

1026

A.I.A. File 31 i 5

STROWGER AUTOMATIC
DIAL SYSTEMS

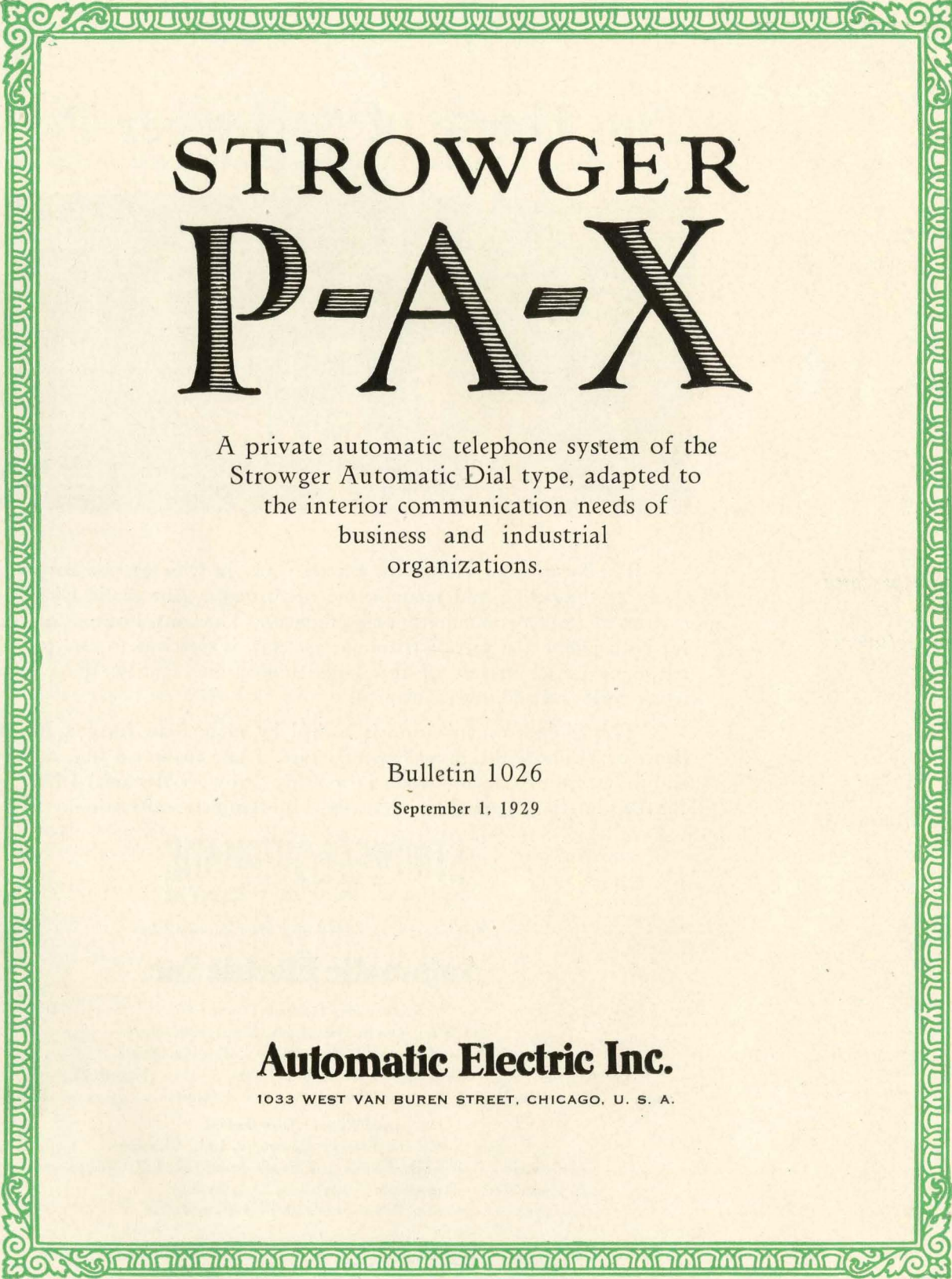
STROWGER P-A-X



Bulletin 1026

Automatic Electric Inc.
CHICAGO, U.S.A.

A.I.A. File 31 i 5



STROWGER P-A-X

A private automatic telephone system of the
Strowger Automatic Dial type, adapted to
the interior communication needs of
business and industrial
organizations.

Bulletin 1026

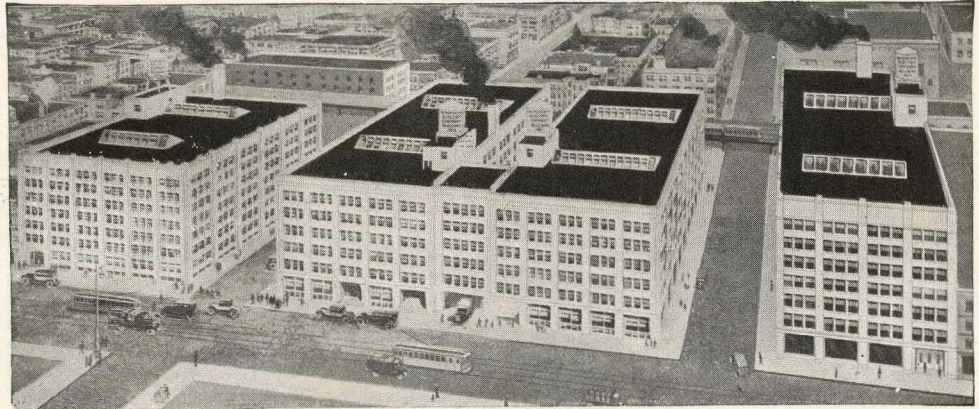
September 1, 1929

Automatic Electric Inc.

1033 WEST VAN BUREN STREET, CHICAGO, U. S. A.

Strowger P-A-X (Private Automatic Exchange)

The Home of Strowger P-A-X



*Originators and
Pioneer
Manufacturers*

The factories of Automatic Electric Inc., in Chicago, are devoted exclusively to the design and manufacture of Strowger Automatic Dial telephone systems and other communication equipment. The annual output of the plant, for both public and private telephone systems, is sufficient to care for 300,000 telephone lines. Because of this large production capacity, quick service on repair parts and additions is assured.

This pioneer organization is backed by more than forty years of experience in telephone design and manufacture. More than two thousand business and industrial organizations are now using Strowger Automatic Dial Systems for their interior communication needs, with complete satisfaction.

**STROWGER AUTOMATIC
DIAL SYSTEMS**

Engineered, Designed and Manufactured by

Automatic Electric Inc.

Factory and General Offices:

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

Sales and Service Offices in the Following Cities:

Boston Los Angeles Cleveland New York Kansas City
St. Paul Atlanta Detroit Philadelphia

General Export Distributors

The Automatic Electric Company, Ltd., Chicago

In Canada—Independent Sales and Engineering Co., Ltd., Vancouver

In Australasia—Automatic Telephones, Ltd., Sydney

In Japan—Automatic Telephones Ltd. of Japan, Tokyo

Associated Companies

American Electric Company, Inc.

Chicago

International Automatic Telephone Co., Ltd.

London

Automatic Telephone Manufacturing Co., Ltd.

Liverpool

The New Antwerp Telephone and Electrical Works

Antwerp

Strowger P-A-X (Private Automatic Exchange)

What the Strowger P-A-X Is

Strowger P-A-X (Private Automatic Exchange) is primarily a private automatic telephone system especially designed for the private communication needs of business and industry. It permits every man in an organization, in effect, to sit by the side of every other man; places every department in direct communication with every other department; and enables an executive, without personal effort, to keep in touch with every unit and every process in his organization.

Telephone service is, however, only one of the many services which can be furnished by Strowger P-A-X. With many of the types, such special services as Code Call, Conference, and Emergency Alarm Service can also be supplied—and all without the services of operators or other attendants.

Among the most commonly used special services are the following:

Code-Call Service

Through the P-A-X code-call feature (see description on page 16), provision is made for the immediate location of, *and conversation with*, any executive, foreman, or other person it may be desired to find, no matter where in the plant he may be at the time.

Conference Service

This service provides for interconnecting any number of telephones for a conference, the conferees remaining at their desks.

Emergency and Fire-Alarm Service

An alarm service interconnected with the telephone facilities and offering to industrial plants and other establishments a protection that is highly effective and complete in every detail.

Watchman's Service

This feature offers a means of supervising watchmen in industrial plants, and for a chief watchman or gatekeeper to keep in constant touch with his subordinates at all times—in emergencies as well as under normal conditions.

Executive Right-of-Way

Enables an executive to place a signal tone in the telephone of the two parties engaged in a conversation, to inform them that he wishes to speak to one of them. This service saves the valuable time of important executives.

Miscellaneous Services

Although the above are the most important of the services rendered by Strowger P-A-X, it is an apparatus so flexible that it is capable of meeting, in a business or industrial establishment, every requirement that relates to communication or remote control.

Features of Strowger P-A-X

Strowger P-A-X Is Really Private

On many "private" telephone systems, eavesdropping is so easy that really private, confidential information cannot be transmitted over the telephone. There is no such danger where Strowger P-A-X is employed. Connections made on the P-A-X are automatically locked against intrusion, and there is no operator to hear what is said.

*A Rapid and
Accurate Interior
Communication
System*

*Interior
Telephone
Service*

Code Call

*Conference
Wire*

*Watchman
Supervision*

Strowger P-A-X (Private Automatic Exchange)

*Strowger
P-A-X Is Fully
Automatic*

Strowger P-A-X Is Automatic

None of its services is ever delayed or hampered because an attendant is absent. The delays and errors that characterize human operation are eliminated. The services rendered by the P-A-X are rapid and accurate, and are available twenty-four hours a day.

Strowger P-A-X Restricts Personal City Calls

There are usually a large number of employees who need intercommunicating facilities, but not the public telephone service facilities. When P-A-X is used, such employees are given P-A-X telephones only, the outside telephones being assigned only to those who need them.

Strowger P-A-X Cuts Rental Costs

By reducing the number of outside telephones needed, P-A-X cuts telephone rental costs. Also, as it keeps the rented telephones free at all times for outside business calls, there are fewer busy signals on incoming calls, and more messages can be completed without increasing the number of trunks.

Strowger P-A-X Better Your Outside Telephone Service

Your private branch exchange, free from handling interior calls, gives better service on public-exchange calls. Your operator can give all of her attention to incoming and outgoing calls. Busy signals, on incoming calls, are much less frequent, because the outside telephones are not used for interior calls.

Strowger P-A-X Is Simple to Install, Maintain and Operate

It is built in compact units, easily mounted and wired. Metal covers protect the equipment from dust and dirt. Wearing parts hold adjustments over a long period of time, and such parts as do wear out are low in price and easily replaced. The dial used is the simplest and most convenient calling device yet invented. It requires little mental or physical effort and its operation is becoming universally known through its use on public telephone systems.

Strowger P-A-X Is Used

The convenience, privacy and reliability of Strowger P-A-X encourages the use of the telephone for internal business. This prevents the wasting of many hours of time by individuals who would leave their desks and walk, rather than use a manual system.

“Double-Track” Telephone Service

When P-A-X is installed and operated as a system entirely independent of the public telephones, the utmost usefulness is secured from both systems. The man who is supplied with both P-A-X and outside telephones enjoys the advantages of what is, in effect, a “double-track” telephone system. He has direct contact with every department of the organization through the P-A-X: he can deal with customers, or others outside the plant, through the public telephone system; and, when necessary, he can do both of these *at the same time*.

This convenience of “double-track” service is of great value when he is asked for information which he does not have immediately available. Without leaving his desk, he can secure the desired information from any place in the plant.

Instead of saying, “I’ll look that up, and call you back,” he says, “Wait a minute—I’ll find out.” Then he dials over the P-A-X, and in a few moments is able to answer the calling party’s question. The saving of time and annoyance on such calls constitutes one of the greatest advantages of the Strowger P-A-X.

Strowger P-A-X (Private Automatic Exchange)

How Strowger P-A-X Operates

In making use of any of the automatic services of the P-A-X, the telephone is operated as follows: the receiver is first lifted from the hook and the dial turned from the proper digits to the finger stop and released. As soon as the proper number, "7-4" for instance, is called, the equipment begins to render the service required.

If an interior telephone call is made, the bell at the called telephone rings, or, if that line is busy, a buzz is heard in the receiver.

If a code call is sent out, bells, buzzers, gongs, horns, etc., sound the proper code until the person desired calls the response number.

If an alarm is sent, immediately the signals are heard throughout the establishment.

All of the Strowger P-A-X services are automatic, immediate, and always available. All are controlled by the dial, over a single pair of wires.

The operation of the mechanism may be understood in a general way by a consideration of a typical interior telephone call. The following description varies as to the type of installation, but it will give a general understanding of the operation of the equipment. Suppose, for instance, Mr. X, whose P-A-X telephone is No. 25, wishes to call Mr. Y, at P-A-X telephone No. 74.

*Easy to
Operate*

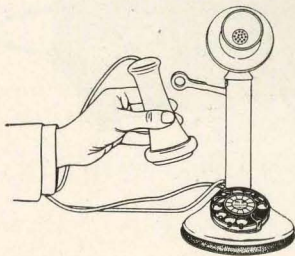


Figure 1

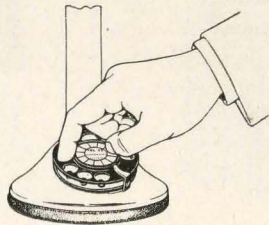


Figure 2

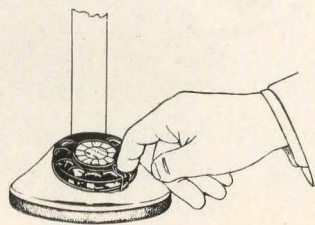


Figure 3

When Mr. X lifts the receiver of his telephone (Fig. 1) the line switch or finder switch (depending on the type of switchboard installed) immediately operates to extend his line to an idle connector switch. He then turns the dial from the figure "7" to the finger stop and releases it (Figs. 2 and 3). The dial turns back to its original position of its own accord and transmits a series of seven electrical impulses to the connector switch. In a similar way, dialing the second figure, "4," causes four impulses to be transmitted to the connector. Acting under the control of these impulses, the connector immediately establishes connection with the terminals of line 74.

Without any further operation of the dial, the connector tests the line, rings the bell automatically and intermittently if the line is not in use, or sends the busy signal back to the receiver of the calling telephone if the called telephone is busy. When Mr. Y answers by lifting the receiver of telephone No. 74, the connection is ready for conversation. Replacing the receivers on the hook after conversation causes the immediate release of the switches, which are then ready for another call.

Strowger P-A-X (Private Automatic Exchange)

Strowger P-A-X Telephones

Every public telephone company takes the utmost care in the selection and purchase of telephone instruments for its subscribers. They know that to buy cheap or unstandard telephones invites complaints, poor service, and unjustified repair and replacement expense.

The conditions under which the Strowger P-A-X telephones are used are frequently more severe than those of public telephone systems. They must be able to withstand the most constant use over a long period of years without undue deterioration.

The telephones of Strowger P-A-X are built especially for such service. There is nothing cheap or flimsy in their construction. They are identical in design and construction with the telephones used for service in hundreds of large public automatic exchanges, and are built to meet the exacting needs of the world's most prominent telephone engineers.

Standard Type Instruments



The Type 1-A Monophone



The Type 2 Monophone

The P-A-X Monophone

This beautiful telephone is now coming into wide use both by public telephone companies and for private service. The Monophone combines the compactness and efficiency of the conventional telephone with the additional advantage of having the transmitter and receiver in a single convenient unit. This transmitter-receiver unit is ruggedly constructed of bakelite and so shaped that no matter how it is placed on the rest, it will always slide into its proper position.

The P-A-X Monophone

Monophone desk stands are furnished in two different styles. The No. 1-A type is designed for use with the usual type of ringer box mounted separately. The No. 2 type has the Monophone and ringer box in a single complete unit. Either type is very pleasing in appearance, and makes an attractive addition to the executive's desk.

The Type 1-A Monophone is now available in a variety of attractive colors, with gold or chromium plated fittings. The main parts of the telephone are made of solid colored bakelite; the finest is absolutely permanent. Color folder may be had on application.

Strowger P-A-X (Private Automatic Exchange)

P-A-X Wall Monophone



P-A-X Wall Monophone

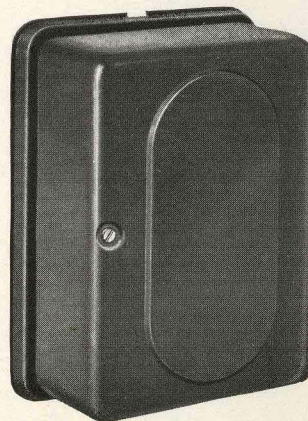
This is a most compact and useful instrument, designed for mounting on a wall or by the side of a desk.

A Monophone of this type is made by mounting a Monophone cradle on a black-japanned steel ringer box, of the enclosed-gong type. The dial is mounted at a convenient angle on the cover of the box. The wall set, complete with the combination unit, measures 9 inches in width and 12 inches in height, and projects 5½ inches from the surface on which it is mounted.

*A Convenient
Wall Set*



The P-A-X Desk Telephone



The P-A-X Ringer Box

The P-A-X Desk Telephone

This instrument is identical in size and appearance with the conventional desk telephones used with large public automatic telephone exchanges. It embodies the most highly approved ideas in exterior design and interior mechanical and electrical construction.

It is similar in style to the familiar manual telephone except for the addition of the calling dial, by the manipulation of which the user selects and controls the P-A-X service it is desired to use.

*P-A-X Desk
Telephone*

The Ringer Box

Associated with each desk telephone or Type 1-A Monophone is a ringer box, which contains the ringer and condensers and the terminal block to which the telephone line is connected. The box is made of heavy steel, parkerized and japanned. It is 7¼ by 9⅝ by 4 inches in size.

Strowger P-A-X (Private Automatic Exchange)

P-A-X Wall Telephone

The P-A-X Wall Telephone

This instrument is very compactly assembled and is sturdy in construction. The case is heavy steel, black enameled. All parts are easily accessible for adjustment or repair.

Wherever it is desired to install a telephone that cannot conveniently be placed on a desk or stand, the wall type gives excellent service, and is frequently used in corridors, and on walls or columns in shops and factories. Dimensions of box same as ringer box shown on previous page. Overall width, 10 inches.



The P-A-X Wall Telephone

Flush Type Wall Telephone



The P-A-X Flush Type Telephone

The P-A-X Flush Type Wall Telephone

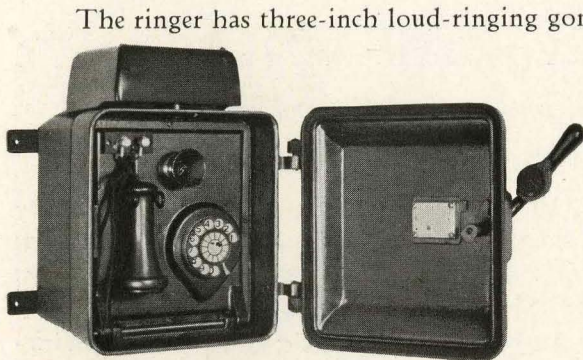
Telephones of this type are used principally in halls, corridors or in places where the usual type of wall instrument is not suitable. All working parts are mounted on a steel plate that has been given a durable black enamel finish. The front plate is mounted on a steel box that is first placed in the wall to protect the telephone parts. It is then held securely in place by four machine screws. The front plate is perforated to permit the ringer being heard distinctly. Each telephone is equipped with a standard type transmitter, dial and receiver.

Dimensions of front plate 13 by $7\frac{3}{8}$ inches. Dimensions of inside box $11\text{-}13/16$ by $6\frac{1}{4}$ by 4 inches deep.

The P-A-X Mine Telephone

The telephone shown on page 9 has been designed for use in mines, for police systems, street railways, quarries and various other outside uses. A cast iron case encloses all working parts. The door is fitted with a handle having a cylinder lock. When the outer door is open, only the parts actually used in making a call are exposed. All other parts are contained in a second compartment, so designed and constructed that it is airtight and waterproof.

Strowger P-A-X (Private Automatic Exchange)



The P-A-X Mine Telephone

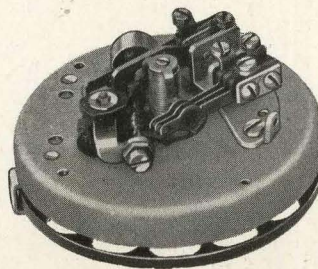
The ringer has three-inch loud-ringing gongs, mounted on top of the iron case and protected by an iron hood. Ringer coils are impregnated with a water-proofing compound and the wiring is carried in rubber-covered conductors. On the back of the iron case are two horizontal mounting bars. Dimensions, 11½ inches wide, 15 inches high, 12½ inches deep.

Mine Telephone

The P-A-X Dial

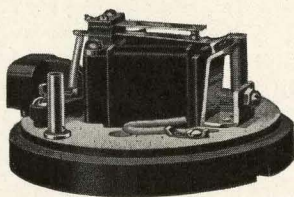
The dial is a small, compact and sturdy device, 3 inches in diameter, mounted on the telephone as shown in the illustrations.

The rear of the dial is shown on this page with all its working parts. When the front disc is turned, the main spring is wound up and this returns the disc to normal when released, breaking the line circuit a number of times in quick succession, corresponding to the figure dialed. This, in turn, operates the switches and connects the calling party with the telephone desired. This dial is the same as that used by all independent telephone companies operating Strowger Automatic Dial systems.

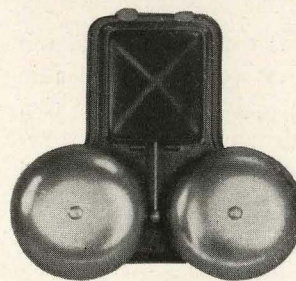


The P-A-X Dial

A Simple and Sturdy Dial



The P-A-X Telephone Relay



The P-A-X Loud-Ringing Extension Bell

Telephone Relay

This relay makes it possible to increase the efficiency of a telephone system in noisy places by substituting for the usual ringer, a louder and more powerful signal.

Loud-Ringing Extension Bell

This loud-ringing extension bell is used in place of the regular bells on the ordinary P-A-X telephone. The telephone, located in a noisy part of the factory, is equipped with one of these loud-ringing extension bells and operates when that particular station is being called.

Special Signal Apparatus

Strowger P-A-X (Private Automatic Exchange)

The Type I P-A-X

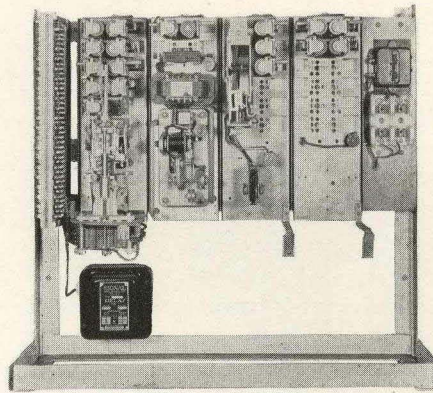
(Capacity 90 Telephones, One Conversation)

(Special Services---Code-Call, Private Line)

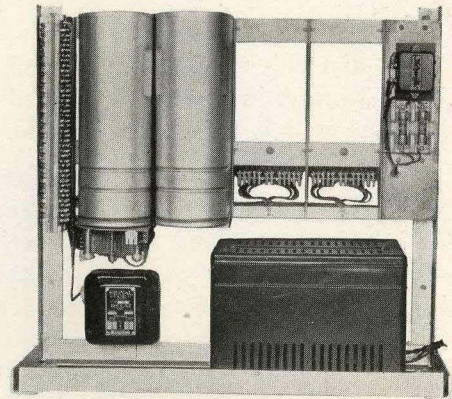
For Small Organizations

The Type I P-A-X is especially designed to meet the needs of relatively small organizations, where the needs of intercommunication are of a somewhat limited nature. It enables such organizations to take advantage of the quick, accurate and convenient service of the P-A-X, at the lowest possible cost.

It consists of a single, standard, automatic switch; a vibrating ring-current converter; and the necessary relays and fuses. This equipment is mounted on a small frame of angle steel.



Type I P-A-X Unit, with Switch Covers Removed



Type I P-A-X Unit, with Rectifier

A common pair of wires is run to all of the telephones, and each telephone also has a single wire leading to it. This individual wire is for ringing the bell of the called station to the exclusion of all others. Since the telephones are all wired common to the one switch, this telephone has a capacity of only one conversation at a time. It is, therefore, seldom used for more than twenty or thirty telephones, although it has a capacity of ninety.

Telephones are called by dialing two digits. Immediately after the last digit of the number is dialed, the called telephone will be given a single ring. To repeat the ring, it is necessary to dial the number again, but it is not necessary to replace the receiver first.

The Type I P-A-X operates on 22 volts, direct current, supplied from an 11-cell storage battery of twelve ampere-hours capacity. The battery is trickle-charged by an electrolytic rectifier, at a rate just high enough to compensate for the normal current-drain. In this way, the battery is automatically kept in a fully-charged condition. A signal relay and buzzer are provided, to signal any failure of the charging current.

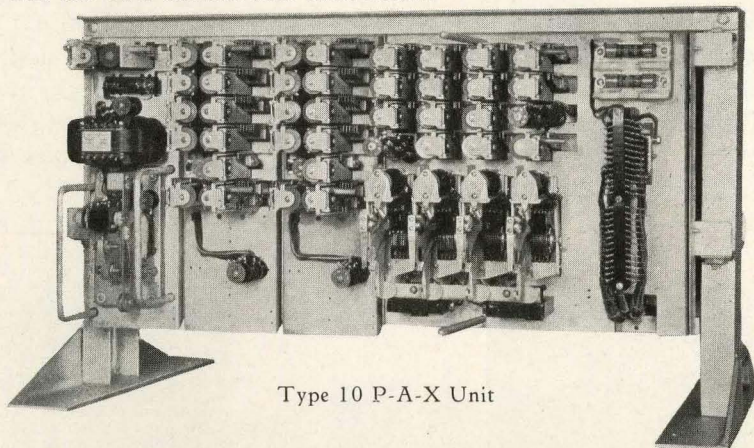
The Type I P-A-X may, if desired, be equipped for code-call service with a maximum of 10 code combinations, and with a private line between 2 telephones. The equipment for these services is mounted on standard switch bases, for which space is provided on the switchboard. See illustration at left.

Strowger P-A-X (Private Automatic Exchange)

The Type 10 P-A-X

(Capacity 10 Lines, Two Simultaneous Conversations)

The Type 10 P-A-X is a full automatic, selective-ringing, secret-service Strowger Automatic Dial system having a capacity of 10 lines and 2 simultaneous local calls. Two telephones may be placed on each line, using code ringing, but the two cannot call each other.

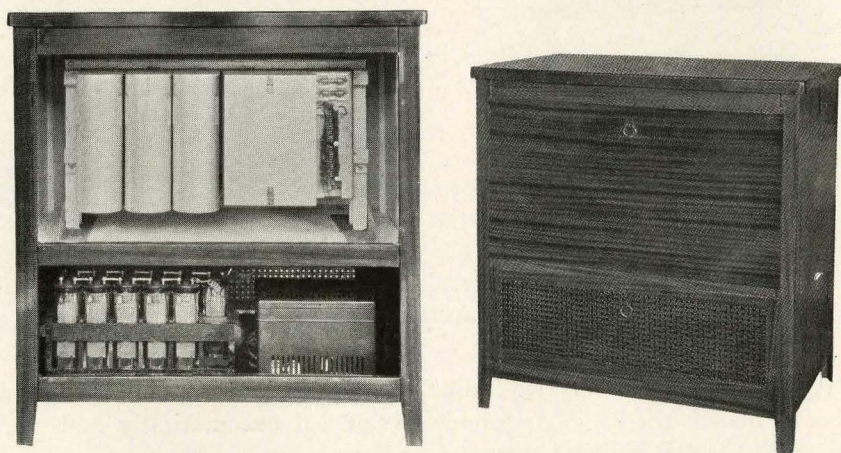


Type 10 P-A-X Unit

The entire equipment, consisting of a combination of simple Strowger rotary switches and Strowger relays, is mounted on a frame together with the ringing-current generator, fuse block, and terminal block, as shown in the illustrations. The apparatus is normally protected with steel dust-proof covers.

To make a call, the telephone number (1 digit) is dialed first, and followed by the dialing of a single figure (usually "8") for ringing. To repeat the ring, the last digit must be dialed again. If the called line is busy, the usual "busy tone" is received at the calling station.

A 10 Line Unit



Complete Type 10 Installation in Cabinet

The current supply of the Type 10 P-A-X is furnished by an 11-cell storage battery of 12-ampere hour capacity, the battery being floated from an electrolytic rectifier. In cases where commercial power of 110 volts D. C. is available, battery may be charged from this source through a resistance. The dimensions of the central unit are 2'8" long, 1'5" high, and 1'6" wide.

Strowger P-A-X (Private Automatic Exchange)

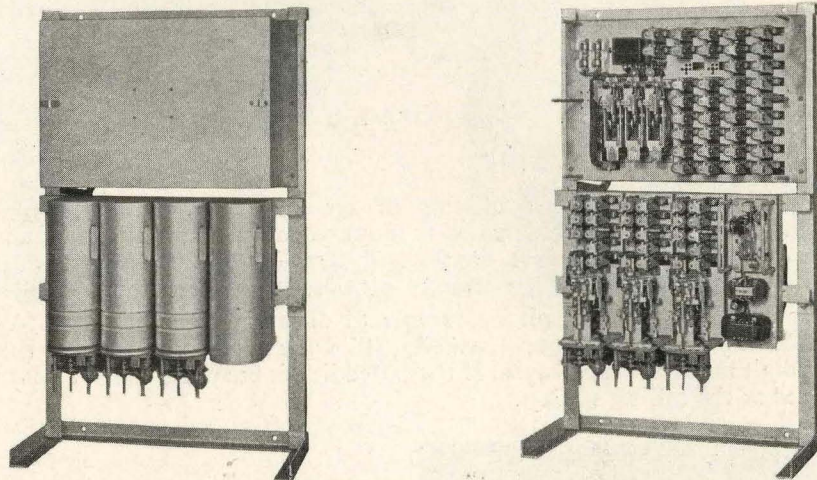
The Type 2 P-A-X

(Capacity 25 Lines, Three Simultaneous Conversations)

A 25-Line System

When a private telephone system reaches a size of approximately 25 lines, it is usually necessary to provide facilities for more than one or two calls at a time. The Type 2 P-A-X, a 25-line system, is therefore supplied with sufficient equipment to handle three simultaneous conversations.

The switchboard equipment is assembled on a frame of angle steel, arranged to be mounted either on the floor or bolted on the wall. At the top of this frame is a plate mounting a group of three finder switches, together with the necessary relays and power fuses. Below this are mounted three connector switches and a ringing converter of the vibrating-reed type.



The Type 2 P-A-X Shown With and Without Switch Covers

The connector switches are the "operators" of the P-A-X, and perform the work of making and releasing the connections. When a telephone receiver is lifted, preparatory to making a call, one of the finder switches automatically rotates to the line of the calling party, and connects it through to a connector switch. The connection is then completed, under control of the calling party's dial, by the connector switch.

All telephone numbers are 2-digit. Immediately after the last digit of the number is dialed, the called telephone is signaled automatically and intermittently, until the call is either answered or abandoned. If the telephone called is busy, the familiar busy tone is sounded in the calling party's receiver.

The Type 2 P-A-X is operated on 48 volts, direct current, supplied by a 23-cell storage battery of 12 ampere-hour capacity. The battery is kept fully charged by an electrolytic trickle charger, and a signal buzzer gives indication of any failure of the charge.

Strowger P-A-X (Private Automatic Exchange)

The Type 5 P-A-X

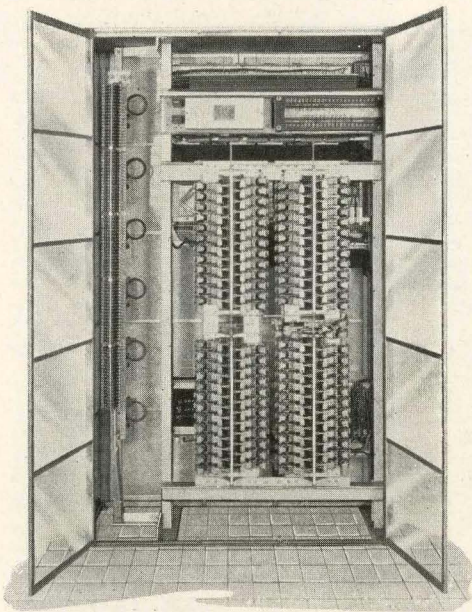
(Initial Capacity Up to 100 Lines)

(Special Services---Code-Call; Watchman's Supervisory and Recording; Conference; Executive Right-of-Way; Emergency or Fire Alarm)

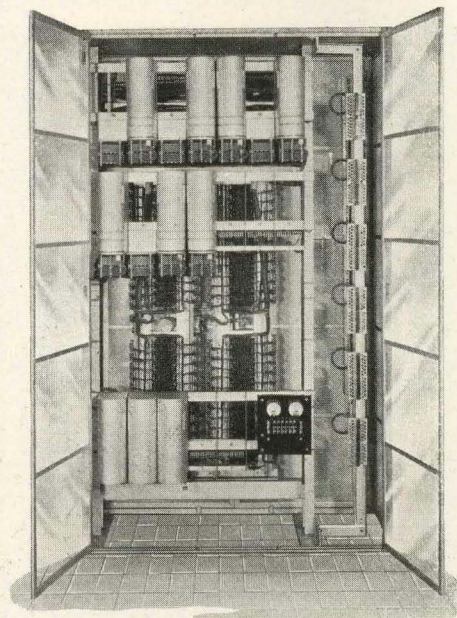
The Type 5 P-A-X is particularly adapted for use in large establishments where the telephone traffic is comparatively heavy and a number of simultaneous conversations must be accommodated.

The switchboard equipment is mounted on a heavy steel frame, completely enclosed in a glass and steel cabinet. It consists of line switches (one for each line in service), connector switches (in number equal to the number of simultaneous calls required), and the power and ringing-circuit equipment.

*The 100-Line
P-A-X*



The Type 5 P-A-X. Front View, Showing Line Switches



The Type 5 P-A-X. Rear View, Showing Connector Switches

The line switch of a line operates when the telephone receiver on that line is removed, and extends the line through to one of the connector switches. The connection is then completed by the connector, under control of the calling subscriber's dial. The number of connectors required depends upon the amount of traffic at the busiest time of the day. Seven connectors are usually furnished, although there is space for as many as 20.

Strowger P-A-X (Private Automatic Exchange)

All telephone numbers are of 2 digits (00 to 99). Ringing commences automatically, after the second digit, and is cut off when the called party answers.

The Type 5 P-A-X operates on 48 volts, direct current, supplied from two storage batteries, each consisting of 23 cells of 24 ampere-hour capacity. These batteries are installed in a wooden battery-rack; or, if they are to be installed in a place where appearance is important, a neatly finished steel battery-cabinet, similar to the cabinet shown on page 11, can be supplied.

The battery-charging control equipment of this P-A-X is contained in a metal cabinet designed for wall mounting. Three types of charging are available: Tungar rectifier for commercial alternating current; resistances for commercial direct current having positive side grounded; and motor-generator for direct current not so arranged. Floor plan is shown on page 27.

The Type 7 P-A-X (Unlimited Capacity)

*Unlimited
Capacity for
Expansion*

The Type 7 P-A-X is an expansion of the Type 5, with selector switches added to select a connector in the called hundred-line group. If the traffic is light, the selectors are mounted on the rear of the line switchboards, with the connectors. If traffic is heavy, so that connectors occupy the space, it is necessary to installed a separate unit for mounting the selectors.



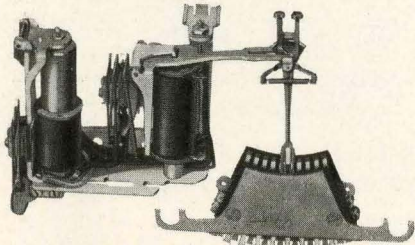
A Typical Type 7 P-A-X Installed, Capacity 300 Lines

Units for this purpose are furnished in 3 different capacities, depending on the ultimate number of line units that might be installed—namely 54, 100, and 200 selectors.

The battery charging circuit of the Type 7 P-A-X may be arranged either for a voltage-controlled charging scheme whereby the charging device is started automatically whenever the voltage on the switchboard busbars reaches the low limit and cut off whenever the voltage reaches the high limit, or a time-controlled scheme as described in connection with Type 5.

Strowger P-A-X (Private Automatic Exchange)

The Switches of Strowger P-A-X



The P-A-X Line Switch

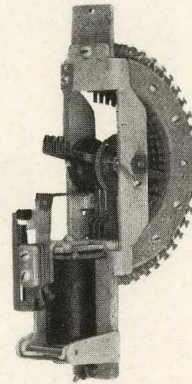
The Line Switch

The line switch is a simple selecting mechanism which automatically connects the calling line to an idle one of a common group of connectors or selectors, when the receiver is removed preparatory to dialing. As used in the Type 5 P-A-X and Type 7 P-A-X, the line switches are mounted one above another in groups of 25, and with 4 groups in each 100 line unit. The contact bank has a capacity of 10 trunks to major switches.

P-A-X Line Switch

The Finder Switch

The finder switch, used on P-A-X's Types 2 and 10, performs a similar function to that of the line switch except that the operation is reversed. That is, instead of the subscriber's line equipment operating to find an idle connector when the receiver of the calling station is lifted, as in the case of line switch systems, the finder switch associated with an idle connector rotates to find the line that is calling, and connects with it. It will be noticed that in the Type 2 P-A-X and Type 10 P-A-X there is one finder switch for each connector.



The P-A-X Finder Switch

Finder Switch

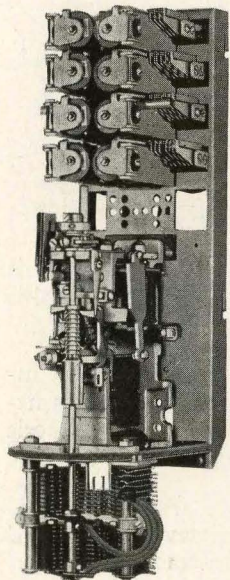
The Connector

The connector is the "operator" of the P-A-X. It consists essentially of a shaft carrying 3 wiper springs at its lower end, so arranged that when the shaft is given first a step by step vertical motion and then a similar rotary motion, the wiper springs will be caused to rest on the contacts of the called line.

At the top of the switch is a group of control relays. Below this are the vertical and rotary magnets, the associated ratchet mechanism for lifting and rotating the shaft, and the release magnet for permitting the shaft to drop to normal, when conversation is finished. In the Type 10 P-A-X the connector is of the rotary type of switch similar in design to the finder switch shown above.

The Selector

The selector is used in systems of more than 100 lines for selecting a connector serving the proper hundred groups. It is similar in general design to the connector, having the same shaft and contact springs with the same vertical and rotary motion.



The P-A-X Connector

P-A-X Connector

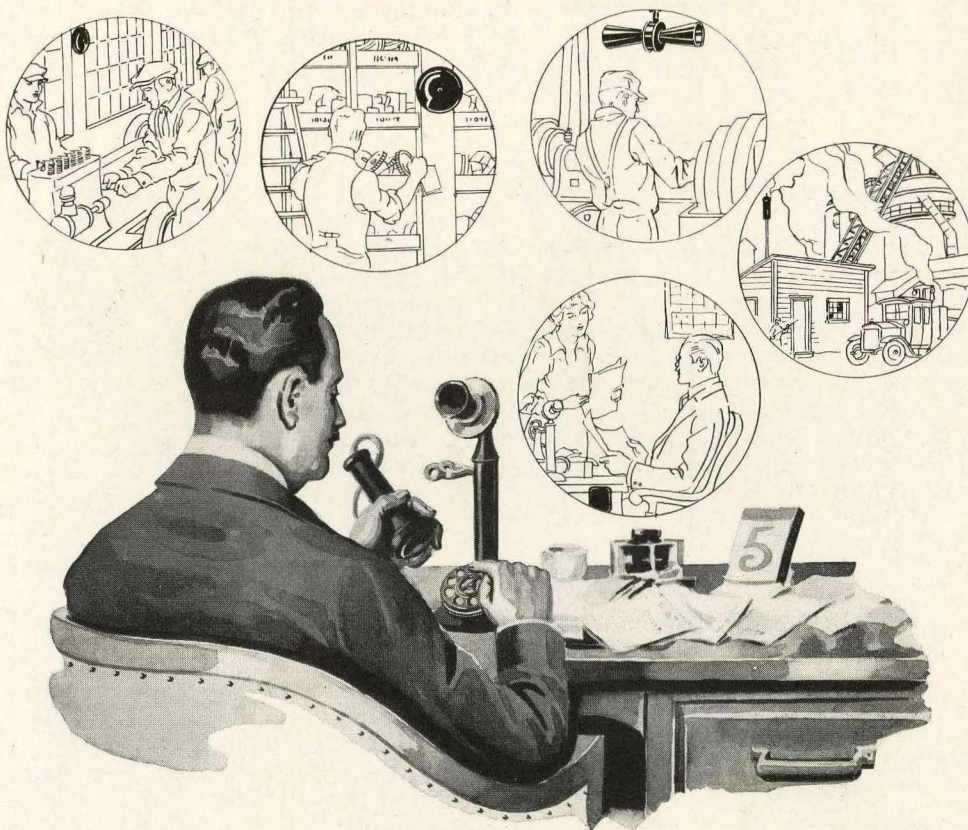
Strowger P-A-X (Private Automatic Exchange)

Code Call Signalling

Strowger Code Call Service

The Code Call service of the Strowger P-A-X completes and perfects the advantages of the P-A-X intercommunicating service. The P-A-X Code Call is more than a man finder. It makes possible not only immediate location of, but also conversation with any executive, foreman, mechanic or any other employe—no matter in what part of the building or plant he may be at the time.

For example, a customer calls in over the city telephone and asks for a definite delivery date for certain material he has ordered. You dial the number

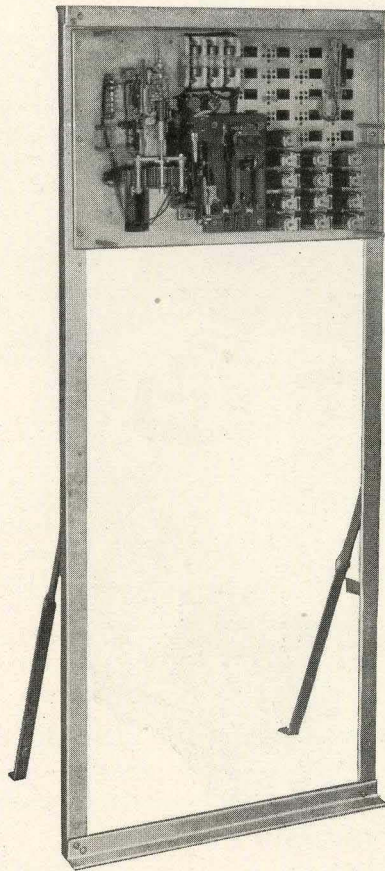


of the P-A-X telephone at the production manager's desk, and after hearing his telephone bell ring for a few seconds, decide he is not there—or perhaps his stenographer answers and says he is "somewhere in the factory."

You immediately momentarily depress the hookswitch, releasing the connection, and dial the code number assigned to the production manager. Immediately bells, buzzers, horns, whistles, etc., begin to sound that particular code in all parts of the plant, each signal device designed and adjusted to be suitable for the particular department in which it is used.

The production manager hears the code signal, recognizes it as his own, and turns to the nearest P-A-X telephone, dialing the code call answering number. The code signal stops, and he is immediately connected to your own telephone, and you are able to secure the desired information for your customer at once.

Strowger P-A-X (Private Automatic Exchange)



The P-A-X Code Call Equipment

The code call may be operated from any of the automatic telephones. The operator on the telephone company's private branch switchboard may also use the code call service for locating persons when wanted on calls from the outside. For this purpose she is simply provided with a regular P-A-X telephone, by means of which she puts on the call in the usual way. When the party answers, the code stops. She may observe this without holding the receiver to her ear.

Most P-A-X units, when installed, are already wired for Code Call service. To take advantage of the service, it is merely necessary to install the Code Call machine as illustrated, and the necessary signal devices and wiring.

The Code Call machine consists of a combination of standard switches which operate under the control of the P-A-X user's dial to generate, select, and send out the proper code ringing combinations. For example, on the Type 5 (100 line) P-A-X, the preliminary calling code is "7-0." To call a person whose code is "2-1," a P-A-X user dials "7-0-2-1." Dialing the "7-0" connects the line with the code machine. Dialing the "2-1" causes the machine to generate and send out the "2-1" code to all of the signal devices, which immediately

begin to sound the proper signal—"two strokes—pause—one stroke"—the signal being repeated at regular intervals.

The party called hearing his code being sounded, steps to the nearest P-A-X telephone and dials the common answering number ("79"). This stops the code and connects him with the person calling. In case the call is not answered, the calling party may stop the code merely by hanging up the receiver.

If the plant in which the Code Call service is used is a large one, extending over many buildings or many floors, it may be advisable, to avoid confusion, to use several code machines, one for each section or floor. In this way it is possible to sound a code signal in any one section or building and not in the others. In addition, another code machine may be used for sounding codes in all parts of the plant at once.

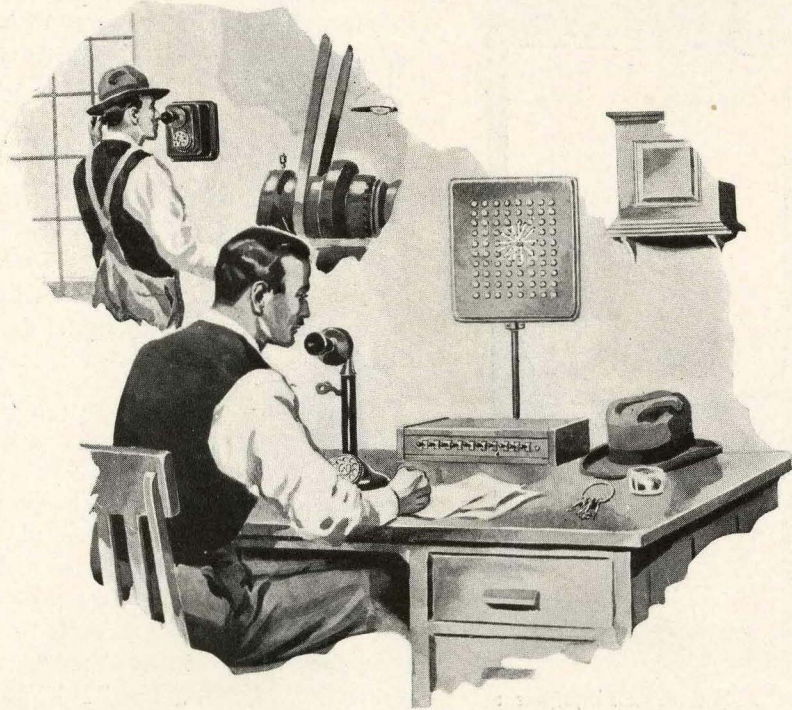
*How the
Code Call
Operates*

Strowger P-A-X (Private Automatic Exchange)

*A Complete
Watchman's
System*

Watchman's Service

In buildings or plants that are extensive or contain valuable equipment, it is customary to employ a watchman, or, in the larger plants, a staff of watchmen under a chief or supervisor, who are, or should be, constantly patrolling the



property during the night hours on the lookout for possible outbreaks of fire, attempts at burglary, or perhaps malicious damage by some disgruntled employe.

In the P-A-X equipped plant, the Watchman's Service feature offers a ready means of keeping all watchmen in constant telephonic touch with the chief, and of automatically recording and supervising the movements of watchmen on their rounds. Properly adjusted to the conditions and requirements of each individual plant, it increases the efficiency of the staff and offers a protection that is most effective and complete in every detail.

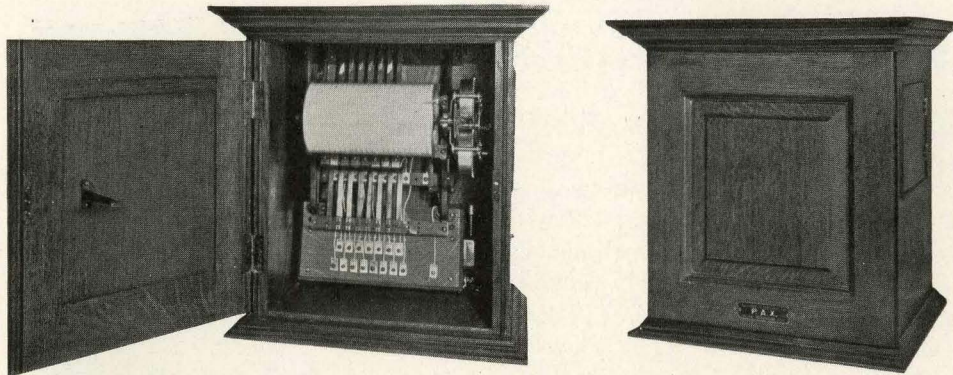
In the past, many variations of the Watchman's Service feature have been placed in operation in P-A-X equipped plants, all of them alike in their essentials, but differing in their details of application.

The system described below represents what experience has shown to be the most typical and valuable in the average plant, but can, of course, be adjusted to meet conditions that may seem to require somewhat different treatment.

Watchman's Service Equipment

Each P-A-X telephone is potentially a watchman's reporting station, and any or all of the telephones on a given route may be used as reporting stations, as conditions may require. The supervisor's equipment consists of a standard P-A-X telephone, an audible signal, and a lamp and key panel for purposes of supervision. The automatic recording of watchmen's movements is taken care of by an electric clock of the recording type, illustrations of which are shown.

Strowger P-A-X (Private Automatic Exchange)



P-A-X Watchman's Recording Clock

This clock gives clear and separate registrations for two-day periods without changing the dial. The dial is of paper and is fastened over a corrugated hard rubber drum. Registration is made by means of needles, one for every station, which perforate the dial, the perforations showing both the numbers of the stations and the time of recording.

1. When a watchman calls in, a distinct tone is sounded in his receiver to notify him that his call has been recorded.
2. The supervisor is given audible and visual signals when a watchman calls in. The number of the station from which the call is made is indicated on the lamp panel.
3. Means are provided whereby the supervisor may determine whether the proper party is operating the station equipment.
4. Means are provided for permanently recording the number and time of each call.
5. An alarm is given if more than a predetermined interval of time elapses between calls from consecutive stations.
6. An alarm is given if a watchman does not call in from his various stations in the prescribed order.
7. Arrangements may be made so that these alarms are given at a distant point, police headquarters, for instance.
8. Means are provided for the supervisor to communicate with such distant point.

Operation of System

When a watchman on his route arrives at the P-A-X telephone designated as his first station, he removes the receiver, dials a predetermined number, say 77, and waits a few seconds in case the supervisor wishes to verify the fact that the proper party is calling in. The watchman receives a buzzing sound in his receiver indicating that his call has been properly recorded. At the same time the lamp on the supervisor's panel, corresponding to the station calling, glows and shows up the station number. The lamp continues to glow until the watchman calls in from the next station. If the supervisor wishes to speak with the watchman, he may cut in on the station by pressing a key on his desk while the watchman is waiting, or by dialing the number of the station if the watchman has already hung up.

The lamps on the panel are divided into a number of groups, one group for each route.

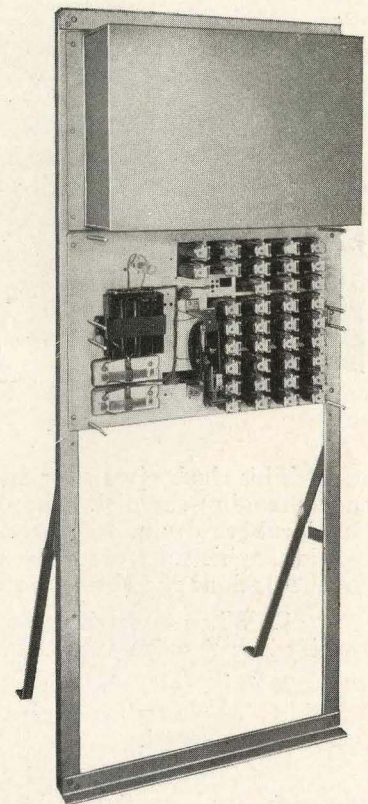
*What the
Watchman's
System Will Do*

*Operation of
Watchman's
Service*

Strowger P-A-X (Private Automatic Exchange)

If the watchman, for some reason, fails to call in from the next station on his route within the prescribed time interval, a buzzer alarm is operated at the supervisor's office. The supervisor, on hearing the buzzer, inspects the lamp panel to determine the meaning of the alarm. Finding that the lamp associated with the last station from which the watchman called in is still glowing, and is the only glowing lamp in the lamp panel, the supervisor realizes that the next call-in is overdue. The glowing lamp in the lamp panel also indicates the location from which the last call-in was made, and the supervisor may then make an investigation.

If the watchman makes an error in the order in which he calls in from the stations on the route, or fails to report from one or more stations, the buzzer at the supervisor's desk is operated. On hearing the buzzer, the supervisor inspects the lamp panel to determine the meaning of the alarm. Finding two lamps glowing, he realizes an error has been made in the order of calling in, and gets in touch with the watchman, who goes back to the station (or stations) overlooked and calls in from each station in order.



P-A-X Watchman's Service Equipment. Equipped for Two Watchmen.

Fire Alarm Service

Fire Alarm Service

The special equipment for Strowger Fire Alarm service, used in connection with a supervised watchman's system, consists of a number of closed circuit alarm boxes similar to those in general use, placed at convenient points, a supervisory panel at the gate house or fire marshal's office, and a code sender.

If, upon an outbreak of fire, a pull-box is operated, the code sender automatically sends out the fire code for that box to all of the code call signal devices.

Experience has shown, however, that most fire alarms are turned in over the telephone. For this reason, in the P-A-X Fire Alarm system, a special telephone number is set aside for the fire marshal or chief watchman. If, in the event of an outbreak of fire, this number is dialed, a loud ringing bell is sounded in the fire marshal's office, the bell being associated with his telephone. He may then ascertain the exact location of the fire and he presses a key associated with the fire box for that location, which operates the code sender exactly as if the corresponding pull box is operated. This avoids the confusion which results when a pull-box is operated at some location other than that of the fire.

Strowger P-A-X (Private Automatic Exchange)

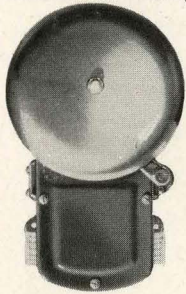
Executive Right-of-Way Service

The Type 5 and Type 7 P-A-X may be so arranged that any one or more executive officials may be given "right-of-way" service over existing connections. In this way, in an emergency, an executive may speak with any employe via P-A-X, even if such employe is already using his P-A-X telephone.

*Executive's
Priority
Service*

Signal Devices

The signal devices illustrated and described below have been carefully examined and tested by the engineers of Automatic Electric Inc. and are recommended as being particularly suited to P-A-X Code Call requirements.



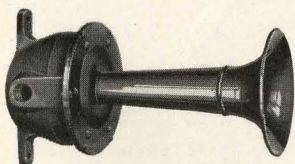
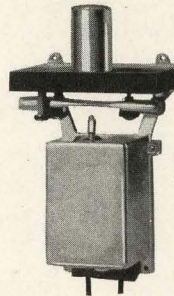
Single Stroke Bells

These bells are furnished for all standard voltages, 12 to 250 A.C. and 6 to 250 D.C., in 4, 6, 8, 10 and 12 inch sizes. They may be had in either indoor or weatherproof styles.

*Special Signal
Apparatus*

Executive Signal

This is a particularly pleasing soft-toned signal designed especially for private offices where the ordinary type of signal is too loud or unpleasant. The Executive Signal consists of a metal reed surmounted by a dome-shaped resonator. The reed is actuated by a plunger moving within a solenoid. May be obtained in all standard voltages, both A.C. and D.C.

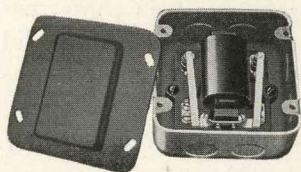
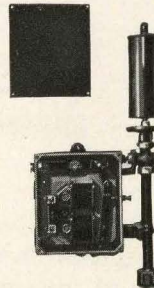


Industrial Horns

These industrial horns have a peculiar penetrating tone pitch which makes them a most effective form of audible signal for factory use. They may be had for 110-V. A. C. or D.C., and for either interior or exterior use.

Outdoor Whistle

This powerful whistle is found to be exceptionally useful in noisy rooms or in wide open spaces, such as railroad or lumber yards. The whistle valve is operated by an electromagnet.



Power Relay

This relay operates on current from the telephone battery and is used for closing a circuit to signal devices operating on power leads.

Strowger P-A-X (Private Automatic Exchange)

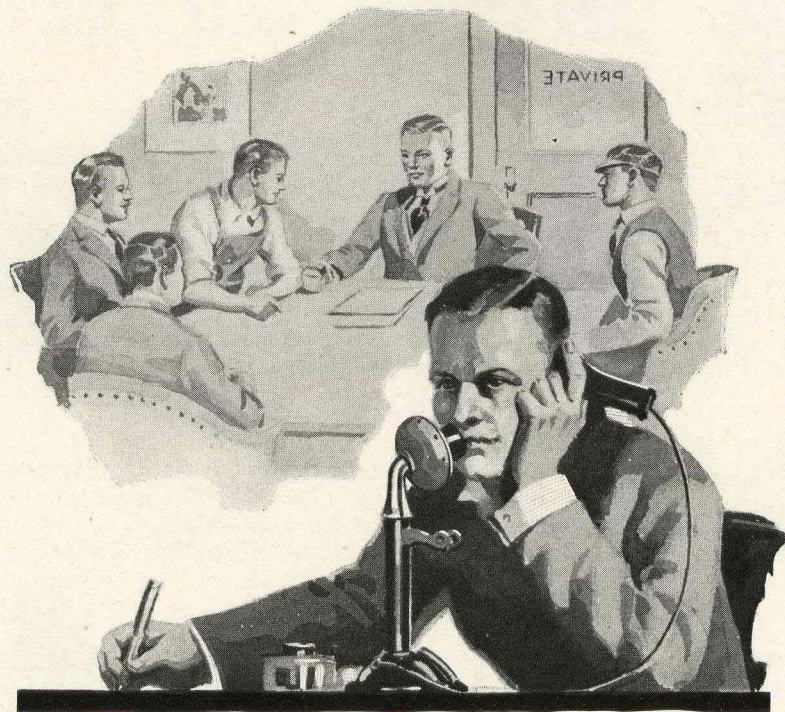
Conference Service

A Business Time Saver

One of the most valuable of the miscellaneous features of the P-A-X is the Conference Service. Whether added to an existing installation or included with an original purchase, it will be found to be an efficient time saver and an indispensable asset to plants or business houses having a large executive staff.

The purpose of the conference service is to enable the General Manager or other executive to call, on short notice, a private consultation with a number of people in his organization without loss of time and without making it necessary for those with whom he wishes to talk to leave their offices or desks.

All the P-A-X telephones in the system are arranged for Conference Service. However, it is advisable to connect only six telephones to the conference line at one time, because of the possibility of transmission loss.



How the Conference Service Operates

The general manager, for example, desires to confer with the treasurer, vice-president, auditor and sales manager. He will instruct his secretary to dial each of these numbers separately and tell them to dial the common conference number, which we will say is 8-0. He then dials the same number, 8-0, as did the other four officials, and after his connection is made to this common conference line, the conference may begin. At any time during the conference, any of the conferees may withdraw by hanging up their receivers, or any others may come in on the conference as desired.

Strowger P-A-X (Private Automatic Exchange)

To Architects and Engineers

The forms of specification printed on the following pages, are for the information of architects or engineers whose work involves the specifying of interior telephone systems for their clients.

Complete technical details on all P-A-X equipment will be found in the P-A-X Handbook for Architects and Engineers, copies of which will be furnished gratis on request. A typical floor plan for a complete installation will be found on page 27 of this bulletin.

Strowger P-A-X (Private Automatic Exchange)

Wiring Specifications

THE installation of P-A-X telephone wiring is governed by the following standard specifications:

“Telephone wiring for dry locations shall be of No. 19 B & S gauge twisted pair rubber covered and braided interior telephone wire. For locations where dampness may be encountered, No. 18 B & S gauge twisted pair wire, rubber covered and with saturated braid, shall be used. Where found more convenient, standard No. 22 B & S gauge lead covered cable with saturated core may be used from local distribution points to the switchboard, this wire being silk and cotton insulated and coded. One pair of wires should be used from each telephone directly to the automatic switchboard or to the nearest distributing cable terminal. Cable and telephone distribution wire shall be terminated on approved terminal blocks mounted on suitable terminal cabinets.”

Full information covering building wiring requirements for the automatic telephone equipment will be mailed upon application.

Specifications

for

Interior Telephone System

(Common Talking, Selective Ringing)

UNDER these specifications shall be furnished a Strowger Automatic Telephone System of the type known as Common-Talking, Selective Ringing, as manufactured by AUTOMATIC ELECTRIC INC.

Service shall be continuously available and provide for a single conversation at any time. All stations shall be able to communicate with each other, all calls to be controlled automatically by the dial attached to each telephone. The ringing of the bell shall be controlled automatically from the central switchboard without the necessity of a ringing key or button at any telephone.

The switchboard shall be furnished complete with batteries, ringing equipment, rectifier, power panel with fuses, knife switches and voltmeter, and battery box.

Telephone Instruments—Telephones shall be of the following types:

- Wall Telephones
- Desk Telephones
- Monophones Type 1
- Monophones Type 2

Strowger P-A-X (Private Automatic Exchange)

All telephones shall be of the highest quality, and in design, construction and performance, the equal of telephones used by public telephones companies.

Each telephone shall be equipped with a standard calling dial consisting of a revolving disc having ten finger holes, under which shall be mounted a stationary dial containing the figures 1, 2, 3, 4, 5, 6, 7, 8, 9 and 0.

All telephones shall be equipped with ringers of the polarized, double-gong type.

Specifications for Interior Telephone System (Full Intercommunicating)

UNDER these specifications shall be furnished all apparatus for a complete Strowger Automatic Telephone System as manufactured by AUTOMATIC ELECTRIC INC., including automatic switchboard, power plant, main distributing frame, and telephones.

The system shall provide for the following features: full intercommunication, dial operation, secret connections, busy tone, automatic or dial ringing of bells, ringing tone, two-wire line circuits.

Switchboard—The switchboard shall have a capacity of..... individual lines and connecting units, equipped initially with the apparatus required to give adequate service.

For economy and to facilitate additions, the switchboard shall be furnished with the remaining positions reserved for the ultimate equipment, completely wired and equipped with switch jacks, multiple cable and apparatus for tying together the station lines and connector trunks so that a station or trunking apparatus can be added by simply placing the required apparatus in the jack.

Telephones—The telephones shall be of the following types:

-Desk Type Monophones
-Wall Type Monophones
-Standard Desk Telephones
-Standard Surface Wall Telephones

All telephones shall be of the highest quality and in design, construction and performance, the equal of telephones used by public telephone companies.

Each telephone shall be equipped with a standard calling dial, consisting of a revolving disc, having ten finger holes, under which shall be mounted a stationary number plate marked with figures 1, 2, 3, 4, 5, 6, 7, 8, 9, and 0.

All telephones shall be equipped with bakelite receiver shells, caps and mouthpieces, and shall have ringers of the polarized, double-gong type.

Storage Battery—An approved storage battery of proper voltage and capacity shall be furnished, such battery to have enclosed-top glass jars and to be installed in a wooden rack or an enclosed type steel cabinet.

Strowger P-A-X (Private Automatic Exchange)

Rectifier—The rectifier, if one is used, shall be designed to operate on 110-115 Volts, 60 Cycle, Single Phase, and shall be of sufficient capacity properly to charge the storage battery at the normal charging rate. (Note—Where direct current only is available, specify resistor or motor generator of proper capacity.)

Miscellaneous—Power control apparatus shall include a reliable type of voltmeter and ammeter of the proper calibrations for use with the operation of the switchboard, an ammeter of such a type that the reading will show the rate of charge or discharge, an automatic type of reverse current circuit breaker, a charging switch and fuses, voltage control relays and supervisory signals and relays for indicating unstandard conditions of the switchboard or power equipment. (Note—Switchboards of less than 50 lines capacity do not include voltmeter, ammeter, circuit breaker, or supervisory signals.)

The switchboard shall include terminal blocks for the cross connection of the station lines with the switchboard line equipment.

The switchboard shall be enclosed in a substantial all steel or steel and glass cabinet designed to be as dust-proof as practical, also each line-selecting unit is to be covered with an individual metal dust-proof cover of a slip-on type.

A suitable set of maintenance tools consisting of wrenches, pliers, and other tools, including a hand test telephone, are also to be furnished, together with a set of circuit and wiring diagram blue prints, and also a complete set of adjustment specifications covering the relay and mechanical equipment.

Specifications

for

Code Call Signaling System

(To Be Installed in Connection with Interior Telephone System)

UNDER these specifications shall be furnished and installed a complete Code Call Signaling System in connection with the Automatic Interior Telephone System, as hereinafter described.

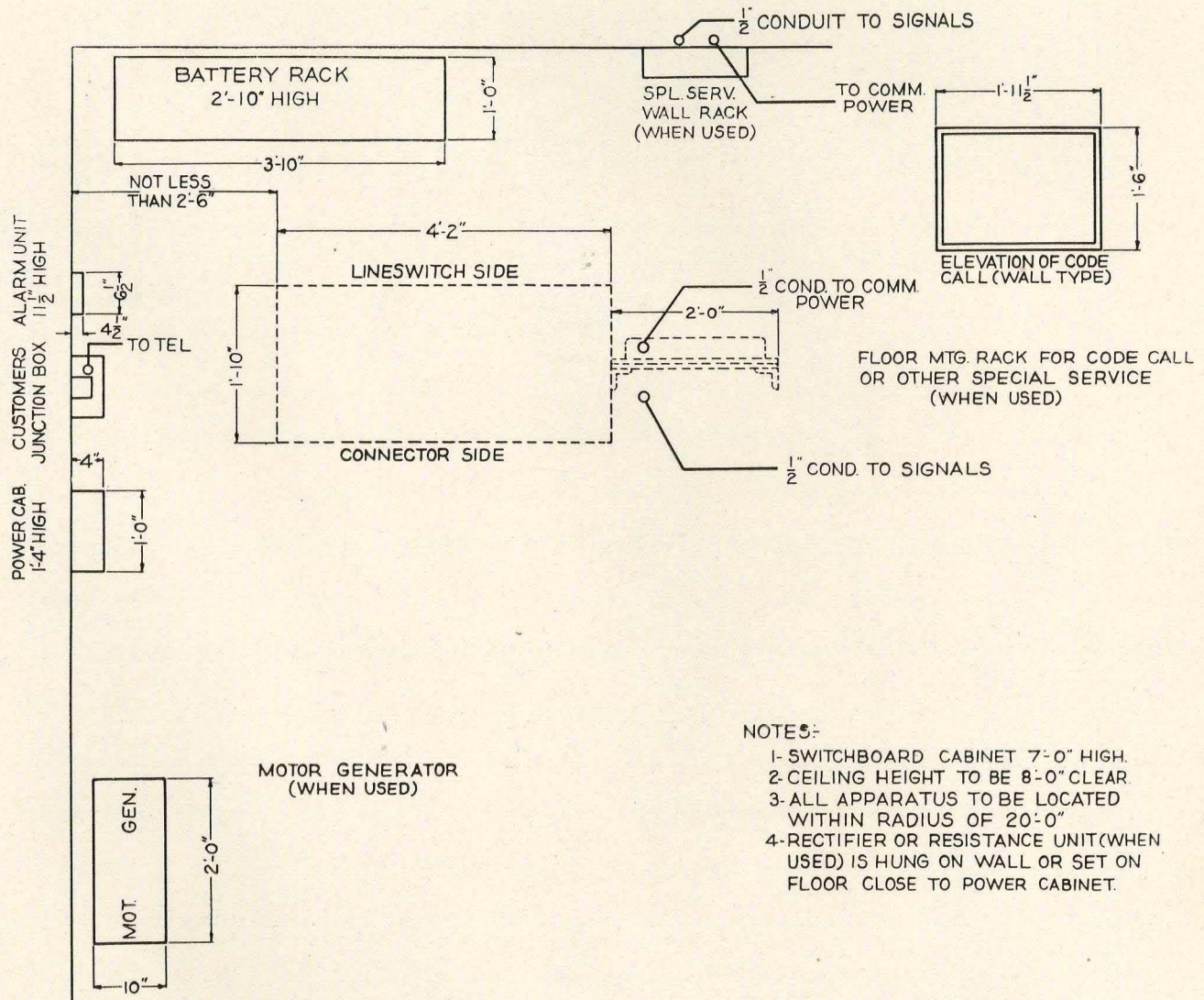
General—The apparatus shall consist of Automatic Electric Inc.'s Code Call Signaling System and shall be connected directly to the automatic telephone switchboard in such a manner that every automatic telephone station shall have access to the use of the Code Call Signaling System without having to refer the call to an operator or attendant.

Calling a predetermined number on the telephone system shall connect the calling party's telephone to the Code Call machine, whereupon by dialing two additional digits, the user may set any code he desires. This code shall be transmitted through a master relay to all signals.

Code Machine—The Code Signaling machine shall be Automatic Electric Inc.'s standard machine, capable of sounding 100 different codes, each code consisting of two numbers or digits.

Strowger P-A-X (Private Automatic Exchange)

Typical Apparatus Layout for Strowger P-A-X



NOTES:-

- 1-SWITCHBOARD CABINET 7'-0" HIGH.
- 2-CEILING HEIGHT TO BE 8'-0" CLEAR.
- 3-ALL APPARATUS TO BE LOCATED WITHIN RADIUS OF 20'-0"
- 4-RECTIFIER OR RESISTANCE UNIT (WHEN USED) IS HUNG ON WALL OR SET ON FLOOR CLOSE TO POWER CABINET.

Floor Plan for Type 5 (100 Line) P-A-X

Strowger P-A-X Data Sheet

Each establishment faces particular problems and conditions, and Strowger P-A-X equipment must be specified to meet them. By filling out the blanks below and sending this sheet to us, we can tell you exactly what Strowger P-A-X can do for your organization. Address to:

AUTOMATIC ELECTRIC INC.
1033 West Van Buren Street
Chicago, Illinois

Name of Company or Institution _____

Kind of Business _____

City _____ State _____

How many telephones are required for immediate use? _____

Wall _____ Desk _____

How many telephones (approximately) will be required in 5 years? _____

How many officials and employes would you like to be able to reach instantly, no matter where they might be about the establishment? _____

Would conference calling, so that several officials or department heads could talk together over the telephone, be desired? _____

What electrical current is available? _____

Direct current _____ Alternating current _____

Voltage _____ Phase _____ Frequency _____

Approximate maximum calls at any one time _____

REMARKS: _____

Data compiled by _____ Date _____

