

Automatic Telephone

A JOURNAL OF INFORMATION FOR THE TELEPHONE PROFESSION

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No. 11




**The Expansion of Production Activities
at Liverpool**

**Van Wert's New Automatic
Exchange**

Automatic Switches and Air Conditions

**The P.A.X. at the Philadelphia
Navy Yard**

“E are glad to say that we are more than delighted with the way our Glenwood C. A. X. equipment has proved out; indeed, the operation has far exceeded our expectations, both in regard to the number of complaints about service (which have been very few), and in economy of operation.

The charging current expense has averaged \$4.46 per month for the last six months; this with the cost of inspections, which will not average over one and one-half trips per week (there have been times when the office has not been unlocked for three weeks at a time), brings the operating cost down to so low a figure that it does not sound reasonable.

The operating cost during the winter months is a little higher, due to the fact that we have a local man that looks after a hard coal fire at the building twice a day at a cost of \$1.25 per week.

Without doubt, we will make all future extensions of our system in this country along the same line as the Glenwood exchange.”—

Extract from a letter received from Mr. George H. Davis, General Manager, Rushville Co-Operative Telephone Company, Rushville, Ind.

Automatic Telephone

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The Sales Manager's Page

THOSE who object to Automatic telephone equipment on the ground that it costs more than manual overlook, usually, an important fact—that the real test of a piece of industrial machinery is not what it costs to *buy* but what it *does* and what it *saves*.

There are two conditions necessary for the continued and successful existence of a telephone company. First: it must furnish a satisfactory service to its patrons. Second: it must return a fair profit to its owner. If it fails in either of these essentials and its failure continues over an extended period it is headed for disaster.

Telephone companies are buying Strowger Automatic equipment every month when they could, in many cases, buy manual equipment with a smaller investment—but, after a most rigid investigation of all the facts, they are buying Automatic. The natural question is "Why!"

Speaking of investigation, Automatic equipment probably undergoes, before its initial purchase by any telephone company, more rigid scrutiny than any manual equipment sold. The reason for this is natural. Telephony, up to a few years ago, was largely a manual business. The majority of telephone men of to-day have been brought up to operate manual equipment. To change to Automatic has been, to most companies, a somewhat radical move, and before taking so important a step they naturally make it their business to be sure they are making no mistake.

So, before buying Automatic, they investigate its past performances and its possibilities much more carefully than they would investigate manual equipment. They already know what manual can do—but Automatic must stand the test of the most rigid scrutiny before it can be sold. It is a most flattering testimonial to Strowger Automatic equipment that it is being widely sold today in the face of investigations and scrutinies made by prospective purchasers, many of whom frankly admit beforehand that they are doubtful about the Automatic idea.

These prospective purchasers leave nothing undone in their investigation of Automatic equipment before they buy. They usually visit Automatic plants now in operation. They talk to the owners of those plants, to their Managers, and to the users of the telephones there. They look carefully into costs of operation and into maintenance, depreciation, replacement and all of the other expenses incident to running a telephone central office. They find, sometimes to their surprise, Strowger Automatic plants successfully and profitably operated that have been in service with the same equipment fifteen, seventeen, perhaps twenty years. They find that the telephone users in those communities are

in general so favorable to Automatic service that they boast of it when in neighboring towns where Automatic is not used. They find that replacements of Automatic equipment because of wear are practically negligible, which is entirely natural—because Automatic has only mechanical wear and is built to withstand that wear, while manual equipment is subject to the undeterminable wear brought on by many people of varying skill handling and using the equipment day in and day out.

These visitors usually find in charge of Automatic plants men who formerly operated manual plants themselves but who "swear by" Automatic now. They find men who, like themselves, were somewhat loath to part from manual systems, which were more or less a certainty to them, to accept a mechanical system which was something new in their experience, hardheaded business men who, convinced by facts, came to see that, as an operating, service and revenue proposition, Automatic was the thing.

It is no strange thing, when all these facts are considered, that many Independent telephone companies have bought and are buying Automatic equipment even in the face of an investment which is more than that required for manual equipment. It is not strange that many more Independent companies are planning to install Automatic equipment in the near future—some of them immediately.

The real test of telephone equipment is the same as the real test of any other industrial machinery: not what it costs to buy but what it does and what it saves. Automatic equipment does this: it furnishes the highest grade of telephone service known, eliminates most of the service troubles of the operating Company, saves the Company operating money and pays its owners a profit.

These are general statements, to be sure, but Automatic Electric Company is glad to have the opportunity to verify them on any particular case in question.

It is doubtful if the history of industrial progress records a case where a thing is long continued to be done by hand after there has been developed machinery which will do that thing mechanically better and at less expense. That is really the history of industrial progress—the development of machinery to do things formerly done by hand. We believe it to be just as certain now that the majority of telephones in the future will be mechanically operated as it was certain some years ago that the typewriter would supplant pen and ink for most of the writing that is done. The Automatic telephone is real progress in telephony.

At the coming Convention of the United States Independent Telephone Association which will be held at the Hotel Sherman in Chicago, November

15th, 16th, 17th and 18th, Automatic Electric Company will display in the "Rose Room" on the Convention floor, various types of modern Automatic Telephone equipment. Independent telephone men attending the Convention are cordially invited to call and inspect the equipment and to learn

first-hand from those in attendance the facts concerning it. The Sales Department of the Company stands ready then or at any other time to furnish information concerning the Company's equipment or to make estimates on any given case very promptly. Deliveries can be made promptly.

E. C. BLOMEYER, Sales Manager.

T. C. Thompson Appointed General Superintendent

Former Factory Manager is Placed in Charge of Automatic Electric Company's Immense Production Organization After Twenty Years of Varied Activities. Mr. E. R. Neir, Succeeded by Mr. H. P. Mahoney as Superintendent of Installation and Operation, is Appointed Factory Manager.

IN few other industries are production methods necessarily so intricate and involved as in the engineering and manufacture of Automatic telephone equipment; in few other industries is an experienced and time proven executive personnel so essential. Mere formal training alone cannot develop the qualifications necessary for the efficient conduct of the production departments of this most complex business.

Mr. T. C. Thompson, who, on September 25th of this year was appointed General Superintendent of Automatic Electric Company, possesses, besides unusual ability as an executive and engineer, those qualifications that only varied experience and continued study of the Company, its product and its problems can bring.

Beginning as factory helper early in 1901, Mr. Thompson has been actively engaged in almost every department of the business, both as subordinate and executive.

After one or two years at switch testing and assembling, Mr. Thompson in 1903 was transferred to the installation department, probably the most practical and effective preliminary training medium for executives of the Company. For the next seven years he was engaged in installing Automatic equipment in various plants throughout the country, Grand Rapids, St. Mary's, Dayton, Los Angeles, Portland and others.

Returning to the factory in 1910 Mr. Thompson was made foreman of one of the switch testing and assembly departments. Later, with the formation of

the Operating Department, he was transferred to this work, traveling from exchange to exchange studying operating methods and initiating improvements. In

1914 he was again called back to the factory and spent some years in installing new and improved manufacturing methods.

In 1917 Mr. Thompson was transferred to the Sales Department of Automatic Electric Company, and placed in charge of P. A. X. sales in the Philadelphia territory, later being appointed Eastern Manager. Early in 1920 he again returned to Chicago as Factory Manager, which position he filled until his recent appointment as General Superintendent.

With a native ability for organization and direction, combined with twenty years of concentrated effort and wide experience, Mr. Thompson is eminently fitted for the efficient performance of his new duties.

Succeeding Mr. Thompson, Mr. E. R. Neir, for many years Superintendent of Installation and Operation, has been appointed Factory Manager.

Although Mr. Neir's efforts have been chiefly directed to the installation and operation of Automatic equipment, he has by no

means neglected the other departments of the business. Having given close personal supervision to the training of many of the present factory foremen and subordinates, Mr. Neir is as well acquainted with the personnel and problems of this branch of the business as with those of his former department.

Mr. Neir entered Automatic Electric Company's



T. C. THOMPSON
General Superintendent, Automatic Electric Company



E. R. NEIR

Now Becomes Factory Manager
Succeeding Mr. Thompson

employ in 1903, and after the usual apprentice course in the factory was transferred to the Installation Department, where after four years of this work he was placed in direct charge of the Installation and Operating Departments. It is interesting to note that until recently practically every Automatic cutover was made under the personal supervision of Mr. Neir.

Mr. H. P. Mahoney, who early this year was made assistant to Mr. Neir, has been appointed Superintendent of Installation, with full and direct responsibility for this work.

Mr. Mahoney began work with Automatic Electric

Company in 1904 and since that time has been engaged almost continuously in the installation and operation of Automatic equipment.

After spending several years in installing and maintaining Automatic exchanges in various parts of this country, Mr. Mahoney went to England where he spent several months in similar work for the Liverpool organization which was just beginning its activities along this line.

Since that time Mr. Mahoney has supervised the installation of several of the larger installations in this country, including those at Elyria, Ohio; Norfolk, Va., and Philadelphia, Pa.



H. P. MAHONEY

Has Been Appointed Successor of
Mr. Neir as Superintendent of
Installation and Operation

Union Mills and Dial Service

Ninety Line C. A. X. Placed in Service at the Union Mills Exchange of the LaPorte (Indiana) Telephone Company. Cutover Process Completed in Less than One Minute. Publicity Campaign Great Aid in Avoiding Confusion.

THE subscribers of the Union Mills Exchange of the LaPorte Telephone Company have unanimously placed their stamp of approval on Strowger Automatic telephone service. The change from the old magneto switchboard to the new Community Automatic Exchange equipment was accomplished entirely without confusion or trouble of any kind, and the subscribers since that time have accepted Automatic service as a matter of course, and they are distinctly pleased with the improvement in service offered by the Automatic equipment.

CAREFUL STUDIES MADE

Many things are responsible for the general satisfaction with the change, but there are perhaps three outstanding reasons:

First—The general type and detail engineering features of the equipment installed were decided upon by the management of the Company only after a very careful study of the accomplishments of similar equipments elsewhere, and of the traffic and service conditions that had to be met at Union Mills.

Second—The Union Mills subscribers had, prior to the cutover, been thoroughly "sold" on the Automatic telephone. This was accomplished by means of an extensive publicity program embodying the distribution of circular letters, newspaper announcements and personal and public demonstrations.

Third—The line construction of the exchange had been brought to the highest degree of perfection, almost all of the outside cable work being entirely new.

This, besides bringing the quality of transmission up to a very high standard, had the effect of eliminating every element of uncertainty in operation and transmission.

EDUCATIONAL CAMPAIGN

The publicity program was more of an educational than of a selling nature, and was conducted under the personal supervision of Mr. Frank V. Newman, General Manager of the LaPorte Telephone Company. Not a stone was left unturned to eliminate every possibility of confusion because of lack of understanding on the part of those who were to use the new system. Two of the circular letters used in this campaign are reproduced herewith.

About one week before the date of the cutover the Company held open house in the Union Mills telephone building, where daily demonstrations were held and the "mysteries" of the switching equipment explained to visiting subscribers. Wherever possible or convenient, a personal call was made at each subscriber's home for purposes of instruction. The co-operation of the subscribers in this work was extremely gratifying. There was one case in particular, mentioned by Mr. Newman, of a farmer, who, when approached on the subject, detained the visitor while he called in the family and help and admonished them

The Automatic telephone is essentially an efficiency device; it recognizes the fallacy of wasting minutes to use the telephone seconds.

to "pay close attention to this gentleman, hear what he has to say, and remember his instructions."

This program of education may seem somewhat elaborate to those not conversant with the facts, but the management of the Company realized its value not only from service and equipment standpoint, for the new Automatic equipment is a radical change from the old magneto switchboard which it replaced, but also from the standpoint of securing good will and furthering pleasant public relations.

That the program was very effective from an equipment and operating standpoint, the smoothness of the cutover procedure and the subsequent operation of the exchange amply proves. The actual work of conversion which took place at 1:30 P. M. on Wednesday, October 5th, was completed in less than one minute, and immediately afterwards the calls began to come in on the new switchboard.

The chances for confusion were apparently great. The new telephones had been installed some time before the cutover date, but the old magneto instruments had to be used until the moment of cutover. The only part of each new telephone used until that time was the ringer, yet not a single case was recorded of any subscriber attempting to use the old telephone after the cutover, nor was there any confusion in answering the code rings on the party and rural lines. Within two days after the cutover the subscribers were using the Automatic service just as though they had never known any other.

On Friday, Saturday and Sunday following the cutover, every subscriber was called from the central office and inquiry made as to his or her opinion of the service. The management of the Company was gratified to find that the very few complaints received were all of a minor nature and that none of them had any reference to the change from manual to Automatic. This is all the more remarkable, in view of the fact that many of the Union Mills subscribers were at one time far from convinced that Automatic service would be satisfactory.

That so little trouble

was indicated at any time in the central office is due largely to the very excellent condition of the outside line construction, much of which is entirely new. During the first week only three cases of line trouble were reported, and these were found to be superficial rather than fundamental.

The C. A. X. equipment is of the usual 100 line type and is capable of unlimited expansion as the traffic of the community grows. The only additional feature is the substitution of machine generated codes for the push-button ringing now customary in unattended Automatic exchanges. Automatic code ringing, of course, has the advantage of making codes positive and relieves the subscriber of some burden in making calls.

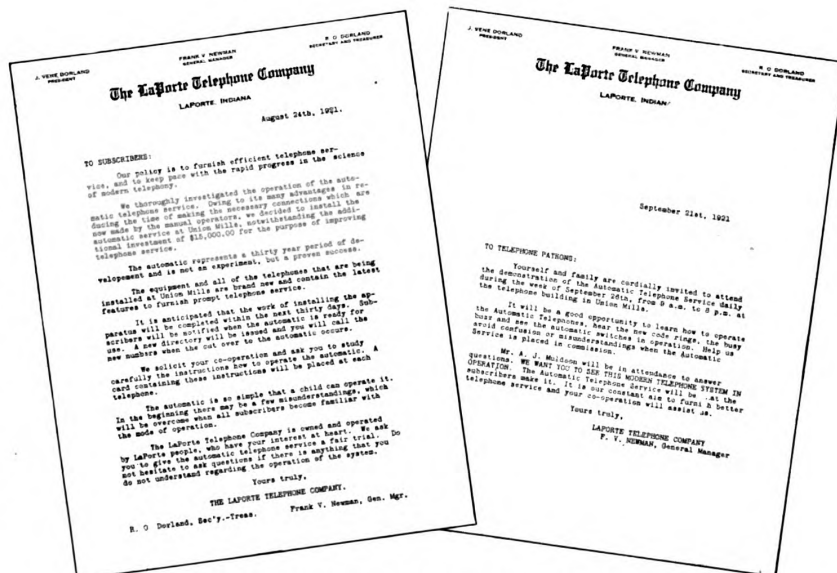
The numbering scheme for Union Mills and the inter-exchange trunks is indicated on the front cover of the new Union Mills directory, which has been reproduced herewith.

Each local or rural line (97 in all) terminates on a line switch of the rotary

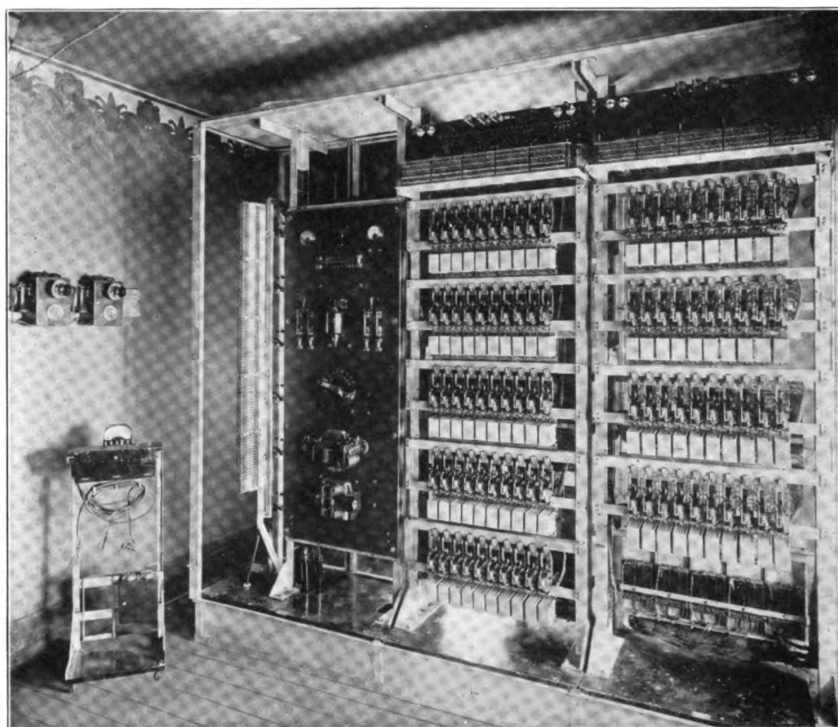
type. These switches have access to a group of 10 local connectors, which number may be added to whenever the growth of the local traffic makes such procedure necessary. Attached to each connector is a code selector and a code interrupter. The code interrupter generates and groups the code signal combinations while the code selector, operated by the two final digits of each call number, selects the proper



FRANK V. NEWMAN
General Manager, LaPorte Telephone Company



Two of the Circular Letters Used in the Publicity Campaign



The C. A. X. Switchboard at Union Mills.

combinations and causes the ringing to start. For calls between stations on the same line, two reverting call switches have been installed. These are similar in design to the code selector but are equipped to ring back on the originating line.

A reverting call is made by dialing 01 and then the two final digits (code signal) of the station desired. When the calling subscriber has finished dialing such a call, he hangs up the receiver temporarily, which starts the code signals on all stations of that line. When the call is answered the ringing stops and the conversation may proceed. It is interesting to note that as many as three reverting call connections have been found in use simultaneously, indicating that subscribers have lost no time in learning the operation of the reverting call feature.

INTER-TOWN TRUNKS

Free service is given Union Mills subscribers to LaPorte, Hanna, Wanatah and Westville, also through Wanatah to LaCrosse and through LaPorte to Rolling Prairie. Each of the trunks from these towns terminates in a toll connector which may be operated from the desk of the operator in the distant exchange for calls incoming from that exchange. All trunks are used for two-way traffic.

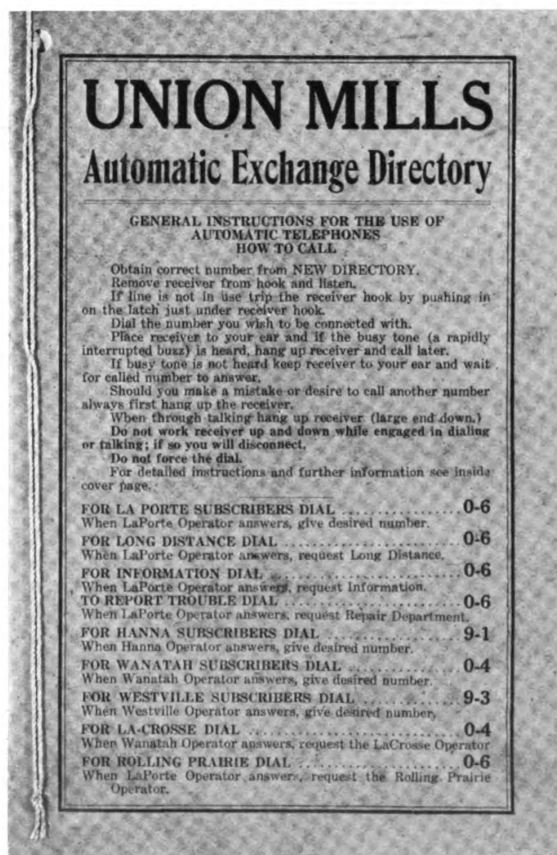
Since there is no commercial power available at Union Mills, the battery equipment is arranged for gasoline-engine charging. Arrangements have been made with a man living in the exchange building to start the charging set periodically. When the batteries are properly charged the ignition circuit of the gasoline engine is opened automatically.

As is customary with small unattended exchanges,

The Automatic telephone is the taxicab of telephone transportation; a subscriber goes direct to his destination without stopping for others to get on or off.

the operation of the equipment is supervised from the main exchange (LaPorte in this instance). The operator at LaPorte dials the supervision code (9911) periodically, which notifies her by means of a distinctive tone of any unstandard condition at the Union Mills Exchange.

The LaPorte Telephone Company is owned and operated by LaPorte men, who are well known not only in their own community, but to the telephone fraternity of Indiana in general. Mr. J. Vene Dorland is President of the Company and Mr. R. O. Dorland is Secretary-Treasurer. Mr. Frank V. Newman, upon whom, as General Manager of the Company, responsibility of the operation of the property rests, is also President of the Northern Indiana Telephone Association.



The New Union Mills Directory

The Original LaPorte Automatic Directory

The Automatic telephone of today differs from that of 1892 by the improvements resulting from 30 years of experience and development, and the Union Mills' subscribers are to be congratulated on having placed at their service an equipment so thoroughly modern and so exactly suited to their needs.

This work was carried out and completed under the personal supervision of Mr. H. N. Collins, Superintendent of Equipment of the Citizens' Telephone Company.

In addition to the program, Mr. Pitcher called an old-fashioned camp meeting of testimonials and there were many favorable allusions to methods of obtaining publicity and handling different plant problems. Chief among these was Mr. Trautwein's information on buried cable put in by the Morrison Telephone Company, the plant which he manages at Morrison,



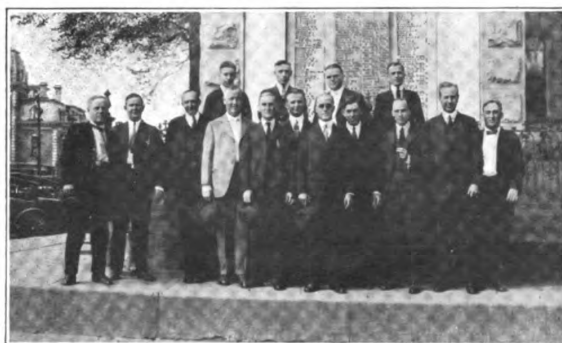
Enthusiastic Attendance at Jacksonville

Illinois. He surprised many of the visitors when he told them he had buried cable which extended six miles into the country and on which he operated common battery rural lines.

Mr. E. R. Allen of Savannah, Illinois, gave an interesting outline of his experience in restoring relations with the public after they had been severely strained by poor service conditions. His favorite method is to bring the obstreperous subscriber to the office and sit him back of the operator with a listening-in set. Mr. Allen explained how this shows him the trouble that an operator has in handling subscribers, and the subscribers' troubles in dealing with operators, and usually makes him more considerate thereafter.

Mr. W. S. Vivian, Manager of the Public Relations Department, Automatic Electric Company, conducted an operators' school. The young ladies were as usual very enthusiastic and great interest was shown in the instructions in toll ticket passing over the demonstration toll boards furnished for this purpose.

Mr. G. Canon, General Manager of the Stephenson County Telephone Company, Freeport, Illinois, was voted a most capable host and his guests were greatly interested in his very excellent plant.



Some of the Freeport Delegates

In Jacksonville on Wednesday, October 12th, about fifty telephone officials and operators assembled for the discussion of those things that were of most interest to the companies of that district.

The principal speaker was Mr. Mitchell, who, after outlining the general utility situation in the State of Illinois, continued with his talk on Public Relations, emphasizing the necessity of keeping the public informed on telephone matters by means of paid newspaper advertising. Mr. Mitchell said in part: "When a company meets opposition to an increase in rates, it is usually because the public does not understand the situation. If your company is losing money, the public ought to know it."

The address of welcome was given by Mr. J. H. Dial, Secretary of the Illinois Telephone Company. In the absence of Dr. Gordon, Dr. J. G. Swarz of Jerseyville was elected to preside.

The following day, Mr. E. D. Glandon, General Manager of the Pike County Telephone Company at Pittsfield, brought about forty of his operators from the several offices throughout Pike County into Pittsfield for the purpose of an Operators' School. In addition to his own girls, guests were present from Quincy, Illinois, Louisiana, Missouri, and Jacksonville, Illinois. This was a real get-together meeting and was somewhat in the nature of an anniversary, as it was almost exactly 25 years ago that Mr. Glandon moved to Pittsfield and started in the telephone business. At that time there were just two operators in Pike County, one of whom was Mr. Glandon. Today, he has in the neighborhood of 5,000 telephones in the county.

The school was conducted by Mr. Vivian, and the young women and the men present gave him the closest attention. Mr. Glandon entertained his guests and employees at a luncheon in a local cafe.

The meeting at Jacksonville was the last district meeting of the Association to be held before the State Annual Convention, at the Leland Hotel, Springfield, November 7th, 8th and 9th.

*United States Independent
Telephone Association
Twenty-fifth
Annual Convention*

November 15-16-17-18

Hotel Sherman, Chicago

**Make the Strowger Automatic
Exhibit Your Headquarters.**

"Dial of Destiny"—a Screen Study of the Strowger Telephone

Automatic Telephone Featured in New Film Play. Novel and Valuable Publicity Medium for Owners and Manufacturers of Strowger Equipment Soon to be Available.]

WILLIAM S. FAIRBANKS
in
"WILD WEST WILL"
AND
THE AUTOMATIC TELEPHONE
in
"DIAL OF DESTINY"
A Two Reel Educational Feature

THE above shows the way in which a large number of "movie" posters may be expected to read in a very short time, according to the present plans of the Department of Public Relations of Automatic Electric Company.

Work on a two-reel motion picture film, designed to bring out in story form the methods and advantages of Automatic operation of telephone systems, is nearing completion, and it is a matter of only a few days before the film will be released for exhibition.

The value of such a method of publicity both to the manufacturers of Automatic equipment and the telephone companies operating it, has been long realized. There are many who still look upon an understanding of Automatic telephony as being beyond the efforts of anybody but a telephone expert. The scenario has been designed to bring out the simplicity of operation of Automatic equipment, as well as its effectiveness under all traffic and service conditions.

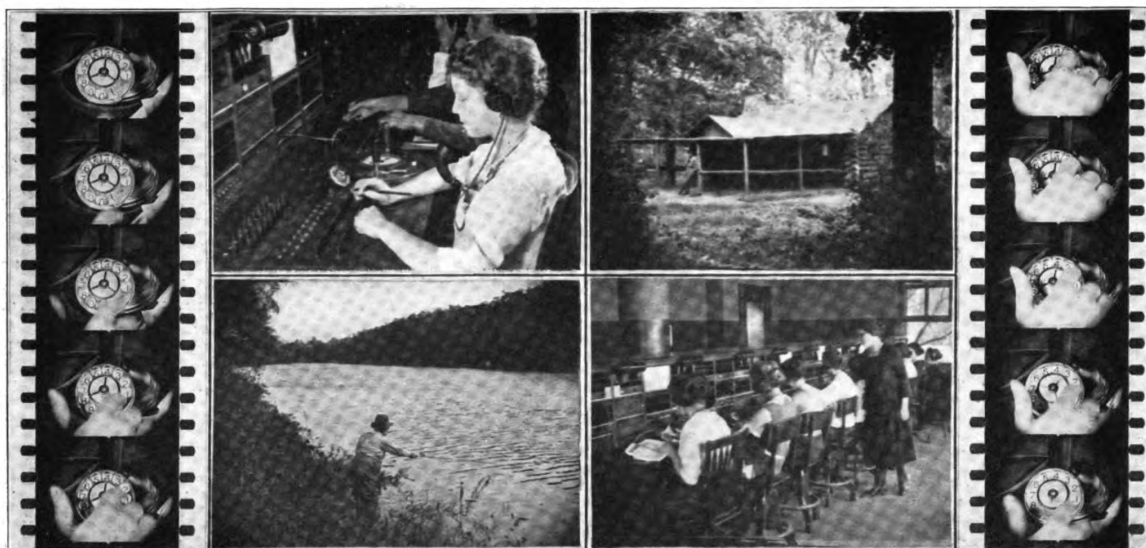
Mr. W. S. Vivian, Manager of Department of Public Relations of Automatic Electric Company, is supervising the preparation of the film, many of the scenes for which have already been photographed. The switchroom at Marion, Ohio has been used for much of the "Automatic" interior work, the light and space available there offering unusual facilities for work of that nature. The fact that President Harding has been closely identified with the Marion County Telephone Company, as a director, also lends a timely interest to these scenes.

An interesting feature of the film will be the use of "close up," "ultra-rapid" views showing the details of operation of the line switch, selector switch and connector switch, thus offering excellent opportunities for the study of switch movements.

Arrangements have also been made for including animated diagrams of switches, simple circuits and trunk connections, for showing with greater clearness the electrical and other features that cannot well be photographed. Explanations of these diagrams and other special features will be included in the subtitles. A number of "stills" of Automatic Electric Company's apparatus, as well as of typical switchrooms now in operation in various parts of the country, are also being prepared.

The "plot" which was written by Mr. Vivian, has been made quite simple, but tells an interesting story that will carry the audience along. The scenario pic-





Some Scenes from "Dial of Destiny"

turizes the operation and mechanics of the various parts of an Automatic telephone system, including the telephone calling device and the Automatic switches. The operation of the system in city exchange systems and in the Community Automatic Exchange is fully illustrated and described. Dialing over long distance lines is also an important feature of the play.

According to present plans, the first exhibition will be given at the Illinois State Convention at Springfield, Illinois, November 8th, 9th and 10th. The showing of this film will also be an important part of the program of the National Convention to be held at Hotel Sherman, Chicago, November 15th to 18th inclusive. It is anticipated that other films of a "popu-

lar" nature will be also available for use at these exhibitions.

At a later date a number of duplicate films will be prepared so that by the beginning of next year they will be available for simultaneous exhibition in a number of public theatres throughout the country.

Telephone men and others visiting the National Convention will find it very interesting to see this exhibition and judge for themselves the value of Automatic operations of telephone exchanges.

The only way in which quantity telephone service can be handled without impairing quality is by Automatic switching.

Adjusting Strowger Automatic to Small Exchange Operation

How Strowger Equipment Has Been Developed to Meet the Needs of Small Exchanges by Retaining All the Essentials of Good Telephone Service and Eliminating All Features that are Rendered Unnecessary by the Conditions that Exist in Small Towns and Rural Districts

By R. H. BURFEIND

Assistant Sales Manager
Automatic Electric Company

IT has become quite common within recent years to hear and pass comments on the increasing similarity between conditions that exist in cities and those that exist in rural communities. How the barriers of distance and seclusion have been swept away, bringing to the farm and the small town, the markets, conveniences, and pleasures of the large city have been, and are still being frequently emphasized.

That definite and very excellent improvement in facilities and living standards have taken place in such communities, cannot be denied. Rural citizens have always required, and in the great majority of instances, are now able to avail themselves of,

opportunities and conveniences that have for a long time existed only in the larger cities.

But there still is, and apparently always must be, differences. To say that the inhabitants of farms and villages expect, or even desire, all of the facilities that are often essential to city life, would be absurd. No farmer, for instance, unless he is fortunately located, expects to have electric current generated by a public service company placed continuously at his service. Instead, he is content either to be supplied only during certain hours of the day, to make use of a substitute, or to generate his own current.

(Continued on page 107)

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Issued Monthly by
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CHICAGO, U. S. A.

H. E. CLAPHAM :: Editor

*This publication will be sent without charge to all
interested persons upon request*

Rates and Service

"PUBLIC utilities, just as other departments of business, must expect to cope with periods of depression and poor earnings, just as at other times they enjoy periods of prosperity and full dividends. If the public is expected to make up every deficiency in order to give a good round rate of earning power, then the public is entitled to the benefits of surplus prosperity."

The above quotation is taken from a decision recently handed down by the New York State Public Service Commission. Although this decision refers to a case that is somewhat remote from telephone matters, it contains food for thought for telephone companies as well as for other utilities.

It is to be assumed that occasional periods of general business depression are unavoidable, and that with utilities as with other business enterprises, such periods must inevitably be reflected in corresponding periods of reduced profits.

The commission takes the apparently severe but really just position that, since it is impossible from a practical standpoint for the public either to be awarded their share of the surplus earnings of prosperous times, or to accord financial assistance to utilities during periods of depression, such utilities must face the necessity of operating at a loss when business conditions are unfavorable.

In the case of a telephone company, for instance, the decision indicates that either the losses occasioned by periods of depression must be pocketed with as good grace as the surplus earnings of prosperous times are accepted, or the management of the property must be so arranged that as much protection as possible is secured against violent fluctuations in operating costs.

One of the fundamental advantages of Automatic operation of telephone systems is its effect in stabilizing earnings regardless of business conditions. When a company's central office equipment is Automatic, the trouble and expense (and frequently futility) of constant petitions for rate re-adjustment are thus largely avoided.

Here is another interesting paragraph taken from the same decision:—

"It is the duty of a company to so administer its affairs, through economies and improvements, that the rate to be charged to the public will be at the lowest possible minimum consistent with good service and an adequate return to the investors."

This means that while the public may very properly be called upon to pay rates which will insure a reason-

able rate of return to an operating company, the company on its part must see to it that the service it renders is thoroughly satisfactory and that the equipment it uses is in keeping with the latest scientific developments and is adequate for the company's maximum traffic needs.

Strowger Automatic equipment is thoroughly modern. Operating expenses in a telephone plant are lowest when the central office equipment is Automatic. Briefly stated, companies that have installed Strowger Automatic have done almost everything possible to meet the second condition indicated in the decision referred to above, while the stability of Automatic operating costs protects them against the conditions referred to in the first paragraph.

Automatic for Arabs

(From the Kansas City Star, September 21st, 1921)

AN industrial product, invented in Kansas City, is being installed in the Sahara desert for the use of the Arabs. Its manufacture and sale throughout the world is controlled by Kansas City men, yet it will not be in use here until next April. It is the Automatic telephone.

A. F. Adams, president of the Kansas City Telephone Company, is also president of a half dozen companies that manufacture and sell the Automatic telephone. He was at his office in the telephone building yesterday for the first time in months, having returned from an European trip of several months' duration. While there he inspected many of the Automatic telephone systems his companies have set up abroad.

"The Automatic telephone is being established at the rate of 1½ million lines a year," Mr. Adams said. "In ten years it will practically supplant the old system. In the last two years it has been placed in the great cities of Europe. Now our engineers are taking it to old world peoples, to China, India and Africa. A few years hence tribes in the heart of Asia will be jabbering at each other over the telephone, and they will be getting their number without talking to an operator."

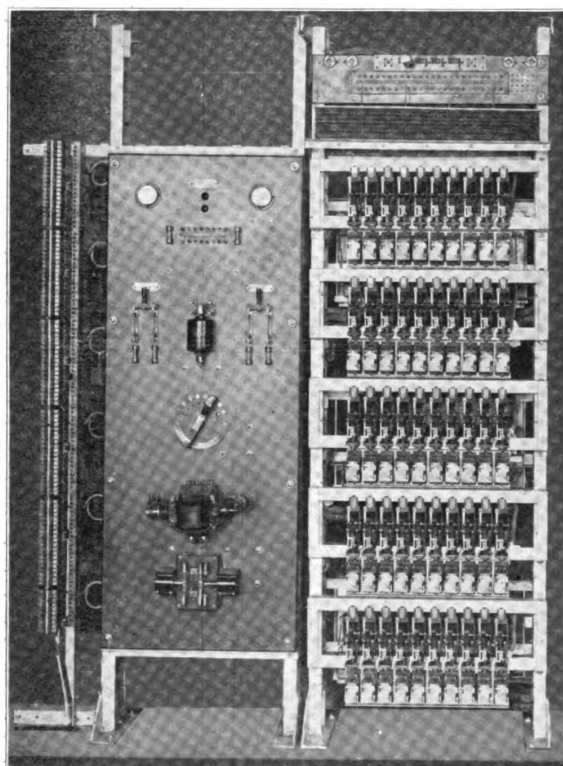
"The Automatic telephone is a product of high prices. Not that it is more costly than the old system; quite the reverse. It came into general use as a means of reducing the high cost of labor. It was invented by A. B. Strowger, a Kansas City undertaker, in 1888. Yet until 1900 hardly a dozen exchanges had been established. What brought the Automatic telephone into general use was the increase in the wages of operators. The new system reduces the number of operators 80 per cent. It makes possible a reduction of rates, and is more satisfactory from the standpoint of service."

Mr. Adams is president of Automatic Electric Company, Chicago; the International Telephone Sales and Engineering Corporation, New York; the International Automatic Telephone Company Ltd., London, and the Automatic Telephone Manufacturing Company Ltd., Liverpool. All of these companies produce or sell the Automatic telephone, and all are controlled by Kansas City men.

"Europe is in better shape than newspaper accounts would have us believe," Mr. Adams said. "England is at work; so is France. Belgium got on its feet ahead of the other western nations. Italy is making fine progress industrially. Germany is making great strides."

Adjusting Strowger Automatic to Small Exchange Operation

(Continued from page 105)



50 Line C. A. X. Switchboard, Fully Equipped

So, too, it is with telephone service. The requirements in rural districts are not, and probably never will be, quite as stringent as for city service. In the one place, satisfactory telephone service means one thing, in the other place, it means something a little different. Some service features are peculiar to each; some are common to both.

One requirement, for instance, that exists wherever telephone service is rendered, is continuous availability. This does not mean night bell service, or anything short of what is generally known as "immediate answering." Time was when a rural or small town subscriber would be compelled either to do without telephone service for several hours during the night, or to wait until the operator would be sufficiently aroused to attend to the call, and then to risk having the call misdirected by an intellect that would be too often only half awake.

The natural development of such communities has changed all this. The need for ordinary telephone service begins earlier in the day and ends later in the evening. Even after that time there are emergency calls, any one of which may be more urgent than half a dozen daytime calls.

Other requirements common to rural and city service are accuracy and promptness of connection and disconnection. These are fundamental and telephone service that is not uniformly accurate and prompt, is not satisfactory under any circumstances.

Wherever telephone equipment is used or for whatever class of subscribers it is designed, these requirements are essential from the subscriber's

standpoint. Beyond these points discrimination begins, and it is with these things in view that the development of Strowger central office equipment has proceeded. Fundamentally Strowger equipment for rural service is no different from that for city service. That is, it is designed to operate continuously and connections are set up and released with uniform promptness and accuracy. But, because conditions are different, and because the need for telephone service is prompted by different considerations, the detail design and arrangement of the equipment need not be the same.

There is, for instance, the matter of signaling. Some service enthusiasts insist that full Automatic ringing should be the rule under all circumstances. It is true many business men in large cities would seriously object to telephone service that would require the turning of a crank or the pushing of a button to signal their parties. Such subscribers are accustomed to time-saving and efficiency devices, and they desire to give no more thought to telephoning than is absolutely necessary. Their business day is comparatively short and it is essential that they be relieved of every possible time consuming operation in making a connection.

MORE SOCIAL CALLS

In a small town the business day is longer, and the ratio of social calls to business calls is much higher. The rural subscriber is able to give more thought to the setting up of his connection, and his service is satisfactory so long as he is assured his call is being taken care of as promptly as possible.

These things have resulted in the adoption of push-button ringing in connection with Strowger equipment for small, unattended exchanges (C. A. X.'s) of 100 lines or less. This not only meets with entire satisfaction the requirements of the subscribers of such exchanges, but permits the use of a much simpler type of switch than is possible when Automatic ringing (either code or harmonic) is used. The 100 line C.A.X is, considering its capacity and usefulness, the simplest form of Automatic switchboard ever produced for public service.

When fully equipped it consists of a power panel arranged for Automatic charging, a storage battery and charging machine, and an Automatic switchboard carrying 100 rotary line switches and a sufficient number of connectors to carry the traffic. The power panel and Automatic switchboard are placed together with the distributing frame in a steel and glass cabinet. A similar switchboard equipped for 50 lines is shown minus the cabinet, in the accompanying illustration.

The connector switches are all of the same simple type arranged for relay ringing, the relay being controlled by a push-button on each subscriber's telephone, and the same group of switches is used for all types of service, individual, party, or rural line. A connector for local, rural or outgoing toll calls is reached through the subscriber's line switch.

To eliminate the necessity for special rotary switches for outgoing toll calls, the toll trunks (usually not more than one or two) are taken from one of the regular connector bank levels in the same

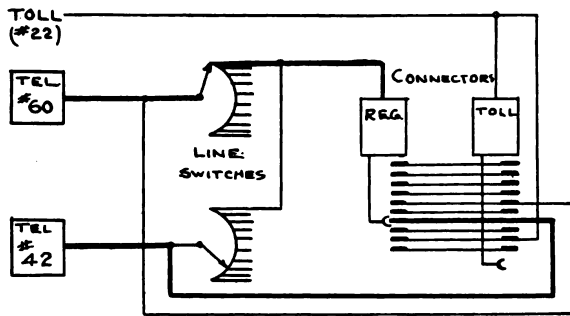


Fig 1—Subscriber No. 60 Calling Subscriber No. 42

manner as a subscriber's line, and terminated in ring-down drops at a toll desk in the nearest attended exchange. Thus for an outgoing toll call the toll operator is reached in exactly the same manner as a subscriber in a local connection.

At the C.A.X. each toll trunk is terminated in an individual connector, which is identical in design with the others. This connector is operated and controlled from the dial on the toll operator's desk. Diagrams illustrating three typical connections through such a switchboard are shown in figures 1 to 3.

Installations for towns whose requirements run to several hundred lines, require somewhat different treatment; but the equipment, like the service requirements, is simpler than that for a large city. Since there is usually some person in attendance at least part of the time each day, the power equipment may be arranged so that the charging of the battery is non-Automatic.

The trunk connections between switch groups are arranged to secure the utmost economy of equipment. Owing to the simpler requirements of toll traffic in small exchanges it is not customary to supply special toll selectors and connectors such as are used in large city systems. Each toll trunk, instead of being attached to a special toll first selector, is treated just as if it were a subscriber's

line, and is terminated on a line switch, so that an incoming toll call is extended through a series of local switches.

In order to reserve as many first selector levels as possible for subscribers' numbers, the special switch desks (toll information, complaint, etc.), are not reached direct from the first selector banks, but through the banks of a rotary connector switchboard. The rotary connectors on this board, besides carrying calls to the service desks, are used for Automatic selection of trunks to P.B.X switchboards, and to churches, schools, etc. This plan is effective in reducing the amount of equipment needed for a given exchange, not only by eliminating special toll switches, but often by dispensing with regular second selectors where they would otherwise be necessary. The toll trunking facilities provided by this plan are entirely adequate for small exchange operation, while for local calls the service facilities are no different from those of the large city exchange.

These remarks must not be construed as being a plea for the use of "simplified" equipment in every case, or as indicating that Automatic switchboards are incapable of being designed to meet the needs of those communities where more elaborate service features are considered desirable. C. A. X. switchboards have been, and are still being installed with standard push-button-less telephones, the switches being arranged for Automatic ringing (Automatic code or harmonic on rural or party lines). Just as many such features may be added as may be found desirable.

But it is realized that first cost in exchange equipment is of utmost importance. An equipment may be made so as to encompass the needs of every possible class of subscriber under every conceivable condition, but such equipment will not solve the problems of a telephone company if the first cost is beyond its reach. This is particularly true of the small exchange owner, for whom financing is often the most difficult phase of the telephone business.

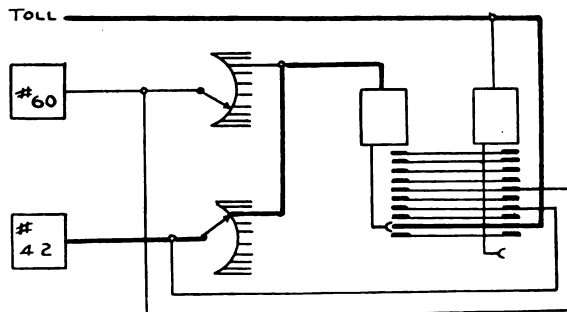


Fig. 2—Subscriber No. 42 Calling Toll

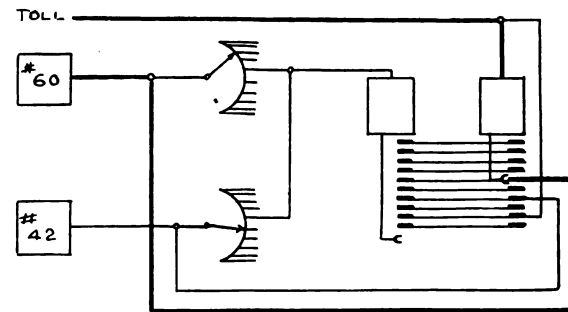


Fig. 3—Incoming Toll Call to Subscriber No. 60

See *Strouger*
C. A. X.
Equipment
in operation at the
Illinois State
Convention
Leland Hotel, Springfield, Ill.
November 8-9-10

St. Paul's Humboldt Office Building Completed

Handsome New Structure of Tri-State Telephone and Telegraph Company at St. Paul Ready for Installation of Automatic Equipment.

UTILITY, economy and beauty in pleasing proportions are combined in the new Humboldt office building of the Tri-State Telephone and

Telegraph Company at St. Paul, Minn. The building which will shortly house about 3,500 lines of new Strowger Automatic equipment, was planned by Mr.

George A. Gann, General Superintendent of the Tri-State Company. It occupies the front of a large site and is so constructed that it may be added to at the rear when it becomes necessary. The cost of erection was approximately \$20,000, a remarkably economical figure in these days, when it is remembered that the construction is absolutely fireproof, and is thoroughly first class in every respect. Much of the economy was achieved through Mr. Gann's close personal supervision of the planning and execution, and also illustrates the fact that Strowger equipment can be very adequately housed at a very low figure. The smaller equipment space, and the simpler stair and hallway, plumbing and other requirements, make a substantial difference in the total cost of the building.



New Humboldt Office of the Tri-State Telephone and Telegraph Company

New South Office at Lincoln, Nebr.

Automatic Switchboard Equipped with Rotary Line Switches and Serving 3500 Subscribers Placed in Service. Arranged for Smooth Interworking With Three-Wire Switches Installed in 1904.

AT 11 o'clock on the night of Saturday, October 8th, the new South Office of the Lincoln Telephone and Telegraph Company at Twentieth and Sumner Streets, Lincoln, Nebr., was cut into service, the culmination of more than two years engineering, manufacturing and installation work.

The new office, which is already serving more than 3,500 stations, is designed to meet the needs of the fastest growing residential section. The added equipment will enable the company to extend the area of service so as to include a part of the city now served from the main exchange which is located in the business part of the city. This, in turn, will permit a decrease in the average length of subscribers' lines and consequently in the cost of maintenance as well as investment.

The new Central Office equipment consists of an Automatic switchboard, power and supervisory panels,

and battery and charging machines. Installation began on June 25th last, and since that time eleven men of Automatic Electric Company's installation department and a number of the Lincoln Company's force had been at work preparatory to placing the new equipment in service. The actual work of installation was completed on the 30th day of September, and the interval from that time until the cutover date was utilized in making final tests and getting the switches in perfect working condition.

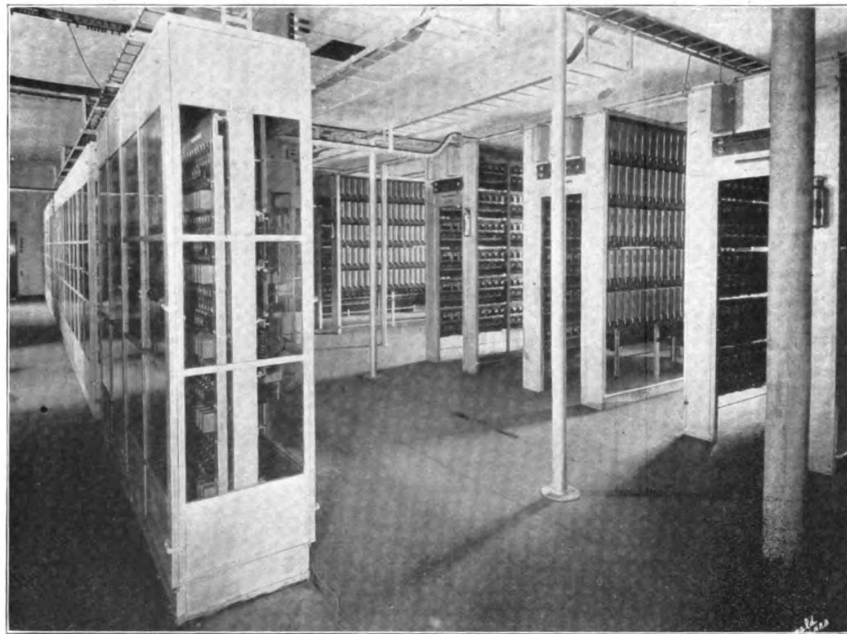
The line switch equipment in the new office is all of the rotary type, which was decided upon as being best adapted to the traffic conditions of the community served.

This new construction followed closely the recommendation of experts from New York City who spent two months in the city during the fall of 1919, studying past movements of population in order to form a basis

for ascertaining where future developments would be necessary. It lays the foundation for the company's keeping pace with the expected growth of Lincoln for several years at least. This major improvement was made necessary, by the extremely large growth of Southeast Lincoln in recent years. This growth, with that of other parts of the city, has taxed the capacity of the plant, but with the placing in service of this new equipment the congestion in handling orders from new subscribers and for changes in address will be generally relieved.

The Lincoln company began business in 1903 when an Automatic exchange of about 3,000 lines was installed. From that time on the success of the venture was assured and its growth has been phenomenal, especially since nine years ago, when it took over and consolidated a competing exchange with its own center office.

The original 1903 equipment in the Main Office is still in service and the new equipment in the South



General View of Switchroom, South Office, Lincoln

Office is working in harmony with the old three wire switches.

The Automatic has neither congested busy periods nor neglected slack ones.

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

THE object of this paper is to place before you some of the means which are used in setting up toll telephone connections by Automatic switches, together with enough of the historical development to show the present status of this branch of telephony. It is believed that many of the devices used are of interest to telephone and telegraph men, and to many of the power electrical people besides.

Toll Service:

Service to the public is the first consideration of telephony. Aside from this there is no right to expect a revenue. It is in accordance with the paradox of business, that he who would honestly make money must apparently forget money, devoting himself to serving others in those things for which they are willing to pay. It is a matter of record that he who wholeheartedly serves others, having due regard to financial safety, always profits by it. To give the best possible service to the public is the aim of the telephone industry.

In general, the desirable elements of toll service are the same as of local service. Among them are ac-

curacy of connections, speed of securing connections, and easy conversation.

The toll operating company rightfully tries to get the greatest possible revenue with the least possible investment, keeping in mind the quality and reliability of service. Of great importance in this respect is the time-efficiency of telephone toll lines. Low time-efficiency means great investment to handle a given amount of traffic.

Telephone toll business cannot be stored to the extent that telegraph business can be stored. A conversation calls for the simultaneous presence of two persons in two different places but on the same line. The only call storage possible is to ask people to wait for a time, until the line is ready for use which gives little increase of service.

From the standpoint of operating, there is much time lost in setting up and breaking connections by hand. Manual operation induces methods which are peculiar to it though they are sometimes not recognized as such. The slowness of getting operators at intermediate toll switch offices to set up and disconnect a circuit has led to the use of many direct lines

between cities quite far apart. This necessitates more investment in lines and their equipment, but is often felt to be worth the cost because of the immediate availability which they secure. This is a condition which is peculiar to manual working.

There are a few parts of toll service which are essentially manual, such as

Information, (rates, conditions, etc.)

Charging for service (records, timing of calls, discrimination, etc.)

Supervision, (introduction, release, etc.)

There are some cases of long free trunk lines which are in many respects like toll lines, though they do not have the above named manual essentials. But the technical handling of switching is the same.

Why Automatic Toll Switching?

Any improvement is welcome if it gives better service without more cost. It is doubly welcome if it improves service and at the same time reduces the cost. That is what Automatic switching on toll lines has been found to do.

Automatic toll switching is used, because it enables more business to be done over the same lines, and shortens the time which the user has to wait for his connection. This is secured by the high speed with which a connection is set up and disconnected. The latter is a gain of especial value, particularly at intermediate switching offices.

INCREASED EFFICIENCY

The total business handled by a toll line has been increased by 50% to 100% by the Automatic switching.

Manual toll switching is usually conducted as follows:

The subscriber calls the A operator and requests long distance. The A operator plugs up the connection to a recording toll operator who records the desired call on a ticket and informs the subscriber that he will be called when the connection is ready. This connection is then pulled down.

The recording operator passes the toll ticket to a toll line operator who calls an intermediate toll office (if there be one) and requests a line to the desired city. The toll operator at the intermediate office connects the line through and rings the desired city, or permits the toll operator at the originating exchange to do the ringing.

The toll operator in the distant city answers the call and plugs up a connection to the B board in the desired office in that city. The B operator then plugs up the connection to the desired subscriber line.

As the connection approaches completion, the toll operator in the originating exchange calls a B operator in the proper office, who plugs up a connection to the calling subscriber's line. When the called person in the distant city answers, the toll operator in the originating exchange calls the subscriber who originated the call and permits conversation to take place, making record of the time consumed.

When the subscribers hang up their receivers, the toll line operator in the originating exchange and the corresponding operator in the called exchange are expected to get in on the line as soon as practicable and assist each other in pulling down the connection. It is often necessary to ring the operator at the intermediate toll office to get her to pull down her cords.

Automatic switching of toll lines is usually conducted as follows:

The subscriber dials the long distance number, which almost instantly connects him to the recording

toll operator who records the call as above and informs the subscriber that he will be called. The ticket is passed to the toll line operator, who dials up a connection through the intermediate toll office, into the distant city, and directly to the line of the called subscriber. In all of this she is not delayed by waiting for the help of any other operator.

When the called subscriber answers, the toll operator dials the number of the calling subscriber, which automatically connects the toll line to the calling telephone. Conversation now proceeds.

If desired, the toll operator can call the calling subscriber's line and hold it until the called person answers.

When both subscribers hang up their receivers, the toll operator pulls down her cords. This automatically causes all the switches in the three places to release and be restored to normal. This action is accomplished in less than one second.

Historical Notes:

Although development work has been going on for many years, the period of greatest activity in experiment and development was from 1910 to 1916.

Tabular presentation shows the development most easily.

1907 Los Angeles, Cal. John Wicks dialed from Los Angeles to San Diego, 125 miles (201 Km), 3-wire operation, trial successful, although the line was in bad shape.

1910 Newark to Columbus, Ohio. Trial circuit 3-wire operation, successful. Resulted in 30 circuits being put into use automatically in the next few years.

1910-1911 San Francisco and Oakland, Cal. Suburban toll, 2-wire.

1911 Aurora to Chicago, Ill. B. C. Groh used simplex circuit through center of repeating coil.

1912 South Bend from Fort Wayne, Ind. Simplex dialing, with way station at Warsaw, Ind.

1913 Winnipeg to Brandon, Canada. Simplex dialing. H. M. Friendly's A.I.E.E. paper on Automatic toll switching, Vol. 32, Part 2, page 1305.

1914 Quadruplex dialing and quadruplex with phonoplex, produced by Arthur Bessey Smith.

1915 Quadruplex common side used to dial from Houston to Dallas, Texas. (Polar side used for Morse).

Private Automatic exchanges connected by long trunks, Great Northern R. R., St. Paul to Duluth.

Composite used for Automatic dialing on physical lines and on phantom lines, Ohio State Telephone Co., John Wicks.

1917 Dakota Central Telo. Co., connected six exchanges by Automatic toll lines.

1920 Canada, Edmonton to Calgary, simplex dialing on phantom circuit 300 miles (483 Km).

Canada, Saskatoon, Regina and Moose Jaw, Automatic toll lines simplex without manual ringing.

THROUGH DIALING

Automatic dialing over toll lines is most profitable in a region filled with Automatic exchanges, for then the operator at the originating exchange can dial to the called subscriber without the aid of any other operator.

It is believed that as the present wave of Automatic exchange construction makes itself felt in the years that are coming, there will be increased use of Automatic toll switching, first for the short haul business

(perhaps under 500 miles) (804 Km) and afterwards for much longer lines.

Operating Conditions:

Practice is tending toward the following conditions as desirable to be met by any device for dialing over toll lines.

1. Dialing must not cause noise on adjacent circuits, or at least not enough noise to affect commercial transmission of the voice.
2. When an operator seizes the line, the line must be made busy wherever it may be seized by any other operator or any switch.
3. The release must be simple, such as the pulling out of the plug of the toll cord.
4. If the called line is busy (in the distant city) or if a desired section of the toll line is busy, an audible signal must be returned to the calling operator.
5. Ringing must be accomplished by the same act as for manual operation, that is, by the operator pulling the ringing key on the cord.
6. The line must be capable of being used manually at any time.

Though the above conditions are recognized as being desirable, many toll lines are being operated automatically with great satisfaction with one or more of the conditions unmet. For instance, some have cut loose entirely from manual operation, causing the operators to dial on the toll line for everything that they want. The ringing is Automatic in the same way that it is arranged for local calling, and the operator does not ring on the line at all. Many variations are found in practical use, from all of which much experience is being obtained.

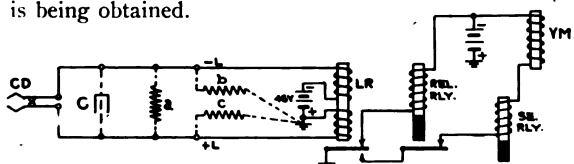


Fig. 1—Effect of Leakage on 2-Wire Impulses

Toll Line Properties:

To dial over a toll line for setting up Automatic switches is essentially a telegraph matter, with the conditions of telephony added. But there is this difference: the apparatus must not need as much wet weather adjustment as is permissible in telegraph work. The relays are expected to work through all variations of weather, from dry to wet and back again.

Copper wires No. 8 and No. 10 B & S gauge are the most typical of the toll lines in which Automatic dialing has been done.

If we consider only open-wire lines, the four electrical properties will have approximately the following values:

Conductor resistance, loop, ohms	6.8	4.2	10.8	6.7
Single wire ohms.....	3.4	2.1	5.4	3.4
Insulation resistance, single wire, megohms, erratic:				
Dry weather	10	16	10	16
Wet weather	1	1.6	1	1.6
Capacitance, 2-wire loop, M. F.	0.0086	0.0053	0.0082	0.0051
Simplex to earth, M. F.	0.0123	0.0076	0.0121	0.0075
Inductance, 2-wire loop, M. H.	3.53	2.19	3.68	2.29
Simplex to earth, M. H.	2.14	1.33	1.81	1.12

Dialing Circuits:

It is well to consider the line circuits by means of which the switches at a distant exchange are controlled. We will examine them as they appear without any means for involving them in the talking circuit—merely as impulse transmitting circuits.

The two-wire circuit of Fig. 1 is that which is now used by all Automatic telephone exchanges. The two battery conductors pass through the two windings of a line relay (LR) to the two lines wires (—L and +L) and unite at the contact springs of the calling device (CD) in the subscriber's telephone. Leakage from one line wire to the other affects the dialing adversely about twice as much as leakage from the negative line (—L) to earth. Leakage from the positive line (+L) to earth does not affect the dialing very much. In fact, on a line of moderate length it may be dead grounded without causing the switch to fail. This circuit is not much used for dialing on toll lines.

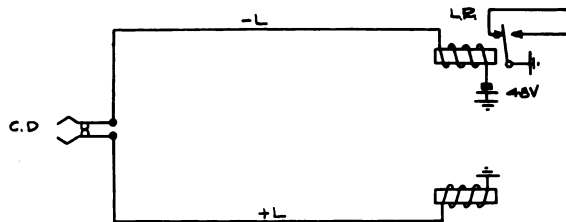


Fig. 2—2-Wire Loop, Line Relay in Negative Line

The two-wire two-relay circuit of Fig. 2 is not very much used. Since the line relay is in the negative lead alone, it gets the full benefit (?) of any leakage on the line.

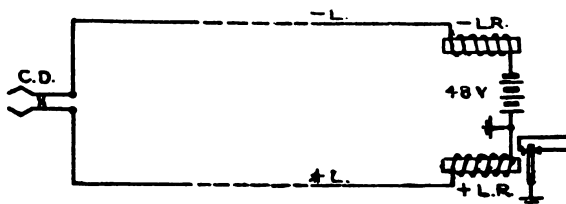


Fig. 3—Rural Line Impulse Circuit

The two-wire two-relay circuit of Fig. 3, with the impulsing relay in the positive lead is much used for rural exchange lines, where there is likely to be much leakage. For this purpose it is much better than Fig. 1. It is usual to reduce the impedance of the relay in the negative lead during dialing by shunting it with a non-inductive resistance.

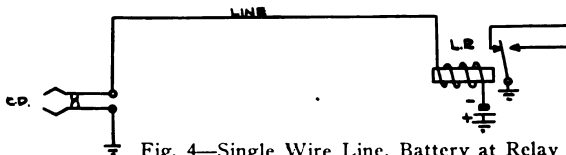


Fig. 4—Single Wire Line, Battery at Relay

The single-wire circuit of Fig. 4, with line relay and battery at one end of the line is often used for local dialing over a wire which is separate from the talking wires. It dials about the same as Fig. 2.

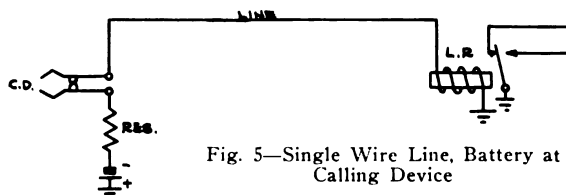


Fig. 5—Single Wire Line, Battery at Calling Device

The single-wire circuit of Fig. 5, with battery at the calling device end of the line, is the best for toll dialing and is most used for that service.

(To be continued)



Automatic Electric Company

Factory and Home Office

Corner Morgan and Van Buren Sts.
Chicago, U. S. A.

Branch Offices

New York City, 21 East 40th St.	Cleveland, 415 Cuyahoga Bldg.
Philadelphia, The Bourse Bldg.	Boston, 445 Tremont Bldg.
Detroit, 525 Ford Bldg.	Pittsburgh, 608 Fulton Bldg.
Rochester, 612 Mercantile Bldg.	Washington, 405 Munsey Bldg.
Kansas City, 1001 New York Life Bldg.	Columbus, 516 Ferris Bldg.

Associated Companies

International Telephone Sales and Engineering Corporation,
21 East 40th Street, New York City

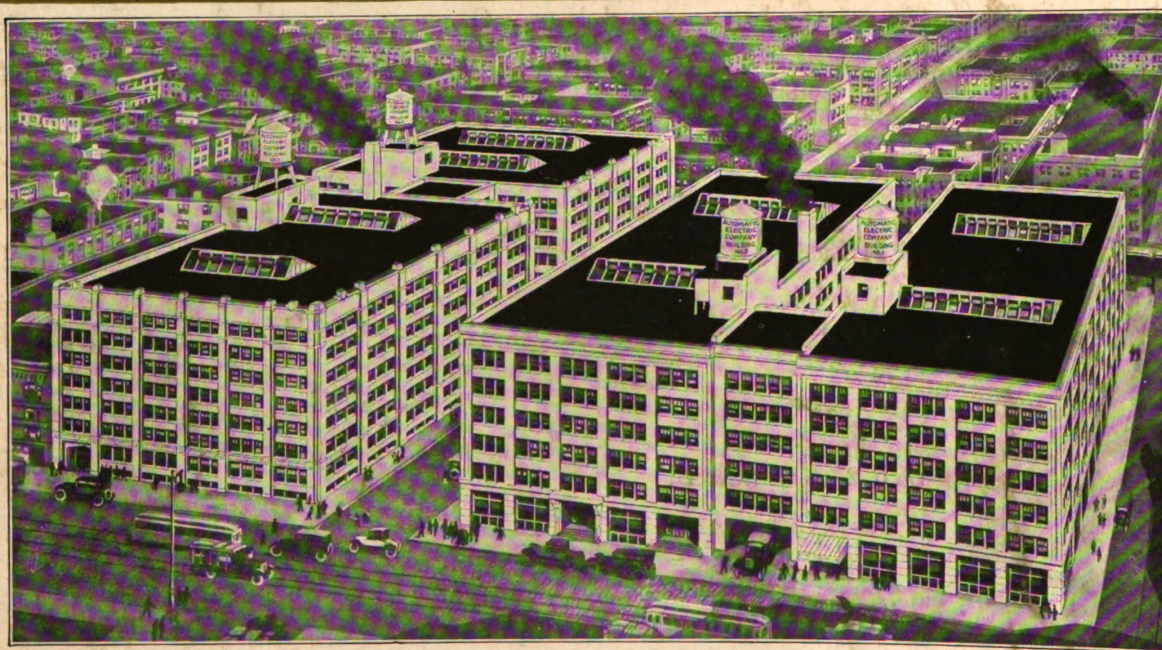
International Automatic Telephone Company, Ltd.,
60, Lincoln's Inn Fields, London, W. C. 2

Automatic Telephone Manufacturing Co., Ltd.,
Milton Road, Edge Lane, Liverpool, England

Automatic Telephones (Australasia), Ltd.,
207 Macquarrie Street, Sydney, Australia

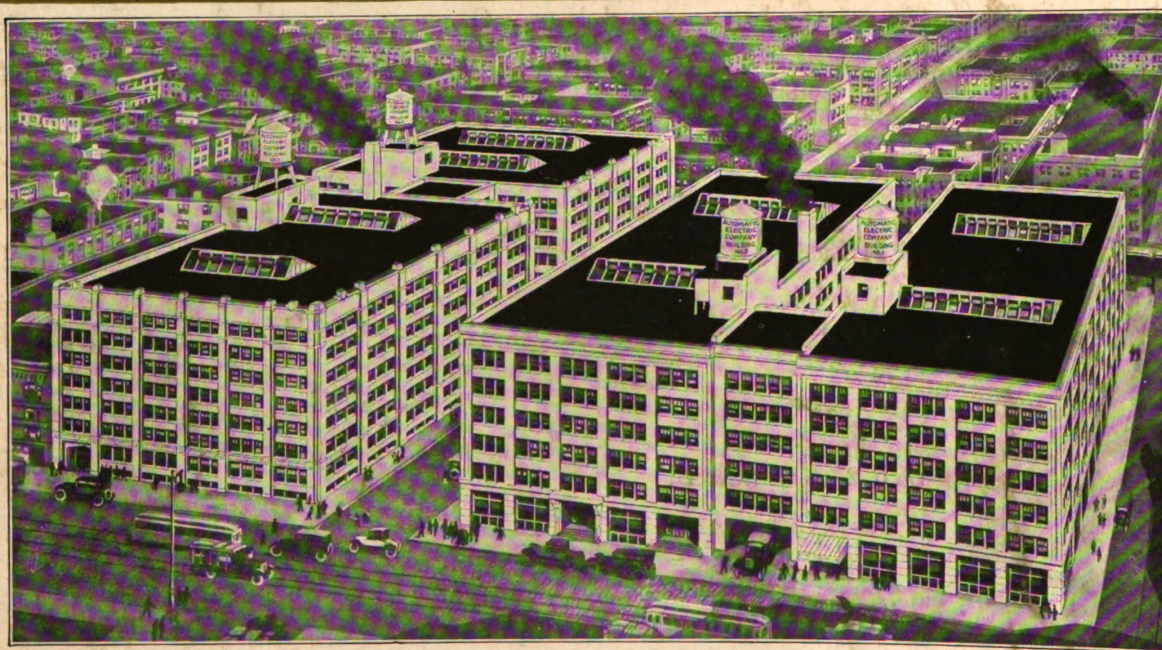
Compagnie Francaise pour l'Exploitation
des Procédés Thomson-Houston,
13, Passage des Favorites, Paris, France

The Home of the Automatic



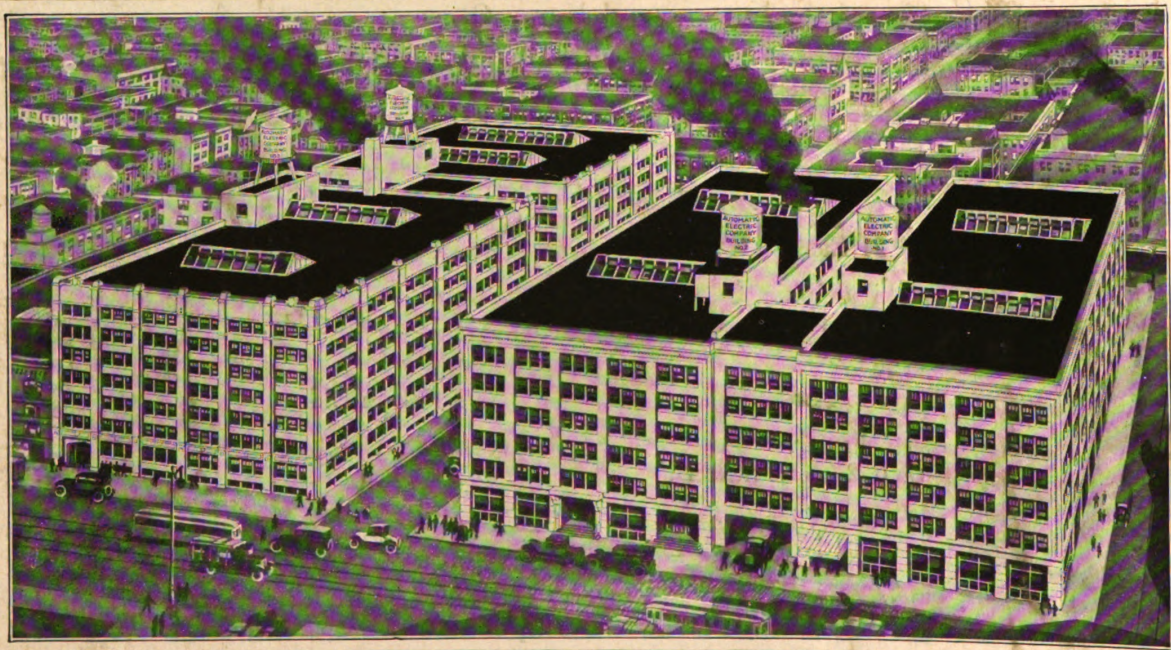
Automatic Electric Company's Factory, at the Corner of Morgan and Van Buren Streets, Chicago. It has a Floor Space of 10 Acres and is Devoted Exclusively to making Automatic Telephones and Telephone Supplies.

The Home of the Automatic



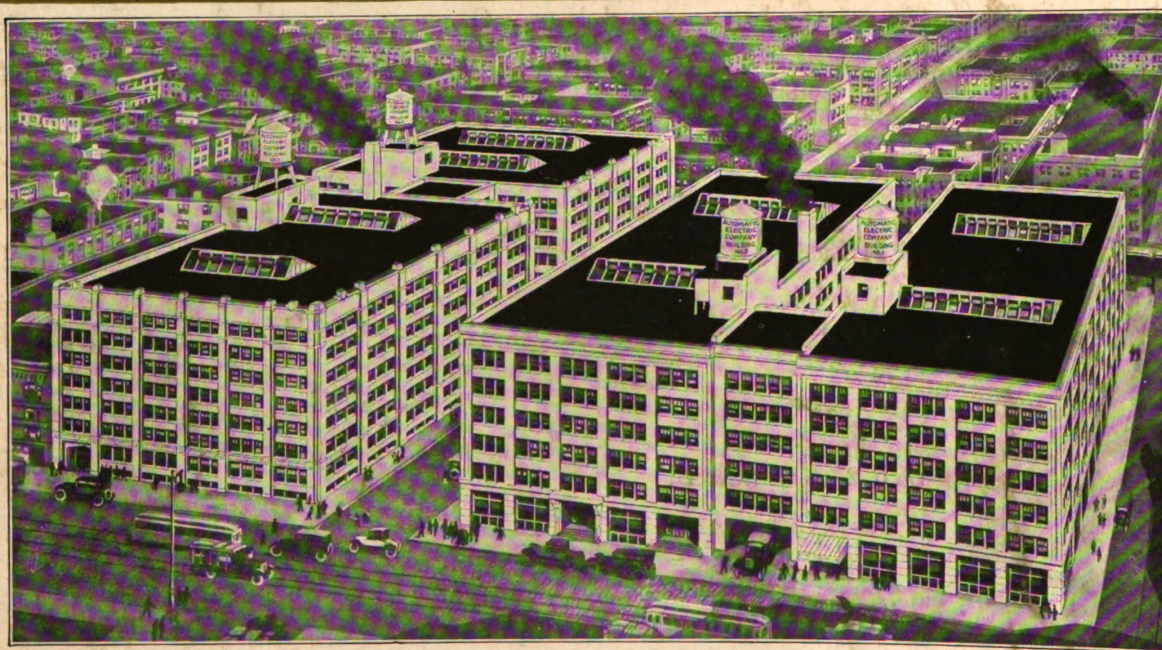
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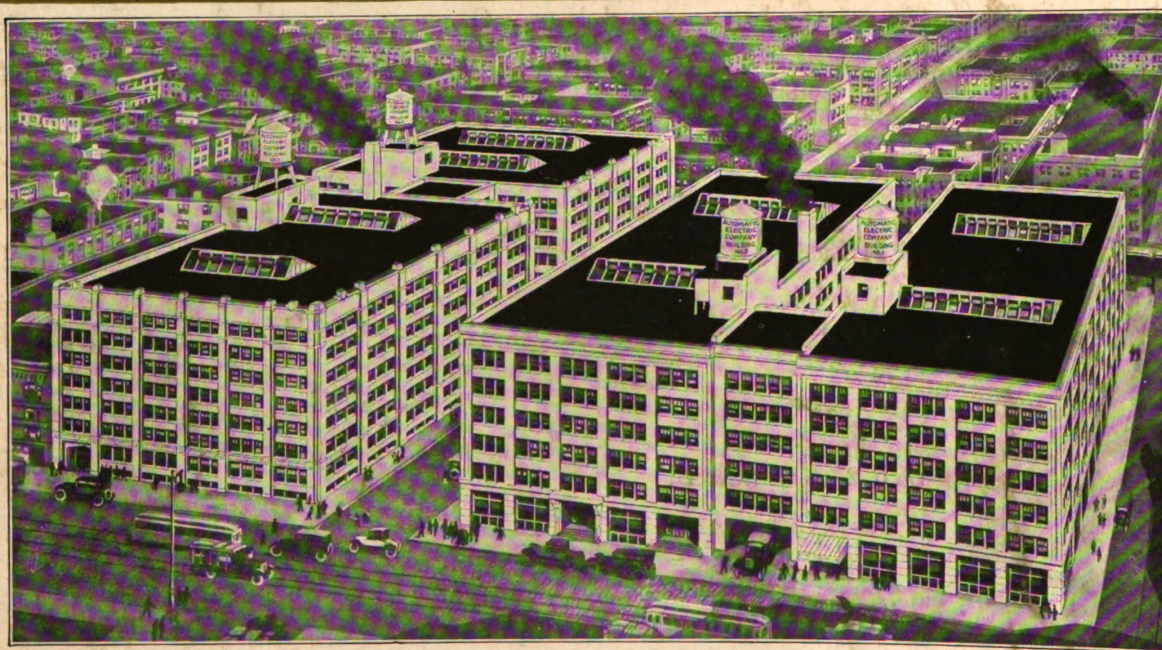
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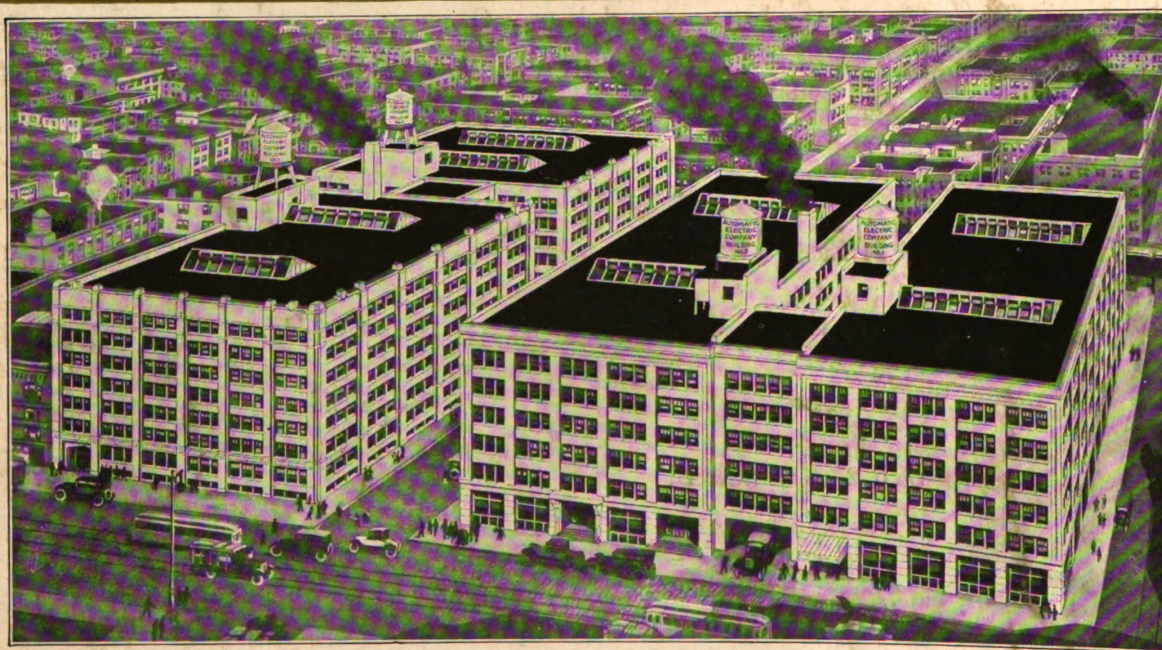
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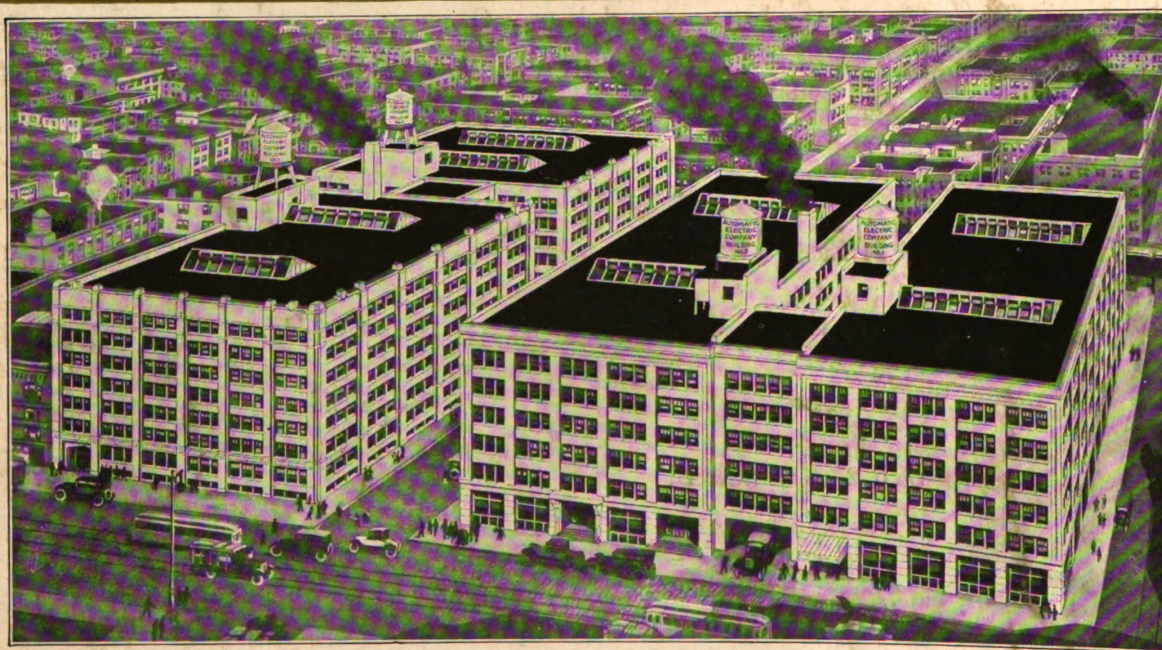
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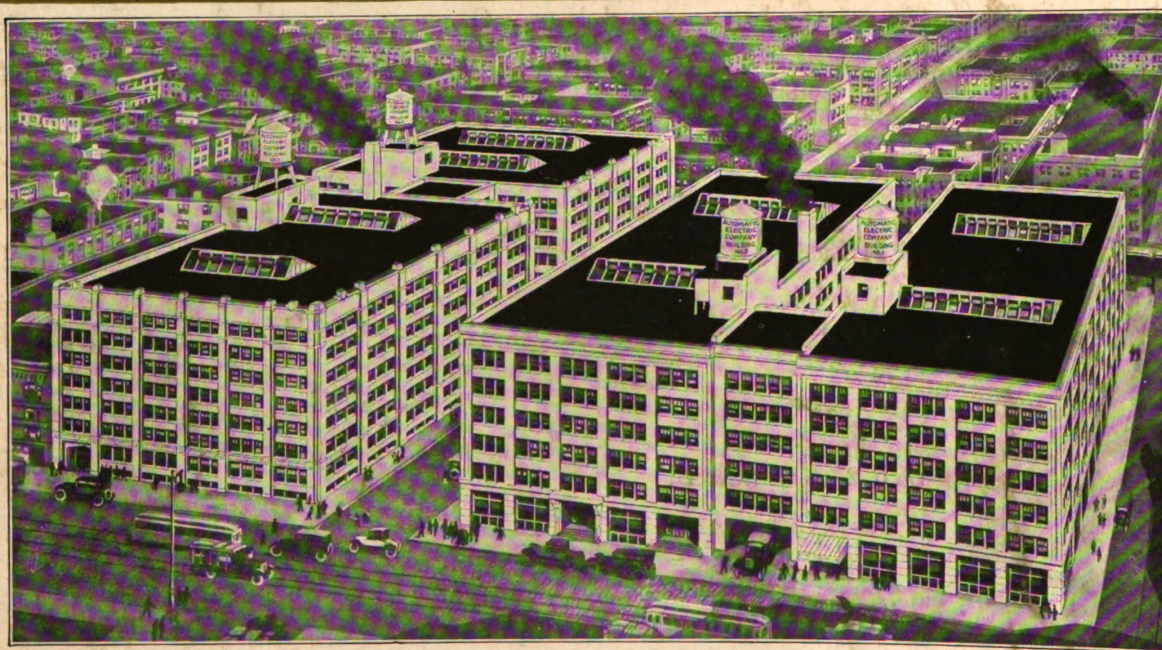
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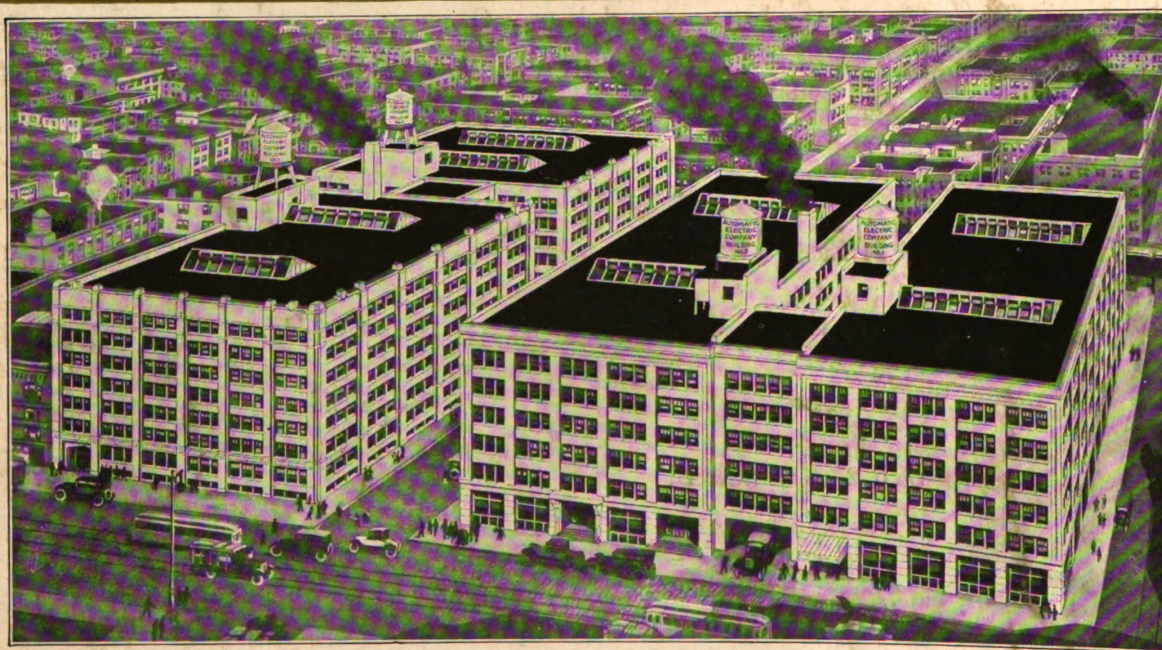
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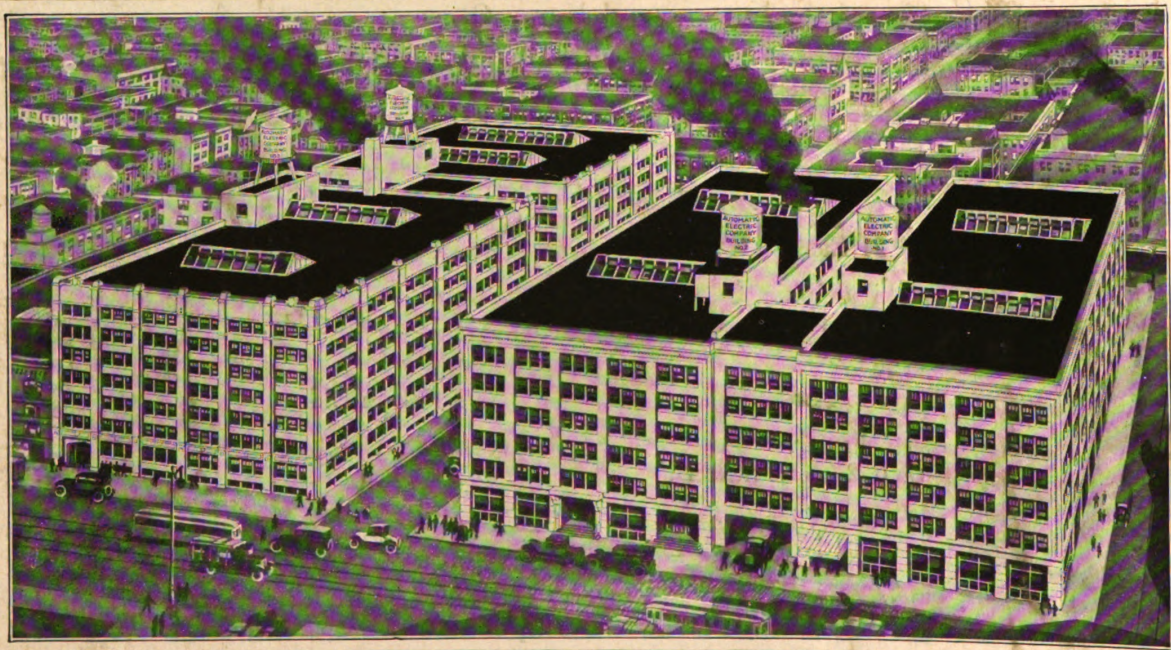
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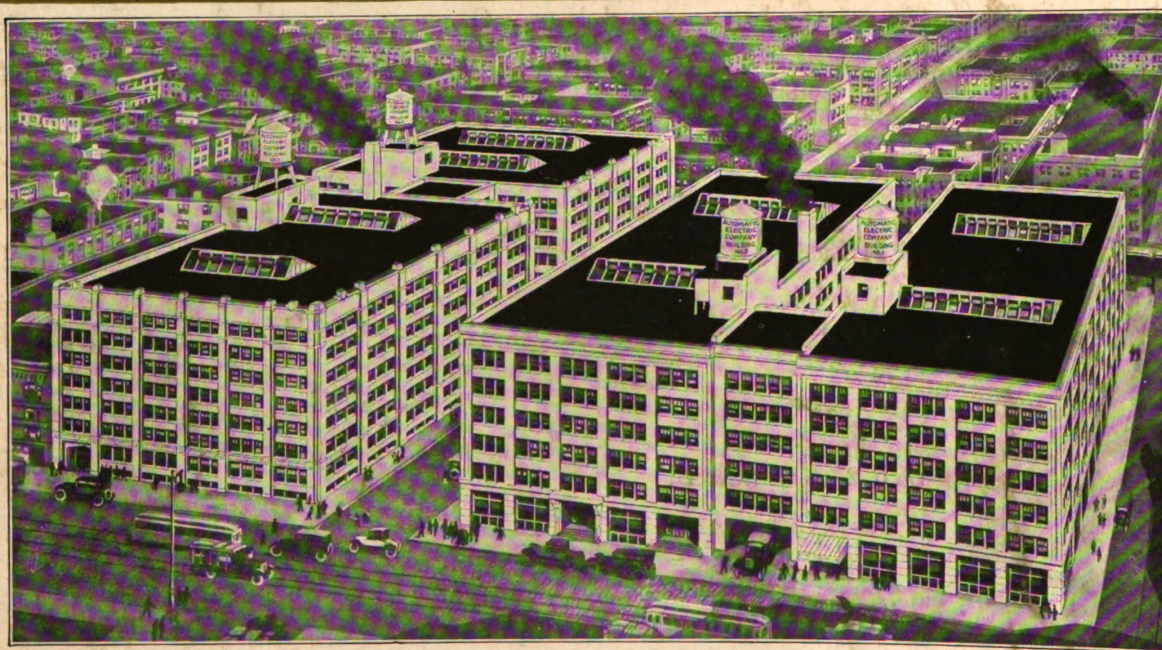
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The Home of the Automatic



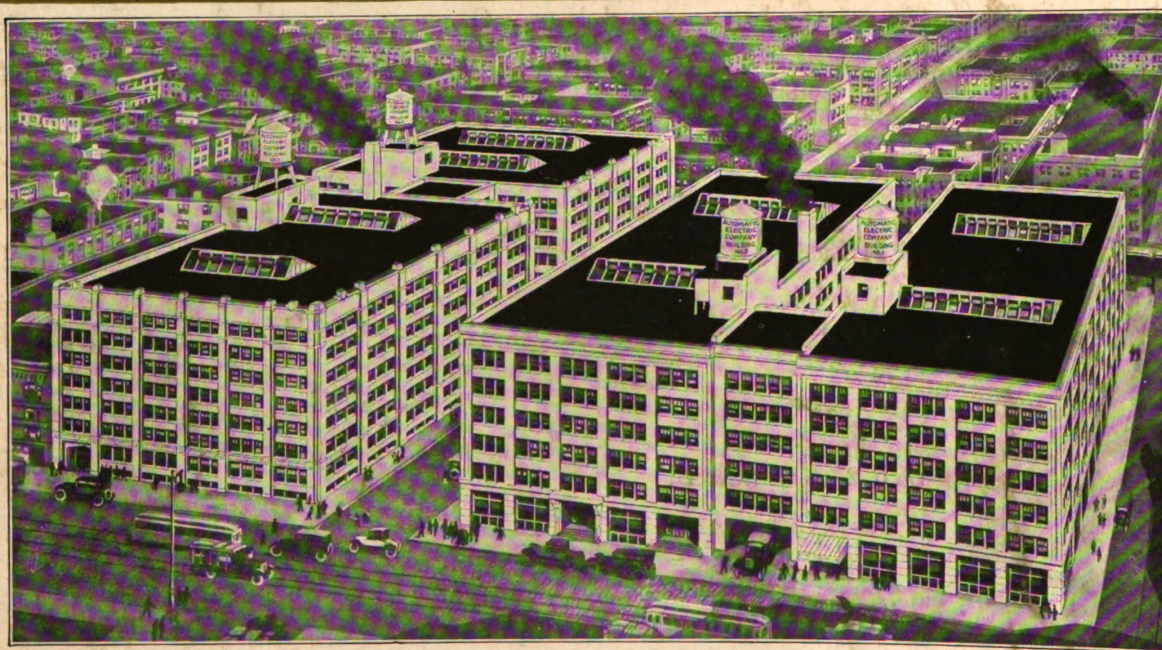
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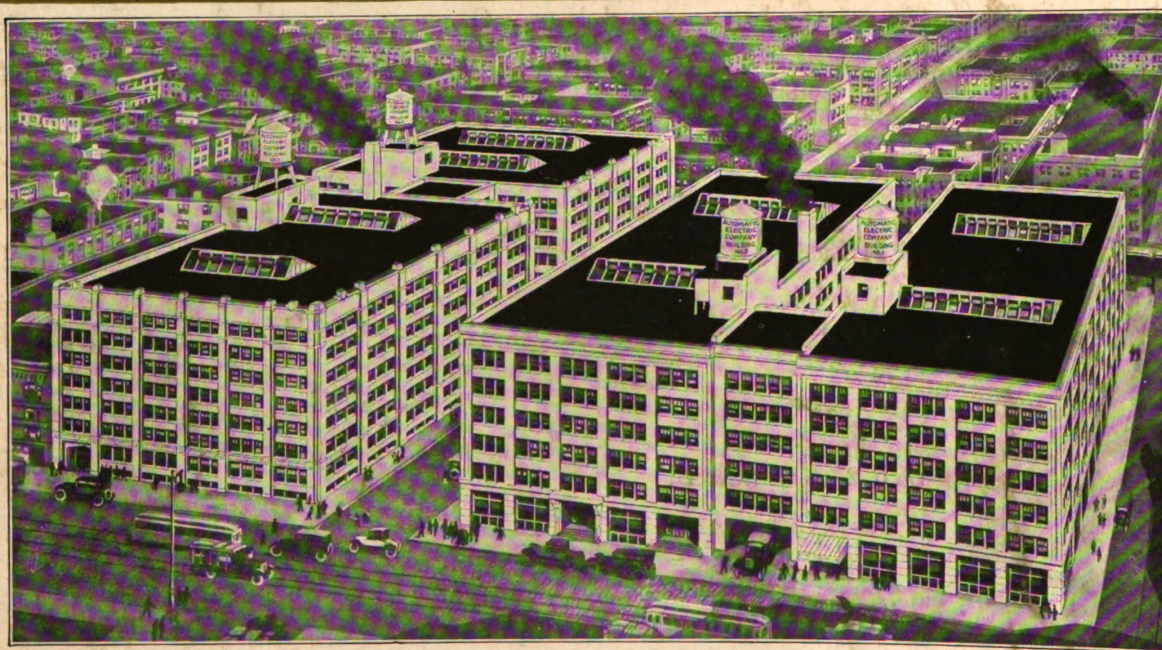
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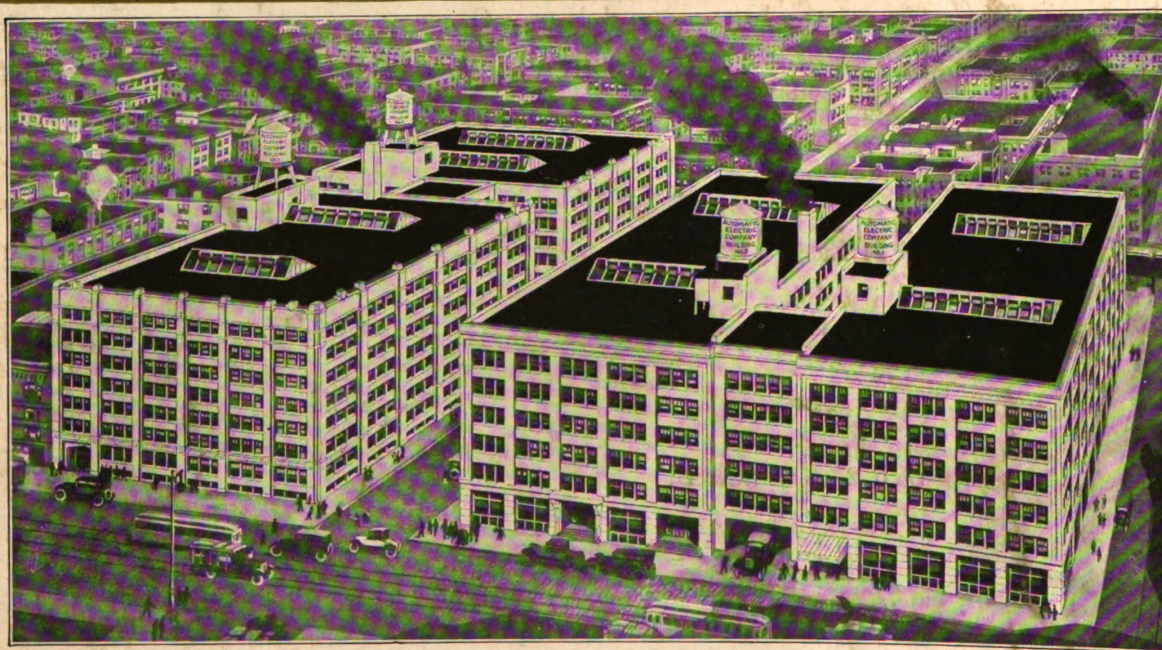
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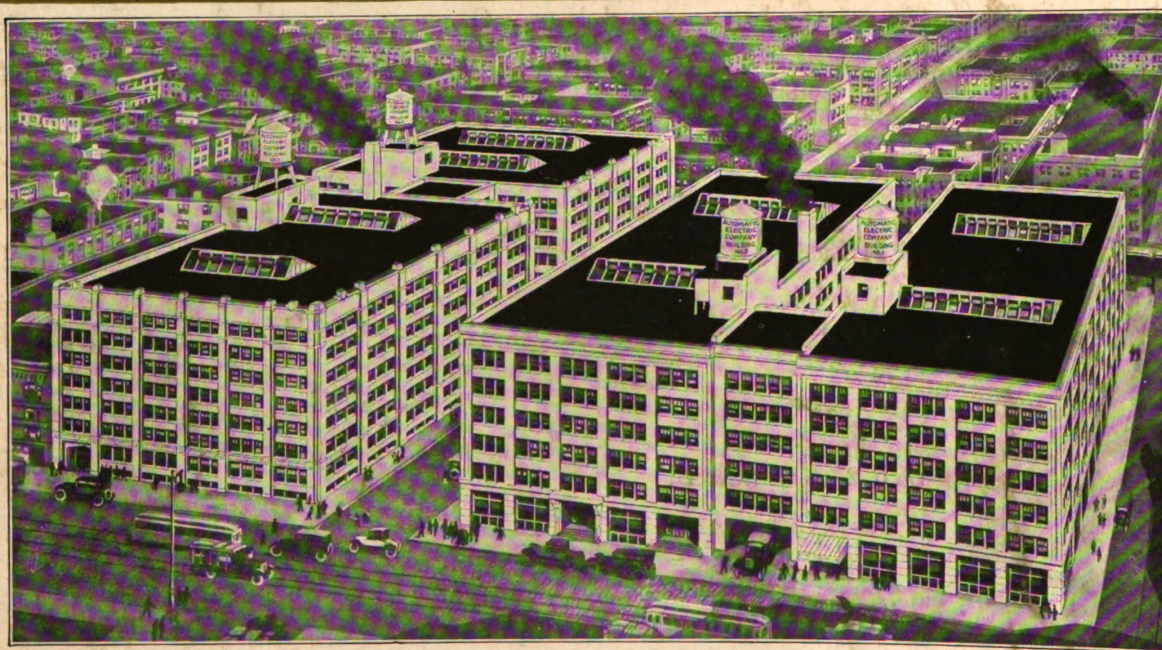
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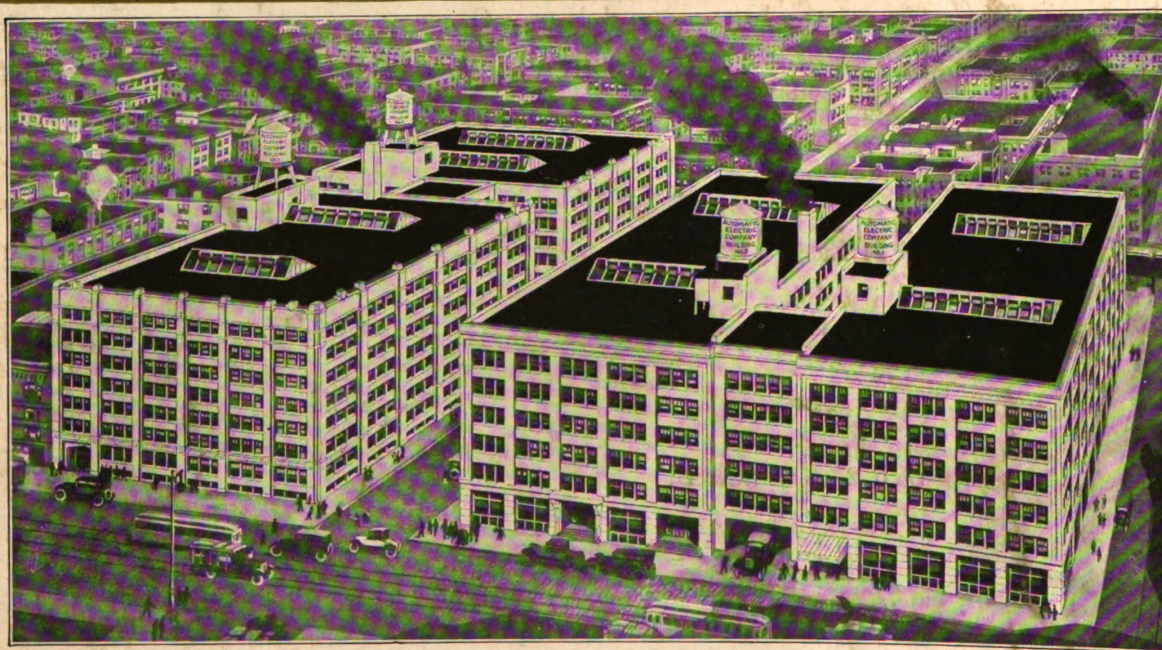
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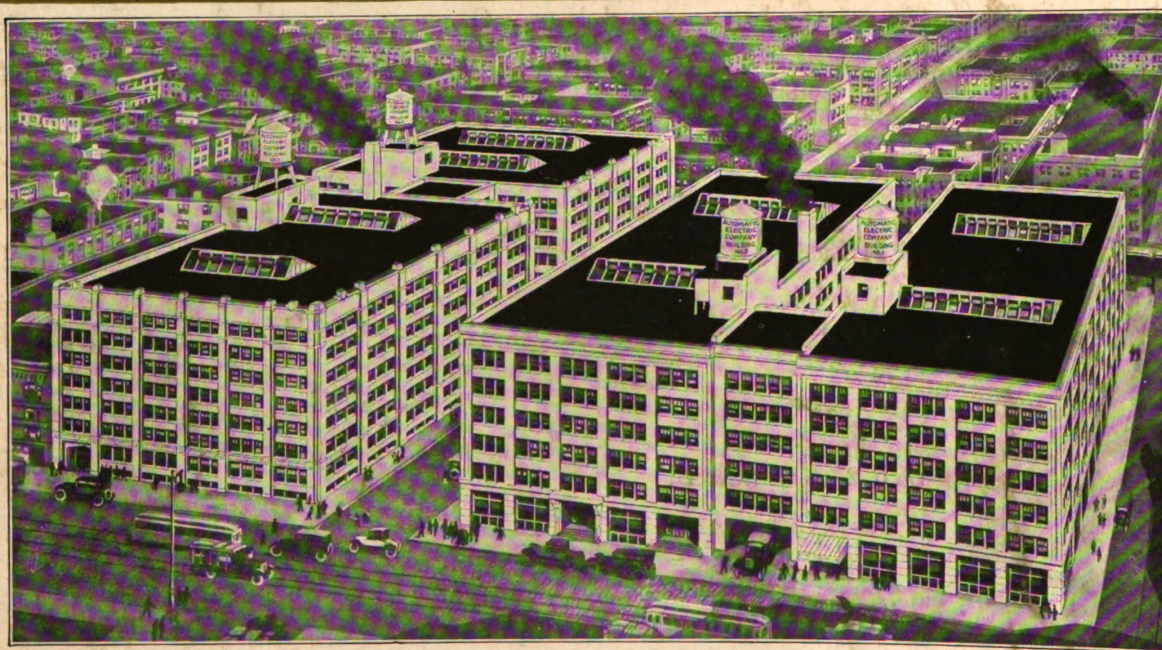
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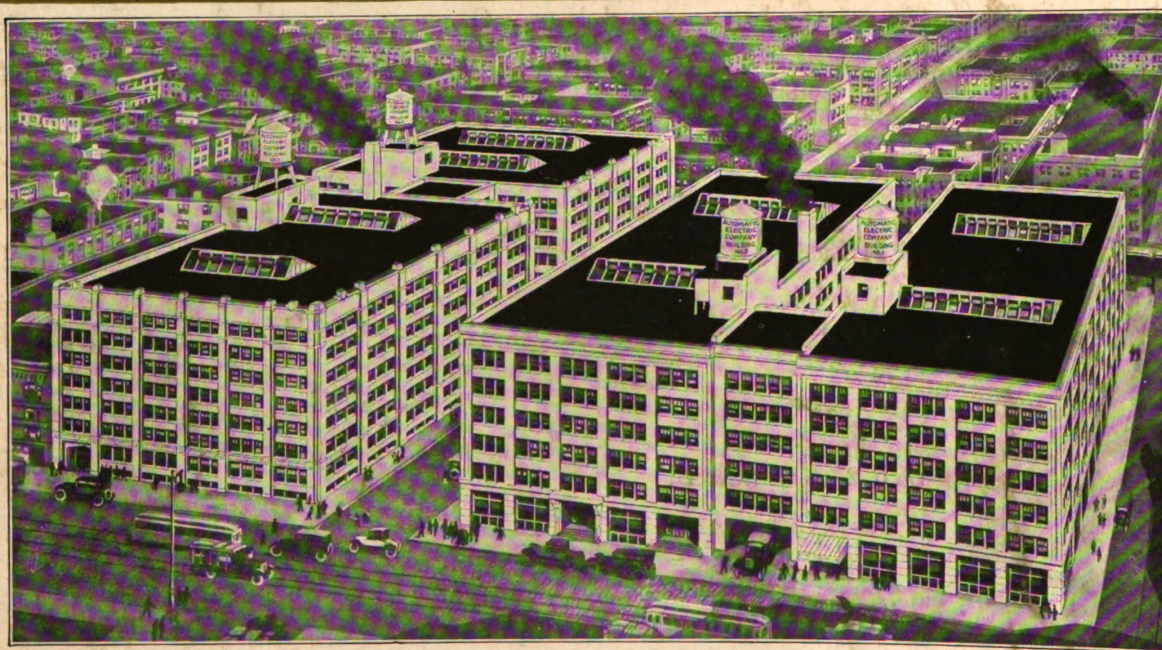
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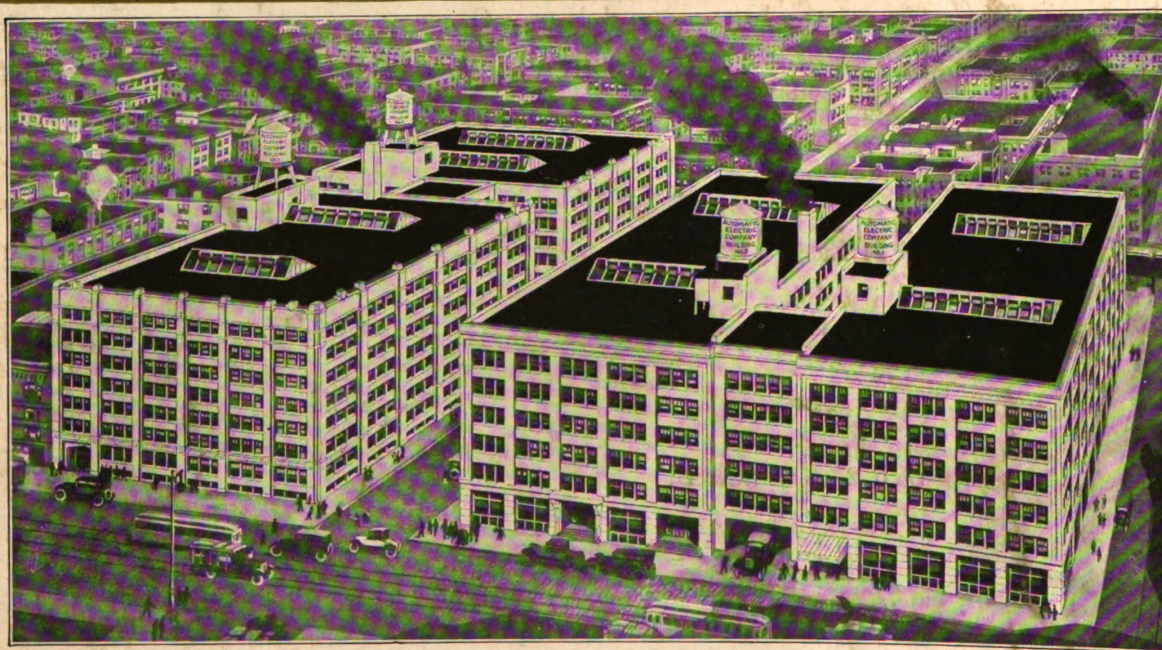
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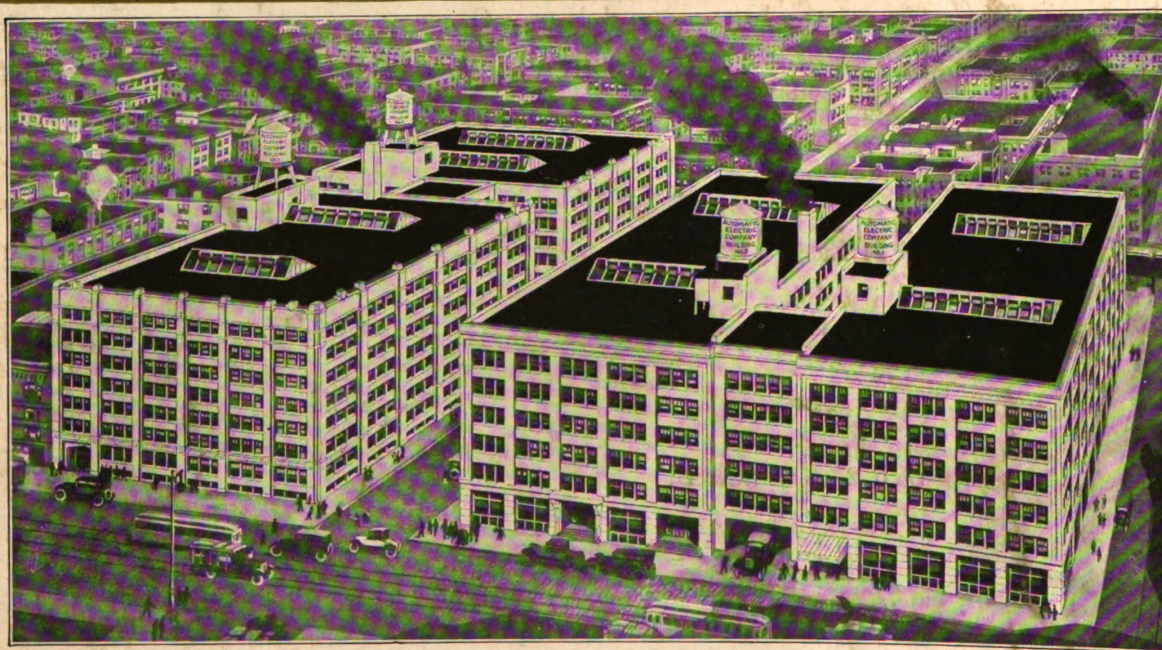
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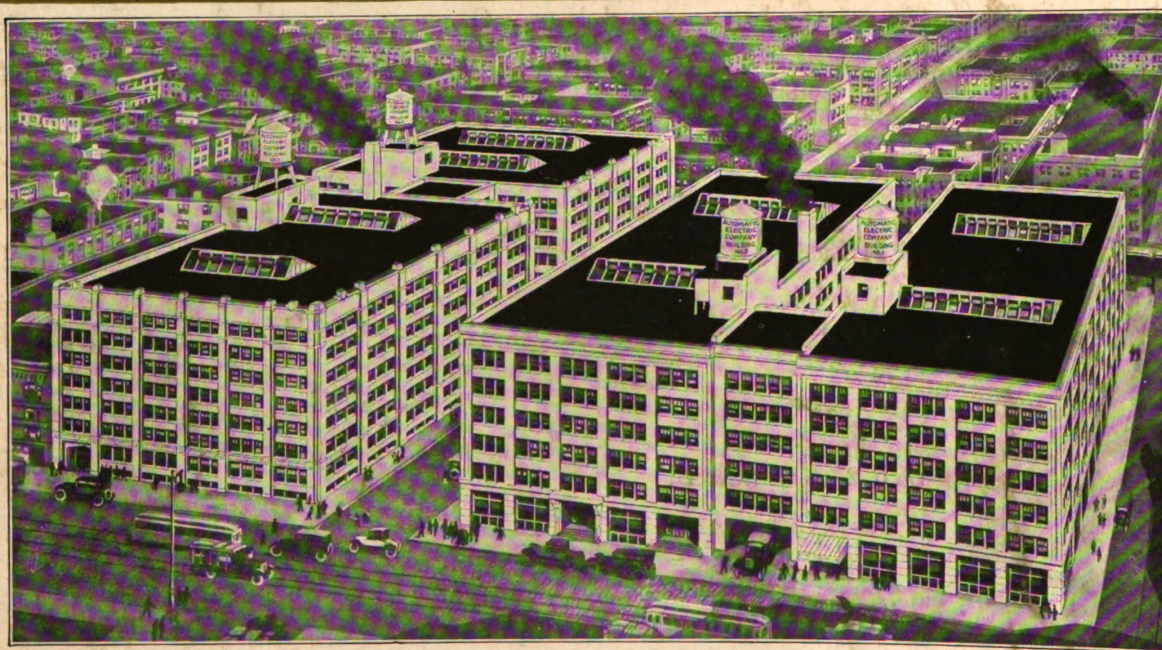
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