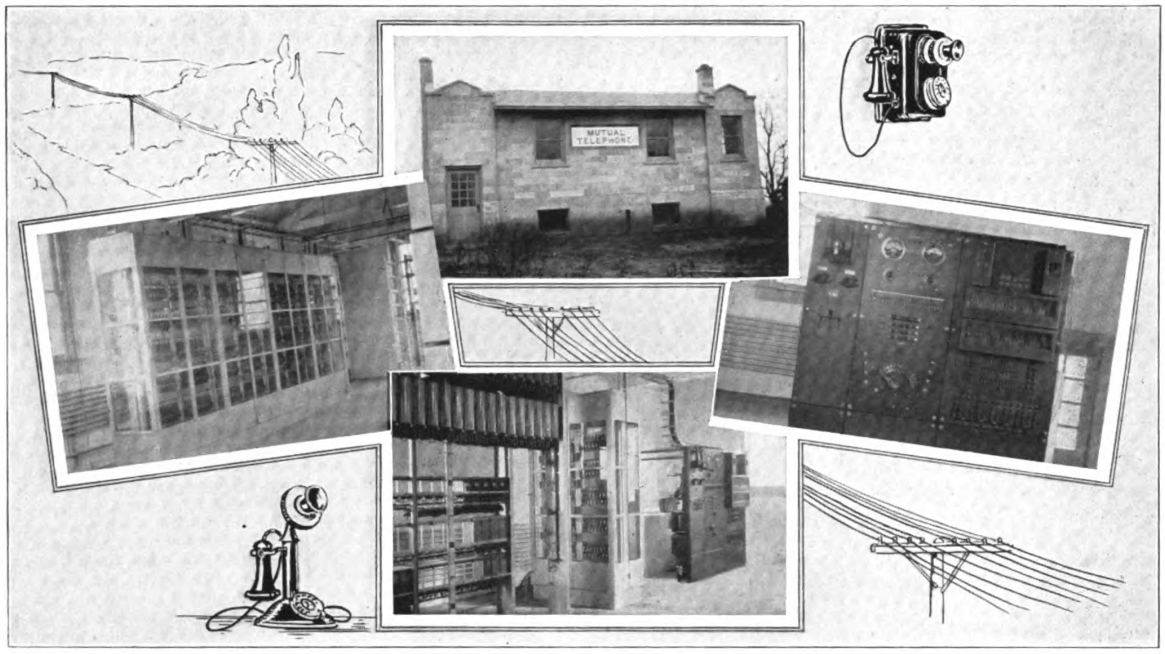
3rd: The use of the Director introduces no undue delay to the subscriber, after the last pull of the dial.

4th: The numbering scheme is conformable with any trunking scheme, so that changes can be made in one without affecting the other, by means of changes in simple cross connections.

5th: Existing exchange names can be retained in practically all cases, except where there is conflict between the numerical equivalents of the letters for two office codes.

6th: The Director can be added to existing Strowger two-wire installations at any time it becomes desirable to dissociate the numbering and trunking schemes.

7th: The Director is in use only during the setting up of a call, after which it is automatically cut out of circuit and is available for another call.



Some Views of Erie's New West Office Recently Completed

held up everywhere, the Mutual company was able to supply heavy demands for increased service.

The company has prided itself in its high grade of service. No expense or pains have been spared to give its subscribers service of the very highest grade. Nowhere is there to be found more efficient or dependable telephone service.

Through careful and economical management, the rates have been kept down to the lowest point. Few people realize that the rates charged by the company are the lowest in the country for a city the size of Erie, thus effecting a tremendous saving to its patrons.

For many years William B. Trask was president of the company. Its successful start was due largely to his efforts and influence. To the time of his death, among all his varied business interests he looked upon the Mutual with particular pride.

Officers and directors of the company are as follows: A. A. Culbertson, president; J. C. Spencer, vice-president; John Z. Miller, secretary; A. W. Hayes, treasurer; E. P. Selden, James Burke and James Russell.

The various departments are under the efficient management of the following men and women: John Z. Miller, general manager; M. Victor Wright, plant superintendent; Frank C. Sparks, superintendent of line construction; Burt F. Huffman, superintendent of cable construction; Earl B. Glover, superintendent of installation; Charles F. Tess, auditor; D. W. Nichols, cashier; Harry M. Lewis, commercial manager, Miss Marion Lucey, long distance chief operator; Miss Mary Gordon, local chief operator; H. F. Gingenbach, wire chief.

Hastings' Automatic System Pleases Visitors

FEW things stimulate pride in the ownership and management of a telephone exchange so much as the knowledge that the equipment used is the most up-to-date available and renders service that is pleasing to the subscribers. This is why visitors to telephone exchanges using Strowger automatic equipment are always impressed with the enthusiasm shown by men operating such exchanges and by the subscribers they serve.

Recently, a delegation of men interested in the service and profit advantages of automatic equipment called on Manager J. E. McElwain of the Citizens Telephone Company at Hastings, Mich., to investigate the service rendered in that city. They went away quite convinced that if their town could get such good telephone service as Hastings enjoys, the improvement would be so marked, that their fellow citizens would have every reason to congratulate themselves.

Manager J. E. McElwain piloted the visitors through the work rooms and offices, and they were much impressed with the manner in which an automatic plant is operated. Some one has to oversee it and be ready to overcome any little "hitches" that may arise in the working of the equipment by means of which No. 3717, for instance, hooks up with 2415 without any word to the operator at a switchboard.

But that was not the real question. They had seen other machinery that looked all right and which salesmen declared to be the best ever but which really did not justify the claims made for it. The question about the Hastings exchange in their minds was not, therefore, "Did it look attractive, and did it seem to do the work intended?" The real questions were, "What do the people of Hastings think about their telephone system? How do they find it actually works in practice? Are they pleased or displeased with it? What kind of service is rendered by the new as compared with the old equipment?"

As the visitors wished to know how the actual patrons of the local exchange felt about the present telephone service, Manager McElwain called first one of the city's physicians, who enjoys an extensive practice. He complimented the telephone system

there very highly, and said that he had only one fault to find, and that was that it worked so well at night after he retired that he had to get up and answer, no matter how tired he was. One of the grocers who has a large trade, and a flood of telephone orders between the eight and 10 o'clock deliveries, said that the service was excellent. Two managers of local factories, the postmaster, a proprietor of one of the department stores, a leading clothier and others commended the automatic, and said it was so much of an improvement over the old switchboard system that there could be no comparison—it was a contrast. Supt. Keyworth, of the city schools, said the telephone service in Hastings was the best he had ever enjoyed, and so far superior to the switchboard type of service that the other towns he had lived in had, that there was no basis for comparison.

Supervisory Signal Equipment for Automatic Switches

The Alarm Signal Apparatus Recommended by Automatic Electric Company for Strowger Exchanges is Based on Wide Operating Experience. It is Adequate for All Conditions But Includes Nothing That Is Not Required for Good Service and Ease of Maintenance

By C. J. DIEHL
Power and Signal Equipment Engineer
Automatic Electric Company

MANY of the problems encountered in the development of automatic telephone equipment are so closely linked up with, and dependent upon, conditions in actual operation, that they do not admit of final solution through research or laboratory tests. Long use under actual working conditions is the only criterion.

One such problem has been to decide to what extent automatic supervision shall be carried in the operation of a Strowger Automatic exchange. By this is meant, first, what operating functions shall have automatic supervision; and second, how much apparatus shall be supervised in common by one signal or group of signals.

There are three things to be considered in this connection: good service, ease of maintenance and reasonable first cost.

Good service is of prime importance. An adequate number or combination of supervisory alarms means a shorter average lapse of time between the failure of operation of some part, and the correction of such trouble. It also means that fewer troubles will reach the attention of subscribers.

Adequate supervisory equipment facilities maintenance by indicating both the nature of a case of trouble and its source, and by tending to make the work of the maintainer preventive rather than corrective.

While the first cost of supervisory apparatus, when reduced to a per line basis, is not large, it is nevertheless an important limiting factor. Supervisory equipment that merely adds to the first cost of an installation without offering advantages in improving service or simplifying maintenance, is a joy only to the engineer or circuit designer.

The experience of the manufacturers of Strowger Automatic equipment has been sufficiently extensive to leave no doubt as to the best combination of supervisory equipment to use, and their standard arrangement has been proven adequate in every case.

In the following paragraphs are outlined briefly the general distribution of alarm equipment in a typical Strowger switchroom.

Selector Supervisory—This provides for a visual signal operated whenever a selector is seized but fails to extend the connection through to the rest of the switches of the series used. The most frequent source of trouble in this connection is with first selectors when the telephone lines become permanently short circuited or grounded. The signal lamps (one opal covered miniature lamp for each shelf of twenty selectors and one tubular pilot lamp for each board) are mounted in plain view on the trunk board power panel. It is a simple matter to discover which switch has originated the alarm by lifting the shafts of the switches on the shelf indicated successively, and noting which one fails to operate the release magnet.

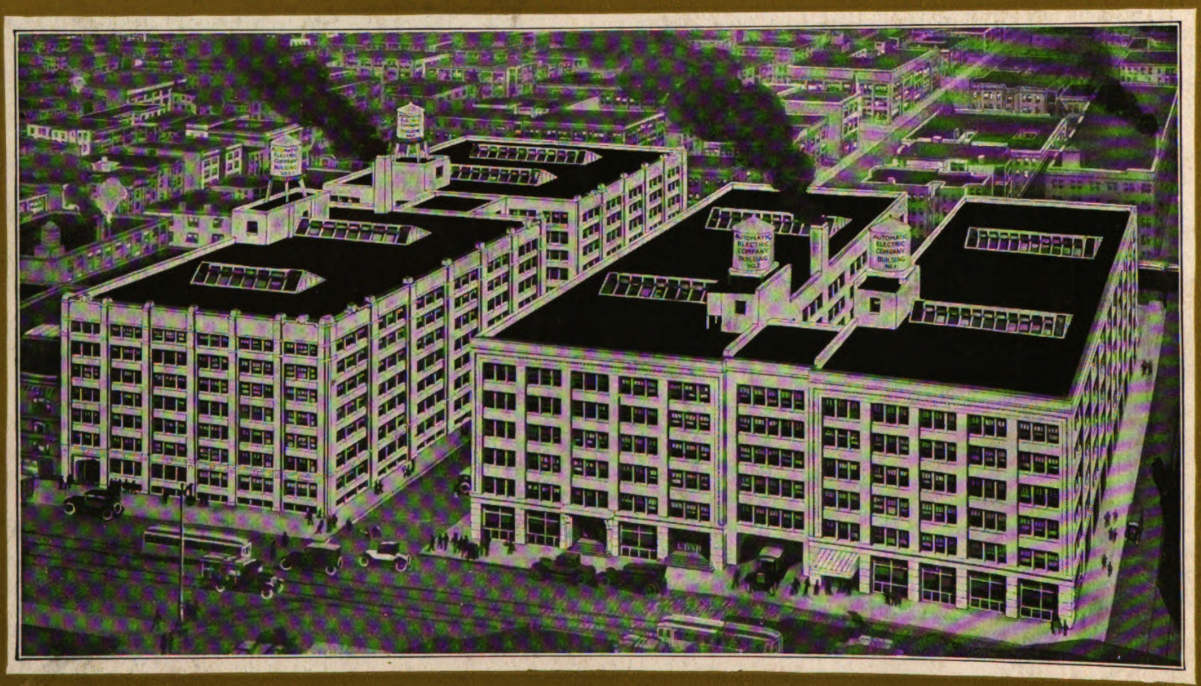
At the time that the present covered type switch was developed, it was thought that it might be desired to provide individual selector supervisory lamps, but after operating covered switches for several years, it is now quite apparent that the one lamp per shelf arrangement is entirely adequate.

Connector Supervisory—This provides for a visual signal, similar to the selector signal, operating when either subscriber holds a connector for an unduly long interval after conversation. Both connector and selector supervisory signals are normally inoperative but are turned on at intervals during the day by the maintainer according to routine.

From the beginning it has been customary to supply one connector supervisory lamp for each 100 group of lines, and in spite of the fact that the standard connector used by Automatic Electric Company is arranged for "last-party release," the one lamp has always been found adequate.

In cases where the circuit of the connector is arranged for release by the calling party, it is doubtful if connector supervision would be justified at all, since the number of connections held by the calling party is practically negligible. On the other hand, the use of a "calling-party release" connector entails considerable wear and tear on the line switches and first selectors, due to the fact that, if the calling party hangs up before the called party does, the line switch of the called line will seize a first selector. This not only causes undue wear and tear on the switch, but, during the busy hour, is lia-

The Home of the Automatic



Automatic Electric Company's Factory, at the Corner of Morgan and Van Buren Streets, Chicago. It has a Floor Space of 10 Acres and is Devoted Exclusively to making Automatic Telephones and Telephone Supplies.