Automatic Telephone

Vol. 10 January, 1922 No. 1

The Sales Manager's Page

WE have, at various times in the past, in these columns, repeated and answered some of the arguments put forth against the Automatic telephone. It has been unnecessary to undertake to repeat and answer all of them, for two reasons: first, the real facts about Automatic are rapidly becoming accurately known to all telephone men, and second, most of the arguments made against this system of telephony fall of their own weight when the prospective purchaser undertakes actual study of Automatic for his own needs. There are, however, certain "stock" claims against the Automatic telephone which we would like to mention briefly, and comment upon at this time.

These are: that Automatic equipment is expensive, that it is complicated, and that Automatic telephone service is not satisfactory.

As to the first claim, that Automatic telephone equipment is expensive, high-priced, costly to buy, or whatever term may have been used, the facts are these: Automatic Electric Company has never claimed, nor does it now claim, that Automatic telephone equipment can be purchased and installed as cheaply—as to first cost—as manual equipment. The initial investment for the installation of an Automatic telephone exchange will in the average case be more than that required for the installation of a manual telephone exchange—although, as a matter of fact, the difference will not be nearly as great as many telephone managers have been led to believe through the advertising and other activities of those to whose interest it is pertinent to oppose the sale of Automatic equipment.

But the real test of the value of any piece of machinery or equipment which is expected to be used over a term of years is not the first cost but the *final cost*—that is, the initial investment plus the money necessary to keep that equipment doing the thing it is designed to do, throughout its life. We have therefore asserted, and continue to assert, that Automatic telephone equipment is, in the long run, the cheapest, on two counts: first, because it lasts longer, and second, because it costs less to operate while it lasts.

Proof? We will be glad to furnish it—from the records of the many successful telephone companies who discarded the "cheaper" manual equipment for the "more expensive" Automatic equipment years ago—and have made money year after year on their investment!

As to the second claim, that Automatic equipment is complicated; something depends upon the meaning of the word "complicated." It might be said that a typewriter is complicated, because it has hundreds of moving parts; that an automobile is a complicated device, or that a sewing machine is complicated—or even a manual telephone switchboard, especially when there have been added to the latter various peculiar cord circuits, combinations of relays and so on, designed to make the manual board a substitute for Automatic. If, however, by the statement, it is meant that Automatic equipment is so unduly complicated that it cannot be properly, easily, successfully and economically maintained and operated, by persons of average ability and training, throughout its life—then the statement is wrong.

Proof? The many Strowger Automatic telephone exchanges now operating, satisfactorily and profitably, under varied and different conditions, in practically all parts of the world! If the student of this question does not care to take our own opinion on the subject, he is referred directly to the managements of any or all of these plants. The proof of our answer is there, awaiting him.

Our answer to the claim, sometimes made, that Automatic telephone service is not satisfactory, is this: ask any telephone company operating Automatic—and ask the subscriber who uses it!

Service is the very essence and fundamental of the telephone industry. Any class of telephone equipment that did not furnish satisfactory telephone service would not stand the test of public favor one week, no matter what other virtues it possessed. Strowger Automatic exchanges have been in operation for almost three decades—and the regular user of an Automatic telephone would be the first person to resent the injection of the human element into his telephoning.

Strowger Automatic equipment furnishes all the classes of telephone service that have become customary in the development of the telephone industry, and it will continue efficiently and economically to meet traffic and service developments in the art—or, as it has often done in the past, to anticipate them.

It does all this efficiently and profitably to the company operating it—and with a uniformity and dependability of service possible only when performance is by machinery and not subject to the vagaries and errors that naturally creep into any and all things done by human hands.

Automatic Electric Company asks of the intending purchaser of telephone exchange apparatus no more than this: that for the benefit of his company as well as for the sales benefit to Automatic Electric Company, he investigate—thoroughly investigate—Automatic before he buys. The Sales Department of Automatic Electric Company will give him, in this undertaking, such assistance as he may desire, without obligation on his part. Preliminary or final traffic studies will be made for him; an estimate of the cost of the equipment for his use will be furnished him, and all facts in connection with the matter will be freely

Automatic Electric Company's Pole Line Supply Service

Sales Connections Made with Two Largest Producers of Poles in the Country. Importance of Careful Selection and Proper Butt Treatment Pointed Out.

By J. H. FINLEY,
Merchandise Sales Manager,
Automatic Electric Company

IN developing our plans to handle everything required by telephone companies, electrical contractors and dealers, we were quick to realize the vital importance of good poles.

There has been in the past some tendency to look upon a pole merely as a stick of wood, something to hang the wires upon. We are strongly impressed with the fact that a good foundation is fully as important for a pole line as for a power house or exchange building.

After an exhaustive study of the pole situation from every angle and a careful investigation of the various methods of manufacture and seasoning, shipping facilities, size of stocks, and facilities for butt treatment, we have made sales connections with two of the largest producers of poles in the United States, namely: E. T. Chapin Company, Spokane, Wash. (Western Red Cedar Poles), and T. M. Partridge Lumber Company, Minneapolis, Minn. (Northern White Cedar Poles).

HIGH-CLASS PRODUCTS

Both of these companies have established reputations for producing material of the very finest quality. We are prepared to offer the highest type of service and to supply buyers of poles of all kinds with material of exceptional quality.

The methods of producing, handling and treating poles by companies such as these that have a national reputation, are of prime importance to the consumer. Many things enter into the manufacture of poles which may not occur to the average buyer. For example, in the operations of the E. T. Chapin Co. in the northwest, only carefully selected western red cedar timber is used.

This timber grows at a high altitude; consequently the trees grow slowly, are stockier, and have a greater taper than the average timber of this species. Chapin's poles, therefore, have a more pronounced taper, and larger circumference at the butt and ground line, than other western red cedar poles. Since the trees grow slowly, the annular rings are close together, forming close grained timber of great strength and remarkable resistance to decay.

As the poles are manufactured in the woods and rigidly inspected by a man who is an expert in the line, they are brought into the yards for seasoning. As shown in the accompanying illustration, the poles are decked, with the tiers separated to permit a complete circulation of air around every pole. This thorough, uniform seasoning is a matter of great importance; such poles will not check after they are set in the line, as will poles that have been seasoned by other methods.

LARGE STOCKS

In these yards, by far the largest in the northwest, large stocks of poles in all standard sizes are constantly maintained. This, together with every facility for loading quickly, and direct connection with five transcontinental railroads, insures prompt, efficient service at all times.

Northern White Cedar Poles are manufactured in much the same manner as the Western Red Cedar Poles. Every precaution is taken to make certain that all poles are perfect and as uniform in quality as it is possible to make them.

Adequate butt treatment is a matter of great importance to every pole user. Sufficient data is now available to prove conclusively that butt treatment of

A Scene in the Cedar Forests of the Northwest. The 80 and 85-Foot Poles Give Some Idea of the Sizes that Can Be Furnished.

EAST CENTRAL INDIANA ASSOCIA

A VERY profitable convention was held by the East Central Indiana Telephone Association at Richmond, Indiana, on Friday morning, December 9th. More than 150 telephone men and women were present when the meeting was called to order by Secretary-Treasurer William M. Bailey.

Pending the arrival of the President of the Association, Mr. C. M. Martz of Tipton, Indiana, Mr. Bailey requested Mr. Max Hosea, Treasurer of the Indiana Telephone Association, to preside. After a few appropriate remarks, Mr. Hosea introduced the Hon. Lawrence A. Handley, Mayor-Elect of Richmond, who gave an unusually cordial address of welcome. In the course of his remarks Mr. Handley complimented Mr. Bailey and his associates of the Richmond Home Telephone Company on the splendid service they were furnishing the subscribers in Richmond. Following this, the Hon. Henry A. Barnhart, President of the Indiana Telephone Association, was introduced, and gave the response.

While Mr. Barnhart was talking, President C. M. Martz arrived. At the conclusion of Mr. Barnhart's address Mr. Martz turned the convention into a class meeting and asked every one of them in the order in which they were sitting, to arise and tell who they were, where they were from, and to make such other remarks as they might feel disposed to make.

Some of the Deleg

In lieu of a scheduled debate on "Automatic versus Manual Telephone Equipment," Mr. W. S. Vivian of

poles is not only a good investment but that the pole buyer can not afford to use untreated poles. It is conservatively estimated that a thorough treatment, such as the guaranteed Pentrex, will double the life of the pole. It is readily apparent that maintenance and replacement costs are thus reduced to the absolute minimum, and the cost of the pole per year of service leaves no doubt as to the greater economy of the treated pole.

All authorities on pole preservation now agree that the depth and uniformity of the penetration of the creosote actually determine the value of the treatment. We strongly recommend the Pentrex treatment by which a definite uniform penetration is guaranteed. The fact that several of the largest pole users in the United States, after careful study of the subject by their engineers, now specify this treatment, is ample evidence that the time is not far distant when the use of untreated poles will be considered as contrary to modern practice.

It is well to consider also that while present timber resources are ample the average cedar tree suitable for pole manufacture is upwards of one hundred years old. Naturally we are consuming far in excess of natural replacement. Therefore, anything that will tend to conserve our available supply of pole timber is worthy of serious consideration both by the producer and the consumer of poles. Pole preservation by butt treatment is one method by which our timber resources can be conserved.

A more general use of treated poles will help to keep down the cost of manufacture, which must necessarily increase as year by year it becomes necessary to go farther into the forest for suitable timber, into

Illustrating the Methods Employed by the E. T. Chapin Co. for Seasoning Western Red Cedar Poles.

It is, and will continue to be, the policy of Automatic Electric Company to pass on to its customers savings accruing from increased production or improved manufacturing methods.

For simplicity, reliability and sturdiness of construction, Automatic Electric Company's dial of today stands alone. It is the standard Automatic telephone dial of the world, and it will continue to represent at all times the highest development and farthest advance in the art of Automatic telephony.

The new price of $3.90 will apply also to dials and dial-equipped telephones now on order for delivery in 1922.

Machine Tool Production and the P-A-X

The Colburn Machine Tool Company Regards P-A-X as an Important Feature of its Cleveland Plant Equipment, and a Valuable Aid in Speeding up its Production Processes.

EDITOR'S NOTE.—It is a significant fact that a large number of the manufacturing firms that decide to install the P-A-X already have a widespread reputation for up-to-date operating methods and all-around production efficiency.

A rapid, reliable and complete system of interior communication is to them just one of the many essentials of profitable operation. That is by no means the least of these is evidenced by the following letter recently addressed to the Cleveland office of Automatic Electric Company by Mr. H. W. Breckenridge, General Manager of the Colburn Machine Tool Company:

Automatic Electric Company, Cleveland, Ohio.

Gentlemen: In equipping our new Cleveland plant, which has the distinction of being one of the most modern and complete machine tool shops in the country, we conconstantly had in mind economy of operation, efficiency in handling work, and quick and easy transmission of information to the various departments.

After a careful investigation, we came to the conclusion that the P-A-X was the interior telephone system best suited to our requirements. We therefore purchased a switchboard and thirty telephones, which have now been in operation about one year.

It affords us pleasure to state that we are greatly pleased with the installation. There is necessarily considerable noise in a shop where many machines are in operation, but this does not seem to affect the satisfactory working of our instruments. Connections are quickly and correctly made without trouble and annoyance due to the mistakes of an operator.

Our experience thus far has been that the cost of upkeep is practically negligible.

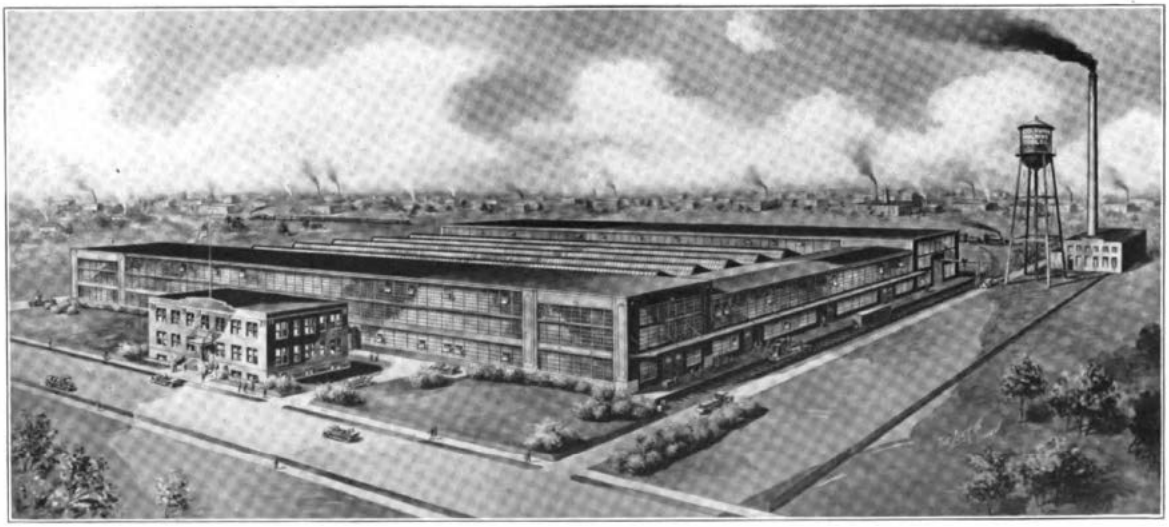
Yours very truly,

THE COLBURN MACHINE TOOL CO.
H. W. Breckenridge,
Vice-Pres. and Gen. Mgr.

ALMOST interesting example of a well arranged, well equipped and well lighted machine tool shop is that of The Colburn Machine Tool Company located at 1038 Ivanhoe Road, Cleveland, Ohio.

In drawing up the plans for constructing and equipping this new plant, two things of prime importance were kept constantly in mind. First, a factory layout that would insure the greatest possible operating economy; and second, the installation of the most modern and efficient equipment.

As a result, they now have what is considered one of the most complete plants of its kind in the middle west. The building is constructed of steel, brick, and



Cleveland Plant of the Colburn Machine Tool Company

call, and the party desired is reached immediately.

There are a great many instances in which the P-A-X saves time and money in the production of Colburn heavy duty drill presses and boring and turning mills. However, the fact that the use of the P-A-X has become universal and a part of the daily routine of the plant is the most convincing evidence of the valuable service it is rendering.

The P-A-X equipment itself is very simple, both to install and maintain. The main switchboard, power apparatus and code call machine take up very little space and are located in the office building. A lead covered cable carries the wires to a distributing box in the shop for factory use, and special conduits are provided to carry all telephone wires from the switchboard into each office. Only one pair of wires leads to each telephone from the switchboard.

The present capacity of the switchboard is thirty stations, which are located at convenient places throughout the shop and office building. Each station is provided with a card directory showing the names and call numbers for all stations. Approximately 150 calls a day are carried over the P-A-X, or an average of five calls per station.

The P-A-X was installed because the Colburn organization felt the need of an intercommunicating telephone system that would harmonize in efficiency with the rest of their equipment. They have found that it meets their needs in a very adequate manner and have nothing but praise for the service it renders. In fact, they have frequently said that they would freely recommend it to anyone whose requirements call for an efficient, dependable system of interior communication.

Automatic Switching of Toll Lines

A Paper Presented Before the Western Society of Engineers in Chicago on Thursday, October 6th, 1921, and Reprinted Here by Permission.

By ARTHUR BESSEY SMITH

Chief Research Engineer
Automatic Electric Company

(*Continued from last month*)

Attachment of Automatic Toll Line to Automatic Exchange:

There are two aspects to the matter, (1) the trunking arrangements (2) the electrical circuits. Both will be illustrated by the example of a single office exchange. The multi-office exchange differs from it by relatively small details, although these details sometimes are important.

Trunking Arrangements:

Out of the many plans which are in use, the arrangement of Fig. 14 has been chosen to illustrate the matter.

The toll line from outside passes through the main distributing frame (MDF) the test panel, and the intermediate distributing frame (IDF) almost as usual. On the test panel the composite ringer appears on jacks, the ringer apparatus being on the repeater board of the Automatic exchange. The composite coils and condensers are located on the coil rack and connected to plugs on the test panel. This includes the operating leg, which goes to a plug of its own.

On the intermediate distributing frame (IDF) is the meeting place of manual (toll board) and Automatic. The operating leg is jumpered directly to the toll selector-repeater, but the talking circuit and auxiliary wires are multipled between the three points as necessary.

Toll calls are made automatically by the toll line operator (L) who dials through the composite apparatus, as has been described in connection with Figs. 18 and 19. It is assumed that the distant exchange is equipped in the same way as the one illustrated here.

Automatic toll calls come into the exchange through a selector-repeater which is one of the toll switches provided. Its bank leads to several second selectors, which in turn lead to connectors, designed for toll work and called "toll connectors." Their banks are multipled with the local connectors.

The calling subscriber at telephone "T" calls the long distance number (usually "O") which connects him over the toll recording trunk to the recording toll operator (R). The latter passes the usual ticket (dotted arrow) to the toll line operator (L) who dials up the distant city. It is usual for her to use the toll service trunk at once to call the calling subscriber, merely holding his line without ringing.

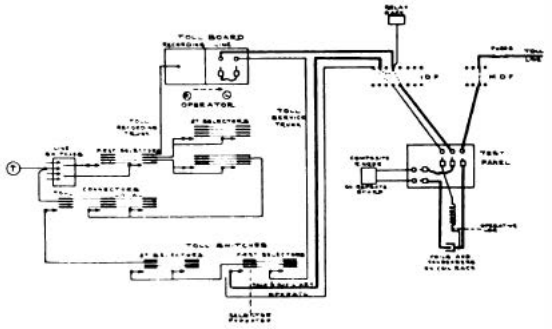


Fig. 14.—Automatic Toll Line—Connection to Exchange.

In the distant city, the call comes in through the MDF to the test panel, where the impulses pass over the operating leg to the toll selector-repeater. The latter acts as a selector on the first digit of the call number, and selects an idle trunk to the second selectors. But on all subsequent digits, the first selector acts as a repeater, repeating the impulses either to two-wire or to single wire as the second selectors and connectors may be made.

It is somewhat simpler to lead the incoming toll line from the test panel through the IDF to a line switch. In this case the line relay of the composite set (or of the simplex set if that is used) will be arranged to close the talking circuit and to control it according to the principles of Fig. 7. This necessitates that the ringing be the same as

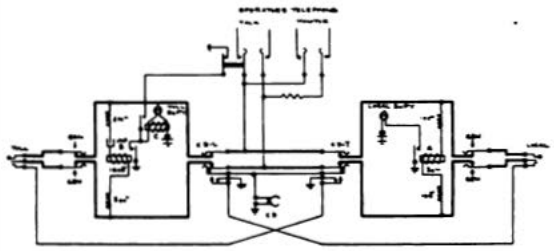


Fig. 15.—Cord Circuit, Sleeve Dialing—Toll and Local.

that used for local calls, which is usually Automatic and periodic. Although it does not give the operator as good control as key ringing, it is preferred by some operating companies for short-haul traffic.

Purely manual ringing has been found to be much less effective than perioding ringing. Hence it is now the practice to arrange it so that the toll operator merely starts the ringing in the distant city when she uses her ringing key. The ringing is periodic and does not stop until the called subscriber answers. If he hangs up, the operator may start it again by ringing as before, causing the periodic ringing to begin again.

The arrangement in a multi-office exchange may differ from the above in the toll service trunks. They may be run by groups to the offices, so that the toll operator does not dial the first part of the local subscriber's call number. The office is chosen by selecting the group of trunks. But it has been found that the operators prefer to dial the entire number rather than to handle part of it one way and the rest another way.

Circuits for Automatic Toll Lines:

At first, toll lines were operated directly from the toll board by the same kind of circuits as were in use for the local exchange. If it was a three-wire plant, a three-wire calling device was attached to the toll line, either permanently or by a key, or was keyed onto the cord circuit. In both arrangements it operated directly on the lines used for talking. Later it became the practice to dial over the sleeve conductor of the cord circuit, relaying or repeating the impulses into whatever kind of fundamental controlling circuit was applied to the toll line.

Figure 15 shows a toll and local cord circuit, arranged for sleeve dialing. The left end is for the toll line, the right end for the toll service trunk to the local exchange. The simplest form of circuit is given, in order not to divert our attention from the salient features under discussion.

Normally the sleeve of each plug is dead grounded. On plugging into the jack of a line or trunk, this ground will operate the cut-off relay with the usual results. When it is desired to dial an Automatic call, one of the two calling device keys is thrown (CD-T or CD-L). If the call is to the Automatic toll line, the key CD-T is thrown, cutting off the local end of the cord circuit from the operator's set and inserting the calling device (CD) into the sleeve wire. Operating the calling device interrupts the sleeve current and sets up the connection.

The operation of actual composite circuits on an Automatic toll line may be studied by the use of Fig. 16. This particular circuit is arranged for four outlets, the toll board, the toll line, and two with the local Automatic exchange.

The toll board connection is at the upper left hand corner, the jack, line drop (LD), busy lamp, and cut off relay (COR). The toll line appears at the upper right hand corner, where it comes in through the composite coils and condensers and the composite ringer. The wipers at the selector-repeater appear in the lower right hand corner, through which connection is established to the local exchange. At the left center appear the banks of selector switches, by means of which calls may be made automatically onto the toll line, as if this were a toll switching office.

The sleeve circuit from the toll board loops through the switching relay (Sw Ry) of the selector and runs through relay R-2 to negative batter . This is the relay which repeats impulses into the composite leg through the line relay LR, which at this time is idle. On relay R-2 may be seen the impulse springs which supply impulses of negative battery which were typified by the calling device springs of Fig. 10. Relay R-4 renders the line relay (LR) harmless while dialing from this end of the line; it also operates the drop cut-off relay (COR).

For calls coming into this exchange over the toll line, the line relay (LR) controls switching by means of R-3. The latter acts on the vertical magnet of the selector and afterwards repeats impulses thru wiper P-1 (lower right hand corner) to the second selector, etc. At the proper time the switching relay (Sw Ry) and relay R-1 switch the toll line thru to the Automatic switches, cutting off the manual board. Relay R-5 makes the toll line busy

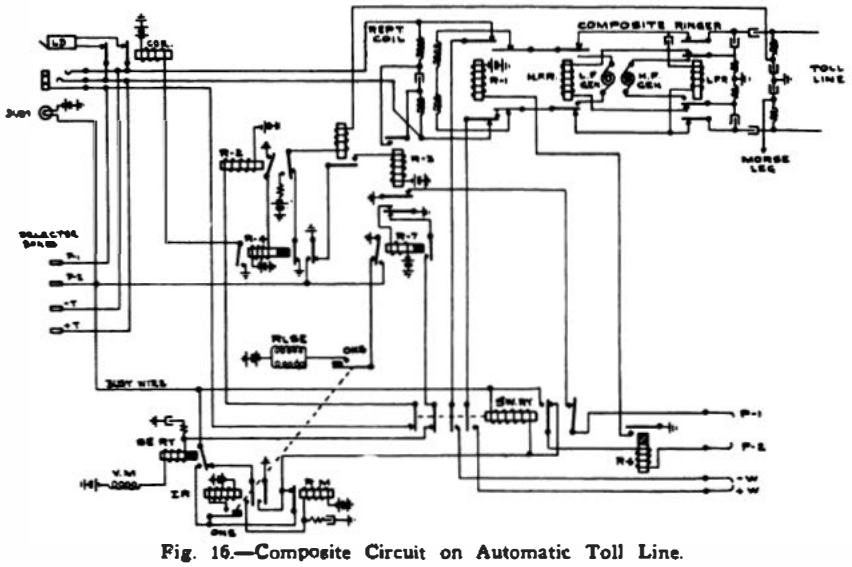


Fig. 16.—Composite Circuit on Automatic Toll Line.

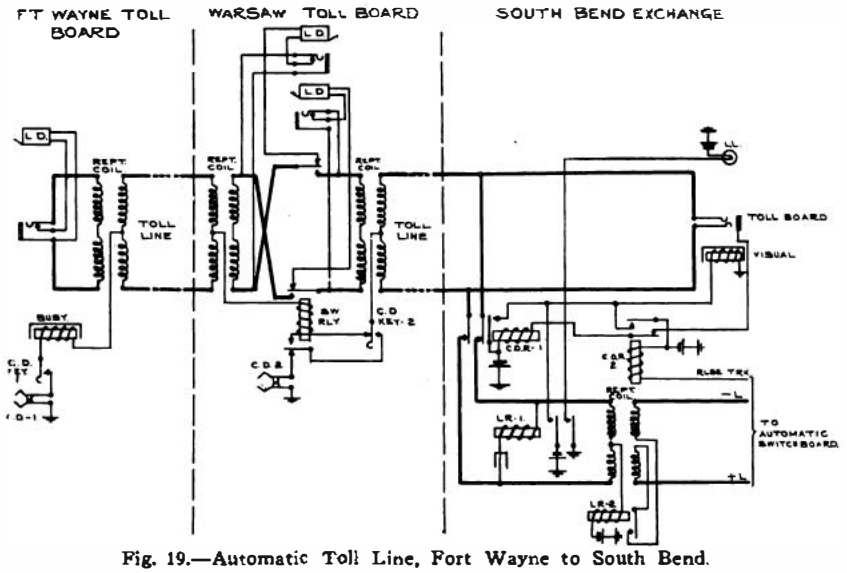


Fig. 19.—Automatic Toll Line, Fort Wayne to South Bend.

second instead of 10 per second which is now standard. Each group of impulses on the vertical line (VL) was followed by one on the rotary line (RL) for the purpose of changing the switch circuits so that the next group on the vertical line would perform the next action.

TYPICAL CIRCUITS

Columbus, Ohio, simplex polar

The arrangement of Fig. 18 was put into use about 1911 to dial from outlying towns into Columbus, Ohio, which at that time was wholly 3-wire. The controlling circuit was simplex, with a polar relay at the Columbus end.

The manual end, a calling device and a ringing key were associated with the simplex circuit. At the Columbus end, the simplex circuit was grounded thru a polar relay and a marginal slow acting relay. Both act on a repeater interposed between toll line and Automatic switchboard.

Plugging into the toll line jack seizes the line automatically because the cut off relay (COR-1) connects the battery to the simplex.

In the Columbus exchange, the polar relay and the marginal relay pull up and prepare the repeater to act.

Operating the calling device (CD) causes the dialing relay (DR) to reverse the battery connections and the polar relay vibrates in unison. The repeater takes care of the translation from single-wire control to 3-wire control.

Ringing is accomplished by operating the ringing key, which interposes 2000 ohms into the simplex circuit. The polar relay in Columbus holds, but the marginal relay falls back as long as the current is reduced. The back contact of the marginal relay short circuits the ringing relay which operates on the vertical line (VL) to cause the conector switch to ring the called station. At the proper time, the repeater has cut off the cut off relay (COR-3), made the line busy on the toll board, and cut off the line drop by COR-2.

When the calling operator pulls down the connection, the relay (COR-1) removes battery from the line, which allows the polar relay at the Columbus end of the line to fall back. The repeater thereupon releases the 3-wire connections by grounding the vertical line and the rotary line and clearing them.

SOUTH BEND TOLL LINE

Tandem Simplex, South Bend, Indiana.

This toll line (Fig. 25) runs from Fort Wayne (manual) to South Bend (Automatic) with a pay-station at Warsaw (manual). Fort Wayne can dial any subscriber in South Bend, during which time the operator at Warsaw cannot cut the connection off, although she can listen on the line. When the line is free Warsaw can dial South Bend subscribers without interruptions from Fort Wayne.

Normally there is a simplex circuit from battery and line relay (LR) at South Bend to Fort Wayne. It is carried around the jacks at Warsaw by two repeating coils, with a relay (Sw Ry) in series. It is practically Fig. 4 adapted to simplex.

(To be concluded)

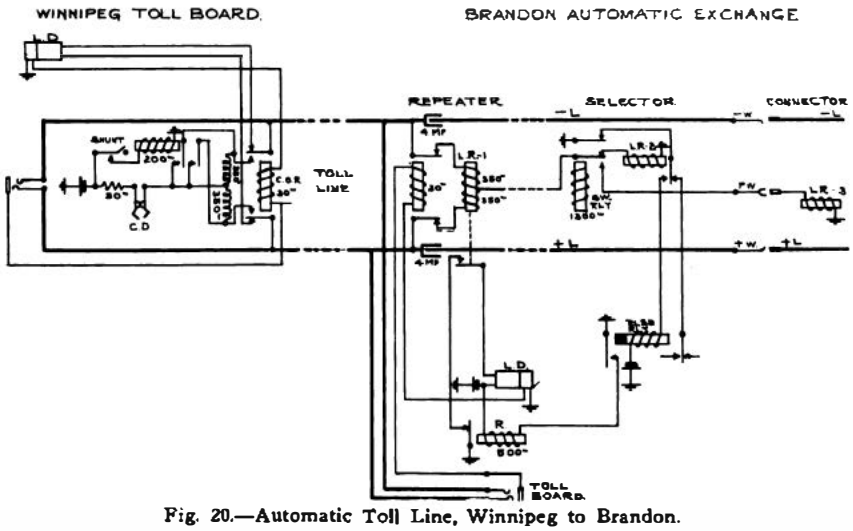


Fig. 20.—Automatic Toll Line, Winnipeg to Brandon.

A List of Users of the P-A-X

Arbuckle Bros., New York, N. Y.
American Linseed Co., New York, N. Y.
American Optical Co., Southbridge, Mass.
American Rolling Mills, Middleton, Ohio
Aunt Jemima Mills Co., St
Autocar Company, Ardmore
American Cotton Oil Co., C, Ohio
Asylum for the Blind, Londo and
Australia Gas Light Co., Syd tralia
Aetna Life Insurance Co., C, Ohio
Bellevue Hospitals, New Yo
Borden Home Farms, Walk
Berea College, Berea, Ky.
Barrett Company, The, Det
Bethlehem Steel Co., New C
Brown & Bigelow, St. Paul, M
Buda Company, Harvey, Ill.
California Packing Corp., San
Chatfield & Woods Co., The,
Continental Can Co., Jers
Calumet & Arizon
Curtis Pub
C

Fuller-Morrisson Co., Chicago, Ill.
Fairbanks Morse Co., Beloit, Wis.
Federal Electric Co., Chicago, Ill.
Felt & Tarrant Mfg. Co., Chicago, Ill
d, Henry, Estate, Dearborn, Mich
al Reserve Bank, Chicago, Ill.
National Bank, Detroit, Mich
Sons Co., Wm., Boston, Ma
Northern Ry. Co., St. Paul
l Post Office, London, En
l Post Office Sydney, Au
R. I , Delhi
eral El Bridgep
Goodrich Boston
Harvey & Company
Hotel LaSalle
Hre

McGraw-Hill Co., Inc., New York, N. Y.
Mason Tire & Rubber Co., Kent, Ohio
Maxwell Motors Co., Inc., Detroit, Mich.
McCord Mfg. Co., Detroit, Mich
Morris & Company, Chicag
Moss & Co., J., Liverpool, En
National Cash Register Co., Da
National Lamp Works Co., Cle
National Tube Compan
New Departure
Nor

Shanghai Construction Co., Shanghai, China
Singer Sewing Machine Co., Elizab
Solar Refining Co., The, L
Solvay Process Co
Sta
Sw

P-A-X

AUTOMATIC ELECTRIC SERVICES

The Influence of P-A-X Service

It's almost certain that at least one concern with which you do business is P-A-X-equipped. More likely, *many* of them are.

But it's safe to say that in some way, directly or indirectly, the Automatic Electric Services of the P-A-X affects you and benefits you. Perhaps the close co-ordination, brought about by the Inter-communicating Service, cuts production costs on some material you use. Or it may be that the Code Call or Conference Service are improving the service you are receiving. The chances are you are dealing with a Bank that is using the P-A-X to increase the efficiency of its service to you.

Today, P-A-X-equipped organizations are dominant. You will cut your costs and improve your service to your customers by installing the P-A-X.

We suggest that you have one of our field engineers survey your needs and make recommendations. Just write or telephone our nearest office.

The Automatic Electric Services of the P-A-X combine inter-communication, code call system, conference wire, emergency alarms, watchman's calls and other related services.

The P-A-X augments and completes but does not supplant nor connect with local and long distance telephone service.

AUTOMATIC ELECTRIC COMPANY

HOME OFFICE AND FACTORY: CHICAGO, ILLINOIS

BOSTON OFFICE, 445 Tremont Bldg.; NEW YORK OFFICE, 21 East 40th Street; PHILADELPHIA OFFICE, The Bourse Bldg.; ROCHESTER OFFICE, 612 Mercantile Bldg.; WASHINGTON OFFICE, 405 Munsey Bldg.; PITTSBURGH OFFICE, 608 Fulton Bldg.; DETROIT OFFICE, 525 Ford Bldg.; CLEVELAND OFFICE, 415 Cuyahoga Bldg.; COLUMBUS OFFICE, 516 Ferris Bldg.; KANSAS CITY OFFICE, 1001 New York Life Bldg.; SAN FRANCISCO OFFICE, 320 Market St.

...m, Mass.
..., Mich.
..., New York, N. Y.
... Johnson & Co., Endicott, N. Y.
...ce Forge & Steel Co., Erie, Pa.

...Britain, Conn.
...omfield, N. J.
...mpany, Indianapolis, Ind.
...ell Lumber Co., Quitman, Miss.
...irie Armand Colin, Paris, France
...ouisville & Nashville R. R., Louisville, Ky
Montgomery Ward Co., Chicago, Ill.
Michigan Central R. R., Detroit, Mich.
Mercy Hospital, Pittsburgh, Pa.
Michigan Farm Colony, Wahjamega, Mich.
Mellon, A. W., Residence, Pittsburgh, Pa.

...Chicago, Ill.
...Coke Co., Chicago, Ill.
...Navy Yard, Philadelphia, Pa.
...ion Wholesale, Edmonton, Alta., Can.
Racine Auto Tire Co., Racine, Wis.
Republic Iron & Steel Co., Youngstown, Ohio
Republic Motor Truck Co., Alma, Mich.
Republic Rubber Co., Youngstown, Ohio
Ryerson & Sons, Jos. T., Chicago, Ill.
Racquet & Tennis Club, New York, N. Y.
Royal Arms Apartments, Portland, Ore.
Rock Island Arsenal, Rock Island, Ill.
Robert Dollar Co., San Francisco, Cal.
Swift Residence, L. F., Lake Forest, Ill.
Seibetling, F. A., Residence, Akron, Ohio
State University of Iowa, Iowa City, Iowa.
Sinclair Refining Co., Chicago, Ill.

...on, Ohio
...w York, N. Y.
... Co., Tonopah, Nev.
...e Bank, Fort Worth, Texas
...s. Marine Hospital, San Francisco, Cal.
U. S. S. "Camden"
U. S. Quartermaster's Depot, Chicago, Ill.
Usher's Hotel, Sydney, Australia
Union Carbide Co., Niagara Falls, N. Y.
U. S. Aluminum Co., Undercliff, N. J.
U. S. Envelope Co., Rockville, Conn.
U. S. Rubber Systems, Woonsocket, R. I.
United Fruit Co., Boston, Mass.
Vacuum Oil Co., Paulsboro, N. J.
Vassar College, Poughkeepsie, N. Y.
Waterman Co., L. E., Chicago, Ill.
Willys-Overland Co., Toledo, Ohio
Wrigley Co., Wm. Jr., Chicago, Ill.
Wanamaker, John, Philadelphia, Pa.
Victoria Railways, Melbourne, Australia
Western Union Tel. Co., Indianapolis, Ind.
War Department of France, Paris, France
Willys-Overland Co., New York, N. Y.
Washburn Crosby Co., Minneapolis, Minn

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