

This is

AUTOMATIC  ELECTRIC

PIONEERS IN COMMUNICATION TECHNIQUES

**Research • Product Development
Engineering • Manufacture • Installation**

This is

AUTOMATIC  ELECTRIC

PIONEERS IN COMMUNICATION TECHNIQUES





BACK IN 1889

*A*LMON B. STROWGER, a lone inventor laboring over a crude home-made mechanism, looked forward to the day when all telephone connections would be set up by machines controlled from the subscribers' telephones.

This was both the beginning of Automatic Telephony, and the origin of the group of companies whose major product—the Strowger Automatic Telephone System—has revolutionized telephone communication, and has set the pace for modern telephone switching in all parts of the world.

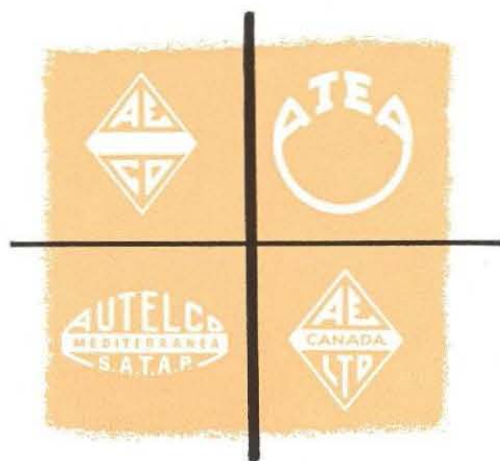
This booklet tells the story of this group of companies, of their manifold contributions to telephone science, and of the techniques by which, since 1891, they have kept constantly abreast of changing needs.

this is the story of

AUTOMATIC ELECTRIC

this is the

AUTOMATIC ELECTRIC GROUP



*T*HE AUTOMATIC ELECTRIC GROUP is comprised of four telephone engineering and manufacturing companies, strategically situated in the Eastern and Western hemispheres, and so organized as to place at the service of telephone operating administrations of the world the most modern facilities for the design and production of Strowger Automatic Telephone Equipment and the many auxiliary types of apparatus that make up a complete and efficient telephone system.

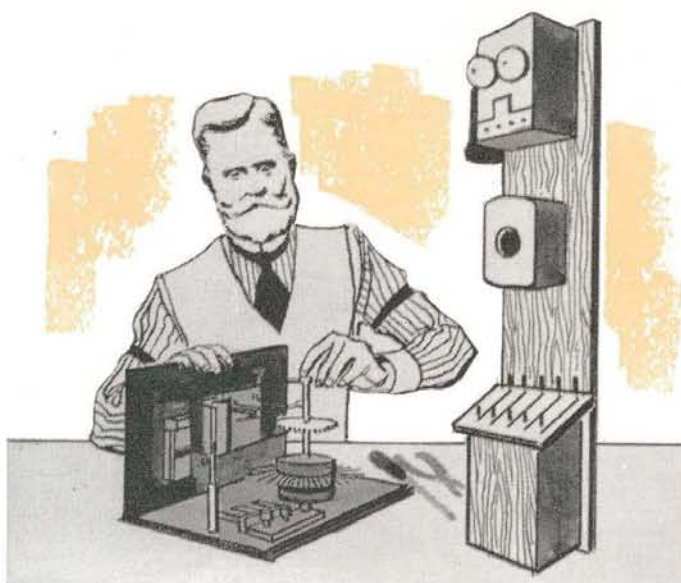
THE AUTOMATIC ELECTRIC GROUP is staffed by research scientists, equipment designers, production experts, and installation technicians, whose work is guided by experience extending back to the first practical automatic telephone system.

THE AUTOMATIC ELECTRIC GROUP maintains close liaison with its customers through trained and experienced field consultants throughout the world. Having long familiarity with the adaptation of Strowger Automatic equipment to particular requirements, they are readily available for personal consultation with operating and administrative officials in the areas they serve.

THE AUTOMATIC ELECTRIC GROUP is strong and stable financially, with resources to attract and retain the best in personnel, to keep its production facilities abreast of technological advances, and to carry out long range development programs.

THE AUTOMATIC ELECTRIC GROUP has at its disposal the resources of Associated Telephone and Telegraph Company, of Wilmington, Delaware, and Theodore Gary and Company, of Kansas City, Missouri. These companies have from time to time furnished the Group with financial support important to Group operations.

THE AUTOMATIC ELECTRIC GROUP is world-wide in scope, with ample facilities for gathering, storing, and making available experience drawn from all parts of the globe. Its uninterrupted career of designing, building, and installing automatic telephone systems under varied conditions has resulted in that accumulation of knowledge and skills which assures equipment having the highest standard of service, dependability and long life.



Strowger's switch of 1889, on which the first automatic telephone patent was obtained, used an up-and-around, magnet-driven stepping mechanism. It was the prototype of most of the automatic switches in use today.

A NEW IDEA FOR A NEW ERA

DURING the last decade of the 19th century, "Strowger Automatic" challenged the telephone world with a new idea. Since then that idea has dominated telephone thinking, and has set the pattern for all subsequent development in that field.

In 1889, Almon B. Strowger, of Kansas City, Missouri, annoyed by the defects of manual telephone service, decided to eliminate the switchboard operator by putting a machine in her place. A daring and persistent dreamer, but endowed with above average common sense and native ingenuity, Strowger envisaged an up-and-around line selecting mechanism moved by pawls and electro-magnets controlled by electrical impulses sent from the calling telephone. Using such crude materials as he could find and hampered by lack of mechanical skill, he nevertheless succeeded in constructing a model which operated and upon which he obtained the first patent on an automatic telephone exchange.

The neat, compact, sturdy and reliable Strowger switch of today bears little resemblance to the original model, but the up-and-around principle, though challenged from time to time, still stands supreme. Today about two-thirds of all automatic telephones in the world are served by equipment which uses this principle, and this proportion is steadily growing.

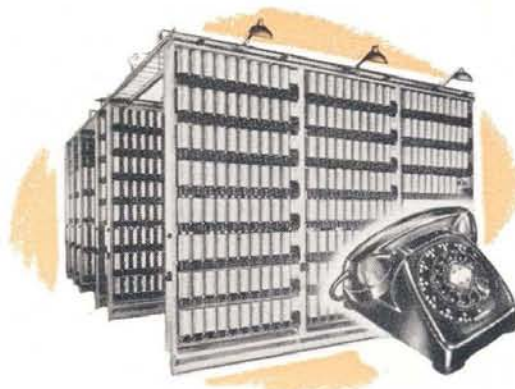
It was a long and arduous road from Strowger's basic idea to the world's first automatic telephone exchange which, in 1892, began to render service to a few subscribers in LaPorte, Indiana—not far from the city of Chicago where the Automatic Electric organization had set up its plant.

Small and crude as it was, the success of that first installation was immediate. It answered with a decisive "Yes" the two vital questions: Would it work? Would the public like it?

Encouraged by these assurances Automatic Electric engineers drove ahead to refine and perfect the equipment, a process that has never ceased. The first essential was to meet the conditions of telephone service as then known, to do all that manual switchboards could do, and to do it faster, more accurately, and more economically. In the pursuit of this program, the LaPorte installation was followed by scores of other Strowger Automatic exchanges throughout the United States. As a result of this early experience, a basic design was evolved which, while remaining unchanged in principle, has proved so sound and so flexible in application that it has met the most exacting tests of service and economy.

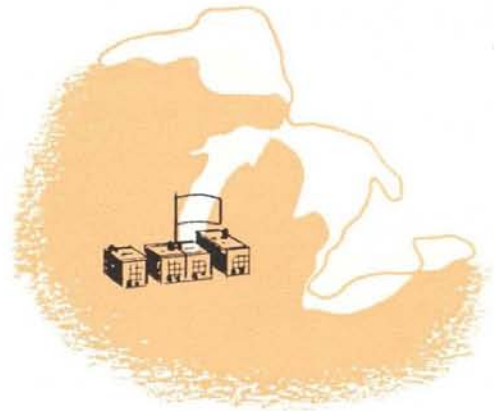
As the demand for telephone service continued to grow and the operating requirements became more complex, the Automatic Electric engineers systematically attacked the problems of adapting basic Strowger Automatic principles to new and more complex conditions. New service standards hitherto thought impossible were achieved and maintained; the equipment itself took on added refinement and mechanical harmony; its economy and its flexibility in meeting new and unforeseen requirements became a forceful and growing challenge to existing ideas. Thus, within a few years after the installation of the first automatic exchange—and while others were still debating its practicality—Automatic Electric engineers had arrived at a solution of the basic problems of automatic telephony.

The modern Strowger Automatic exchange retains the proved principles of the up-and-around mechanism originated by Strowger, and offers also the flexibility afforded by small unit design.





**AUTOMATIC
ELECTRIC
COMPANY**



THIS, THE LARGEST of the manufacturing units of the Automatic Electric Group, is the outgrowth of a company formed in 1891 as The Strowger Automatic Telephone Exchange for the development and manufacture of the automatic telephone system originally devised by Almon B. Strowger. The present company was organized in 1901, when a six-story manufacturing plant was erected at the intersection of Morgan and Van Buren Streets on the west side of Chicago, Illinois. Growth since that time has continued without interruption; today the Company has 14 large buildings in that immediate area.

For many years after the Chicago plant was established, its business was devoted exclusively to the development, engineering, and manufacture of Strowger Automatic telephone equipment, which was the first automatic telephone system to be used commercially, and today this activity remains the mainstay of the Company's operations. In addition Automatic Electric also manufactures various other types of equipment used by telephone companies, including long-distance switchboards, power equipment, telephones of various types, testing equipment, electronic equipment—in fact, a large proportion of the items that enter into the construction and operation of a complete telephone exchange. The Company's products also include a wide range of electrical and electronic control components for use in the broad fields of industry, science, transportation, communication, and other business and commercial activities outside of the telephone field.

The general office building at 1033 West Van Buren Street houses the executive and administrative offices, research and testing laboratories, and the affiliated sales and service organizations, both domestic and international. The remaining buildings are devoted to the manifold aspects of equipment engineering, processing, manufacturing, warehousing, and shipping which are involved in the supply of communications and electrical control equipment to meet the widely varying needs of the Company's customers.

The Automatic Electric Group in Chicago



Here are the Automatic Electric headquarters in Chicago, Illinois, where automatic telephony was first brought to the stage of practical utility and economy. Above are shown Buildings 1 to 4 inclusive, which house administrative offices, laboratories, affiliated sales organizations, and certain manufacturing operations. Numerous other buildings in the immediate neighborhood are devoted to engineering, manufacturing, storage, and shipping facilities.

The personnel of the Chicago company and its immediate affiliated sales and service companies numbers almost 6,000 employees, and it is significant to its customers that this combined group has had continuity of organization for over sixty years. At all times throughout this long period, the preponderance of personnel has been experienced in the design, engineering and production of automatic equipment. The Company has always been closely allied with the Independent telephone industry of the United States, which includes over 5,000 telephone companies serving about two-thirds of the geographic area of the United States.

THE GROWTH OF STROWGER AUTOMATIC

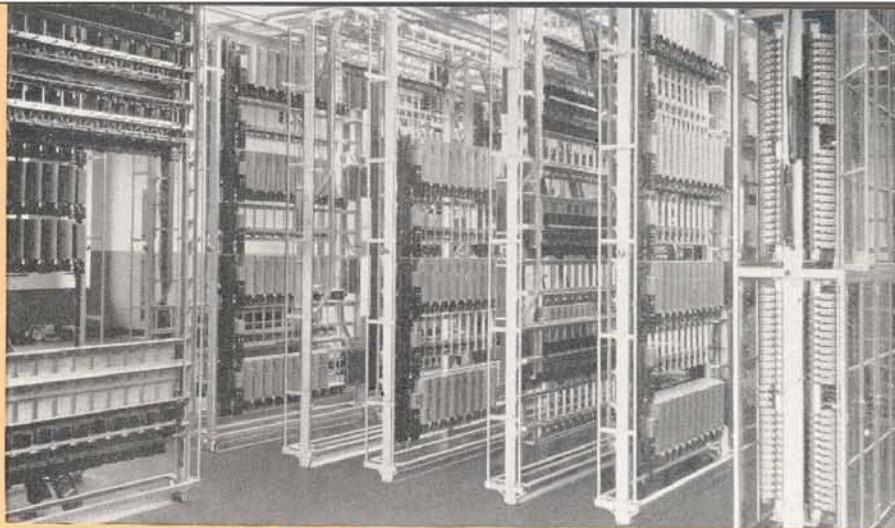
*I*T IS ALTOGETHER NATURAL that the Strowger Automatic system, as created and developed by Automatic Electric, should have found its first wide application in the country of its origin, where telephone service is rendered jointly by the extensive networks of exchanges of the Bell Telephone System, and those of the thousands of Independent companies.

Today, as in the past, the Independent telephone companies of the United States represent the largest single group of customers for the Automatic Electric organization in Chicago. These companies—there are more than five thousand of them—serve more than two-thirds of the geographic area of the United States, and almost twice as many communities as are served by the Bell System. In size, they range from a score or so telephones to multi-office networks serving hundreds of thousands of stations. Their exchanges and toll lines are interconnected with those of neighboring companies and also with the nationwide long distance network of the Bell System.

It was largely through close cooperation between the Independent companies of the United States and Automatic Electric Company, of Chicago, that the Strowger Automatic system was brought to the stage of practical perfection, and these companies also have been largely responsible for the development of operating techniques which have since been applied on a world-wide scale. Today, the great majority of Independent automatic stations are served by Strowger Automatic equipment supplied by Automatic Electric. The year 1919 marked the beginning of an extensive program by the Bell System for the installation of Strowger Automatic telephone equipment in both large and small exchanges. Under this program Automatic Electric manufactured and installed the first Strowger Automatic system designed specifically for the Bell System. This was an 11,000-line exchange for Norfolk, Virginia, completed in December, 1919.

During that year also, Automatic Electric entered into long term contracts with the Bell System for the engineering and manufacture of equipment for other similar installations. For many years thereafter, the bulk of Strowger Automatic telephone equipment installed for the Bell System was made in the Automatic Electric factory at Chicago. Today Strowger Automatic telephone equipment still predominates in the Bell System, whether measured by stations in service or central office equipment being installed.

St. Paul, Minnesota, one of the many hundreds of Bell System exchanges using Strowger Automatic equipment.

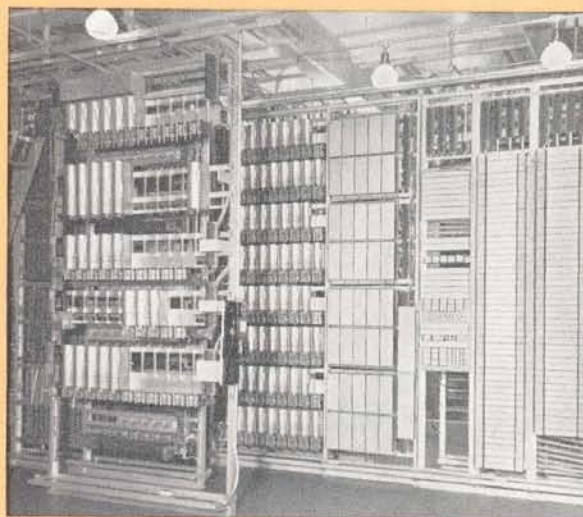


Strowger Automatic in the United States

DURING the first 30 years of its development, Strowger Automatic was the only now surviving system used in public exchanges in the United States. In automatic exchanges being installed today, Strowger Automatic remains the predominant choice of both Independent and Bell System companies. A few typical installations are shown on this page.



Bloomington, Illinois (Illinois Telephone Company).



Logansport, Indiana (General Telephone Company of Indiana).



Chillicothe, Ohio (Chillicothe Telephone Company).

Against the background of early success in the United States, it was inevitable that telephone operating administrations in other countries should become interested in the advantages of Strowger Automatic equipment. The system made its first appearance abroad in London in 1898—an exhibit switchboard of 200-line capacity. A year later, the German Post Office purchased a 400-line system which they installed for public service in Berlin. These two installations were the earliest forerunners of the world penetration that was soon to come.

Canada, Cuba and Australia were among the first countries to recognize the manifold benefits of the Strowger system and to adopt it on a widespread scale. Argentina, India and New Zealand soon followed. For many years, all of the Strowger Automatic telephone equipment installed in these and other countries was manufactured and installed by the Automatic Electric organization.

Keeping pace with this wide-spread acceptance of the Strowger system by operating administrations, the principal manufacturers of telephone apparatus in Europe and the United States, recognizing that Strowger Automatic would dominate and underlie all future progress, sought licenses under Automatic Electric's numerous basic patents and these were extensively granted.

Today, the leading telephone administrations throughout the world use Strowger equipment as standard, and the telephone systems of most of the world's important cities are partially or wholly converted to that type of operation. In Great Britain, the British Post Office, after the most exhaustive studies and tests, standardized on the Strowger Automatic system and is using it exclusively, both in London and in scores of provincial cities. The government-operated telephone systems of Australia, South Africa and some of the Canadian provinces have also standardized on Strowger.

Typical cities using equipment based on Strowger Automatic principles include Vancouver, Toronto and Winnipeg in Canada; Buenos Aires, Rosario and Cordoba in Argentina; Sydney and Melbourne in Australia; Havana, Cuba; Honolulu and Manila in the Pacific; Berlin and other principal cities in Germany; the principal cities in Japan; Sao Paulo and Petropolis in Brazil; and the principal cities in Venezuela, Colombia, Uruguay, and other Latin American countries.



AUTOMATIC ELECTRIC SALES CORPORATION

*H*IGHLY IMPORTANT to the operations of Automatic Electric, and equally important to its customers, are the comprehensive sales and service facilities maintained by Automatic Electric Sales Corporation. This company, with headquarters in Chicago and branch offices in all principal cities, acts as distributor in the United States and possessions for all Automatic Electric products as well as those of companies manufacturing telephone construction materials, tools, and supplies.

The personnel of Automatic Electric Sales Corporation is made up largely of field representatives and staff engineers who are prepared by long experience and practical training to assist telephone companies and other customers in solving whatever problems they may face. Such assistance embraces a wide variety of services; typical examples are described on this and the following two pages.

Field Engineering—First step in the consideration of any Strowger Automatic installation is a detailed study of exchange traffic. Automatic Electric field engineers are prepared to offer competent assistance in making such studies and can supply automatic recording equipment to insure accuracy, so that switching equipment can be supplied in the exact quantities and types required.

Plant Engineering—In cases where re-arrangement or extension of outside plant is needed, Automatic Electric's experts in that field are in a position to offer recommendations. They are alert to the latest construction methods, and can also advise as to the most efficient means of handling toll traffic.

Installation—Whenever desired by the customer, Automatic Electric central office equipment is installed, tested and placed in service by the Company's staff of installation technicians, who are not only thoroughly trained in the techniques of construction, wiring, cabling and testing, but are also selected for their ability to deal with customers on a footing of dignity and assurance.

Operating Services—Automatic Electric also maintains a staff of trained engineers who are thoroughly familiar with operating practices and who are available for counsel and assistance on matters relating to operating and maintenance procedures.

Warehouses—In addition to its central warehouse in Chicago, Automatic Electric maintains branch warehouses at key points for prompt service on such stock items as telephones, protectors, and construction and maintenance materials.

Right: Traffic surveys help to determine the exact amount and types of switching equipment needed for each exchange.

Financial planning is supplemented by aid in applying for upward rate adjustments.



Complete Service Protects Users of Strowger Automatic



Toll system planning insures handling of toll traffic by the most modern methods and at lowest cost.



Switching equipment is individually planned to meet the specific requirements of each exchange.

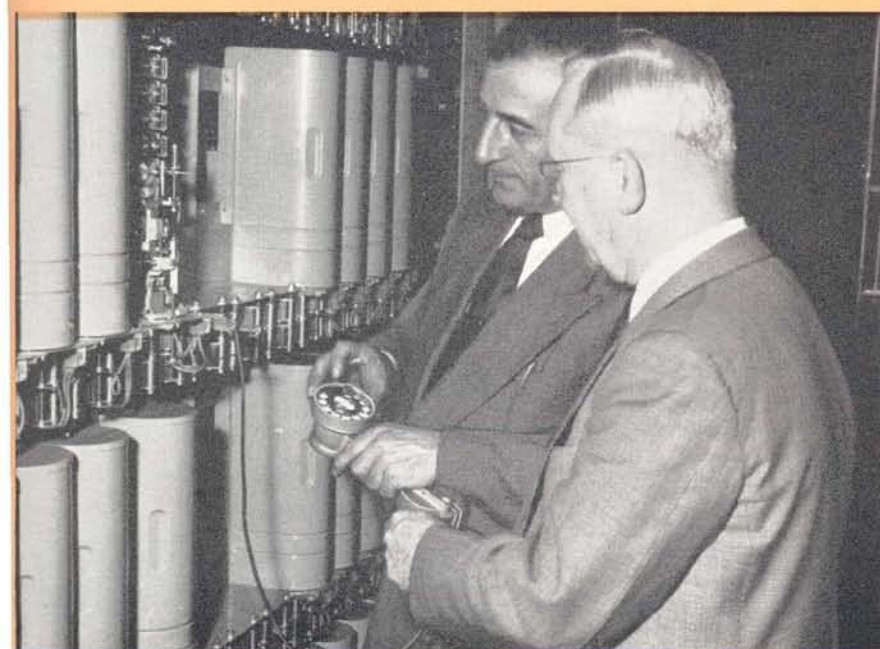


Left: Personnel training may be given in the Automatic Electric Training School or textbooks supplied for on-the-job training.

Demonstration units are available to aid in subscriber education — help to encourage proper use of the telephone

THE telephone company that installs Strowger Automatic equipment benefits not only from a 60-year background of world-wide experience in automatic switching techniques, but also from the services of one of the most comprehensive and experienced engineering and consulting organizations in the telephone field.

The services supplied embrace everything needed, from preliminary field planning to operating counsel throughout the life of the equipment. They help insure sound conversion, economical operation, and the highest standards of service and public relations.



Competent counsel is available throughout the life of the Strowger Automatic equipment, including advice on all phases of operation and maintenance.



Expert installation whenever desired, from erection to final testing, including power equipment and manual positions.

AUTOMATIC ELECTRIC SALES CORPORATION

General Offices: 1033 W. Van Buren Street
Chicago 7, Illinois



BRANCH SALES OFFICES

- | | |
|---|---|
| 1. Atlanta 5, Georgia
900 Peachtree Street | 8. New York 16, New York
21 East 40th Street |
| 2. Boston 16, Mass.
Statler Office Building | 9. Philadelphia 8, Pa.
410 North Broad Street |
| 3. Chicago 7, Illinois
1033 W. Van Buren Street | 10. Pittsburgh 22, Pa.
507 Liberty Avenue |
| 4. Cleveland 14, Ohio
815 Superior Avenue, N.E. | 11. St. Louis 10, Missouri
4030 Chouteau Avenue |
| 5. Detroit 2, Michigan
New Center Building | 12. San Francisco 5, Calif.
55 New Montgomery Street |
| 6. Kansas City 8, Missouri
2121 Main Street | 13. Seattle 4, Washington
644 Central Building |
| 7. Los Angeles 19, Calif.
4415 W. Pico Boulevard | 14. Washington 5, D. C.
601 Washington Building |

And at Honolulu 13, Hawaii, Alexander Young Building



FIELD SALESMEN AT:

- | | |
|-------------------|-----------------------|
| Alexandria, Minn. | Indianapolis, Ind. |
| Augusta, Ga. | Lewisburg, Pa. |
| Bristol, Tenn. | Lincoln, Neb. |
| Brookline, N. H. | Lutz, Fla. |
| Brownwood, Texas | Mansfield, O. |
| Chillicothe, O. | Rocky Mountain, N. C. |
| Dallas, Texas | Rochester, N. Y. |
| Galesburg, Ill. | Sacramento, Calif. |
| Grinnell, Iowa | Slingerlands, N. Y. |

Wisconsin Rapids, Wis.



WAREHOUSES

- | | |
|------------------------|-------------------|
| 1. Chicago, Ill. | 3. Portland, Ore. |
| 2. Kansas City, Mo. | 4. Richmond, Va. |
| 5. Johnson City, N. Y. | |





**AUTOMATIC ELECTRIC
SALES CORPORATION**

THE AUTOMATIC ELECTRIC LABORATORIES

HAVING ITS INCEPTION at a time and in an area of intense competition in the telephone field, the development of Strowger Automatic equipment was, of necessity, guided into channels of the utmost utility, from which it has never deviated. But realizing also that an operating telephone system, like a chain, is only as good as its weakest link, Automatic Electric's research scientists, designing engineers and production technicians have never ceased to strive for perfection in all of its many varieties of apparatus. From the subscriber's telephone and calling device to the most intricate problems of local and long distance switching and transmission, new and revolutionary developments have been undertaken and brought to success, while traditional and proved equipment has been constantly refined through the use of better materials, more precise fabrication and rigid inspection throughout the whole production process, thereby insuring more reliable operation and longer service life.

The keystone of Automatic Electric's outstanding position in the telephone industry today is found in its extensive system of research and development laboratories—the only group of its kind in the world which has the benefit of continuity of organization, and development records and experience extending back to the beginning of automatic telephony. Equipped with the most modern apparatus, much of it specially devised to meet particular requirements, and staffed by groups of mature men with life-long experience in telephone science in all its branches, these Laboratories engage in a number of major activities directed to the creation of new systems and products, to the improvement of older products, and to the adaptation of existing designs to the new needs which are constantly arising in the field.

An important division of the Laboratories is the Analytical Research staff, whose members carry on basic physical and electrical research, as well as investigations dealing with the fundamental principles of techniques and equipment for the purpose of discovering the most promising lines of attack for the meeting of future needs. An example of this work can be found in the field of *transistors*. While the word “transistor” itself is a coined word, referring to the *transfer* of signals through a *varistor*, it has become a generic term for semiconductor amplifiers of many types. A new technology is growing around the transistor, with the promise of profound effects on communication science.

Automatic's present research effort on the characteristics of transistors and their manufacture, though relatively limited, is growing. The field is still very new, and as the

studies progress and understanding increases so also does the prospect of the transistor's usefulness. The outlook is promising—promising in terms of what can be done, speed of operation, power and space advantages, as well as probable cost and reliability in service. The transistor will emerge as an important part of telephone technology only as rapidly as its sound practical ability to meet the rigid requirements of switching and other telephone applications can be developed.

The Analytical Research staff is an important influence in the development of new ways of meeting conditions which arise from the constantly expanding scope and complexity of communication science. New services, and new methods of providing present services, are being examined continuously. The transistor gives them what promises to be a powerful new tool in these studies.

Another, and equally vital, function of the Laboratories staff is to devise, test, and perfect new circuits and new types of apparatus. Some of these are to meet special conditions peculiar to the operations of a particular customer, while others are pioneering ventures into hitherto unexplored fields. Here are found inventions in the making, from the first rough and tentative sketches through the various processes of refinement to final operational and durability tests before release to factory production.

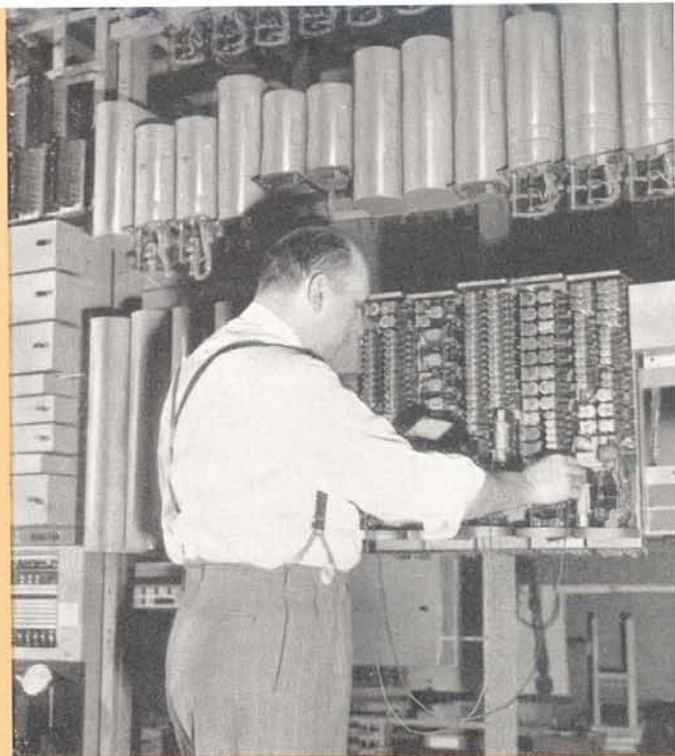
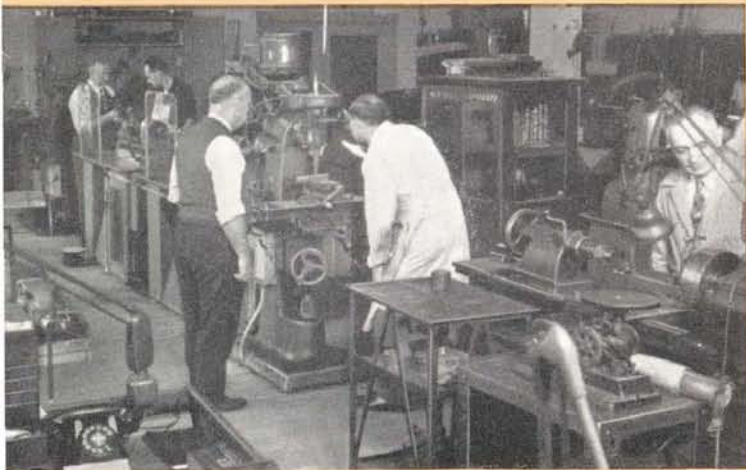
In this work, the project engineers in this group — the Product Design section — work closely with the production experts to insure a design which will bring the maximum in performance and durability as well as the utmost economy of production. The Product Design section also includes well equipped mechanical laboratories, in which models for new designs are built.

Still another essential phase of the Laboratories' operations is concerned with the constant checking of performance characteristics. Thorough testing and inspection of all manufactured products are, of course, integral parts of the routine factory production processes, but supplementing this is a program of constant tests not only of newly developed products, but also of sample equipment taken directly from the assembly line to insure that the prescribed standards are rigidly observed. Tests in both classes include endurance runs under conditions which are far more rigorous than those encountered in actual service, and the results of such tests are constantly being reflected in improvements which result in longer life and more dependable performance.

As has characterized all Automatic Electric progress from the earliest days, all of these activities of the Laboratories, ranging from purest research to practical design, embody the combined vision, skill and experience of many men working as a team. And, equally, each activity is eminently practical and opens up new possibilities of service improvement and economy, which year by year, are reflected in greater use and greater satisfaction.

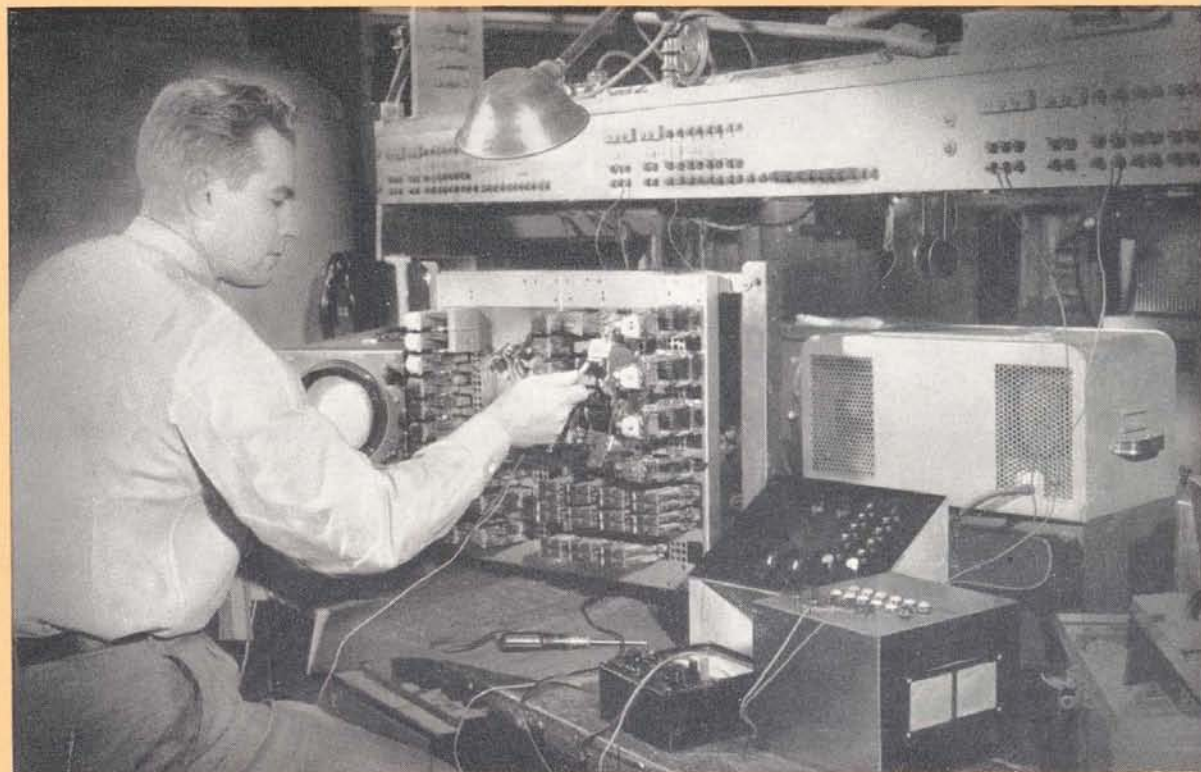
Right: A member of the Laboratories staff is shown here analyzing the circuit functions of a new Director development.

In the Automatic Electric Model Shop, prototypes of new products take shape.



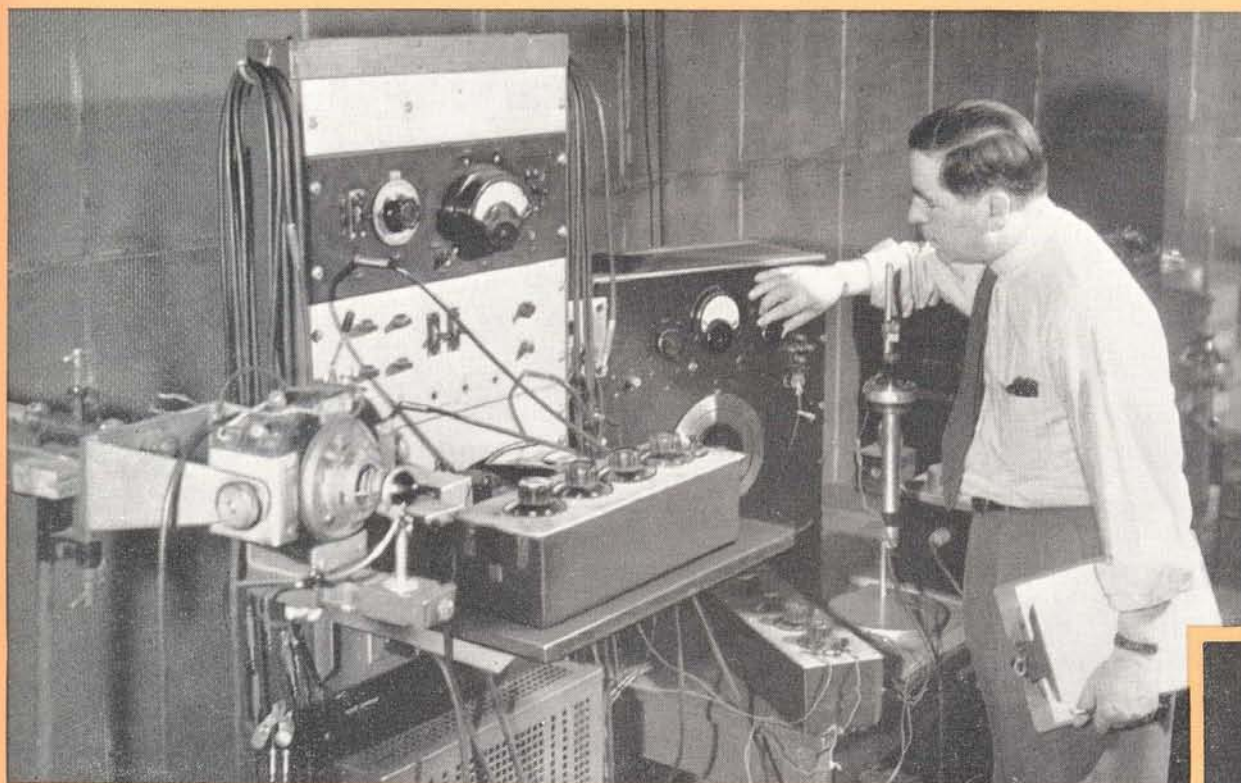
Where Tomorrow's Equipment Begins

HERE in the Automatic Electric Laboratories is creative enterprise in telecommunications at its finest. Here new ideas take shape and are put to the test. Some are discarded because they fail to meet the challenge of service or economy. Those that survive exacting standards are added to the list of Automatic Electric achievements, as new products or improved designs.

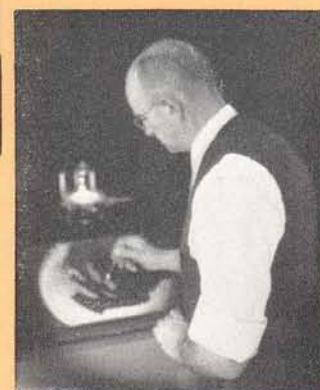


A member of the Laboratories staff is shown putting a new impulse sender through its paces.

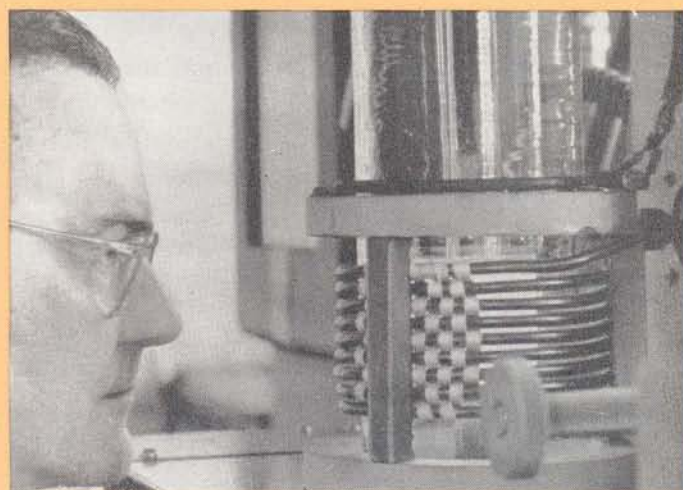
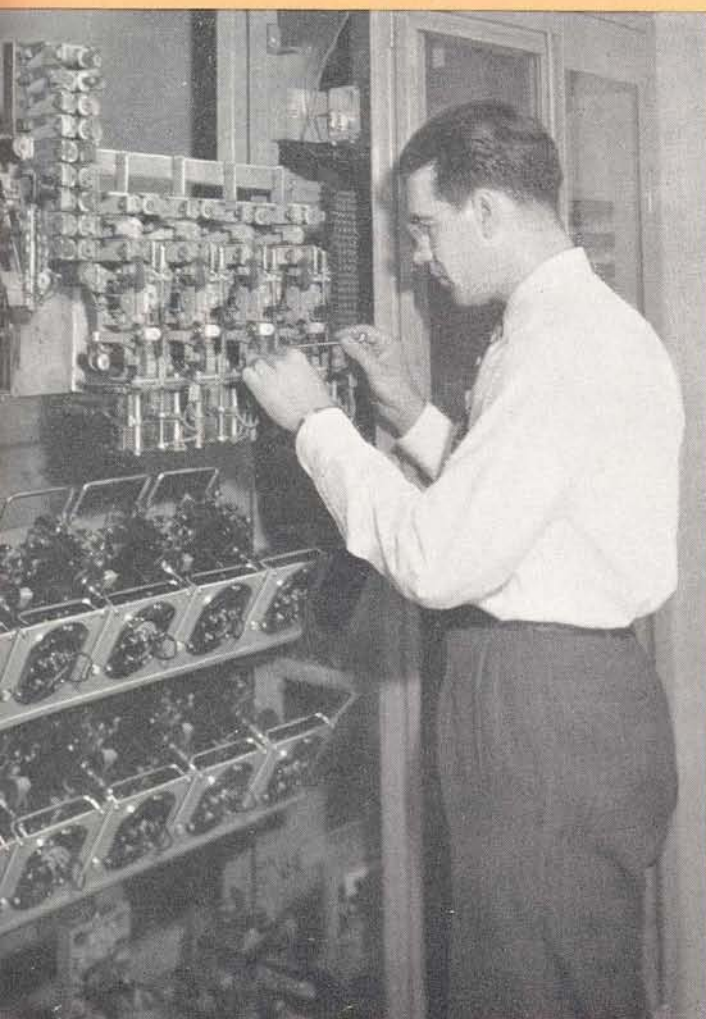
TCI Library: www.telephonecollectors.info



Investigating the acoustic properties of a telephone, utilizing the artificial voice and ear.



The Comparator, shown at right, provides a means of inspecting the contour of a piece part by projection of its outline.



A technician of the Laboratories staff checks progress as a germanium crystal for transistors is "grown" in a high-frequency furnace.

Strowger two-motion switches and dials under accelerated life test.

ADVANCES IN ENGINEERING TECHNIQUES

*M*ANY ELEMENTS contribute to, and are embodied in, the hundreds of Automatic Electric central office installations which today are rendering accurate, dependable and economical service throughout the world.

During the years of world expansion in the use of the Strowger Automatic system, the Automatic Electric technical staff has steadily continued its work of perfecting the apparatus, increasing its efficiency and extending its scope of usefulness. To attempt to list the many refinements they have added and are adding year after year would be fruitless, but it will be interesting to note a few of the outstanding principles of automatic telephony which they have originated and which have become permanent and accepted features of telephone service wherever automatic switching is used. Among these are automatic trunk selection, automatic intermittent ringing, reverberating tone, automatic busy tone, toll line dialing, party line selection, unattended rural automatic exchanges, private automatic exchanges, and interconnections in multi-office areas. They have also pioneered in the adaptation of automatic principles to the switching of toll traffic in both local areas and over long distance circuits extending through other exchanges; and also in techniques for the automatic recording and ticketing of suburban, metropolitan and long distance toll calls.

Modern Telephones for Every Need



Type 80 Desk Monophone



Type 40 Desk Monophone

IN these efficient handset phones, Automatic Electric has combined beauty and convenience of design with transmission performance that meets the highest standards of volume and fidelity over both local and long distance circuits. Here are examples of modern design giving outstanding satisfaction to both subscribers and operating companies.

AUTOMATIC ELECTRIC TELEPHONES

To the user of these services in all their wide varieties—the telephone subscriber—the most familiar element is his telephone instrument and its associated calling device. Automatic Electric was a pioneer in refining and perfecting this apparatus, being the first to introduce the modern molded plastic handset, which has now entirely replaced the earlier types with their separate transmitters and receivers. Today's sturdy and compact instrument is unexcelled in beauty of design, ease of handling and quality of transmission. The standard models available from all units of the Automatic Electric group include the widely used cradle-type desk set, as well as those adapted for wall or desk-side mounting, most of them being supplied as self-contained units, with the bell in the base, and plastic-molded for maximum beauty and durability. Special models to meet a wide variety of special needs and applications are also available. An essential part of each is the "whisper-quiet" Automatic Electric dial which has long set the highest standards for quietness, permanence of adjustment, long life, and trouble-free operation.

THE STROWGER AUTOMATIC SWITCH

The basic mechanism in all Strowger Automatic central office installations is a sturdy and compact electro-magnetic unit which operates under the control of the subscriber's dial with a degree of speed, precision, accuracy and uniformity unequalled by any other type of apparatus. Hundreds of Strowger Automatic exchanges operating in all parts of the world testify to its dependability, long life, and low maintenance cost. A complete unit within itself, it is mechanically independent of all other switches, and requires no power driven shafting or other mechanical linkage, with its ever-present danger of incapacitating large groups of lines.



Type 50 Wall Monophone



Type 43 Monophone



Type 47 (Three-Line) Monophone

Strowger switches may be grouped to serve small or large switching centers with equal ease and complete flexibility, and may therefore be concentrated at a single central point to serve many thousands of stations in the heart of a densely populated section, or conversely, with equal efficiency and economy, can be dispersed in a number of smaller units. Thus the same basic equipment is not only used for both small and large offices, but can also be arranged to take full advantage of the most economic type of plant distribution. Switch quantities can also be readily increased or the switches themselves readily shifted from one part of an exchange to another as changes in traffic may require.

DEVELOPMENTS IN SMALL AUTOMATIC EXCHANGES

This same flexibility of the basic Strowger switch made possible one of Automatic Electric's most original and outstanding contributions to telephone exchange operation—the development of unattended automatic exchanges for small villages and rural areas. The first unattended Strowger Automatic units—known as Community Automatic Exchanges—were developed as early as 1916 for service in rural exchanges operated by Independent telephone companies in the United States. Since then thousands of similar exchanges, varying in size from a dozen or so lines to several hundreds have been supplied by Automatic Electric to telephone companies and administrations throughout the world.

An important advantage of the use of such units is that, whether they are installed singly or in groups, they permit elimination of all manual operating functions at such exchanges, and permit the centralization of toll, information and other similar services at convenient attended toll centers.

All such exchanges make use of special facilities to meet the conditions peculiar to small exchange operation. Such conditions may include dialing over various types of toll circuits, selective signaling of stations on multi-station lines, and the provision of high transmission standards under the difficult conditions imposed by long lines and heavy station loading.

THE PRIVATE AUTOMATIC EXCHANGE

Almost from the beginning of Strowger Automatic development, leaders of business and industry were quick to recognize the advantages of automatic telephone switchboards in meeting their needs for fast, dependable intercommunication.

The use of private automatic exchanges, based on adaptations of Strowger equipment to the needs of business organizations, began on a broad scale in 1917 and has since proceeded at an ever increasing pace. In a typical case, an installation consists of a

simple automatic switchboard using standard Strowger apparatus and principles and as many automatic telephones as may be needed. All internal calls are made by dialing two or three figures, with a considerable saving of time over manual methods of transmitting information between individuals and departments.

In many cases, the private automatic system is connected to the public exchange facilities and the equipment includes, in addition to the local automatic switching equipment, an attendant's switchboard for the handling of local or long distance calls to or from the public exchange. In other cases, the private automatic exchange is a separate system for internal traffic only, and is supplemented by an attended private branch exchange having connections to the central office for handling public exchange traffic. Strowger Private Automatic Exchange equipment available today embraces switchboards in a wide range of capacities, and with service features to meet every modern business and industrial need.

STROWGER AUTOMATIC IN METROPOLITAN AREAS

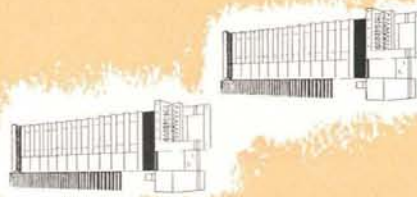
Further evidence of the flexibility of Strowger Automatic design is found in its extensive use in large multi-office exchanges in all parts of the world. The first city network to use multi-office trunking was that at Los Angeles, California, equipped by Automatic Electric in 1904. Today, a large majority of the world centers of population use Strowger Automatic equipment.

An especially significant development of Strowger Automatic techniques for metropolitan networks was the invention of the Strowger "Director"—a combination of standard Strowger components especially devised to meet the traffic and service conditions of large cities and to make full use of the economies of tandem trunking in conjunction with universal numbering and facilities for alternate routing of traffic. It was this development that was influential in the decision of the British Post Office in 1923 to adopt Strowger equipment for the large and complex network of offices in the Greater London area. Similar equipment has since been installed in a number of other multi-office exchanges in various parts of the world.

STROWGER AUTOMATIC IN TOLL SERVICE

The fast growing importance of toll service has in recent years focussed attention on the extension of automatic switching principles to toll lines, to permit the operator at an originating exchange to dial subscribers at distant points either directly or through automatic tandem exchanges. Automatic Electric pioneered the application of automatic toll dialing principles as far back as 1910, and notable examples of such applications appeared soon thereafter in both United States and Canada. These principles

Each Strowger switch is a complete mechanism, with control relays. Wiring is terminated in a jack on the base.

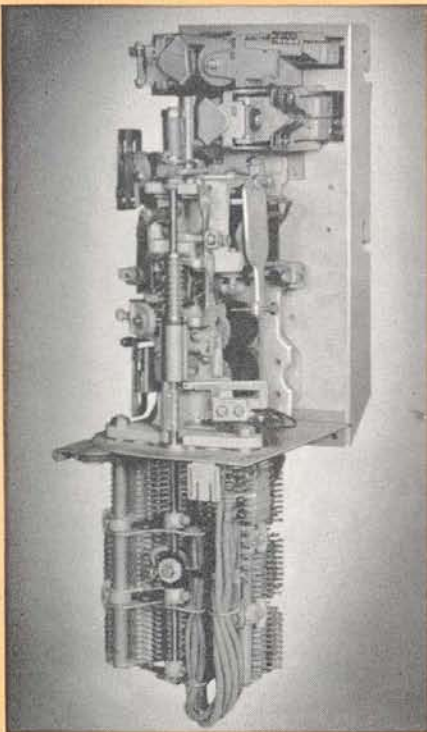


Standard shelves provide mounting facilities, complete with bank and shelf wiring and terminal blocks.

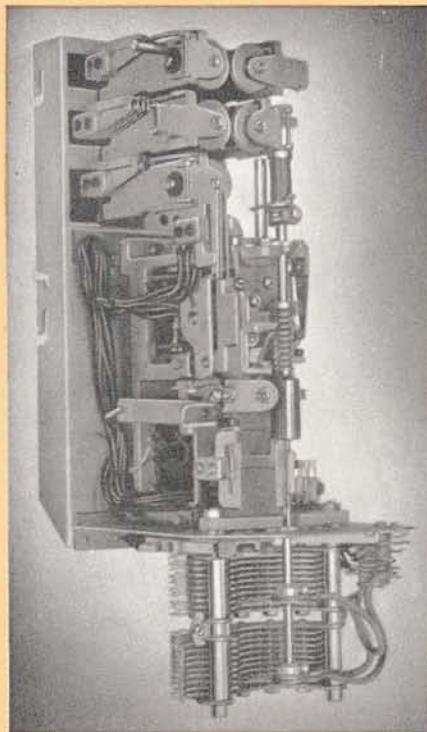
Standard frames are rigid steel structures, upon which the shelves and switches are easily mounted.



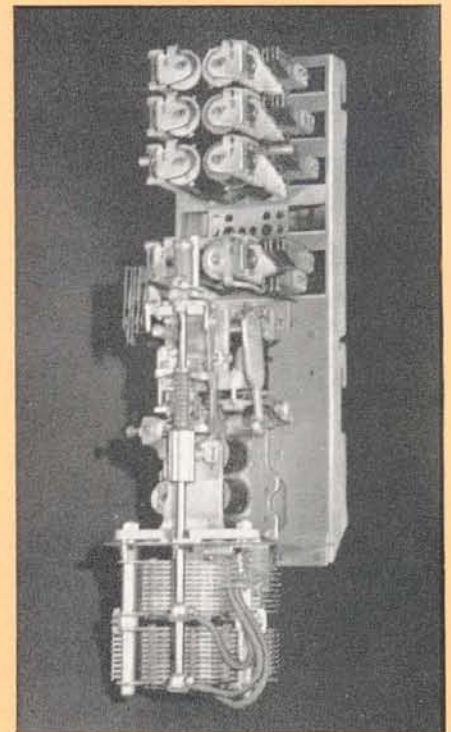
Typical Strowger Automatic Components



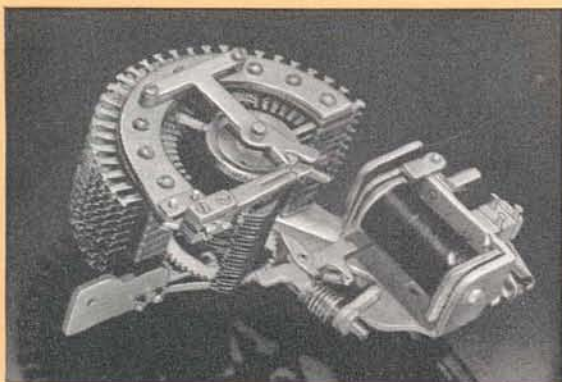
Strowger Line Finder



Strowger Selector

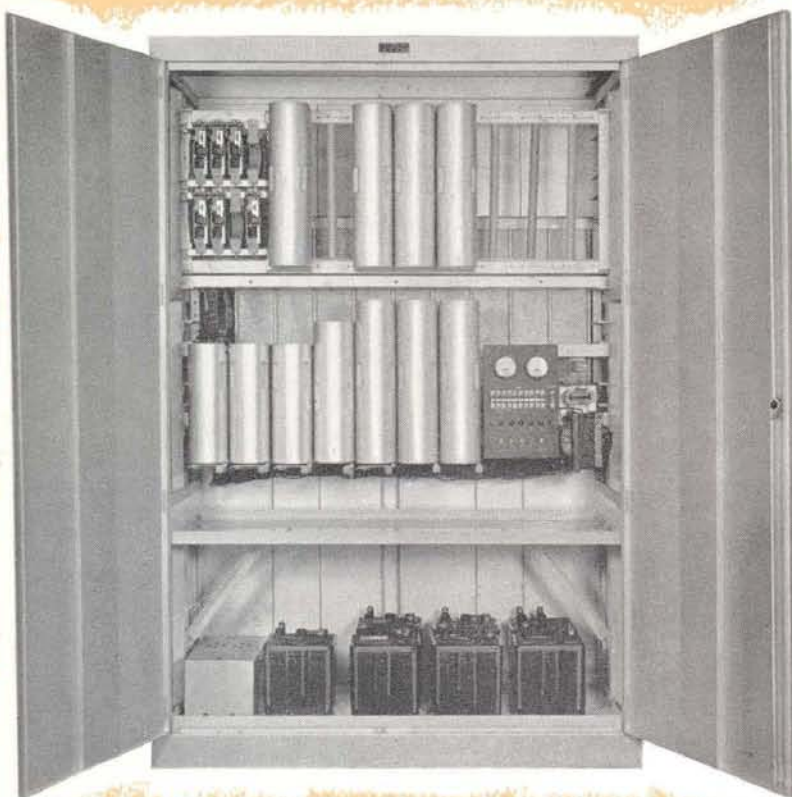


Strowger Connector



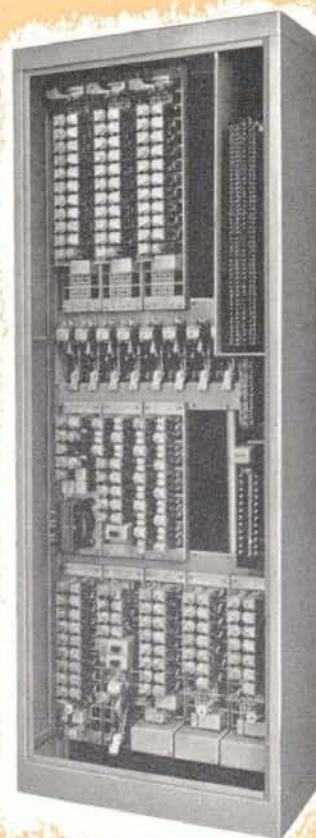
Type 45 Rotary Switch, a high speed switch used as finder or connector in small exchanges.

THE Strowger Switch — basic unit of the Strowger System — is at once highly standardized in principle and flexible in its application. Here are shown a few of its scores of variants, as well as a modern high-speed rotary switch.

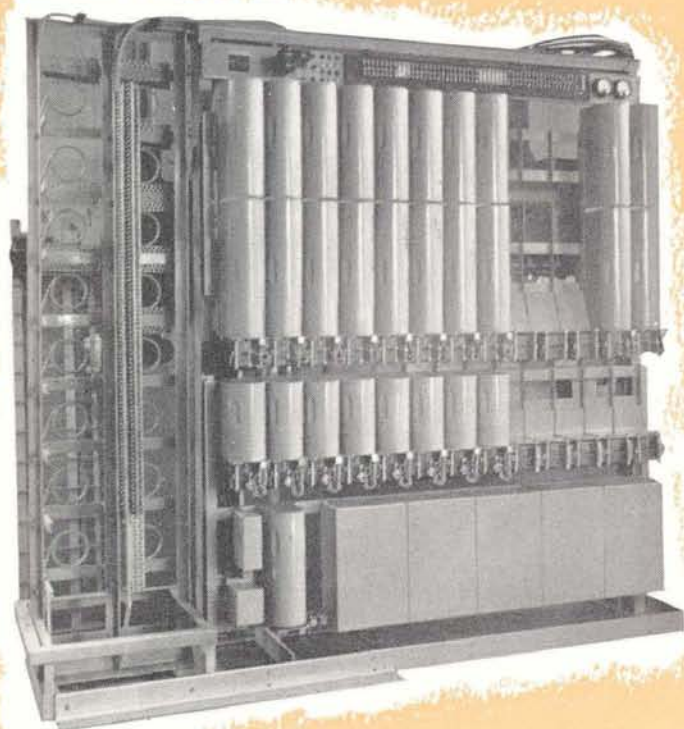


Type 46B Community Automatic Exchange (50-line capacity)

Type 48A Community Automatic Exchange (20-line capacity)



Strowger Automatic in the Small Exchange

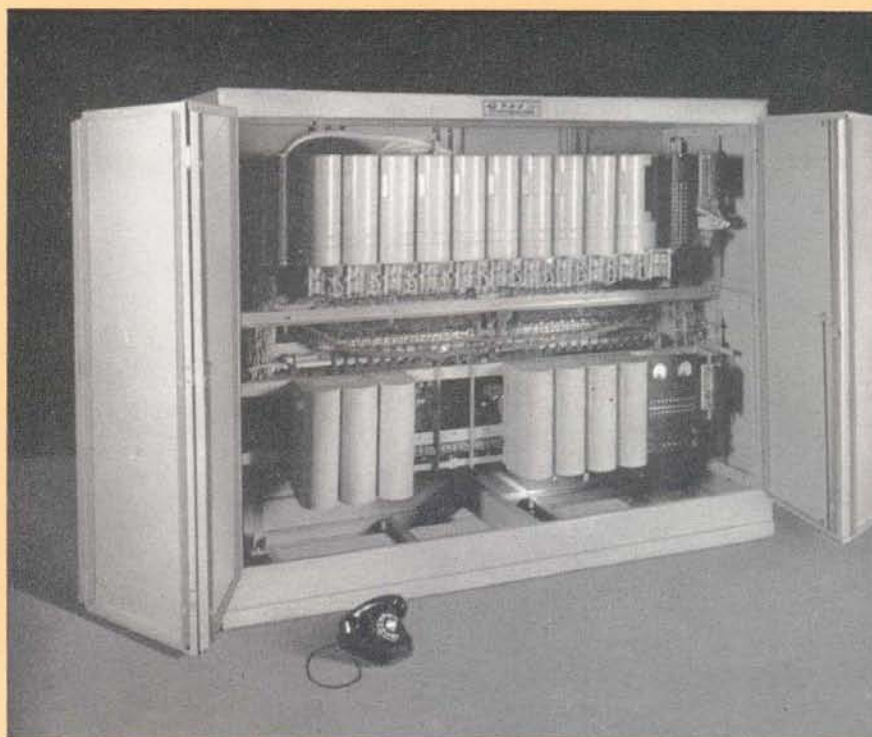


Type 10 Main Automatic Exchange For 100 lines—expansible to any ultimate.

THE flexibility of small unit design has made it easy to adapt Strowger Automatic equipment to the traffic and service needs of small exchanges, and thus to bring the benefits of high standardization to administrations operating both large and small exchanges. Here are shown typical small exchange units provided by companies of the Automatic Electric group.

Better Service for the Modern Business

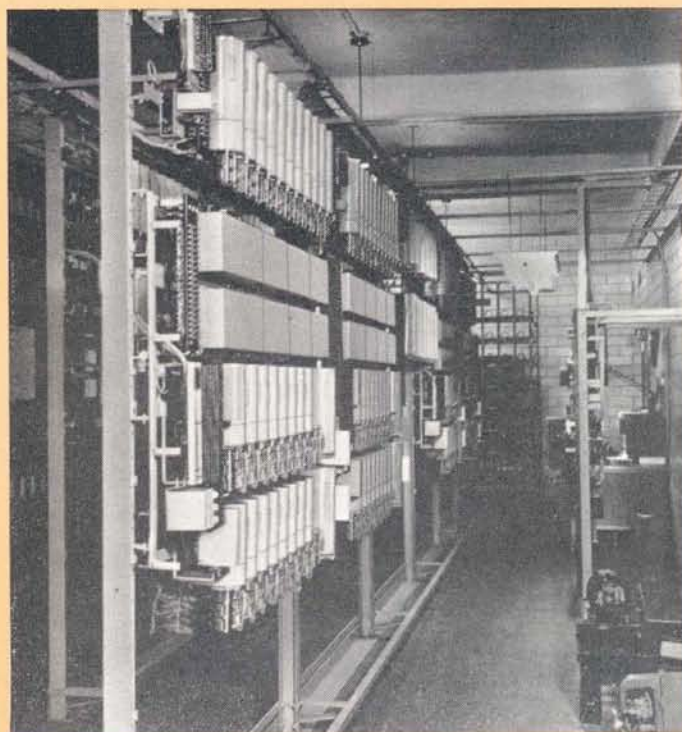
THE design and production of modern telephone equipment for business and industry has long been an important phase of Automatic Electric's activities. Such equipment embraces Private Automatic Exchange systems in various capacities and a wide variety of control units, automatic and manual, to meet every need.



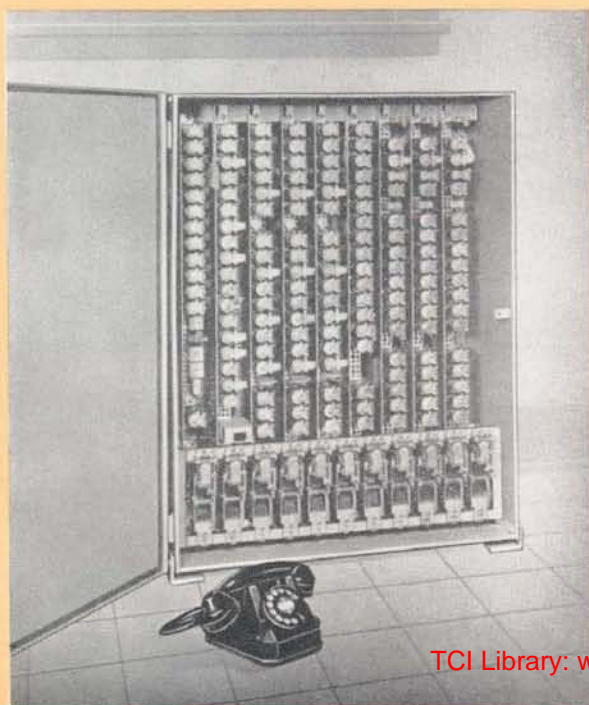
The Type 50 Private Automatic Exchange Switchboard, available without central office trunk facilities. Normally recommended for 5 to 200 lines.



A Type 32A21 Private Automatic Exchange Switchboard, for 22 lines.



For larger Private Automatic Exchange Systems, Line Finder Switchboards like this are used.



The Type 95 Private Automatic Branch Exchange, for 12 lines, 3 trunks.

have since been adapted to a wide variety of toll networks in the United States and in other countries.

In their early development of toll switching techniques, Automatic Electric engineers anticipated by many years the introduction of toll dialing in networks covering wide areas, and a large proportion of the Strowger Automatic exchanges have been engineered in anticipation of the ultimate needs of such wide scale toll switching plans.

Other Strowger toll switching developments which have proved their worth through actual use include Automatic (cordless) toll boards for the local or remote switching of toll circuits, and automatic toll dialing over carrier and radio circuits.

STROWGER AUTOMATIC TOLL TICKETING

The rapidly-growing adaptation of Strowger Automatic principles to toll switching soon presented another area for development. The increasing complexity of metropolitan and suburban networks and the need for greater speed on calls between exchanges made it desirable to devise means so that subscribers could dial calls to subscribers anywhere within the metropolitan area without the service of an operator.

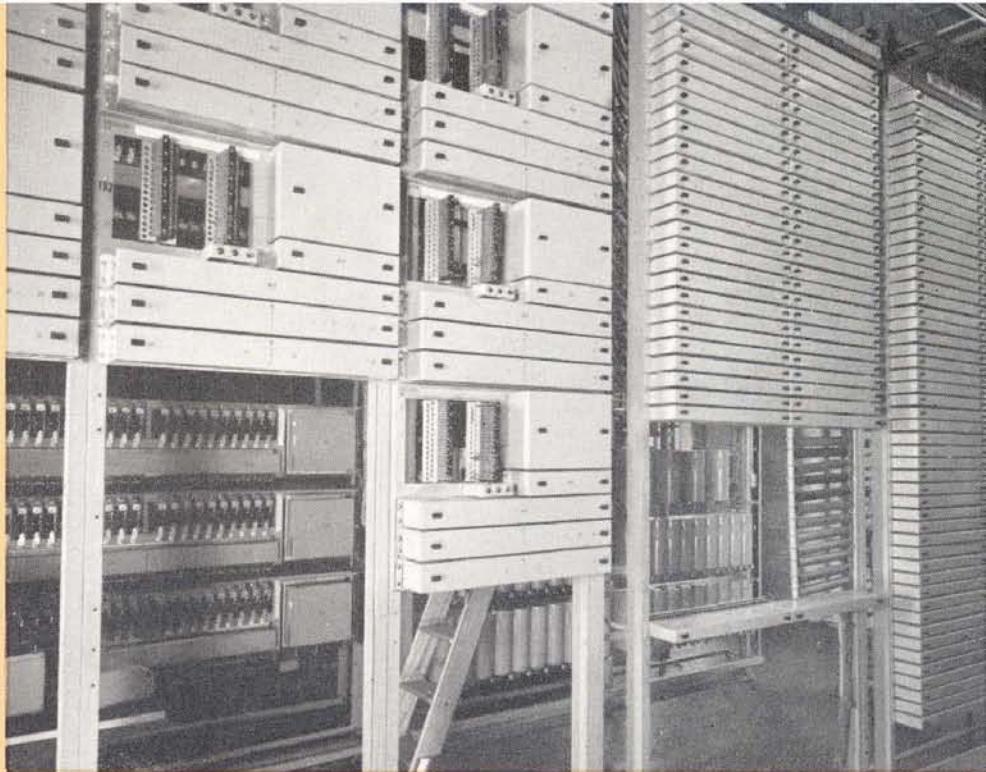
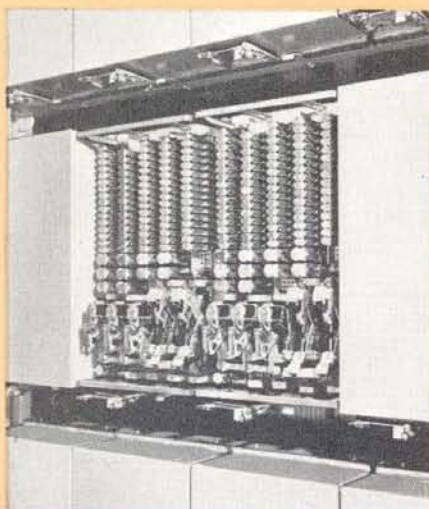
This need led to the development of the Strowger Automatic Toll Ticketing (SATT) System, which provides for the handling of suburban toll calls in the same manner as local calls, that is, under subscriber control all the way. The SATT System is arranged automatically to provide a complete record of each suburban toll call for billing purposes, the recorded data including the numbers of the calling and called stations, the time and duration of the call, the unit rate, the computed charges, and all other data needed for billing and accounting purposes.

Since the pioneer installation was made in Mons, Belgium, in 1937, SATT has become an important activity of the Automatic Electric group, here and abroad. As a contribution to the nationwide customer toll dialing plan, and in collaboration with the Independent and Bell Systems, Automatic Electric now offers a wide variety of SATT systems for use in various sizes of exchanges and networks, ranging from metropolitan areas to small communities.

ELECTRONICS IN THE TELEPHONE FIELD

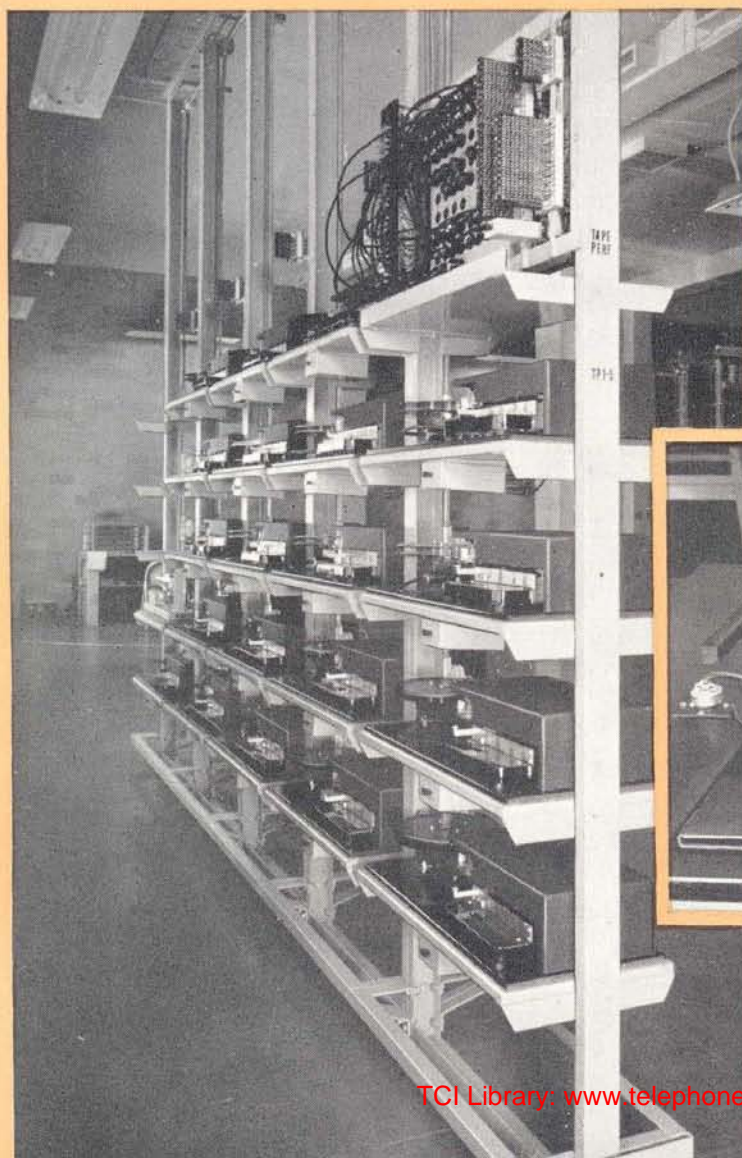
While the basic principles of telephone systems have changed but little over the years, it was inevitable that the science of electronics should find widespread application in telephone service. The Automatic Electric technical staff has taken a leading position in this field, and in recent years much of its work has been directed to making the fullest possible use of electronics as a communications tool. In the main, the effect of elec-

S.A.T.T. Ticketer Frame, showing two ticketer details.



A portion of the Detectors and Tabulators in a S.A.T.T. System.

S.A.T.T.-For Subscriber Toll Dialing

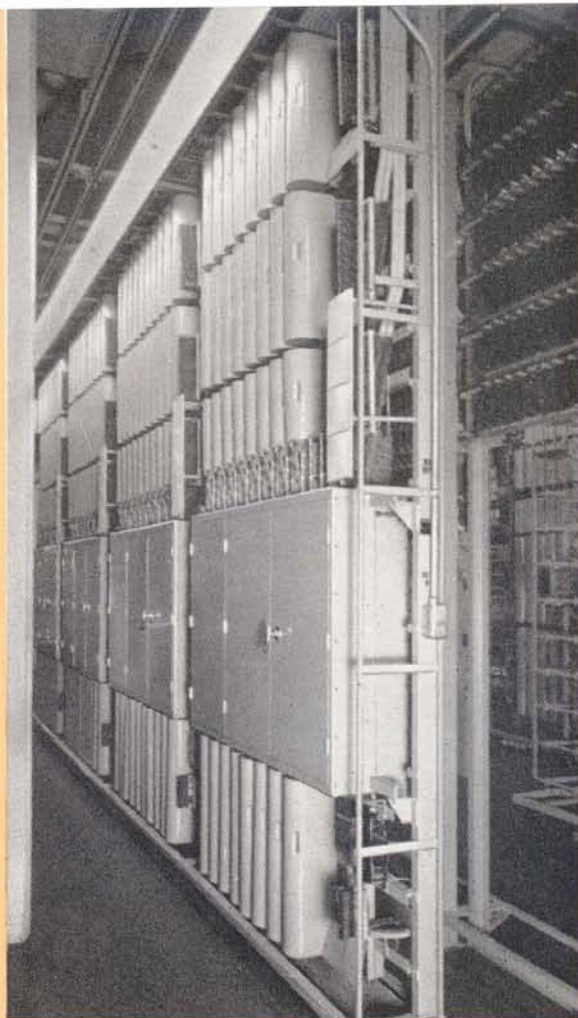
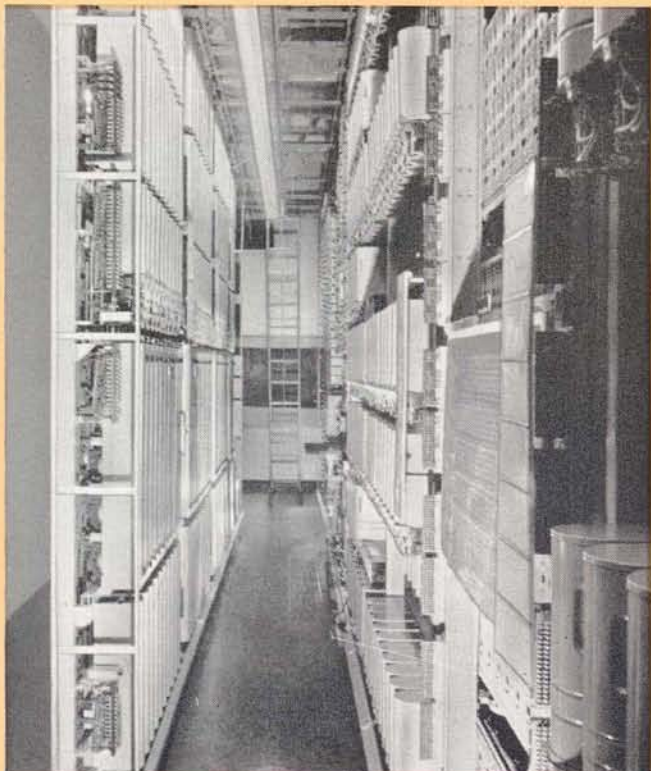


STROWGER Automatic Toll Ticketing equipment—one of the most outstanding creations of the Automatic Electric Laboratories—permits subscriber dialing of toll calls and the automatic recording and timing of each call to provide records for billing and accounting purposes. Various units of equipment used in the S.A.T.T. System are shown here.



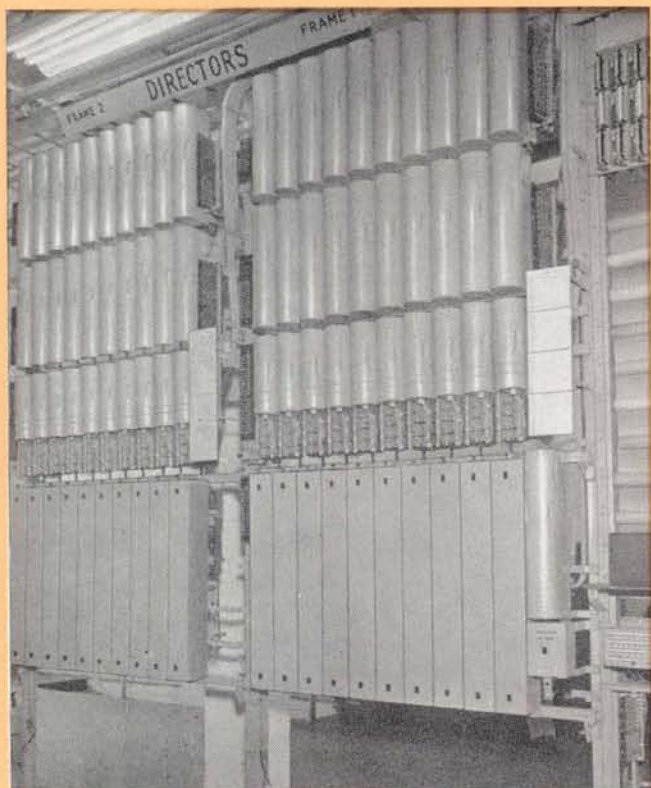
S.A.T.T. Tape Perforators. Tapes from these machines may be used to prepare conventional toll tickets, or used with automatic punch card billing procedures.

Director Frames (left) at Sunland, California.
(Sunland-Tujunga Telephone Company)



Director equipment at Park Ridge, Illinois,
(Middle States Telephone Company)

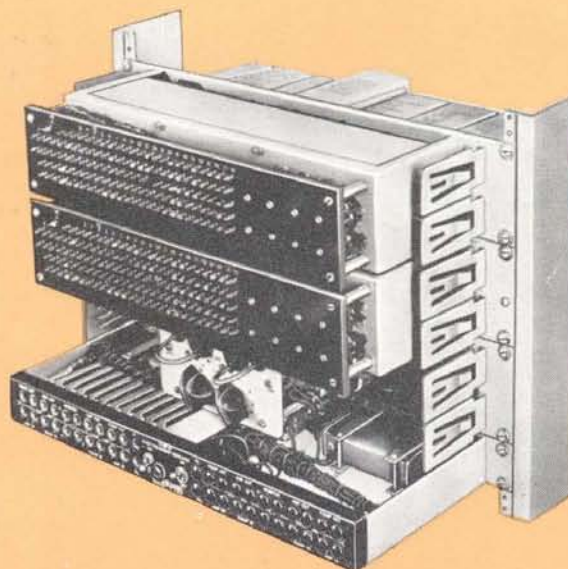
The "Director"— Magic Brain of the Modern Network



OF growing importance in metropolitan and toll telephone networks is the requirement for "digit translation" facilities to permit universal numbering with the economies of tandem trunking. In Strowger Automatic systems these facilities are provided by the Director. An important feature of this development is that it can be economically used where it is needed—even added to existing non-Director networks—or omitted where it offers no advantage.

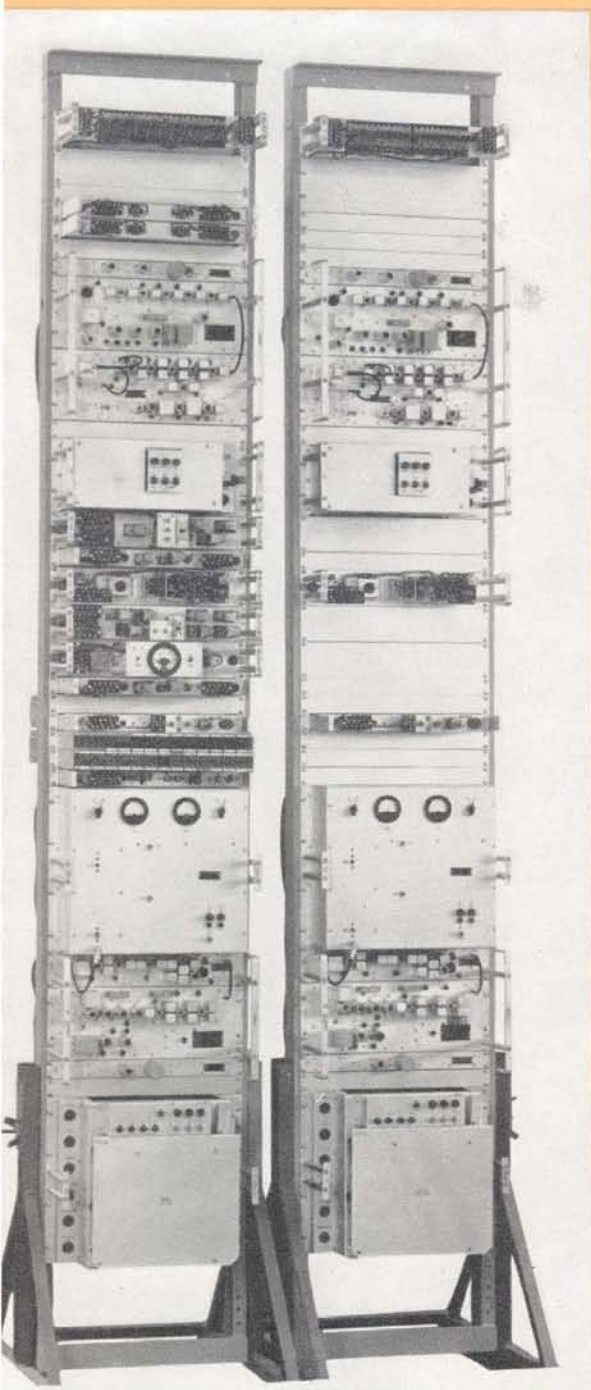
Directors at San Fernando, California.
(California Water and Telephone Company)

Electronic Telecommunications

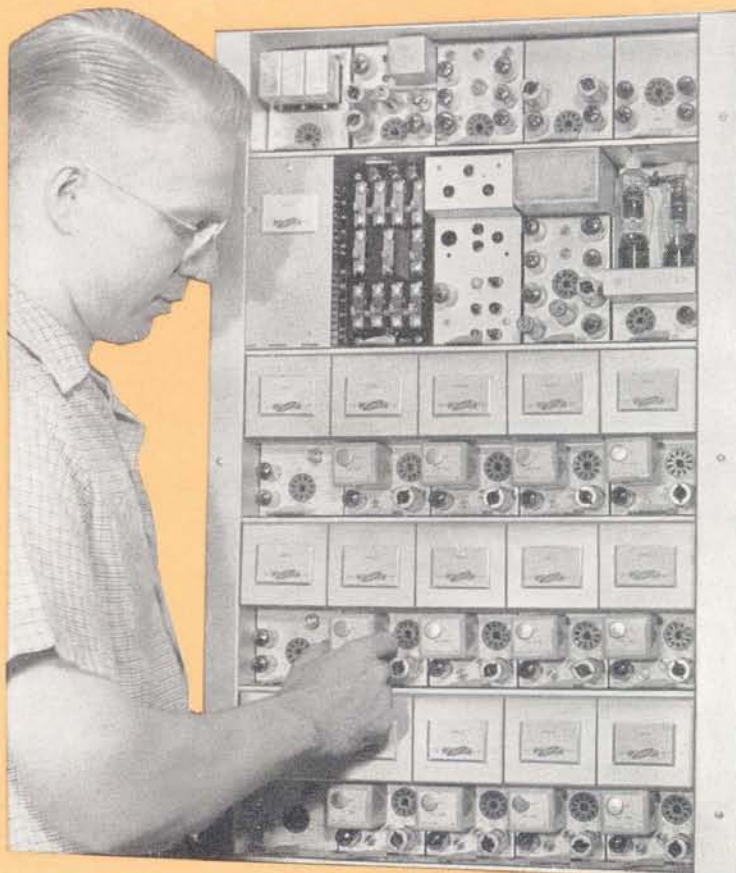


Type 47 Two-wire Intermediate
Voice Frequency Repeater.

AUTOMATIC Electric has taken a leading position in the application of electronic principles to telephone switching. Here are shown typical examples of electronic equipment supplied by Automatic Electric.



Lenkurt Type 72 Radio Equip-
ment (dust covers removed).



A typical rack assembly of a Type 45A,
12-channel, high-frequency carrier system.

tronic applications to telephony has been not to change the basic principles of central office switching, but rather to provide new and better ways of accomplishing ends which were heretofore subject to the limitations of wire and cable circuits.

Most widely used of all electronic applications to telephone systems is the "carrier" system, which makes it possible to transmit two or more two-way telephone conversations over a single wire (or radio) circuit. The principle involved is the application, on wire or radio telephone circuits, of "carrier" waves on which are superimposed the "voice frequency" currents of ordinary telephone conversations.

One or more such carrier waves, each of them modulated by voice currents, may be transmitted over the basic circuit and separated or "filtered out" at the distant end, thus providing for a number of simultaneous two-way conversations over plant facilities normally used for single conversations.

The equipment required consists of "carrier terminals" at each end of the circuit. Equipment of this type supplied by Automatic Electric is manufactured to rigid specifications by Lenkurt Electric Company, Inc., San Carlos, California, and is available in single-channel and multi-channel units for application to wire or radio circuits. The distances over which such channels operate is extended by the use of carrier repeaters at suitable intervals. Carrier terminals are also available to provide both telegraph and telephone channels and facilities for dialing or signaling to meet any combination of requirements.

Other electronic applications which Automatic Electric supplies to the telephone field include the following:

Voice Frequency Telephone Repeaters—vacuum-tube or transistorized voice-amplifying units for gain in transmission levels over long toll lines.

Radio-Telephone Toll Links—providing radio-telephone toll circuit facilities between points where the construction of pole line or other types of physical wire circuits is difficult or uneconomical.

Transistorized Telephone Instruments—for noisy locations or the hard-of-hearing. These include telephones, handsets, and operators' headsets.

EXCHANGE ACCESSORY EQUIPMENT

It has always been Automatic Electric's policy to manufacture completely in its own shops as much as possible of the wide variety of parts and equipment that enter into a complete Strowger Automatic central office installation, and in any event to formulate its own specifications for the manufacture of parts and materials which it is not economically equipped to produce.

A complete telephone central office will consist not only of the automatic switchboard itself, but also of a power plant (including storage battery, charging equipment and power board). There will also be such accessory equipment as distributing frames, wire chiefs' desks, test desks, toll switchboard, repair clerks' desks, information desks, and other miscellaneous equipment. All of this equipment, with the exception of storage batteries and certain types of ringing and charging machines, is made in Automatic Electric's own plants, and designed and specified by its own technical personnel. Thus each company of the group has complete control over quality of its products and their fitness for the service they are intended to perform.

Other miscellaneous telephone products manufactured by Automatic Electric include a complete range of protective equipment for central office and substation use, rectifiers and battery eliminators for noiseless power supply, paystations, telephones of standard and special types, and a wide variety of testing equipment for the efficient operation and maintenance of telephone exchanges of all sizes.

In addition, Automatic Electric, through its affiliated sales and service organizations, acts as distributor for the wide variety of materials, tools, and supplies which are used by telephone companies in the construction and maintenance of plant and central office facilities.

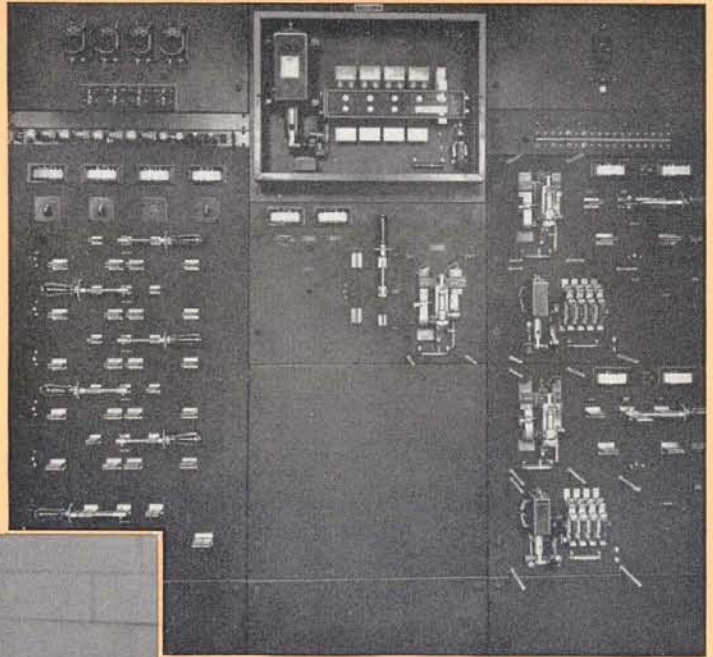
APPLICATIONS IN ELECTRICAL CONTROL

The basic principles of the Strowger Automatic switchboard and its components have found use not only in the switching of telephone lines but also in a wide variety of industrial and commercial applications in which there is need for the remote selection of electrical circuits or the remote control of circuits or functions over wires.

The Strowger Automatic Telephone System itself is the world's foremost example of the application of electrical control over wires. Through their long experience with control techniques, Automatic Electric engineers have been able to make important contributions in the adaptation of the same basic methods to other fields, either through collaboration with the manufacturers of control systems and equipment, or by undertaking complete development and manufacture of the entire equipment.

The attention of industrial engineers and designers has also been attracted to the versatility of the components of Strowger Automatic switchboards, such as relays, stepping switches, solenoids, keys, etc., and the supply of these components for use in various industrial devices forms a steadily growing part of Automatic Electric's business.

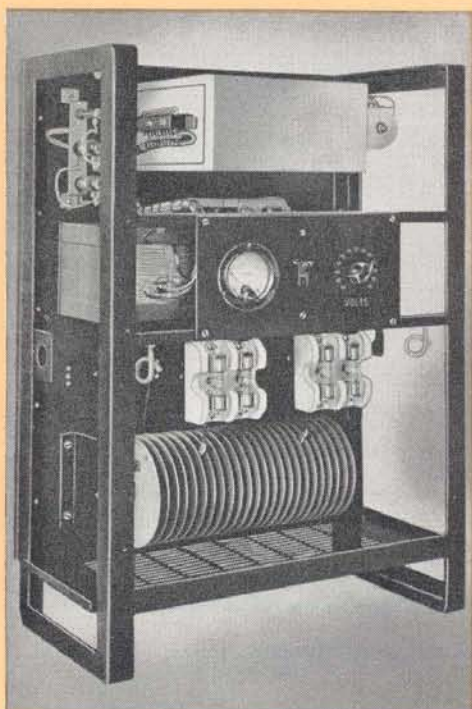
Power Equipment for Every Need



Front View of a large
exchange power board.



Motor-generators as used in a large
Strowger Automatic Exchange.

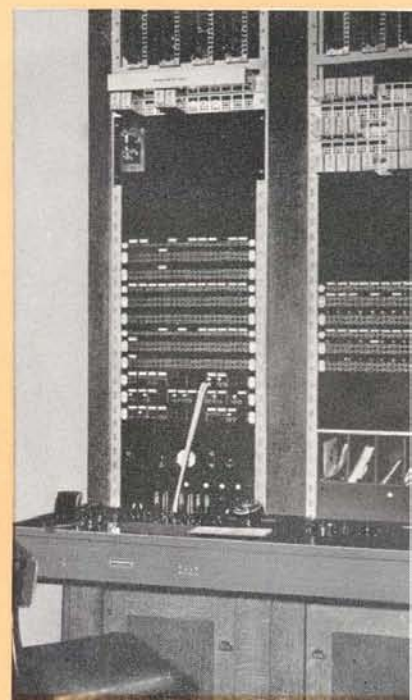


An Automatic Electric "Convotrol",
a selenium type rectifier charger for
small exchange use.



Electronic Ringing
and Tone Generator
With Interrupter

Toll and Special Service Desks for the Modern Exchange



Combined Toll and Local
Test Panel.

Automatic Toll Board sup-
plied by Automatic Electric.



Type 3 Automatic Electric Information Desk.



Automatic Electric Dial Service "A" Board.

BUILDING

AUTOMATIC ELECTRIC EQUIPMENT

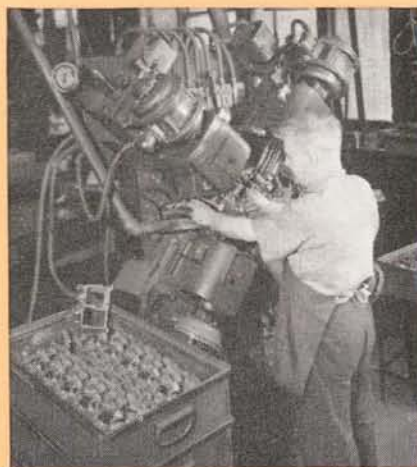
EQUIPMENT ENGINEERING

The manufacture of Strowger Automatic telephone equipment for a central office installation begins with the work of the equipment engineer, who takes the basic ideas and apparatus which originate in the Laboratories and plans their practical application to the requirements of the telephone exchange, correlating them with the specifications worked out through collaboration of the customer and the field sales engineer. The duties of the equipment engineer are concerned with visualizing the completed installation in its broad aspects, and planning it in such detail that it will exactly meet the needs of the exchange it is to serve. In handling a typical installation, the equipment engineer is responsible for:

1. The selection of the proper switches and circuits to meet the service needs of the exchange, including such modifications of standard equipment as are needed to meet any special conditions that may exist.
2. The study of traffic data, their application to the basic trunking plan, and the computation of switch quantities to handle the traffic efficiently and economically.
3. The design of mountings and frameworks and the preparation of central office equipment floor plans.
4. The engineering of power equipment, manual desks, distributing frames and other apparatus needed for the complete exchange.
5. The preparation of complete and detailed instructions and drawings for the manufacturing departments.
6. The preparation of specifications and instructions to guide the work of the installation engineers.

The personnel of the equipment engineering department in each plant consists of highly trained and experienced telephone men, most of whom have had experience either with operating organizations or in the installation of central office equipment. An important qualification for all members is the ability to visualize the final project—soundly planned, carefully constructed and installed, and smoothly operating.

Multiple drill press for machining
Strowger Switch frames.



Wiring Strowger switch base



Modern plastic molding processes produce
telephones of surpassing beauty.

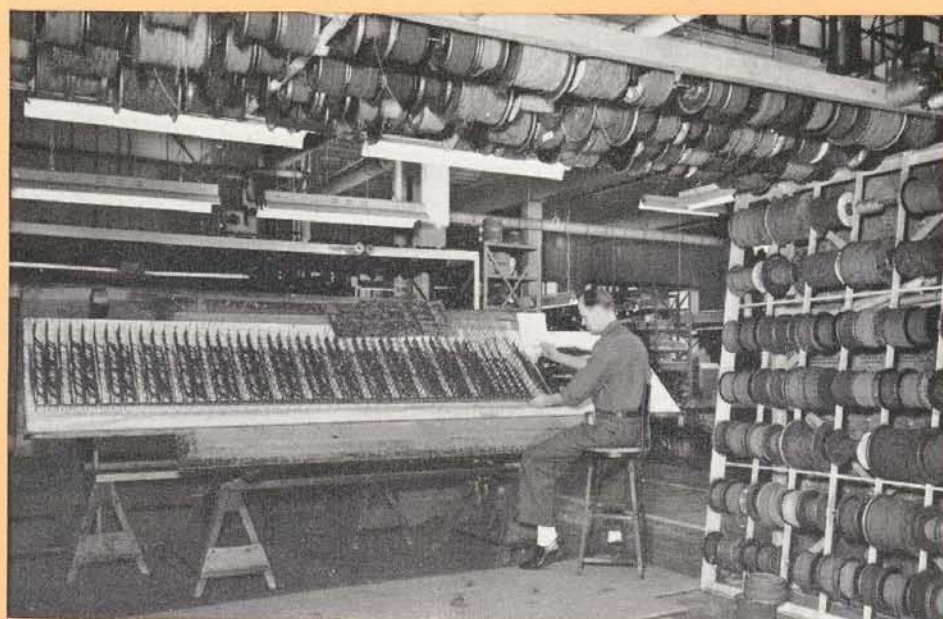
Modern Processes Insure Quality and Economy

Exhaustive tests to in-
sure compliance with
specifications mark
every phase of equip-
ment manufacture.

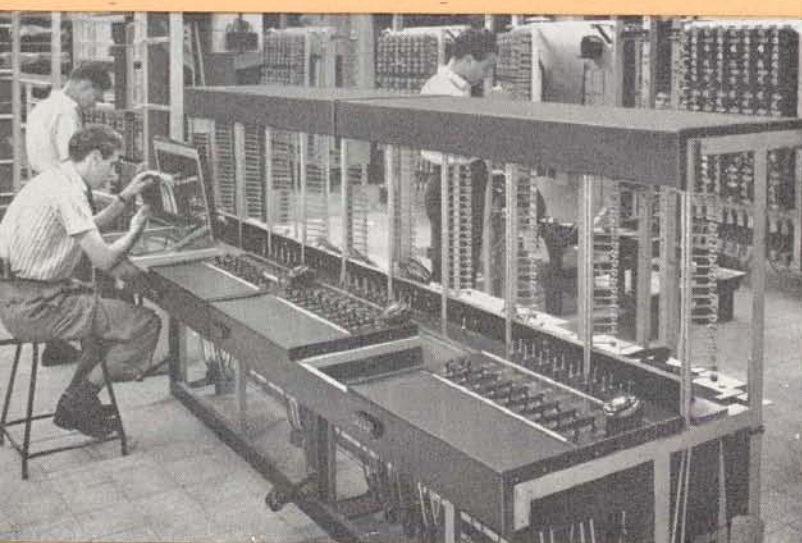




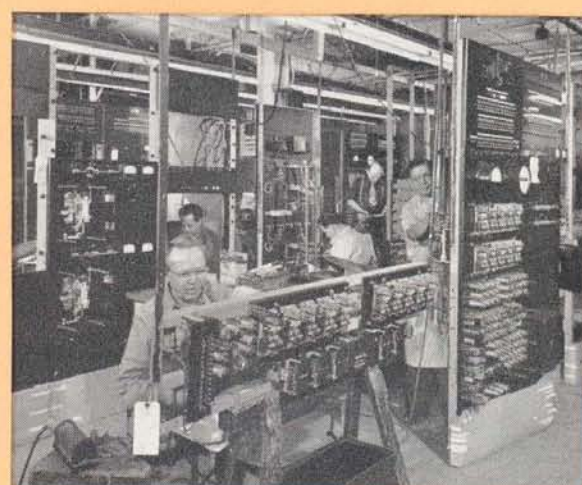
above: The Strowger switch bank multiple is designed and constructed for maximum durability and flexibility. Twisted pairs avoid crosstalk, and soldered connections make for permanence.



Cable forming for switchboard units.



Annual Toll Switchboard in process of assembly.



Shelf wiring is designed for permanence and flexibility.

Quality Control in Every Process

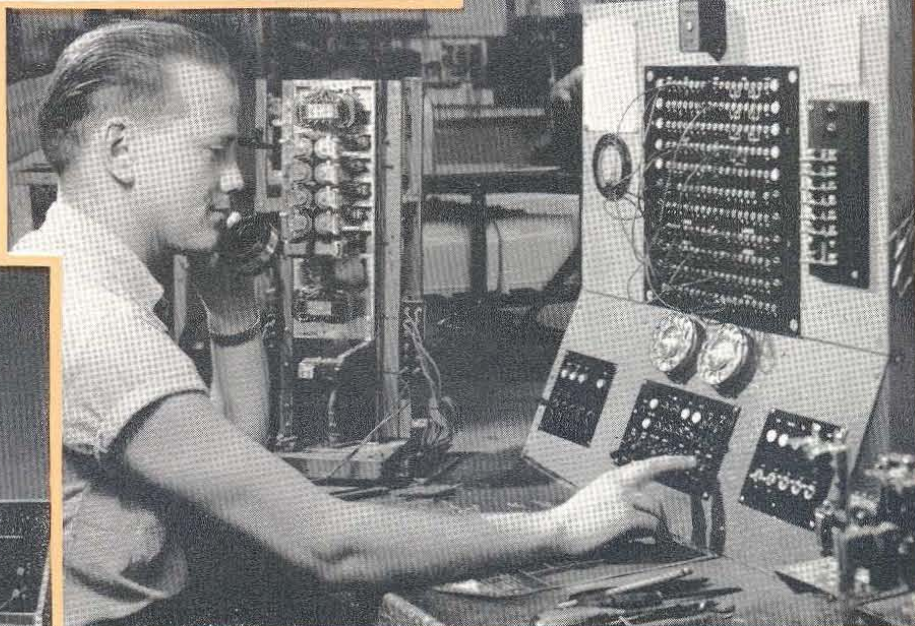
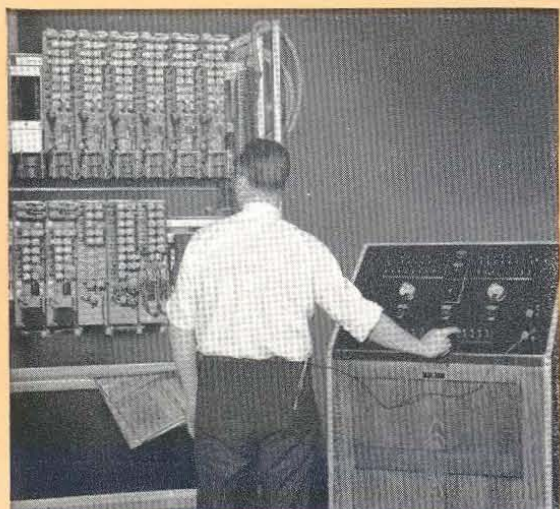


By means of test units like this, coils are automatically tested for resistance and insulation breakdown. Lamp signals indicate acceptance or rejection.

Quality control of Automatic Electric production requires a comprehensive array of precision testing equipment, much of it being made and maintained by Automatic Electric's own quality control staff.



Completed automatic switchboards are subjected to final operating tests under extreme conditions by the use of portable test sets like this.



Testing circuits of Strowger switches and relay groups.

MANUFACTURING PROCESSES

The manufacture of Strowger Automatic equipment and other Automatic Electric apparatus is not a mass production process in the usual sense of that term. While the equipment produced by Automatic Electric is made up of switching units and other elements which are basically similar in design, the number and combination of such elements must differ widely for each project. Thus the equipment for each installation is "tailor-made" to individual specifications, while at the same time the economies of volume production are applied to basic parts and assemblies.

It will therefore be seen that Automatic Electric's production operations are not only exceedingly complex but also highly specialized, requiring for their maximum effectiveness a perfection of manufacturing techniques which only long continuity of organization can provide. It is significant, and of great importance to Automatic Electric's customers, that its personnel is made up predominantly of people who have had long and intimate contact with the production problems peculiar to its field. The supervisors in charge of the various departments are trained to be constantly on the alert for improved methods and materials which will add to the efficiency of manufacture, and the quality and performance of the finished product.

CONTROL OF PERFORMANCE

The products of Automatic Electric have long been recognized the world over for their high standards of performance, durability, and dependability. In the protection of this reputation, nothing is left to chance. The control of quality begins with rigid inspection and test of all raw materials and parts which come from suppliers, and continues through all stages of manufacture.

Exacting standards are established by inspection engineers, and many special tools and measuring devices are employed to insure that all parts and assemblies are processed to fall within the narrow tolerance limits required for dependable service and long life. When final assembly is complete, each item of equipment is put through actual operating tests under conditions much more severe than those encountered in practical service. The rigid standards which are set for this work are largely responsible for the reputation for dependability which Automatic Electric equipment has wherever it is used.

THE ADVANTAGES OF STROWGER AUTOMATIC EQUIPMENT

LATE IN 1953 the 50,000,000th telephone in the United States was installed in the White House with appropriate ceremonies in the presence of President Eisenhower. By early in 1955, the estimated number of telephones in the world reached the 95 million mark, of which more than 70% were automatic. At that time in the United States the number of telephones was an estimated 55 million, of which more than three-fourths were automatic. And, of these automatic telephones, over two-thirds operate under the Strowger principles originated by Automatic Electric, and developed largely by engineers of the Automatic Electric group.

This predominant use of Strowger Automatic equipment did not come about by chance, but rather because it is the only equipment which has consistently proved its ability to meet the needs of telephone administrations and their subscribers for the highest quality of service and the greatest economy to the operating organization.

Simplicity and dependability of apparatus are important factors in both quality and economy. The basic equipment unit, the Strowger Automatic switch, is a sturdy and compact electro-magnetic mechanism, fundamentally of the simplest construction, operating on the step-by-step principle under the control of relays. The trunking arrangements for the complete exchange are on a straightforward decimal basis, and the circuit principles are simple enough to be readily understood and the equipment easily maintained by anyone having a working knowledge of ordinary telephone apparatus. All Strowger Automatic components are designed and manufactured for *long service and unfailing reliability*. It is not uncommon to find Strowger Automatic exchanges that have been in continuous operation for thirty years or more and that are still giving dependable and satisfactory service.

The *flexibility* of Strowger Automatic equipment is an important factor in its economy. The equipment is constructed and assembled in small self-contained units which are arranged to "jack-in" to the permanent wiring of the mounting shelves. Thus the equipment can be initially grouped in large or small quantities to meet the requirements of individual exchanges or networks, and at the same time the quantity of these switches can be readily increased or decreased or any of the equipment shifted, as changes in traffic may require. This flexibility also results in economy in the use of floor space.

Furthermore, the flexibility of Strowger Automatic telephone equipment makes it ideal

for enlarging existing exchanges, or adding to groups of exchanges, even where the original equipment is of another type of manufacture. This has been amply demonstrated by the successful addition of Strowger Automatic telephone equipment to networks in various parts of the world where the initial installations were of other types.

The *low maintenance cost* for Strowger Automatic equipment is a matter of record among the hundreds of telephone administrations which have used this equipment under varying conditions for many years. From the beginning of its development, Strowger Automatic equipment has been intentionally designed so that the few parts that may normally be expected to wear out with long continued use, such as wipers and wiper cords, can be quickly and easily replaced at very low cost for labor and materials, and without interruption to service. The company or administration that adopts Strowger Automatic equipment thus avoids all financial risks entailed by unpredictable maintenance costs.

THE AUTOMATIC ELECTRIC TRAINING SCHOOL

*A*N IMPORTANT factor in placing and keeping Automatic Electric in the forefront of telephone progress is its Training School, which insures a steady and adequate supply of trained personnel, both for its own staff and to meet the requirements of the companies and administrations which operate Strowger Automatic equipment. In this school young men with sound and broad scientific backgrounds receive specialized training fitting them for technical and supervisory duties which may lead ultimately to positions of top responsibility.

The students, selected graduates of outstanding engineering schools and men nominated by Automatic Electric's customers in all parts of the world, are given a thorough course in the basic theory of automatic telephony and kindred subjects through lectures and demonstrations by specially qualified Automatic Electric engineers and technicians. This is supplemented by an equally thorough training in shop work in all the production processes, whereby knowledge of and proficiency in each step—assembly, adjustment, inspection and testing—are gained through actual experience.

Through the years, the Training School has steadily grown in scope and influence, its graduates including not only a large number of Automatic Electric employees, but also many engaged in technical and commercial work for telephone enterprises in countries throughout the world.

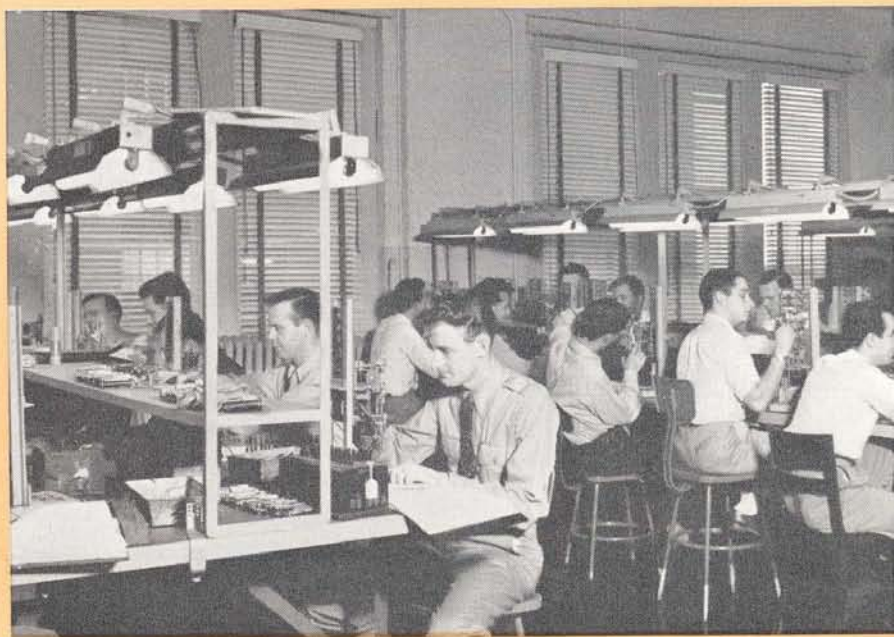
Where Careers in Automatic Telephony Begin



Here a student from Arabia gets pointers on switch adjustment.

Left: The Automatic Electric Training School sessions include lectures by qualified technical personnel.

Below: Circuit class, showing instructor using the Visual-Cast Projector, by which a circuit is projected on a screen in front of the class.



Above: This view shows students engaged in assembly and adjustment of Strowger switch mechanisms.

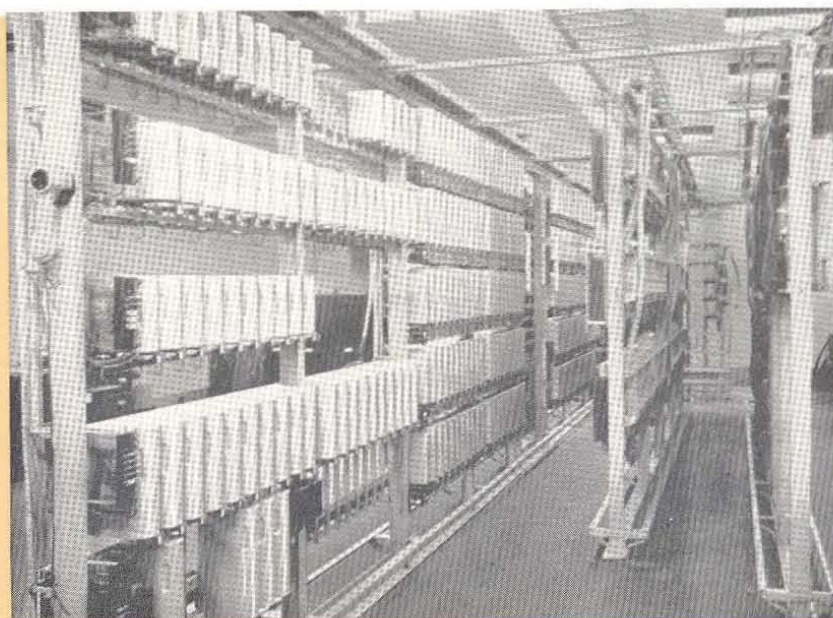
AUTOMATIC ELECTRIC AND THE ARMED SERVICES

THE DESIGN and manufacture of Automatic Electric communication equipment for military and naval uses dates back almost to the beginning of the Company's history. Prior to the first war, the U. S. Army and Navy had used Strowger Automatic equipment in various types of land stations, and during the second war, production of that equipment was continued on a vastly increased scale.

Use of Strowger Automatic equipment on Naval vessels began in the middle twenties, when the Company's engineers collaborated with the U. S. Navy Department in the design of the first ship's service automatic telephone system. By the end of the second war Automatic Electric had supplied such systems for over 350 vessels.

The Company was called on further to cooperate with both Army and Navy authorities in the development and manufacture of many special types of apparatus in the fields of communication and electrical control. Long experience in meeting the rigid and complex requirements of the armed services has not only placed Automatic Electric in a position to make enlarged contributions to this field, but also to fortify its technical and manufacturing position with respect to the needs of its customers in the telephone field.

This is one of the large number of automatic telephone systems manufactured by Automatic Electric for the armed forces of the United States. (U.S. Army Signal Corps Photo.)



THE INTERNATIONAL AUTOMATIC ELECTRIC GROUP



*T*O MEET the needs of the many telephone operating organizations throughout the world, the Automatic Electric Group has, through the years, built up a complete and balanced organization, comprising engineering, manufacturing, distributing and service companies on a scale commensurate with the international aspects of world telephone development.

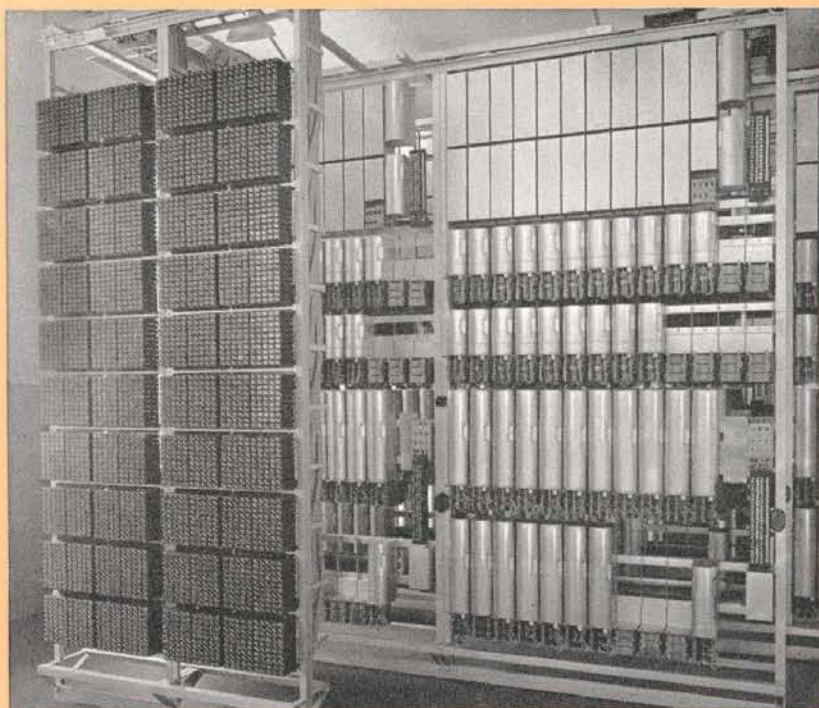
This has been the result of no hasty throwing together of facilities and personnel; rather it has been a steady and organic growth, each step carefully considered and designed to meet efficiently and completely definite present or clearly foreseeable future requirements. This development, in all its parts and aspects, has aimed un-deviatingly at a single purpose: to design and produce the most efficient, reliable and economical telephone equipment the mind of man can conceive, to adapt it to the specific needs of each locality where it is to be used, and to make it economically available to telephone administrations anywhere in the world.

To facilitate the great and growing world-wide demand for Strowger Automatic telephone equipment there has been established under the guidance of the parent Automatic Electric organization in Chicago, a group of affiliated manufacturing enterprises with plants in Canada, Belgium and Italy; and a corollary group of advisory, service, and distributing companies, comprising collectively the International Automatic Electric Group, with trained and experienced personnel and technical facilities at key cities in the principal countries throughout the world.

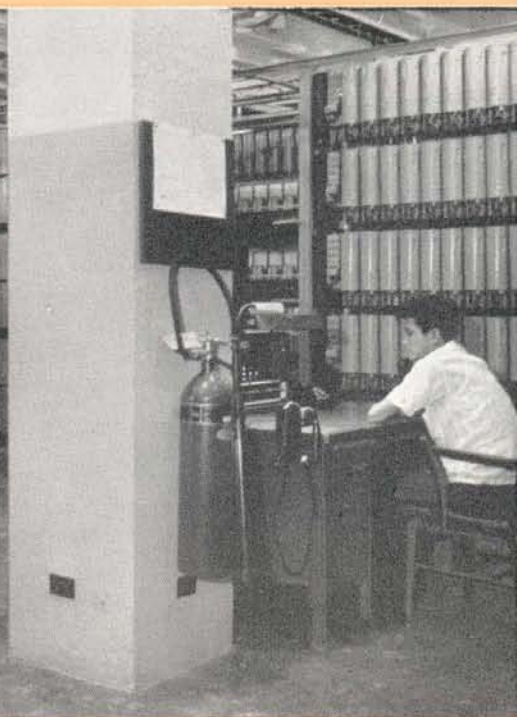
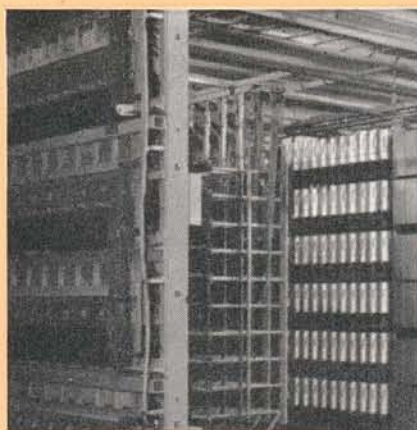
All of these companies have access to, and contribute to, the great pool of technical knowledge and experience which has been accumulating since the early nineties. These combined resources—gathered, organized, and made available to all units alike—represent an impressive aggregation of technical knowledge and practical experience covering the field of telecommunications techniques with particular emphasis on the field of automatic switching. Together, this knowledge and experience are helping to direct the thinking of telephone men everywhere in channels that are recognized today as the soundest and most progressive in the industry.

Strowger Leads the Way Throughout the World

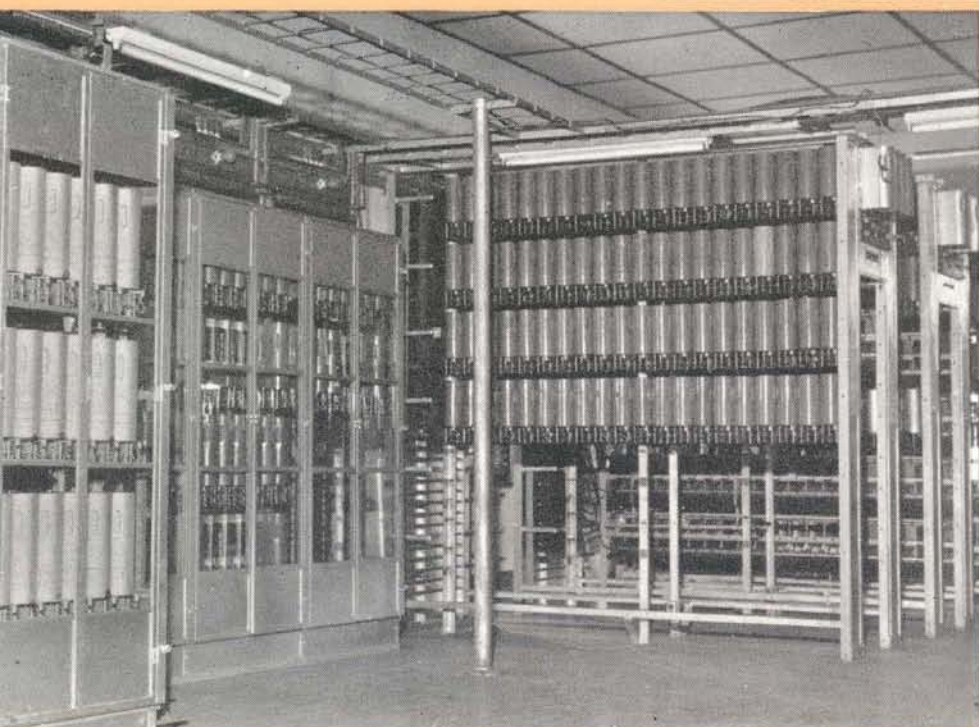
AUTOMATIC telephone equipment based on Strowger principles is used either exclusively or in part in more than sixty countries throughout the world. Typical examples of the hundreds of exchanges equipped by companies of the Automatic Electric group are shown on this page.



A Strowger Automatic central office at Milan, Italy. Subscribers' meters are shown at the left.



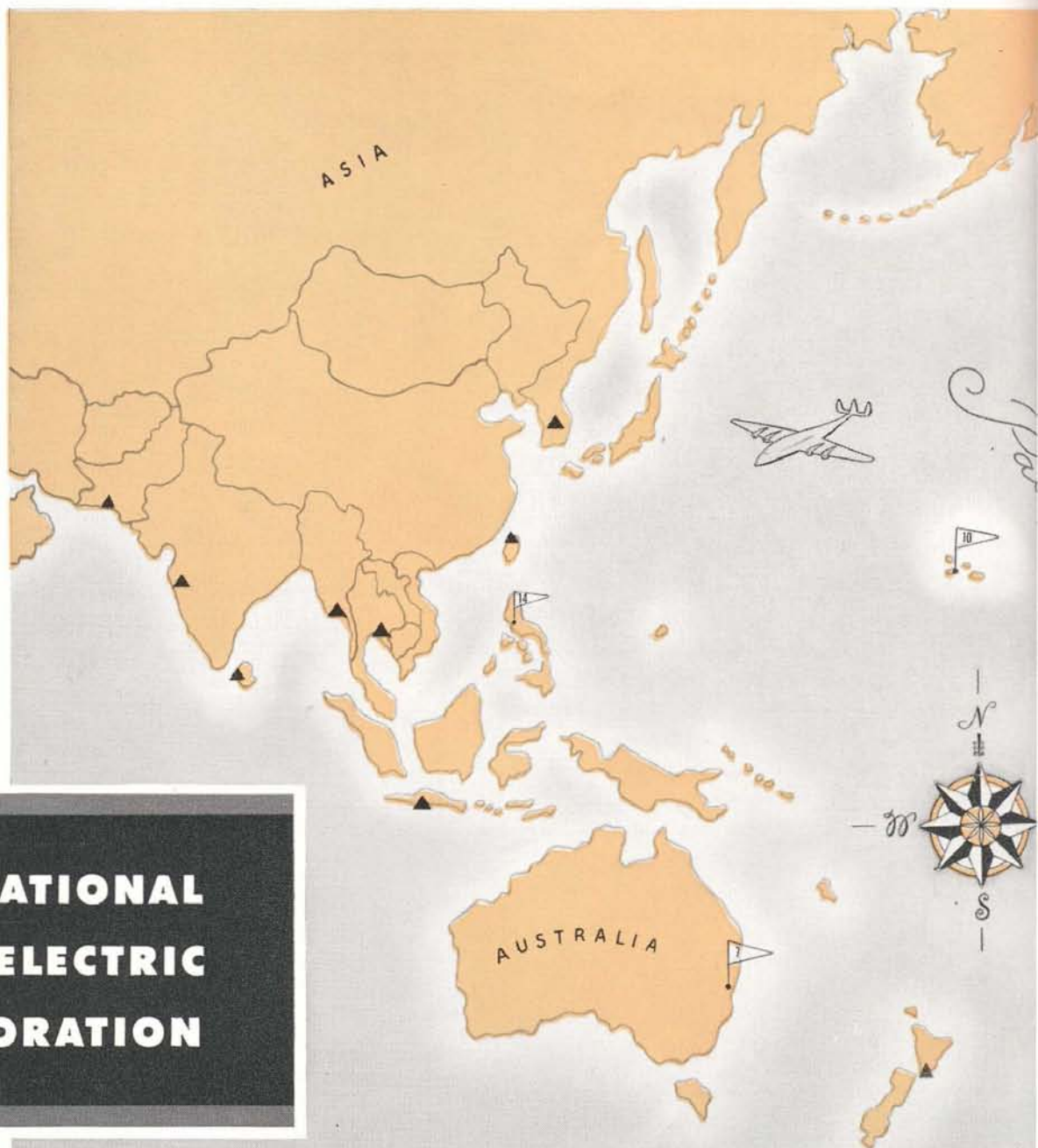
Honolulu, T. H. (Hawaiian Telephone Company).



Manila, Philippine Islands. (Philippine Long Distance Telephone Company).

INTERNATIONAL AUTOMATIC ELECTRIC CORPORATION

Chicago
New York



MANUFACTURING PLANTS

1. Automatic Electric Company
Chicago, Illinois, U.S.A.
2. Automatic Electric (Canada) 1953 Limited
Brockville, Ontario, Canada
3. Automatique Electrique, S.A.
Antwerp, Belgium
4. Autelco Mediterranea S.A.T.A.P.
Milan, Italy

REGIONAL DISTRIBUTING COMPANIES AND REPRESENTATIVES

5. Automatic Electric Sales (Canada) Limited
185 Bartley Drive, Toronto, Ont., Canada
6. Cia. Industrial de Telefones, S.A.
Carrera 14, 15-42, Bogotá, Colombia, S. A.
7. Automatic Electric Telephones Limited
86 Holdsworth Street, Woollahra, N.S.W., Australia
8. Automatique Electrique, S.A.
22 Rue du Verger, Antwerp, Belgium
9. Automatic Electric Telephones Limited of Brazil
Rua Conselheiro Crispiniano No. 69, Sala 61,
Sao Paulo, Brazil



10. J. R. Reed
Alexander Young Bldg., Honolulu, T.H.

11. Autelco Mediterranea S.A.T.A.P.
Via Bernina 12, Milan, Italy

12. International Automatic Electric Sales Company, S.P.A.
Via di San Basilio 41, Rome, Italy

13. Automatique Electrique, S.A.
Huygenstraat 6, The Hague, Netherlands

14. J. K. Barrington
1131 M. H. del Pilar, Manila, Phillipines

15. A. E. Hermelin
c/o Henry S. Dabdoub S.A., Mexico D.F., Mexico



CANADIAN BRANCH SALES OFFICES

Winnipeg, Manitoba
Montreal, Quebec
Regina, Saskatchewan
Brockville, Ontario

Vancouver, British Columbia
Ottawa, Ontario
Hamilton, Ontario
Edmonton, Alberta



REGIONAL AGENTS

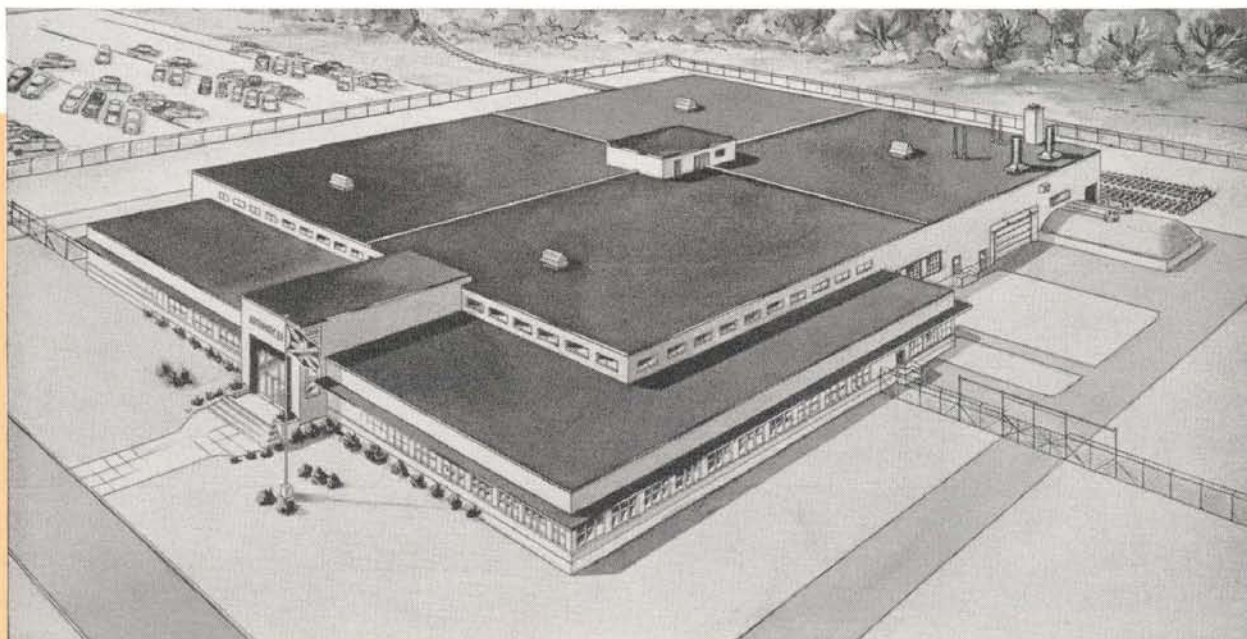


**AUTOMATIC
ELECTRIC
(CANADA)
1953 LIMITED**



*A*UTOMATIC ELECTRIC (Canada) 1953 Limited is the Canadian manufacturing affiliate of Automatic Electric Company. Its modern factory in Brockville, Ontario, produces a wide variety of telephones, telephone dials, relays, and a complete range of Strowger Automatic switchboards and accessory equipment.

The Automatic Electric group's manufacturing operations in Canada began in 1930 with the acquisition of Phillips Electrical Works, Limited, Brockville, Ontario, which at that time was devoted exclusively to the manufacture of a complete range of copper conductors and cables for the communication, power, and transport fields. In 1935, an addition was made to the Phillips plant to provide for the manufacture of telephones, automatic and manual switching equipment, and other communication apparatus. In the years that followed, this operation was steadily expanded to meet the rapidly growing needs of Canadian telephone companies and administrations.



The Brockville, Ontario, plant of Automatic Electric (Canada) 1953 Limited, shown here, occupies 125,000 square feet of floor space and is so designed that the building can be expanded up to 500,000 square feet. The building is located in the Schofield Hill area, west of Strowger Boulevard.

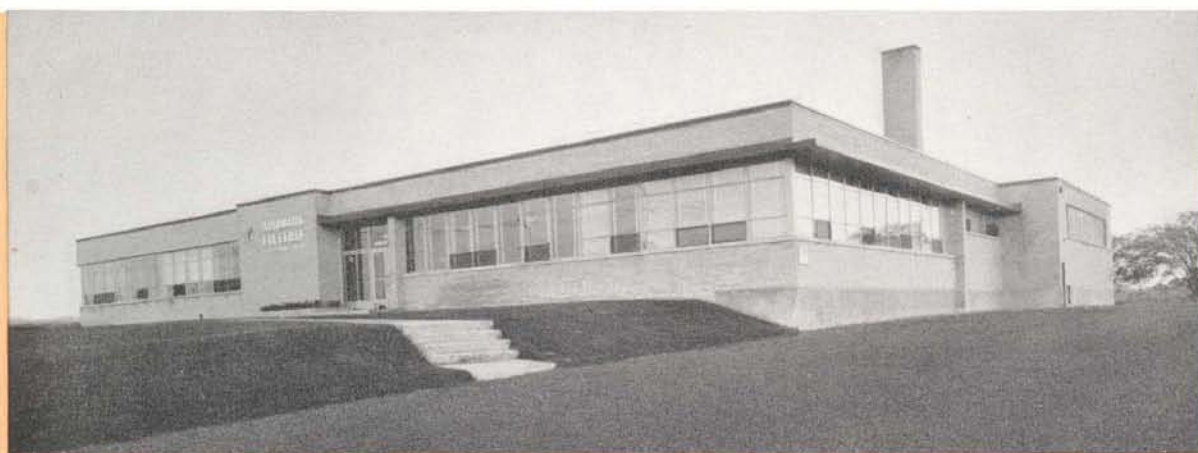
In May, 1953, Automatic's Canadian affiliate sold its wire and cable manufacturing facilities for the purpose of concentrating solely on the production of communication and electrical control equipment. This was followed by the organization of the present Canadian manufacturing company, and the construction of a new manufacturing plant. After careful consideration of several possible locations, a 33-acre site at Brockville was selected.

The one-and-one-half million dollar plant was started on August 5, 1953, and was officially opened on September 22, 1954. It is most modern in design and combines the latest architectural and production techniques. Situated in the heart of the largest industrial section of Canada, Automatic Electric (Canada) 1953 Limited, however, became the first new industry to open its doors in the St. Lawrence Valley after the plans for the St. Lawrence Seaway were finalized.

A point of interest in the development of the Automatic plant in this area was the naming of Strowger Boulevard, a gesture of the cooperative spirit between company and corporation officials, in honor of the memory of Almon B. Strowger, inventor of the first automatic telephone system to be used commercially, and whose name the Automatic Electric system continues to bear.

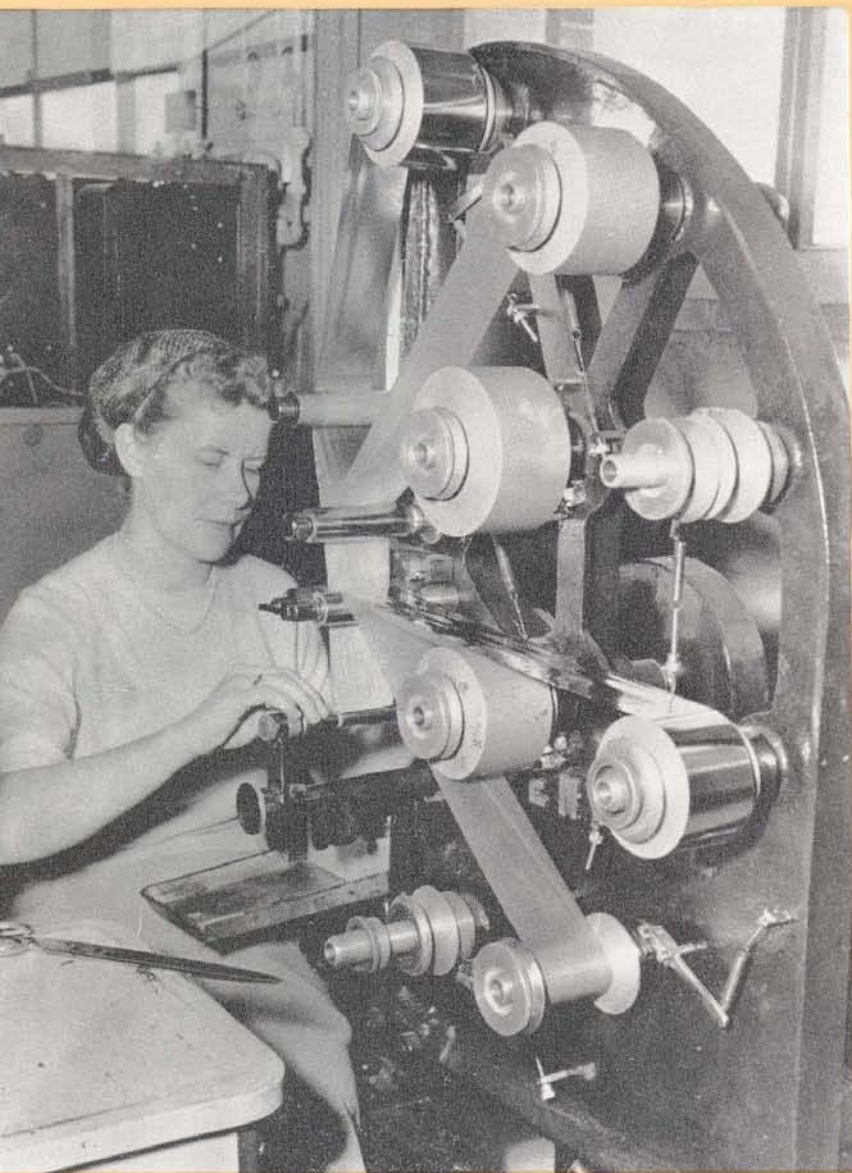
Automatic Electric has always been closely allied with the telephone industry of Canada, which includes over 2800 Independent companies and provincial government systems as well as the Bell Telephone Company of Canada. Strowger Automatic switching equipment is used predominantly by all three groups.

Sales and distribution for Automatic Electric products in Canada are handled by an associated company, Automatic Electric Sales (Canada) Limited, with head offices and main warehouse in Toronto, and with branch offices, warehouses, and agents at other points to afford complete service to its growing list of customers in the Dominion.



The completely modern building at Toronto, shown here, houses the Head Office, Toronto Sales Office, and Central Warehouse of Automatic Electric Sales (Canada) Limited.

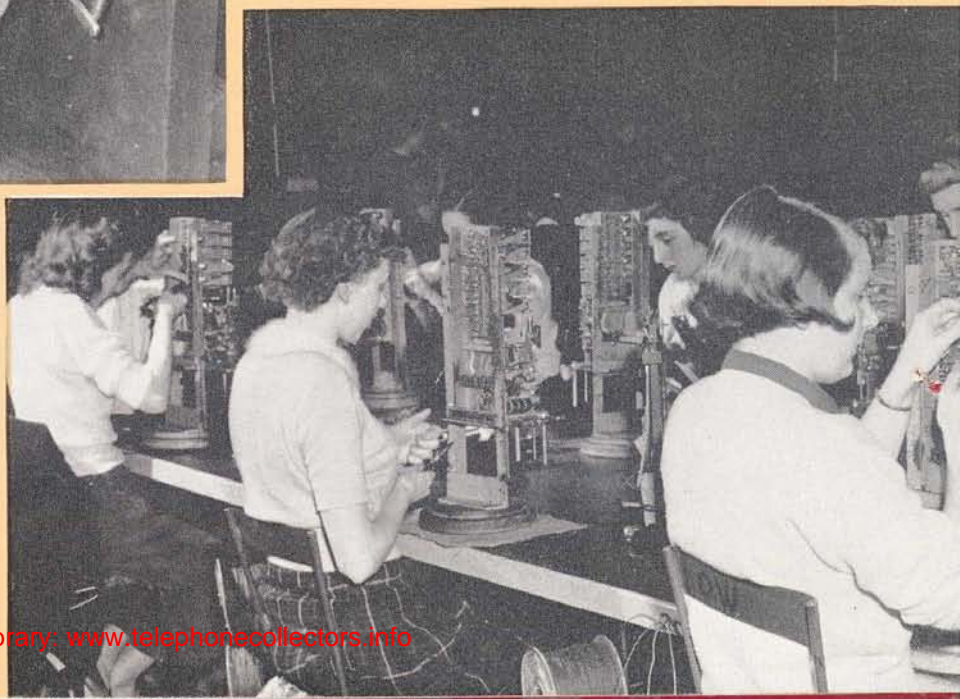
Strowger Automatic in Canada

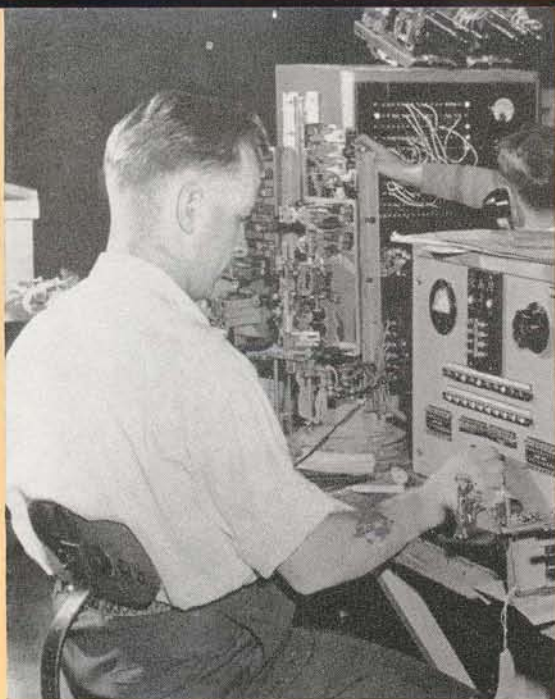


The assembly of Automatic's Type 51 Dials is a precision operation requiring expert craftsmanship.

Rigid control of all processes, such as this capacitor-wrapping operation, insures high-quality components for customers of Automatic Electric (Canada) 1953 Limited.

The wiring of Strowger switches is an example of the efficient production line techniques at the Brockville plant.

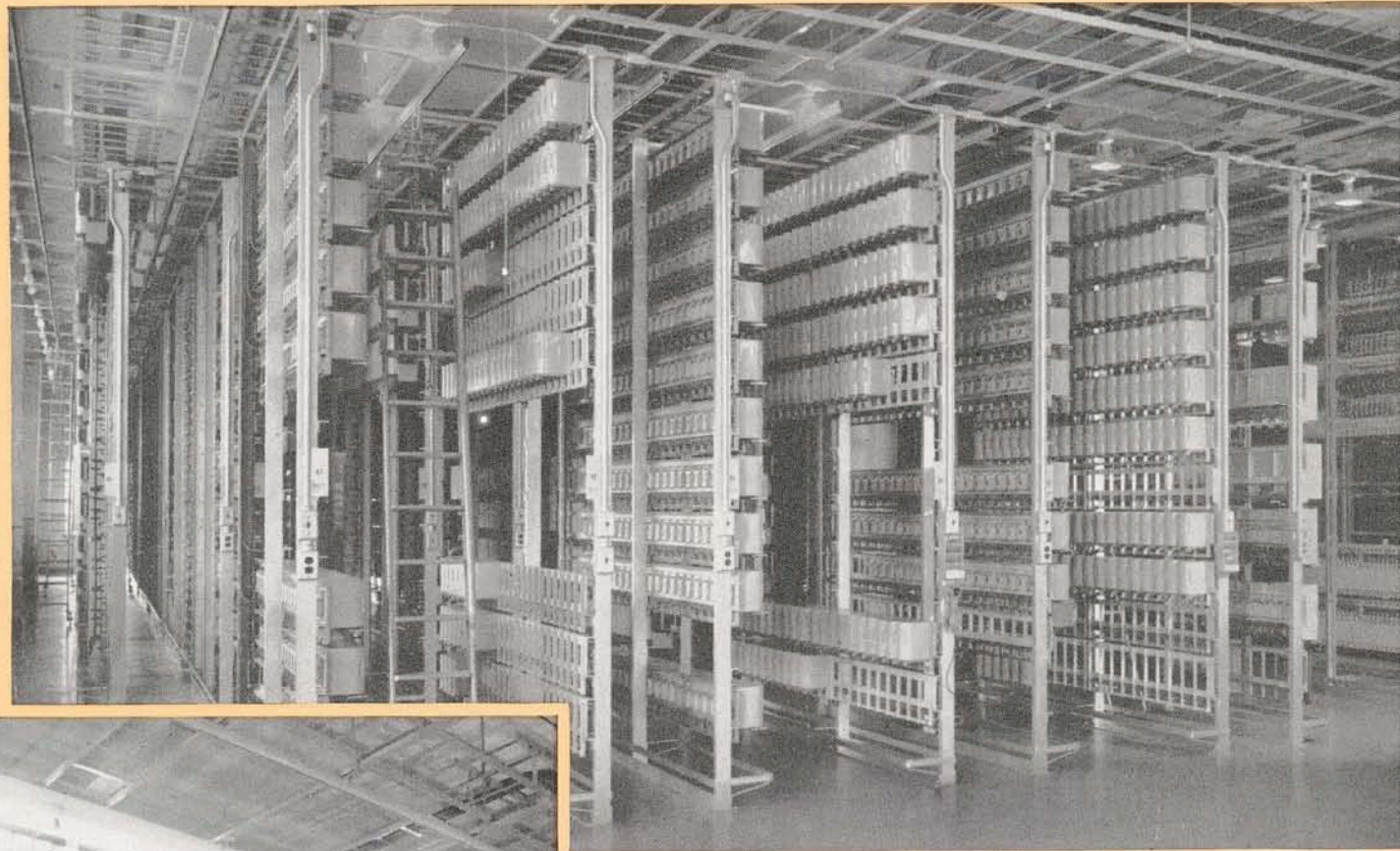




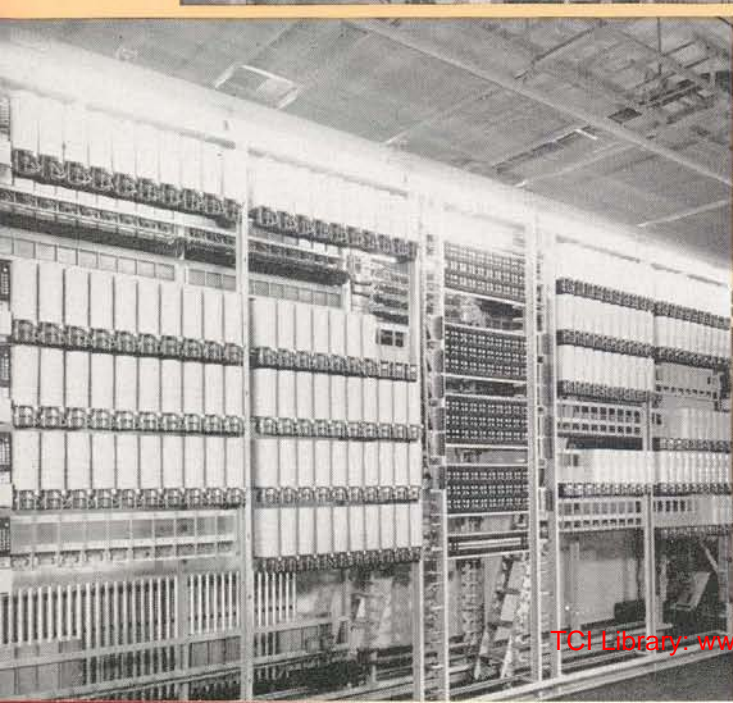
Testing circuits of Strowger switches and relay groups.



Shelf testing under specifically imposed operating conditions.



Automatic Electric (Canada) 1953 Limited is the manufacturer in Canada of Strowger Automatic Telephone Equipment. This shows one of the central office units of the British Columbia Telephone Company installed at Vancouver, B. C.



Strowger Automatic Installation at Prince Rupert, B. C.



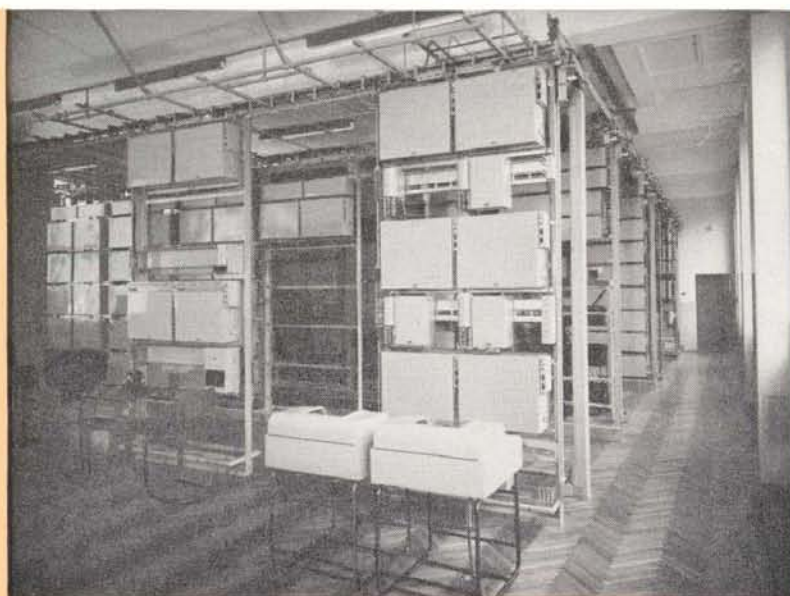
**AUTOMATIQUE
ELECTRIQUE, S. A.**



*A*UTOMATIQUE ELECTRIQUE, S.A., Antwerp, Belgium, known originally as Ateliers de Téléphonie et d'Electricité d'Anvers, was founded in 1892, and is therefore one of the oldest telephone manufacturing companies in Europe.

From its inception, the Company played a prominent part in the development of the telephone industry, and the present century was not far advanced when apparatus bearing the famous "ATEA" trade mark could be found in operation throughout Europe and Asia. Under the name of the The New Antwerp Telephone and Electrical Works, ATEA in 1926 became, as it is today, an important and integral part of the Automatic Electric group.

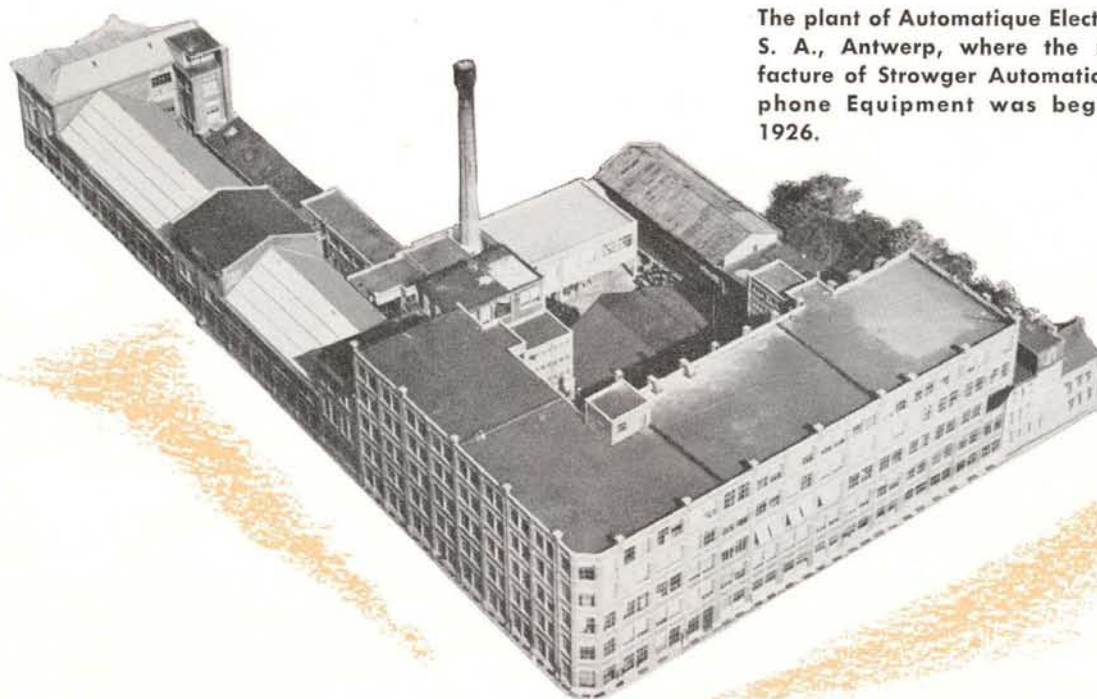
Now, as Automatique Electrique, S. A., with its extensive buildings, modern manufacturing facilities and well-equipped laboratories, and sharing the highly advanced techniques and research achievements of the entire group, the company manufactures a complete range of Strowger Automatic and manual telephone equipment—central office and sub-station—for public, private, marine and defense purposes.



Strowger Automatic equipment supplied by Automatique Electrique, S.A., for the important switching center of Tongres, Belgium. Equipment which provides for the automatic ticketing of toll calls can be seen in the foreground.

As an important supplier of telephone equipment for the Belgian Telephone Administration (Régie des Télégraphes et des Téléphones) ATEA has an impressive list of Strowger Automatic telephone exchanges now functioning or under construction in Belgium. Important networks or switching centers in this category are those centering in Tournai, Mons, La Louvière, Tongres, Hasselt and Hornu, all of which provide for the automatic ticketing of toll calls. Another engineering achievement has been the nation-wide network which provides for the telecommunication needs of the Belgian State Railways—a network more modern than anything of the kind to be found in any other country.

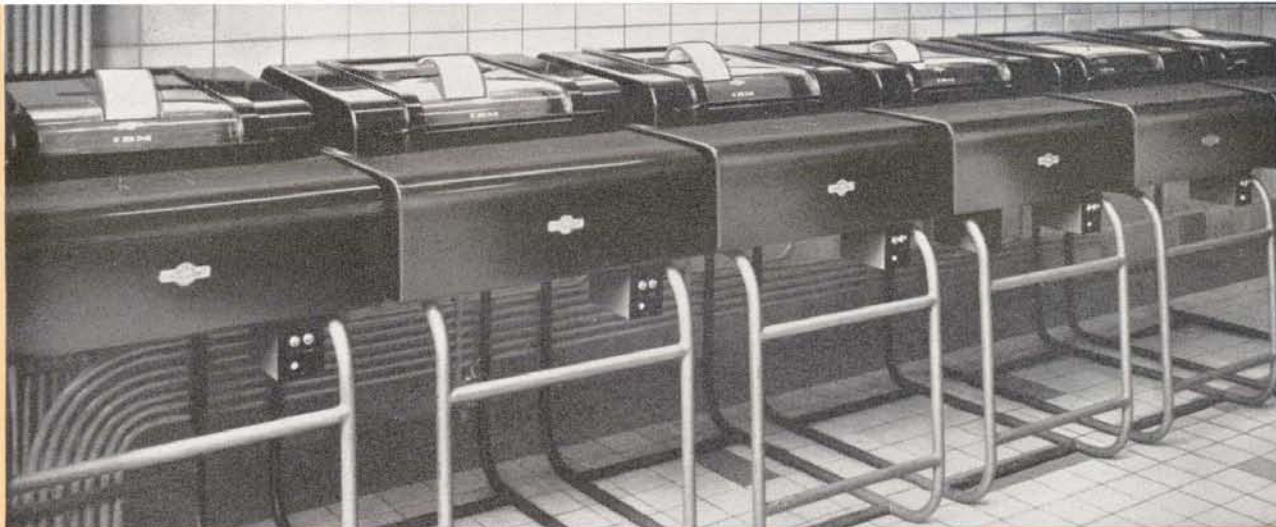
Automatique Electrique, S.A., is also a principal manufacturer of electrical measuring and recording apparatus, and is one of the well-known European producers of watt-hour meters, monophasic and multiphasic, for household and industrial purposes.



The plant of Automatique Electrique, S. A., Antwerp, where the manufacture of Strowger Automatic Telephone Equipment was begun in 1926.

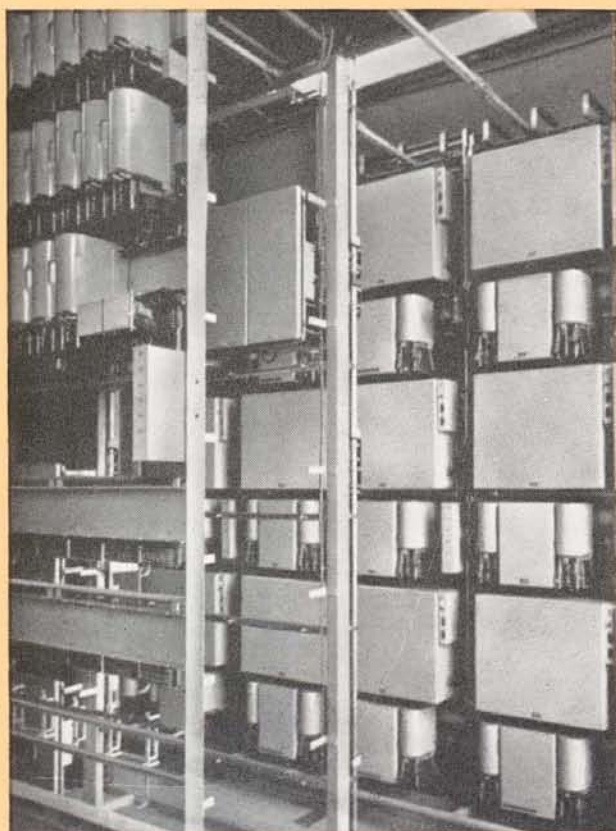
Highway and street traffic signals are a further important item in the Company's range of products, and include a wide variety of types for every need—synchronized and non-synchronized, and fixed time and traffic operated types.

Directly, or through the world-wide service organization of International Automatic Electric Corporation, Chicago, Automatique Electrique, S. A., supplies "ATEA" equipment and materials to telephone administrations and other purchasers in almost every part of the world.



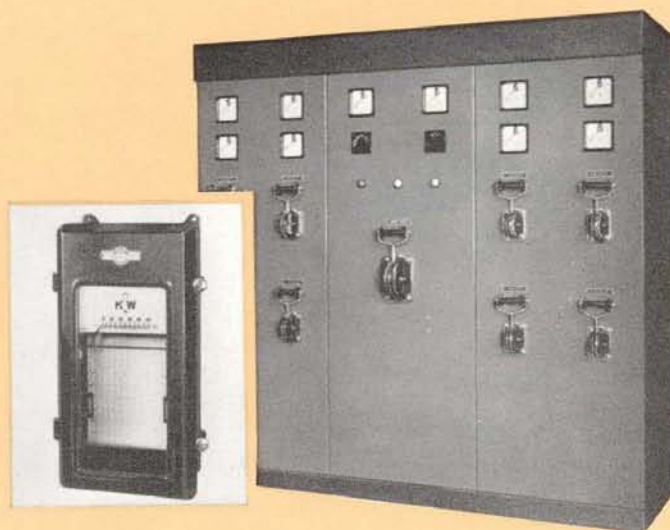
Automatique Electrique, S.A., is an important supplier of telephone equipment to the Belgian Régie des Télégraphes et des Téléphones. Above is shown a group of toll ticket printers supplied by ATEA for the exchange at La Louvière.

ATEA's Telephone and Electrical Products



Corner of La Louvière switchroom, showing Strowger Automatic Directors at right.

This ten-position switchboard is typical of the manual equipment being supplied by ATEA for service in Belgium.



ATEA electrical measuring instruments find wide application in industrial and power plants. Inset shows an ATEA recording kilowatt meter.





AUTELCO
MEDITERRANEA
S. A. T. A. P.



*A*UTOMATIC ELECTRIC began its operations in Italy in 1926 with the assignment there of a field representative to bring the advantages of Strowger Automatic telephone equipment to the attention of telephone administration executives in Italy and neighboring countries. To expedite this work, the company opened a sales office in Milan in 1927, and as an outgrowth of this step a number of small public automatic exchanges and private automatic systems were manufactured in Chicago and supplied to various Italian telephone companies.

One of the most significant of these early projects was the equipping of the Seregno network in the Province of Milan . . a network comprising 24 exchanges with facilities for full automatic intercommunication and time and zone metering.

Telephone operating executives and engineers in Italy soon began to appreciate the excellent qualities of design and durability that characterize Strowger Automatic equipment; and to meet the steadily increasing demand for this equipment a technical staff was rapidly recruited and trained under the guidance of the Chicago organization.

By 1936, these activities had grown to such magnitude that production of equipment in Italy became both feasible and desirable, and in 1937, Società Anonima Telefoni e Apparecchi di Precisione (S.A.T.A.P.), in Milan, became a part of Automatic Electric. This company had long specialized in the design and manufacture of various types of telephone apparatus, and on this foundation of sound experience the present organization, known as Autelco Mediterranea S.A.T.A.P., was built.

For a number of years further development was hampered by war conditions, but since 1946 expansion has been rapid and on a scale commensurate with the needs of the area directly served. Thoroughly modern facilities, carefully designed for the most economical and efficient operation, were created under the guidance of Automatic Electric production experts, while an engineering and production staff has been built up which is capable of designing and manufacturing Strowger Automatic equipment to meet every requirement.

An important development in the demand for Strowger Automatic equipment in Italy was the growing need for additional automatic offices in the cities of Milan and Rome. The earlier automatic offices in those cities were of German manufacture, based on Strowger principles but differing widely in circuit and mechanical detail, and made by a company originally licensed under Automatic Electric patents. Strowger Automatic additions to these networks, completed by Autelco Mediterranea during the period from 1947 to 1949 and interconnected with the original German-made equipment, have given full satisfaction—a further demonstration of the flexibility of Strowger Automatic design in meeting unusual conditions.

The Milan organization in 1950 moved into its new and enlarged manufacturing plant at Via Bernina 12, Milan, and today, with the progressive development of its expert technical, engineering, and development staffs, and with the addition of the most modern tools and production machinery, the Company is now in position to supply a full range of Strowger Automatic telephone equipment, and also continues to supply selective telephones and other train dispatching equipment to Italian railroad administrations.

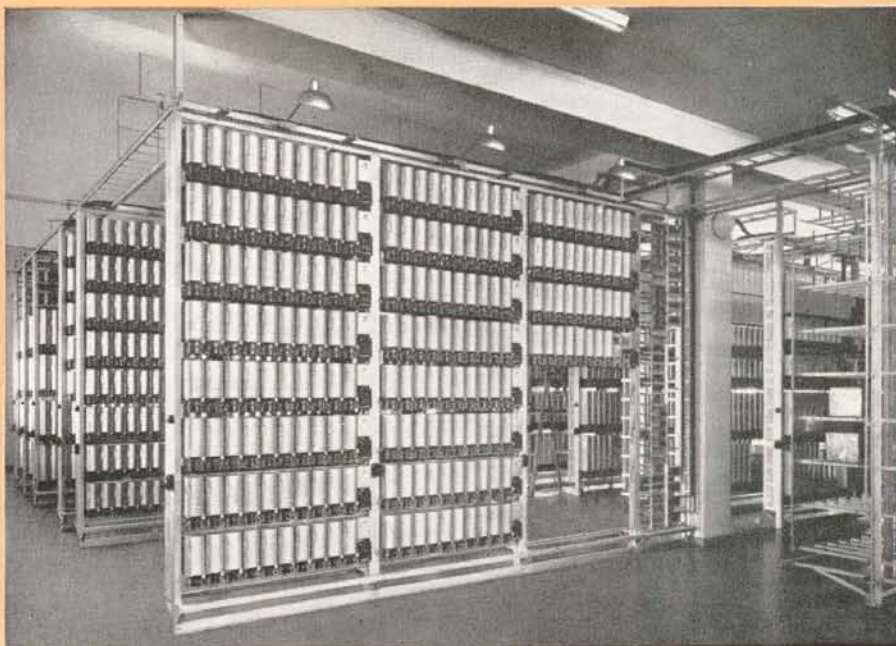
Like other affiliates in the Automatic Electric group, Autelco Mediterranea distributes its products to purchasers either directly or through the world-wide facilities of International Automatic Electric Corporation.



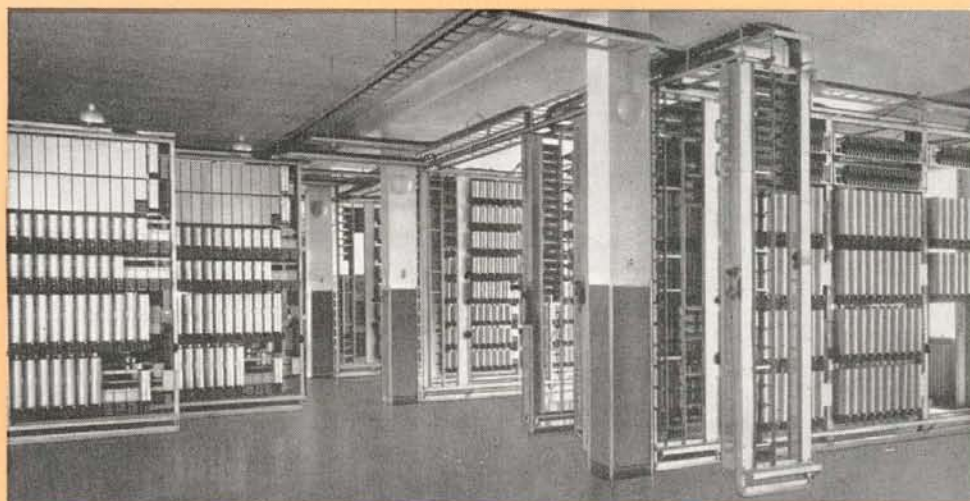
Factory and General Offices of Autelco Mediterranea S.A.T.A.P., Milan.

Strowger Automatic in Italy

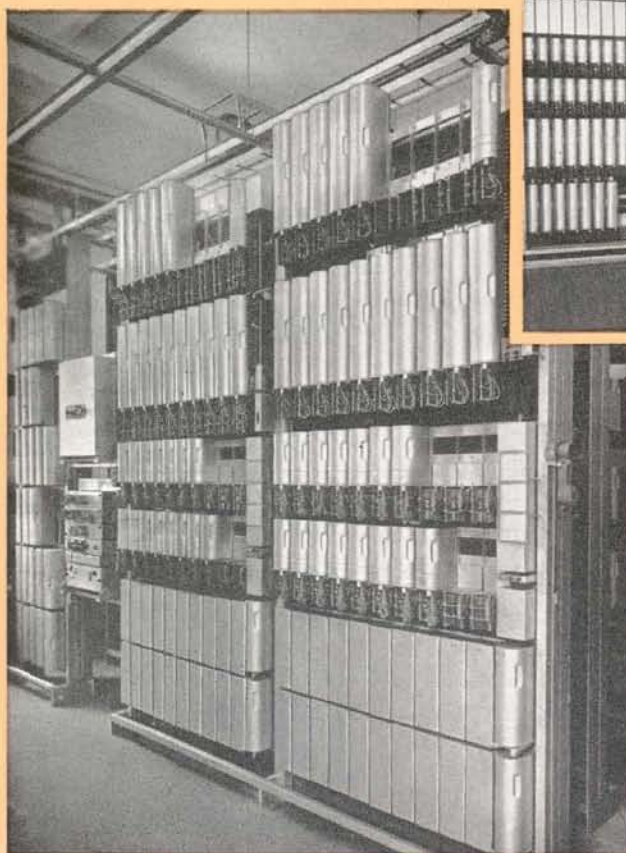
ON this page are shown some typical examples of Strowger Automatic exchanges in Italy, equipped by Autelco Mediterranea S.A.T.A.P.



Bersaglio Strowger Automatic Exchange, Milan, Italy.



Piazza Napoli Exchange, Milan, Italy.



Strowger Automatic equipment at Rieti, Italy.



The Piazza Napoli exchange building at Milan, having a capacity of 10,000 lines of Strowger Automatic equipment.

A LOOK INTO THE FUTURE

*I*N 1890 Strowger Automatic presented the great challenge to the telephone industry. Today, Strowger Automatic, and the vast accumulation of skill, experience and resources which is Automatic Electric, stand supreme in their field. In facing the future, those who have seen the inception and growth of that organization and have been a part of its development can take no narrow or partial view.

What lies ahead no one can foresee, but as yet no basic and revolutionary change comparable to that of the first two decades of this century, which rendered obsolete all that went before, can be discerned. Judging from the past, the portents of any such revolution, should it approach, will certainly be quickly perceived by those who make up Automatic Electric. As in the past, they will guide the stream of progress and keep abreast of it rather than follow it.

The more probable prospect is an orderly and logical refining and perfecting of that which now exists. To that end, the Automatic Electric group is giving constant and close attention to the need for meeting the increasing complexity of service requirements in both local and toll operations, and to the development and use of such supplementary services as may fit into the expanding pattern of telephone operations. Thus the work of Automatic Electric in this and related fields is following the traditional pattern of keeping research and development well ahead of field requirements.

In yet another way, Automatic Electric offers telephone operating organizations assurance as to the future:

Upon those responsible for the expenditures necessary to create and expand telephone operating systems the requirements of the future impose necessities which cannot be neglected. However well an installation may meet present needs, unless it can reasonably be expected to fulfill all conditions which may arise during the normal life of the equipment—unless it can be adjusted economically to unforeseen changes—it will present elements of uncertainty against which there can be no adequate protection. As never before this situation demands the most careful consideration in selecting the type of telephone equipment to be installed.

The history of Strowger Automatic, more than that of any other type of equipment, has been a history of success in meeting changing conditions. Small communities

served by Strowger Automatic have grown into large towns; towns have become cities; single-office exchanges have become multi-office networks; traffic has increased, and service demands have become more complex. Strowger Automatic has never once failed to demonstrate its ability to meet all these changes at minimum cost and without disturbance to existing service or equipment.

The reputation earned by Automatic Electric in the exacting field of telephone communications has led to many developments in other phases of communication science. A notable example is the completely automatic teletypewriter switching center developed for the U. S. Army Signal Corps, providing instant liaison between military headquarters over wide areas. Performing mechanically and with amazing rapidity most of the jobs formerly requiring manual operation by a considerable number of skilled technicians, the switching center automatically receives and relays telegraph messages, and in so doing makes use of many of the automatic switching techniques developed by Automatic Electric for the telephone industry.

Through the years, Automatic Electric has also steadily expanded the scope and variety of its operations to embrace the most modern developments in a host of complex techniques in electrical control for industrial operations and industrial products—techniques that have become increasingly significant to *all* industry. Already, machines that sense more than fingers, see more than eyes, move faster than minds, are making miracles common. But their magic has scarcely begun. We have only scratched the surface of the new electrical-electronic technology, and new components are constantly emerging from Automatic Electric's research laboratories. Many industrial users, nation-wide, have found these components thoroughly dependable in a wide variety of applications: calculating machines of all types, aircraft synchronization, welding cycle control, photo-electric processes, machine-tool control—to name only a few. Here is evidence not only of the widespread acceptance of Automatic Electric components, but of their adaptability to an increasingly large range of functions—now and in the future.

For these reasons, industrial users of Automatic's "telephone-type" components, like telephone operating companies and administrations, can depend on the creative work of Automatic's Laboratories' personnel, the experience of its engineers, and the skill of its trained production workers. Thus, in the future as in the past, telephone and industrial organizations of every size and variety can rely on the foresight, the progressiveness, and the stability of Automatic Electric.

WHEN YOU NEED INFORMATION

*I*N A BOOKLET of this scope, it is impossible to present more than a broad perspective of the range of service and products offered by the Automatic Electric group. More specific information and literature on particular products will be supplied on request.

The Automatic Electric group maintains offices in principal cities throughout the world. Its resources and facilities are at your command, and its representatives are available for consultation on any project, small or large. Simply write or call the office nearest you.

PRINCIPAL PRODUCTS OF THE AUTOMATIC ELECTRIC GROUP

Strowger Automatic Telephone Systems—Complete automatic central office equipment for exchange areas of every size, from small towns to the largest metropolitan networks.

Community Automatic Exchanges—Unattended Strowger Automatic units for small rural or suburban areas, with facilities for switching into attended exchanges.

Toll Switchboards—Both automatic and cord types, equipped with the most modern circuits and facilities to meet the most exacting needs of local or nationwide long distance networks.

Special Service Switchboards—Information, Wire Chief and Test, Repair, DS“A”, and all other types of auxiliary service desks, equipped as desired to meet local needs.

Telephone Instruments—Modern handset designs in molded plastic for automatic, central battery manual, or magneto manual exchanges; and a complete range of special types to meet particular needs.

Exchange Power Equipment—Control and supervisory panels, battery charging and ringing current machines, tone generators and interrupters, and all other power accessories for both small and large exchanges.

Toll Dialing Systems—Switching systems and circuit facilities for operator dialing over direct toll lines and tandem networks.

Strowger Automatic Toll Ticketing Systems—Complete facilities for subscriber toll dialing in both metropolitan and country-wide areas, including automatic timing and ticketing of toll calls, and “Director” facilities for universal numbering and alternate routing.

Manual Telephone Switchboards—Magneto and central battery switchboards for public exchange service and private branch exchanges to meet every commercial need.

Private Automatic Exchanges—A complete range of systems in all capacities, with or without central office connections, and with or without attendants’ switchboards.

Intercom Systems — Modern push-button handset telephone systems, with single or multiple conversation channels in capacities to meet every business need.

Telephone Exchange Accessories — Testing equipment and instruments; protective de-

vices for central offices, substation and outside plant; paystations; battery eliminators and rectifiers; loading coils for physical and carrier circuits; traffic measuring devices; and all other accessories needed for the operation and maintenance of the modern exchange.

Electronic Equipment — Point-to-point and mobile radio-telephone systems; voice frequency repeaters with electronic amplification; single-channel and multi-channel carrier systems for telephone, telegraph, signal and pulse transmission over wire or radio circuits; voice operated constant level amplifiers.

Measuring Apparatus (ATEA)—A complete line of fixed and portable instruments for laboratory and industrial uses, including ammeters, voltmeters, frequency meters, phase-meters, and single and multiple pen recorders; watt-hour meters for single-phase or multi-phase use.

Traffic Signals (ATEA)—Modern street and road signal systems of both vehicle-actuated and fixed time types; synchronized and non-synchronized signals; interrupted warning lights; and level (grade) crossing signals.

Companies of the Automatic Electric group are makers also of electrical control apparatus and systems for industrial, engineering, and public utility companies and administrations, telephone apparatus for railroad and pipe line companies, electrical and communications devices for aircraft and airways control, and special communication apparatus for military and naval applications. Through their affiliated sales companies throughout the world, they also act as distributors of a complete line of materials, tools and supplies for the construction, operation and maintenance of all parts of the modern telephone exchange.

TYPICAL USERS OF STROWGER AUTOMATIC TELEPHONE EQUIPMENT

*L*ISTED BELOW are some of the hundreds of administrative organizations and companies operating telephone systems for public service in various parts of the world to whom companies of the Automatic Electric Group have supplied, or are supplying, Strowger Automatic Telephone Equipment:

ALASKA

City of Fairbanks

ARGENTINA

Argentina State Telephone Administration

AUSTRALIA

Australian Post Office

BELGIAN CONGO

Belgian Congo Administration

BELGIUM

Régie des Télégraphes et des Téléphones

BOLIVIA

Bolivian Power Company, Ltd.

BRAZIL

Companhia Telefonica Brasileira

CANADA

British Columbia Telephone Company

Northwest Telephone Company

Okanagan Telephone Company

Prince Rupert Municipal System

Saskatchewan Government Telephones

Alberta Government Telephones

City of Edmonton

Manitoba Telephone System

Port Hope Telephone Company

Town of Kenora Utilities

The Avalon Telephone Company, Ltd.

Northern Telephone Company

Maritime Telephone & Telegraph Company

Canadian National Railways

CANAL ZONE

Canal Zone Authority

Panama Railroad

COLOMBIA

Empresas Municipales de Cali

Empresa Nacional de Telecomunicaciones

Boyacá Departmental Telephone System

North Santander Departmental Telephone System

Empresa Telefonica de Santander

CUBA

Cuban Telephone Company

ERITREA

Government of Eritrea

GREECE

Greek Telephone Organization

HAITI

Ministry of Public Works

HAWAII

Hawaiian Telephone Company

INDONESIA

Standard-Vacuum Oil Co.

ISRAEL

Ministry of Communications

ITALY

Italian State Telephone Administration

Società Telefonica Interregionale
Piemontese e Lombarda

Società Telefonica delle Venezie

Società Telefoni Italia Medio Orientale

Società Telefonica Tirrena

JAMAICA

Jamaica Telephone Company, Ltd.

JAPAN

Ministry of Telecommunications

NEW ZEALAND

New Zealand Post Office

PAKISTAN

Department of Posts and Telegraphs

PHILIPPINE ISLANDS

Philippine Long Distance Telephone Co.

City of Baguio Telephone Administration

California-Texas Oil Co.

Broken Hill Proprietary Co., Ltd.

PORTUGAL

The Anglo-Portuguese Telephone Co., Ltd.

PUERTO RICO

Puerto Rico Communications Authority

DOMINICAN REPUBLIC

Cia. Dominicana de Teléfonos C. por A.

SAUDI-ARABIA

American Arabian Oil Company

Saudi-Arabian Railroad

Trans-Arabian Pipe Line Company

SUMATRA

Northeast Railway Co. (Deli Spoorweg)

Standard-Vacuum Oil Co.

UNITED STATES

Independent operating telephone companies

Operating companies of the Bell System

United States Government—all departments

URUGUAY

Administracion General de las Usinas

Electricas y los Teléfonos del Estado

VENEZUELA

Cia. Telefónica de Venezuela

Empresa de Teléfonos de Apure

Mene Grande Oil Company

Creole Petroleum Company

AUTOMATIC ELECTRIC

®

Originators and Developers of the Strowger Step-by-Step "Director" for Register-Sender-Translator Operation Machine Switching Automatic Dial Systems

Makers of Telephone, Signaling and Communication Apparatus...Electrical Engineers, Designers and Consultants

Factory and General Offices: 1033 West Van Buren Street, Chicago 7, U.S.A.

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AUTOMATIC ELECTRIC SALES CORPORATION

1033 West Van Buren Street, Chicago 7, U.S.A.

Sales Offices in All Principal Cities

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Automatic Electric (Canada) 1953 Limited - - - Brockville, Ont., Canada

Automatique Electrique, S.A. - - - - - Antwerp, Belgium

Autelco Mediterranea S.A.T.A.P. - - - - - Milan, Italy

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EUROPEAN GENERAL OFFICE

INTERNATIONAL AUTOMATIC OVERSEAS, S.A.

Brussels, Belgium

LONDON FINANCIAL AGENTS

THEODORE GARY AND COMPANY LONDON

London, England

REGIONAL DISTRIBUTING COMPANIES AND REPRESENTATIVES

AUSTRALIA

Automatic Electric Telephones Limited
86 Holdsworth St., Woollahra, N.S.W., Australia

BELGIUM, LUXEMBOURG, FRANCE AND SCANDINAVIA

Automatique Electrique, S.A.
22 Rue du Verger, Antwerp, Belgium

BRAZIL

Automatic Telephones Limited of Brazil
Rua Conselheiro Crispiniano No. 69
Sao Paulo, Brazil

CANADA

Automatic Electric Sales (Canada) Limited
185 Bartley Drive, Toronto, Ontario, Canada

COLOMBIA

Cia. Industrial de Téléphones, S.A.
Carrera 14, 15-42, Bogotá, Colombia, S.A.

PHILIPPINES AND SOUTHEAST ASIA

J. K. Barrington
1131 M.H. del Pilar, Manila, Philippines

ITALY

Autelco Mediterranea S.A.T.A.P.
Via Bernina 12, Milan, Italy

MEDITERRANEAN AREA AND NEAR EAST

International Automatic Electric Sales Co., S.P.A.
Via di San Basilio 41, Rome, Italy

NETHERLANDS

Automatique Electrique, S.A.
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URUGUAY

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