Automatic Telephone

A JOURNAL OF INFORMATION FOR THE TELEPHONE PROFESSION

Published Monthly By

AUTOMATIC ELECTRIC COMPANY, CHICAGO, U.S.A.

VOL. 9 OCTOBER, 1921 No. 10

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

"WE are very much pleased with our Automatic installation at Big Pine. It is working very nicely, giving twenty-four hour service seven days a week, and is showing a substantial saving in cost of operation over the manual exchange which it superceded. We plan eventually to make nearly all of our small exchanges Automatic.—"

(Extract from a letter received from the General Superintendent of the Interstate Telegraph Company, Bishop, Cal.)

Automatic Telephone

Vol. 9 October, 1921 No. 10

The Sales Manager's Page

RECENTLY there was an occurrence typical of many cases with which the Sales Department of Automatic Electric Company has to deal. The Manager of an Independent telephone company told us that within a short time, he was expecting to buy new equipment for an exchange of about 2000 subscribers.

He told us frankly that, while he believed that Automatic telephone service would satisfy his subscribers, he was convinced that Automatic equipment could not be justified, on an earning basis, at his exchange. He had practically determined, he said, to buy new manual equipment, but he realized that he owed, both to himself and to his company, the duty of investigating thoroughly all possibilities before deciding. If, under the circumstances, we wished to go to the trouble of making a study of his exchange and submitting an estimate for Automatic equipment there, he would promise to give our proposal honest consideration before purchasing equipment anywhere.

This case, as we have said, is typical of many we meet, although not all prospective purchasers are as frank concerning their views as was this gentleman. It is typical because the majority of telephone men have never operated Automatic, and we are all more or less skeptical of those things in which we have never had experience.

The important point is that this telephone executive realized that the Automatic telephone, regardless of his personal views concerning its adaptability to his exchange, occupies such a position in the telephone industry that it cannot be ignored by the intending purchaser of equipment. While the manager who intends to buy may be fully and honestly convinced that Automatic equipment, for some reason or other, will not properly fit conditions at his exchange, the fact is that he cannot satisfy himself that he has considered all the possibilities of progress and improvement for his company until he has given such equipment unbiased and thorough consideration.

That is all that Automatic Electric Company asks of the prospective purchaser of equipment—that he give unbiased and full consideration to Automatic, as well as other equipments before he buys. The prestige, the standing, and the future of the Automatic telephone are such that he cannot do less than that and feel satisfied that he has done his job of buying thoroughly.

* * * *

It is the lack of information about a thing that does the harm. You may have heard that the Automatic telephone is fine for the cities, but not the thing for the small exchange; that it is so expensive that it can be justified on an earning basis at only a few places, where, labor conditions or rates are abnormal; that deliveries cannot be promptly made; that the proper maintenance of the equipment requires expensive and highly specialized help; that it will fail to operate satisfactorily under certain climatic conditions. But they are not *facts*—and we have the facts! Or, if you prefer, make your investigations as to such things yourself; but do not let "hearsay" decide for you when *facts* are available.

You may have had it suggested to you in all sincerity, that it might be better to wait a while before buying any kind of Automatic equipment because developments are being made so rapidly that an equipment purchased today might be obsolete within a short time. This statement is, to say the least, a flattering recognition of Automatic telephony. An Automatic telephone system, however, is not a thing that is invented, full fledged and complete; it is not only the result of many inventions and improvements on them, but especially the result of a course of development extending over a long period of years, the developments coming from experience in the *actual use of the apparatus in the field*.

Strowger Automatic is offered to the trade as an actual, tried and successful, complete Automatic telephone system. It has back of it years of experience of the pioneer Automatic developing, engineering and manufacturing organization. It is not an experiment and it can be bought now with the full assurance on the part of the purchaser that he is getting an Automatic system that is daily meeting the most exacting service requirements in all parts of the world, and doing this profitably to its operating companies.

It is worth while to know that Strowger Automatic equipments are today in service that were manufactured and installed fifteen or twenty years ago and are giving service today that is, in almost every way, comparable with that given by the most modern type of equipment. Not only do the older types of Strowger equipment work efficiently with additions of newer type but Strowger equipment is so flexible that it is not difficult to add to older equipments those refinements of later years so that apparatus installed many years ago can, without great difficulty, be made practically modern and up-to-date.

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You may be as much surprised as was the telephone executive whom we have mentioned. He made an investigation of his own concerning Automatic, and he depended upon his own figures, gathered from the actual experiences of Automatic operating companies, for his decision. He found, to his admitted surprise, that he could give his subscribers the benefit of Automatic telephone service, and at the same time free himself from many oper-

ating worries—and, along with it, make more real net profit for his company. He bought Automatic equipment for his exchange.

This is by no means an isolated case. The Sales Department of Automatic Electric Company expects to meet the natural hesitancy of the telephone company that has had no experience in Automatic operation or results, and it is to the credit of the operating man that he must be "shown." It is on this basis that Automatic equipment is sold—and it was on this basis that the many successfully operating Automatic plants in service today were sold. That fact, of itself, should be a credential for Automatic equipment sufficient to make it worthy of the consideration of every intending purchaser.

You are invited to avail yourself of the services of the Automatic sales staff, which you may do without the least obligation on your part. Studies and estimates of costs can be very promptly made and furnished you; this will be done just as willingly whether you do or do not anticipate an early purchase of any kind of equipment. The Automatic is the telephone of the present and the future, and it is never too early to begin consideration of the inevitable replacement of equipment now in use.

E. C. BLOMEYER.

Automatic Switches and Air Conditions

Only Exceptionally Severe Air Conditions Necessitate Special Treatment for the Successful Operation of Automatic Switches. This Shown by Installations in Cuba, Hawaii, on Ocean-Going Steamers, in Chemical Plants and Other Places where Conditions are Extreme

WHAT is the behavior of Automatic switches in localities where the air is unusually moist or dirty? Do such air conditions require special treatment when Automatic switches are installed?

In the past such questions were often asked by prospective users of Strowger Automatic Telephone equipment. It would naturally be a matter for serious consideration in the mind of a customer if, upon installing Automatic equipment he found that the air in his switchroom was too dry or too sticky or too smoky for the operation of the switches to be reliable. It would also be a serious matter for the manufacturers of the equipment, almost fatal, in fact, to their success, if it was necessary to specify a definite degree of humidity and a certain limit as to dustiness or smokiness of the air in the switchroom. Yet in the past the question of humidity and dust control has been raised many times and answered as often.

It was believed that further explanation on the subject of air conditions and Automatic operation would be unnecessary, for a time, at least. But recently the attention of the manufacturers of Strowger Automatic equipment was directed to an article that appeared in the June issue of "Sirocco Service" a monthly magazine published by the American Blower Company at Detroit, Mich. This article dealt with some air conditioning equipment which was installed in the main exchange of the Citizens Telephone Company at Grand Rapids, Mich., and its effect on the operating conditions in the manual and Automatic switchrooms of that exchange.

While it was known that the Citizens Telephone Company had found it desirable to install such equipment in their main exchange, it was thought that the article as it appeared in "Sirocco Service" conveyed impressions which might give rise to misunderstanding.

With this thought in mind the Sales Department of Automatic Electric Company immediately communicated with Mr. C. E. Tarte, General Manager of the Citizens Telephone Company, requesting information concerning the "Sirocco" equipment, when and why it was installed, and its effect upon operating conditions in the exchange.

Mr. Tarte's reply was decidedly illuminating; and in order to permit the readers of "Automatic Telephone" to judge the matter for themselves, it was decided to reproduce here in full, both the article and illustrations as they appeared in "Sirocco Service" and Mr. Tarte's reply to the inquiry. The article follows:

Main Exchange, Citizens Telephone Company, Grand Rapids, Mich.

"GOOD BYE, LITTLE 'HELLO' GIRLS!"

"Once upon a time, so the story goes, there was a telephone operator who never made a mistake.

"It was a joy to pick up the 'phone and ask for a number, and get the one you wanted, the first time!

"Nobody's nerves and temper were ever frayed trying to use a 'phone when she was on the 'change board.'

"Nobody was ever roused out of bed in the middle of the night to answer the 'phone only to learn it was 'the wrong number!'

"But she was too good to last. She died, or got married, or something.

"And then everybody began getting wrong numbers and losing their tempers and their sleep again.

"And as they remembered their perfect operator, they all used to say sadly, 'She wasn't human. To err is human, and she never made a mistake!'

"And, the story goes on, an inventor came around about this time and heard all this.

"So he said, 'Why not invent an exchange board, then, that will do away with this erring, human element entirely?'

"So he invented the Automatic switchboard that did away with all the so-human, erring telephone girls—and all the wrong numbers, lost tempers and lost sleep.

"That's the way the story was told to us. Maybe it didn't happen just that way at all. We won't vouch for the way the 'Automatic 'phone exchange' came to be invented. But for the rest of this we will vouch—this we know:

"At one time the 'Automatic 'phone exchange' worked all right as long as the weather was right, but when the weather was off, it, too, was off. When it was too hot, or too cold, or too sultry, and so on, the 'Automatic' was about as reliable as a telephone girl.

"Now in Grand Rapids, Mich., the 'phone service is largely dependent on the Citizens Telephone Company and this Company uses the 'Automatic exchange.'

"So they called in the 'Sirocco' air conditioning engineers to see what they could do to keep the atmospheric conditions of the exchange constant—always just right for the perfect working of the exchange.

"It was found after a summer's run that a relative humidity of 60% and uniform temperature of 75° gave perfect operating conditions. The plant has been operated satisfactorily during the hottest days.

"Previous to the intallation of this equipment, it was necessary to maintain twelve trouble men in this switchroom. These men could stand the work in this room for a period averaging only six months, because the atmospheric condition was so unusually hard on their health.

"After the installation of the 'Sirocco' equipment, only three men were maintained in this room—and the atmospheric conditions were such that the job of being one of these three was one of the prize jobs of the Telephone Company.

"An additional ventilating outfit for the long distance toll room where about 25 operators are necessarily employed, followed the successful installation in the switch room.

"This system provided fresh, invigorating, washed air to the operators, without necessity for opening windows and permitting outside noises to disturb the operators at their work."

The "Sirocco" Equipment in the Main Exchange

Mr. Tarte's letter replying to the inquiry made by Automatic Electric Company is reproduced herewith.

CITIZENS TELEPHONE COMPANY
GRAND RAPIDS, MICH.

September 10, 1921.

Automatic Electric Co.,
Chicago, Ill.

Gentlemen:

Answering your inquiry of recent date, asking information in regard to the installation by us of a De-Humidifying System in 1913, why we installed it and what the effects of its installation were.

You undoubtedly know that the original installation in the Grand Rapids Exchange of Automatic equipment was completed in January, 1904.

The switches installed were of the individual selector type with no protection whatever around the switches from dust or air conditions of any kind.

Our Exchange, as you also know, is located on the banks of the Grand River in the heart of the manufacturing district and within a short distance of the main line of the northern division of the Grand Rapids and Indiana Railroad and the Pere Marquette Railroad. The dust and dirt conditions are very bad.

During the year 1912 humidity conditions in Grand Rapids and in all of the Central States were very bad. I know that to be the case because almost every one of the large telephone companies issued circulars to their subscribers, explaining the bad effects of humid conditions on central office equipment, extension cords, etc.

It was necessary to operate our Exchange during the summer months with the windows open so as to make it possible for our central office employes to stand the extremely hot, humid conditions.

After investigation, we came to the conclusion that we could improve conditions for our employes and for our central office apparatus by putting in a system that would clean the air, reduce the humidity and lower the temperature during the summer months and as a result of investigation, we installed a De-Humidifying System manufactured by the American Blower Company. This system proved very satisfactory. We were able to tightly close all of the windows in the switch-

Switchroom, Main Exchange

room, the living conditions in the switchroom were better, and the cleanliness of the switchroom was wonderfully improved.

I am not able to find from our records showing the number of employes in the switchroom before the installation of the De-Humidifying System and after the installation of same, that any reduction was made in the number of employes but I am positive that service was improved by more cleanly conditions in the switchroom and more efficient employes.

I doubt very much whether it would have been necessary to install this system with the style of Automatic equipment now used, whereby the entirely exposed apparatus is done away with and Keith units and enclosed switches are used.

We have, as you know, three branch exchanges in which we use Keith units and we never have found it necessary or deemed it desirable to install a De-Humidifier in these Exchanges. You know, of course, that we operated the Main Exchange from 1904 to 1913 without a De-Humidifying System and with open windows and plenty of dust and dirt.

If I can give you any other information in regard to the system, I will be glad to do so.

Your truly,

Citizens Telephone Company
C. E. Tarte
General Manager.

It will be noticed from the foregoing letter that the decision to install the air conditioning equipment was prompted as much by a consideration of the health and efficiency of the employes as of the proper operation of the Automatic switches.

INDIVIDUAL COVERS

Prior to 1906 Automatic switches were designed without covers, so that naturally when the air was humid, the moisture condensed on the switches and held any dust that settled on them. Since that time gradual improvements have been made in that respect, until now the working parts of all Automatic switches are absolutely dustproof, each major switch, (selectors, connectors, etc.) being protected by an individual dust-tight cover. The value of this development is indicated in Mr. Tarte's letter where he explains that he does not consider it necessary or even desirable to install air-drying equipment in switchrooms that house the more modern equipment.

EFFECTS OF HUMIDITY

It is true of course, that the better the condition of the air in the switchroom the more reliable is the operation of the switches, and the more efficient are the switchroom employes. So it is with any type of machinery, particularly telephone apparatus. A high relative humidity tends to cause low insulation resistance and electrolytic action, and allows dust to deposit itself on moist surfaces of working apparatus. That Automatic switches will operate even under such conditions is evidenced by the fact, as Mr. Tarte has pointed out, that the Main Exchange at Grand Rapids was operated from 1904 to 1913 with open windows and plenty of dust and dirt. The matter of insulation resistance and electrolysis in damp places has been largely corrected within recent years by the use of switchboard cable and wiring with enamel insulation.

Nevertheless, the reliability of Automatic switch operation under extreme conditions may be decidedly improved by certain preventive measures. Switch operation in certain other exchanges besides that at Grand Rapids, notably those at Havana, Cuba, Norfolk, Va., and Honolulu, T. H., has been materially enhanced by the installation of air conditioning apparatus.

On the other hand, many Automatic telephone installations, although placed in service under conditions apparently extremely detrimental to proper operation, have experienced no trouble whatever. There is, for instance, a fifty-line switchboard installed on the steamship "Orizaba" which plies a course on the Atlantic Ocean between Mexico and Cuba and Spain. This switchboard was installed in the engine room where, although the amount of moisture is decidedly excessive, no trouble from that source has been experienced.

SOLVAY P. A. X.

Another case worthy of note is that of the 300-line P. A. X. of the Solvay Process Company, Solvay, N. Y., which is operating continually in air that is impregnated with chemical fumes. Numerous other cases of a similar nature could be pointed out.

Investigations made by Automatic Electric Company's engineering staff and the experience gained by companies operating Strowger equipment are sufficient evidence that only where the conditions are unusually severe, as in the case of the Grand Rapids Main Exchange, is any special treatment justified, and it is believed that in those cases, any necessary special treatment would apply not only to Automatic telephone equipment, but to electrical machinery in general, and especially to telephone equipment of all kinds.

WE frequently make mention of the fact that Automatic Electric Company has been engaged in the manufacture of Automatic Telephone equipment for more than thirty years. This is not because we believe that any particular interest is manifested in the commercial history of our company, but the fact that we have succeeded in selling a radically different type of telephone equipment for that length of time proves the existence of sound reason back of its manufacture.

Executive Members of the Sales Department

WE believe that the pleasure of business relationship is greatly enhanced by personal contacts; that closer acquaintance between the staff of Automatic Electric Company and its customers and prospective customers will result in great mutual benefit. To assist in attaining this end, we plan to present in these pages from time to time group photographs of the executives of the various departments of this organization.

Since the Sales Department of Automatic Electric Company is naturally the chief connecting link between that company and its clients, we are pleased to present herewith the executive members of this department.

Above—J. H. Finley, Manager, Merchandising Sales; W. S. Vivian, Manager, Department of Public Relations; N. P. Bartley, Manager, P. A. X. Sales, Director of Publicity.

Below—W. N. Curtis, Assistant Sales Manager, in charge of Foreign and Contract Sales; E. C. Blomeyer, Sales Manager; R. H. Burfeind, Assistant Sales Manager, in Charge of General Sales.

Redwood Falls Now Has Automatic Service

A TYPICAL small exchange Automatic switchboard was placed in service on Thursday, September 1st, when the 600 station system of the Redwood Falls Electric Telephone Company at Redwood Falls, Minn., was converted to dial operation.

This switchboard is a combination of the 1000 and 10,000 number type, the individual line numbers having three and the party line numbers four digits. The new equipment replaces a 400 line common battery manual switchboard.

Besides the exchange of this company there is in Redwood Falls the switchboard of a mutual company operating about thirty rural lines, and the Tri-State Telegraph and Telephone Company's toll switchboard. Arrangments have been made for handling interconnections between the three switchboards in the following manner:

Calls between city subscribers—full Automatic.

Calls from city subscribers to toll operator—dial "O."

Calls from city subscribers to rural operator—dial "9."

Calls from rural to city subscribers—set up automatically by rural operator's dial.

Calls from toll to city subscribers—set up automatically by toll operator's dial.

Calls from rural to toll or toll to rural are switched direct.

The Mutual Company's rural board is located in the new building of the Redwood Falls company. During the day the entire staff of the Redwood Falls company consists of the manager and clerk. At night, the only occupant of the building is the rural operator. The rural board is equipped with a night alarm, so that information, complaint or other special calls from city subscribers can be referred to the manager's home by the rural operator. In this way, the Automatic equipment is practically unattended at night. It is probable that arrangements like these will be made with equal advantage in other communities where the conditions are similar.

The Philadelphia Navy Yard's Modern Telephone System

Excerpts from an Article Appearing in the August, 1921, Issue of the Shipbuilders' News and Navy Yard Employee, a Publication Devoted to the Interests and Activities of the U. S. Navy Yard Employees

By J. E. GREENWOOD
Expert Aide
Philadelphia Navy Yard

THE Philadelphia Navy Yard, located four miles from the business section of the city, having an area of over 900 acres, 3,000,000 square feet of floor space, approximately 100 ships of all kinds berthed at its docks and furnishing telephone service to a naval magazine two miles away, presents problems in communication not usually found in a commercial establishment and requires for its telephone service a combination of interior communication, branch exchange and central office system.

There are large offices requiring interior communication service, ships having from one or two telephones to trunk connections to the ship's switchboard system, shops and tool houses, street 'phones and a fifty-line isolated Automatic branch exchange at the Fort Mifflin Naval Magazine. Traffic is very irregular, at times practically no connections established and a few minutes later traffic at its highest peak and every one wanting instant service.

It is evident from the varied service requirements that the telephone system of a large military or industrial establishment similar to the Philadelphia Navy Yard, to be of real service and time saving to its users without excessive operating or rental costs, must be of modern type and owned by the user.

Before adopting Automatic switching telephones the Philadelphia Navy Yard had thirteen positions of manual switchboard and employed about twenty-eight operators to furnish twenty-four-hour service, with a maximum traffic of 12,000 calls a day. Practically all of the equipment was on a rental basis and service was not all that could be desired, although the cost of the service and operators approached $50,000 a year.

A small installation of Automatic telephones was

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

made to cover a particular field and relieve the operators of some of the traffic, there being no thought at that time of the Automatic equipment being extended to a point where it would displace the manual equipment. The service given by this small installation of Automatic was so satisfactory that a universal demand was immediately created for more Automatic telephones. The system was increased as fast as additional apparatus could be obtained until the entire Yard was equipped with Automatic telephones.

Then the large manual switchboard was removed and the operating force reduced.

The Manual Switchboard Which Was Replaced

There are now over 600 full Automatic and 100 manual telephones connected to the Automatic system. The manual 'phones are used on board ships and on the streets for general use and watchmen's service. Owing to the constant changing of ships' telephones and some ships using their manual switchboard systems connected to the Yard system, these lines are connected to a one-position manual switchboard which is interconnected to the Automatic system. This manual switchboard is also connected by trunk lines to the telephone company's system in Philadelphia. One operator is required at this board to distribute the incoming calls from the city to the Yard, to set up the connections from ship to ship, from ships to Yard Automatic, from Yard Automatic to ships and for a general information operator. Calls to the city system are made from Automatic 'phones in the Yard by dialing one digit and getting a connection direct from the city operator. This city service being on a flat rate basis, no means of separately counting these calls is provided, although each 100 unit of the equipment is provided with a counter for counting its total originating calls.

The entire cable system of the Yard is underground, with submarine and aerial cable to Fort Mifflin. In addition to the usual small wires in the cables for telephones there are a few larger wires in each cable that are used for the Yard fire alarm system. The cable system, wires, Automatic equipment and the telephones are owned and maintained by the government. The Automatic system and its manual connections now average approximately 14,000 calls per day with peak days of 16,000 and requires for its operation one operator and part of the time of one mechanic for maintenance of the Automatic equipment. The total cost to the government for the purchase of the Automatic equipment and telephones was approximately $30,000; this amount is saved annually in operator's wages alone. In addition to this saving there is a saving of fifteen to twenty seconds on each call made on the Automatic system over that formerly required to make a call on the manual system. While a saving of seconds may seem a small item, at the average rate of pay for the telephone users in the Yard this means an annual saving of from $10,0 0 to $15,000 in employes' time. The equipment being government owned, there are no delays in obtaining additional telephones as they are carried in store by the Supply Department. There are no rental charges for the Automatic equipment and telephones, which, if on a rental basis, would amount to approximately $20,000 per annum.

Automatic telephone switching, while more than twenty-five years old and quite common in sections of the country where telephone service is supplied by independent companies, is comparatively new to most telephone users in the eastern states. It was not until the report of the Congressional Committee investigating the telephone system of the District of Columbia in 1918 was published that the eastern public had an insight into the saving and quick service made possible by the use of Automatic equipment.

In the Congressional report referred to above is brought out the fact that if the government had its own Automatic system for interdepartmental service in Washington it would save over $100,000 per year in the cost of this service. It would be possible with an Automatic system for the government offices at Washington to dial direct to its various naval stations at Philadelphia, New York and Boston over its leased lines that are now operated manually. By this method the efficiency of the leased lines would be greatly increased due to the rapid connections and disconnections made possible by Automatic equipment.

The apparatus is more flexible than the manual equipment and can be added to at any time without discarding or changing existing equipment. It is made in units of 100 lines, which are assembled much on the order of a section bookcase. An Automatic telephone system is not confined to strictly telephone use; it can be used for fire alarm purposes, for a code signal service to locate executives about a plant, for a watchmen's service or to control the operation of electrical apparatus, lights or motors at remote points.

The Expansion of Production Activities at Liverpool

How the Plant Facilities of the Automatic Telephone Manufacturing Company Ltd. have been Extended to Meet the Growing Demand for Strowger Automatic Equipment in Great Britain and Foreign Countries.

TO recover entirely from the almost complete dislocation of normal resources and activities imposed by the needs of the war—

To manufacture and place in service during the war many thousands of lines of Strowger Automatic equipment despite the serious hindrances that war time projects entailed—

After the war to adopt and carry out plans for the entire re-arrangement and re-conditioning of manufacturing equipment—

To build up an engineering and manufacturing organization that is entirely adequate for meeting the most extensive needs of the present and future in Automatic telephony.

These are some of the outstanding accomplishments of Automatic Electric Company's contemporary enterprise, the Automatic Telephone Manufacturing Company, Ltd., which, with Works and Offices situated in Edge Road, Liverpool, England, is now equipped with the most modern and complete machinery and appliances for the manufacture of Strowger Automatic telephone equipment and its allied apparatus.

The buildings of the Company occupy a site of nearly ten acres adjacent to one of the principal railway arteries of the country, and include, besides manufacturing shops, an up-to-date laboratory and research department and a commodious suite of offices for the accommodation of the Engineering and Commercial staffs.

TELEPHONE ASSEMBLY SHOP
Selector and Connector Section

Organized in 1911, the major activities of the Company were immediately directed towards the engineering and manufacture of Automatic equipment, and during the short interval from this time until the beginning of the war remarkable progress was made. A number of exchanges were installed and contracts with the British Government were entered into for the equipping of other plants.

When the war intervened, almost the entire capacity of the plant had to be devoted to the production of munitions, which imposed so severe a strain on the existing machinery, that at the date of

SWITCHBOARD WIRING SHOP
Fitting Section

General View of Switchboard Wiring Shop

the armistice, plans had to be adopted for the entire re-arrangement and conditioning of the plant equipment, the restoration of buildings, and the renewal of floors, to facilitate a return to normal production.

Advantage was taken of this emergency to modernize the plant, and to establish engineering and production methods in keeping with the very latest practices. To assist them in this work, Automatic Electric Company's twenty-five years of experience in mass production and engineering, as well as the personal services of a number of that company's foremost engineers and manufacturing experts, were placed at the disposal of the Liverpool company.

How thorough their work was, and how satisfactory the results, may be judged from the photographs reproduced herewith. It will be admitted that the details shown in the way of machinery and other plant equipment support in every way the claim to modernity; and while the extent of the production capacity indicated is great, it is necessarily capable of considerable expansion to meet the anticipated and growing demand for Strowger Automatic.

Prior to March, 1920, the Company operated as a separate entity, but being impressed with the advisability of concentrating upon mass production as the best means of meeting international competition,

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TELEPHONE ASSEMBLY SHOP
Subscribers' Sets Section

MACHINE SHOP
General View

Automatic Telephone

A Journal of Information for the Telephone Profession

Issued Monthly by

AUTOMATIC ELECTRIC COMPANY

CHICAGO, U. S. A.

H. E. CLAPHAM :: Editor

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

IN making the recent check on the mailing list for "Automatic Telephone," we took the liberty of addressing a request to each of our many readers for criticisms and suggestions for increasing the value of the publication to the telephone field.

The replies received so far have been extremely gratifying both in number and nature. We are pleased to take this opportunity of thanking those of our readers (and they were the majority) who expressed themselves as being entirely satisfied with the paper as it is conducted at present; but we are still more grateful to those who have pointed out ways in which improvements are possible.

These comments have enabled us, in some measure, to "see ourselves as others see us," and for this we are profoundly thankful. We wish to assure our readers that their suggestions will prove very valuable to us in making our publication more interesting and valuable to them.

* * * *

A particularly large number of the replies received contained the suggestion that we initiate a Query Column, where questions on the application, operation or maintenance of Strowger equipment could be answered for the benefit of all readers. This seems to us an excellent suggestion, and if readers who are perplexed about any particular phase of Automatic Telephony will write us, we will be glad to put them straight. Only *bona fide* questions of *general* interest can be answered in these columns; others will be referred to our engineering or operating departments for special answering direct to the correspondent.

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We do not believe we are undeceiving the readers of "Automatic Telephone" when we tell them that the prime purpose of this publication is, frankly, to facilitate the sale of Strowger Automatic equipment. Ever since its inception more than eight years ago, we have endeavored (and we believe with considerable success) to attain this purpose by placing before the telephone industry, the facts relative to our product and its application. We propose still to be guided by such a policy, for "Automatic Telephone," like any other house publication intended for outside distribution, is primarily a publicity medium.

If, in telling our readers about our product we succeed in interesting or entertaining them, we shall be highly pleased. If, further, we succeed in convincing them, as we are ourselves convinced, that Strowger Automatic equipment has a legitimate place in every telephone exchange today, we shall be more than pleased. This paper will then have accomplished all that we ever hope or expect that it will accomplish.

"For Value Received"

MR. F. B. MacKinnon, President of the United States Independent Telephone Association, struck an important note in his address before the Indiana Telephone Association at Indianapolis, when he intimated that the only real and permanent solution to the rate and service problems confronting the telephone industry, is compensation proportionate to the grade of service rendered.

There has been and still is much injustice in the matter of telephone rates, although conditions in this respect are today vastly better than they have been in the past. There was a time when a telephone company needed only to show figures proving their return was inadequate in order to be awarded an upward adjustment in rates, when very possibly better management would have made such an award unnecessary. Obviously such a procedure was an injustice to the live manager, and frequently served to discourage honest effort.

Fortunately, regulating commissions are coming closer and closer to the realization that penalizing inferior service and rewarding satisfactory service regardless of profits is a much more equitable arrangement, and is a step in the right direction.

But there is still much to be done. As yet, except in one or two isolated cases, there has been no attempt to define satisfactory service, or to establish definite grades of service. The present methods of establishing rates through court procedure are slow, uncertain, and costly, and because of this are still too often unfair. It will not be an easy matter to establish definite rates for definite grades of service, but if done it will eventually facilitate the work of commissions and serve to encourage those companies that are in the business for the pleasure and prestige as well as profits that come with the rendering of first class telephone service.

Death of Howard Spencer Baker

IT is with very real regret that we have to record the death of Mr. Howard S. Baker, of Sioux City, Iowa, who passed away suddenly on the afternoon of September 9th, at the age of 60 years. For the past 16 years Mr. Baker had been President and General Manager of the Sioux City Telephone Company, and under his care and constant personal attention the company prospered until it has become one of the most successful in the United States.

Besides being an active worker in the business life of Sioux City, Mr. Baker figured prominently in social and club life. He was an organizer and one time president of the Sioux City Country Club, president of the Sioux City Boat Club and a charter member of the B. P. O. E. The deceased is survived by his widow, one son, and a brother.

Mr. James A. Rae, formerly General Superintendent of the Sioux City Telephone Company, has been appointed Vice-President and General Manager and will take over the active management of the company.

(*Continued from page* 89)

an alliance with a sales organization, the International Automatic Telephone Company of London, was entered into.

The new company operates outside the United Kingdom only, and having succeeded in securing a valuable range of foreign contracts, may be regarded as an economic venture which has thoroughly justified itself. Among the installations which are already well under way are the following:

Buenos Aires, Argentine,
Iriondo, Argentine,
Cordoba (extension), Argentine,
Dalvy, Manchuria,
Basra, Mesopotamia,
Poona, India
Lahore, India
Shanghai, China,
Teishinshho, Japan.

In addition to these, several valuable inquiries are under consideration, and promise to develop into orders at an early date.

Both at London and Liverpool, first-class engineering staffs have been organized. Experienced telephone engineers from all parts of the country have been brought into the service of the company. In addition to this, through the continual preservation of the close relationship between Automatic Electric Company and their British associates, the latter are able to avail themselves of all the information and experience gathered by the former company during their many years of activity.

With the talent now under the control of the British company, and the engineering information and resources placed at their disposal, their clients throughout the world are assured of the very latest information on the Strowger Automatic system and the most expert handling of any problems that may confront them now or at any future time.

Van Wert's New Automatic Exchange

Modern Strowger Switchboard Replaces Local Battery Three-Wire System of Van Wert (Ohio) Home Telephone Company. Outside and Inside Plant Completely Reconstructed

THE final step in the rehabilitation of the Van Wert Home Telephone Company's plant at Van Wert, Ohio, was completed on the night of Saturday, August 27th, when a new 1500 line Strowger Automatic Switchboard of the latest type was cut in service, replacing a three-wire, local battery, push button system that had been operating successfully since 1904.

The work of re-construction has been going on for nearly three years and the completion sees an entirely new plant, both inside and out. All line construction within the corporation limits is of cable and placed underground in concrete.

To house the new central office equipment a handsome new two story building has been erected, fronting on Market Street. The first floor of the building is occupied by the executive offices and commercial department. The second floor contains a public reception room and operators' quarters in front, and the Automatic switchboard in the rear.

The Automatic switchboard installed has a capacity of 1,400 individual lines, and 100 P. B. X. Trunks, and includes the customary toll switches for the use of long distance operators. In general, the switchboard has a trunk capacity of approximately 10% throughout.

The cutover process was somewhat complicated by the fact that it was not possible to remove the old three-wire telephones until after the cutover was complete, since the three-wire switches cannot be operated from the new type telephones. As a result, for some time preceding the cutover, each subscriber had two telephones in his residence or place of business. Press announcements and directory instructions were very effective in practically eliminating the confusion which might otherwise have resulted.

BREAKING OLD HABITS

One case was discovered where a subscriber, failing to get his connection, admitted the fault was his because of an attempt to use his old telephone in connection with the new equipment, and pleaded seventeen years' of habitual use of the old telephone

General View of Switchroom

The New Building of the Van Wert Home Telephone Company

as an excuse. Another subscriber said he could not use his telephone because "he could find no push-button on it." One or two such cases as these occurred immediately after the cutover, but on the whole the amount of confusion was remarkably small.

It is said that it is an ill wind that blows nobody any good. Conversely, a telephone system that pleases everybody is probably too good to be true. One or two subscribers remarked upon the substitution of Automatic ringing for push-button ringing as a deplorable feature. Formerly many persons would call up at a friend's house, and if they wanted Mary they pressed the button twice; if they wanted John they rang three times, etc. But now only one kind of ring can be given, and this is an Automatic, intermittent one.

The cutover was witnessed by a number of telephone men from various parts of the state, and by officials of the Van Wert company, including Mr. J. W. Longwell, General Manager, and Mr. McKeddie, General Superintendent. The installation was superintended by Mr. V. L. Bunkleman, and the cutover procedure by Mr. C. F. Ingerman of Automatic Electric Company.

Illinois Association Holds Successful District Meeting at Bloomington

ON Wednesday, Sept. 7th, The Illinois Independent Telephone Association held a very successful meeting at Bloomington, Illinois.

Mr. Thos. Ainesworth, Manager of the Kinloch-Bloomington Telephone Company, at Bloomington, had engaged the Chamber of Commerce rooms for the Convention, and this provided the visitors with very comfortable quarters, suitable for a meeting of that character.

The day proved to be bright and sunny, so that early in the morning, telephone men and telephone operators within a radius of 100 miles, started for Bloomington, a great majority going by automobile.

Dr. R. E. Gordon of El Paso, Ill., President of the Association, presided over the men's meeting, while W. S. Vivian of Automatic Electric Company, Chicago, Ill., conducted the operators' school in an adjoining room.

Dr. Gordon, after calling the meeting to order, introduced Mr. W. S. Ferguson, of Lynton T. Block & Company, St. Louis, who gave a very interesting talk on utility insurance. He explained various kinds of insurance, liability, and their participating or reciprocating features.

Following Mr. Ferguson, Mr. E. D. Glandon, General Manager of the Pittsfield Telephone Company of Pittsfield, Illinois, described numerous short cuts in accounting methods that have proved of value to him.

Following lunch, Dr. Gordon and Mr. Jay G. Mitchell, the Secretary and Treasurer of the Association, gave talks outlining the necessity of advertising to secure public good will. The speakers argued that this is the time when telephone companies should, by means of publicity and in other ways, take the public into their confidence, and overlook no opportunity to cultivate the good will of their subscribers, patrons, and the general public.

Following this part of the program, an open forum was held, in which everyone participated. The attention given to the discussions in both the men's conference and operators' school, showed that all were greatly interested, and the meeting was considered by those present as being one of the most successful of the many district meetings which have been held.

All are expecting a Banner Convention in both interest and attendance at the annual meeting to be held in Springfield, Nov. 8th, 9th and 10th.

Seven Messages in Three Minutes by Means of Dial

THE following incident which came to light recently, is one of the many that are continually occurring to illustrate the comparative speed in the setting up of Automatic and manual telephone connections.

It was during the Winter of 1920-21, when industry was just beginning to recover from the coal shortage which had necessitated drastic economies in the consumption of fuel.

In a large city in the middle west, the Department of Electricity is provided with a P.A.X. (Private Automatic Exchange), with private lines leading to the seven municipal substations from which points are controlled the city's street lighting circuits.

For some weeks, because of the shortage of fuel, the streets had been kept darkened at night. One evening the situation appeared to be somewhat relieved, and it was decided to have the street lamps turned on.

A clerk in the office of the Commissioner of Electricity dialed the number of each of the municipal substations in turn, and gave instructions to have the city streets illuminated. These instructions were completed in a little less than three minutes.

At the same time it was desired to reach the seven corresponding substations of the company that generates and distributes the current for that city, to give instructions to release current to the municipal substations. These instructions, of course, had to be given over the public (manual) telephone system. Nearly half an hour passed before these calls had been completed. In the meantime the employes in some of the municipal substations were waiting and wondering why current had not yet been released for their use.

Books Received

Three Valuable Publications Recently Released that will be of Interest to All that are Engaged in the Telephone Business in Any Capacity

AUTOMATIC TELEPHONY, by Arthur Bessey Smith, E. E., Mem. A. I. E. E., and Wilson Lee Campbell, E. E., Fellow A. I. E. E. McGraw-Hill Book Co., New York, N. Y.

This book and the authors thereof need little introduction to the telephone world. The first edition, which appeared in 1914, was the first publication to be devoted entirely to Automatic telephone systems and made many enthusiastic friends in the industry. In the second edition, just published, the subject matter has been re-written almost entirely.

Practically every development that has occurred during recent years has been added to the present volume, all circuits and mechanical details have been brought up-to-date and much new material added. The chapters on "Trunking, its Physical Arrangements and Variations" and "Traffic Studies," embody the very latest practices of the manufacturing companies and are of particular importance to the equipment engineer and operating man. Automatic switchboards for rural lines and small exchanges are also treated at length.

Although the subject matter refers principally to the Strowger system as manufactured by Automatic Electric Company and its associated companies in different parts of the world, other Automatic systems, including the rotary and panel type systems of the Western Electric Company, and the North Electric Company's Automanual system are thoroughly covered.

Any telephone man to be successful, cannot afford to neglect the study of the most significant developments in his work. The second edition of this well known book places such developments easily and and in an interesting manner within his reach.

AUTOMATIC TELEPHONE SYSTEMS, by William Aitken, M.I.E.E., A.Am.I.E.E., Vol 1, Benn Bros., Ltd., London.

This is a comprehensive book covering many systems including the following:

Automanual (Coventry Automatic Telephones)
American Automatic Telephone Co.
Lorimer System.
Relay Automatic Telephone Co.
Siemens Brothers.
Strowger System (Automatic Electric Co., Chicago, Automatic Telephone Manfg. Co., Ltd., Liverpool, and associated companies).
Western Electric Panel Type System.
Western Electric Rotary System.

The descriptive matter is preceded by an interesting statement of the development and present status of Automatic telephony, properly emphasizing the importance of Automatic switching at the present time.

The first volume, now available, is devoted to descriptions of the various systems, their mechanism and electrical circuits, with a little about trunking. This book very thoroughly tries out on a large scale a new method of describing circuit operation. The description is written in very small paragraphs, each limited to a single action. Each of these paragraphs is numbered and the same number placed on every wire in the diagram through which current flows in securing that action; a very complete and detailed method of circuit description.

Many of the diagrams are printed on folders, which may be spread out to the right, making it easy to read any page containing a description of a circuit.

The second volume (to appear later) will cover substation equipment, party lines, multi-office systems, measured service, trunking, traffic and power plants.

On the whole these volumes form a valuable addition to the literature of modern telephony.

TELEPHONE SERVICE, U. S. Bureau of Standards, Telephone Division. Superintendent of Documents, Washington D. C.

This bulletin is the result of many months of close study and reasearch by the Bureau of Standards, and serves to clarify many important but formerly obscure points in the rendering of telephone service.

The book begins with an interesting history of telephone development and follows with a semi-technical description of the various types of plant equipment in use to-day and the way in which they attempt to meet modern telephone service requirements.

Attention is directed particularly to the section entitled "Principal Elements of Telephone Service," which describes in detail the various points to be considered in the grading of telephone service. Rate problems and commission laws are also fully treated. At the end of the book many valuable statistical tables are presented.

This volume is of value to all telephone men, and particularly to operating men and others who are entrusted with the task of rendering telephone service to the public.

Some Interesting Figures on Dial Maintenance Cost

ONE of the favorite contentions of those that doubt the validity of complete Automatic operation of telephone systems is that the calling device, with which each Automatic telephone is equipped, is too delicate a piece of mechanism to be entrusted to telephone subscribers, the great majority of whom are unfamiliar with mechanical movements and forces.

Mr. A. B. Clark, Operating Manager of the United Home Telephone Company, Muskegon, Mich., has kept careful records of the labor and material costs in maintaining the calling devices used by the subscribers of the Muskegon exchange, which has been operating automatically for about six years.

The maintenance data recently received cover the twelve-month period ending December, 1920. During this period there were an average of 4600 calling devices in use and of these only 382, or 8.3% required attention. Since most of these calling devices have been thoroughly tested by six years' of ordinary operation, these figures indicate that in the average case a calling device would require attention only once in twelve years.

The total material and labor cost was $192.32, or an average of about five cents per dial per year, a really insignificant amount when set off against the contentions of those who still oppose Automatic on the grounds of excessive dial maintenance cost.

Indiana's Good Convention

"Service" and "Co-operation" were the Keynotes of the Second Annual Convention of the Indiana Telephone Association. Wide Variety of Interesting Topics Discussed. Manufacturers' Exhibits Prove Great Attraction

THAT the telephone men of Indiana are live and up to date in every way was evidenced by the success of the second Annual Convention of the Indiana Telephone Association, which was held September 13th and 14th at the Severin Hotel, Indianapolis.

The program and the speakers back of it were altogether excellent, and great interest was manifested in the live and interesting subjects discussed. It was felt that a large number of managers left the Convention feeling that many of their personal problems had been answered either in part or in full by those that took part in the discussions.

When on Tuesday morning, September 13th, the Hon. Henry A. Barnhart, President of the Association, called the meeting to order, practically all of the 250 who had registered were present.

After expressing his pleasure at seeing such a fine attendance, he introduced to the Convention the Governor of Indiana, Hon. Warren T. McCray. Mr. McCray's address was of the kind that wins the confidence and good will of every audience. It was not necessarily a telephone talk, but a frank heart-to-heart talk on the responsibilities he had in his position as Governor. He told his audience of the kind of government he was trying to put into active effect and of the type of men that he was appointing to office. He alluded to the Public Service Commission and the members he had appointed, and indicated that he was well satisfied with his choice and with the results they were obtaining.

The Governor's address was followed by a formal address by the President, Mr. Barnhart. Mr. Barnhart reviewed the work of the association and outlined the need for more aggressive work for the future, emphasizing the need for having every company in the State of Indiana as a member, and not only as a member, but as an active member of the Indiana Association.

Next on the program was the Hon. Geo. M. Barnard, of the Indiana Public Service Commission. Judge Barnard's address was on the subject of Government, but before taking up this subject, he made an earnest plea to the telephone men of Indiana for fair play and co-operation. He asked that telephone men give the Commission a fair chance and a careful study of all matters before condemning its members.

Mr. F. O. Cuppy, Secretary of the State Association, presented the Secretary's report.

Mr. F. B. MacKinnon, President, U. S. Independent Telephone Association, Chicago, was the next speaker, and discussed with the Convention three different subjects. First: The necessity of solving the problem of inductive interference. Second: The necessity for getting more prompt relief where increased rates are necessary. Mr. MacKinnon emphasized the need of classifying exchanges so that an exchange of a certain size operating under certain conditions and rendering a certain grade of service, would take the rate of its class. He said that at the present time with some companies managed efficiently and others inefficiently, while both the size, amount of investments, expenses, etc., are the same, and they get the same rate, the service in one is very superior to that of the other. Mr. MacKinnon's third topic was excess profits taxes.

When Mr. MacKinnon was introduced, he mentioned that it was the first time he had been able to meet with them since they had married into the Bell family. He mentioned, however, that he was very well acquainted with their mother-in-law down at New York, and that he had found from experience that mother-in-laws usually had their own way about things.

NECESSITY FOR PUBLICITY

When Mr. J. G. Brown, President of the Indiana Federation of Farmers' Associations, was next introduced, he asked how many in the audience had been raised or had worked on farms. Practically the entire audience responded. Mr. Brown gave a most interesting talk from the farmer's viewpoint. He very frankly stated that from the farmer's viewpoint, it did not look a bit right to have telephone rates increased when everything else was apparently coming down in price. He frankly admitted that his relations with the telephone business had always taken the form of objecting to increases in rates and finding fault with the service. He explained this by further stating that the farmers objected to increases in rates mainly because they assumed that the telephone companies had always made good profits in the past, and that their future looked bright. The lesson to be learned from this is unquestionably that telephone men everywhere not only need to know the facts as they see them, but must take every possible opportunity to make their patrons fully informed of their business.

The talks given by Mr. F. V. Newman, of La Porte, President of the Northern Indiana Telephone Association; L. W. Conarroe, of Brookston, representing the Benton Telephone Association; W. L. Bott, of Rensslaer, President of the Jasper County Telephone Company, describing the history, purposes and objects of their respective associations, were most interesting. Those who were present could not help but realize that there was a great value in such organizations, that there was a real field for them and a need for the work they are doing, and that they should get together even more often rather than less often.

Mr. S. M. Isom, of Mitchell, President of the Southern Indiana Telephone Company, gave a most interesting address on Public Relations. Mr. L. C. Griffitts, of Seymour, Secretary and Treasurer, Southern Indiana Telephone Association, presented his views as to the future telephone business.

On Wednesday, Mrs. A. T. Cox, Director, Department of Women and Children, Indiana Industrial Board, presented an interpretation of female labor laws as affecting telephone companies. This was listened to with great interest. All telephone managers realized that operators are and for several years past have been a real problem. The information given by Mrs. Cox simply showed that they were even more of a problem than many had supposed.

On Wednesday afternoon, Mr. A. C. Lindemuth, of Richmond, ex-President, National Independent Telephone Association, gave an interesting address on the origin and development of district, state and national associations. Mr. W. S. Vivian, of Chicago, Manager Public Relations Department, Automatic Electric Company, made a plea for a more thoroughly active organization and for greater publicity. Mr. Frank E. Bohn, General Manager of the Home Telephone and Telegraph Company, Fort Wayne, gave a most inspiring address, using for his text the word "Courage."

The manufacturers' exhibits on the twelfth floor were very complete both as to variety and type. The array of modern plant devices and equipments excited great interest. Prominent among these were the various types of central office switchboard equipment, of which probably none attracted greater attention than the Strowger Automatic exhibit.

Most of the visitors were unanimous in their enthusiasm for the Strowger system and expressed the opinion that it is coming more and more to be recognized as the only solution to the problem confronting the telephone managers today.

Standard Nomenclature for Telephony

List of Definitions Reprinted from Chapter XII of the Standards of the American Institute of Electrical Engineers

(Concluded from last month)

12229 **Superimposed Ringing Current.**—A superimposed ringing current is a combination current for ringing, consisting of a direct and an alternating current.

12230 **Pulsating Ringing Current.**—A pulsating ringing current is current for ringing in which the succeeding impulses are separated by intervals approximately equal to those of the impulses themselves.

12231 **Harmonic Selective Signaling.**—Harmonic selective signaling employs devices tuned mechanically or electrically to the frequency of the ringing current, so that each device will not operate when receiving current intended to operate another device.

12232 **Multiple Harmonic Signaling.**—Multiple harmonic signaling employs frequencies which are integral multiples of the lowest frequency.

12233 **Non-Multiple Harmonic Signaling.**—Non-Multiple harmonic signaling employs frequencies which are not integral multiples of the lowest frequency.

12234 **"To Call".**—"To call" is to originate a telephone call.

12235 **"To Dial".**—"To dial" a number is to use a dial type of calling device in order to control automatic switches.

12236 **"To Set Up".**—"To set up" a number is to use a key type or multiple lever type of calling device in order to control automatic switches.

12237 **Calling Device.**—A calling device is an apparatus by means of which automatic switches are controlled for the purpose of establishing a connection.

12238 **Calling Party.**—A calling party is a person who originates a telephone call.

12239 **Called Party.**—A called party is the person who answers when a station is called.

12240 **Reverting Call.**—A reverting call is one between two stations on the same subscriber line.

12241 **Telephone Traffic.**—Telephone traffic is the aggregate volume of communication handled in a given time.

12242 **"Busy."**—"Busy" is the condition of a line or an apparatus when it is in use.

12243 **Free.**—Free is the condition of a line or an apparatus when it is not in use. Free is the opposite of busy.

12244 **"To Make Busy".**—"To make busy" is to cause a line or an apparatus to appear to be busy.

12245 **"To Release" or to "Disconnect".**—"To release" or "to disconnect" is to terminate a telephone connection by disengaging the apparatus.

12246 **"To Clear".**—"To clear" is to restore a line or an apparatus to the free condition.

12247 **Trunk.**—A trunk is the wire connection between switching devices or central offices.

12248 **Trunk Circuit.**—A trunk circuit is a trunk with its associated individual apparatus.

12249 **Trunked Call.**—A trunked call is one which employs an interoffice trunk or a trunk between two switchboard positions.

12250 **Relay.**—A relay is a device by means of which contacts in one circuit are operated by a change in conditions in the same circuit or in one or more associated circuits. (See Rule **4016** standardization Rules, A. I. E. E., 1918).

12251 **Polar Relay.**—A polar relay is a relay which operates in response to a change in the direction of the current in the controlling circuit.

12252 **Quick Operating Relay.**—A quick operating relay is one which operates its contacts within a specified brief time limit.

12253 **Quick Release Relay.**—A quick release relay is one which releases its contacts within a specified brief time limit.

12254 **Quick Acting Relay.**—A quick acting relay is one which has the properties of both a quick operating and a quick release relay.

12255 **Slow Operating Relay.**—A slow operating relay is one which will not operate until after a specified delay.

12256 **Slow Release Relay.**—A slow release relay is one which when operated will not release until after a specified delay.

12257 **Slow Acting Relay.**—A slow acting relay is one which has the properties of both a slow operating and a slow release relay.

12258 **Line Relay.**—A line relay is one whose coil is normally in the line circuit.

12259 **Cut-Off Relay.**—A cut-off relay is one which when operated disconnects from a line apparatus normally connected to it.

12260 **Relay Coil Section.**—A relay coil section is one of two or more windings of a coil on one and the same core. The several sections may be concentric or placed side by side on the core.

12261 **Tension Spring.**—A tension spring is one which functions to exert mechanical pressure but does not carry an electrical current.

12262 **Contact Spring.**—A contact spring is one which takes an electrical part in switching a circuit.

12263 **Main Contact Spring.**—A main contact spring is one which may switch a circuit between two or more other contact springs.

12264 **Armature Spring.**—An armature spring is the first of a group to be moved by the armature. It may or may not be a main contact spring.

12265 **Plunger Spring.**—A plunger spring is the first of a group to be moved by the plunger.

12266 **Impulse Springs.**—Impulse springs are those which act to make or break a circuit for the purpose of sending impulses.

12267 **Make-Before-Break Contact Springs (Abbreviation "M.B.B.").**—Make-before-break contact springs are those in which the main spring touches the front contact before it breaks away from the back contact. Also called a continuity preserving contact.

12268 **Back Contact Spring.**—A back contact spring is one against which the main contact spring rests when in the normal position.

12269 **Front Contact Spring.**—A front contact spring is one against which the main contact spring rests when in the operated position.

12270 **Automatic Signaling.**—Automatic signaling is effected without the aid of an operator.

12271 **Automatic Switch.**—An automatic switch is a remote control device for controlling talking or signaling circuits.

12272 **Finder Switch.**—A finder switch is a switch connected to one of a smaller number of circuits and which finds automatically a circuit out of a larger number of circuits from whence the signal comes.

12273 **Line Switch.**—A line switch is a switch connected to one of a larger number of circuits from which a signal comes and which finds automatically a circuit out of a smaller number of circuits.

12274 **Selector Switch.**—A selector switch is a switch whose duty is to select a particular group of trunks and one trunk of the group selected. In particular cases, one of these functions may be omitted.

12275 **Connector Switch or Final Selector.**—A connector switch or final selector is a switch whose duty is to establish a connection with the called line. It is usually operated by the last digit or digits of the call number.

12276 **Switch Frame.**—A switch frame is a structure for mounting an assembly of switching apparatus which may be integral therewith.

12277 **Section of Switches.**—A section of switches, considered from a trunking standpoint, is a group of adjacent switches whose banks are multipled together.

12278 **Switchroom.**—A switchroom is a room which contains an assemblage of automatic switches and associated apparatus.

12279 **Bank Wires.**—Bank wires are those wires which multiple adjacent switch banks to each other.

12280 **Bank Cable.**—A bank cable is one which connects a switch bank to a terminal rack.

12281 **Multiple Cable.**—A multiple cable is one which multiples together two or more sections of switch banks by connecting together their terminals.

12282 **Impulse.**—An impulse is any sudden change of brief duration in the current of a circuit.

12283 **Make Impulse.**—A make impulse is an impulse due to a temporary flow of current.

12284 **Break Impulse.**—A break impulse is an impulse due to a temporary interruption of current.

12285 **Impulse Frequency.**—The impulse frequency is the number of impulses occurring per second. The reciprocal of this is the impulse period.

12286 **Impulse Period.**—The impulse period is the period of time included between the corresponding points in periodically recording impulses. It thus corresponds to the period of alternating current.

12287 **Impulse Ratio.**—Impulse ratio is the ratio of duration of an impulse to the impulse period.

12288 **Impulse Circuit.**—An impulse circuit is one through which impulses are transmitted.

12289 **Telephone Impulse Repeater.**—A telephone impulse repeater is a device for repeating impulses from one line circuit into another and for performing other duties.

12290 **Supervisory Signal.**—A supervisory signal is a device for attracting attention of an attendant to a duty in connection with switching apparatus or its accessories. This includes cord supervisory lamps on a manual switchboard and the supervisory lamps in an automatic exchange which indicates that a switch has been occupied but has not completed its function.

12291 **Tell-Tale Signal.**—A tell-tale signal is a device for locating the failure of some apparatus; for example, the blowing of a fuse, the continued drawing of heavy current by apparatus intended to receive only momentary current, etc.

12292 **Alarm Signal.**—An alarm signal is a sound producing device for attracting attention to either a supervisory or tell-tale signal.

12293 **Amplifier.**—See #13040.

12294 **Telephone Repeater.**—A telephone repeater is a device for amplifying a voice current from one line circuit into another line circuit.

12300 **Telephone Receiver.**—A telephone receiver is an electrically operated device designed to produce sound waves or vibrations which correspond to the electromagnetic waves or vibrations actuating it.

12301 **Microphone.**—A contact device designed to have its electrical resistance directly and materially altered by slight differences in mechanical pressure.

12302 **Telephone Transmitter.**—A telephone transmitter is a soundwave-operated or vibration-operated device designed to produce electromagnetic waves or vibrations which correspond to the sound waves or vibrations actuating it.

12303* **Coefficient of Coupling of a Transformer.**—The coefficient of coupling of a transformer at a given frequency is the ratio of the mutual impedance between the primary and secondary of the transformer, to the square root of the product of the self-impedances of the primary and of the secondary.

12304 **Repeating Coil.**—A term used in telephone practice meaning the same as transformer, and ordinarily a transformer of unity ratio.

12305* **Retardation Coil.**—A retardation coil is a reactor (reactance coil) used in a circuit for the purpose of selectively reacting on currents which vary at different rates.

(12303) Single frequency voltages and currents are here supposed to be represented by complex numbers. Their ratio is therefore a complex number.

(12305) In telephone and telegraph usage, the terms "impedance coil," "inductance coil," "choke coil" and "reactance coil" are sometimes used in place of the term "retardation coil."

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

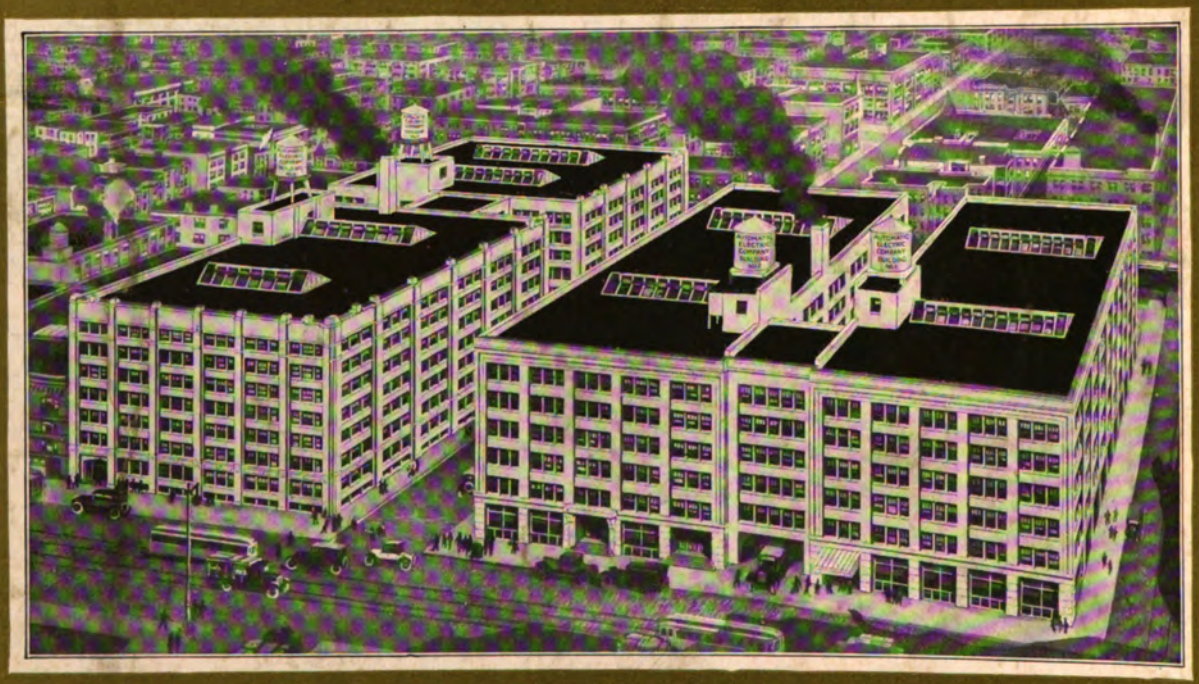
International Automatic Telephone Company, Ltd.,
60, Lincoln's Inns Field, London, W. C. 2

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

Automatic Telephones (Australasia), Ltd.,
77 King 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.