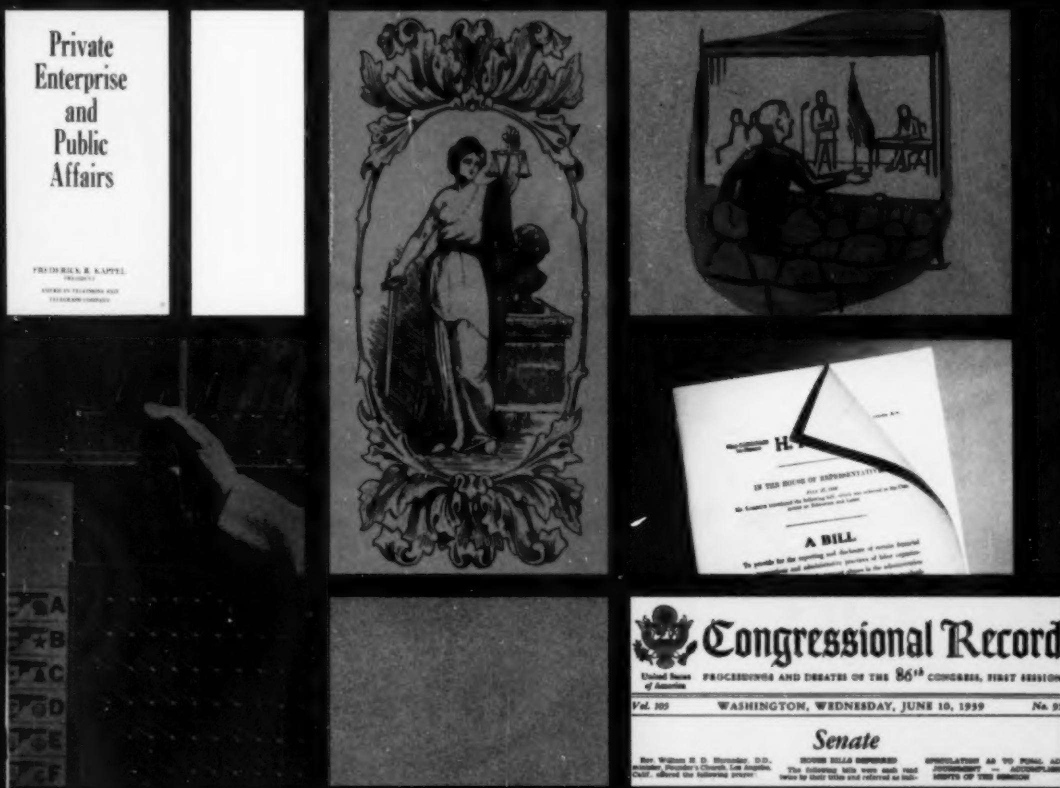
Bell Telephone MAGAZINE

WINTER 1959-60



Public affairs—every citizen has an obligation

IN THIS ISSUE

VOLUME XXXVIII NUMBER FOUR WINTER 1959-60

Bell Telephone MAGAZINE

A non-technical review, published quarterly to give Bell System management people a broader view of the history, objectives, operations, and achievements of this business than they might attain in the course of their day-to-day occupations, and an added sense of participation in the problems and accomplishments of our nation-wide public service.

Cover: The design by Salvatore J. Taibbi, this magazine's art editor, suggests some of the elements of public affairs as discussed in the article on page two of this issue.

A MEDIUM OF SUGGESTION and A RECORD OF PROGRESS

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Here are some observations on the duties of every citizen—his obligations to the political life of his country—some hopes and some pitfalls

Some Thoughts on Public Affairs

Charles W. Ebersold, *Assistant Vice President*
PUBLIC RELATIONS DEPARTMENT, A. T. & T. CO.

AMERICAN BUSINESS PEOPLE are beginning to face up to their total political responsibilities more effectively than they have for at least a generation—perhaps more effectively than they ever have.

We are rediscovering an old truth—that we live in a political economy, with the adjective often more important than the noun. And we are realizing the significance of this truth as the state continues to spread its influence over both our private and our business lives.

Big government has come on with a rush in the last 30 years. It has been estimated that, of all persons employed in the United States in 1929, one out of 24 worked for the government (national, state or local)—today the figure is about one out of six.

The Citizen's Duty

In fact, government has become so important in our lives that it simply can't any longer be ignored by anyone, anywhere, anytime. It needs the personal attention of every citizen, every day. Our society has reached the point where there are laws dealing with housing, rents, wages, prices, employment, food, communications, farming, transportation, amusement. You name it and you can almost be sure that we have laws or regulations — and proposals for *new* laws and *new* regulations as well.

The old attitude is being shaken off

for another and better reason, too—the recognition that in a republic all citizens have the duty to participate in the political processes.

The Bell System companies have been reappraising their public affairs policies. One expression of such a policy can be found in the talk given at the Bond Club of New York a little more than a year ago by Mr. F. R. Kappel, president of A.T.&T.

". . . to engage in political affairs as individuals . . ."

The Corporation's Role

The Company, as a corporation, will not take part in partisan politics, he said, nor will it take a position on individual candidates. However, it will speak out for or against laws and regulations that affect the operations of the business.

And it will try hard and continuously to make sure that the Company's objectives and policies are fully understood by government officials.

Employee Action

Mr. Kappel also pointed out that employees will be encouraged, as individual citizens, to become more effective in public affairs:

"I am not talking about running for office and holding down a management job at the same time. Though there may be exceptional cases, generally the two do not mix. I think it might be difficult, for example, to be the mayor of a city and at the same time manager of the local telephone exchange. On the other hand, there will be situations where there is no possible conflict of interest, and one person can handle two jobs well. Circumstances alter cases. And quite apart from office-holding, I see every reason for encouraging people in business to engage in political affairs, as individual citizens, and no possible reason for discouraging it."

Another Pressure Group?

The cynic may say that such a policy is merely an attempt by business management to form a pressure group in its own selfish interest. The cynic may say a lot of other things, too. He

". . . an obligation to make opinions felt . . ."

". . . the very minimum obligation is to vote . . . thoughtfully."

is entitled to his opinions. But in the Bell System case he is wrong; and, as Roy Campanella reportedly said of one of his teammates, "he's not only wrong, but he's loud wrong."

The reasoning behind the policy is quite simple.

First:

- In a republic all citizens have the obligation to participate in public affairs.
- Bell System people are citizens.
- Therefore, Bell System people should participate in public affairs.

Second:

- The country will benefit from such participation.
- The Bell System is part of the country.
- Therefore, the Bell System will benefit.

The policy on individual action is a policy without pressure — focused on every employee's duty to be a responsible citizen.

Thus a beginning has been made. Yet, in the words of a famous French scientist — "beginnings have an irritating but essential fragility." The handle-with-care label must be attached to programs that are being drawn to carry out such policies. We are dealing with basic human rights and this, of course, must always be done with dignity and understanding.

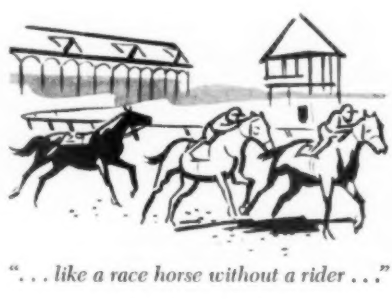
What is 'Participation'?

For example, "participation" should be broadly defined, since there seems to be a tendency to pin it down to rushing out and trying to become an official of a local political club. It seems to me that this is much too narrow an interpretation — and a dangerously restrictive one. Participation might mean anything from becoming a better informed and more articulate citizen to becoming a party big-wig. There is plenty of room for both, and for all the shades between.

Whatever course we may choose to take, certainly the very minimum obligation—the threshold to good citizenship—is to vote regularly and *thoughtfully.* The country has a right to this and the business expects it of its employees.

Some Pitfalls

Probably one of the pitfalls of programs to encourage participation is that they will lack staying power unless very great emphasis is placed on



". . . like a race horse without a rider . . ."

people becoming better informed and more thoughtful citizens. We have to equip ourselves so that we shall be better able to judge the effects of various courses of political action — be able to debate them with understanding and conviction. This self-education is a tough, long-range proposition. In fact, it never ends. But without it public affairs programs will be doomed to the short life of all fads.

Participation, without knowledge, is like a race horse without a rider. If we merely encourage a dash "into politics," we are grasping at shadow, not substance, and will surely fail.

Business men will have to dig deeply if they are going to help solve the problems of inflation, trade deficits, subsidies, debt management, education, etc., but they have the brains and the energy to make an important contribution to the political life of the country, if only they will. On the corporation's responsibility to its people in this area, Mr. Kappel said, in part:

> ". . . I certainly think we should do the most we can — and that is more than we have been doing—to discuss policies and issues and call attention to their impact."

We as individual citizens have an obligation to make our opinions felt. And those who do will be better men for it.

There are risks. But with or without business men's participation the laws will be passed, the taxes levied, the regulations issued. Can any one of us honorably say: "I'll sit this one out"?

". . . self-education . . . never ends . . ."

How can we provide enough country-wide telephone numbers to meet future growth, new services? This new numbering plan is a practical answer

New Numbers for Tomorrow's Telephones

William A. Sinks, *Traffic Facilities Engineer*
OPERATIONS DEPARTMENT, A. T. & T. CO.

EACH WORKING DAY, about 17,000 telephones are added to the 76,000,000 now in use in the United States and Canada. That means 85,000 by the close of business each Friday, over 340,000 by the end of the month—more than four million by the year's end.

Providing the facilities that permit all the new millions of telephone users to communicate swiftly and easily is an undertaking of staggering dimensions. But there is an important behind-the-scenes aspect of meeting this rapid growth that is little understood and often taken for granted – the problem of providing telephone numbers. Yes, there are enough telephone numbers—now. But are there enough available to meet future growth and to satisfy the many new services as they appear on the horizon?

Most of the 17,000 telephones added today, tomorrow and the day after require a telephone number and all of them are or will be a part of the Direct Distance Dialing network. Within this framework, each telephone number that is used country-wide consists of ten characters which are distinctive and do not conflict with any other country-wide telephone number in the numbering plan.

Here, then, is the real question: Is there enough capacity in our present numbering plan to meet the needs of the future – is there enough to keep step with the steady increase in the use of the telephone in a time when distance is becoming less and less a barrier to communications?

It has often been said that a panoramic study of the past equips us more ably to predict the future. If this is true for social, political and economic changes, might it not also be helpful in forecasting telephone number requirements? So, before attempting to predict the adequacy of our numbering plan, let us pause and review the brief history of the present arrangement.

The Present System

By the middle 1930's, it was evident that the Operating Companies, in order to provide customers with faster, more accurate and more economical long distance service and to keep pace with the ever increasing message volume, would have to turn to mechanization. This resulted first in "Operator Toll Dialing" and later in customer Direct Distance Dialing (DDD), whereby the long distance operator or customer could dial directly to the desired telephone.

In implementing this program for mechanization, a numbering system was a necessity. Each telephone in the United States and Canada, whether Bell owned or independent, required a

Additional Numbering Plan Area *codes have been required in 26 states and provinces since 1947. Here C. M. Conway, C. Clos, T. V. Ashton, J. P. Ringland of A. T. & T. Traffic discuss the introduction of two new numbering plan areas in northern California.*

country-wide number. As a result, our present numbering plan was adopted. Under this system, local numbers consisting of the first two letters of a central office name plus five numerals are used over and over again. Country-wide numbers consist of the local number preceded by a distinctive three-digit area code, thus resulting in a ten-character number, as for example 718 TRiangle 3-9970.

Under the present numbering plan, the first three numerals of the ten characters always have "0" or "1" as the middle numeral. These three numerals identify the specific area (Numbering Plan Area—"NPA") in the United States or Canada to which a call is to be directed. The next three characters, known as the central office code and distinguishable because of the letter designations and the absence of "0" or "1" in the middle, identify the appropriate local central office within the NPA while the last four numerals constitute the telephone line number.

With ten numerals on a telephone dial, there are potentially 200 (10 x 2 x 10) NPA codes available. However, the numeral "0" is used for reaching the operator and the numeral "1" was not initially considered usable as the first numeral of an NPA code because of the need to protect against preliminary pulses. Such pulses usually resulted from unintentional operation of the switchhook before dialing. Therefore, there are 160 (8 x 2 x 10) potential NPA codes. Of these, 152 are reserved for NPA code use and 8 (those with the numeral "1" in both the second and third places) are reserved for information, repair and other special services.

In 1947, 86 NPA codes were assigned in the United States and Canada. This code requirement was based on the "ultimate growth requirements in central offices" for both Bell and independent companies and reflected "a forward looking estimate for a long period of years."

Numbering plan area boundaries were drawn to coincide with state and province boundaries wherever possible to assist operators and customers in identifying the proper NPA code. One code was adequate for each of the

The numbering plan area assignments as of January 1, 1960 are shown above. There are 117 numbering plan areas in the U. S. and Canada now compared to 86 in 1947. Color shows where new area codes have been assigned.

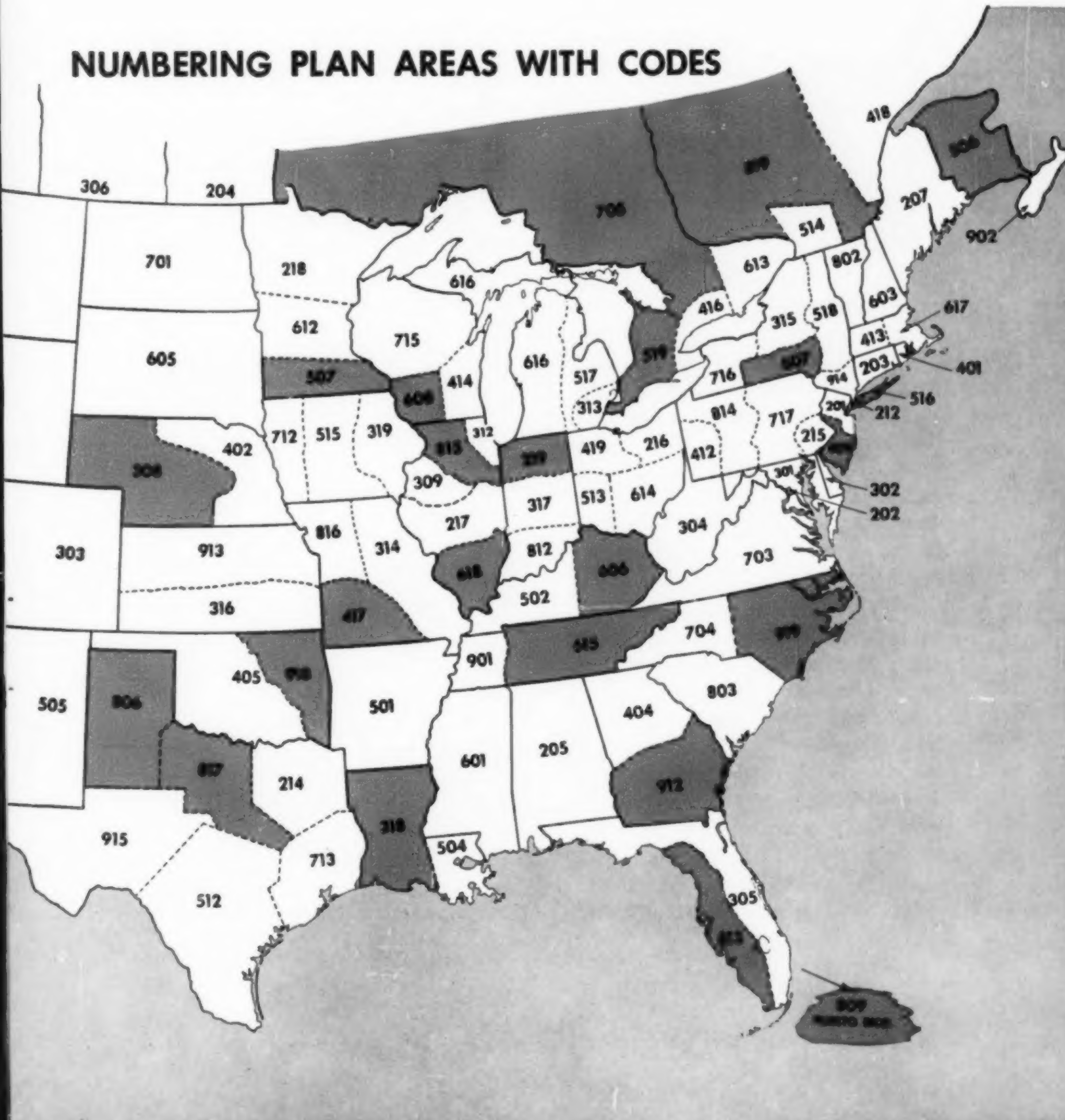
states and provinces except for 16 where two or more were necessary.

Needed: Greater Capacity

A margin of 66 (152–86) unassigned NPA codes was thought to provide adequate safety in the capacity of the numbering plan to meet all unforeseen developments beyond 1947. Yet, in the ensuing 12 years, assignment of 31 additional codes has been necessary. The number of states and provinces requiring two or more NPA codes has grown from 16 to 26 during this period.

The rapid post-war telephone growth has been largely responsible for the need for the additional area codes. Today, only 12 years after the numbering plan was conceived, it is anticipated that its capacity will be exceeded by the mid-1970's.

NUMBERING PLAN AREAS WITH CODES



Uniformity and Flexibility

Besides the need for a numbering plan of greater capacity in the forseeable future, there are some current but associated considerations involved.

For the most successful use by customers of Direct Distance Dialing service, it is very important that the dialing procedures be uniform, uncomplicated and easy to understand. Unfortunately, the wide variety of facilities already in service has brought about considerable non-uniformity. For instance, customers making DDD calls to Newark, New Jersey, dial seven characters from Asbury Park, nine from New York City, ten from Harlingen, Texas, 12 from Hamilton, Ohio, and 13 from Hartford, Connecticut. Uniformity in the way a customer dials should be a major objective in any expansion of our present plan.

Another consideration in any change in the numbering plan is the flexibility with which new services can be introduced and existing services expanded. An example is customer dialing of person-to-person and other special calls that now require full operator handling. Under present thinking, a customer will place this type of call by dialing a prefix followed immediately by the desired seven or ten-character number.

With this service, an operator will be automatically connected to the line just long enough to determine the type of call (e.g., person-to-person, collect, charge to third telephone, etc.) and to take appropriate action. Billing information will be automatically recorded. To date, this new service has been used successfully in two trial offices and customers like it.

Besides direct dialing of person-to-person and special calls, any long range numbering plan must be adaptable to such services as push-button telephones, direct dialing to mobile telephones and to personal signaling sets, direct in-dialing to P.B.X.'s whereby each extension served requires a country-wide telephone number, international dialing and others not forseeable at this time.

Why Act Now?

Our present plan appears adequate for the next ten to 20 years. Is it premature to decide now on how best to expand that plan?

The answer: It is not too early by any means.

Equipment modifications will eventually be required in hundreds of local and toll dial switching offices. These modifications could be extremely costly if made on a "crash" basis. On the other hand, expenditures can be minimized by modifying the switching equipment in conjunction with other equipment changes, e.g., changes required for customer dialing of person-to-person and similar traffic, or in connection with normal additions for growth.

New Numbering Plan

Extensive studies have been made during the last few years to determine the most suitable dialing plan for the future. The studies have included the possibility of eight-character local numbers, of four-digit area codes, the provision of a separate button on telephone sets to identify subsequent digits as NPA codes, and others. However, as the studies have progressed, there seems to be considerable merit in retaining the basic structure of the ten-character concept for country-wide numbers. This will tend to minimize customer difficulties during the transition period and keep the number of characters at a reasonable level.

With this premise, any substantial increase in country-wide telephone numbers must be achieved by overcoming the current limiting feature on the number of NPA's, i.e., the "0" or "1" in the middle place of the NPA code. In other words, provision must be made for using codes with additional numerals in the middle.

Looking ahead, we see that the large majority of all DDD calls will require a prefix. This comprises all person-to-person and special DDD calls and those station paid DDD calls that originate in offices where the type of equipment requires a directing code to reach the long distance network. (Over half of the total customers are served by such offices.) By adding a prefix to only the remaining station paid DDD calls, the new NPA codes can be identified and uniformity in customer dialing can be achieved.

As a result of these and other considerations, the dialing procedure as shown in the table below is planned for general adoption.

With this new dialing procedure, the prefixes "1" and "0" will serve multiple purposes. They will signal the switching equipment that a DDD call is being originated and hence the next three characters may be an NPA code. If the three characters are used either as a central office code in that specific area or a distant NPA code but not both, the dial equipment is able to identify the type of code and route the call properly. If, however, there is a conflict and the code is used for both purposes, further identifying information is required. Receipt of only seven characters following the prefix identifies the first three as a central office code, otherwise an NPA code.

In addition to the use of the "0" prefix for identification of an NPA code, it will also signal the switching equipment to connect an operator to the line on person-to-person type DDD calls. If no characters are dialed immediately following "0", the equipment routes the call to the regular operator.

Use of the prefixes "1" and "0" to identify potential area codes is a Bell System long-range objective. However,

DIALING PROCEDURES ADOPTED BY THE BELL SYSTEM

Local calls	**7 characters**
Station-to-station sent paid calls	**"1" + 7 or 10 characters**
Person-to-person, and special calls . . .	**"0" + 7 or 10 characters**
Assistance calls	**"0"**

in some connecting companies these prefixes may not be feasible. In such instances, other prefixes may be substituted. A substitution, however, does not affect the basic ten-character number concept or the capacity of the expanded numbering plan.

With this prefix plan, what has happened to the number of NPA codes available? Instead of 152 codes of the type with "0" or "1" in the middle, 800 (8 x 10 x 10) will be available with the expanded plan. A sizable increase to say the least!

Central Office Codes

Perhaps we might stop here. But if a prefix is employed to identify a potential NPA code, might not the absence of a prefix be used as identification of a central office code? Might not codes with "0" and "1" in the middle be assigned in the future as central office codes, thus increasing the number of these codes? Might it not be desirable to examine our basic two-letter five-numeral structure of local numbers to determine its adequacy?

First, let us look at some of the reasons for more central office codes.

They will be particularly important in large metropolitan areas. The extensive use of direct in-dialing to PBX's, plus direct dialing to mobile telephones and to personal signaling sets, etc., will result in a sizable increase in the need for central office codes.

One solution, with more NPA codes available, is to split the areas affected into two numbering plan areas. This approach solves the shortage of central office codes. But where does it leave the customer within these areas? He would be required to dial 11 characters to reach many of the same subscribers that he formerly could reach by dialing either seven or eight — more characters required and more dialing errors.

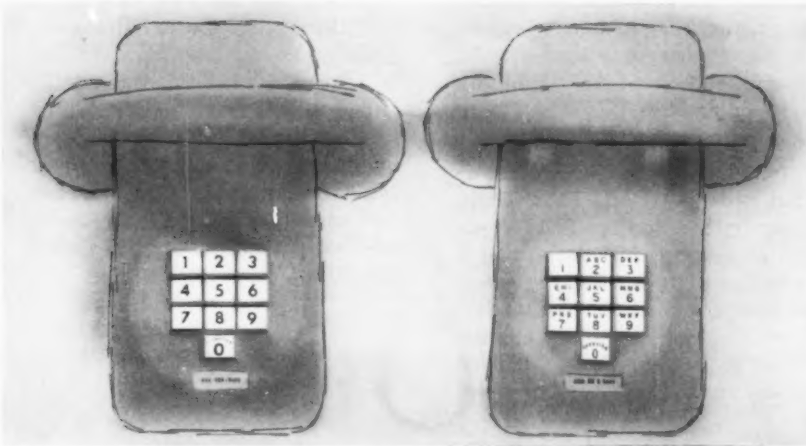
Another and possibly a more serious problem is that the country-wide telephone number for perhaps half of the customers in the original NPA would have to be changed. Customers with DDD in other areas that have occasion to make calls to customers with new country-wide telephone numbers would have to be informed of the change through instruction media, by operators, and other means.

So a better solution would be one whereby more central office codes are obtained. How can this be done? Change the dial to put letters in the "0" and "1" places? Rearrange the letters on the dial to permit suitable names for each numerical combination? Both sound simple, but consider that it would require an installer's visit to change the dial plate on each of the 76 million telephones in the United States and Canada. And, if letters were rearranged, it would mean a number change for millions of telephones. Also, the whole process would have to be accomplished on a "flash cut" basis. Indeed, neither is a practical answer.

'Name' Problems

Even if the dial could be redesigned to make more codes available, the two-letter five-numeral system with central office names is not entirely satisfactory. Customers and operators continue to misspell names, e.g., MU instead of ME for Mercury, LI instead of LY for Lyric. This results in unsuccessful attempts, wrong numbers, customer irritation and occasionally serious customer complaints. Similarly, confusion when dialing between the letter "O" and the numeral zero, and the letter "I" and the numeral one, presents the same problem.

Customers occasionally object stren-



All-Number Calling *would eliminate the need for letters on telephone dials or push buttons. Artist's conception compares conventional and all-numeral button arrangements.*

nously to a particular name selected for their local central office. Objections may be based on the premise that the name selected, GYpsy for example, does not enhance the prestige of their town. The Chamber of Commerce in a locality known as the "Garden Town" objected when "GArden" was assigned as a central office name in a nearby community. A stock insurance company objected to the name "MUtual." Use of names requires a continuing public relations program.

Further, a trend on the part of customers away from using central office names has been developing. Many are using, instead, the first two letters of the name. This is particularly evident in advertising media—billboards, classified ads, displays on motor vehicles. This is a natural trend. All the dial switching equipment requires to complete a local call is seven characters, the first two of which can be letters. Why not adopt this? It sounds logical and sensible—saves space and serves the purpose.

One drawback however—standard central office names were selected to minimize phonetic conflicts and, when spoken, offer little confusion. CEdar, DEwey and TEmple are quite distinctive phonetically. But CE, DE, TE—the letter counterparts—may cause some confusion because of the "E" sounds.

All-Number Calling (ANC)

What appears to be needed is not a numbering system that perpetuates names or letters but one that eliminates them. All-numeral telephone numbers provide such a system. This system is not dependent on letters on the dial or on suitable names for particular combinations of characters. Hence, it makes available additional central office codes and, in addition, eliminates the disadvantages of names and letters. With the new dialing procedure, approximately 800 instead of the 540 usable central office codes under the present numbering plan would be available. Furthermore, ANC can be introduced on a progressive basis. During transition it can be used right along with the present type of numbering by retaining the lettered dial during this period—no problem.

Seven-digit All-Number Calling was first introduced in the Bell System on a trial basis in Wichita Falls, Texas, in January 1958. Previous Bell Laboratories experiments had shown that it was a faster, more accurate system than names, and a field trial was arranged. The trial showed that customers liked the system; that they dialed numbers more quickly and with fewer errors and found it easy to use.

The ability of customers to remember all-numeral numbers has been considered. This ability is difficult to evaluate through a field trial. Consequently, extensive experiments were conducted to determine customer's long and short-term memory ability as well as the way this ability affects performance. Results indicate that all-numeral telephone numbers are about as easy to learn as those with names or letters. Dialing performance was actually somewhat better with ANC.

Based on the favorable results of the trial, ANC is now recommended for all Bell System offices not yet converted to two-letter five-numeral numbering. The initial introduction in a large city will take place in Omaha, Nebraska in September 1960. Methods of converting those cities now on a two-letter five-numeral basis to ANC are now being studied.

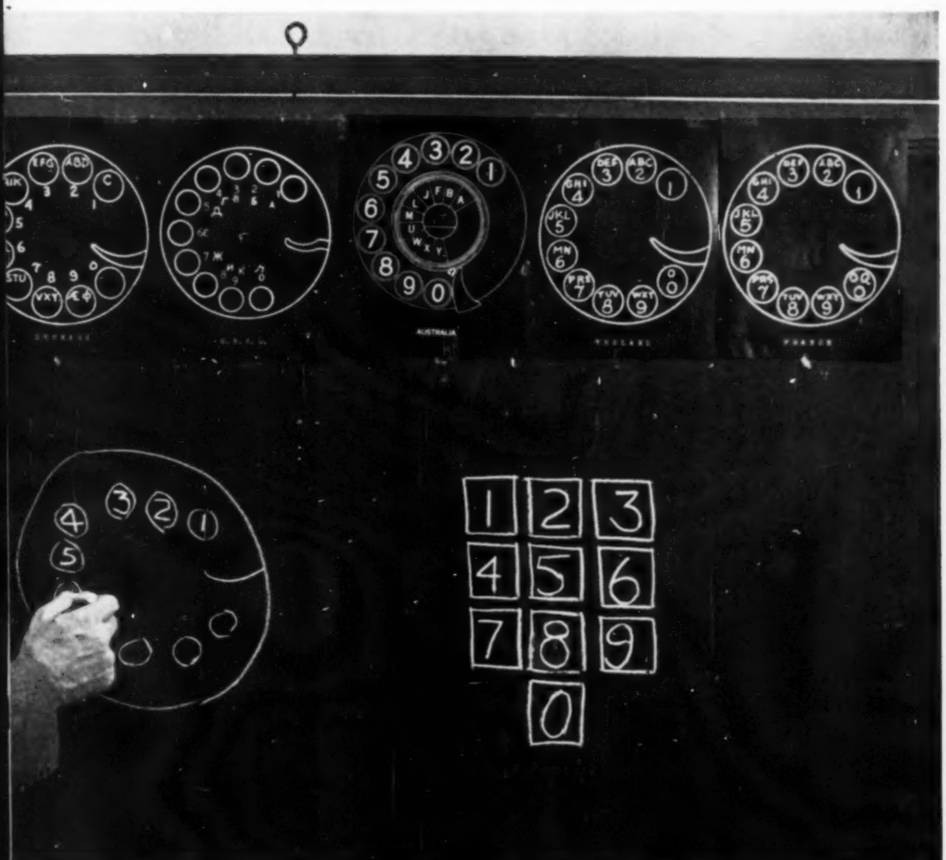
Eventually, with ANC there will no longer be a need for letters on the dial. This will reduce the characters now standard on Bell System dials from 34 to 10 (excluding the "operator" designation) and will permit miniaturization of dials or push buttons without impairing their legibility.

With the prefix plan and All-Number Calling, two-way international dialing by customers will be facilitated. The letters or characters used on dials differ from country to country, but the Arabic numbering used on the dials is practically universal. Many foreign countries now use or plan to use all-numeral telephone numbers—e.g., Venezuela, Australia, Japan, Germany.

What Do We Gain?

The combination of All-Number Calling and the increase in NPA codes will permit an eightfold increase in country-wide telephone numbers. This will provide enough capacity to take care of our needs in the forseeable future.

Beyond that, in a world where the divergence of ideas and ideologies is vast but where the physical barriers to communication are rapidly disappearing, the means to keep these ideas in constant, easy interchange not only neighbor-to-neighbor and state-to-state but nation-to-nation is of increasing importance. Something as basic as a telephone dial that is a "common denominator" among nations might, by facilitating the flow of communication, have its effect upon our ability to live together within "one world."



Arabic numbering *is almost universal; therefore All-Number Calling, besides its many other advantages, will facilitate international dialing. The author demonstrates this common denominator on German, Danish, U. S. S. R., Australian, English and French dials.*

How our patent licensing policy benefits all industry, promotes freedom of research —and helps in assuring that Bell customers will get the best possible service for their dollars

Bell System Patents: Why Do We Have Them? How Are They Used?

Edward T. Lockwood, *Assistant Vice President*
ADMINISTRATION-B DEPARTMENT, A. T. & T. CO.

A PIECE of telephone equipment, besides being property in the usual sense, is also an embodiment of ideas, some of which may have been sufficiently novel to give rise to another form of property: patent rights.

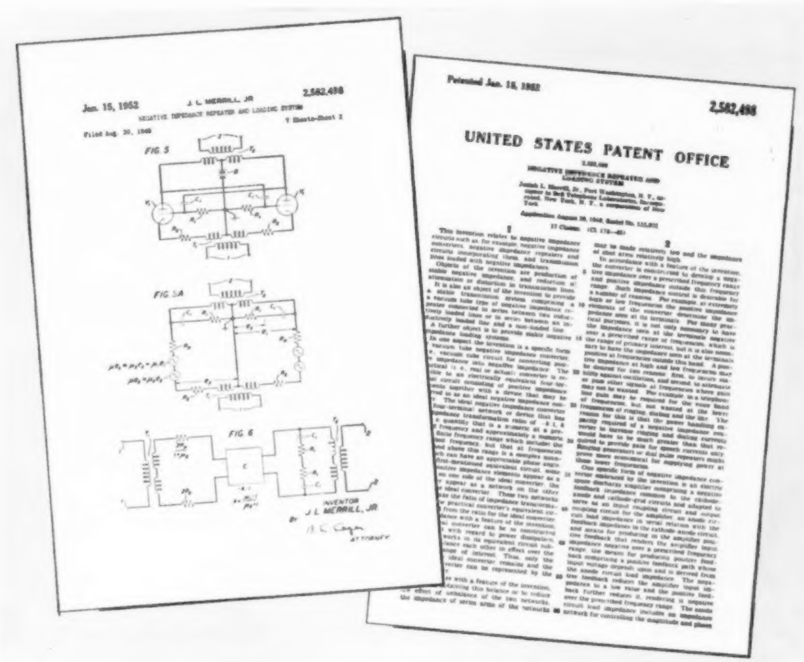
To illustrate this point let's take a specific case—the so-called negative impedance (E-type) telephone repeater, over a million of which have been made by the Western Electric Company for use in the Bell System. This repeater was invented by J. L. Merrill, Jr. of Bell Telephone Laboratories in the late 1940's during the course of some studies on possible ways of overcoming transmission losses in wire lines.

The conventional telephone repeater overcomes these losses by amplification. The E-type repeater, on the other hand, does so by partially annulling the electrical impedance of the telephone line—that is, by inserting a *negative* impedance to counteract the line's *positive* impedance.

A patent application based on Mr. Merrill's work was filed in 1949, resulting in two U. S. patents: No. 2,582,498 which was issued on January 15, 1952, and No. 2,742,616 which was issued on April 17, 1957. These patents were both assigned by Mr. Merrill to Bell Telephone Laboratories.

Under the patent laws the Bell System has the right, unless it chooses to do otherwise, to exclude others from using the inventions covered by these patents during their respective 17-year lives. Why it doesn't do so will be explained, but first it is important to understand some of the basic reasons for the patent system.

It is a common notion that the purpose of the U. S. patent system is to reward ingenious people. This is one



Patent *for the E-type telephone repeater shown above is typical. The Bell System takes out patents so as to be assured of its freedom to use the inventions developed by its own engineers and scientists and also for use in trading with other business firms.*

of the consequences of having a patent system, but the real purpose of the system is to stimulate useful invention and encourage inventors to publish their ideas for the benefit of society.

Representing the public, our government says, in effect, to the inventor, "If you will devise a thing that is truly new and useful, and permit us to publish a complete description of it, you may, if you choose, exclude anyone else from making, selling, or using your invention for 17 years, after which it will be open to the public. As long as it is in force, your patent right will resemble your right to other property you own — such as land — on which other people may not trespass."

'To promote . . . useful arts . . .'

The early colonists brought the idea of patent protection to America and a number of the colonies established patent laws of their own. The clearest evidence of the importance attached to patents, even at that time, is the fact that the delegates to our Constitutional Convention adopted, without debate, a provision for a United States patent system, which still stands as a part of the Constitution:

"The Congress shall have power . . . to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive rights to their respective writings and discoveries."

Encouraging inventors and providing incentive for the commercial development of inventions tells only a part of the patent story. Every patented invention serves as a potential stepping stone for further advancement in the art. In the case of the invention that is not patented, the natural tendency of the inventor is to try to keep his knowledge secret. But where a patent issues the new quantum of knowledge appears in a public document, with the result that everyone benefits.

Patent Assignment

Patents are granted to individuals, not to companies or corporations, but individuals may assign their patents to an employer. In this country, employees engaged to do research and development work usually work under patent assignment contracts. They receive stable incomes while doing work that may result in patentable ideas. In a place like Bell Telephone Laboratories they benefit from the mental stimulation and assistance of their associates and the use of the best of laboratory facilities and scientific instruments — things which might not be available to them as unaffiliated individuals. They are encouraged to publish their discoveries and to participate locally and nationally with other engineers and scientists in professional societies.

Our Reasons for Patenting

We come now to the reasons why the Bell System wishes to have the right to exclude others from using the inventions of its research and development employees—even though, as mentioned above, it does not do so as a practical matter. The System wants these rights for two important reasons.

In the first place it desires, obviously, to be free to use the inventions of its own scientists and engineers. If these inventions are not covered by patents, the possibility always exists that other inventors might be successful in obtaining patents on ideas that Bell inventors actually have been the first to conceive and put into practice. The anomaly of the Bell System's being thus denied the use of its own inventions is apparent. And yet, without going into expensive and time-consuming litigation, that is actually what might happen were it not for the patent protection on Bell System inventions.

Exchanging Patent Rights

Another reason why the Bell System obtains patents is that it may license others under its patents in exchange for licenses to use their patented inventions, or for cash where the value of rights received is less than the value of rights granted. This ability to trade patent rights is important to the Bell System, which is perhaps unique among U. S. industries in the extent to which it desires rights to use existing and future inventions of others. The System produces, owns and uses the most extensive system of interdependent technical devices in existence. There is scarcely an area of research in the physical sciences in which discoveries are not likely to have potential application in Bell System plant.

The pentode electron tube is an example of an important invention needed by the Bell System but covered by patents of another company. The right to make and use this very important component of our carrier systems was obtained as part of a

Cross-licensing *of patents leads to the prompt sharing of discoveries. Here a group of cross-licensees is seen discussing a new invention by scientists at the Bell laboratories.*

broad cross-licensing agreement between the Bell System and Phillips of Holland, the owner of the patent on the pentode.

Through trading, the Bell System has acquired rights under patents relating to automatic message accounting, traveling wave tubes, klystron tubes, ferrites and the use of "doped" germanium in semi-conductor devices — to name only a few of the important instances.

The Bell System takes out patents not only in the U. S. but also in foreign countries, particularly Canada, the United Kingdom and the nations of Western Europe. Its primary purpose in doing so is to be able to use these patents for trading with other firms. For example, the Bell System may grant rights under its French patents to a foreign company in return for rights under the latter company's U.S. patents.

The patent work of the Bell System is done by A.T.&T., Western Electric, Teletype Corporation and Bell Telephone Laboratories. Patent attorneys of these companies file and process the patent applications. They also study proposed equipment designs to determine whether it will be necessary to secure patent rights from others before making or using them.

A.T.&T.'s Responsibilities

American Telephone and Telegraph Company has undertaken two major responsibilities for the Bell System in the patent area. In the license contracts between A.T.&T. and the Associated Operating Companies in this country, A.T.&T. undertakes to protect the companies from all actions or suits charging infringement of patents arising from the use of any equipment, methods or systems that A.T.&T. has recommended for System use. A.T.&T. also agrees that it will acquire rights for the System to use any patented invention or discovery that may be needed in the telephone business, provided this can be done on reasonable terms. The Associated Companies are thus largely relieved of the work and the problems relating to patent protection and the acquisition of needed patent rights.

Our Policy

The Bell System's policy regarding the licensing of others to use its inventions is a liberal one. It was set forth in an article entitled "Bell System Patents and Patent Licensing" by Keith S. McHugh, published in the Winter 1948-49 issue of this magazine. Key points of that statement were:

> "It is the Bell System's policy to make available upon reasonable terms to all who desire them non-exclusive licenses under its patents for any use . . ."
>
> ". . . Where the proposed licensee has patents upon inventions which the System desires to use in the communications business, a non-exclusive license under such patent is always expected . . . "

This policy, which had been voluntarily adopted, was later made mandatory by the terms of the Final Judgment of January 24, 1956, which terminated the government's antitrust suit against the A.T. & T. Company and Western Electric Company. The judgment also required that virtually all of the Bell System's United States patents issued prior to the date of the judgment be licensed royalty-free to any applicant willing to license the

Symposium: *Important Bell System discoveries are described before large groups of patent licensees. This group is hearing about a truly historic invention—the transistor.*

Bell System, in turn, under the applicant's patents on reasonable terms.

How Licensing Works

Perhaps the easiest way to describe some of the more important features of Bell System patent licensing is to consider two hypothetical situations.

Company "A" is a manufacturer of electrical testing and measuring equipment. It has no research or development organization, owns no patents on inventions that might be needed in the telephone plant and is not likely to secure any in the future. In carrying forward its business, Company "A" finds that it would like to make use of inventions covered by patents owned by the Bell System. It makes its needs known to the Patent Licensing Organization of Western Electric Company, which represents the Bell System in such matters.

The result of their discussions is a one-way license agreement between Western Electric and Company "A" under which the latter is granted a non-exclusive license to employ or embody, in the manufacture, sale or use of electrical measuring and testing equipment, any invention of any U.S. Bell System patent made prior to the end of a five-year period beginning with the date of the agreement.

This license continues for the lives of the patents. In return Company "A" agrees to pay the Bell System a royalty amounting to a specified percentage of the net selling price of any testing and measuring equipment employing or embodying an invention covered by a licensed U.S. Bell System patent (other than one issued before January 24, 1956) so long as the patent is in force.

The case is merely illustrative. If Company "A" had so desired it could have obtained a license under one or more *specified* patents, or a broad license covering not only testing and measuring equipment but other kinds of equipment as well.

Cross-Licensing

Company "B"—our second hypothetical case—manufactures a broad line of electronic equipment, including microwave radio systems, radio and television broadcast transmitters and receivers, vacuum tubes, etc., and does a world-wide business. It has a research and development organization and owns a substantial number of patents, some of which are of possible interest in the telephone business. It also seems likely that in the future the laboratories of Company "B" will produce inventions the Bell System might want to use.

Representatives of Company "B" and of Western Electric's Patent Licensing Organization get together and bargain out a cross-license covering, perhaps, all countries of the world. Both parties list the types of equipment for which they desire licenses and agree that the licenses to be exchanged will continue for the lives of both existing patents and patents on inventions made during five years in the future.

Let us say that in this instance the total value of the licenses to be granted by Western Electric appears to be greater than the value of the licenses to be granted by Company "B". It is agreed, then, that all of Company "B's" grants to Western will be free of royalty, that some of Western's grants to Company "B" will be free of royalty, but that the others will call for royalty payments to Western at specified percentages of the net selling prices of the equipments involved.

A patent license *agreement is discussed between members of the Western Electric Patent Licensing Organization and representatives of another manufacturing company.*

'Patent Pending'

Why, it might be asked, do the Bell System and others grant licenses for future as well as existing patents? As background for answering this question, it should be understood that a patent application, which during its pendancy is not available to the public, may be pending for several years (the present average is 3.7 years in the U.S.) before the patent, containing the disclosure, is issued and published. It sometimes happens, therefore, that Mr. Smith makes a discovery and files a patent application, only to find out later that he has been anticipated by Mr. Jones.

If Smith's company is not protected by a cross-license agreement with Jones' company and has proceeded to make use of what it believed to be Smith's invention, it may be found to infringe Jones' patent and be liable for damages. At best, Smith's company is then at a serious disadvantage in negotiating for a license from Jones' company.

Cross-Licensing Promotes Research

Cross-licensing of future patents, tends to promote freedom of development effort and encourages research along lines that might not otherwise be pursued. Where two companies have so licensed each other it is possible for their research and development people to engage in considerably freer discussion about mutual licensed equipment than would otherwise be the case.

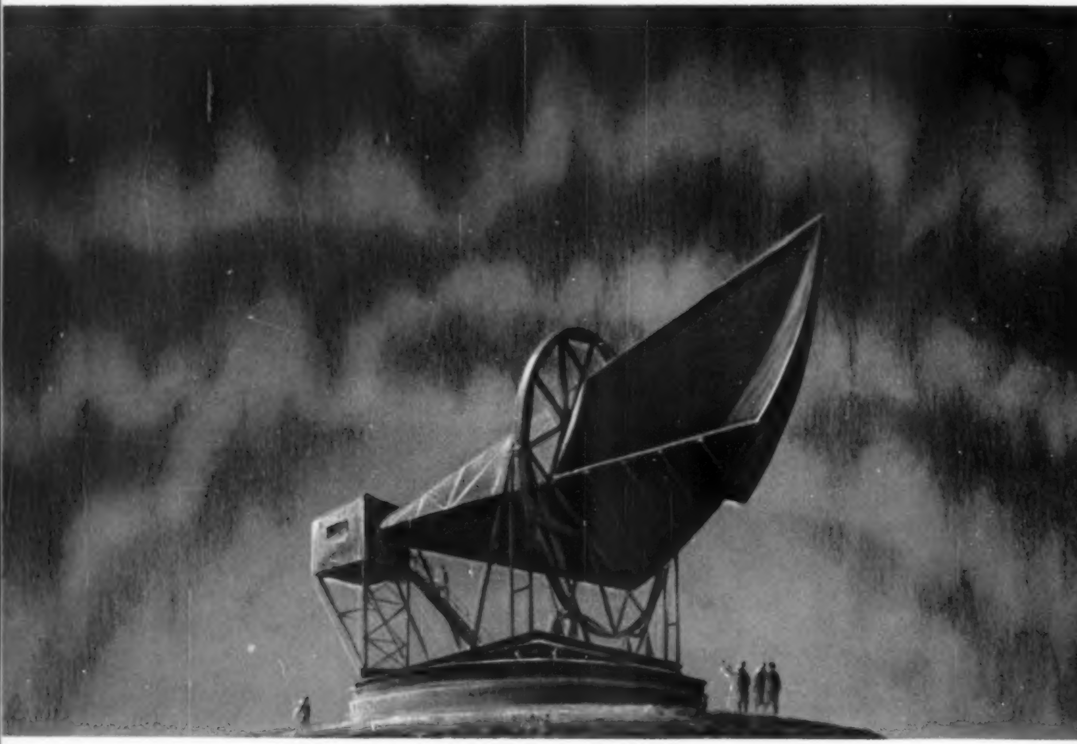
They are able, whenever it is deemed mutually advantageous, to visit each other's laboratories, see work in progress and discuss problems and solutions — all of which is of great value in the direction of the research efforts of both parties.

In addition, cross-licensing of future patents makes for prompter publication of new discoveries than would otherwise occur. If the owner of an important new discovery is cross-licensed with other major sources of invention in the same field, he is more likely to publish his knowledge at an early date because he participates in the benefits derived from the research and development efforts of his cross-licensees. Their work, stimulated by such publication, may hasten the time when equipment embodying the invention may be available for use.

The history of the transistor is a good case in point. Publication in technical literature of the first transistor inventions made in Bell Telephone Laboratories was not delayed beyond the period necessary to file patent applications and to make such confirming tests and experiments as would insure that a full, exact and reliable disclosure could be made. Following the announcement and the furnishing by the Bell System of much detailed technical information to its transistor licensees, the entire electronics industry became active in transistor development and application. Competition and rivalry were keen. Improvements in the art doubtless occurred faster than if the disclosure of the invention had been delayed in the hope that a larger share of the improvements and inventions would be made by Bell engineers. The value of the transistor to the nation's military defense was also a factor favoring early publication.

As this brief review has sought to make clear, the Bell System's policy and practice in the patent field are focused on the all-important objective of furnishing the most and best communication service for the customer's dollar. That objective dictates the patenting of the System's inventions and the exchanging of licenses under these patents for rights to use inventions of others. Over and above this primary purpose the Bell System recognizes and acts upon the belief that the ready access by others to the use of its inventions is very much in the public interest.

Publication *of articles on inventions in journals such as these can hasten time when an invention is put to use. Cross licensing stimulates such free exchange of knowledge.*



Artist's conception of the large horn antenna for receiving signals during the satellite experiments. Antenna is now under construction at the BTL Holmdel, N. J. Laboratories.

Are man-made satellites a long-sought answer to future transoceanic communications needs? Experiments being conducted by Bell Telephone Laboratories are designed to help find out

Communication Satellites

John R. Pierce, *Director of Research-Communication Principles*
BELL TELEPHONE LABORATORIES

Mr. Edgar M. Cortright, Chief, Advanced Technology Program, National Aeronautics and Space Administration, has commented as follows on transoceanic communication facilities:

"There is one transatlantic cable in operation today with a capacity of 36 voice channels. [Ed. Note—There are now two such cables.] In 1950 there were approximately one and a half million messages transmitted across the Atlantic. Three million messages are expected in 1960. The capacity of the present cable . . . will be exceeded by 1962 by voice communication alone.

"By 1970 it has been estimated . . . that we might expect 21 million transatlantic voice messages . . . Clearly the situation is ripe for a fresh approach to the problem." ("Satellites for World Communication"—Hearings, Committee on Science & Astronautics, H. of R., 86th Cong., 1st Sess., p. 98)

In the early part of this century it would have taken an incorrigible visionary to foresee what we now accept as commonplace communication techniques in the Bell System. Gentle amusement certainly would have followed predictions that direct distance dialing, undersea telephone cables, coaxial systems and transcontinental microwave radio relay would be in widespread use in 1960.

This progress in telephony grew out of work which in its inception seemed far from any practical reality, a familiar circumstance at the Bell Laboratories where it is part of our duty to look far ahead, to study possible future communication services and thus build a fund of knowledge to draw upon if these services should become economically attractive.

An important way in which we are looking ahead today is in careful study, experimentation and measurement of techniques of communication via man-made satellites. We have high hopes, but alas no proof as yet, that satellites may some day be important to the Bell System in providing broadband transoceanic radio communication. Transmitting an ordinary telephone conversation involves a very narrow segment of the radio band, and a broadband channel would be able to handle about 1,000 telephone calls.

Working at the forefront of the communication art, we were able to build across the Atlantic telephone cables which, initially, handled 36 two-way telephone calls each. From a solely technical point of view, a communication satellite which would make possible broadband transmission should be able to handle the 1,000 telephone calls mentioned above, or direct transmission of live television. This, of course, is not now possible on the relatively narrow bandwidths provided by undersea cables.

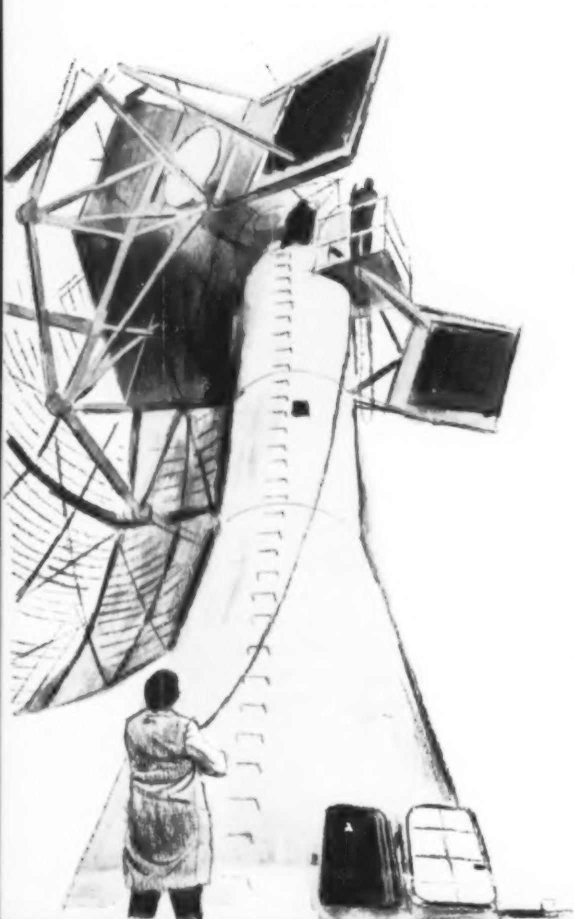
It seems apparent that satellite communications is not going to replace telephone central offices in any foreseeable future. In terms of communications over inhabited land, over a civilized country such as the United States, it seems obvious that satellites would prove to be very expensive and inflexible compared with cable and microwave radio networks.

On land, cables and microwaves give us the option of going from any point to any other point and of setting up circuits for particular purposes. They are far cheaper than anything else we have. But it is obvious that if communication satellites can compete successfully—in quality, dependability and cost—with undersea cables and radio systems, then satellite transmission could be of great value to the Bell System. However, no one is as yet prepared to say to what degree various forms of satellite communication can meet those criteria, or even to what degree our various experiments will be successful.

But there can be no question, that we should examine this new communication possibility promptly and carefully. This we are doing. Indeed, as early as 1954, we at the Bell Laboratories seriously looked into the matter of satellite communication.

As a result of those studies, I published in *Jet Propulsion*, the journal of the American Rocket Society in 1955 a technical paper, "Orbital Radio Relays." This paper considered the matter of satellites for long distance radio communication. It appeared then, and does now, that the natural field for satellites was in transoceanic communication, a field in which one has difficulties with other means of transmission.

Transmitting antenna and base.



Active and Passive Satellites

The paper reported calculations concerning the use of passive reflecting satellites—large spherical objects that could be used to reflect radio waves beyond the horizon of the earth and over to another continent. Among many devices, I also considered "active" satellites, that is those that might amplify the signal transmitted to them and then re-send the signal halfway across the world.

I examined the use of satellites in orbits a few thousand miles high, and in orbits 22,000 miles high where the satellite goes around the earth in 24 hours and stays always over one portion of the equator. The article considered corner reflectors, the use of large plane mirrors, and active satellites with directive antennas on them.

We wondered, then, what sort of laboratory work could be done toward satellite communication. We had no competence in rocketry or rocket vehicles, and you will recall that this was about three years before any nation had achieved sufficient competence in those arts to succeed in placing an object in orbit in outer space.

It seemed to us then that the best thing we at Bell Laboratories could do was to keep the matter of satellite communication in mind and to pursue advances in the microwave art which might make that type of transmission more attractive.

Basic Programs

Today, of course, circumstances are very much changed. We must necessarily continue to leave rocketry to others, but in the years since 1954 a large degree of uncertainty has been eliminated from the technique of placing some kind of vehicle into a low-altitude orbit. So we may talk now with some sense of being in touch with reality of some kinds of communication satellites. It appears that what we will study eventually will be the outgrowth of the following three basic programs:

We begin with calculations.

High Orbit Active Satellites. This program calls for satellites to be placed in orbit 22,400 miles above the equator. At that height, a satellite would rotate in step with the earth and would seem always to hang in the same position in the sky. Such satellites would be "active" relay stations—that is, they would be equipped with receivers and transmitters, and probably with accurately-pointed directive antennas. This proposal raises several serious problems: the formidable difficulty of sufficiently accurate rocketry to give such a satellite exactly the right velocity at the right height, the problem of providing some sort of long-life equipment which will keep the satellite so oriented that the antennas point at the earth, and the severe task of maintaining communications equipment life in such relay stations. In addition, the transmission time or delay from earth via satellite and back to earth is over a quarter of a second; this interval can have an appreciable effect in telephone conversations though it would not be such a serious matter in one-way communication, such as television programs.

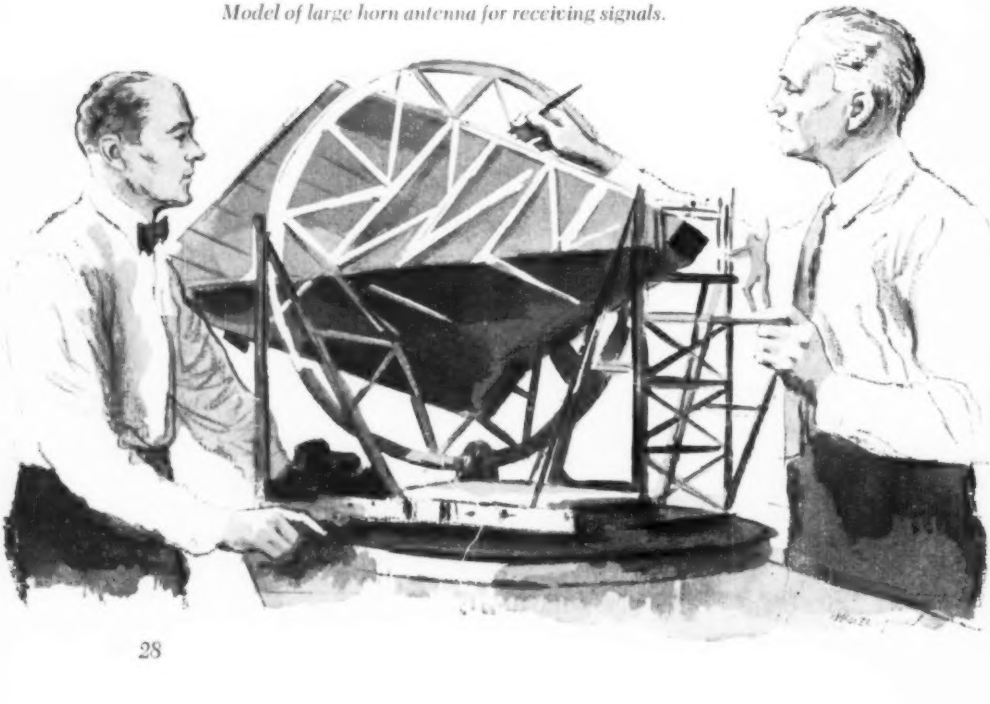
Low Orbit Active Satellites. In this proposal, active satellites would be placed in orbit a few thousand miles above the earth. The satellites would not be stationary in relation to the earth, but, with a sufficient number of them, signals could be relayed from each whenever it was in a usable section of its orbit. This plan eases somewhat the rocket accuracy required, but equipment life in a low-altitude relay station is as serious a question as in a high altitude orbit.

Passive Reflectors. With low-altitude satellites, a skyborne transmitter and receiver are not essential. Instead, we may have in orbit a group of "passive reflectors" that is, simply satellites which act as "mirrors" for radio signals beamed to them. Large, high-power transmitters on the ground could beam a signal to a satellite, the signal would be reflected from the sphere, and reach a distant land-based receiver. This procedure, however, calls for very large antennas and also high power for a broadband channel.

The First Experiments

This last proposal has been adopted for the initial experiments by the National Aeronautics and Space Administration (NASA), with whom we will cooperate in the studies. The passive satellites which NASA proposes to use are plastic balloons, 100 feet in diameter, with an aluminized surface that

Model of large horn antenna for receiving signals.



has a high reflectivity for radio waves.

We are now building an installation at our Holmdel, N. J., Laboratories for a test this year (1960) of whether satellite transmission can be accomplished. In one stage of the tests, a telephone call will be transmitted from Holmdel to the Jet Propulsion Laboratory at Goldstone, Cal., and vice versa. Of course, we will want to know eventually how the satellite will serve for broadband transmission.

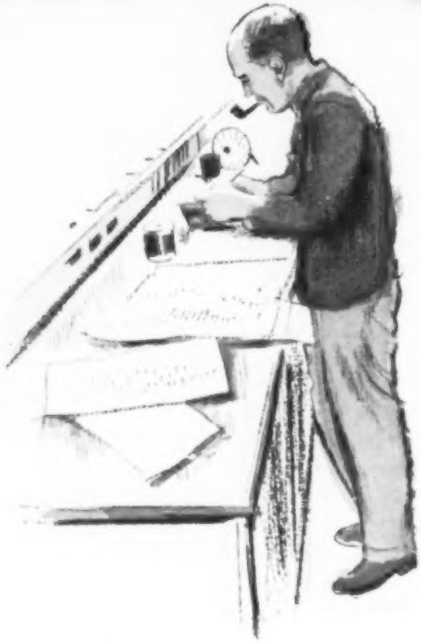
Noise

Are there any difficulties that we can foresee in this experiment? Yes, very many. Perhaps the most obvious we can predict is "noise"—essentially, what the home radio listener refers to as static—and the need for the noise level to be low enough so it does not drown out the signal we are sending. There are three sources of noise that could restrict the range of satellite communication: (1) the noise added by the amplifier in the receiver; (2) cosmic noise, which comes from the universe itself and which was discovered by Karl Jansky of Bell Laboratories in the early thirties; and (3) atmospheric noise.

We can represent noise that is added to a received signal by means of an effective temperature. No noise would correspond to what we designate as 0° Kelvin, or absolute zero (−460° F.). An ordinary microwave receiver adds to a signal noise corresponding to a temperature of many hundred degrees Kelvin, a forbidding addition with the transmitter powers we intend to use in satellite communication. We think we have overcome this barrier with a new type of microwave amplifier called a "maser" that adds practically no noise to the received signal, and we have hopes that it will eliminate No. One of our noise problems.

Cosmic noise becomes negligible at the higher frequencies of the radio spectrum, thus offering an obvious solution to the second source of interference. Atmospheric noise is a more serious limitation. Even cold air at high altitudes is hot compared to absolute zero, so air radiates noise as hot iron radiates heat and light. If the atmosphere were perfectly transparent we wouldn't receive any radiation from it, but oxygen in the atmosphere causes the atmosphere to be not quite transparent at very high frequency microwaves. To evaluate the noise, we must consider how transparent the atmosphere is at a given frequency and also how much atmosphere an antenna "sees" as it follows a satellite. If we look out toward the horizon we see a lot of atmosphere and pick up noise; if we look straight up we see

Talking with Goldstone.



Charts and data for accuracy.

less atmosphere and hear less noise. Our studies show we may be able to cope with atmospheric noise in a large part by use of signals from a satellite only when the sphere is seven degrees or more above the horizon.

This is a mere sampling of some of the problems ahead. There are other technical difficulties at least as important as noise, and it may be that the progress of the experiments will uncover even more. For instance, we cannot be sure that the required type of satellite reflector will withstand the conditions of space and maintain its shape in orbit—once it gets there.

What Are the Alternatives?

With all these difficulties, you may ask if there is not some other way in which we can achieve transoceanic broadband transmission. Let us look at the sorts of radio upon which we have relied for long distance communication. They are: short-wave radio, the microwave relay system across the U.S., ionospheric scatter and, most recently, over-the-horizon transmission utilizing tropospheric scatter.[1]

Briefly, there are extensive problems of one kind or another in all of these methods. Short-wave does not permit of broadband transmission; there is no economically practical method for placing microwave relay towers every 40 miles across the Atlantic ocean; and ionospheric scatter, "bouncing" signals from the turbulence of the ionosphere or from meteor trails, proved too erratic and would handle only a narrow bandwidth. Over-the-horizon transmission, relaying signals beyond the curvature of the earth via the lower-altitude troposphere, is exceedingly practical.

Over-the-horizon circuits designed by the Bell Laboratories and installed by Western Electric are in operation over the DEW line in the Far North, and in the "White Alice" system in Alaska. In addition, a broadband tropospheric scatter system for commercial telephone and television service was established between Florida and Cuba in 1957. This circuit handles 36 telephone channels, and has the capacity for handling 120 more, and has been used for television transmission (which requires broadband circuits). Another system of this type has been opened between Florida and the Bahamas.

Is 'Over-the-Horizon' Transmission Practical?

Can we not then install over-the-horizon facilities for future broadband radio transmission between North

[1] Readers wishing a more detailed explanation of the technical development of these methods and an understanding of their problems are referred to: Pierce, J. R., "Exotic Radio Communications," *Bell Laboratories Record*, Sept., 1959, P. 323-329.

America and Europe? Yes, it might be possible to set up a series of relay stations via Greenland, various North Atlantic islands and Scotland. Our studies indicate, however, that this type of communication network would be very expensive. Large antennas and high power transmitters would have to be built and maintained in remote arctic locations. Further, the final result probably would be a very low-grade television picture, although several dozen telephone channels might be provided.

It should be clear at this point that investigation of other methods of broadband transmission is not only good sense, but eminently desirable if the Bell System is to continue to provide the facilities which will be needed in the years ahead. We cannot do otherwise than to at least examine communication via satellites.

We Need More Knowledge

As I have previously warned, we do not at the moment have enough knowledge or experience to describe in detail a practical system of satellite communication, or to state exactly how the satellite might be used. We can, at this time, do little but speculate.

Perhaps the reader may feel that we have speculated too much, that we have raised more problems than those we have answered, and perhaps think it might be wiser to try planting telephone poles on the Atlantic ocean bed and hook copper wires onto the poles when they sprout from the sea. Such a feeling emphasizes the point of our discussion: we need more fundamental knowledge of many kinds before we can talk practically and realistically about satellite communications. The only way we can acquire this knowledge is to continue our traditions of careful study, experiment and measurement.

The circumstances of research and development force us sometimes to be incorrigible visionaries. The occasional amusement of others has too often turned to applause for us to notice a smile here and there.

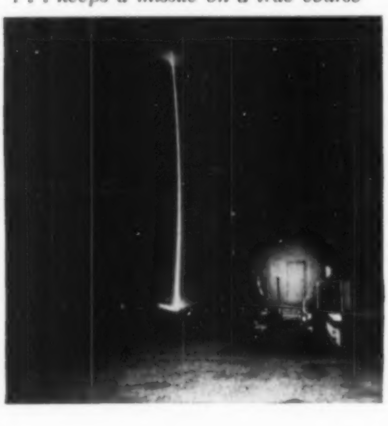
Testing equipment by bouncing signals off the moon.

SPACE AGE ALBUM

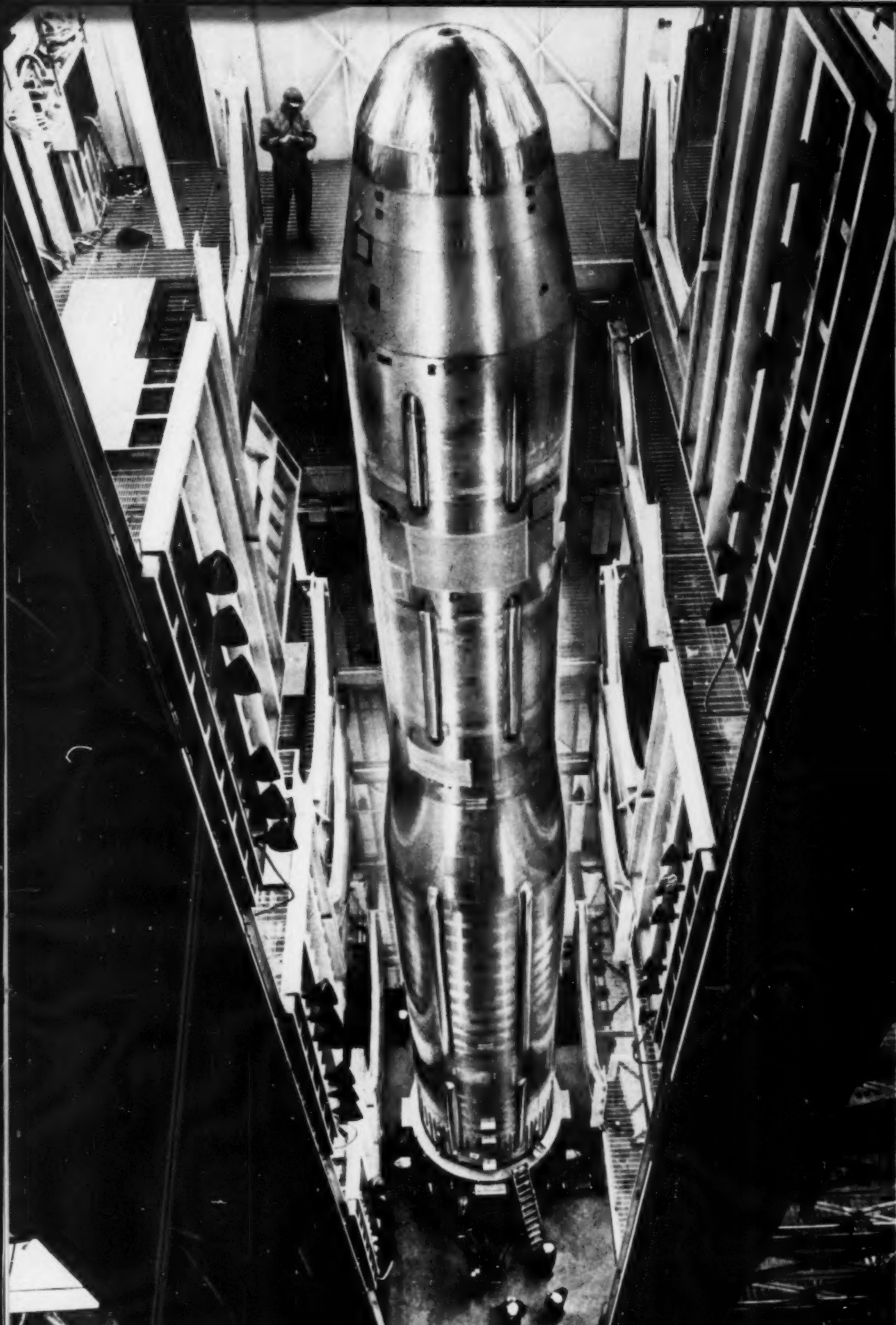
As mankind reaches out from his planet toward infinite frontiers, Bell System people are adding importantly to the sum of new knowledge, the perfection of new techniques. They not only explore the uses of space as a means of improving man's communications but help to defend the nation against the potential danger of attack from the sky. They work toward the day when they can help bring the first man back from his great venture beyond our atmosphere. A sampling of the Bell System's many-faceted contribution to the space age is shown on these pages.

Bell Labs-designed guidance system . . .

. . . keeps a missile on a true course



Titan ICBM on the launching pad. Our guidance system sends it to targets a quarter-way around the world.



BEHIND THE SCENES

Our work is done in laboratories, in factories, in control centers at Cape Canaveral and shoulder to shoulder with military men on distant outposts and ships at sea. Though what we do is seldom exposed to public view, it is as vital as the soaring rockets themselves. Ours is the guidance system that sends a missile with deadly accuracy to a target streaking across the sky or makes it possible to retrieve the nose cone of a Thor-Able test missile from a predetermined patch of sea.

Bell System missile guidance systems exist first as mathematical equations on Bell Laboratories blackboards.

Test missile units take form as Bell Laboratories and Western Electric engineers work side by side.

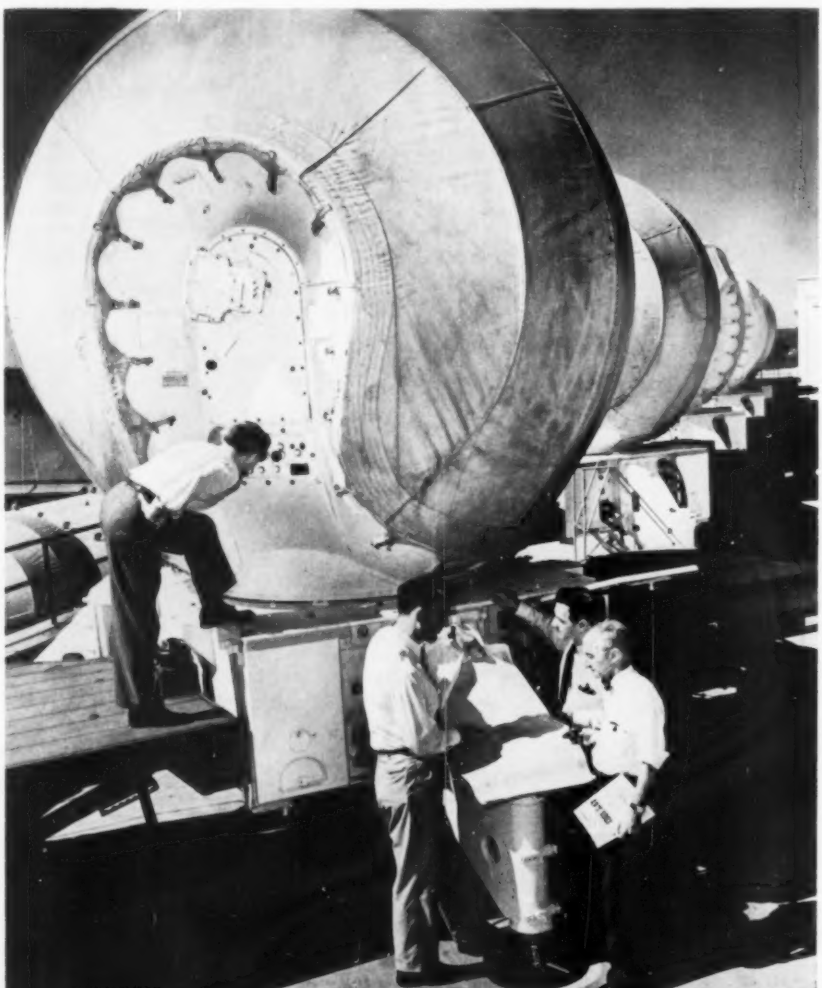
At Canaveral, Thor-Able roars skyward . . .

. . . far at sea, the nose cone is retrieved.

DEFENSE

A deadly, white javelin, Nike-Hercules stands guard over our cities. Poised, ready, its radars searching far skies, it is both defense and deterrent against the day which must never come.

Nike antennas are inspected by Bell Laboratories and Western Electric engineers on the roof of the Western Electric Burlington, N. C., Shops where they were made.



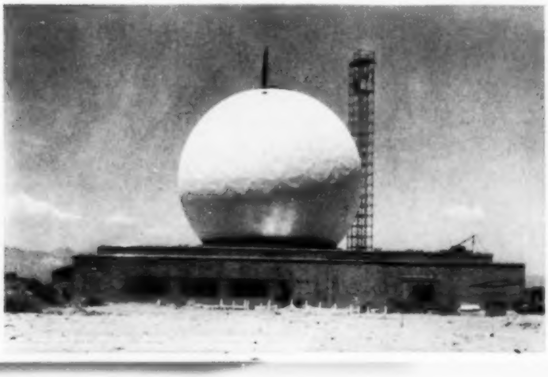
Plans for part of the electronic guidance system of Nike-Hercules are checked by Bell Laboratories engineers. The system was developed by the Laboratories and is made by Western Electric.

Terrier missile for Marine Corps air defense has Bell System guidance system.

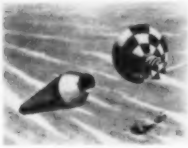
Control panel for Nike-Hercules where two sets of radar data are electronically computed and plotted.

NIKE-ZEUS

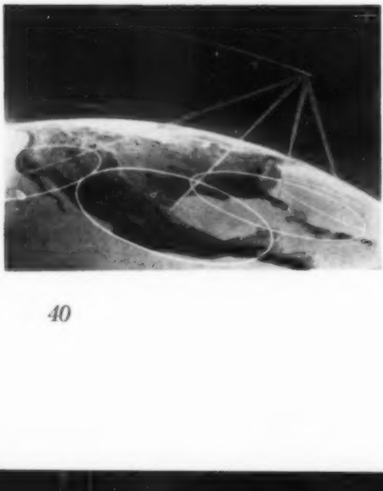
Here, we look toward the future. For the first time, we see an early test model of the Army's Nike-Zeus anti-missile missile as it was test-fired at White Sands Missile Range recently. The building containing guidance equipment with its radome is seen below. Continued research and development work on the Zeus system is being pursued by Western Electric, Bell Laboratories and 17 major industrial associates including the Douglas Aircraft Company. Their awesome objective: a defensive missile which can strike down man's most terrible weapon—the nuclear ICBM.



PROJECT MERCURY



Objective: To launch a man into space. The Bell System's contribution: Western Electric as prime contractor and Bell Laboratories are part of an industrial team (others include Bendix Aviation, Burns and Roe and IBM), which is engaged in a major effort to achieve a world-wide chain of ground stations which will keep an electronic eye and ear on America's first astronaut as he orbits through space. Hundreds of scientific and engineering people from the team have been working without let-up on this urgent and complex job. Construction has already begun at some of the sites.



Sketches show how ground stations will communicate with capsule containing astronaut and view of composite ground station plan.

Meeting direct, aggressive competition in selling our products and services is a new, vital factor in the business today. To be successful, we need the 'competitive spirit'

Competition

Stanley F. Damkroger, *Assistant Vice President—Sales*
MARKETING DEPARTMENT, A. T. & T. CO.

This has to do with a word that is comparatively new in the Bell System vocabulary. But we are going to hear and use it more and more frequently in the weeks and months and years ahead. For it is more than a word, more than an abstract idea. Competition is an immediate fact, a force, in our business lives today. The manner in which we—and by that I mean all of us—respond to its stimulus is a matter of far-reaching importance in terms of the future growth and welfare of the business.

It is important, therefore, to understand what this new era of competition means to the Bell System and how it is going to influence our thinking and the way in which we approach our jobs.

In one sense, competition is not new to us. We have always been in competition for our share of the customer's dollar. However, we have not in the past faced real, hard-hitting, direct competition such as we face today and will face with increasing intensity in the future. From now on we will be competing directly, item by item, in both the home and business markets.

Our Aggressive Competitors

Today's competition comes directly from others in American industry who manufacture and aggressively sell communication systems for the home and business. Particularly aggressive are the manufacturers and distributors of microwave systems. Many of these businesses have a lot to offer; their products are good, too. The great advances in the communications art have actually increased our vulnerability to this direct competition. The net result of this is that we are now matching our products and sales efforts against those of others who have aggressive and capable sales forces; it means that we are in a contest with people to whom the rough and tumble of competition is the very breath of business life.

The markets we serve are great today and are getting bigger and bigger. Today, people want and demand new types of communications service. As the national income rises, more and more householders will want, and be able to afford, the newest and best in home communications arrangements. As American businesses continue to prosper and expand, more and more of them will be in the market for communications services tailored to their own specific needs and desires. Particularly important in the business market is the future of "machine to machine" communication. This vast communication potential will result from the increased use by industry of business machines, computers and related devices.

All of these factors will create ever growing needs for communications services and equipment of all types. These needs must and will be satisfied. And, if we telephone people don't meet this demand of the market place, someone else will. Also, this growing and ever changing requirement for communications demands services that are forward looking in design and concept.

Optional Services

That's why today a substantial part of our business has to do with a whole spectrum of optional services and why we will continue to offer an expanding and changing line of new instruments, systems and services. The list of our products designed to appeal to large numbers of customers is impressive. For example, the Call Director, the Princess, the Home Interphone, Data-Phone and other forms of data communications systems, special PBX arrangements such as the Automatic Call Distributor—these and a growing list of other products are helping us to serve people better and develop new business for ourselves.

Of course, these optional services introduce a new element of risk into the business. In times of economic downturn, people can dispense with them far more easily than they can do without basic telephone service. This, as was pointed out in the Autumn issue of this magazine, stresses the need for earnings comparable to those of other progressive industries. But the business is well worth the risk if we price our services properly. And we can price them so that they will add to our financial good health and still continue to give our customers the best possible service and maintain our position of leadership in the communications field.

The Competitive 'Spirit'

This isn't a job for "the other fellow" to worry about. If we are to get our share of the customer's dollar in these areas, everyone in every organization in every Bell Company must develop the same spirit that people in companies that sell washing machines, automobiles and other competitive products have. For, make no mistake about it, we in the Bell System are now in the market place just as much as they are.

There is a difference between supplying the optional services needed to meet competition and working with such mainstays as central office equipment, cable, wire, and the like. With the latter we are usually engaged in big, long-term projects. Obviously each step has to be carefully planned in advance. Each item of equipment has to be painstakingly tested. Generally the timing of such projects is under our control. We are expert in handling such projects, as indeed we are in providing individual customers with efficient and economical basic telephone service.

We Must Act Fast

However, in providing a special communications service for a customer, fast action is a must. He wants the service right away. If we can't furnish it when and as he wants it, there will be a competitor ready and waiting who can. That means there will be cases where we must decide the main factors immediately and iron out the details as they come along. This means, too, that we must assume new risks and it also means that those who design the equipment, those who make, install or service it, as well as everyone else even remotely involved, must be on fire with the competitive spirit. To serve that customer in the way he'd like to be served, tradition and "routines" may well have to be set aside. All this is just making sure that our services are readily available when the customer wants them.

Can We Do It?

Can we compete successfully against people more practiced in it than we are? I haven't the slightest doubt but that we can. I know enough about Bell System people to be completely confident that they can do just about anything that needs doing. I have seen what they can do in a competitive situation. The people who sell Yellow Pages advertising are an example. Since 1948, advertising media in general have about doubled their revenues. The Yellow Pages people have tripled theirs!

The spirit so necessary in the market place has been abundantly demonstrated by Bell System people engaged in national defense work. The bold, ingenious approach, the willingness to try the untried and to take the calculated risk which have helped make the DEW Line, White Alice, Nike and other projects so successful, is not far removed from the approach which we must now apply in the telephone end of the business.

Our service representatives in our business offices and our installers and maintenance men have demonstrated that they can sell effectively. Finally, our sales people working in the important business market are growing in competence every day. Through new training, better selection of the market to be covered, and improving management know-how, those involved in the direct selling job are being equipped to meet the challenge of competition.

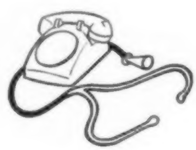
In undertaking this aspect of our jobs, we of the Bell System have tremendous resources to draw upon. We have as fine a product as is offered anywhere. We have the human talent, experience, ingenuity and we have earned our position of leadership in the technology of communications.

The challenge of competition is real and dynamic but with all of our resources to back us, with our service offerings geared to the market, priced right, easy to buy, readily available, and soundly and aggressively sold, we can and will meet the challenge and have fun doing it.

The Role of Communications In Advancing Medicine

C. C. Duncan, *Assistant Vice President*
LONG LINES OPERATING STAFF, A. T. & T. CO.

Atomedics, Inc., an organization of professional men and industrial leaders, set up two years ago by Dr. Hugh MacGuire of Montgomery, Ala., is interested in reducing the high cost of hospital care and investigating new developments in industry and pure science which may be of use in medicine. Some months ago Mr. Duncan was invited by this group to outline some of the ways in which communications have been utilized in medicine. The following article is drawn from his presentation before the second Atomedics Symposium held at the Air University, Montgomery, Ala. It describes some important and interesting ways in which telephone equipment and telephone people are rendering special service in the medical field.

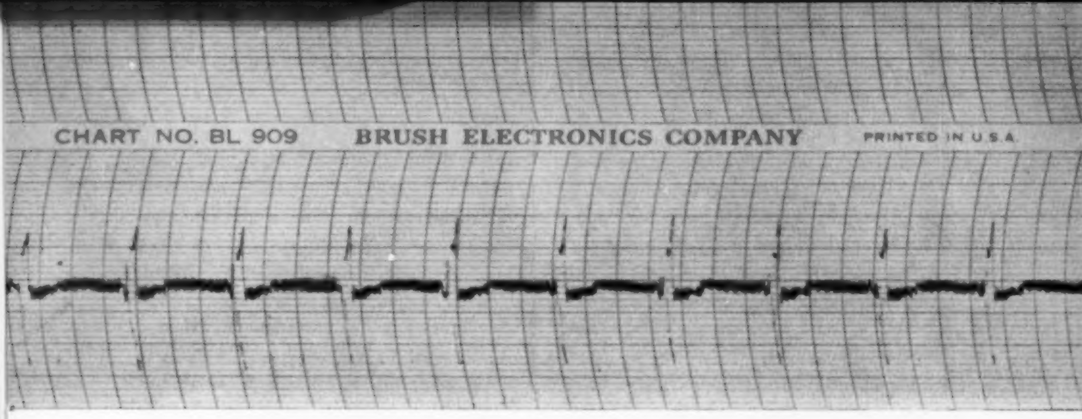


THE INVENTION of the telephone came about through Dr. Alexander Graham Bell's humanitarian efforts to provide help for the hard of hearing. So I think it is quite fitting for the telephone industry to be involved in helping the medical profession today. I want to point out some of the ways in which communications have already been applied in medicine. While these cases are interesting in themselves, I think they can be especially useful in stimulating thinking about additional applications. Therefore, let us look for a moment at the broad scope of communications today and its possible potentials to the medical profession.

The Scope of Communications

In addition to voice and telegraph, there are facsimile, television and telephotograph pictures, telemetering and control signals, and the whole new field of data transmission. Information transmitted by various devices now ranges from the track of a guided missile to the inventory of all the groceries in a supermarket.

The DATA-PHONE, one of our newest services, provides a type of telephone



Electrocardiogram *shown above as it was recorded at the Atomedics Symposium after having been transmitted via regular telephone circuits from Hawaii to Montgomery, Ala.*

call that will soon become commonplace. Its staccato, recurrent tones may seem meaningless to casual listeners but, if they are transmitted a mere 20 seconds, they can provide data covering 150 items of inventory in a supermarket. In fact, it would take only 16 minutes to send the 7,000 items in a typical complete inventory.

Just as we can transmit the number of cans of peas on a shelf, so we can transmit the number of spare airplane engines at a base, the inventory of rare medicines in a hospital. In fact, if information, including that needed in the medical profession, can be turned into electrical currents we can transmit it anywhere on earth – and even into space and back.

Now to turn to matters more immediately related to the medical profession, I should say, first, that we in the telephone business are not trying to develop apparatus and equipment to record heart sounds. But a rather spectacular example of what can be done with ordinary telephone circuits was demonstrated following my talk before the Atomedics Symposium when the Governors of Alabama and Hawaii matched heartbeats in what was the first heart diagnosis by transoceanic telephone. *A description of the demonstration Mr. Duncan refers to follows. Ed.*

The sounds of the heart of Governor John Patterson of Alabama as well as the electric potentials used to secure an electrocardiogram were sent by a tiny radio transmitter to a receiving set on the opposite side of the Montgomery Auditorium. There, they appeared as wavy lines on an oscilloscope and as ink lines traced by a pen recorder.

A regular telephone call was then dialed from the auditorium to a Seattle operator, who completed this call to a telephone on the stage at Montgomery. The sounds of Governor Patterson's heartbeat were sent over this circuit and again presented on the receiving equipment.

Two local heart specialists analyzed tracings of the heartbeats and the electrocardiogram before and after transmission over the circuit. The diagnosis was just as easy to make when the sounds of the heartbeats were sent via Seattle.

A telephone call was next dialed from the stage to the Iolani Palace in Honolulu; then the electric wave from the heart of Hawaii's Governor William Quinn was sent over the same circuit for easy diagnosis. It was announced, by the way, that both Governors' hearts were normal.

Afterwards, tracings of two persons who had had heart attacks were transmitted from Hawaii. Heart specialists on the stage at Montgomery, with no advance information about the patients, were able to make diagnoses that were confirmed by a doctor in Hawaii who knew the histories of both patients.

In transmitting audible heartbeats and electrocardiograms by telephone we in the communications business are simply connecting machines to machines. For 50 years, we have been doing this with teletypewriters. It makes little or no difference to the Bell System whether the electrical signals passing over its networks originate with a human voice, a business machine, or specialized instruments in the field of medicine.

However, the communications features which are being used in medicine cover a wide range. I think of them as being in three broad categories — (1) things which have been done to help in running hospitals; (2) communications in medical education; (3) applications to assist in diagnosis.

Communications in Hospitals

Not long ago the Northwestern Bell Telephone Company became interested in the communications problems of hospitals. A detailed case study of one hospital was made with the complete cooperation of the staff. The resulting report, which received wide distribution and attention, disclosed some interesting things. Some of the specific problems which are dealt with are, I suspect, problems which exist in nearly all hospitals.

The study showed that a great deal could be done simply by adopting features that are already standard offerings of the local telephone companies. Here are just a few of the special situations found and remedies suggested:

It was discovered that the hospital's two-position switchboard was overloaded. It was also found that the operators were being called on to give out information, write out and deliver messages, operate the paging system and to function as a locating service by calling various people in the hospital. The study group recommended that calls for these types of services be routed to an information desk which would be better equipped to handle them. This would also avoid the expense of adding a new switchboard position and operator.

One of the hospital's problems is the difficulty of locating people in a hurry. The ordinary loudspeaker paging system won't do because it is too loud for some areas. To overcome this, the study recommended paging systems with visual indicators or "whisper" speakers for quiet areas. A dial feature permits paging through only one speaker when desired, or a call can be broadcast to all speakers.

The "Bell Boy" pocket radio paging system will be valuable in this connection, too. When the wearer hears a tone signal he goes to the nearest telephone and calls a special number to receive his call or message. The need to page doctors when they were away from their offices or hospitals was one of the principal reasons for the development of this system.

There is need for speedy recording of dictation by doctors and technicians. Central dictating was recommended so the doctors and staff personnel can dictate from any telephone in the hospital and from home and office phones. Different functions of the recorder, such as start, stop and erase, are controlled by dialing single-number codes.

In some departments, such as surgery or X-ray, people may not be able to spare one hand from their work, their hands may be wet, or strict sterile techniques have to be followed. Thus the use of the ordinary telephone may be difficult if not impossible. The speakerphone will fill the bill here. When equipped with a foot switch it need not be touched at all.

Blue Cross Teletypewriter Networks

One of the exasperating things that a patient often has to put up with in a hospital today is the delay, often of a week or two, in clearing his Blue Cross record. Meanwhile, he is being billed by the hospital and often feels that he is delinquent. At the same time he knows that his bill will be paid by the Blue Cross when the red tape is finally unwound.

The Blue Cross commonly consolidates its record keeping at one location within a large urban area. This helps hold down its clerical costs but, on the other hand, the remoteness of the records tends to slow the clearance of the records of an individual patient. Quite a few of these Blue Cross record offices have found that they can cut the time they require to service their customers by using private line teletypewriter networks.

Teletypewriter services with full-time private line networks are used by Blue Cross in many metropolitan areas. The network in Columbus, Ohio, uses an additional interesting feature. It serves 11 hospitals within a 35-mile radius of downtown Columbus on a full-time basis. However, 11 additional hospitals connect with the centralized Blue Cross records by means of TWX or teletypewriter exchange service. These hospitals have relatively few cases to handle, so full-time teletypewriter circuits are not justified. Using TWX, they place their calls through a switchboard operator in much the same way that voice calls are handled through an operator and they are billed a small amount for each message.

Even though substantial economies are gained through centralized record keeping with teletypewriter communications, there is considerable manual labor involved which costs money and takes time. More and more businesses with large volumes of data to process use communications networks that connect accounting machines and electronic computers. While the Bell System has not yet provided such networks for anyone in the medical field, this type of operation is a logical outgrowth of the Blue Cross networks just mentioned.

Communications in Medical Education

Now let's turn to communications as a help in medical education.

The practicing doctor or dentist has a big problem in keeping up with new advances in his profession. Once he is established in practice he is a very busy man who can ill-afford to take time out for travel to a distant place for refresher courses. Some of the universities, medical associations and pharmaceutical houses have tried to overcome this problem by bringing the classroom or laboratory to the doctor. There are several different ways in which we in the telephone industry have helped them to make this possible:

Closed Circuit Telephone

Since the beginning of radio broadcasting the telephone industry has provided voice channels to connect microphones at the program originating point with the hundreds of broadcasting stations scattered across the country. This same sort of service has been

Closed Circuit TV *showing an operation being televised for a "Grand Rounds" program. The Bell System supplies the channels between operating room and remote viewers.*

provided on frequent occasions for various medical men. The usual setup makes use of loudspeakers in a downtown auditorium where the local doctors gather to listen.

The University of Illinois College of Dentistry in Chicago has used this arrangement on frequent occasions. For example, as part of its education extension program in 1952 and 1953 it had five one-hour sessions at monthly intervals. It connected auditoriums filled with dentists at 116 locations in all parts of the United States and Canada. The program featured authorities in the field of dentistry. The total cost to the University for the five sessions heard at these points was $24,000 for the communications facilities. We understand that for courses of this type the University covered all expenses with a registration fee of about $5.00.

Message Telephone

Another example of this sort of thing occurred in December, 1958 when Dr. George Crile of Cleveland delivered a one-hour lecture by telephone to a group of doctors at Ft. Sam Houston, Texas. The same lecture was later repeated to a group at Duke University in Durham, N. C.

Dr. Crile's office phone in Cleveland was equipped with a jack into which he plugged an operator's headset. This permitted him to lecture from his desk where he had access to reference material, and where he could be free from interruption and completely relaxed. The headset also gave him full use of both hands while working with his notes and reference material.

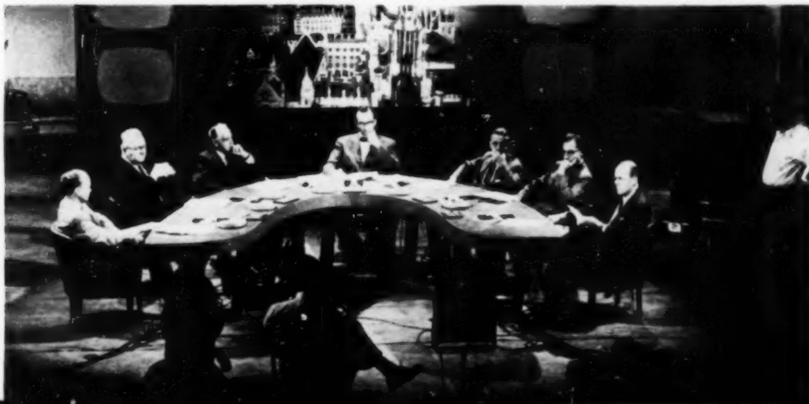
Dr. Crile established his calls by regular long distance but, at the distant end, the local telephone line was connected to a loudspeaker and microphone arrangement in an auditorium. He lectured for the first half-hour and then had a question-and-answer session for the remaining half-hour. The total cost for the two calls on both occasions was approximately $70.

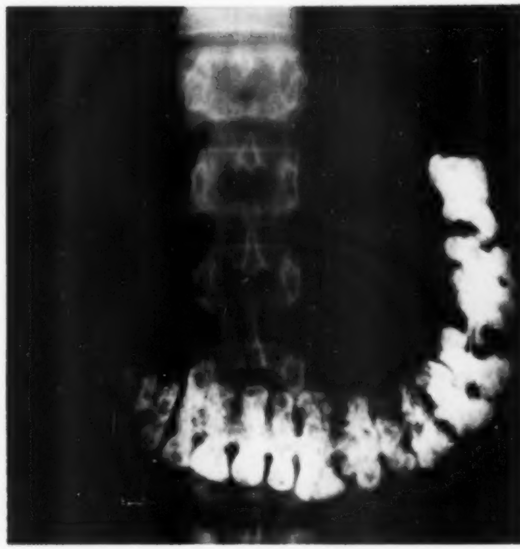
Closed Circuit TV

Telecasts of operations over closed circuit networks, usually in color, have become commonplace in recent years. In many hospital operating rooms television camera and control equipment are now permanent fixtures.

The "Grand Rounds" programs sponsored by the Upjohn Company and produced by the Medical Radio and Television Institute in New York are such a presentation. As part of one telecast, a film was shown in which Dr. J. N. Morris of London discussed coronary disease. After the film, this panel in New York carried on a discussion with Dr. Morris by means of a transatlantic telephone cable circuit. The whole proceeding was shown over the

Panel Discussion *seen below was part of a "Grand Rounds" program. This scene was televised while panel carried on discussion via a transatlantic telephone cable circuit.*





X-ray *sent over telephone circuit by telephotograph before and after transmission.*

closed circuit television network.

Some of the Grand Rounds shows have had 55 cities on the network with audiences of about 20,000 people. The Bell System's part in such undertakings is limited to providing the communications channels to bridge the distance between the viewers at remote locations and the operating room. Between cities we use TV channels of the same type as those we furnish to nationwide broadcasting networks.

Communications for Diagnosis

As you look at your daily newspaper you will notice that many pictures have a small credit line at the bottom which says "AP wirephoto" or "UPI photo." This means that the photograph was sent over telephone circuits from the point where the newsworthy event happened to many widely scattered newspaper publishing plants. The press associations have been doing this for years by connecting telephotograph machines to these circuits.

Telephotograph X-Rays

Since 1948, thousands of X-ray films have been transmitted over a telephone circuit from Atlantic City, N. J., to the office of a radiologist, Dr. Gershon-Cohen in Philadelphia. The facsimiles received from these transmissions have been interpreted and checked with the original X-ray films. No cases have occurred where an improper interpretation was made as a result of imperfections due to electrical transmission. Minor imperfections are occasionally introduced by electrical disturbances, or "noise," but the radiologist can always identify this condition.

Facsimile machines used for newspaper photographs are not suitable for X-ray prints because of the extreme range of contrast required. But a special facsimile machine to produce the required variations in shading has been developed by the Times Facsimile Corporation. The receiving machine is designed to give a reproduction one-half the size of the original without loss of detail.

The "SAVE" Program

Ordinarily, we do not develop and provide the multiplicity of clinical tools necessary to obtain data from the patient and convert it to electrical form. However, some Bell System engineers, working on an out-of-hours volunteer basis, are doing some development work on clinical apparatus with significant results. They support the contention that a closer working relationship between medicine and other technical fields might produce new techniques important to national health.

The project I have reference to is called "SAVE," which stands for Service Activities of Volunteer Engineers. William V. Kahler, president of Illinois Bell, is on the Board of Trustees of the University of Chicago and, through this connection, he became aware of some of the research problems of the University's medical school.

Early in 1957 Mr. Kahler asked his engineers to help this medical research staff. He pointed out to the medical people that these engineers had special knowledge of electronics, sound transmission, data processing etc., which might help with medical problems.

About 40 engineers are in the SAVE project. They are divided into teams which work on specific problems in their spare time, using their home workshops. Following the guidance of the doctors, this group has already completed and presented the university with an electronic stethoscope for use during surgery. This device gives the surgeon an audible and visible check on heart action during an operation without his having to use a conventional stethoscope. The group has also successfully completed a cumulative pulse counter which can be worn continuously by a patient. This device is small enough to fit into a cigarette package and the pick-up electrodes are taped to the body. The counter can be read at any time intervals specified by the physician. Again, a cytodiagnostic test apparatus to aid in the detection of cancer has been turned over to the medical people.

Other projects being worked on include:

- An electronic calorimeter for use in metabolism checking, etc.
- A brain tumor detector.
- A machine which instantly reports any change in the respiratory volume of newborn babies.
- Micro-probes to be placed in the body, to determine exactly how much X-ray radiation is reaching a particular point, are now undergoing development.

The examples cited of the ways that telephone equipment and telephone people can render special service in the medical field are only a small indication of what can be done and doubtless point toward other more helpful applications. The telephone industry is ready to help. We can provide the communications know-how. We have a vast telephone network which can interconnect with almost every telephone in the world. We can offer service which is fast, flexible, and far-reaching. The challenge to us—and to the medical profession—is for us both to work to utilize this tremendous asset to its full potential.

Who's Who & What's What In This Issue

IT WOULD be difficult indeed to find any one more deeply convinced that business men have an obligation to participate in public affairs than Charles W. Ebersold, who has contributed "Some Thoughts on Public Affairs" (page 2). Mr. Ebersold has been closely and enthusiastically associated with Bell System public affairs policies and practices since January 1958. He is responsible for long-range planning and coordination of public affairs information and for the Bell System Public Affairs Letter. Mr. Ebersold started his Bell System career with Illinois Bell in 1938, the same year and the same place as William A. Sinks, also a contributor to this issue. Mr. Ebersold's first job was that of student manager. Although most of his service has been with Illinois Bell, he had a previous tour with A. T. & T. as an engineer in Operation and Engineering. He has also worked in the Wisconsin Company as district manager and general commercial supervisor. He was general commercial manager of Illinois Bell when he assumed his present post as assistant vice president in charge of the programs division in the headquarters Public Relations Department in January 1958. During World War II, Mr. Ebersold was a captain in the U. S. Army Signal Corps.

THE AUTHOR of "New Numbers for Tomorrow's Telephones" (page 6) speaks from his experience with this important topic as A. T. & T.'s traffic facilities engineer. William A. Sinks started with Illinois Bell as a Traffic student in 1938. After three years in Traffic field assignments he went into the Navy and served for four and a half years during World War II. After his return to Illinois Bell he became successively assistant district traffic superintendent and district traffic superintendent. In 1951 he was appointed cost studies engineer, and in 1955 transferred to A. T. & T. as equipment methods engineer. He assumed his present position in May 1956.

THE TITLE of Edward T. Lockwood's interesting and highly informative discussion of Bell System patent policies (page 16) poses two questions about patents: Why do we have them? How are they used? In the course of answering these questions, Mr. Lockwood gives us valuable insight into an important aspect of the business which, since it is largely a headquarters function, is outside the experience of most of our readers. He also helps to dispel some popular misconceptions in regard to patents in general. "It is a common notion," he points out, "that the purpose of the U. S. Patent System is to reward ingenious people. This is one of the consequences of having a patent system, but the real purpose of the system is to stimulate useful invention and encourage inventors to publish their ideas for the benefit of society." Certainly, as Mr. Lockwood reveals in his article, the manner in which our patents are used is "for the benefit of society." And, while this fact will come as no surprise to most of our readers, the extent to which our licensing policy promotes freedom of research and benefits industry and the public in general will be revealing to many. Work on patent matters has been an important facet of Mr. Lockwood's responsibilities since he came to his present post in the Administration B Department in 1953. Prior to that he had been vice president and general manager of the Washington-Idaho Area of the Pacific Company.

John R. Pierce, whose article on the fascinating subject of "Communication Satellites" appears on page 24, is director of research in communications principles of Bell Laboratories. He joined the Laboratories in 1936, shortly after receiving the Ph.D. degree from California Institute of Technology. He had previously received the B.S. and M.S. degrees from California Tech in 1933 and 1934, respectively. At the Laboratories, Dr. Pierce has specialized in the development of electron tubes and in microwave research. During World War II he concentrated on the development of electronic devices for military applications. He has been granted 55 patents for his inventions in electron tubes and communications circuits, especially electron multipliers, electron guns and microwave tubes. He became director of electronics research at Bell Laboratories in 1952, director of research in electrical communications in 1955, and assumed his present post in October 1958. For his research leading to the development of the beam traveling wave tube, Dr. Pierce was awarded the 1947 Morris Liebmann Memorial Prize of the

Charles W. Ebersold

William A. Sinks

Edward T. Lockwood

John R. Pierce

Stanley F. Damkroger

Charles C. Duncan

Institute of Radio Engineers. He was voted the "Outstanding Young Electrical Engineer of 1942" by Eta Kappa Nu, national engineering honor society. Dr. Pierce is the author of three books: *Theory and Design of Electron Beams* (1949), *Traveling Wave Tubes* (1950), and *Electrons, Waves and Messages* (1956); and with E. E. David is co-author of *Man's World of Sound* (1958).

AS HEAD OF an organization which is directly engaged in a contest for a share of the customer's dollar, competition is a way of life for Stanley F. Damkroger. As he points out in his article on the subject (page 41), meeting aggressive competition is becoming an increasingly important factor in selling our new products and services. But he regards this not as something to be regretted but as a stimulating challenge. "After all, competition is the very breath of business life," he says. "The direct competition we have today is something new. It is important that telephone people learn to 'think competition' as people in businesses we are competing with do. If we all have the spirit we'll get our share of new business and have fun doing it."

CHARLES C. DUNCAN is indeed the logical author of such an article as "The Role of Communications in Advancing Medicine" (page 44). He has not only a broad and varied background of Bell System experience to draw upon but also familiarity with the problems and objectives of the medical profession. Mr. Duncan's Bell System experience includes direction and coordination of plant protection and defense activities for Long Lines; duties as supplies practices engineer in Operation and Engineering, as Long Lines operating staff engineer, and as general manager, special projects, during which time he was responsible for the engineering and building of the Atlantic, Alaskan and Hawaiian cables. He later became assistant director of operations in charge of the Long Lines headquarters engineering staff and was director of the operating staff when he assumed his present position as assistant vice president, Long Lines operating staff in April 1959. Mr. Duncan joined the Bell System in 1927 as a student in the Long Lines Plant Department in St. Louis. His familiarity with the medical profession comes from his role as member of the Board of Managers of St. John's Hospital in Brooklyn. Hospital volunteer work is an established custom in the Duncan family. Mrs. Duncan is volunteer public relations director of the St. Francis Cardiac Hospital in Roslyn, Long Island, N. Y.

HEADQUARTERS SUMMARY

- *Outstanding Building Designs*
- *Service Links Added*
- *New Booths*
- *Bellboy*
- *All-Number Calling*
- *Cable to Puerto Rico*
- *Telephone Production Record*
- *New Handwriting Reader*

First architectural judging for outstanding telephone building designs took place recently at 195 Broadway. Photographs of the buildings were reviewed by a jury of Bell System building engineers, some of whom are also licensed architects. The awards program is intended to promote better telephone building architecture at low cost.

Each entry was judged as an individual solution to its own particular problem. Awards are based on the excellence of that solution without regard to the comparative merits of other entries.

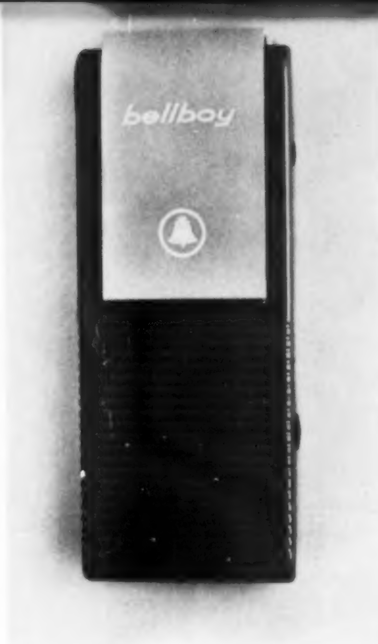
Factors that weighed in the judging include: intrinsic architectural excellence; appropriateness to its surroundings; appearance—that by its very presence makes us good neighbors; appropriate identification and a corporate "image" that shows the company to be progressive and alert and gives the impression of a stable, reliable company that serves the community well.

Cost was an important factor. Economical buildings are essential to our successful operation. To qualify for the awards program, a building has to be close to or lower than the average cost for the type of structure it represented.

Judging building designs.

Bell System Overseas Service now reaches 128 countries and territories. Maritius, the British island colony in the Indian Ocean off the coast of Africa 500 miles from Madagascar, was linked to the service on September 26. Service is via London. In addition, the service between Oakland and Saigon in Vietnam, handled via Japan since 1957, was placed on a direct basis on November 23.

Recent openings of high seas telephone service to four liners bring this service to a total of 63 ships. The 38,650-ton S. S. *Rotterdam* of the Holland-American Line was linked to the service on September 1, the *Franca* and *Bianca* of the Home Lines on October 27, and the *Victoria* of the Home Line on December 23. The latter three liners ordinarily sail between Genoa and New York but also engage in winter cruises in the Caribbean.



Bellboy.

A "new look" is being introduced in the indoor booth line. The current wooden booth is to be supplemented by a new aluminum booth which is a smaller brother of the Airlight outdoor booth. Although designed primarily for indoor use, this new booth can be used advantageously at outdoor locations where space or other considerations warrant. It is expected to be available to the Companies sometime in the early part of 1960.

The booth will be provided in two types—stand-up or equipped with a seat. In addition to the standard aluminum finish, it will be available in red, blue or green. If other colors are needed they may be applied to the aluminum finish. A new feature is the ability to multiple these booths with a single layer of glass between adjacent booths. A ventilator, available on an optional basis, mounts in the ceiling, drawing in air from the outside and circulating it in the booth.

As a further step in this field, a radically new design of indoor booth is to be tried out around the middle of 1960. It will differ significantly in appearance from the current indoor booths. For example it will have a circular door which will slide into an aperture in the side wall of the booth.

These projected changes, along with the walk-up/drive-up and semi-booth types introduced in the last few months, are intended to provide not only improved and less expensive public telephone installations, but also to show users of public telephones that we value their patronage and are working to make this phase of telephone usage more convenient and comfortable.

Bellboy Personal Signaling Service is being made available in 12 additional cities. (Allentown, Pennsylvania and Columbus, Ohio have been pioneering the service for some time.)

Men and women who must be "on call" when away from their offices or homes will welcome this service. It will be particularly valuable to doctors, clergymen, sales and service personnel, contractors, real estate brokers and others who are on the move in the course of their day.

This service uses a pocket-sized transistorized radio receiver operating at 35 mc which the customer carries with him.

Each Bellboy receiver is individually signaled. Receipt of this signal causes a tone to sound in the receiver. This indicates to the customer that he should check in by telephone in accordance with a prearranged plan.

For purposes of further development, a Bell Laboratories trial of 150 mc personal signaling is planned to start in New York City in the Spring of 1960. Direct dialing by customers to the pocket receivers will be tested in this trial.

The auctioneer's hammer was a prominent feature of an eight-hour program over a closed TV network established by Long Lines on October 7. The network was used by the U. S. Government to auction off a variety of surplus goods ranging from clothing to road-building machinery. It linked groups of prospective bidders in New York, Chicago, Philadelphia, Boston, St. Louis and Columbus, Ohio, with depots at Granite City, Ill., and Shelby, Ohio, and with the Philadelphia Naval Shipyard.

Seven-digit all-numeral numbering of telephones (see page 6, this issue) has been recommended for those cities which have not yet been converted to the two-letter five-numeral (2L-5N) plan of numbering. In cities currently on the 2L-5N numbering basis, no change in numbering has been suggested at this time pending further study of methods of introduction of All-Number Calling.

The Northwestern Company is planning the initial introduction of All-Number Calling for a large city in Omaha, Nebraska in September 1960. This will also be the first instance where numerals have been substituted for existing central office names—Omaha now has 2L-4N telephone numbers.

Key telephone systems utilizing 6-button key sets and the new Call Directors are very popular with business customers. The demand for this type of service has mushroomed rapidly in the last five years and we are presently installing well over a million of these phones a year.

A great deal of effort has been required to install the "behind the scenes" switching and wiring equipment for these systems. Combined efforts of a "195" task force and the Bell Laboratories have resulted in the design of a new line of pre-wired packages of key system apparatus. Western Electric shipments started in November and December.

Also, to reduce the number of wires from the apparatus to the sets and the consequent complication in installation and rearrangement, a line of concentrators is being made available. These will reduce by 60% or more the number of wires going to the station sets or to the Call Directors. Further work is being done to improve the flexibility of these systems, both as regards apparatus assemblies and the wiring layouts, so that the customer can be provided with the features desired in a very short interval of time and with a minimum of effort.

Final plans for the launching of National Yellow Pages Service—the sale of all directory items on a "customer headquarters" basis—were adopted at a recent joint meeting of representatives from all Bell Companies.

This new service will offer the customer many advantages—including the opportunity to buy Yellow Pages representation from one source in 2400 directories with a circulation of 60 million copies. No other publication provides such complete market coverage.

The service will be offered on a full scale basis May 1, 1960. The Companies have geared up to handle demand business on a limited basis as of January 1 with increased efforts as they move toward the official starting date.

The New England Company recently completed two more major steps to provide nation-wide dialing for their customers. On November 15, 110,000 main telephones in and around Worcester, Massachusetts were given access to the nation-wide network. On November 23, the service on 641,000 main telephones in the Boston area, whose range had been limited to eastern Massachusetts and Rhode Island, was expanded to permit nation-wide dialing. Ninety-two per cent of Boston's customers now have access to the nation-wide network.

The last major DDD expansion for 1959 was completed by the New York Company on December 13. It brought nation-wide dialing to 1,149,000 more main telephones in New York City and Nassau County.

Some 15 million (over 35%) of the main telephones in the Bell Companies can now dial nation-wide, approximately double the number of a year ago.

A deep sea telephone cable between the United States and Puerto Rico—a joint project by A. T. & T. and a subsidiary of I. T. & T.—has just been completed. Service began January 26.

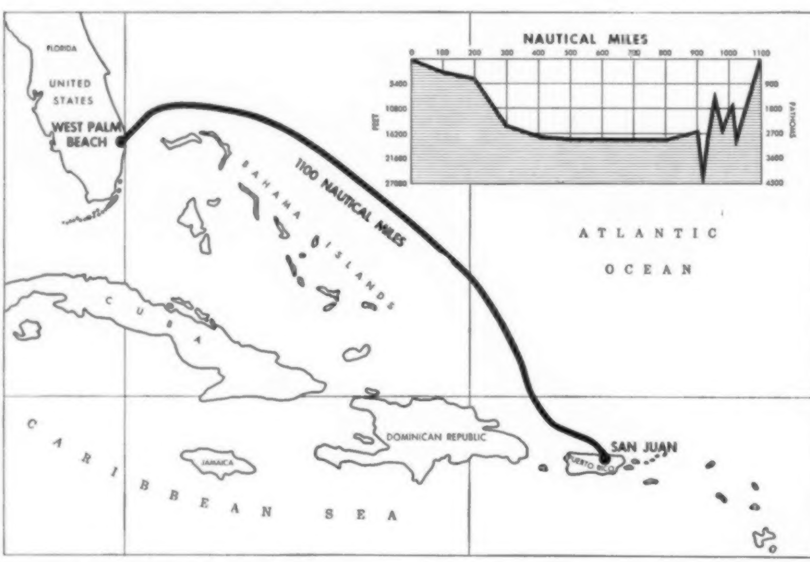
Calls, now handled by radio, have jumped a hundredfold from 1936, when service was first opened, to 159,000 in 1958. This new, high-reliability system comes, therefore, at an opportune time to meet added service requirements. A great majority of the calls over the cable will be handled by operator distance dialing.

Of a twin-cable design like the other transoceanic cables, the United States-Puerto Rico cable is unique in two respects. By a new terminal equipment design, it provides 48 circuits initially as compared with 36 for the others. It has also set a new record for depth in the sea—this in spots reaching five miles.

Western Electric manufactured a total of well over 7,000,000 telephone sets during 1959—the largest number ever made in one year in Bell System history. The new telephone production figure tops 1956's previous high by half a million.

Nearly 3,300,000 general-purpose "500" sets made up a large part of this record total. More than half of the year's new sets were color telephones.

Volume manufacture of the petite, oval-base Princess telephone began at Western Electric's Indianapolis Works last fall and totaled about 248,000 at year's end. Initial production is supplying the sets to four market-test areas among the operating companies—Colorado, Georgia, south-central Pennsylvania, and Illinois outside Chicago. Since the Princess is scheduled for System-wide introduction toward the end of 1960, Western Electric expects to manufacture over 2,000,000 of the compact new instruments during the present year.



Route of the United States – Puerto Rico cable.

Popularity of the Call Director telephone among business subscribers caused its original production program to be nearly quadrupled for a total of 71,200 in 1959. This year, according to present plans, some 61,000 Call Director telephone sets will be made.

To help meet the challenge presented by 1960's telephone production program, the Western Electric Indianapolis Works plans to increase present manufacturing floor space by some 235,000 square feet and to add more than 600 people to the staff. In addition, several million dollars will be invested to bolster present manufacturing facilities.

An experimental device that reads handwritten words has been built at Bell Laboratories. It has a ten-word vocabulary—the spelled-out words "zero" through "nine." About the size of a briefcase, the handwriting reader demonstrates character-recognition methods that might eventually be applied to a wider variety of material.

To use the reader, a person writes with a metal stylus on a special surface just as if he were writing with a pen or pencil on paper. After completing the word, he touches an "Identify" button with the stylus, and a light appears beside the numeral, corresponding to the word he has just written.

The wired stylus makes electrical contact with 15 horizontal metal strips alternately sandwiched between strips of insulating material in the writing surface. Up-and-down movements of the stylus provide electrical connections to the metal strips in sequence. The sequence and number of connections tell the word-reading device which of the ten words has been written.

The Laboratories device is believed to be the first that actually reads cursive script despite variations in individual style. Also, it reads entire words, rather than individual letters.

Although the device can read most individual styles of connected handwritten

Handwriting reader.

material, it does have limitations. The writer must not print the words, nor lift the stylus between letters. And, he must dot his "i's" faithfully as he learned to do in grammar school.

Bell System salesmen are going to school these days in an effort to do a more effective job in meeting the opportunity and challenge of telephone salesmanship.

Beginning in mid-summer, a series of classes lasting two weeks has been held for Associated Company and Long Lines salesmen. Group discussions and role-playing of various types are used to teach effective selling. Sales supervisors are given additional training related to their responsibilities for their forces. This course was developed for Bell System use by the Marketing Department at 195 Broadway, with the aid of a top-flight firm of sales training consultants.

Long Lines salesmen are also being given a course concerning selling in a particular field—"tie-lines," a private line telephone service. This course will also be offered to Associated Company salesmen.

Countrywide response to telephone training programs in secondary schools, directed at teaching students good usage techniques, has led to an increased demand for the "Teletrainer," the device used in these programs. The Teletrainer has recently been redesigned at Bell Laboratories for quantity production, and present plans call for production of about 10,000 units in the next five years to supplement the 3100 or so currently in service.

Operationally, the redesigned Teletrainer is very similar to the one presently in use, which was designed by the Lecture-Aid Group at the Laboratories. The redesigned model is more compact and lighter, and the exterior has been styled by Henry Dreyfuss.

Construction of a permanent home for Western Electric's Engineering Research Center near Princeton, New Jersey, is now getting underway. Established early in 1958 to undertake fundamental research and development studies in manufacturing processes for Bell System products, the center has been temporarily housed in an existing building purchased as part of the 192-acre site. It is expected that the new W. E. center will facilitate even closer coordination of various work with the work of Bell Laboratories, thus expediting technical progress.

The Blue Pencil

LAST ISSUE, this space was devoted to a few words of tribute to the former editor and a brief statement regarding this publication's future course. Nothing was said at that time about the *new* editor because of his belief that anonymity is the most fitting —and sometimes the safest—role for all editors. However, readers have manifested a certain curiosity regarding the incumbent. There have also been recurrent suggestions from higher echelons that we introduce ourself. As a result we will drop the "editorial we" and lapse briefly and with seemly modesty into the third person.

The summer-suited individual pictured here is George B. Turrell, Jr., who has edited the *Bell Telephone Magazine* since last September 1st. He came from Western Electric public relations where, over a period of 16 years, he performed a variety of chores, mostly having to do with publications of one kind or another. During a good part of the period he was successively feature editor, managing editor and editor of Western Electric's national employee publication, *WE*. Prior to that he had worked on publications and done public relations work outside the Bell System. Just before joining Western Electric he was managing editor of *Country Life* magazine. He finds his present assignment with the *Bell Telephone Magazine*—which he interprets as an effort to develop the magazine's full potential as a valuable and interesting medium of information—to be most stimulating. He hopes that his enthusiasm will be apparent on the magazine's pages and highly contagious among its readers.

The editor.