American Telephone & Telegraph Company

OFFICERS FOR THE YEAR 1907.

THEODORE N. VAIL,	*Presid*
EDWARD J. HALL,	*Vice-Presid*
THOMAS SHERWIN,	*Vice-Presid*
CHARLES P. WARE,	*Vice-Presid*
WILLIAM R. DRIVER,	*Treasur*
CHARLES EUSTIS HUBBARD,	*Secreta*

DIRECTORS

CHARLES W. AMORY.	CHARLES EUSTIS HUBBARD
THOMAS B. BAILEY.	WILLIAM LOWELL PUTNA
GEORGE F. BAKER.	THOMAS SANDERS.
FRANCIS BLAKE.	SYLVANUS L. SCHOONMA
ALEXANDER COCHRANE.	NATHANIEL THAYER.
T. JEFFERSON COOLIDGE, JR.	THEODORE N. VAIL.
W. MURRAY CRANE.	JOHN I. WATERBURY.
HENRY S. HOWE.	MOSES WILLIAMS.

- universality of service
- inefficiency of competition

REPORT OF THE DIRECTORS

OF

AMERICAN TELEPHONE AND TELEGRAPH COMPANY.

NEW YORK, March 10, 1908.

TO THE STOCKHOLDERS:

The results of the business for the year 1907, as shown by the Comptroller's statement appended, were as follows:—

Profits	$23,479,290.10
Interest	7,209,902.16
Balance	16,269,387.94
Dividends paid	10,943,644.00
Carried to Reserve	3,500,000.00
Carried to Surplus	1,825,743.94

The following were the corresponding figures for the year 1906:—

Profits	$17,857,687.37
Interest	4,886,750.61
Balance	12,970,936.76
Dividends paid	10,195,233.50
Carried to Reserve	1,773,736.62
Carried to Surplus	1,001,966.64

SUBSCRIBER STATIONS.

The number of stations at the end of the year operated directly by the associated companies which constitute our system in the United States was 3,035,533,

an increase of 308,244. In addition to this number there were 755,316 exchange and toll stations connected to our system by our toll and long-distance lines, but operated by local, co-operative and rural independent companies or associations having sub-license or connection contracts. Adding also our telephones employed for private-line purposes, there was a total of 3,839,000 stations connected to the Bell system as against 3,070,660 stations at the close of the previous year, an increase of 768,340 stations.

The increase in the number of subscriber stations operated directly by our associated companies was less than last year, due to more rigid collection of bills and more careful scrutiny of applicants. As the average cost of connecting subscribers far exceeds the average annual income per station, permanency is more desirable than numbers. The result has been an improvement in the class of subscribers, so that, notwithstanding this smaller increase in subscriber stations, the increase in gross revenue is fully equal to that of former years.

Wire Mileage.

The total mileage of wire in use for exchange and toll service was 8,610,592 miles, of which 1,141,687 were added during the year. These figures do not include the mileage of wire operated by sub-licensees.

Traffic.

Including the traffic over the long-distance lines, but excluding sub-licensees, the daily average of toll connections was about 494,000, and of exchange connections

about 18,130,000, as against corresponding figures in 1906, of 462,000 and 16,478,000; the total daily average for 1907 reaching 18,624,000, or at the rate of about 5,997,000,000 per year.

Construction.

In the early part of the past year there were signs of a coming change in general business conditions, and steps were taken to stop all construction not necessary either for immediate demand or to put the plant in condition to economically meet future demand. The result of this action has been satisfactory. The construction expenditures during the latter part of the year were largely reduced.

The amount added to construction and real estate by all the companies, excluding sub-licensees, constituting our system in the United States during the year 1907 was:—

For exchanges	$44,184,800
For toll lines	4,426,400
For land and buildings	4,310,200
	$52,921,400

Construction of Previous Years.

The amount added in 1900 was $31,619,100; in 1901, $31,005,400; in 1902, $37,336,500; in 1903, $35,368,700; in 1904, $33,436,700; in 1905, $50,780,906; and in 1906, $79,366,949, making the grand total of expenditure upon these properties during the eight years $351,835,655.

Maintenance and Reconstruction.

During the year $36,626,667 was applied out of revenue to maintenance and reconstruction purposes.

The total amount of maintenance and reconstruction charged against revenue for the last five years was over $147,000,000. This expenditure is reflected in the superior condition of the plant, the theory and practice being that the plant must be kept in standard condition at the expense of revenue.

American Telephone and Telegraph Company Investment.

The amount contributed by the American Telephone and Telegraph Company in 1907 by way of investment in its own long-distance plant ($1,285,000), in real estate ($585,485), and in the purchase of stock and bonds and in advances to its operating companies ($29,952,000), was in all $31,822,485, an addition of about ten per cent. to its entire investment up to January 1, 1907.

Associated Companies.

financial condition.

The associated operating companies of the United States (not including the American Telephone and Telegraph Company) commenced the year with rather an abnormal indebtedness. Measures were at once taken to bring this within the normal limits of current operations. This has been done and the obligations of the

companies to other than the American Telephone and Telegraph Company decreased for the year $21,000,000, while the cash on hand increased at the same time $1,500,000—a net improvement in such liabilities of $22,500,000.

During the year the Western Electric Company decreased its indebtedness $9,400,000 and increased its cash $1,150,000, making a net improvement of $10,550,000 for that company.

The total improvement of our associate operating and manufacturing companies in the United States was $38,050,000, bringing the current and floating indebtedness of all the associated companies well within the limits of current operations.

construction for the current year.

Estimates of all the associated operating companies and of the American Telephone and Telegraph Company for all anticipated requirements for 1908 have been prepared, thoroughly studied and considered in connection with available resources. Maximum expenditure in each case has been agreed upon, which is well within the available resources. All who are responsible for the expenditures are working in entire accord with these agreements and understandings, and it is believed that the results will be well within the limits fixed.

Western Electric Company.

The Western Electric Company desired to extend its relations with our company and the associated companies, and to cover with its operations the entire

telephonic field, whether connected with the Bell system or not. At the same time it was thought that the management, which would remain the same, if brought into closer touch with the general organization of the Bell system, could avoid duplication of effort in electrical and mechanical development and in this way and by the concentration of the purchase and distribution of supplies effect greater efficiency and economy.

To this end contracts have been made with most of the Bell companies, and the contract between our company and the Western Electric Company has been modified in respect to the sale of telephones and telephonic apparatus.

The business of the year 1907, considering the unusual conditions and the large contraction in business, was fairly satisfactory, if taken alone by itself. When taken in connection with the overstock from 1906, and the amount of merchandise and material on hand or in process at the beginning of the year, it shows very small profit.

Marketable goods and merchandise on hand at the end of the year 1907 were inventoried at $2,000,000 less than cost, and concessions in prices to the amount of $335,000 were made.

These items, in addition to the high rates and unusual amount of interest paid, made it necessary to pay substantially all of the dividend of 1907 out of surplus.

At the end of the year cash and cash assets exceeded the payables by about eighteen per cent. The quick assets including merchandise exceeded the payables more than two to one. The plant stands on the books

at about $12,000,000, which is fifty-one per cent. of the actual cost.

During the year an issue of bonds to the amount of $15,000,000 was authorized which will be used when conditions are favorable to provide additional working capital if needed.

A proposition was made by our company to purchase the outstanding share capital of the Western Electric Company at a price agreed upon with some representative shareholders as fair and equitable. Over 30,000 shares have accepted the offer, making the total holdings of our company over 120,000 out of 150,000 shares.

Gross Revenue and Expenses — Operating Companies.

Attention has been given to the operating expenses with a view to bringing them down to the lowest economy consistent with the highest efficiency.

In spite of increase in wages and the continuance of the same high standard of maintenance which has always prevailed, the ratio of expense to gross revenue has decreased so that the net revenue shows a gratifying improvement.

It is expected and believed that the continuation of the present policy through the coming year will produce equally satisfactory results.

The following table shows the year's results of all the telephone operating companies associated with the Bell system, not including the long-distance business and the Bell Telephone Company of Canada, for the year 1907, compared with 1906.

COMPARATIVE CONSOLIDATED STATEMENT OF BELL TELEPHONE COMPANIES IN UNITED STATES. AMERICAN TELEPHONE AND TELEGRAPH COMPANY NOT INCLUDED.

(EXCLUDING DUPLICATIONS.)

	1906.	1907.	Increase.
Gross Earnings .	$105,441,600.	$120,753,200.	$15,311,600.
Expenses:			
Operating and General .	47,206,400.	53,242,300.	6,035,900.
Maintenance .	30,639,200.	34,665,700.	4,026,500.
Total Expenses .	77,845,600.	87,908,000.	10,062,400.
Balance, Net Earnings . .	27,596,000.	32,845,200.	5,249,200.
Deduct Interest .	5,197,800.	7,025,500.	1,827,700.
Balance . .	22,398,200.	25,819,700.	3,421,500.
Dividends Declared	16,682,000.	19,206,100.	2,524,100.
Undivided Profits .	5,716,200.	6,613,600.	897,400.

ISSUE OF NEW SHARE CAPITAL.

Early in the year, anticipating the possibility of an uncertain financial condition, your Directors authorized an offer of 219,252 shares of capital stock to the existing shareholders, at the ratio of one share to each six shares then held. Of this issue all but 9,486 shares were subscribed for and taken. The money realized placed our company in such condition that it was enabled to fully protect all of its associated and allied interests during the exceedingly critical financial period just passed, and left it in a position to meet all anticipated demands of the current year based on a complete discussion of and agreement on the requirements and resources of our company, and of the associated and controlled companies.

With this issue there are now outstanding 1,525,280 shares of capital stock distributed among 23,469 shareholders, an increase of 5,275 over January 1, 1907, being an average of sixty-five shares each.

It will be interesting to note that 1,312,502 of these shares are held by 23,453 shareholders, an average of less than fifty-six each, the balance, 212,778, being held by sixteen shareholders of 5,000 or over shares each —an average of 13,298 each. More than three-quarters of the entire share capital is held in New England.

SELLING TELEPHONES.

The policy of our company in the past has been to lease telephones, and to allow the Western Electric Company to sell only apparatus to our licensees. Believing that the best interests of all would be advanced by the general use of standard telephonic apparatus, after consultation with and with the approval of our associated and licensed companies, we authorized the Western Electric Company to sell both telephones and telephonic apparatus to all applicants. While the time has been too short to show positively the effect of this policy, the indications are that the benefits direct and indirect will be large, particularly in the development of unoccupied territory in connection with the Bell system.

Exaggeration of Telephone Profits for Speculative Purposes.

Much of the agitation against legitimate telephone business is founded on false and exaggerated statements of the profits originally made by the early Bell companies.

These statements have been used by the promoters of both good and bad enterprises.

As a matter of fact, the shareholders of The American Bell Telephone Company and its predecessors paid into the treasuries of those companies more actual cash than was represented by the capitalization at par value.

The only shares of The American Bell Telephone Company not issued for cash at par or at a premium were the shares amounting to $5,100,000 issued in exchange for the shares and property of the National Bell Telephone Company. The premiums received by the company on further issues of stock amounted to more than this sum.

The substitution of the American Telephone and Telegraph Company for The American Bell Telephone Company was, in effect, the purchase of the property of The American Bell Telephone Company for cash at somewhat less than the average market price prevailing prior to the purchase. None of the American Telephone and Telegraph shares now stand on any other basis than cash at par value.

In view of the enterprise shown and the risk incurred by the original investors, who received no interest or dividends for years, the return was certainly not large to those who created an enterprise which has probably

done more to bring about a new and advantageous condition in the affairs of mankind than any other industry in the history of the world.

Physical Valuation of Telephone Plants.

For the purpose of determining the relation between the physical plant and the capitalization, a valuation of the exchange, toll and long-distance line plant included in the Bell system was made at the close of the year. The valuation was based on the replacement cost of the existing plant, and does not include any "unearned increment" or allowance for franchises, but assumes a clear field and free franchise. When to this valuation is added the value of rights of way now unobtainable, patents, franchises, and other valuable considerations, it will be conceded that the Bell system is unique. This showing is interesting and should serve to correct some popular but erroneous impressions.

January 1, 1908, all obligations of the American Telephone and Telegraph Company and its associated operating companies in the United States, including capital stock at par, held by the public were $554,939,000.

Cash on hand, quick receivables, working assets, and sundry investments were . . . . . $101,074,000.

Balance, Capital representing plants, $453,865,000.

The plants are carried on the books of the various companies at . . $492,496,000.

Appraised value by Engineers (copper at 15 cents) . . . . . $488,296,000.

Outstanding obligations against plant, $453,865,000.

Appraised value in excess of outstanding obligations	$34,431,000
Book value exchange construction only, per exchange station . .	$114
Book value all plant (toll line and exchange) of Bell operating companies in United States (not including long-distance) per exchange station . .	$149
Book value all plants in the United States, including long-distance, per exchange station	$162

Promotion and Competition — Independent Companies.

The unusual production and prices, during the past few years, of those commodities which this country sells to the whole world, with accompanying very general distribution of wealth, resulted in an almost phenomenal financial and industrial activity, stimulating new enterprises and promotions of all kinds, among them independent telephone companies.

The exaggerated stories of the fortunes made by original telephone investors, together with misleading statements of probable profits, made it possible to launch many of these companies pledged to *low rates for exchange service and high dividends to investors.* Under these low rates, with "maintenance" and "reconstruction" expenses either intentionally or ignorantly disregarded, these companies for a time had an appearance of prosperity.

The result has been unfortunate in nearly every case.

The promises and pledges as to rates and profits, made as an excuse for their coming, as a basis for their franchise, and as an incentive to attract capital, are now admitted to be impossible. Most, if not all, of these companies, which have had an existence long enough to force attention to the items of "maintenance" or "reconstruction," are now asking for increased rates, and to be absolved from onerous conditions freely accepted and assumed at the beginning. Reorganizations are now in progress.

It would seem, as a whole, that the gain of the public through competition based on low rates has not compensated for the loss of capital invested in these enterprises.

During this period of strife and rush for development and extension, many subscribers were connected to exchange systems with little or no benefit to themselves or advantage to others, and much was done that under ordinary conditions would not have been done.

Rates and Rate Regulation.

The result of these conditions has been to create in the minds of the public, and of public bodies, misleading and mistaken ideas of the telephone business. It has encouraged attempts at regulation of rates and business on lines that if obligatory or persisted in would be ruinous. In controversies as to rates, the policy of our associated companies has been to make a complete and absolute showing of the condition, cost and value of plant, cost and value of service, cost and necessity of proper maintenance, and the broad position is taken

that neither our company nor the associated companies have anything to conceal or anything to apologize for. That the capitalization of all the companies is conservative, far within justifiable limits, and in the relation between the replacement value of the properties and the capitalization of the companies, unique. Fair rates, therefore, should be authorized or acquiesced in, for it is only by fair rates that good service to the public and permanent, healthy conditions can be created or maintained. With a full knowledge of all surrounding circumstances and conditions, it is believed that this would be fully acquiesced in by the public.

Fair rates would insure high-class plant and equipment maintained at a high state of efficiency, and would provide fair wages to employees, the highest paid for similar class of employment. Both of these are necessary to good service.

Fair rates should give fair return on the investment, and promise fair return on new money needed. This is necessary to maintain the interest of the existing shareholders in the proper administration of the business, as well as to provide for the continually increasing public demand.

Any revenue produced over and above such requirements and the proper reserve to provide for contingencies could be used for the benefit of the public, allowing the company to retain a part sufficient to stimulate the most efficient and economical management. It would be difficult, if not impossible, to get effective and economical management, such as would produce the best results for both the public and the shareholders without recognizing this principle.

 1907

It does not seem possible that there can be any question of the justice of this position. That being granted, the facts to be settled are : —

Is the management honest and competent ?

What is the investment?

Is the property represented by that investment maintained at a high standard?

What percentage of return does it show?

Is that a fair return?

Is it obtained by a reasonable distribution of gross charges?

If these questions are answered satisfactorily, there can be no basis for conflict between the company and the public, and the less the working conditions are made inflexible by legislative proscription, the better will be the solution of the constantly changing problems incident to a growing business.

The question of maintenance is of the greatest importance and will be referred to more at length later.

Competition.

The value of any exchange system is measured by the number of the members of any community that are connected with it. If there are two systems, neither of them serving all, important users must be connected with both systems. Connection with only one is of but partial value and cannot be satisfactory. Two exchange systems in the same community, each serving the same members, cannot be conceived of as a permanency, nor can the service in either be furnished at any material reduction because of the competition, if return on

inefficiency of competition

investment and proper maintenance are taken into account. Duplication of plant is a waste to the investor. Duplication of charges is a waste to the user.

The advantages claimed for competition are lower rates and improved service. Exhaustive competition may temporarily produce either or both of these results, but, as before stated, this temporary gain is purchased by an excessive waste. Duplication of plant and operation cannot produce either result without exhaustive competition. Given the same management, the public must pay double rates for service, to meet double charges, on double capital, double operating expenses and double maintenance. In most cases of proposed competition an examination of the prospectus will show that, by some process, it is expected to make good a capitalization equal to at least two or three times the actual cost of the construction. The only benefits are to the promoter.

Public Control.

It is contended that if there is to be no competition, there should be public control.

It is not believed that there is any serious objection to such control, provided it is independent, intelligent, considerate, thorough and just, recognizing, as does the Interstate Commerce Commission in its report recently issued, that capital is entitled to its fair return, and good management or enterprise to its reward.

What is Fair Return on Capital?

With guaranteed or reasonably certain income, money can be obtained for any enterprise at moderate rates.

With uncertainty — owing to competition and opposition, possible or actual, or possible regulation of rates without proper investigation or consideration — a more or less speculative price must be paid.

Subject to these general rules, "locality" and existing general conditions will establish the rate.

Fair Charges. Upon What Based.

Exchange Service.

An exchange system is made up of circuits (each consisting of two wires) radiating from a central office, or from central offices connected by trunk lines, so arranged that each circuit can be connected directly or through trunk lines with the others. There are in these circuits of the Bell system about 7,000,000 miles of wire — over two miles of wire to each subscriber — one-half in underground conduits. The system of radiating circuits is the most expensive part of the exchange system to build, it is least durable, therefore most expensive to maintain, calls for the largest part of the total investment, and consequently must bear the largest part of the cost of capital.

The real value of a telephone exchange system depends entirely on the distribution and number of other members of the same or other communities connected with the same or connecting systems, with whom any subscriber can have prompt and satisfactory communication.

Any member of a community connected with an exchange system can be reached as well, but not as conveniently, from a central or public office as from a subscriber's station.

To reach any member of a community not connected with any exchange system, whether from public station

or subscriber's station, is too inconvenient and impractical to be considered for ordinary use.

Therefore, the particular circuit connecting any subscriber with the exchange is what might be termed a *convenience to that particular subscriber, but a necessity to all other subscribers.*

It is not merely the maintenance of the individual circuit connecting with the exchange that is paid for by any subscriber; *it is in a greater measure the use from time to time of the circuits, trunks and facilities which make communication possible with all other subscribers.*

It is the ability to communicate with others that makes the exchange valuable; it is the use of other circuits than your own.

The cost and value of the system to any subscriber do not depend so much on the number of communications had as on the number and extent of other circuits and facilities necessary to give the communications desired.

It is plain, therefore, that the character of the circuit connecting any subscriber with the exchange does not determine either the cost or value to that subscriber of the exchange connections.

The many and complicated systems of charges prevailing indicate the struggles experts have had in their efforts to establish consistent and reasonable rates.

As the value of the exchange to the subscriber depends upon the number of subscribers within reach — rates must be so established that the maximum number of subscribers can be obtained, so that the greatest number of those with whom communication may be wanted will be connected with the exchange. The cost of any

circuit, therefore, must be largely distributed between those who may desire to communicate with the particular subscriber connected by that circuit.

The cost or value cannot be exactly distributed — an approximation is reached by measured service charges, or by a classification of service between business houses and residences with a sub-classification of plant between "direct" and "party" line.

Business rates are higher for the reason that presumably the business subscriber connects with the greatest number of other subscribers, and consequently makes use of the greatest number of circuits and operating facilities in an exchange.

Residence rates are lower because the residence subscriber connects with a limited number of other subscribers, and because he makes more limited demands on the central office.

It being established that the measure of value is not in the particular class of line connecting any subscriber to an exchange, but in the use of the exchange system as a whole, and that the value of any exchange depends on the area covered and the maximum number of desired individuals that can be reached, rates must be so adjusted that no rate shall bear unjustly on particular individuals or classes; that, at some rate, connection with the exchange is within reach of anyone who can add to the value, to others, of the exchange, and that, as a whole, the revenue will be sufficient to maintain the plant, pay fair wages, make enough return on capital and enterprise to insure good economical management and sufficient capital to meet the increasing demands of the public.

"Toll" Line and "Long-Distance" Service.

Toll line and long-distance communications require, as in exchange connections, the exclusive use of a circuit, two wires, between two points for an interval of time, varying with the conditions; over the whole system the average "time interval" consumed in the completion of each communication is about seven and one-half minutes.

Direct service between two points with large demands for service is the least complicated; the average "time interval" of each communication lasts about three and one-half to five minutes. Between points of small demand, or between intermediate points on local lines, both complications and cost increase, and the average "time interval" is not less than five minutes each. Between points on side or branch lines, or distant points requiring combinations of circuits, or complicated and delicate auxiliary apparatus with many attendant operators, complications and cost increase rapidly, and the "time interval" taken for each communication varies from five or seven and one-half minutes to an indefinite period.

Cost is determined by the capital and maintenance charges of the plant and operating costs, divided by the average number of communications.

Cheap rates for service depend upon high average use of facilities.

High average is obtained ordinarily in public service by putting on higher pressure — crowding — or in some way rendering more than normal service through or

over any given facilities during the limited periods of great demand.

It is by this means, and by this means only, that cheap service is rendered to the public.

Whatever inconvenience or discomfort there may be caused on one hand is compensated for by the reduced price charged for service.

In this particular, toll line or long-distance service is unique. In whatever way the circuit is made up, a certain "time interval" must be given exclusively to each communication, and to the communicating parties. No other communication can be crowded on that circuit during that "time interval."

Any "time interval" passed without being utilized is lost beyond recovery. A good average cannot be made by crowding two or more communications into the "time interval" of one, nor by putting on higher pressure to get more "time intervals" over the same circuit.

There are only a certain number of five-minute "time intervals" in each hour, or five-minute "spaces" on each clock. If you want more "time intervals" or more "spaces," you must take more hours or more clocks. In toll line business anything above the normal capacity of each circuit must be provided for by additional circuits.

Toll line or long-distance business requires the presence of the communicating parties; for that reason it is confined to the business or working hours of the day; and further, the greater part of this business is not only limited to those few hours when parties are most likely to be located at some particular place, but to that part of those few hours immediately after the

general business of the day has developed. For this reason the greater part of the toll line or long-distance business is crowded into an exceedingly small part of the business day. The periods of great demand are short. The facilities provided are idle a great part of even the business hours.

The diagrams following illustrate this most graphically — one taken at Washington, where the business hours, due to the newspaper correspondence, extend well into the night, the other at a city which shows better than the average.

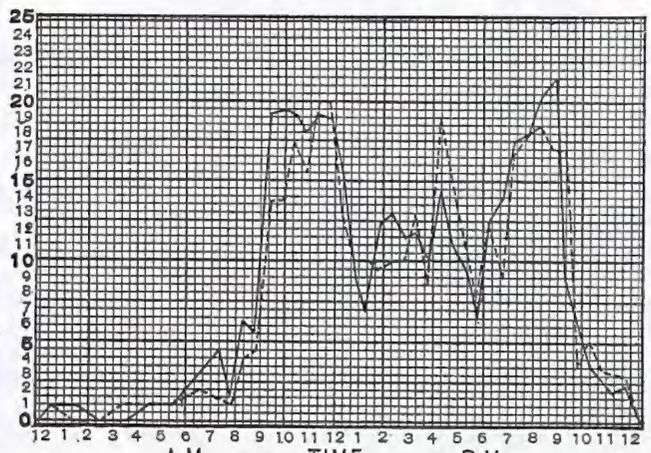
Examination shows that about half the facilities are utilized to a fair part of the capacity during business hours only. All the rest are utilized only to a fractional part of the capacity at any time. If during certain hours the business as shown on these diagrams could be subjected to a half hour's delay, the facilities required could be reduced one-third at least.

Toll line or long-distance business is in the minds of the public similar to telegraphic message business. There is no comparison. Telegraphic circuits between points are at most one wire, on all trunk lines two to four circuits over one wire.

Telegrams are handed in, filed before an operator and despatched in order. In this way the business is distributed more uniformly over working hours, and during the night hours the lines are used for press messages, night messages, or for long-distance messages in transit.

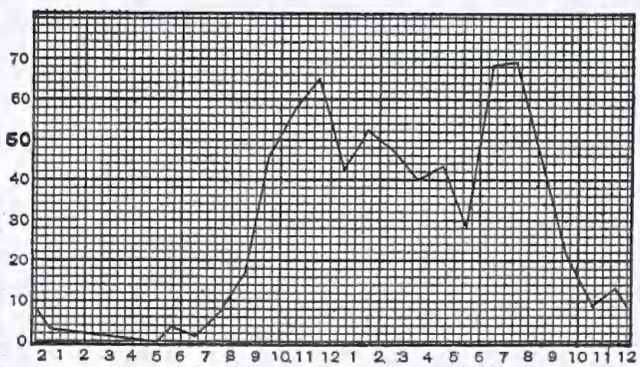
Maintenance.

Utter disregard for repairs and reconstruction, usually comprised under the head of "maintenance," has been



TYPICAL SERVICE CHART
OF
LONG DISTANCE TOLL CALLS

Full Line —— represents Orders received
Dash Line - - - represents Completed Connections



TYPICAL SERVICE CHART
SHOWING VARIATION IN
IN AND OUT LONG DISTANCE TOLL CALLS
HANDLED HOURLY IN
WASHINGTON, D.C.

the cause of more misunderstanding on the part of the public and public bodies having to do with rates, of more self — or selfish — deceit on the part of promoters of telephone enterprises, and of more mistakes on the part of the investing public than any one factor in the telephone business.

With a new plant, "current repair" is at a minimum, and can be for a time disregarded; with a growing plant it is too easy to lose it in construction; but sooner or later, if not provided out of current revenue, where it belongs, it will be found either in increased construction — that is, capital charges — or in a depreciated plant.

Any company paying dividends and fixed charges, particularly dividends, without first providing for proper maintenance, can have but one end — disaster.

In any consideration of this question the leaning should be towards liberal rather than inadequate maintenance. In any properly administered company any excess would be found in betterments or construction, and consequently in reduced capital investment, while inadequate maintenance would soon show in quality of service and in reconstruction requirements. In other words, surplus maintenance would be offset by decrease of capital charges, while inadequate maintenance requiring new construction in time would increase capital charges.

Attention is called to the facts shown above that during the past five years there has been expended out of revenue for maintenance and reconstruction about $150,000,000 on plant, which now has a replacement value of $488,000,000.

Comparative Statistics and Statements.

Appended hereto, as usual, are a series of comparative statistics showing certain phases of the development of the business of the company and its associated companies; the balance sheet of the company as of January 1, 1908; also a comparative statement of the earnings and expenses for the years 1906 and 1907, and a statement showing the net revenue and the dividends paid 1900-1907.

In connection with the improvement shown in the year's business, it may not be amiss to call attention to the fact that each year in the past has shown an improvement over the previous year, whatever may have been the general business conditions.

Everything indicates that the current year will be no exception to this.

It is only in times like the present that the true economy and value of the telephone service with its varied relations to the dispatch and conduct of business and to social relations can be realized. This only emphasizes the fact that of all services the telephone service is the last to be dispensed with.

General.

The past year completes what may be called the thirtieth year of corporate organized work in the development of the Bell Telephone System. In the mind of Mr. Bell, the invention and its application had simultaneous growth. During the first year, such of the many "imaginations" and ideas as to development as were demonstrably practical were assimilated and the

business was established on the lines now followed which make our company with its associated companies a national system with millions of subscribers connected by millions of miles of circuit with local exchange systems, all bound into one large comprehensive system by the toll and long-distance lines with their 163,000 miles of poles and 1,664,000 miles of wire, the whole inter-dependent and inter-communicating, an aggregation or union impossible to destroy in detail and impossible to reproduce as a whole.

Each year has seen some progress in annihilating distance and bringing people closer to each other. Thirty years more may bring about results which will be almost as astonishing as those of the past thirty years. To the public, this "Bell System" furnishes facilities in its "universality" of service and connection, of infinite value to the business world, a service which could not be furnished by disassociated companies.

The strength of the Bell system lies in this "universality." It affords facilities to the public beyond those possible on any other lines. It carries with it also the obligation to occupy and develop the whole field. The urban field was the first to receive attention and the development keeps pace with the demand. The semi-urban and rural demand came later. This has been met both directly by the operating companies and indirectly through local, co-operative and rural combinations, under license from, and connected by toll lines with, our operating companies. The policy adopted during the year, of selling telephones and telephone apparatus, has given fresh impetus to this line of development, which is now showing most gratifying results.

This position of our company has been reached only by a large expenditure of capital, which is, however, fully represented by plant and property with an earning power that must be considered satisfactory.

If this expenditure is but considered as the financing of thirty-five distinct companies occupying thirty-five distinct territories and is considered as so distributed, rather than as a whole, the aggregate does not seem formidable. In this focussing of capital there are distinct advantages in that the revenue is derived from so many and such varied sources, and that the success of our company lies not in the success of any one company but in the average of all.

For the Directors,

THEODORE N. VAIL,

President.

1905

ANNUAL REPORT

OF

THE DIRECTORS

OF

AMERICAN TELEPHONE & TELEGRAPH COMPANY

TO THE STOCKHOLDERS

FOR THE

YEAR ENDING DECEMBER 31, 1905.

PRESS OF
ALFRED MUDGE & SON,
BOSTON.
1906.

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AMERICAN TELEPHONE & TELEGRAPH COMPANY

OFFICERS FOR THE YEAR 1905.

FREDERICK P. FISH,	*President.*
EDWARD J. HALL,	*Vice-President.*
THOMAS SHERWIN,	*Vice-President.*
C. JAY FRENCH,	*Vice-President.*
WILLIAM R. DRIVER,	*Treasurer.*
CHARLES EUSTIS HUBBARD,	*Secretary.*

DIRECTORS

CHARLES W. AMORY.
GEORGE F. BAKER.
FRANCIS BLAKE.
CHARLES P. BOWDITCH.
GEORGE L. BRADLEY.
ALEXANDER COCHRANE.
T. JEFFERSON COOLIDGE, JR.
W. MURRAY CRANE.
FREDERICK P. FISH.
HENRY S. HOWE.
CHARLES EUSTIS HUBBARD.
CHARLES E. PERKINS.
WILLIAM LOWELL PUTNAM.
THOMAS SANDERS.
NATHANIEL THAYER.
THEODORE N. VAIL.
JOHN I. WATERBURY.
MOSES WILLIAMS.

REPORT OF THE DIRECTORS

OF

AMERICAN TELEPHONE AND TELEGRAPH COMPANY.

NEW YORK, March 27, 1906.

TO THE STOCKHOLDERS:

The results of the business for the year 1905, as shown by the Treasurer's statement appended, were as follows: —

Gross Revenue	$21,712,831.29
Expenses, including interest and taxes	8,678,792.90
Net Revenue	13,034,038.39
Dividends paid	9,866,355.00
Carried to Reserve	1,743,295.16
Carried to Surplus	1,424,388.23

The following were the corresponding figures for the year 1904: —

Gross Revenue	$18,546,659.21
Expenses, including interest and taxes	7,270,957.46
Net Revenue	11,275,701.75
Dividends paid	9,799,117.50
Carried to Reserve	586,149.20
Carried to Surplus	890,435.05

The net output of telephones during the year 1905 was 1,217,694, making the total number in the hands of the operating companies 5,698,258.

The number of exchange stations at the end of the year operated by the companies which constitute our system in the United States was 2,241,367, an increase of 441,784. In addition to this number there were 246,337 exchange and toll stations operated by so-called sub-licensees, namely, independent companies or associations under sub-license or connection contracts and making use of our telephones. Adding also our telephones employed for private-line purposes, our companies had a total of 2,528,715 stations as against 2,003,213 stations at the close of the previous year.

The total mileage of wire in use for exchange and toll service was 6,043,518 miles, of which 1,372,480 miles were added during the year. These figures do not include the mileage of wire operated by sub-licensees.

Including the traffic over the Long Distance lines, but excluding sub-licensees, the daily average of toll connections was about 368,000, and of exchange connections about 13,543,000, as against corresponding figures in 1904 of 301,000 and 11,149,000; the total daily average for 1905 reaching 13,911,000, or at the rate of about 4,479,500,000 per year, being 54 telephone calls for each man, woman and child in the United States.

The amount added to construction and real estate by all the companies, excluding sub-licensees, constituting our system in the United States during the year 1905, was:—

For Exchanges	$36,771,312
For Toll Lines	9,832,204
For Land and Buildings	4,177,390
	$50,780,906

The amount added in 1900 was $31,619,100; in 1901, $31,005,400; in 1902, $37,336,500; in 1903, $35,368,700; and in 1904, $33,436,700; making the grand total of expenditure upon these properties during the six years $219,547,306.

The amount expended by this Company in 1905 for the construction, equipment and supplies required for its own Long Distance lines was $3,805,053, making the total investment in Long Distance lines and equipment, up to the close of the year, $34,694,763.

The growth of the business during the past year has been greater than ever before. There is no doubt that the business will continue to increase. The use of the telephone is extending more and more in every section of the country and in every class of the community. It is revolutionizing business methods and social relations to a substantial extent.

The added experience of each year shows more clearly what are the specific requirements which must be met in order to make our telephone system as useful as possible. It is the effort of the Bell companies to adapt the service to the demands of large and small users, business and residence, in large and small cities, rural towns and country districts of various kinds, and to devise and introduce rate schemes that will fit the many and diverse conditions with which the companies are confronted. In pursuance of this policy, combinations of individual and party lines have been introduced; special equipment has been devised for hotel, department store, apartment house, and private branch exchange service; prepayment coin boxes, public pay stations and special farmer and ranch line service have

been provided, in each case with suitable rates adapted to the user and to the service. The enormous growth of the system during the past few years would have been impossible if the utmost attention had not been given to the differentiation required for such varied uses. Every year it becomes more clear how best to meet the needs of the public, and it is in large part because we are better able to fit the service to the varying requirements and thus broaden the field of use, that the demand for telephone service and the extent to which the service is used is increasing far beyond any increase that is due to the development of population or the expansion of business and social activity. Everything that makes the service of greater value, in and of itself accelerates the rate at which the business will grow, and outside of improvements in the service itself, which have been and are constantly effected, there is nothing which adds so much to the value of the service to those who employ it, as the increase in the number of subscribers and the extension of the service into every field.

The entire history of the electrical transmission of human speech is contained within the thirty years that have elapsed since 1876, when the telephone was invented.

The telephone itself, although it has been improved from time to time, was an extremely satisfactory instrument from a comparatively early date.

The great difficulty on the technical side of the business resided in the development of apparatus and methods which would render efficient that general intercommunication among telephone subscribers which

characterizes the business. The improvements in apparatus and methods designed to bring about this vitally important result have been extraordinary in quality and number. By reason of them, not only is a service given, the extent and character of which could hardly have been deemed possible in the early days of the business, but there have been attained a permanency of equipment and a relative economy in construction and operation which are in striking contrast to the earlier conditions.

Only a comparatively few years ago the bulk of the exchange plant throughout the country was of a character which telephone experts now recognize to have been extremely crude as compared with present standards. From the beginning the business grew beyond expectation, but it was only when it had attained a substantial growth that the real nature of the problems to be solved became so clear as to permit of the general application of what we know now to be sound and permanent methods of construction and development.

Since the very rapid increase in the business, which began in the last year of the nineteenth century, the art has so far developed as to create, to a large extent, conditions of definite stability. Apparatus of a permanent type has been devised and put into use; to a constantly greater degree, uniform and standard methods of engineering have been applied in all new work and in the reconstruction of old work; more effective methods of operation have been employed. Moreover, great progress has been made in the direction of systematic organization, proper inspection and supervision, and in the adoption of methods of accounting adapted to the

complicated requirements of a business dealing with an infinite number of small units of service.

On the executive and business side there has been a development equally on right lines. It was and is a definite advantage that the control of an enterprise extending throughout the United States was not so definitely centralized as to prevent local initiative and an obligation on the part of competent men in each section of the country to grapple on the spot with the peculiar problems which each locality has developed. The country is covered by our associated operating companies, nearly forty in number, each having its own trained officials in every department, and its own Board of Directors, made up of men of standing in their respective communities who know and sympathize with the needs of those communities. In this way many of the great problems of the business, including the greatest of all problems, that of rates, which was discussed to some extent in our last annual report, have been studied and dealt with practically, by a large number of organizations, each in touch with the peculiar conditions of its own locality, but all so related as to give to each the benefit of the views and experience of the others. While many problems are still unsettled and new ones arise every year, great progress has been made toward the establishment of sound views as to the way in which the business should be handled so as to give satisfactory service everywhere and to all classes in the community, at as reasonable rates as are consistent with the maintenance of good service and with the development of the business on safe lines. There is, every year, a better understanding on the

part of our companies with the communities in which they respectively work, the companies appreciating more clearly the needs of those communities and the people recognizing that the companies are endeavoring to conduct a difficult public service on sound, fair, and honest lines.

Speaking generally, the business of our organization throughout the country is at the present time on as permanent a basis as that of any large business enterprise serving the public. It is protected by the grant from the proper authorities of rights in cities and towns and rights of way for toll lines that, in almost every instance, afford the necessary assurance of business permanency; and the necessity of the service is so thoroughly recognized that additional rights of this character are, as a rule, readily secured by a fair and reasonable understanding with those from whom such rights must be obtained.

The plant is to a large extent stable and standard. Fifty-four and one-tenth per cent., in miles, of all the exchange wire in the country is now in cables underground; and in the very many places where for technical or economical reasons it is impossible to go underground with exchange circuits, overhead cable construction has taken the place of the open wires formerly in use, to the great advantage of the telephone companies and their subscribers, inasmuch as liability to injury by storms is reduced and the service greatly improved.

At the end of the year 1905, all except about twenty per cent. of the exchange wire in the Bell system was in cables, overhead or underground.

At the present time, the companies making up the Bell system have in use not less than three hundred and twenty million pounds of copper wire, much of it in cables of a permanent type, the value of which, as copper, if removed and sold, it is easy to estimate; not less than 8,000,000 poles and 95,000,000 duct feet of underground conduit are installed and in use to support or contain this wire; but the actual value of this aerial and underground plant is no more to be measured by the value of the raw materials than is the value of a first-class railway in actual service to be based upon what could be realized from the rails and sleepers if they were to be removed and sold as junk.

The real estate owned by the companies making up the Bell system, at the end of the year 1899, amounted to $12,997,458; at the end of the year 1905 it was $29,763,741.

The requirements of the telephone business are such that in the larger cities it is a distinct economy and great advantage to the service that the companies should own their own buildings. Even in the smaller places, it is often impossible to find proper quarters that may be leased, and an intelligent and conservative investment in real estate is as essential an element of a proper and well organized telephone system as poles and wires and central office equipment.

Since January, 1900, the number of telephones in the hands of our companies increased from 1,580,101 to 5,698,258; the total number of stations using Bell telephones, from 675,761 to 2,528,715; the miles of wire in toll and exchange use, from 1,518,609 to 6,043,518; the

number of officers and employees of all classes, from 29,599 to 87,212; the number of yearly conversations, from 1,708,800,000 to 4,479,500,000. The American Bell system of the United States now exceeds, in the number of subscribers, mileage of wire and extent of traffic, the telephone systems of Great Britain and all of continental Europe combined.

The American Telephone and Telegraph Company is the central company of a great organization which is giving telephone service throughout the country. Much of the operation, namely, all that which is local in its character, is done through its associated companies, each of which controls a definite territory within which it supplies telephone service. The American company itself owns and operates a comprehensive system of long distance lines extending through and interconnecting the territories of the associated operating companies, which covers the United States from the Atlantic seaboard to and beyond Minneapolis, Omaha, Kansas City and the eastern portion of the Indian Territory. Its investment in these long distance lines is about $35,000,000. Aside from the long distance lines, its telephones which are leased to operating companies, and its real estate to the value of about $2,500,000, substantially all of its assets consist of securities of the associated companies.* These securities are carried on the company's books at a valuation that is distinctly

* In addition to its interests in the associated telephone companies, the American company holds stock in the Western Electric Company, which is a large manufacturer of telephone and other electrical apparatus and supplies. Outside of the United States, it is a holder of stocks and bonds in the Bell Telephone Company of Canada.

conservative. To do its proportionate part, in the development of the business of those companies, the American Telephone and Telegraph Company sells and issues its own stock and bonds, investing the proceeds in stock, bonds and notes of the associated companies.

The funds thus paid by this company into the treasuries of the associated companies, together with those derived from issues of stock to the other stockholders and from other purchasers of the securities of those companies, furnish the means to enable the associated companies to extend their properties, to construct and enlarge their exchanges, connect hundreds of thousands of new subscribers, and to build toll lines and erect buildings for the operation of central offices.

Briefly stated, practically all of the money paid into the treasury of this company by subscribers to our issues of stock or bonds, with the exception of that expended from year to year for our own long lines and telephones, passes into the treasuries of our associated companies, in exchange for their securities, and is by them expended exclusively upon construction and additions to the plant.

Through this process, the issues of securities by the associated companies, to the extent of our purchase of those securities, reappear in the capitalization of this company, that is to say, each $1000 realized from the securities of the American Telephone and Telegraph Company which is paid over by it into the treasury of one of its associated companies appears again in the form of $1000 of the securities of the company into whose treasury it is paid, and by which it is invested in plant.

In like manner the dividends of the associated companies, that are paid to our company, reappear in the dividends paid by our company to its stockholders.

Dealing with the capitalization of the companies in view of what has just been stated, that is to say, presenting the fact exactly as it exists, the aggregate capitalization of the American Telephone and Telegraph Company and its associated companies in the United States, including capital stock, and bonded and floating debt, was on January 1, 1906, as shown in the following table, which also shows certain other details of capitalization: —

Entire capitalization (stock, bonds and all obligations as above) of all the companies, including this company .	$384,524,583
Number of Stations (excluding sub-licensee and private line stations) .	2,241,367
Average capitalization per Station .	$149.
Deducting cost Toll Lines . . .	$99,293,987
Balance, Cost of Exchanges* . .	$285,230,596
Average capitalization per Station (excluding toll line investment)* . .	$105
Miles of Toll Wire	1,265,236
Average investment per mile of Toll Wire	$78

It is only upon the aggregate capitalization above stated, that our companies, including the American Telephone and Telegraph Company have to earn and pay dividends and interest.

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* In these items are included all the capitalization and investment of the companies, excepting only the cost of toll lines.

It is to be borne in mind that these figures of capitalization and investment per station and per mile of toll wire are an average of all the stations and toll wire throughout the country. In many instances it is greater and in others less than the figures given, the cost in any particular case depending upon the character of the stations and toll lines, the condition of the plant with which they are associated and the cost of construction, which varies greatly under different conditions, such as the size of the city or town in which our exchange exists and the character of the country through which a toll line runs.

There has been from year to year a constant reduction in the investment per station, which has continued even through the recent years in which the cost of raw material and of labor has been much greater than ever before. This is due in part to economies in other directions, but mainly to two causes: first, the introduction of sound engineering and construction methods, which tend directly to economy of installation; and, second, to the fact that there have been developed to a substantial extent new classes of service, such as party and farmers' lines, private branch and hotel service and extension sets, where the cost per unit is much less than that of a special circuit and central office apparatus for each individual station of a standard exchange.

The average cost of operation per station throughout the system has also been substantially reduced from year to year, in part from the same causes that have brought about a reduction in the investment per station.

It is largely because of this reduction in the cost of construction and of operation, that the Bell companies

have everywhere been enabled to make such a marked reduction in their average rates during the past few years. The value of the service has been greatly increased by the addition to the system of a constantly increasing number of subscribers, many of whom were of the new classes to which the service has been exteuded and which required a relatively low rate. For a substantially more valuable and efficient service, small users are now actually paying less than ever before and the cost to large users per unit of service has been reduced to at least an equal degree.

At the present time, the reduction in cost of construction and operation is still continuing and the public everywhere is constantly getting the benefit of this reduction in a lowering of the average rate for telephone service throughout the country. It is the policy of all the companies so to adjust their rates from time to time, that, taking all things into consideration, the net earnings will afford only a fair return upon the investment, after providing proper reserves for depreciation and the natural contingencies of the business.

The figures above given show that the investment cost of our companies is reasonable and their basis of capitalization conservative. All the new money which comes into the business is invested, dollar for dollar, in plant, and every effort is made to apply the money as economically and effectively as possible. No stock or securities are issued except for actual capital, necessary to provide adequate facilities for the business.

The active competition which has existed for many years in many portions of the country still continues, in some cases to the detriment of certain of our com-

panies. It seems clear, however, that within the last three years the general situation, in so far as competition is concerned, has become distinctly more favorable to our interests.

In many portions of the country in which our business was unprofitable a few years ago, it is now in satisfactory condition, and there are but few companies of those which have had to face strenuous competition in which there are not definite indications of an improved condition. In some instances the recovery may be slow, but we believe that it is sure to come everywhere in a reasonable time.

That the competition of two telephone companies, operating in the same field, is an economic mistake, from the standpoint both of the investor and the telephone-using public, is coming to be more and more fully recognized.

The subscriber, to derive the greatest value from telephone service, should be enabled to connect with all subscribers in his exchange area. If there are two companies, the subscriber having considerable business interests finds it almost indispensable that he should be connected with both companies, at increased cost and inconvenience. Those who have the service of one company only cannot carry on conversation by telephone with the subscribers of the other company and have therefore no connection with a portion of the telephone using public.

The competing companies, having an erroneous idea of the cost of giving service, for the most part undertook to secure subscribers by offering telephone service at a price that was unremunerative. This has been shown

in many ways, among others by their repeated efforts to raise the low rates originally established. Many of them were and are capitalized at a high rate, from $200 or $250 and even above $350 per station, as compared with a much lower average per station of the Bell companies operating under similar conditions; and their gross revenue, as far as the same is made public, is, as a rule, far below the amount requisite to cover expenses of operation and even a moderate return upon the capitalization. It is hard to find a competing company that in its published figures does not purport to operate at an aggregate expense of not more than sixty per cent. of its gross receipts; and in some cases from the figures and prospectuses of such companies it would appear that from thirty-five to fifty per cent. of the gross receipts are regarded as sufficient to pay all the expenses of carrying on the business, including maintenance and depreciation, to the extent to which, as is not infrequently the case, these essential items of expense are not ignored.

The gross revenue of the Bell Telephone companies throughout the United States for the year 1905 was $100,440,264; and their total expenses, including a proper allowance for maintenance and depreciation, were $74,110,795; the ratio of expense to gross income being seventy-four per cent. Eliminating all items of revenue and expense except those relating directly to the telephone business, the ratio of expense to gross revenue was about seventy-three per cent. It seems reasonable to suppose that a proper recognition of the element of depreciation and maintenance would in many, if not in most, cases carry the expenses of the

competing telephone companies to a point so nearly equal to (if not exceeding) their gross receipts as to leave but little, if any, margin of return upon capital investment.

There are a large number of independent telephone companies and associations whose projectors entered into the business and invested their capital in entire good faith, and with the purpose of supplying service in small communities and rural districts which our system had not yet developed.

There has been a growing disposition on the part of organizations of this class, as is evidenced by the large increase of the number of sublicensee stations, to adopt the use of Bell telephones and connect themselves with the systems of our companies. This is true, also, of a considerable number of companies which have operated in direct competition with the Bell exchanges.

It is the duty of our companies to employ the best business methods, to adhere to their conservative capitalization, to continue their efforts to establish and maintain the highest practicable standards of efficiency, both in engineering and in operation, and to give to every portion of the public, as far as possible the class of service that it requires, and at the lowest rates consistent with a proper return upon the investment. It is in the public interest that this return shall be such as will attract the capital that must be furnished from time to time for many years to come, in order to build up what the inhabitants of this country need, namely, a national telephone system in which, within the limits that are physically possible, every subscriber can be connected with every other subscriber throughout the land.

In spite of the great progress that has been made in the past few years our work is not yet completed. We have still much to learn and many improvements to make before our business can be brought to the perfection for which we aim. The zeal and energy with which throughout the country, the executive officers, the engineers, the traffic men and others upon whom the future development of the service depends, are working for the results we hope to attain, afford every assurance that there will be continuous progress from year to year in the right direction, and we believe that our efforts to give the country such a telephone service as it requires is appreciated and will be more appreciated as time goes on.

At a special meeting of the stockholders held December 21, 1905, authority was given to issue convertible bonds of the Company to the amount in the aggregate of $150,000,000.

By the terms of a contract dated February 8, 1906, convertible bonds to the amount of $100,000,000 were sold to Messrs. J. P. Morgan & Company, Kuhn, Loeb & Company, Kidder, Peabody & Company and Baring Brothers & Company, Limited. The terms of the sale were favorable to the Company, and your Directors believe that the transaction was of distinct advantage to the Company and to each individual shareholder.

It is expected that the funds provided by this sale will supply the money required for the development of the business until well into the year 1908, including the payment of $20,000,000 of notes of the company due May 1, 1907.

Appended hereto, as usual, are a series of compara-

tive statistics showing certain phases of the development of the business of the company and its associated companies; a statement of the ledger balances of the company as of December 31, 1905; also a comparative statement of the earnings and expenses for the years 1904 and 1905 and copies of the reports of the Committee on Treasurer's Accounts of May 20, October 13, and December 2, 1905; and March 7, 1906. There is also appended a list of the stocks and bonds of the associated companies, owned by this Company.

On the back of the cover of this report is a diagram illustrating graphically the growth in telephone stations connected with the Bell system throughout the United States, from the beginning to the thirty-first day of December, 1905.

For the Directors,

FREDERICK P. FISH,

President.

INSTRUMENTS IN THE HANDS OF BELL LICENSEES, UNDER RENTAL.

THE FIGURES IN LOWER LINE SHOW INCREASE FROM YEAR TO YEAR.

Dec. 20, 1896.	Dec. 20, 1897.	Dec. 20, 1898.	Dec. 20, 1899.	Dec. 20, 1900.
772,627	919,121	1,124,846	1,580,101	1,952,412
97,651	146,494	205,725	455,255	372,311

Dec. 20, 1901.	Dec. 20, 1902.	Dec. 31, 1903.	Dec. 31, 1904.	Dec. 31, 1905.
2,525,606	3,150,320	3,779,517	4,480,564	5,698,258
573,194	624,714	629,197	701,047	1,217,694

TOLL LINES IN THE UNITED STATES OF THIS COMPANY AND THE COMPANIES ASSOCIATED WITH IT.

	Jan. 1, 1897.	Jan. 1, 1898.	Jan. 1, 1899.	Jan. 1, 1900.	Jan. 1, 1901.	Jan. 1, 1902.	Jan. 1, 1903.	Jan. 1, 1904.	Jan. 1, 1905.	Jan. 1, 1906.	Increase.
Miles of Pole Lines	60,453	67,791	75,718	89,292	101,087	110,459	122,409	130,178	136,547	145,585	8,988
Miles of Wire....	268,866	324,888	385,911	501,832	607,599	716,265	837,912	975,702	1,121,228	1,265,236	144,008

TOLL CONNECTIONS.

The average daily number of toll connections is	368,088
Or a total per year of about	118,522,000

EXCHANGES OF THE BELL COMPANIES IN THE UNITED STATES.

	Jan. 1, 1897.	Jan. 1, 1898.	Jan. 1, 1899.	Jan. 1, 1900.	Jan. 1, 1901.	Jan. 1, 1902.	Jan. 1, 1903.	Jan. 1, 1904.	Jan. 1, 1905.	Jan. 1, 1906.	Increase.
Exchanges .	967	1,025	1,126	1,239	1,348	1,411	1,514	1,609	4,080	4,532	452
Branch Offices	832	937	1,008	1,187	1,427	1,594	1,861	2,131			
Miles of wire on poles and buildings .	299,326	341,091	411,832	524,123	644,780	841,140	1,109,017	1,358,140	1,654,379	2,183,167	528,788
Miles of wire underground	234,801	282,634	358,184	489,250	705,269	883,679	1,328,685	1,618,691	1,888,760	2,585,742	696,982
Miles of wire submarine .	2,818	2,675	2,973	3,404	4,203	4,200	6,048	6,358	6,671	9,373	2,702
Total miles of wire . . .	536,845	626,400	772,989	1,016,777	1,354,202	1,729,019	2,443,750	2,983,189	3,549,810	4,778,282	1,228,472

EXCHANGES OF THE BELL COMPANIES—Continued.

	Jan. 1, 1897.	Jan. 1, 1898.	Jan. 1, 1899.	Jan. 1, 1900.	Jan. 1, 1901.	Jan. 1, 1902.	Jan. 1, 1903.	Jan. 1, 1904.	Jan. 1, 1905.	Jan. 1, 1906.	Increase.
Total Circuits .	264,645	295,904	338,298	422,620	508,262	592,467	742,654	798,901	930,251	1,135,449	205,198
Total Employees	14,425	16,682	19,668	25,741	32,837	40,864	50,350	53,795	59,451	74,718	15,267
Total Stations .	325,244	384,230	465,180	632,946	800,880	1,020,647	1,277,983	1,525,167	1,799,633	2,241,867	441,784

EXCHANGE CONNECTIONS.

The estimated number of exchange connections daily in the United States, made up from actual count in most of the exchanges, is 13,543,468

Or a total per year of about 4,360,996,000

The number of daily calls per station varies in different exchanges, the average throughout the United States being about 6.

LEDGER BALANCES, DEC. 31, 1905.

DEBTORS.

Construction, Equipment and Supplies	$34,694,763	91
Telephones	3,507,144	98
Real Estate	2,577,869	87
Stocks and Bonds	161,554,277	28
Patent Account	243,384	35
Machinery and Tools	96,168	81
Cash and Deposits	4,841,992	57
Notes and Accounts Receivable,	36,676,200	14
American Bell Telephone Co.,	22,110,400	00
Old Colony Trust Co., Trustee,	25,000,000	00

CREDITORS.

Capital Stock		$158,661,800 00
Surplus		7,025,487 88
Bonds		48,000,000 00
Bonds (Collateral)		25,000,000 00
Notes		20,000,000 00
Reserves		9,208,834 68
*Accounts Payable		9,760,869 05
Contingent		18,645,210 25
	$296,302,201 86	$296,302,201 86

WM. R. DRIVER, *Treasurer.*

* Of this amount, $7,250,906.50 is for the dividends payable January 15, 1906, to stockholders of record December 30, 1905.

Comparative Statement of Earnings and Expenses.

EARNINGS.

	1904.	1905.
Dividends	$8,400,301 18	$8,897,879 95
Rental of Instruments	3,438,605 54	3,896,151 27
Telephone Traffic	5,575,447 90	6,529,556 82
Real Estate	76,782 49	82,884 46
Interest	1,055,522 10	2,306,858 79
	$18,546,659 21	$21,712,831 29

EXPENSES.

Expenses of Administration (including Legal 1904, $83,530 42; 1905, 93,126 68)	$1,137,023 87	$1,313,586 32
Interest and Taxes	2,670,083 61	3,578,681 86
Telephone Traffic	3,413,850 48	3,786,524 72
	$7,270,957 46	$8,678,792 90
Net Revenue	$11,275,701 75	$13,034,038 39
Dividends Paid	9,799,117 50	9,866,355 00
Balance	$1,476,584 25	$3,167,683 39
Carried to Reserves	$586,149 20	$1,743,295 16
Carried to Surplus	890,435 05	1,424,388 23
	$1,476,584 25	$3,167,683 39

WM. R. DRIVER, *Treasurer.*

Boston, Massachusetts, 20 May, 1905.

Frederick P. Fish, Esquire,

President American Telephone and Telegraph Company,

Dear Sir:— Herewith I enclose the report of Mr. Henry A. Piper, an expert accountant employed by me to examine the accounts of our Treasurer for the three months ending March 31, 1905.

Respectfully yours,

FRANCIS BLAKE,
Committee on Treasurer's Accounts.

Boston, May 20, 1905.

Francis Blake, Esq.,

Dear Sir:— I have examined the accounts of the Treasurer of the American Telephone and Telegraph Company in Boston and New York, for the three months ending March 31, 1905, and have to report as follows:

I have determined the cash in hand and in the banks and trust companies, and find the amount, after allowing for outstanding checks, to agree with the balance of cash on that date.

I have seen approved and receipted vouchers for all disbursements, and have verified the record of cash receipts.

I have seen that all notes and stock certificates owned by the company are in hand and correctly entered upon the books.

I have found all Cash book and Journal entries duly posted to the Ledger, and the footings correct, and have proved the Balance Sheet.

I hereby certify that in all my investigations, as above recited, I have found everything correct.

Yours very truly,

HENRY A. PIPER

Boston, Massachusetts, 18 October, 1905.

Frederick P. Fish, Esquire,

President American Telephone and Telegraph Company,

Dear Sir: — Herewith I enclose the report of Mr. Henry A. Piper, an expert accountant employed by me to examine the accounts of our Treasurer for the three months ending June 30, 1905.

Respectfully yours,

FRANCIS BLAKE,
Committee on Treasurer's Accounts.

Boston, October 12, 1905.

Francis Blake, Esq.,

Dear Sir: — I have examined the accounts of the Treasurer of the American Telephone and Telegraph Company in Boston and New York, for the three months ending June 30, 1905, and have to report as follows:

I have determined the cash in hand and in the banks and trust companies, and find the amount, after allowing for outstanding checks, to agree with the balance of cash on that date.

I have seen approved and receipted vouchers for all disbursements, and have verified the record of cash receipts.

I have seen that all notes and stock certificates owned by the company are in hand and correctly entered upon the books.

I have found all Cash book and Journal entries duly posted to the Ledger, and the footings correct, and have proved the Balance Sheet.

I hereby certify that in all my investigations, as above recited, I have found everything correct.

Yours very truly,

HENRY A. PIPER.

Boston, Massachusetts, 2 December, 1905.

Frederick P. Fish, Esquire,
President American Telephone and Telegraph Company,

Dear Sir: — Herewith I enclose the report of Mr. Henry A. Piper, an expert accountant employed by me to examine the accounts of our Treasurer for the three months ending September 30, 1905.

Respectfully yours,

FRANCIS BLAKE,
Committee on Treasurer's Accounts.

Boston, November 28, 1905.

Francis Blake, Esq.,

Dear Sir: — I have examined the accounts of the Treasurer of the American Telephone and Telegraph Company in Boston and New York, for the three months ending September 30, 1905, and have to report as follows:

I have determined the cash in hand and in the banks and trust companies, and find the amount, after allowing for outstanding checks, to agree with the balance of cash on that date.

I have seen approved and receipted vouchers for all disbursements, and have verified the record of cash receipts.

I have seen that all notes and stock certificates owned by the company are in hand and correctly entered upon the books.

I have found all Cash book and Journal entries duly posted to the Ledger, and the footings correct, and have proved the Balance Sheet.

I hereby certify that in all my investigations, as above recited, I have found everything correct.

Yours very truly,

HENRY A. PIPER.

BOSTON, MASSACHUSETTS, 7 March, 1906.

FREDERICK P. FISH, Esquire,

President American Telephone and Telegraph Company,

Dear Sir:—Herewith I enclose the report of Mr. Henry A. Piper, an expert accountant employed by me to examine the accounts of our Treasurer for the three months ending December 31, 1905.

Respectfully yours,

FRANCIS BLAKE,

Committee on Treasurer's Accounts.

BOSTON, February 28, 1906.

FRANCIS BLAKE, Esq.,

Dear Sir:—I have examined the accounts of the Treasurer of the American Telephone and Telegraph Company in Boston and New York, for the three months ending December 31, 1905, and have to report as follows:

I have determined the cash in hand and in the banks and trust companies, and find the amount, after allowing for outstanding checks, to agree with the balance of cash on that date.

I have seen approved and receipted vouchers for all disbursements, and have verified the record of cash receipts.

I have seen that all notes and stock certificates owned by the company are in hand and correctly entered upon the books.

I have found all Cash book and Journal entries duly posted to the Ledger, and the footings correct, and have proved the Balance Sheet.

I hereby certify that in all my investigations, as above recited, I have found everything correct.

Yours very truly,

HENRY A. PIPER.

LIST OF STOCKS AND BONDS OWNED BY AMERICAN TELEPHONE & TELEGRAPH COMPANY

DECEMBER 31, 1905.

	Shares	Per cent of Whole Stock
Bell Tel. Co. of Buffalo	30,390	50.23
Canada, Ltd.	34,721	38.58
Missouri	34,508	66.27
Philadelphia	*258,351	80.81
Cent. Dist. & Ptg. T. Co.	66,940	66.94
Cent. New York T. & T. Co.	6,603	66.67
Cent. Union Telephone Co.	41,839	76.76
Ches. & Potomac T. Co.	15,121	57.06
Chicago Telephone Co.	72,850	52.04
Cincinnati & Sub'n Bell T. Co	*27,163	30.00
Cleveland Telephone Co.	7,000	22.58
Colorado Telephone Co.	*57,501	52.81
Cumberland T. &. T. Co.	70,056	52.09
Empire State T. & T. Co.	1,378	68.94
Hudson River Telephone Co.	20,331	52.00
Iowa Telephone Co., Pref.	†36,996	93.19
Common	†12,780	25.29
Missouri & Kansas T. Co.	19,442	53.72
Nebraska Telephone Co.	15,372	58.33
New England T. & T. Co.	161,839	58.27
New York Telephone Co.	322,157	64.43
New York & N. J. Tel. C.	15,115	8.78
New York & Pa. T. &. T. Co.	5,007	50.07
Northwestern Tel. Exchange Co.	*21,496	17.91
Pacific States T. & T. Co.	85,172	50.10
Pennsylvania Tel. Co.	*40,178	61.88
Pioneer T. & T. Co.	5,060	57.62
Providence Telephone Co.	*12,000	30.00
Rocky Mountain Bell T. Co.	11,759	51.04
So. Bell T. & T. Co.	147,945	99.96
So. New England Tel. Co.	16,590	33.18
Southwestern T. & T. Co.	16,402	16.40

*Par, $50. †Par, $25.

Western Electric Co.‡ - - -	72,099	60.08
Western T. & T. Co., Pref.§ - -	121,876	76.17
Common -	91,435	57.15
Wisconsin Telephone Co. - -	5,051	16.77
Miscellaneous - - - -	5,662	

BONDS

Bell Telephone Co. of Canada, Ltd. -	$301,000
Cent. Union Tel. Co. - - -	1,000,000
Duluth Telephone Co. - - -	210,000
Iowa Telephone Co. - - -	750,000
New England T. & T. Co. - -	581,000
Miscellaneous - - - - -	138,000

The par value of the above-named stocks is $100, except when otherwise stated.

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‡ The Western Electric Company is a large Manufacturing Corporation having factories in New York and Chicago.

§ The Western Telephone & Telegraph Company owns:

Cleveland Telephone Co. - - -	24,000	77.42
Northwestern Teleph. Exch. Co. - - -	96,504	82.09
Southwestern T. & T. Co. - -	83,598	83.60
Wisconsin Telephone Co. - - -	24,746	82.19

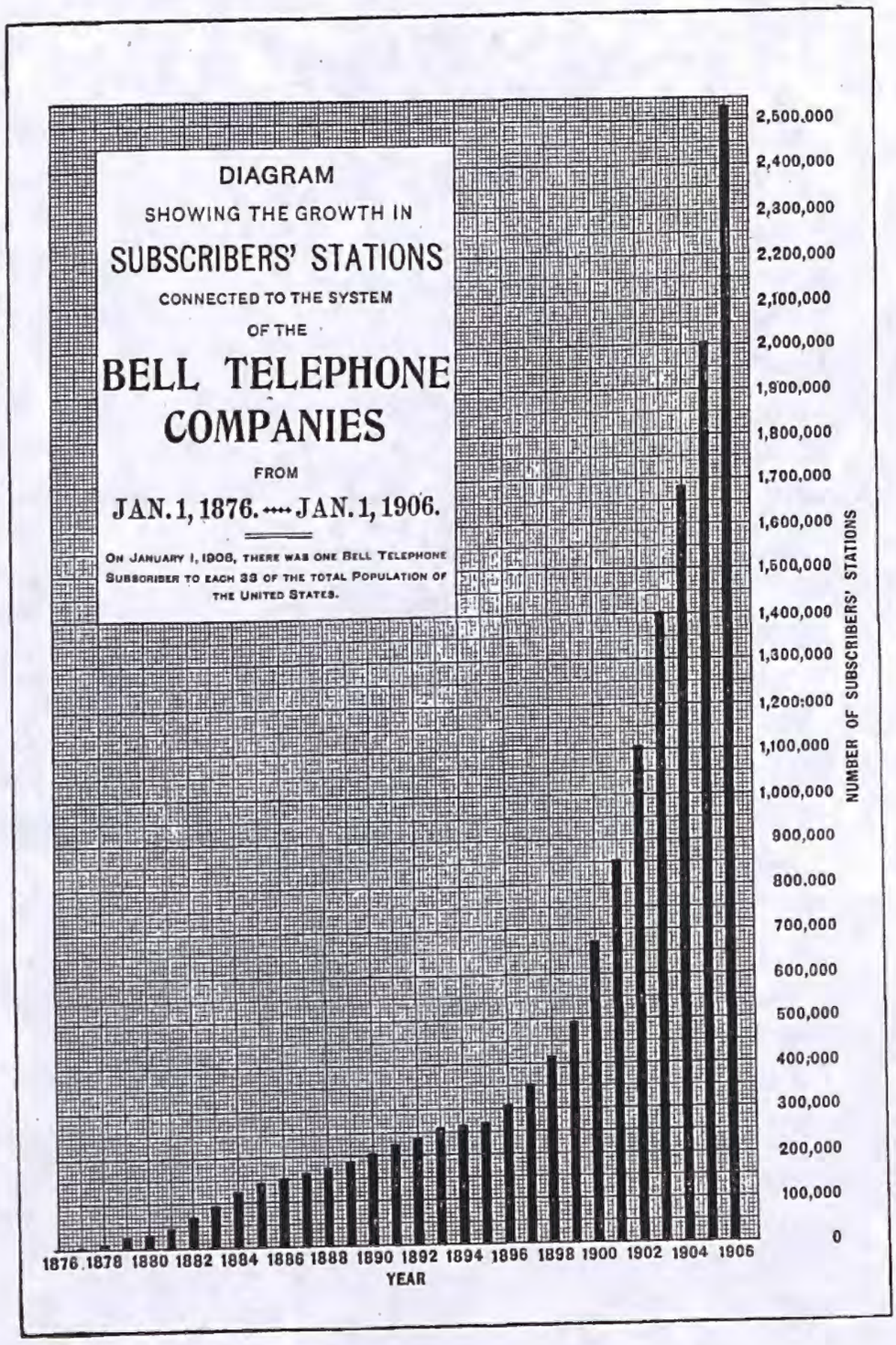
DIAGRAM
SHOWING THE GROWTH IN
SUBSCRIBERS' STATIONS
CONNECTED TO THE SYSTEM
OF THE
BELL TELEPHONE COMPANIES
FROM
JAN. 1, 1876. ···· JAN. 1, 1906.
On January 1, 1906, there was one Bell Telephone Subscriber to each 33 of the total Population of the United States.
2,500,000
2,400,000
2,300,000
2,200,000
2,100,000
2,000,000
1,900,000
1,800,000
1,700,000
1,600,000
1,500,000
1,400,000
1,300,000
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
NUMBER OF SUBSCRIBERS' STATIONS
1876 1878 1880 1882 1884 1886 1888 1890 1892 1894 1896 1898 1900 1902 1904 1906
YEAR

1906

ANNUAL REPORT

OF

THE DIRECTORS

OF

AMERICAN TELEPHONE & TELEGRAPH COMPANY

TO THE STOCKHOLDERS

FOR THE

YEAR ENDING DECEMBER 31, 1906.

PRESS OF
ALFRED MUDGE & SON,
BOSTON.
1907.

1906

ANNUAL REPORT

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TO THE STOCKHOLDERS

FOR THE

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PRESS OF
ALFRED MUDGE & SON,
BOSTON.
1907.

American Telephone & Telegraph Company

OFFICERS FOR THE YEAR 1906.

FREDERICK P. FISH,	*President.*
EDWARD J. HALL,	*Vice-President.*
THOMAS SHERWIN,	*Vice-President.*
CHARLES P. WARE,	*Vice-President.*
WILLIAM R. DRIVER,	*Treasurer.*
CHARLES EUSTIS HUBBARD,	*Secretary.*

DIRECTORS

CHARLES W. AMORY.	HENRY S. HOWE.
THOMAS B. BAILEY.	CHARLES EUSTIS HUBBARD.
GEORGE F. BAKER.	CHARLES E. PERKINS.
FRANCIS BLAKE.	WILLIAM LOWELL PUTNAM.
CHARLES P. BOWDITCH.	THOMAS SANDERS.
ALEXANDER COCHRANE.	NATHANIEL THAYER.
T. JEFFERSON COOLIDGE, JR.	THEODORE N. VAIL.
W. MURRAY CRANE.	JOHN I. WATERBURY.
FREDERICK P. FISH.	MOSES WILLIAMS.

REPORT OF THE DIRECTORS

OF

AMERICAN TELEPHONE AND TELEGRAPH COMPANY.

NEW YORK, March 26, 1907.

TO THE STOCKHOLDERS:

The results of the business for the year 1906, as shown by the Treasurer's statement appended, were as follows:—

Gross Revenue	$24,526,097.82
Expenses, including interest and taxes	11,555,161.06
Net Revenue	12,970,936.76
*Dividends paid	10,195,233.50
Carried to Reserve	1,773,736.62
Carried to Surplus	1,001,966.64

The following were the corresponding figures for the year 1905:—

Gross Revenue	$21,712,831.29
Expenses, including interest and taxes	8,678,792.90
Net Revenue	13,034,038.39
*Dividends paid	9,866,355.00
Carried to Reserve	1,743,295.16
Carried to Surplus	1,424,388.23

The net output of telephones during the year 1906 was 1,409,578, making the total number in the hands of the operating companies 7,107,836.

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* The increase of dividends in 1906 was due to the fact that the last two dividends declared in that year were each two per cent., while the corresponding dividends in 1905 were respectively one and one-half and two and one-quarter per cent.

The number of exchange stations at the end of the year operated by the companies which constitute our system in the United States was 2,727,289, an increase of 485,922. In addition to this number, there were 297,220 exchange and toll stations operated by so-called sub-licensees, namely, independent companies or associations under sub-license or connection contracts and making use of our telephones. Adding also our telephones employed for private-line purposes, our companies had a total of 3,068,833 stations as against 2,528,715 stations at the close of the previous year.

The total mileage of wire in use for exchange and toll service was 7,468,905 miles, of which 1,688,987 were added during the year. These figures do not include the mileage of wire operated by sub-licensees.

Including the traffic over the long distance lines, but excluding sub-licensees, the daily average of toll connections was about 462,000, and of exchange connections about 16,478,000, as against corresponding figures in 1905 of 368,000 and 13,543,000; the total daily average for 1906 reaching 16,940,000, or at the rate of about 5,455,000,000 per year, being 64 telephone calls for each man, woman and child in the United States.

The amount added to construction and real estate by all the companies, excluding sub-licensees, constituting our system in the United States during the year 1906, was:—

For Exchanges	$59,971,094
For Toll Lines	13,585,659
For Land and Buildings	5,810,196
	$79,366,949

The amount added in 1900 was $31,619,100; in 1901, $31,005,400; in 1902, $37,336,500; in 1903, $35,368,700; in 1904, $33,436,700; and in 1905, $50,780,906; making the grand total of expenditure upon these properties during the seven years $298,914,255.

During the year 1906, the amount expended for maintenance and reconstruction, independent of construction, by all the Bell telephone companies in the United States was $32,814,568. This amount came from the earnings of the properties, and was charged into the expenses of the year. As a result of these expenditures for maintenance and reconstruction, the plant of our companies is in a better condition than ever before. That plant could not at the present time be reproduced for a less sum than $70,000,000 in excess of its cost. The scrap value of the lead and copper in the lines and cables alone is not less, at present prices, than $80,000,000. Every year the plant becomes more permanent in character and of longer life. There is no reason to doubt that at the present time it is substantially of a type which need not be replaced until it is worn out.

The amount contributed by the American Telephone and Telegraph Company in 1906 by way of investment in its own long-distance plant ($5,642,000), in telephones ($1,737,000), in real estate ($330,000), and in the purchase of stock and bonds and in loans to its operating companies ($53,432,000), was in all $61,141,000, an addition of almost twenty-six per cent. to its entire investment up to January 1, 1906.

This greatly increased investment was made with the view of lifting the entire business to a distinctly higher plane specifically and as compared with its

competitors. Your Directors believe that the expenditure was wise and that, because of it, the position and business of the Bell companies were never so secure as at the present time. The controlling importance of our companies in the telephone field is even more marked than before, and there is hardly a district of any extent throughout the country in which their business is not supported by a satisfactory plant, a good organization and good service.

While even in these important phases of the business the situation requires constant watching and there still remains much to be done, particularly in some places, the improvement, generally speaking, has been marked and constant.

In the expenditures for construction during the past year, the Bell companies have proceeded more positively than ever before upon a definite theory which is believed to be that required to meet the conditions of the business as now known. They have built for the future as far as was consistent with sound economy. They have laid the foundations for the development that is sure to come and have not limited their construction to the business actually in sight.

In the earlier stages when, as in 1896, there was a gain of only 43,549 stations, or, as in 1900, a gain of only 167,934, it was impossible to realize how rapidly the demand for telephones would increase. It seemed consistent with sound policy to assume a rate of growth not greatly in excess of that then prevailing. If this policy were to be continued, it would be a matter of great difficulty to adjust the plant conditions to the demands of a vastly increased business, and the diffi-

culty would be greater every year. If buildings were erected and central office equipment installed only for the business practically then in sight, it would not be long before those buildings and central office equipments would be inadequate. It is inherent in the nature of the business that when telephone buildings and central office equipment become inadequate, they can be enlarged, in many cases, only at an expense altogether out of proportion to the increased facilities gained by such an enlargement. In fact, it has not unfrequently happened that, because of the unexpected demands for service, it has been found necessary to abandon a building and central office equipment and start again from the beginning, with a new building and new apparatus, as the most economical way of meeting the situation.

The same is true, even to a greater extent, of the line construction, which connects the exchange with the subscribers' stations.

The improvement in cables, made within the past few years, has revolutionized the art of telephone line construction. Not only is it now possible to place in underground ducts, cables containing four hundred or even six hundred circuits, but a pole line the carrying capacity of which would have been exhausted by forty pairs of open wires, can carry six hundred pairs of wires in the form of cables. The old-fashioned exchange pole line rarely carried more than twenty pairs of open wires. When an open wire aerial line has reached the low limit of its carrying capacity, it must be taken down and a larger line built unless there is an opportunity for a new line, which frequently is not the case. In either event, there

is a great waste as compared with a type of construction in which, by the use of cables, a given pole line may have a capacity many times as great. Sound economy has many times in the past year required the scrapping of all the wires on a pole line, cable being substituted for them, as the only way of securing the enlargement of facilities that was required, and not unfrequently it has been necessary to reconstruct the whole line as the cheapest way of securing the opportunity for growth that was required.

In so far as cable construction is concerned, it is not only of great advantage, as a matter of economy and as affording opportunities for growth that are not possible with open wires, but by the use of cables the chances of interruption of service are lessened, and the expense of maintenance is very greatly reduced.

If the very great development of the business could have been foreseen and the engineers and manufacturers had, at an early date, solved the cable problem so that cables of large capacity could have been originally installed instead of open wire, in the places where a large number of circuits would ultimately be required, much money would have been saved.

Now that it is certain that the business will develop on lines of reasonable profit to an extent much greater than even the most enthusiastic telephone man ventured to expect a few years ago, and cables for exchange distribution are made which are in all respects satisfactory vehicles of transmission, it would be the height of folly not to anticipate the certain extension of the business by providing facilities for future growth, when they can be most economically installed.

There will always be a substantial amount of open wire construction where few circuits are likely to be required, but the substitution of cable for open wires as the demands upon the plant increase is a sound practice even though it involves an investment based upon the certain requirements of the future rather than upon what is immediately necessary.

The great extent to which the telephone business was sure to develop became apparent about the year 1901, when the number of new subscribers increased nearly 220,000, as compared with about 167,000, the largest increase in any prior year. The increase was 257,336 in 1902; 247,184 in 1903; 274,466 in 1904; and 441,734 in 1905.

These large increases in the number of subscribers, which were attended by an equally large increase in the demand for toll service, practically exhausted the plant of the Bell companies and involved rebuilding that plant to a large extent. The year 1906 has seen additions to construction which not only enabled the companies to take care of the 2,241,367 subscribers connected with the system on the first of January, 1906, and the nearly 500,000 added during the year 1906, but which resulted in plant conditions, based on scientific study, which will enable the growth of future years to be taken care of with an economy and efficiency due to the application of the most approved methods of work. Constant additions will have to be made to the plant, but they will largely be on predetermined lines, utilizing, extending and rounding out the systematic plant conditions that now exist.

The effort has been made to design buildings and pro-

vide central office equipment that will not be exhausted in a short time. Careful engineering studies have been made of nearly all the large cities in the country, open wires have been displaced to a large extent, and underground construction and aerial and underground cables have been installed that were not merely adequate for the growth then in sight, but for a substantially larger growth. The lines upon which increases of plant should be made have been laid out in advance, so as to fit into the work now done.

The same general engineering plan has characterized the work of our companies in their toll-line equipment. It has been necessary to erect from time to time lines of poles which carried a single circuit, or only a small number of circuits, no larger number being required to do the business between the points connected by the pole line. Every circuit added to such a pole line reduces the cost of the installation per circuit mile, and it is a satisfaction to know that the number of miles of wire per mile of pole line has increased from 5.6 January 1, 1900, to 9.4 January 1, 1907. For the year 1906, the increase in miles of pole lines was 9,334, while the increase in miles of wire was 195.937, the ratio being more than twenty to one.

Another, and by no means the least important, advantage of systematic engineering such as now characterizes our work, lies in the fact that, by reason of it, we shall be much better able to meet promptly and satisfactorily the demands of the public for good service.

It does not seem extravagant to say that, as the result of the work of the past few years, the companies

have started on a new line of development, in so far as plant and business are concerned, which is of the utmost importance and sure to result in better service and more economical operation, and thereby in distinctly better returns on the investment than would otherwise have been the case.

As an indication of the extent to which the companies have built for the future, attention is called to the fact that at the present time not less than $25,000,000 are invested in circuits in cable that are not yet in use, but all of which will soon be in service, and that pole and conduit facilities are now installed which will take care of a very large number of cables over and above those that now exist.

Large expenditures will be required in the future, as in the past, to enable our companies to do the business that is forced upon them by the increasing demand for telephone service. It is the opinion of your Directors that the plant was never in better condition to meet the demand upon our companies, and that the additions to it which are surely necessary will not only result in a proper return, but will create an adequate revenue from a substantial portion of the plant that now exists which in the nature of the case has not yet been utilized.

The extensive building for the future and the very high cost of labor and material during the past year have somewhat increased the cost per station added to the Bell system over the corresponding costs of 1905. The cost per mile of toll wire did not increase.

There is no reason to question the validity of the statement made in the last Annual Report that the

reduction in the cost of construction per unit, which has been so significant during the past few years, will continue to characterize the business as it develops.

As has been the case for many years, there are certain portions of the country in which the return from the business is not satisfactory. These are for the most part localities in which our companies had not been able to cover the field rapidly enough to supply the demand for telephone service, and were, therefore, particularly exposed to competition.

As stated in prior reports, the unintelligent views of our competitors as to what rates for service are possible have created conditions in the portions of the country to which reference is now made, under which neither they nor the Bell companies are getting proper returns for the service rendered. These conditions are sure to correct themselves in time, particularly as almost everywhere, except in some of the comparatively few places in which new promotion schemes are being exploited, our competitors have discovered their mistake and are as anxious to raise their rates as they formerly were to do business at a loss. We have now developed our plant, business and organization in most of these localities to such an extent as to have the situation in hand, and have now only to proceed on sound lines to establish such relations with the public as will enable us to secure a fair return for the service rendered. There are definite indications that the public in these localities appreciates the situation to a greater extent than ever before, and that it will ultimately co-operate to secure the adequate telephone service which it needs, by encouraging our companies to make the readjustment of rates that is

necessary to enable us to give that service under fair conditions.

In by far the greater part of the country, rates are established and maintained with the approbation of the public, which permit the reasonable return required by the Bell companies to enable them to meet the demands of those who use the telephone.

Considering the difficulties in telephone rate making, and the fact that even now there has not been sufficient experience with the constantly changing phases of the business to make it possible to establish rigid theories fitting all conditions, it is a satisfaction to find that the complaints made as to the rates of the Bell companies are comparatively few in number, and are generally based upon some special feature of the system employed in a particular locality, and not upon the scheme of rates as a whole.

The so-called Independent telephone companies which are in competition with the Bell companies throughout the United States have, as far as can be learned, except in a few localities, made no relative gain. It is a matter of common notoriety that many of them recognize that their situation is unstable. Comparatively few new Independent plants have been established in competition with the Bell during the past two years. A number of franchises for competing companies have been granted in various cities, but during the year 1906, and up to the present time in the year 1907, substantially no work has been done under any of the franchises in the more important places. The investors from whom Independent telephone promoters have secured money in the past, are

apparently less inclined than formerly to make the advances required to install telephone exchanges under the very unfavorable conditions, among others the excessive cost of material and labor and the high rates for money, which now prevail. The known financial situation of some of the larger Independent enterprises undoubtedly also operates to check such investment.

In spite of the fact that during the past year a large portion of the time and energy of the executive officers of the Bell companies have been absorbed in construction work and in the extension of the plant and business, the character of the service throughout the country has undoubtedly improved. Effort is everywhere made to keep the service at a proper standard and to improve it. The time and thought of hundreds of engineers and traffic men is devoted, not only to applying the present methods of giving service as efficiently as possible, but to finding out, by careful and intelligent study, methods of operation and of handling the business that will lead constantly to better and more efficient service. Substantial progress has been made in this direction; and while the service in this country is conceded to be the best in the world, there is every reason to believe that it can and will be improved as the result of the comprehensive and intelligent efforts that are being made to that end.

There was during the year 1906 at least the usual amount of destruction of plant by sleet storms, washouts and fire. The San Francisco catastrophe undoubtedly inflicted upon the plant of the Pacific States Company, which operates on the Pacific Coast, a greater injury than any telephone plant ever suffered before.

If it had not been for this disaster, the Pacific States Company would have gained not less than thirty thousand subscribers more than it did in fact gain. The telephone plant in San Francisco has been rebuilt, and the service restored to a surprising extent.

As stated in the last Annual Report, convertible four per cent. bonds of the company, to the amount of $100,000,000, were sold in February, 1906. By the terms of the contract, bonds to the amount of $30,000,000 were taken and paid for during that year. Construction work proceeded so rapidly throughout the country that, during the year, it became necessary for the company to obtain money on short-time notes to secure the funds required, in anticipation of the payments on the bonds. On the first of January, 1907, its short-time obligations amounted to about $21,000,000. It also became evident that if the great commercial development throughout the country which was taxing the resources of practically every public service company, and the telephone companies almost more than any other, was to continue, the proceeds from the bonds would not be sufficient to meet the necessary expenditures of the company to the end of the year 1907, as had been expected.

In January, 1907, therefore, the company sold three-year five per cent. notes to the amount of $25,000,000. These notes were readily placed at a price that was reasonable in view of the abnormal financial conditions that have characterized the past year. From the proceeds of the securities sold, the floating indebtedness of the company will be paid when due, and on May 1, 1907, the $20,000,000 three-year five per cent. notes of the company, due that day, will be paid.

The gross revenue for the year 1906 of all the Bell companies in the United States, taken as a whole and excluding duplications, was over $114,000,000. In spite of the abnormal financial conditions, which involved unusual interest charges, the very great investment in construction, much of which did not become revenue producing during the year, and the high cost of labor and material, the net returns from the business as a whole were not reduced, although there was not the increase which would have been made if the conditions had been more nearly normal. All things considered, the financial results were satisfactory. Your Directors believe that for the year 1907 the financial results of the business of your companies will be substantially better than in the year 1906.

The gross revenue of the companies above given does not include the Bell Company of Canada, nor does it take into account the revenue of the Western Electric Company. The business of that company for the year 1906 was the largest in its history.

Appended hereto, as usual, are a series of comparative statistics showing certain phases of the development of the business of the company and its associated companies; a statement of the ledger balances of the Company as of December 31, 1906; also a comparative statement of the earnings and expenses for the years 1905 and 1906 and copies of the reports of the Committee on Treasurer's Accounts of May 23, September 22, and November 28, 1906, and March 8, 1907.

On the back of the cover of this report is a diagram illustrating graphically the growth in telephone stations

connected with the Bell system throughout the United States, from the beginning to the thirty-first day of December, 1906.

For the Directors,

FREDERICK P. FISH,
President.

INSTRUMENTS IN THE HANDS OF BELL LICENSEES, UNDER RENTAL.

THE FIGURES IN LOWER LINE SHOW INCREASE FROM YEAR TO YEAR.

Dec. 20, 1897.	Dec. 20, 1898.	Dec. 20, 1899.	Dec. 20, 1900.	Dec. 20, 1901.
919,121	1,124,846	1,580,101	1,952,412	2,525,606
146,494	205,725	455,255	372,311	573,194

Dec. 20, 1902.	Dec. 31, 1903.	Dec. 31, 1904.	Dec. 31, 1905.	Dec. 31, 1906.
3,150,820	3,779,517	4,480,564	5,698,258	7,107,836
624,714	629,197	701,047	1,217,694	1,409,578

TOLL LINES IN THE UNITED STATES OF THIS COMPANY AND THE COMPANIES ASSOCIATED WITH IT.

	Jan. 1, 1898.	Jan. 1, 1899.	Jan. 1, 1900.	Jan. 1, 1901.	Jan. 1, 1902.	Jan. 1, 1903.	Jan. 1, 1904.	Jan. 1, 1905.	Jan. 1, 1906.	Jan. 1, 1907.	Increase.
Miles of Pole Lines	67,791	75,718	89,292	101,087	110,459	122,409	130,178	136,547	145,535	154,869	9,334
Miles of Wire....	324,888	385,911	501,832	607,599	716,265	837,912	975,702	1,121,228	1,265,236	1,461,173	195,937

TOLL CONNECTIONS.

The average daily number of toll connections is 461,519

Or a total per year of about 148,609,000

EXCHANGES OF THE BELL COMPANIES IN THE UNITED STATES.

	Jan. 1, 1898.	Jan. 1, 1899.	Jan. 1, 1900.	Jan. 1, 1901.	Jan. 1, 1902.	Jan. 1, 1903.	Jan. 1, 1904.	Jan. 1, 1905.	Jan. 1, 1906.	Jan. 1, 1907.	Increase.
Exchanges .	1,025	1,126	1,239	1,348	1,411	1,514	1,609	4,080	4,532	4,889	357
Branch Offices	937	1,008	1,187	1,427	1,594	1,861	2,131				
Miles of wire on poles and buildings .	341,091	411,832	524,123	644,730	841,140	1,109,017	1,358,140	1,654,879	2,159,567	2,754,571	595,004
Miles of wire underground	282,634	358,184	489,250	705,269	883,679	1,328,685	1,618,691	1,888,760	2,345,742	3,241,471	895,729
Miles of wire submarine .	2,675	2,973	3,404	4,203	4,200	6,048	6,358	6,671	9,373	11,690	2,317
Total miles of wire . . .	626,400	772,989	1,016,777	1,354,202	1,729,019	2,443,750	2,983,189	3,549,810	4,514,682	6,007,732	1,493,050

EXCHANGES OF THE BELL COMPANIES—Continued.

	Jan. 1, 1898.	Jan. 1, 1899.	Jan. 1, 1900.	Jan. 1, 1901.	Jan. 1, 1902.	Jan. 1, 1903.	Jan. 1, 1904.	Jan. 1, 1905.	Jan. 1, 1906.	Jan. 1, 1907.	Increase.
Total Circuits .	295,904	338,293	422,620	508,262	592,467	742,654	798,901	930,251	1,135,449	1,384,175	248,726
Total Employees	16,682	19,668	25,741	32,837	40,864	50,350	58,795	59,451	74,718	90,324	15,606
Total Stations .	384,230	465,180	632,946	800,880	1,020,647	1,277,983	1,525,167	1,799,633	2,241,867	2,727,289	485,922

EXCHANGE CONNECTIONS.

The estimated number of exchange connections daily in the United States, made up from actual count in most of the exchanges, is 16,478,058

Or a total per year of about 5,305,900,000

The number of daily calls per station varies in different exchanges, the average throughout the United States being about 6.

LEDGER BALANCES, DEC. 31, 1906.

DEBTORS.

Construction, Equipment and Supplies	$40,336,776 14
Telephones	10,244,817 89
Real Estate	2,908,098 46
Stocks and Bonds	182,357,238 15
Patent Account	261,384 35
Machinery, Tools and Supplies,	42,299 10
Cash and Deposits	3,018,024 43
Notes and Accounts Receivable,	67,521,977 14
American Bell Telephone Co.,	22,110,400 00
Old Colony Trust Co., Trustee,	25,000,000 00

CREDITORS.

Capital Stock		$158,661,800 00
Surplus		8,027,454 52
Convertible Bonds		30,000,000 00
Collateral Trust Bonds		53,000,000 00
" (Collateral)		25,000,000 00
Five Per Cent. Notes due May 1, 1907		20,000,000 00
Reserves		9,108,138 81
Notes and Accounts Payable		31,358,411 58
Contingent		18,645,210 25
	$353,801,015 16	$353,801,015 16

WM. R. DRIVER, *Treasurer.*

Comparative Statement of Earnings and Expenses.

EARNINGS.

	1905.	1906.
Dividends	$8,897,879 95	$10,281,437 60
Rental of Instruments	3,896,151 27	4,518,990 66
Telephone Traffic	6,529,556 82	7,522,082 31
Real Estate	82,384 46	67,296 29
Interest	2,306,858 79	2,136,290 96
	$21,712,831 29	$24,526,097 82

EXPENSES.

Expenses of Administration	$1,313,586 32	$1,629,802 85
Interest and Taxes	3,578,681 86	5,288,413 95
Telephone Traffic	3,786,524 72	4,636,944 26
	$8,678,792 90	$11,555,161 06
Net Revenue	$13,034,038 39	$12,970,936 76
Dividends Paid	9,866,355 00	10,195,233 50
Balance	$3,167,683 39	$2,775,703 26
Carried to Reserves	$1,743,295 16	$1,773,736 62
Carried to Surplus	1,424,388 23	1,001,966 64
	$3,167,683 39	$2,775,703 26

WM. R. DRIVER, *Treasurer.*

BOSTON, MASSACHUSETTS, 23 MAY, 1906.

FREDERICK P. FISH, Esquire,

President American Telephone and Telegraph Company,

Dear Sir: — Herewith I enclose the report of Mr. Henry A Piper, an expert accountant employed by me to examine the accounts of our Treasurer for the three months ending March 31, 1906.

Respectfully yours,

FRANCIS BLAKE,

Committee on Treasurer's Accounts.

BOSTON, May 22, 1906.

FRANCIS BLAKE, Esq.,

Dear Sir: — I have examined the accounts of the Treasurer of the American Telephone and Telegraph Company in Boston and New York, for the three months ending March 31, 1906, and have to report as follows:

I have determined the cash in hand and in the banks and trust companies, and find the amount, after allowing for outstanding checks, to agree with the balance of cash on that date.

I have seen approved and receipted vouchers for all disbursements, and have verified the record of cash receipts.

I have seen that all notes and stock certificates owned by the company are in hand and correctly entered upon the books.

I have found all Cash book and Journal entries duly posted to the Ledger, and the footings correct, and have proved the Balance Sheet.

I hereby certify that in all my investigations, as above recited, I have found everything correct.

Yours very truly,

HENRY A. PIPER.

BOSTON, MASSACHUSETTS, 22 September, 1906.

FREDERICK P. FISH, Esquire,

President American Telephone and Telegraph Company,

Dear Sir: — Herewith I enclose the report of Mr. Henry A. Piper, an expert accountant employed by me to examine the accounts of our Treasurer for the three months ending June 30, 1906.

Respectfully yours,

FRANCIS BLAKE,

Committee on Treasurer's Accounts.

BOSTON, September 22, 1906.

FRANCIS BLAKE, Esq.,

Dear Sir: — I have examined the accounts of the Treasurer of the American Telephone and Telegraph Company in Boston and New York, for the three months ending June 30, 1906, and have to report as follows:

I have determined the cash in hand and in the banks and trust companies, and find the amount, after allowing for outstanding checks, to agree with the balance of cash on that date.

I have seen approved and receipted vouchers for all disbursements, and have verified the record of cash receipts.

I have seen that all notes and stock certificates owned by the company are in hand and correctly entered upon the books.

I have found all Cash book and Journal entries duly posted to the Ledger, and the footings correct, and have proved the Balance Sheet.

I hereby certify that in all my investigations, as above recited, I have found everything correct.

Yours very truly,

HENRY A. PIPER.

BOSTON, MASSACHUSETTS, 28 November, 1906.

FREDERICK P. FISH, Esquire,

President American Telephone and Telegraph Company,

Dear Sir : — Herewith I enclose the report of Mr. Henry A. Piper, an expert accountant employed by me to examine the accounts of our Treasurer for the three months ending September 30, 1906.

Respectfully yours,

FRANCIS BLAKE,
Committee on Treasurer's Accounts.

BOSTON, November 27, 1906.

FRANCIS BLAKE, Esq.,

Dear Sir : — I have examined the accounts of the Treasurer of the American Telephone and Telegraph Company in Boston and New York, for the three months ending September 30, 1906, and have to report as follows :

I have determined the cash in hand and in the banks and trust companies, and find the amount, after allowing for outstanding checks, to agree with the balance of cash on that date.

I have seen approved and receipted vouchers for all disbursements, and have verified the record of cash receipts.

I have seen that all notes and stock certificates owned by the company are in hand and correctly entered upon the books.

I have found all Cash book and Journal entries duly posted to the Ledger, and the footings correct, and have proved the Balance Sheet.

I hereby certify that in all my investigations, as above recited, I have found everything correct.

Yours very truly,

HENRY A. PIPER.

BOSTON, MASSACHUSETTS, 8 March, 1907.

FREDERICK P. FISH, Esquire,

President American Telephone and Telegraph Company,

Dear Sir: — Herewith I enclose the report of Mr. Henry A. Piper, an expert accountant employed by me to examine the accounts of our Treasurer for the three months ending December 31, 1906.

Respectfully yours,

FRANCIS BLAKE,

Committee on Treasurer's Accounts.

BOSTON, March 8, 1907.

FRANCIS BLAKE, ESQ.,

Dear Sir: — I have examined the accounts of the Treasurer of the American Telephone and Telegraph Company in Boston and New York, for the three months ending December 31, 1906, and have to report as follows:

I have determined the cash in hand and in the banks and trust companies, and find the amount, after allowing for outstanding checks, to agree with the balance of cash on that date.

I have seen approved and receipted vouchers for all disbursements, and have verified the record of cash receipts.

I have seen that all notes and stock certificates owned by the company are in hand and correctly entered upon the books.

I have found all Cash book and Journal entries duly posted to the Ledger, and the footings correct, and have proved the Balance Sheet.

I hereby certify that in all my investigations, as above recited, I have found everything correct.

Yours very truly,

HENRY A. PIPER.

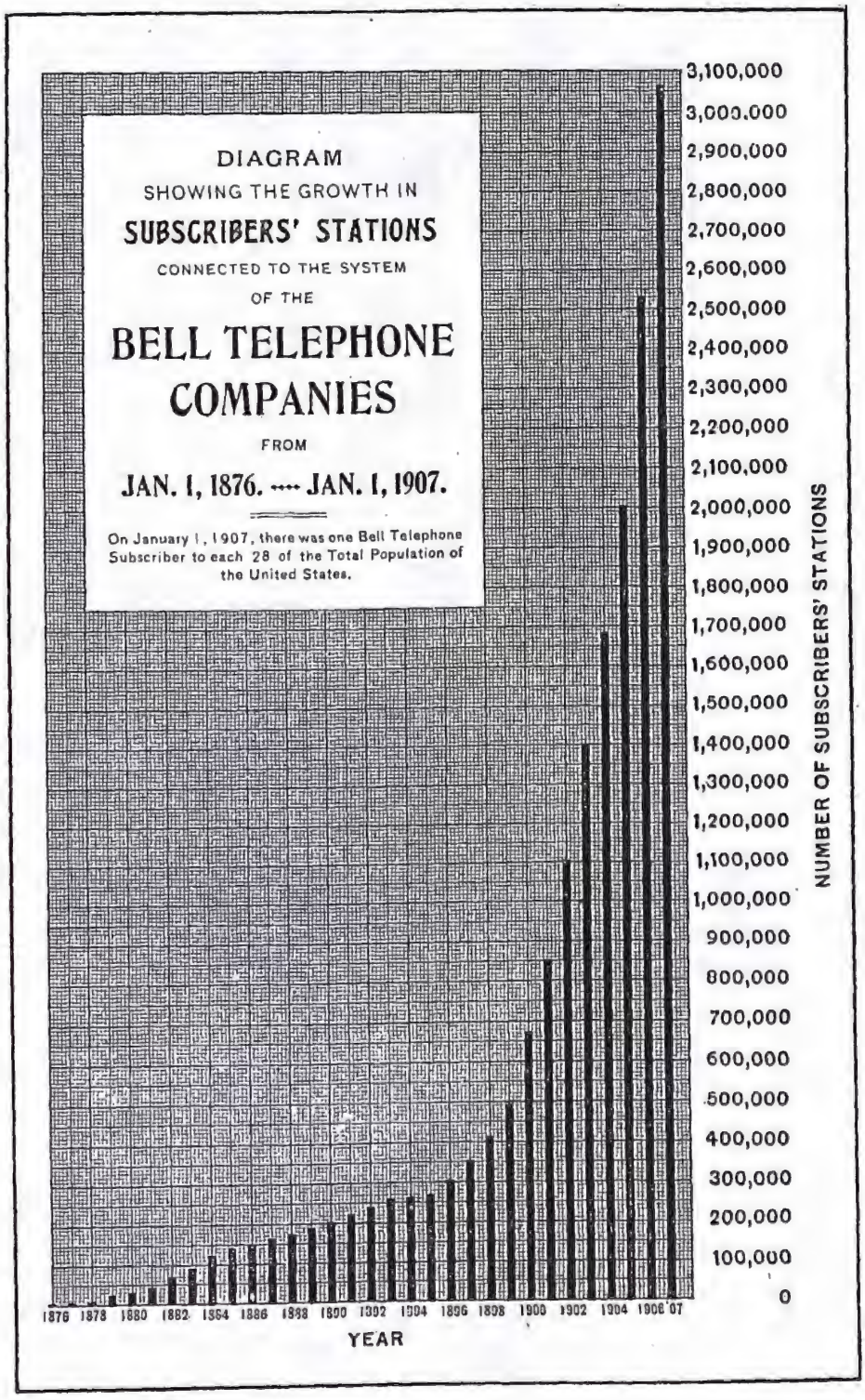


DIAGRAM
SHOWING THE GROWTH IN
SUBSCRIBERS' STATIONS
CONNECTED TO THE SYSTEM
OF THE
BELL TELEPHONE COMPANIES
FROM
JAN. 1, 1876. ---- JAN. 1, 1907.
On January 1, 1907, there was one Bell Telephone Subscriber to each 28 of the Total Population of the United States.
3,100,000
3,000,000
2,900,000
2,800,000
2,700,000
2,600,000
2,500,000
2,400,000
2,300,000
2,200,000
2,100,000
2,000,000
1,900,000
1,800,000
1,700,000
1,600,000
1,500,000
1,400,000
1,300,000
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
NUMBER OF SUBSCRIBERS' STATIONS
1876 1878 1880 1882 1884 1886 1888 1890 1892 1894 1896 1898 1900 1902 1904 1906 '07
YEAR

Biography of Theodore Veil

THEODORE NEWTON VAIL, born 16 July 1845, in Carrolton County, Ohio, belongs to the Morris county family of Vails in New Jersey, descendants of John Vail, a Quaker preacher, who settled in New Jersey in 1710. The family has always been one of position and influence. Lewis Vail, civil engineer, grandfather of Theodore N. Vail, early went to Ohio and was a pioneer in the building of canals and highways. Stephen Vail, an uncle, founded The Speedwell Iron Works, near Morristown, NJ, at which was built most of the machinery for the first steamship which crossed the Atlantic Ocean, sailing from Savannah, GA. Here, also, Morse perfected and first successfully operated the magnetic telegraph, Stephen Vail and his sons, George and Alfred, supplying Morse with the money, and Alfred the mechanical ingenuity. Alfred Vail invented the dot and dash alphabet, which has always been used in telegraphing. William P. Vail of this family was a leading physician and church worker in Northern New Jersey at Blairstown, and George Vail represented his section in Congress and was one of the lay Judges of the New Jersey Court of Pardons.

Davis Vail, son of Lewis Vail, and father of the subject of this biography, born in Ohio, came East at an early age, was connected with The Speedwell Iron Works, and married Phoebe Quinby, daughter of Judge Isaac Quinby of Morris county. By this marriage, he became related to three notable brothers in law, General Quinby, a graduate of West Point, a leading mathematician, Professor of Mathematics at the Rochester University, and general in the Civil War; Dr. William Quinby; and Dr. Augustus Quinby, all sons of Judge Isaac Quinby. After marriage, Davis Vail went to Ohio, remaining there several years. His son, Theodore, was born during the stay of the family in that part of the country. When the lad was about four years old, Davis Vail returned to the East and was again connected with The Speedwell Iron Works. In 1866, he removed to Iowa, where he operated a large farm.

Theodore N. Vail was educated in the old academy in Morristown, and then studied medicine with his uncle, Dr. William Quinby, but, having learned telegraphy at the telegraph office in Headly's drug store in Morristown, he left medicine and went to New York, where he became manager of a local office, being afterward attached to the staff of J. C. Hinchman, then general superintendent of the metropolitan and eastern divisions of The United States Telegraph Co. He went West with his father in 1866, and engaged in farming, but in the fall of 1868, went yet farther west and was made operator and afterward agent at Pine Bluffs, Wyoming, on The Union Pacific Railroad. Pine Bluffs was at that time the principal supply point for wood for The Union Pacific, which had not then been completed.

In the Spring of 1869, Mr. Vail received an appointment as clerk in the railway mail service between Omaha and Ogden, and in August 1869, he married Miss Emma Righter, of Newark, NJ. He devoted himself with great diligence to the improvement of the railway mail service, then in its infancy, and his good work in the perfection of schemes for the distribution of the mails, and especially his services in forwarding the mails during the long snow blockade of 1870, called the attention of the Department to him, with the result that he was assigned to duty between Chicago and Iowa City in the railway post office. On this line, the entire distribution of overland mails was made prior to the establishment of railway post office cars on The Union Pacific Railroad. When the railway post office was established on The Union Pacific, Mr. Vail was assigned to duty as head clerk.

In March, 1873, the Department called Mr. Vail to Washington and assigned him to duty in the office of the General Superintendent of Railway Mail Service, where he was charged with special oversight of distribution of the mails and arrangement of "schemes" or charts of distribution. During this period, the questions of the compensation of railroads and carriage of merchandise in the mails were being agitated in Congress, and the Department placed upon Mr. Vail the responsibility of preparing the post office statements, statistics and answers to Congressional inquiries. His intimate knowledge of the service, energy and capacity were recognized in June 1874, by his appointment as Assistant Superintendent of Railway Mail Service. In 1875, he was assigned to duty as Assistant General Superintendent, and when, in February 1876, Mr. Bangs resigned to go into other business, Mr. Vail was appointed General Superintendent. He had thus reached the highest grade in this branch of the Federal employment. Mr. Vail was the youngest of the officers of the Railway Mail Service, both in years and terms of service, and when the final appointment was handed to him by Marshall Jewell, Postmaster General, the latter said that his only objection to Mr. Vail was his youth.

As General Superintendent, Mr. Vail established upon a firm basis the civil service policy, which had been initiated by Mr. Bangs. The superiority of the results attained under the rules adopted for the railway mail service were recognized by all the civil service commissions in Washington, to the extent that until very recently the employis of the railway post offices were not included in the general civil service laws and regulations. Mr. Vail established the system of six months' probationary appointments, which have since been so generally adopted. It was during the incumbency of Mr. Vail that a reduction took place in the pay of the railroads for mail transportation. In the

controversy which followed, some of the railroads threw the postal cars out of their trains. Within six months, however, relations were re-established with all the leading lines and increased car and train service obtained. Thereafter, more cordial relations existed between the Post Office Department and the railroad managers.

An incident of this time may be referred to. Senator Beck of Kentucky was much interested in having the southwestern mails go over Kentucky routes, and made many efforts to induce the Postmaster General to order them so sent. Being referred by the head of the Department to Mr. Vail, Mr. Beck accused Mr. Vail of being under the influence of certain railroads. In an interview with Mr. Beck, Mr. Vail explained the situation and gave the reasons which governed him. Mr. Beck left apparently not satisfied. Soon after, however, when a proposition to reduce Mr. Vail's pay was pending in the Senate, Senator Beck took occasion to compliment Mr. Vail very highly, and, in a five minutes speech, said that if there were an honest and efficient officer in the employment of the Government, Mr. Vail was the man.

After the invention of the telephone and its reduction to practice, The American Bell Telephone Co. was organized by Gardiner G. Hubbard, father in law of Prof. Alexander G. Bell. Mr. Hubbard had been engaged against the Post Office Department before Congress on the question of merchandise in the mails and was chairman of the commission appointed by Congress to investigate methods of payment to railroads for mail transportation. Believing Mr. Vail to be the right man for the place, he tendered him the position of general manager of The American Bell Telephone Co. Believing in the future of the "toy," as it was then termed, and against the protest of all his friends, he accepted the position in 1878 and devoted himself to the work with his accustomed zeal and ability. The task was at times discouraging. The public were slow to recognize the great value of the instrument, and strong opposition was manifested by The Western Union Telegraph Co., which denied that Professor Bell was the inventor and set up opposition exchanges at every point. Mr. Vail introduced the methods which have proved so successful and have resulted in The American Bell Telephone Co.'s phenomenal growth. A settlement was finally effected with The Western Union Telegraph Co. after years of fighting and negotiating, in which The Western Union conceded every point of importance.

Mr. Vail established the long distance telephone service, against the opposition of all his associates in the company. The first line which was built to New York was called the "Vail's side show." He also introduced the use of copper wire in telephone and telegraph lines, since so generally adopted, having in this matter the assistance of Mr. Mason of Bridgeport, whom he induced to experiment with drawing copper wire in such a way as to give it the tensile strength necessary to withstand the stretching from pole to pole.

In 1888, Mr. Vail retired from the telephone business after having occupied the managing position for ten years. He has since traveled most of the time abroad and has introduced the telephone in many countries. Farming in Vermont now occupies a part of his time and upon his estate of 1,500 acres, called the "Speedwell Farms," he raises French coach horses, including some of the finest in the United States, Jersey cattle, Shropshire and Dorsett horned sheep, and Welsh ponies. He is a member of the Union League club of New York and the Algonquin club of Boston. He has one son, Davis R. Vail, a student in Harvard Law School in Cambridge.

He died, 16 April 1920, in New York, NY.

America's Successful Men of Affairs: An Encyclopedia of Contemporaneous Biography, Volume I, page 671-4

← Vail establishes LD despite associates' opposition

Telephones Goes Long Distan
1910-1920

Vail dreamed of LD

Theodore Vail

Theodore Vail, President of American Telephone and Telegraph (AT&T), dreamed of creating a transcontinental phone system. In 1913 AT&T dispatched teams of workers - through blizzards, lightning, and rough terrain - to string a continuous line of telephone wires between the coasts. The lines were joined on 17 June 1914 in Utah. The longest line stretched 3,505 miles.

Independent operators owned the telephone exchange in towns and other small areas but often did not have access to the toll network. Long distance lines were controlled by Bell; independents were usually denied access or required to pay high prices to use the toll lines. There was no regulation of the problem between independents and the mighty Bell until 1913 when the government intervened and an agreement was finally reached. The Bell system, or AT&T, agreed to let independent telephone companies connect their exchanges to the long-distance toll network.

Lee De Forest

Lee De Forest invented his version of the regenerative circuit in 1912. It amplified the volume of radio or telephone, which made long distance calling clearer.

Dr. Lee De Forest patented the vacuum tube, a device that boosted transmission and made it possible to call over long distances. People no longer had to depend on the telegraph to send long messages although there were still some problems. In San Angelo the first toll line terminated on the wall of the old Landon Hotel. In the early days of the system, persons who wanted to place a long distance call had to go to the hotel and often had to wait a day for the call to be completed.

World War I

During the war 233 U.S. women were part of the Woman's Telephone Operating Unit that went overseas. Many worked under combat conditions close behind the lines.

The 412 Signal Corps Battalion, comprised of telephone employee volunteers, was trained at Camp Morse in Leon Springs, TX. They arrived in France 26 January 1918, and began building a telephone and telegraph line that stretched 400 miles across the field of battle. Telephone engineers developed two-way air-to-ground radio equipment in 1917, and American

pilots used it in 1918 combat in France.

Operators were among the first to know when World War I ended. An operator in Gonzales, Texas was preparing to go off duty. Suddenly, news began to make the rounds that the war was over. The operator decided to stay in case there was further news. As the night went on, church bells began to ring out and lamps began to light up on the switchboard. The two operators took plugs in both hands and began answering the calls with the words "Germany has sued for peace."

Telephone Service Grows

Customers were charged a flat rate. It was much easier to charge everyone the same price instead of trying to figure out who used what part of what line over what distance for how long and for how much. Flat rates were determined by the amount of money the owner needed to keep the business going. This was known as a revenue requirement. The amount was divided by the total number of customers in the exchange. Business customers paid twice the monthly charge as residential customers.

Bell and Watson reenacted their first telephone conversation at the Pan-American Exposition in San Francisco in 1915. Bell, in New York, called Watson and said, "Watson come here, I want to see you." Watson in San Francisco said, "I would be glad to come, Mr. Bell, but it would take more than a week." Long distance service became available immediately.

Phones of the Period

Kellogg Common Battery Wall Type Telephone (1916 and later)

Kellogg Switchboard and Supply Company Common Battery Desk Stand Telephone (1915 and later)

Automatic Electric Candlestick Dial Telephone (1916 and later) Theodore Gary purchased Automatic Electric Company in 1919, developer of the dial-operated automatic system, which replaced manual connections by the telephone operator. Automatic Electric was also the largest telephone manufacturer in the United States.

American Electric Throw Away Intercom Telephone (1918) The parts are crimped together and the telephone has no screws.

Theodore Newton Vail

Carroll County, OH; 1845

Theodore Vail was one of AT&T's most far-sighted presidents. He oversaw the building of the first American coast to coast telephone system ,and it was his dedication to basic science that initiated a new research arm for AT&T: Bell Labs.

Vail was born on July 16, 1845 in Ohio. His first career was in the railway postal service, but in 1878 he was lured away to run Bell Telephone as its general manager. During his tenure, he helped set up the Western Electric Company, a division of the company which built telephone equipment. He also oversaw the first long distance system, from Boston, Massachusetts to Providence, Rhode Island, in 1881.

As AT+T GM, Vail oversaw 1st long distance system in 1881

Vail retired in 1889 -- only to come back again in 1907. In between, he spent time in Argentina making money in mining, waterpower plants and railway systems.

In 1907, Vail returned to what was essentially his previous job, though now the company was known as the American Telephone and Telegraph Company, or AT&T. AT&T was in some trouble because its phone patents had expired and other small companies were getting into the business. Suddenly, AT&T had competition. Vail solved this problem in three ways. First, he decided AT&T must have the very best phone system available: he committed the company to building a long-distance system that would cross the entire US. To do this he knew he would have to invest in scientific research, and he encouraged the development of AT&Ts own laboratory, Bell Labs. Second, he cooperated with the competitors, leasing them the use of AT&T's phone lines. Third, he managed to convince the public and the government that the best possible phone system was one that could provide "universal service" around the country -- in essence, the best phone system would come from a monopoly like AT&T.

Vail committed to to LD service

In 1914, the first transcontinental line across the US became operational. Vail sat in New York and made the first phone call all the way to San Francisco. A year later phone service was available to Europe as well.

Vail retired from AT&T for the second and final time in 1919. He died a year later on April 16.

Resources:
-- Theodore N. Vail
-- Encyclopedia Britannica Online: Vail, Theodore Newton

District Energy Biographies

Theodore N. Vail

Theodore Newton Vail made his fortune in the telephone and mining business, and was the first president of AT&T.

He lost of a good deal of his fortune in the district heating business, when the Boston Heating Company failed in early 1889. This system used William E. Prall's Superheated water system. Vail was introduced to the Prall system by Samuel M. Bryan.

Vail became president of AT&T in 1909. The first transcontinental telephone call was transmitted by a telephone instrument on January 25, 1915. Mr. Theodore N. Vail, President of AT&T, to Alexander Graham Bell, inventor of the telephone in New York. Thomas A. Watson, assistant to Dr. Bell, in San Francisco and President Wilson in Washington, D.C.

The Vail Award, named in memory of Theodore N. Vail, the first president of the former Bell System, is presented to an individual for actions beyond those required in the ordinary pursuit of the job or in emergencies outside the job for acts of unusual bravery or heroism. Only a handful of such awards are presented each year in all of BellSouth's nine southeastern states.

Vail was first president of the Telephone Pioneers of America.

> In One Man's Life: Being Chapters from the Personal and Business Career of Theodore N. Vail Albert B. Paine, 1921 New York: Harper

Born - 16 July 1845, Carroll County, Ohio (near Minerva)
Died, 16 April 1920, New York.
Vail had one adopted daughter, Katherine (daughter of his brother, William Alonzo Vail (1849-1904). Katherine married Arthur A. Marsters, secretary of AT&T on 17 December 1913. She was one of the founders of Bennington College in Bennington, Vermont and lived at 117 East 72d Street in New York. She was on 27 May 1977 in Bellevue Hospital at the age of 95.
She was survived by a daughter, Katherine Hurd; two sons, Theodore N. V. and Andrew C.; 14 grandchildren, and nine great-grandchildren. (New York Times, 29 May 1977, p. 28)

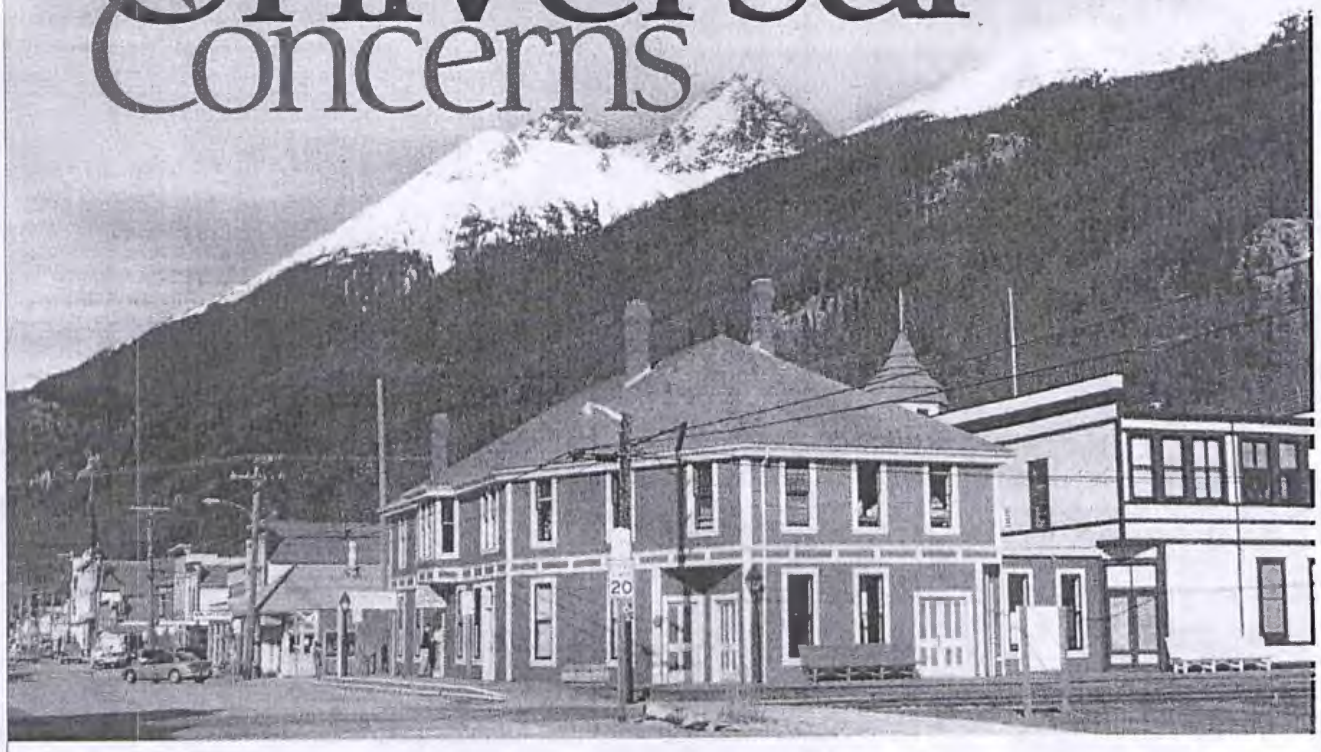
| **District Energy Biographies** |

October 1997

Universal Concerns
Donny Jackson
Telephony; Dec 13, 2004; 245, 24; Sciences Module
pg. 33

REGULATORY

Universal Concerns



Universal service has been at the forefront of U.S. telecommunications policy for 70 years. But financial woes, market changes and political shifts could result in the universal service fund's role changing dramatically during the next year.

by DONNY JACKSON

Since legendary AT&T boss Theodore Vail convinced regulators in the 1930s that a regulated monopoly would best advance U.S. communications, the concept of universal service has been the driving force for the nation's telecommunications policy.

Through the explicit subsidy—and implicit subsidies included in the intercarrier compensation system—even those living in the most remote and unprofitable locations in the nation have been assured of quality phone service at prices comparable to those offered in densely populated areas. The universal service program made the telephone a ubiquitous communications tool in the U.S. and enhanced the value of the public network to all users.

For all its past success, universal service support today is at a crossroads. The current funding mechanism is inadequate and must be altered dramatically to ensure long-term sustainability. But whether the current universal service fund (USF) should be sustained is a vexing question.

During the last 20 years, U.S. policymakers have eschewed the monopoly model in favor of a telecom policy that encourages free-market competition—a notion the FCC has said is inherently contradictory with the notion of universal service.

Meanwhile, many question whether the goal of the current universal service program—affordable telephone serv-

ice—is appropriate for a society that is increasingly dependent on broadband technologies. But others believe expanding universal service this way would only greatly increase the already-burdensome fund and that introducing subsidies would distort any attempts to establish the broadband free market many policymakers seek.

With so many questions surrounding the program, the one certainty is that universal service has become a front-burner issue for the FCC and Congress, with both entities indicating they will seek to resolve the complex issue during the next year.

Indeed, policymakers are almost obligated to address universal service issues quickly because it is obvious the program will collapse financially without changes. While accounting issues (see news story, page 10) and fraud allegations have grabbed headlines in recent months, the real problems are based on fundamental market changes.

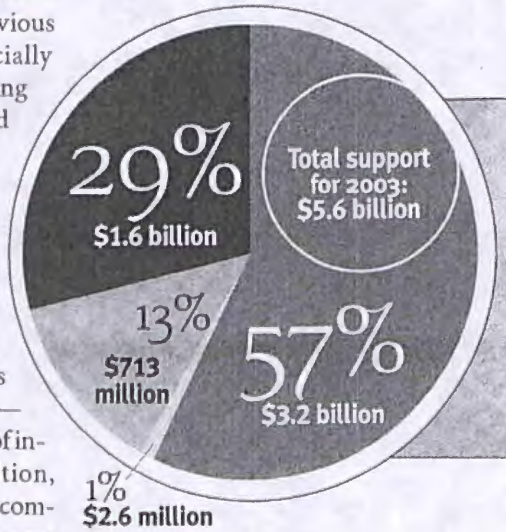
Currently, USF funding is generated from charges paid by consumers who make long-distance calls. The $6 billion federal USF is bankrolled by taking a percentage—8.9% in the third quarter of 2004—of interstate access revenues. In addition, more than 15 states have their own complementary universal service programs that generate a combined $1.9 billion annually, according to the National Association of Regulatory Utility Commissioners (NARUC).

But long-distance revenues are shrinking. Not only are technological advances and IXC competition driving down costs, but an increasing amount of long-distance traffic is being handled through mobile wireless and voice over IP (VoIP) offerings—technologies that effectively let providers pay into universal-service programs at reduced rates.

Meanwhile, the size of the fund is growing. With the passage of the 1996 Telecom Act, the USF—once used solely to ensure that copper wires were affordable to the poor and those in high-cost areas—was expanded to fund Internet connections to schools, libraries and health-care facilities (see figure).

The decreasing funds and increasing demands on the USF have some telecom analysts comparing universal service to Social Security—a longtime sacred cow that politicians have been hesitant to address, even though the current subsidy program obviously cannot be sustained. Certainly, it's not a formula for long-term stability.

"You have decreasing revenues and increasing obligations," said Ray Gifford, president of the Progress and Freedom Foundation. "Obviously, that's not sustainable long term."



Phone Support

How the Universal Service Fund gets distributed to rural areas, schools and other recipients.

- High-cost areas
- Schools and libraries
- Low income areas
- Rural health-care providers

Source: Company reports

In addition, the USF program also stopped benefiting only traditional wireline carriers, as the FCC allowed wireless carriers to apply for the funds via requests to state commissions. But many believe state commissions have been overly liberal in granting the eligible telecommunications carrier (ETC) designations because the funding comes from the federal USF program instead of a state-supported source.

"They [state regulators] really don't have any incentive to refuse ETC applications—after all, the funding's not coming from the state, so it's like free money to them," said one rural carrier source.

As a result, the amount of ETC funding has skyrocketed during the last five years. While this growth is a significant point of contention among rural ILECs, Western Wireless CEO John Stanton notes that wireless carriers receive only 3% of the federal USF support despite contributing 27% of the revenue into the fund—a discrepancy he believes has to change quickly.

"If the system is not fixed, we will revolt," Stanton said during a keynote delivered at Telecom '04.

Meanwhile, the adoption of VoIP technology promises to be even more problematic. Many believe the FCC's recent decision that VoIP is an interstate service likely precludes the possibility that VoIP calls will be subject to intrastate access charges, so there would be no contributions to state universal-service programs.

In addition, the FCC must rule by March 22, 2005, whether to adopt a Level 3 Communications forbearance petition requesting that VoIP calls terminating on the public network be subject only to reciprocal compensation, not long-distance access charges that contribute to universal-service programs.

Currently, the most popular funding proposal being discussed is a numbers-based approach es-

poused by FCC Commissioner Kevin Martin. By charging a flat rate of $1 to every working telephone number, Martin has said enough money would be generated to address all ongoing federal USF obligations while quelling concerns that the contribution system favored one technology over another.

While that could work well for the federal USF program, there are legal questions about whether states could pursue the same approach, according to NARUC general counsel Brad Ramsay.

Courts have prohibited states from assessing state universal service changes on interstate access charges "because that's what the FCC does" to generate funds for the USF, Ramsay said. Applying the same logic to the numbers-based system could preclude states from collecting universal-service revenues via a numbering plan.

"It will be interesting to see how the FCC decides to address this," Ramsay said. "I don't think the FCC wants to fold the $1.9 billion [in the state universal-service systems] into its program."

Of course, the other way to resolve the USF funding concerns would be to reduce the amount of money disbursed through the programs, but there has been virtually no consensus to date. Fundamentally, most FCC commissioners have said they do not advocate the use of USF funds to subsidize competition in areas where it is difficult for even a monopoly carrier to make a return on its investment, but no specific proposal has been made public.

Rural ILEC representatives advocate stricter ETC criteria to reduce the number of carriers getting payouts, thereby reducing pressure on the fund. In addition, they believe the formula for determining payout amounts should be changed. Today, a wireless ETC receives the same amount of money per customer in high-cost areas as the wireline provider, even if the ETC's cost structure to provide service is significantly different. Rural carriers believe ETCs should be compensated based on their own reported costs.

Tom Tauke, Verizon Communications executive vice president of public affairs and communications, said he supports a policy that would eliminate ETCs altogether.

regulatory

To see how the universal-service fund changes might affect other telecom technologies—such as cable and VoIP—check out our Web site.

WWW.TELEPHONYONLINE.COM

"We believe payment should be changed so that it goes only to one carrier in a given geographic territory—the carrier that would probably be designated as the carrier of last resort," Tauke said. "We don't think it makes sense to support multiple infrastructures in an area that is hard to serve."

But some question whether this is practical if a numbers-based collection system is adopted because cable, wireless and VoIP providers likely would object to a system in which they were required to contribute to USF but would not be eligible for universal-service disbursements.

The most formal proposal to reduce USF obligations was adopted early this year by the Federal-State Joint Board, which recommended that the FCC only provide universal-service support for the "primary" line in a given home.

After being roundly criticized as bad for economic development in rural areas and a logistical headache—determining which line is the primary line—the Senate prohibited the FCC from even considering the primary-line proposal when voting on the agency's budget.

The action underscored the power rural carriers wield in the Senate, where the membership must show sensitivity to rural issues in order to be re-elected.

"As long as two senators are elected from every state, rural carriers will be protected," said Bill Hunt, vice president of public policy for Level 3.

And rural carriers' sentiments likely will be a central topic of discussion in future USF debates as Congress revisits the Telecom Act during the upcoming year. That's because the Senate Commerce Committee will be led by two senators from the most remote states in the union—Ted Stevens (R-Alaska) and Daniel Inouye (D-Hawaii).

In the FCC and in Congress, expect USF proposals to be linked closely to plans designed to revamp the intercarrier-compensation system. Together, these two sources generate 50% to 90% of many rural carriers' revenues.

But Beltway observers are watching closely to see where the agenda of rural carriers wanting to maintain this system and the RBOCs' deregulatory agenda collide. After all, it would be tricky for RBOCs to convince policymakers at the FCC and Congress that a deregulated broadband market should be allowed to flourish in the free market while arguing for the preservation of an explicit subsidy like universal service.

Even with support in the Senate, rural carriers may need to revamp their business plans to reduce their dependence on subsidies, according to Jake Jennings, senior vice president of regulatory and industry affairs for NuVox Communications.

"Every carrier has its addictions," Jennings said. "CLECs were addicted to reciprocal compensation, ILECs are addicted to special access and rural carriers are addicted to universal service and access fees. So far, [CLECs] are the only ones that have gone through forced rehab. Now, it's everyone else's turn."

Most rural representatives have indicated they do not plan to let the current universal-service system expire without a fight, but Alltel President and CEO Scott Ford encouraged other rural carriers at Telecom '04 to be open-minded about rules that will give them a way to make a transition to an IP-based environment.

"If all we do is resist, the [universal-service] system will snap," Ford said. ■

RECENT MANAGEMENT PUBLICATIONS
Sloan Management Review (1986-1998); Fall 1987; 29, 1; ABI/INFORM Complete
pg. 81

RECENT MANAGEMENT PUBLICATIONS

Focus: AT&T

The Fall of the Bell System
By Peter Temin with Louis Galambos
Cambridge: Cambridge University Press, forthcoming

Telecommunications in Turmoil: Technology and Public Policy
By Gerald R. Faulhaber
Cambridge, MA: Ballinger, 1987, 186 pages, $26.95

Chronicles of Corporate Change: Management Lessons from AT&T and Its Offspring
By Leonard A. Schlesinger, Davis Dyer, Thomas N. Clough, and Diane Landau
Lexington, MA: Lexington Books, 1987, 250 pages, $27.95

In 1908, Theodore Vail, the legendary leader of the American Telephone & Telegraph Company set forth a goal–"one system, one policy, universal service"–that would guide the development of the Bell System for more than fifty years. Vail envisioned a single telephone company servicing all Americans. To achieve this goal, however, he had to eliminate competition and obtain the cooperation of government officials and agencies. Eliminating the competition was relatively easy; AT&T already held most of the telephone patents, and the company was dedicated to maintaining technological superiority.

Obtaining the cooperation of government officials seemed the more formidable obstacle given the increasing suspicion of big business at the time. Regulation was rapidly becoming the public policy answer to controlling natural monopolies. AT&T adopted a policy of accommodating, rather than fighting, its regulators. Competition was restricted and AT&T was guaranteed a handsome rate of return. By the 1950s, Vail's objective of universal service was essentially achieved, and the Bell System was recognized as the best telephone system in the world.

However, as telecommunications technology became cheaper and public policy toward regulation shifted, AT&T became vulnerable to competition. Eventually, these forces would contribute to the breakup of the Bell System in 1984. Now, almost four years after AT&T's divestiture of the local Bell companies, these three books examine the forces that brought down the Bell System and show how AT&T and the telecommunications industry have fared since then.

Each book provides a history of the events leading up to the divestiture and discusses the strong internal culture that guided–and, some might argue, ultimately destroyed–AT&T. The books also examine the role of regulation in the telecommunications industry.

The Fall of the Bell System, an excellent work by M.I.T. economist Peter Temin, describes the drama of the events leading up to the breakup. Based on AT&T documents and extensive interviews, the book focuses on the role of the key players: senior managers at AT&T, government regulators, and AT&T competitors. Temin argues that personalities and ideological positions–not technology–were primarily responsible for the demise of the Bell System.

Gerald Faull. .ber, a former AT&T economist, takes an opposing view: technological change, he argues, was responsible for the fall of the Bell System. Faulhaber contends that AT&T's dedication to improving the system through superior technology actually eroded industry barriers to entry by making telecommunications technology cheaper and more accessible to competitors.

Faulhaber's analysis of the present state of the telecommunications industry is illuminating. His call for a more complete deregulation of the industry is particularly strong and provocative.

Both Temin and Faulhaber show that the purpose of divestiture was to separate the natural monopoly parts of the Bell System from the competitive parts and to eliminate much of the regulatory mess. Neither author believes divestiture fully achieved its goals. In fact they strongly condemn the federal judge who oversaw the divestiture for his uninformed muddling.

Chronicles of Corporate Change looks at another dimension of the AT&T story. The authors describe how AT&T's strong corporate culture affected its ability to make organizational changes in the years before and after divestiture. They examine AT&T's

All inquiries about these books should be addressed directly to the publishers.

attempts to prepare itself for a new, competitive environment. And they show how many of the local operating companies, relatively unencumbered by this culture, have thrived in the postdivestiture period. One unfortunate weakness of this book is that it reads like the Harvard Business School cases from which much of it is derived. The book is loaded with facts and remarks from key people, but the authors' arguments are left to a concluding chapter. Like the other books, however, *Chronicles of Corporate Change* illuminates another point of view as it tells one of the most fascinating stories in corporate history.

General Listings

Bhopal: Anatomy of a Crisis
By Paul Shrivastava
Cambridge, MA: Ballinger, 1987,
184 pages, $19.95

The increased frequency of industrial disasters, particularly in lesser developed countries, has stimulated comment on the causes of these catastrophes and the related issue of what can be done to prevent their reoccurrence. Much of this comment is speculative and seldom sustained beyond the weeks following the most recent disaster. New York University professor Paul Shrivastava has carefully researched the causes and disastrous consequences of the explosion in an insecticide plant in his native Bhopal. While his research reveals that the scale of the disaster was even more devastating than was first reported, the book makes a compelling argument that crises on the scale of Bhopal are not a necessary consequence of increasingly technological methods of production.

Shrivastava's analysis of the Bhopal disaster focuses on the frames of reference of the main stakeholders in the Union Carbide plant in India. The inherent conflict between goals pursued by the U.S. parent, the Indian subsidiary, the Indian government, and the local community is not in itself the problem, argues the author, but the failure of these parties to accommodate others' frames of reference results in accidents that reach crisis proportion.

Bhopal is an informative discussion of what happened in the Union Carbide plant in December 1984 and in the following months. The book's proposals on crisis management are carefully reasoned and insightful, but the author has not succeeded in integrating the event with those proposals. This regrettable weakness does not diminish the author's contribution to our understanding of a management phenomenon that has major consequences outside of business administration.

The Dynamics of Taking Charge
By John J. Gabarro
Boston: Harvard Business School Press, 1987,
204 pages, $19.95

One challenge every manager or executive must face is assuming responsibility for a new department, division, or organization. In *The Dynamics of Taking Charge*, Harvard professor John Gabarro examines the succession process of seventeen managers and finds some interesting patterns that seem to show which managers are more likely to succeed in taking charge of a new role.

Gabarro's research shows that two factors are most critical to success: prior experience and interpersonal skills. Managers with prior functional experience related to the new position and those who can build strong relationships among their subordinates, peers, and superiors are most likely to succeed. While these factors may seem somewhat obvious, they do have two fundamental implications—the "general manager who can run anything" does not exist; and the "lone ranger" is not likely to be successful. Gabarro also shows that the succession process takes a long time, frequently up to three years. And during that time, the manager will go through five stages of learning in order to fully assume his or her new role, each stage with a corresponding pattern of activity. While Gabarro's book will interest managers who are managing or contemplating succession for others or for themselves, the book is likely to have another constituency—those subordinates of a new manager who would like to better understand the intentions and actions of a new boss.

Forward Thinking: The Pragmatist's Guide to Today's Business Trends
By Robert D. Gilbreath
New York: McGraw-Hill, 1987,
184 pages, $19.95

Forward Thinking is about managing for change. While managers have always had to deal with change, never has change occurred so rapidly as

in recent decades. Successful managers, consultant Robert Gilbreath argues, will not only accept change, but will embrace and profit from it too.

In *Forward Thinking*, Gilbreath shows how our organizations and lifestyles are adapting to a world of change. He gives numerous examples, such as the preponderance of disposable consumer products, which he claims show that change is around us. The intention of this book is to give managers pragmatic advice on what needs to be done to adapt to this new environment. While Gilbreath makes strong arguments for generalist education, investment in human capital, and more egalitarian management, little of what he says is particularly new or provocative. Moreover, those most likely to read the book are those already most prepared for change.

Growing the Next Silicon Valley: A Guide for Successful Regional Planning
By Roger Miller and Marcel Côté
Lexington, MA: D.C. Heath, 1987,
158 pages, $30.00

Many business executives, community leaders, and even presidential aspirants argue that a region can achieve economic success by establishing high-technology centers such as those in Silicon Valley in California and around Route 128 in Massachusetts. Create an environment that encourages the growth of entrepreneurial, high-technology companies, the argument goes, and prosperity will follow. Easier said than done, the authors of this book contend.

Silicon Valley and Route 128 hold no monopoly over technology; indeed they are only the third and fourth largest employers of high-tech workers in the U.S. Their success, however, in establishing an infrastructure that fosters and supports technological enterprise makes these regions an interesting focus of research. Other areas, such as Minneapolis and Philadelphia, which the authors study in detail, have also developed a strong technology base. Miller and Côté believe that similar infrastructures can be constructed elsewhere, and this book is a guide to such development.

The authors' research suggests that a few factors, including military expenditures for R&D, the proximity of research-based universities and private laboratories, and a large urban area tend to encourage the development of a technology-based region. Yet, regional planners had better be patient; the development of a high-technology infrastructure takes time, usually between ten and twenty years.

The New Manufacturing Challenge: Techniques for Continuous Improvement
By Kiyoshi Suzaki
New York: The Free Press, 1987,
255 pages, $24.95

The subtitle of this book describes a philosophy of operations management that only recently has gained popularity in the United States. The philosophy is that manufacturers can remain competitive only if they continue to make improvements in the workplace. Some argue that it is exactly this philosophy that has led the Japanese to develop many of the operations techniques for which they are famous. Just-in-time inventory, *kanban*, and shorter setup times are examples of the developments of the philosophy guided by a desire to eliminate waste, improve quality, and simplify production processes.

The New Manufacturing Challenge, however, is not a book on Japanese production techniques. The author describes methods and ideas that have been developed in the United States as well. Rather, the author's purpose is to inspire managers to make improvements in the workplace. And, in this regard, Suzaki is likely to succeed. While the book is oriented to the practitioner of manufacturing management, the author's clear prose, together with excellent charts, diagrams, and sketches, should make the book accessible and interesting to all students of management.

The PIMS Principles: Linking Strategy to Performance
By Robert D. Buzzell and Bradley T. Gale
New York: The Free Press, 1987,
322 pages, $24.95

For many corporate planners and students of strategy, PIMS (Profit Impact of Market Strategy) brings to mind market share as the secret to eternal profitability. Attitudes toward market share have changed considerably since the early publications that gave rise to this rather simplistic belief, but the PIMS database has proven robust and has been the basis of an impressive body of research on corporate and industrial strategy. *The PIMS Principles* offers the managerial reader a concise restate-

ment of what the current state of the research is and includes an excellent bibliography for those who want to delve deeper. The basis of the principles on market share, vertical integration, investment intensity, and other dimensions of strategy is the performance of 3,000 business units monitored by the Strategic Planning Institute in Cambridge, Massachusetts.

Buzzell and Gale have been closely associated with the research from its inception and have coauthored many of the PIMS articles in academic and general management journals. Their views on corporate strategy based on fourteen years of PIMS analysis should be of interest to academic readers. However, the final word on PIMS' contribution to the study and practice of corporate strategy should not be left to its authors. The assertion in the preface that "the unique ingredient [of PIMS] as compared with all other writers in the field is factual evidence" surely throws down the gauntlet to scholars of strategy using alternative approaches.

Union Corporate Campaigns
By Charles R. Perry
Philadelphia: Wharton School Industrial Research Unit, 1987,
211 pages, $30.00

Imagine you are the CEO of a money-center bank. You also sit on the board of a large industrial corporation that is negotiating with its labor union over the terms of a new contract. One day, you arrive at your office to find union members protesting your support of the "unfair" labor practices of the corporation on whose board you sit. The union threatens to withdraw large deposits—primarily pension funds—from your bank in the hope that you will use your role as a director to influence the corporation's management. It may, in fact, force you to resign your position as a director to avoid injuring your bank. You and your bank have become targets in a "corporate campaign," an increasingly popular tool used by unions in their relations with management.

In a corporate campaign, the union seeks to identify a company's vulnerabilities (e.g., its relations with other companies, a reliance on government contracts, or a dependency on a good public image). Recent corporate campaigns that have received attention from the press have been those carried out against J.P. Stevens and the Hormel Corporation. In *Union Corporate Campaigns*, Charles Perry examines corporate campaigns against these and other companies. He identifies five "games" upon which unions base their campaigns—principle, politics, protest, pressure, and principal. The game of principle—or "seizing the moral high ground"—seems to have the most success. Thus, those companies that desire anonymity in their operations or that are concerned about consumer and governmental attitudes are most vulnerable to a corporate campaign. Perry presents a thorough study of the corporate campaign issue that should be useful not only to other researchers but also to union and corporate management.

Wall Street and Regulation
Edited by Samuel L. Hayes III
Boston: Harvard Business School Press, 1987,
199 pages, $24.95

Recent court decisions and aggressive moves by some large commercial banks have eroded many of the regulatory barriers that have excluded depository institutions from the securities industry since the New Deal. At the same time that some regulations are being relaxed, however, others are being reinforced. In the wake of the insider-trading scandals and recent bank failures, the SEC, Congress, and other regulatory bodies are being pressed to develop new regulations to prevent abuses of and failures within the U.S. financial system.

The five essays in *Wall Street and Regulation*—originally presented at a Research Colloquium at the Harvard Business School in 1986—explore how regulation has affected the development of the financial services industry in the United States. ■

BUSINESS HEROES THEODORE VAIL

The American serial entrepreneur Theodore Newton Vail was part of a generation of entrepreneurs who changed the face of America and the world at the turn of the 20th century. It was the era of the electrical revolution and the pioneering spirit of men like Vail sparked the transformation from the steam age to the electrical age.

The American serial entrepreneur Theodore Newton Vail was part of a generation of entrepreneurs who changed the face of America and the world at the turn of the 20th century. It was the era of the electrical revolution and the pioneering spirit of men like Vail sparked the transformation from the steam age to the electrical age.

Theodore Newton Vail (1845-1921) was born in Carroll County, Ohio. His father, of Quaker descent, and Dutch mother had only settled there temporarily however. Two years later the family returned to New Jersey where they remained until 1866 when they moved to a farm in Iowa.

The young Vail found farming life mundane and longed for a life of adventure. Before long he was headed west across America. Back in New Jersey Vail had been taught telegraphy by his uncle Alfred who had helped finance FSB Morse's invention and development of the telegraph. Vail put this knowledge to good use landing a job as a telegraph operator in a Union Pacific boxcar.

But it was not long before the ever-restless Vail moved out of the boxcar and into the railway mail delivery service. It was here that his talents began to shine. The railway mail service was a shambles with no sorting system in the trains; no routing for letters other than the major cities; and no systemised train connections. Vail set about sorting out the mess. He pored over railway timetables and train connections calculating the quickest routes. The end result was a railway mail guide allowing for the efficient transport of mail in the region.

It wasn't all planning and theory either. Vail wasn't afraid to get his hands dirty. On one journey the train that Vail was travelling on found its progress obstructed by a small avalanche. Countless trains were queued up either side. Vail gave instructions for passengers, baggage and mail to be carried over the snow to the other side where they could continue their journey. The railroad workers who would have normally dragged the hundreds of mail sacks across the snow had their hands full. Vail told the thirty or so mail clerks to get on with it but they refused so, with a couple of helpers, Vail transferred all the mail sacks himself.

Eventually Vail's endeavours came to the attention of the US government and Vail was summoned to Washington. If he could reform his local mail delivery so effectively the government figured, then why not the entire country's? Vail set about the task with his usual energy. He soon climbed through the ranks from assistant superintendent of the mail service to general superintendent. Reforming the mail service was no easy task. Vail was taking on some powerful vested interests. Not least those of the railway companies. Rescheduling the entire country's delivery service cut into the revenues of many of the railroad companies. Yet Vail held out against the lobbying of the railroad companies and carried the day.

It was his indomitable nature that brought him to the attention of Gardiner G Hubbard, father-in-law of Alexander Graham Bell. Bell was the inventor of a contraption that was the subject of much amusement when it was exhibited at the Centennial Exposition in Philadelphia. The invention was the telephone. It was an invention with huge potential. Yet, when it came to creating a commercial enterprise founded on the telephone, Bell and Hubbard came up short. Their efforts were widely ridiculed. *The (London) Times*, for example called it "the latest American humbug". It seemed the telephone would be just another half-baked idea that never achieved mainstream acceptance. What Hubbard and Bell needed was a man with a forceful personality and uncompromising drive to build a company on the back of the telephone. Vail was that man. He had an eye for the bigger picture. He had the vision to see how the telephone could revolutionise communications not only on a regional or even national level, but right around the world.

Sitting comfortably, but no slippers

In 1878, Vail accepted the position of general manager at the newly founded American Bell Telephone Company. "I gave up a $3,500 salary for no salary," he remarked at the time. His salary at Bell was ostensibly $5,000 but he rarely collected it. Instead he devoted his entire energy and passion to rolling out the telephone nationwide. In 1882, Vail oversaw the purchase of the Western Electric Co., of Chicago, one of the premier manufacturers of telephone equipment. In 1885, the group of companies Vail presided over was incorporated as AT&T (the American Telephone and Telegraph Company).

Now that the threat of the telephone loomed large over Western Union's telegraphy business it made every effort to derail Vail. Before Vail had made a success of the telephone, Bell had offered to sell to Western Union for $100,000 and been sent packing. Now the company was willing to pay $100,000 a year to Vail to seduce him away from Bell. They even persuaded friendly railroad companies to attempt to lure Vail away with tempting job offers. But Vail was having none of it. He stuck to his guns and stayed with Bell until it

Vail devoted to nationwide phone

The first conference call

was well enough established to secure the capital it needed to expand across the country, city by city. Then in 1887, when that moment had arrived, Vail bought a 200-acre farm in Vermont and contemplated an idyllic retirement.

But Vail still had time for a world tour. And no ordinary world tour. Not one for sightseeing, it was more of a busman's holiday than a relaxing vacation. Before retiring to his farm, the nomadic Vail toured South America; transformed the horse drawn trams in Buenos Aires to electric lines; opened offices in London; spent time in France and Italy; and installed electric lighting and telephone systems in numerous other cities. Finally, his wanderlust apparently sated, he became a farmer. The farm was rapidly expanded to 6,000 acres as Vail set about farming with the same intensity that he applied to his earlier careers. Comfy slippers and armchairs didn't suit the Vail persona.

Astonishingly, although retired and in his sixties, some of Vail's greatest achievements still lay ahead. In 1907, confidence in big business plummeted. Companies over extended themselves. Banks withdrew credit, capital dried up, stocks withered and new share issues failed. Amid the economic turmoil dark clouds were gathering over AT&T. AT&T's competitors had muddied the company's waters to the extent that the Federal Government was being urged to bust the "telephone trust". So, caps in hand, the directors of AT&T arrived at Vail's Lyndon ranch in Vermont and begged him to come back and save the company. How could he refuse?

Using his considerable business acumen and extensive contacts book, Vail swiftly raised $21 million of new capital followed by a quarter of a billion over the six next years. He attacked the critics of the "telephone trust" head on by buying up competitors and consolidating the telephone networks under the AT&T umbrella. At the same time he campaigned under the "One system, One policy, Universal Service" slogan to persuade the public that a single telephone service was the best way. And to placate the government he acceded to regulatory supervision. It was a masterful performance. Vail saw off the financial crisis of October-November 1907 and AT&T emerged as the unquestioned dominant force in telephony. Vail also earned the loyalty of the workforce by increasing pension, sickness and accident benefits.

A man of vision, Vail was still pursuing new ventures into his 70s. In 1910 he bought control of his onetime foe the Western Union Telegraph Company for $30 million. His intention was to bring people closer together with the "tel-letter" – mail delivered over the wire at a nominal cost. Unfortunately for Vail the Department of Justice stepped in to break up the telegraph-telephone combine and Vail was forced to sell Western Union and agree that AT&T would not buy any more independents thus scuppering his plans for the tel-letter.

When asked how he managed to achieve so much in one lifetime Vail answered: "By never being unwilling when young to do another man's work, and then, when older, by never doing anything somebody else could do better for me."

Vail died in 1921. A serial entrepreneur, the crowning glory of Vail's achievements remains to this day. AT&T is one of the oldest companies quoted on the New York Stock Exchange. ■

Reading

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FORTUNE

Giants of the 20th century: The great communicators

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Abstract (Document Summary)

Brief profiles of 3of the most successful businessmen in the history of the telecommunications are presented. Those profiled are **Theodore Vail**, of AT&T; Bill McGowan, of MCI; and Bernie Ebbers of LLDS/MCI Worldcom.

Full Text (1136 words)

[Photograph]
THEODORE VAIL

[Photograph]
BERNIE EBBERS

[Photograph]
BIL MCGOWAN

This is the sixth in a series of features nominating finalists for our BUSINESSMAN OF THE CENTURY award. We will announce the winner in the Nov. 22 issue of FORTUNE. Stay tuned

WITH ALL THE FEVERISH M&A ACTIVITY IN TELECOMmunications, it's easy to forget that for the first 80 years of the

century, the industry was a monopoly. Before the Department of Justice broke up AT&T in 1982, telecom was a faceless sea of wingtipped, flannel-suited Bellheads-about a million of them, in fact, at the time of the split.

Like most periods of zero competition, this one produced few of the nimble, aggressive, charismatic leaders that a good turf war can bring out. But there was one exception: Theodore Vail, who twice served as head of what would become AT&T-first in the 1880s and again from 1907 to 1919.

Vail left the company the first time after fighting with Boston financiers who thought that dividends-not better networks-were the most important products AT&T could provide. Vail's view, which is still in vogue today, prevailed; indeed, he was recruited back to the company in 1907 by backer J.P. Morgan himself. In 1914, AT&T engineers made the first transcontinental phone call from New York to San Francisco. Six months later the company unveiled commercial service with a ceremonial call between Alexander Graham Bell and Thomas Watson. Vail went on to build the first nationwide telephone network by buying up small mom-and-pop operations and cobbling them together.

While some observers saw Vail as a swashbuckling pioneer, others branded him a robber baron who forced small operators to sign on with his company. Whatever your opinion of his tactics, says Dr. John Fike, director of the Center of Telecommunications Technology Management at Texas A&M University, "if Alexander Graham Bell is the father of the telephone, Theodore Vail is the father of AT&T."

You need to fast-forward 50 years or so to meet the next true titans of the industry. No one thought much of Microwave Communications Inc. when Jack Goeken started it in 1963 to create a network for truckers that linked St. Louis and Chicago. But MCI's founding is one of the seminal moments of telecom history.

The company didn't take off until 1968, when financier Bill McGowan paid off its debts-thus rescuing it from probable bankruptcy-and became CEO. (McGowan's eclectic prior career included working for the producers of the film version of Oklahoma!) McGowan envisioned a nationwide long-distance network to compete with AT&T's, which is not such a radical idea today, given the dozens of companies piecing together nationwide and international networks, but it was so then. And though it took about a decade for MCI to turn a profit (building a network is an expensive proposition), by the time McGowan retired-six months before his death in 1992-the $8.4-billion-a-year company made $551 million and ranked No. 9 on the FORTUNE 500 list of service companies. Says Buddy Pickle, president and COO at Teligent, who worked under McGowan at MCI for two years: "Bill took an idea and built it into not just a company but an industry."

It wasn't easy by any means: McGowan filed a number of antitrust suits against AT&T during his tenure, which helped prompt the longest Department of Justice antitrust investigation in history (and you thought the Microsoft trial was dragging on). That investigation, of course, led to the dismantling of AT&T and the creation of a host of new players eager to capitalize on a newly competitive industry. The CEOs in this current crop are some of the most talented the industry has ever seen. Buoyed by Wall Street's support, they've demonstrated that it's not the oldest ideas but the best that succeed.

Take Bernie Ebbers, a former bouncer and milkman from Canada, who became CEO of LDDS (Long Distance Discount Service) in Mississippi in 1985. Over the past decade Ebbers has used a buoyant stock currency to make more than 60 well--chosen acquisitions-and has managed to retain the talent and preserve the entrepreneurialism of these smaller companies while integrating them into the larger organization. His crowning moment: foiling critics (and many skeptical journalists) by beating staid telcos British Telecom and GTE in a 1997 bidding war for MCI. "Bernie Ebbers is the modern-day Theodore Vail," says Jeffrey Kagan, a top telecom analyst and 15-year industry vet. "He promised Wall Street that he would reduce costs and keep his revenues and profits high. He delivered on promises time after time and was able to keep his stock price very high to buy more companies."

In the wake of Ebbers' success, smaller telecom companies have aped his strategy-both in recognizing the importance of the Internet and data networks and in using their inflated stock to swallow larger companies. (Look no further than Qwest and Global Crossing duking it out over US West.) And with each of these mergers, the CEOs inevitably give a nod to Ebbers and MCI WorldCom.

In light of the events of the past few years, there's no doubt this consolidating trend will continue. Chances are, telecom's next mogul is at the helm of a company we don't even know yet. "The challenges the industry faces aren't going to be solved in this year or the next," says Kagan. "We're at the beginning of a 50-year revolution."

TeleKinetic

Despite its long life as a monopoly, telecom has become one of the world's most entrepreneurial and technologically astute industries. Here are a few people who keep it that way

Bob Annunziata, Global Crossing

He built Teleport Communications Group-one of the first direct challengers to the Baby Bells-from scratch, then sold it to AT&T in 1998 for more than $11 billion. As Global Crossings CEO, he made it a player in just six months.

Mike Armstrong, AT&T

In less than two years at AT&T, CEO Armstrong has revitalized the once-osteoporotic Ma Bell via a joint venture with British Telecom and by dropping $130 billion on cable networks in order to offer local phone, data, and video services.

Jim Crowe, Level 3

Crowe founded MFS, which built its own local network, and then created incredible shareholder value by selling it to WorldCom in 1996. Now he's doing it again as CEO of Level 3, building the first totally Internet-based network.

Carly Fiorina, Lucent

After a 19-year stint in the Bell system, Fiorina is now president of Lucent's global service provider business (which generates $18.8 billion in annual revenue). She was FORTUNE's most powerful businesswoman in America in 1998.

Joe Nacchio, Qwest

Critics scoffed 2% years ago when Nacchio left AT&T to be CEO of Qwest in Denver. But through shrewd financing he has built a nationwide data-friendly network and transformed the anonymous upstart into a $2.2-billion-a-year powerhouse.

[Photograph]
Armstrong (above) sees AT&T's future in cable; Lucent's powerful Fiorina (left).

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The Toppling of the Natural Monopoly Doctrine

Edwin B. Parker

William Melody's early work on the economic theory of telecom competition was a major contributor to economic growth throughout the world in the latter part of the 20th century. In the 1950s and 1960s, the prevailing economic theory was that telecom was a 'natural monopoly' and therefore should be a government-regulated or government-owned monopoly.

In the United States the AT&T monopoly, familiarly known as Ma Bell, dominated all aspects of telecom. Other telephone companies did operate in geographic locations not served by AT&T, but they interconnected with AT&T for long distance services and did not compete with AT&T. Most economists who researched or wrote on telecom issues were supported financially by AT&T or accepted the prevailing natural monopoly theory.

Melody was foremost among the very few qualified and respected economists whose research, writing and public testimony challenged the prevailing dogma. What was new in the decades following World War Two was the emergence of a new telecom technology, microwave radio communication. Melody's then novel argument (later proven correct) was that when technology is changing, the assumption of natural monopoly is not correct. Melody's economic arguments were a key factor in persuading the US Federal Communications Commission to grant to a start-up entrepreneurial company called Microwave Communications Inc. (MCI) licences for microwave radio frequencies on the route between Chicago and St Louis and a licence to sell private line long distance services on that route.

AT&T understood the risks to its monopoly and vigorously opposed Melody's arguments at every opportunity. An AT&T executive was assigned to work full time on monitoring all of Melody's writings and oral public statements. (Since AT&T's regulated monopoly status permitted telephone charges to users that recovered all costs plus an allowed profit, AT&T users paid all of the salary and other costs associated with that executive's work.) The executive had the task of monitoring all statements by Melody and coordinating AT&T's public response to his novel arguments.

One of Melody's arguments was that if the provision of long distance telecom service by any and all technologies was a natural monopoly, then AT&T had nothing to fear from a risk-taking entrepreneurial company. If AT&T's natural monopoly assumption was correct, then the MCI experiment was doomed to failure. If the natural monopoly assumption was correct, there was no need to protect that monopoly with regulations barring competitive entry. If, as Melody believed, the assumption was false, there was no need for government regulations designed to protect a contrary-to-fact economic theory.

That early work by Melody was a major factor that led to the regulatory precedents that opened the United States telecom market to competition. The total investment in telecom infrastructure following those precedents increased because competitors made investments that the incumbent monopolist would not have made. The pressure of competition also forced the incumbent to invest in new technologies at a faster pace than would otherwise have been the case. The resulting increased investment in the telecom sector in the United States was a major contributor to the productivity gains and the growth of the United States economy in the last third of the 20th century. A number of econometric studies have confirmed that telecom investment leads to economic growth (Parker et al. 1995; Hardy 1980; Cronin et al. 1991; 1992; 1993a,b).

The demonstrable success of telecom competition as an engine of economic growth in the United States led to competitive policy being emulated by other countries that were serious about growing their economies. Melody deserves credit as a major contributor to the resulting global economic growth.

Nevertheless, these orders were not enough. Financial circumstances forced him to give up most of the rights to his patents to a large corporation. Over the autumn of 1916, he negotiated with American Telephone and Telegraph, and for the first time in his life he was driving a very hard bargain, "$250,000 for exclusive rights to all pats.—*but* my Co. must retain rights for all . . . foreign, & government fields." In addition, he stipulated that Western Electric "must agree not to license anyone whom we are suing for patent infringement." For the first time ever, the De Forest Radio Telephone Company would pay some handsome dividends over the next four months of $1.45 a share, $174,000 on de Forest's 120,000 shares. Early in April 1917, just at the time the United States was declaring war upon Germany, he completed the deal.

"So *at last*—after 17 years of hard & unrelenting struggle," de Forest recorded triumphantly in his journal, "with never a letup, never a *certainty* of success . . . I have at last reached a safe & secure resting place." No more would he feel "the dread uncertainty of the morrow." Counting himself a very wealthy man, de Forest spared no extravagance. "*Now* at last I can live a little . . . now beautify my home, now adorn my pretty wife . . ." He did all three, and more. He built a wide verandah with awnings on the western side of Riverlure, so that he and Mary might look out over the Hudson and the far palisades each evening at sunset. He bought Mary an elaborate wardrobe. He ordered a limousine top placed on his Hudson automobile. Each morning, a chauffeur would roar down from Riverlure to his factory on Sedgwick Avenue in a new Roamer Roadster. "And meantime," de Forest exulted, "the company thrives."

In later years, as inventors discovered more and more uses for his radio tube, and his own fortune dwindled, de Forest came to believe the sale of the audion to AT&T had been at a bargain price. Forgetting that the patent on the audion tube had just seven years before it expired, that the Marconi Company had successfully challenged his rights to the invention, and that Armstrong was successfully contending his right to the oscillating and regeneration patents, de Forest thought only of the money AT&T had made. Surely he had been robbed. Why had his lawyers settled so easily? Why hadn't he retained his rights to the audion and simply granted a nonexclusive license? Then he would have been able to license his patents to other radio manufacturers and he and the De Forest Company would be worth millions. At that moment though, secure in the rising tide of government and foreign orders, de Forest thought only of his great (and immediate) wealth.

Such riches as de Forest accrued came at a deeper and more spiritual expense. Giving up the rights to the audion meant not only the sale of his greatest invention, but the sale of a part of himself, a part he would later call "my child." He had already grown angry when he lost a certain cachet after selling the initial patent rights to AT&T. The company had then used his audion to create the first transcontinental telephone service. At the Panama-Pacific International Exposition in San Francisco in 1915, an exuberant celebration of that city's post-earthquake reconstruction and development, AT&T had arranged for Alexander Graham Bell to repeat his famous words of 1876 to his assistant, Thomas Watson; but this time the command, "Come here, Watson, I want you," spanned the continent between California and New York. Never did AT&T mention the tube that had made the feat possible. When it distributed a handsome brochure, "The Story of a Great Achievement: Telephone Communication from Coast to Coast," at its exhibition booth without mentioning his name or his invention, de Forest became incensed. In a white heat he wrote his own account of the long-distance telephone, and on the following day he distributed from his own booth at the exposition a brochure that matched AT&T's, even to the details of typeface and paper stock: "The Story of a Great Achievement: Which Made Telephone Communication from Coast to Coast Possible." True, other inventions beginning with the Bell telephone had contributed to the feat of transcontinental telephone conversations, but "the one last missing link—the genuine *sine qua non* is the AUDION AMPLIFIER OF DE FOREST."

In October 1915, de Forest learned that American Telephone and Telegraph intended to commence wireless transmission of voices between the Eiffel Tower and the U.S. naval station at Arlington. For years, he had been trying to fulfill his dream of "trans-Atlantic Radio Telephony." Now, someone other than he, a corporation other than his own, would attain it. He traveled to Paris, but was barred from the tower. The invention he had labored over since late 1906 had been consumed by a giant with resources his struggling company could never hope to match.

As a youth, Lee had revered Edison and Bell and sought to emulate them. As a young inventor, he had dreamed of making his name rank "at least . . . with that of Marconi." Their three names were secure with their eponymous companies; but "de Forest" would be forgotten. Even the word "audion" was fading from popular language. It would never take its place in the vocabulary as "Vaseline" or "Bakelite" had. Increasingly, people were calling it simply the "radio" or "vacuum" tube. A dozen years before, a tower in St. Louis proclaimed in blazing lights DE FOREST before the world. He had medals to prove his worth, stock certificates emblazoned with wireless towers and light-

ning bolts surrounding his name. But the fame he had sought—along with the money—was in eclipse.

A subtle change was taking place in America, one de Forest did not understand. More than ever the corporation was assuming control, and it was becoming harder and harder for an individual to make a mark outside its structure. Those individuals whose names survived history were from another era. Bell and Edison had preceded him by a quarter century; Henry Ford, creator of a car and a company after his name, by a decade, and even their companies were slowly being incorporated into larger corporations.

Nor did the emoluments of wealth—the wide verandah at Riverlure, the chauffeured automobiles, the expensive clothes—bring de Forest much happiness at home. In the years since their marriage in 1912, his third wife, Mary, had steadily become more dependent on alcohol. The voice lessons became fewer and eventually stopped; the grand piano in the living room at Riverlure was silent. By 1915, de Forest would often return home after a long day at his laboratory in Highbridge to find Mary in an alcoholic stupor. She attempted cures, which relied mostly on willpower, but she always failed. She began to suffer acutely from the effects of rheumatism. More and more she took to her bed and bottle.

On the verge of his major sale to AT&T, de Forest complained in his journal of being "more or less a dead man alive . . . due more than all else to the recurrent sadness & despair of soul which the lapses, ever recurrent, of my wife have caused me." Though Riverlure was supposed to be the place where dreams came true, he reflected in a maudlin mood, "month after month, year after year, one dream after another has atrophied & died."

Evidence of just how much the dream had died appeared in a letter he wrote to Mary, his "dear Desire," on stationery of the Hotel Edouard VII in Paris, where he was trying to sell his radio telephone sets to the French for use in the trenches. He told of learning French, attending the Opéra Comique and *La Bohème*. He alluded to some of his adventures on Armistice Day, though he left out an account of the "charming brown-eyed grisette" with whom he celebrated the evening, and the tale of stealing the American flag from a bank. But then he turned to his greater concerns of Mary's alcoholism and abandoned singing career. Certainly she had "suffered terribly," but he also had endured "mental agony" on account of her intemperance. He implored her to "*stay on the wagon forever.*" With regard to her singing he wrote:

> O, dear girl, if you but only realized the *value* of your voice, & what you could, and *ought* to achieve with it—I would, as I wrote you before, devote my life to your success. But it means work, *work*, *hard* work, yet with the greatest joy you have ever experienced withal, because you can so quickly achieve *great things* for us both.

Still, there were times at Riverlure and elsewhere "filled with happiness," when they were as happy as they had been on their first meeting. In 1915, on a trip to England aboard the Cunard liner *Cameronia* through the submarine-infested North Atlantic, Mary sang at a shipboard gala organized to aid the Red Cross, and de Forest demonstrated his audion. During those times when Mary remained sober, she and Lee spent pleasant hours together. Often Mary would play the piano and sing while her husband listened from the verandah. These were the moments he longed for, the times, he reflected in his journal, when Riverlure was truly the place where, in his romantic mind, dreams came true.

Part of another dream came true, too. De Forest had always wanted a son, a "Lee Junior," who, he imagined, might someday follow him to attain glory at Yale. For years his marriage had been barren, so it with some surprise that he learned in early 1919 that his wife was pregnant. The child, not a son but a daughter, arrived on the last day of September 1919. The new father quickly dispelled his disappointment. He named his new daughter Eleanor, after the heroine of Poe's tale. In the ensuing years he would devote numerous entries in his journal to minute discussion of Eleanor's every action. Though not a boy, Eleanor gave him great pleasure, and there was always the hope Mary would bear another child, a boy.

"It looks like a long war," Edwin Howard Armstrong wrote his mother after he arrived in France in the fall of 1917. Though wrong in his prediction, his tone suggests his commitment to the cause of the Allies. There had been no question about his signing up for service; he accepted his obligation with little comment and volunteered almost immediately. He realized, too, as did the army, that his knowledge of wireless would be valuable. After a hasty summer of officers' training, he embarked for France. He was to work in Paris at the division of research and inspection, a laboratory the signal corps had established on the Boulevard Montparnasse. There he was to keep his eyes open for the problems plaguing wireless communications among the Allies, and solve as many of them as possible.

World War I marked a period of expansion for Armstrong, a time when he made two significant additions to his small circle of friends, and, most important, his second great radio discovery, the superheterodyne, the circuit that makes possible the precise tuning of virtually every one of today's radios and televisions.

Enlisting meant interrupting a number of commitments. Armstrong had been teaching and working in the laboratory at Columbia University, developing and licensing his regeneration invention to interested companies, and, with his lawyer, systematically formulating a strategy to keep de Forest from taking his patents. In addition, he served as the titular head of his family, managed its finances (which had become precarious with the death of his father), and oversaw his younger sister's education at Vassar College as well as the maintenance of his mother's house in Yonkers.

The trip to France via Southampton was uneventful. As soon as the ship left New York harbor, he looked up the radio shack, which was equipped only with a primitive carborundum detector. "The ordinary ship receiver does not carry audions but the operator happened to have one of his own aboard," Armstrong wrote his mother in his first letter home at the end of September, "so I borrowed some wire from the electrician and rigged up a regenerative circuit that brought in signals from all over the map. We got press from both sides of the Atlantic which is unheard of in ordinary ship practice."

Armstrong filled his letters home with practical details, associated with trying to oversee family affairs from abroad: "What payments have been made by the Marconi C," he asked his mother, and then implored her to tell him "what you find your living expenses are running per month . . . Incidentally, have you all the coal you need?" To his sister, Ethel, he voiced even more concerns about their mother: "Have you had the rail put on the cellar steps yet? If not, do it immediately, regardless of what kind of argument you start. Second, is mother working too hard?"

Once he had established himself at the Boulevard Montparnasse, Armstrong made a hasty review of the communications on the French lines, where he found wireless conditions to be primitive. While manufacturers like de Forest in the United States produced tubes by the thousands, few of them seem to have made it to the American Expeditionary Forces, especially at the front. Back in Paris, he built two sophisticated transmitters and receivers with regenerative circuits. After completing these, he worked to create a communications system for the army air corps, personally installing radio sets in the planes and testing them in the air. Armstrong delighted in being able to indulge his twin passions of speed and height.

Gradually, Armstrong began to concentrate on a problem the American Expeditionary Forces regarded as most important: detecting radio communication at very high frequencies. He had learned of it in London from Henry Joseph Round. An engineer for the Marconi Company since 1902, Round was now one of the master's personal research assistants. He had been graduated from the Royal College of London and worked for a while at the

Marconi Company's school for operators in Babylon, Long Island, all the while actively engaged in creating his own inventions to improve wireless. In 1911, he had developed a crystal detector that enabled sharper tuning of receivers. He, too, had discovered a regeneration circuit similar to Armstrong's (but just a few weeks later, so there was no question of claiming interference), and was known as a pioneer in the development of voice transmission over microphones.

As part of his war work, Round was perfecting a system he had devised that employed radio waves to detect the movements of enemy ships and planes. The system had served the British well on May 30, 1916, when they used it to detect a seven-mile shift in the position of the German fleet at Wilhelmshaven 300 miles away. The information allowed the Royal Navy to intercept the enemy at the Battle of Jutland off Norway. His achievement was all the more remarkable since the Royal Navy considered wireless undependable. "Nothing ought to be trusted . . . except direct visual signaling by searchlight flashes," the former first lord of the British admiralty, Winston Churchill, remarked in his account of Jutland. "To trust so cardinal a matter to the wireless reports of cruisers which are out of sight is to run needless risk." But wireless soon proved itself despite Churchill's doubts.

When adverse weather delayed his troop ship at Southampton for three days, Armstrong traveled to London and looked up Round, whom he found late in the evening at the Marconi House, hard at work on his own radio experiments. They had much in common. Each was an individualist with little regard for protocol, and each distrusted technical explanations when engineers used them to mask their ignorance. Like Armstrong, Round possessed boundless energy and an abundance of ideas about radio and its future uses.

Over a late dinner, Round told his new acquaintance of a difficult problem the British—and now the Allies—faced: they suspected the Germans had devised a way of sending messages over very high frequency waves in the range of 500,000 to 3 million cycles, higher than any frequency they had dealt with. With vacuum tubes and a series of transformers, Round and French physicist Marius Latour had created ingenious amplifying circuits capable of detecting signals up to 1 million cycles, but tuning their receiver proved to be extremely difficult. The problem was great, if only because radio waves that inventors like Round and Armstrong dealt with fell within the range of 10,000 to 100,000 cycles. No equipment in France, England, or America could match what the Germans were believed to possess. Round asked if it could be created.

Armstrong ruminated on the question in France. On his inspection of communications at the battlefront, he was asked again how weak high fre-

quency signals might be detected. One night, during a German air raid over Paris, he wondered if it might be possible to detect the ultrahigh frequency (in the range of 10 million cycles, or higher) electrical waves emitted by the engines in the German planes. If it were, he reasoned, anti-aircraft guns might be able to track their fire accurately. But he did not have time to seek a solution until, in 1918, a young sergeant, Harry W. Houck, appeared at the division of research and inspection, announcing he was assigned to assist Captain Armstrong.

The captain was naturally surprised when the sergeant arrived, as just the day before he had received a message that Houck was dead. (The mix-up was not entirely the fault of bureaucracy. Ill and delirious, Houck had wandered from army doctors to the skillful care of a French hospital. When he recovered, he went directly to the Boulevard Montparnasse, bypassing all American posts.) Now that the sergeant appeared before him very much alive, Armstrong wondered what this boy from the farming country of New Cumberland, Pennsylvania, knew about radio. Plenty, he quickly learned. Armstrong had him sketch the circuit of a receiver with a carborundum detector. Houck did so quickly, but then went on to draw something "new," which he claimed to be far superior: a regenerative circuit. Armstrong was impressed by the young man's knowledge and taken with his unaffected and naive innocence: "Captain," Houck remarked, after discussing the virtues of the circuit, "the fellow who invented this has the same name as you."

From that moment, Harry Houck became Howard Armstrong's trusted associate. Always neat and economical in his design and construction of equipment, he possessed technical abilities that proved a good match with Armstrong's imaginative ones. Like his superior, he combined patience with a single-minded attention to technical questions. Though not a genius, he possessed the capacity for original thought. And, as Armstrong quickly learned, his new assistant was willing to work as hard and long as he did. Soon they were working together to solve the problem of detecting high frequency waves and converting them to a lower frequency range audible to the human ear.

The challenge for Houck and Armstrong was to devise a means of bringing these weak and elusive electromagnetic waves down to a level where they could be amplified. Ever since Hertz proved their existence in 1888, people have likened electromagnetic waves to their more tangible and visible counterparts in water. Indeed, electromagnetic waves have some qualities in common with those of the ocean: amplitude (their height and depth); frequency (how fast they move past a fixed point); and length (the distance between their crests). But there the similarities end. Electromagnetic waves travel at the speed of light (which is, of course, simply a part of the electromagnetic spectrum); their frequency is far greater; and their lengths can vary from a few inches to a few miles. The low frequency radio wave Armstrong and others had been working with had a length of about 6,600 feet (2,000 meters). The high frequency waves he had been called on to detect were as short as 330 feet (100 meters).

Armstrong began to connect his notions about high frequency wave detection (and the low power waves given off by airplane engines) with a discovery made early in the century by Reginald Aubrey Fessenden. Guided by an elementary knowledge of harmonics, Fessenden found that two incoming radio signals, each with a different frequency, could be mixed together to produce a *third* signal with a frequency equal to the difference between the two. The model for his thinking had been sound waves. The inventor knew that middle C on a piano produces sound with a frequency of 256 cycles, while B produces a sound with a frequency of 240. Yet when both piano keys are struck together, the chord produces a third sound of sixteen cycles per second. Fessenden applied this same principle to radio waves. If the incoming wave of, say, 51,000 cycles is mixed with a wave created by an oscillator within the receiver of 50,000 cycles, the result is a third, audible, wave of 1,000 cycles. To name this phenomenon, Fessenden turned to Greek: *hetero*, meaning "other" and *-dyne*, meaning "force." In the case of the heterodyne, two different waves were literally forced together to produce a third wave, which he called a "beat" note. Unfortunately, Fessenden's idea of heterodyning the incoming radio signal ran ahead of the available technology. Until Armstrong recognized the oscillating qualities of his regeneration circuit in 1913, there was no reliable method available to produce a radio wave at a correctly regulated frequency within a radio receiver. Armstrong had already used his regenerative circuit to the heterodyne principle, and had presented a paper on the subject to the Institute of Radio Engineers in 1916.

Now Armstrong's conversation with Round, the air raid over Paris, and his work on the heterodyne came together to produce a solution in a flash: "all three links of the chain joined up and I saw the way these signals could be handled." He would call it the "superheterodyne." The arrangement he visualized used his regeneration circuit both as a receiver and oscillator of radio waves and employed eight vacuum tubes in four different stages. First, his superheterodyne receiver would pick up a high frequency wave and heterodyne it with another wave produced by one of his vacuum tubes in oscillation, thereby creating a wave of intermediate frequency. Second, the intermediate frequency wave would travel through an amplifier to increase its power several thousand times. Third, his regeneration circuit would detect the wave and convert it to direct current. Finally, the current would pass through an audio amplifier to earphones or a speaker.

In lectures and papers about the superheterodyne that he delivered later, Armstrong illustrated his invention by receiving a high frequency wave of 3 million cycles per second and heterodyning it with a wave produced by his oscillating vacuum tube circuit of 2,900,000 cycles. This process created a "beat" wave of 100,000 cycles, which then traveled through an intermediate frequency amplifier, his regenerative circuit, and finally through an audio amplifier to a speaker. Sounds of this power from radio waves of this frequency had never been heard before.

Reduced to these basic four stages, the circuit appears relatively simple to us today, yet it was a heady discovery for Armstrong and Houck. No one had thought of such a complex circuit before, a circuit that changed a radio wave from its initial frequency to one that is heterodyned, amplified, changed into direct current, and finally transformed into sound vibrations. And no one had ever thought that such a new wave would preserve essential qualities of the old—its information, modulations of voice, tone of music, patterns of sound. It seemed sorcery or ethereal prestidigitation. Just as the vacuum tube and the regenerative circuit took radio into new territory, so would this novel method of reception and tuning, for it opened up an entire new area of the electromagnetic spectrum. While the principle was obvious to Armstrong at the time, putting it into practice was another matter. Each circuit required careful experimentation until just the correct wiring was found.

In light of the complex circuitry employed in most of today's televisions and stereos, Armstrong's superheterodyne circuit seems remarkably simple and essential. And the circuit has survived because of its economy. It does its job simply and elegantly. Today it forms the basis of the tuner found in virtually every radio and television, as well as in such other devices as radar detectors and police scanners.

Foreseeing the superheterodyne's potential, Armstrong became secretive. "I have been doing a lot of ground work during the bad weather and some of it looks pretty good," he wrote home with typical understatement at the end of February 1918. "I would very much like to get copies of the *Wireless Age* from the time I left the States to date and would appreciate it tres beaucoup." The "ground work" was really all he was able to complete during the war. Much more research awaited him when he returned home. But he had developed it enough to show Round when the English engineer visited Paris after the Armistice of November 11, 1918, and to take out patents in France and the United States. (There was no question in his mind about ownership, because army policy at this time allowed inventors to retain rights to discoveries made while in service.) He filed for a patent for his second great invention on December 30, 1918, in France, and on February 8, 1919, in the United States.

Protecting his invention meant spending vast sums of money, which was very scarce. "Draw positively everything you need from my account," he wrote home guardedly. "By all means be sure you do not go short on food because that is absolutely the poorest way to economize." But then he added, "Before drawing on my account if either Ethel or Rissie [his sister Edith] have anything left of what I gave them before leaving I think they ought to use it because I am going to have some very heavy lawyers' bills after the war and will need everything I can lay my hands on." Later, he returned to the subject of money: "Now in regard to finances I have considerable trouble in view and the situation is considerably complicated over here also."

De Forest also was on Armstrong's mind. Learning that his rival was in Paris, he wrote in a letter home, "You may be interested to know that de Forest is over here now and will report to me before a great while. Don't say anything about this outside Ethel and Rissie. If he had come over before the armistice was signed one or the other of us would have stayed in France but at present I guess he is fairly safe." De Forest also knew that *his* rival was stationed in Paris. The two managed to avoid each other.

Armstrong was too absorbed in the development of his new invention to visit with anyone. On Christmas night 1918, he stopped briefly to enjoy a turkey dinner and plum pudding. On another occasion, he "took time to watch some of the tennis at the Racing Club in the Bois de Boulogne" where he saw the French champion Gobert, and "the great Mlle Lenglen." But such interludes in his work were few.

Armstrong's contributions were recognized by honors he received from his colleagues home and from the French. Early in 1919, he was raised to the permanent rank of major. He was invited to lecture on radio at the University of Paris and the Sorbonne, and General Ferrie, the head of French military communications, pinned the chevalier de la légion d'honneur on his jacket. While in Paris, Armstrong received official word that he had been awarded what he always considered the single greatest honor of his career, the one he valued more than any other of the many he received: the Institute of Radio Engineers medal of honor. It was the first ever awarded by the institute, which recognized his invention of the regenerative circuit. Fifteen years later, in 1934, his conscience would demand that he return it.

So busy was Armstrong with his work in Paris after the war that he neglected his affairs at home. The De Forest Radio Telephone Company was using his regeneration invention without any acknowledgment, as were other companies. His chief rival was seeking to overturn his patent through an interference in the Patent Office, while Armstrong lingered in France with the remnants of the Allied forces. A simple telegram from William H. Davis brought him home: "De Forest pressing action. Your presence ur-

gently needed." The summer of 1919 was fading; no longer could he afford to ignore his responsibilities.

At the end of September 1919, Edwin Howard Armstrong walked up the hill from the Harriman railroad station to his mother's house. She happened to be sitting on the porch at the time, and was shocked to see his head covered by a bloody bandage—the result of an anthrax infection he contracted at Cherbourg. He had returned home to recover. First he would spend two weeks in the hospital to take care of his infection; then he would reclaim his career in the laboratory at Columbia, where he would refine his superheterodyne; finally he would engage de Forest in their struggle over the right to regeneration. After his head had healed, he posed for one final photograph in his military uniform. The twenty-nine-year-old officer, dressed in a high-collar jacket with his arms folded, faces the camera slightly to his left side. On his collar appear the crossed flags of a signal corpsman; on each epaulet a single oak leaf. A leather Sam Browne belt crosses his chest. Chevrons given for his war wounds (even if the enemy was disease!) grace his left sleeve. A soft overseas cap with a single oak leaf denoting the rank of major covers his head. His face reveals determination and confidence. He appears supremely assured of his worth and of his future.

Proud of the part he played in the war, Armstrong henceforth was known by the title "major." Honoring his service as well as his inventions, the Radio Club of America gave a dinner in his honor at the Hotel Ansonia in New York City that fall. A picture taken to commemorate the occasion reveals that his large melon-shaped head, which had been prematurely balding before the war, had been made into a complete dome by the anthrax infection. Only the sandy trace of a friar's fringe remains. His firm mouth, long upper lip, and blue eyes, and, by all accounts, his modest and laconic speech, (tinged with a Bronx accent) and the occasional involuntary twitch of his neck and shoulders (a chronic reminder of his bout with Saint Vitus's dance) survive unchanged.

When the United States declared war on Germany, David Sarnoff held the position of commercial manager for the Marconi Company. In addition to managing the 725 employees reporting to him and the 582 wireless installations on ships that were under his control, he had many other duties. He negotiated all the wireless service contracts for Marconi in the United States; supervised the sales of millions of dollars of equipment to the U.S. government and other private concerns; maintained a voluminous correspondence as the person in charge of Marconi's "customer relations"; and, as the traffic manager, regulated the flow of messages to and from the various Marconi

stations around the country. Sarnoff had been correct in his assessment of the possibilities for advancement as a manager: the office boy who had started at $5.50 a week in 1906, and who had advanced to $7.50 as a junior wireless telegraph operator, had grown into an executive whose annual salary approached five figures.

Sarnoff saw the entry into the war as a chance to prove himself a complete American. Almost from the day he had arrived at Monroe Street, he had ceased to consider himself a Russian. Recently he had been reminded of his origins when he was arranging the sale of Marconi equipment to the Russian Army. Too bad Sarnoff could not go back to his native land to install the apparatus, a czarist general had remarked jocularly. But then, he added darkly, Sarnoff would be arrested as a deserter. Returning to the shtetl of his memory was the farthest thought from Sarnoff's mind. Now that he had the chance, he wanted to serve his adopted country.

He did so, but not before he had encountered what he considered anti-Semitism in Washington. Like others with his abilities, he applied for a commission in the navy, only to have his request intolerably delayed without an answer. As he progressed steadily from the lowest level at the company to be the commercial manager, less and less was he referred to as a "Jew Boy." But the *idea* of his Semitic background remained in the minds of some. Could it be his faith, Sarnoff speculated, that kept him from the commission in the military he so prized?

He was probably right, for race consciousness and anti-Semitism were certainly in the air, especially in the experience of the Marconi Company. The parent company in England had endured one of the nastiest attacks of anti-Semitism in recent history, and some of those feelings had traveled across the Atlantic. In late 1911 and early 1912, Marconi's managing director, Godfrey Isaacs, arranged a contract with the postmaster general, Herbert Samuel, for a chain of wireless stations to ring the island. Isaacs's brother, Sir Rufus, was the attorney general in the British government at the time. Gossip circulated that the terms had been extremely favorable for Marconi, neglecting the fact that it was the only British company—and the only company in the world save Telefunken of Germany—capable of installing such equipment. Newspapers and some members of Parliament suggested that some in the government, especially Sir Rufus, had made enormous sums of money speculating in American Marconi stock, which increased in price dramatically in the aftermath of the *Titanic*. They were, so their accusers said, stock jobbing on inside information. And never far from the minds of journalists and the public was the fact that Samuel and Isaacs were Jews. Always, it seemed, commentators in the British press identified them contemptuously and disagreeably as "Hebrews."

Sarnoff himself had not been safe from such indignities, which would become more frequent in the future. At a meeting of the Institute of Radio Engineers, the anti-Semitism came close to being voiced openly. "Are you accusing me of stock jobbing?" an angry Sarnoff snapped in a heated exchange with a former Marconi employee. In the context of the time and of the Marconi Company's recent history, "stock jobbing" suggested "Hebrew." "If the shoe fits," came the answer to Sarnoff, "put it on." While listeners separated the men, the chairman of the meeting struggled to maintain order. Such scenes represented the last gasp by those whom Sarnoff surpassed in talent and business acumen to degrade him and put him at a disadvantage. When all else failed, when nothing else could stop Sarnoff's advancement before his Protestant colleagues, why not a sly reminder of his faith?

Not about to miss this chance to prove his patriotism, Sarnoff sought to be drafted as an army private. Fortunately for the Marconi Company and the war effort, Rear Admiral Robert S. Griffin, head of the Bureau of Steam Engineering, which oversaw the acquisition of radio equipment, interceded with an urgent telegram. "Exemption is considered absolutely necessary," Griffin wrote, "in order that the Fleet will not suffer delays due to unsatisfactory deliveries in existing contracts." The admiral might well have mentioned contracts to come, for in 1917, American Marconi enjoyed $5 million in sales, most to the United States government. As the commercial manager, Sarnoff oversaw all these orders, commuting regularly between Penn Station in New York and Union Station in Washington. Walking the corridors of the War Department and the Congress as well as the Marconi offices gave him experience he would find invaluable in the coming years.

Thus, staying with Marconi in 1917 enabled Sarnoff to render valuable service to *his* country and continue his upward progress through the ranks of the company's management. But always he would believe his faith had cost him the commission in the military he so deserved.

But it was not the nation's struggle to make the world safe for democracy or his place in that struggle that preoccupied Sarnoff's mind in the summer of 1917. He was getting married. His bride was to be Lizette Hermant, the handsome blond daughter of a French Jewish family that had recently emigrated to the Bronx. Their meeting had been arranged by their mothers, who themselves had met by chance in a synagogue. Son and daughter took to each other immediately, and soon turned their thoughts to matrimony. "I could speak no French and Lizette could speak no English, so what else could we do?" Sarnoff was fond of asking sardonically in later years. The modest ceremony took place on July 4, 1917.

July 4, 1917, Sarnoff always quipped, was the day "I lost my independence." Not exactly. His father had never really served as a model for a husband, nor had his parents' relationship served as a model for marriage. The person whose intimate life he most closely observed was Marconi, that arch philanderer, known to intimates as a sexual conquistador, the man whose amorous assignations in New York, Rome, and London were the stuff of legend. As Marconi's confidant and discreet messenger early in his career, Sarnoff had seen how the master operated. This was the way the successful businessman and entrepreneur behaved; surely, as he moved up through the ranks of Marconi and RCA, he was entitled—perhaps even obligated—to act in the same fashion.

In the coming years, Sarnoff would emulate his mentor with a result that often tried the patience of Lizette and the bonds of their marriage, but never to the breaking point. Her strength and forbearance, sometimes in the face of great provocation on her husband's part, prevented that from happening. For fifty-four years, Lizette Sarnoff watched and tolerated (though not without bitter argument) her husband's actions, forgave his infidelities, and remained loyal no matter his failings. She regarded him with fierce Gallic pride and spirit, and worked to make the marriage survive.

"Do you not know the world is all now one single whispering gallery?" a tired President Woodrow Wilson shouted out to an audience of 10,000 gathered in the Des Moines, Iowa, Coliseum on Saturday evening, September 6, 1919. "Those antennae of the wireless telegraph are symbols of our age." Haggard, close to the massive stroke that overcame him nineteen days later, Wilson betrayed an uneasiness about the impact of the new technology that had developed so quickly during the war. The president recognized the nature of communication was changing, and the effect was not always salutary:

> All the impulses of mankind are thrown out upon the air and reach to the ends of the earth; quietly upon steamships, silently under the cover of the Postal Service, with the tongue of the wireless and the tongue of the telegraph, all the suggestions of disorder are spread through the world.

Now the tumultuous events taking place in Russia could be known across Europe and the rest of the world within hours. Wireless was spreading the "poison of revolt, the poison of chaos."

But wireless need not spread poison; it might have a mithadratic effect upon the world as well. Wilson himself had witnessed the salutary effects of bringing a world together through wireless, the ability of this new method of

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UNNATURAL MONOPOLY: CRITICAL MOMENTS IN THE DEVELOPMENT OF THE BELL SYSTEM MONOPOLY

Adam D. Thierer

Congress finally began the long-needed process of comprehensive telecommunication deregulation in 1994, exactly 60 years after their last major legislative effort, the Communications Act of 1934, was enacted. Legislators appear to finally realize what has been evident to many industry leaders and analysts for years--regulation is impeding the growth of new technologies, jobs, and exports, while simultaneously denying consumers the benefits of competition. Unfortunately, in an attempt to remedy the inefficiencies created by nearly a century's worth of regulation, Congress crafted a reform package that was anything but deregulatory. Both the House and Senate bills were over 200 pages long, contained 50 new regulatory powers, and included protectionist manufacturing requirements. Largely as a result of this pro-regulatory baggage, the bill finally died in the Senate in mid-September of 1994.

Before Congress makes any rash decisions on how to manage competition within the industry, legislators should review how the old Bell monopoly developed. Most legislators, academics, and many others believe the telephone industry is a natural monopoly that was privately monopolized by the aggressive actions of the American Telegraph and Telephone Company (AT&T). That was hardly the case. Although AT&T undoubtedly encouraged the monopolization of the industry, it was the actions of regulators and federal and state legislators that eventually led to the creation of a nationwide telephone monopoly.

In this paper I shall argue that the reason competition did not arise within the industry earlier this century is because it was not allowed to. Specifically, three forces drove the monopolization process:

1. The intentional elimination of what was considered wasteful or duplicative competition through exclusionary licensing policies, misguided interconnection edicts, protected monopoly status for dominant carriers, and guaranteed revenues for those regulated utilities;

2. The mandated social policy of universal telephone entitlement, which implicitly called for a single provider to easily carry out regulatory orders; and

3. The regulation of rates (through rate averaging and cross-subsidization) to achieve the social policy objective of universal service.

The combined effect of those policies was enough to kill telephone competition just as it was gaining momentum. Hopefully, by understanding exactly how those policies encouraged the growth of a telephone monopoly, policymakers can craft more pro-competitive legislation in the future.

The Bogus Natural Monopoly Model

For many decades, economic textbooks have held up the telecommunications industry as the ideal model of natural monopoly. A natural monopoly is said to exist when a single firm is able to control most, if not all, output and prices in a given market due to the enormous entry barriers and economies of scale associated with the industry. More specifically, a market is said to be naturally monopolistic when one firm can serve consumers at lower costs than two or more firms (Spulber 1995: 31). For example, telephone service traditionally has required laying an extensive cable network,

constructing numerous call switching stations, and creating a variety of support services, before service could actually be initiated. Obviously, with such high entry costs, new firms can find it difficult to gain a toehold in the industry. Those problems are compounded by the fact that once a single firm overcomes the initial costs, their average cost of doing business drops rapidly relative to newcomers.

The telephone monopoly, however, has been anything but natural. Overlooked in the textbooks is the extent to which federal and state governmental actions throughout this century helped build the AT&T or "Bell system" monopoly. As Robert Crandall (1991: 41) noted, "Despite the popular belief that the telephone network is a natural monopoly, the AT&T monopoly survived until the 1980s not because of its naturalness but because of overt government policy."

Indeed, a chronological review of the industry's development produces an indisputable conclusion--at no time during the development of the Bell monopoly did government not play a role in fostering a monopolistic system. Adherents to the old school of thought correctly point out that AT&T attempted to restrict competition throughout this century. Yet, this fact is irrelevant. Every business logically tries its hardest to exclude competitors. What is more important, and widely ignored, is exactly how federal and state government actions encouraged the Bell monopoly to develop during the early years of this century. Once the government allowed this monopoly to develop with its assistance, AT&T's strength could not be matched by any competitor, resulting in a monopolistic market structure that survived well into the 1980's.

AT&T's Patent Monopoly, 1876-94

When Alexander Graham Bell patented the telephone on March 7, 1876, few people realized just how important his new invention would become for American commerce and society in general. America was still in love with the telegraph and saw little immediate use for the telephone. Mark Twain even likened investment in the new technology to "wildcat speculation." Western Union, the most powerful telegraph company of the era, actually passed up the opportunity to buy the Bell patents for $100,000 believing the device was nothing more than a passing novelty.

Unfortunately for Western Union, the telephone turned out to be anything but a passing fad. Use of the device slowly gained acceptance, primarily among business users. Yet, compared to later decades, this Bell patent monopoly era was characterized by limited growth of service. From 1880 to 1895, average daily calls per 1,000 of population rose from only 4.8 to 37. Contrasting this 15-year patent monopoly period with the competitive period that followed the expiration of the Bell patents in 1894, average daily calls per 1,000 people jumped from 37 in 1895 to 391.4 in 1910. The number of telephones per 1,000 people also showed much more dramatic expansion during the competitive period after patent expiration than before. Telephones per 1,000 people rose from only 1.1 in 1880 to 4.8 in 1895, but skyrocketed to 82 by 1910. (See Table 1.)

Clearly, the Bell patent monopoly period was not as beneficial for the extension of service as the competitive period that would follow. Yet, by the end of its patent monopoly period, the Bell System had grown large enough to pose a formidable challenge to Western Union, the same company that had failed to buy up the original patents just 20 years earlier. But, with the expiration of their crucial patents between 1893-94, the Bell system faced an uncertain future. Although Bell had filed over 600 patent infringement suits to defend its 900-plus patents during this period, the company had no choice but to try its hardest to fend off the many new firms that were waiting for a chance to gain access to this lucrative new market. The Bell monopoly was, at least temporarily, dead.

Table 1

Spread of Telephone Service, 1880-1920

Year	Average Daily Calls Per 1,000 Population	Telephones Per 1,000 of Population
1880	4.8	1.1
1885	13.3	2.7
1890	23.0	3.7
1895	37.0	4.8
1900	103.6	17.6
1905	258.7	48.8

1910	391.4	82.0
1915	446.0	103.9
1920	486.5	123.9

SOURCE: Hyman, Toole, and Avellis (1987: 93).

The Development of Competition, 1894-1913

Despite AT&T's rapid rise to market dominance, independent competitors began springing up shortly after the original patents expired in 1893 and 1894. These competitors grew by servicing areas not served by the Bell System, but then quickly began invading AT&T's turf, especially areas where Bell service was poor. According to industry historian Gerald W. Brock (1981: 112), by the end of 1894 over 80 new independent competitors had already grabbed 5 percent of total market share. The number of independent firms continued to rise dramatically such that just after the turn of the century, over 3,000 competitors existed. Illinois, Indiana, Iowa, Missouri, and Ohio each had over 200 telephone companies competing within their borders (Brock 1981: 111). By 1907, non-Bell firms continued to develop and were operating 51 percent of the telephone businesses in local markets. Prices were driven down as many urban subscribers were able to choose among competing providers. AT&T's profits and prices during this period began to shrink due to increased competition. Whereas AT&T had earned an average return on investment of 46 percent in the late 1800s, by 1906 their return had dropped to 8 percent (Hyman et al. 1987: 78). As Brock (1981: 122) noted, this competitive period brought gains unimaginable just a few years earlier,

> After seventeen years of monopoly, the United States had a limited telephone system of 270,000 phones concentrated in the centers of the cities, with service generally unavailable in the outlying areas. After thirteen years of competition, the United States had an extensive system of six million telephones, almost evenly divided between Bell and the independents, with service available practically anywhere in the country.

Industry historians Leonard S. Hyman, Richard C. Toole, and Rosemary M. Avellis (1987: 90) summarize the overall effect of this period by saying, "It seems competition helped to expand the market, bring down costs, and lower prices to consumers."

The rapid ascendancy of competition casts doubt on the natural monopoly model of this industry. It appears AT&T's only claim to monopoly power prior to this period could be attributed to their numerous patents, not superior economies of scale as the natural monopoly theorists believed. In fact, as J. Maurice Clark concluded in his famous 1923 *Studies in the Economics of Overhead Costs*, "Telephone companies . . . show no signs of economy with increased size, but rather the opposite" (1923: 321). Hence, the most important justification for regulation of the telephone industry--that it was a natural monopoly with rapidly declining costs as its size increased--was not present during this era. Yet, as we shall see later, that fact would not stop AT&T and government regulators from arguing to the contrary.

Economies of scale constitute only part of the natural monopoly equation; high barriers to market entry constitute the other half. Yet, despite the large costs associated with telephone service initiation, new competitors were entering the market easily during this period. Hence, the barriers to entry were not so high as to exclude immediately new competitors. To explain the rapid demise of competition that would take place over the next few years, some other type of entry barrier had to develop. That new impediment would take the form of both subtle and blatant government intervention throughout the next decade.

Theodore Vail, Nationalization, and the End of Competition, 1913-21

Before examining exactly how the legal barriers to competition developed within the telephone industry, it is important to review the significance of a single man--Theodore Newton Vail. On April 30, 1907, Vail returned to AT&T as president,[1] marking the beginning of [cl12.25]the end of telephone competition. His return to the firm changed its fundamental focus from competition to consolidation. Vail's most important goals upon taking over AT&T were the elimination of competitors, the befriending of policymakers and regulators, and the expansion of telephone service to the general public. Reflecting Vail's belief in the superiority of a single telephone system, AT&T adopted a new corporate slogan as part of an extensive advertising campaign: "One Policy, One System, Universal Service." In AT&T's 1910 Annual Report, Vail summarized his belief in a single system saying, "Effective, aggressive competition, and regulation

and control are inconsistent with each other, and cannot be had at the same time." To achieve this vision, Vail began acquiring a number of independent telephone competitors, as well as telegraph giant Western Union. However, the government made it known quickly that such activity was suspect under existing antitrust statutes.

Wisely realizing the government was considering action to break up the growing firm, Vail decided to enter an agreement that would appease governmental concerns while providing AT&T a firm grasp on the industry. On December 19, 1913, the "Kingsbury Commitment" was reached. Named after AT&T Vice President Nathan C. Kingsbury, who helped negotiate the terms, the agreement outlined a plan whereby AT&T would sell off its $30 million in Western Union stock, agree not to acquire any other independent companies, and allow other competitors to interconnect with the Bell System.

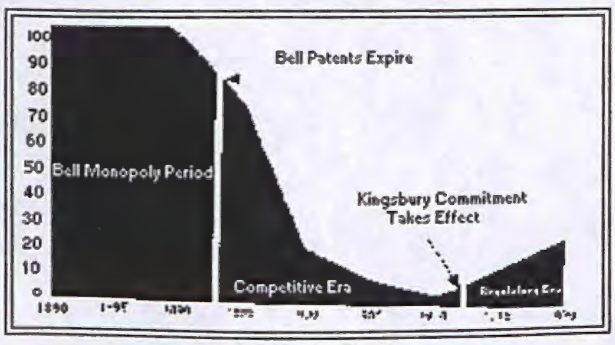
The Kingsbury Commitment was thought to be pro-competitive. Yet, this was hardly an altruistic action on AT&T's part. The agreement was not interpreted by regulators so as to restrict AT&T from acquiring any new telephone systems, but only to require that an equal number be sold to an independent buyer for each system AT&T purchased. Hence, the Kingsbury Commitment contained a built-in incentive for monopoly-swapping rather than continued competition. Brock (1981: 156) noted, "This provision allowed Bell and the independents to exchange telephones in order to give each other geographical monopolies. So long as only one company served a given geographical area there was little reason to expect price competition to take place."

Ironically, the move toward interconnection, while appearing in the independents' favor, actually allowed AT&T to gain greater control over the industry. Brock (1981: 156) found that "interconnection reduced the Bell's ability to drive the independents out of business but also eliminated the independents' incentive to establish a competitive long-distance system." Michael K. Kellogg, John Thorne, and Peter W. Huber (1992: 16-17) concluded:

The government solution, in short, was not the steamy, unsettling cohabitation that marks competition but rather a sort of competitive apartheid, characterized by segregation and quarantine. Markets were carefully carved up: one for the monopoly telegraph company; one for each of the established monopoly local telephone exchanges; one for the Bell's monopoly long-distance operations. Bell might not own everything, but some monopolist or other would dominate each discrete market. The Kingsbury Commitment could be viewed as a solution only by a government bookkeeper, who counted several separate monopolies as an advance over a single monopoly, even absent any trace of competition among them.

Hence, AT&T's short-term deal to steer clear of government regulation, would have long-term gains exactly the opposite of those the government supposedly desired. This was the beginning of the end for telephone competition (see Figure 1). Although it is impossible to say exactly what would have happened if AT&T had not been pressured into the Kingsbury Commitment, it is not outrageous to hypothesize that competition would have continued to flourish.

Figure 1
Percentage of Telephones Owned by Bell, 1800-1920



At this point, more explicit government actions began to have a deleterious impact on the industry. Despite the fears of many public officials that AT&T could become a ruthless monopolist, a contradictory notion began to develop that monopoly was inherently "natural" within this industry. Numerous federal and state officials began arguing quite openly that the telephone industry would function most efficiently if unified as one system. Legislators began referring to competition in the same terms as Vail--"duplicative," "destructive," and "wasteful." A Senate Commerce Committee hearing in 1921 stated that "telephoning is a natural monopoly." And a House of Representative committee report noted, "There is nothing to be gained by local competition in the telephone business" (quoted in Loeb 1978: 14). A Michigan

Public Utilities Commission report (1921: 315) from that same year also illustrates this prevailing sentiment, "Competition resulted in duplication of investment. . . . The policy of the state was to eliminate this by eliminating as far as possible, duplication." Many state regulatory agencies began refusing requests by telephone companies to construct new lines in areas already served by another carrier and continued to encourage monopoly swapping and consolidation in the name of "efficient service" (Lavey 1987: 184-85). Kellogg, Thorne, and Huber (1992: 17) sum up the prevailing sentiment: "To judge by actions, then, rather than words, government officials had no strong objection to monopoly telephone service. This was especially true for state regulators. For them, a local telephone monopoly was both welcome and convenient."

Not surprisingly, Vail's vision of "one system" that would provide "universal service" to everyone, began looking more attractive to many in public office. Richard H.K. Vietor (1994: 172) of Harvard University argues, "Vail chose at this time to put AT&T squarely behind government regulation, as the quid pro quo for avoiding competition. This was the only politically acceptable way for AT&T to monopolize telephony. . . . It seemed a necessary trade-off for the attainment of universal service." As AT&T's 1917 Annual Report noted, "A combination of like activities under proper control and regulation, the service to the public would be better, more progressive, efficient, and economical than competitive systems."

Industry historian Robert W. Garnet (1985: 130) provides further support for Vietor's findings:

> Regulation played a crucial role in Vail's plans. Astute enough to realize that the kind of system he proposed--universal integrated monopoly--would stand little chance of gaining public approval without some form of public control, he embraced state regulation. In doing so, he broke with the company's long-standing opposition to what [AT&T] management had traditionally regarded as an unwarranted intrusion on its prerogatives. But after years of unfettered competition, during which the firm's financial strengths had been sapped and its efforts to build an integrated system had been dangerously undermined, regulation became a much-preferred alternative. Thus, Vail obviously saw government regulation as the way to eliminate competitors: the one-way ticket, not only to universal service, but also to monopoly profits.

World War I and Nationalization

The stage was then set for the complete monopolization of the industry by AT&T. The regulatory treatment AT&T received was facilitating their take-over of the industry while, at the same time, allowing them to state publicly that they were under strict government control. Yet, despite the fact that the tables were certainly tilted in AT&T's favor in most areas, competition persisted in some regions. It was World War I, the nation's first global crisis, that would provide the government with a convenient excuse to forcefully gain control over communications and forever change the structure of the telephone industry. On August 1, 1918, in the midst of World War I, the federal government nationalized the entire telecommunications industry for national security reasons.

At first, AT&T executives became nervous when it was announced that Postmaster General Albert S. Burleson, a long-time advocate of nationalizing the telegraph and telephone industries, would assume control of the market. But, once the benefits of nationalization where made evident to Vail, his anxieties disappeared. Industry historian George P. Oslin (1992: 278) notes when Vail expressed concern over the plan to Western Union President and close personal friend Newcom Carlton, Carlton reassured Vail that the plan was in his interest: "It's your salvation. The government will be able to raise your rates and get you new money." As Oslin (252) argues, "That was what happened. Burleson appointed Vail, rated by Carlton as a genius, to manage the telephone, and Carlton to operate the telegraph."

Noobar R. Danielian (1939: 248) concurs: "There is evidence that Vail appreciated the advantages of Federal control . . . he was not in much of a hurry in the early part of 1919 to have his System back from nominal government control." This attitude should not be at all surprising since shortly after the industry was nationalized, AT&T's proposed contract establishing the terms of government ownership and compensation was accepted by the postmaster general. Danielian (1992: 252) summarizes the deal as follows:

> The federal government . . . agreed to pay to AT&T 4 1/2 percent of the gross operating revenues of the telephone companies as a service fee; to make provisions for depreciation and obsolescence at the high rate of 5.72 percent per plant; to make provision for the amortization of intangible capital; to disburse all interest and dividend requirements; and in addition, to keep the properties in as good a condition as before. Finally, AT&T was given the power to keep a constant watch on the government's performance, to see that all went well with government operation, by providing that the books of the Postmaster General

> would be at all times open for inspection. One might well wonder where the real control was lodged. Needless to say, the contract was eminently satisfactory to the Bell System.

In addition, once the nationalized system was in place, AT&T wasted no time applying for immediate and sizable rate increases. High service connection charges were put into place for the first time. AT&T also began to realize it could use the backing of the federal government to coax state commissions into raising rates. Vail personally sent Postmaster General Burleson studies that displayed the need to raise rates. By January 21, 1919, just 5 1/2 months after nationalization, long-distance rates had increased by 20 percent. In addition to being much greater than returns earned during more competitive years, the rates established by the postmaster during the year of nationalization remained in force many years after privatization. Consequently, AT&T's generous long distance returns continued to average near or above 20 percent during the 1920s.

By the time the industry was returned to private control on August 1, 1919, the regulatory route to competition elimination had paid off handsomely for Vail and AT&T. Of the estimated $50 million in rate increases approved by the postmaster general during nationalization, approximately $42 million, or 84 percent went to AT&T. Additionally, the government cut AT&T a $13 million dollar check at the end of the period to cover any losses they may have incurred, despite the fact that none were evident.

The Importance of Rate Regulation

The year of government nationalization was the nail in the coffin of competition. However, the favorable regulatory treatment AT&T received during government ownership was only partially to blame for the death of competition. Of much greater importance, according to Hyman, Toole, and Avellis (1987: 81), was the initiation of extensive rate regulation:

> During this period of government ownership, the decision was made to set standard long-distance rates throughout the country, based on average costs. In other words, subscribers calling from large cities would pay above costs in order to provide a subsidy to those in rural areas. So, early in the century cross-subsidization began, embraced by the industry, which rarely question the premise behind [fn5]the arrangement that the ability to communicate with subsidized subscribers was of value to the subsidizing subscribers. As long as the telephone industry had a monopoly and regulators approved of the arrangement, it did not matter what subscribers wanted. They had no choice.

The intention of this action was obvious--Vail's vision of a single, universal service provider was being adopted and implemented by the government through discriminatory rate structuring.

The decision to initiate rate averaging is vitally important to understanding exactly how the telephone monopoly developed for three reasons. First, rate regulation in the pursuit of universal service objectives virtually demands a single monopolistic provider in order to be truly effective. Few firms would ever have the ability to adequately fulfill universal service obligations unless they were already sufficiently large to use revenues from one segment of their business to subsidize the extension of service to citizens that policymakers wanted covered. In addition, regulators favor monopolies or cartels to carry out such social polices since they find it easier to control their actions rather than the actions of multiple competitors. Hence, in the quest to achieve social policy goals, regulatory commissions end up depending upon one, or a handful of firms to provide all industry output. Consequently, competition is made difficult, if not impossible. In the words of regulatory economist Alfred E. Kahn (1971: 12),

> When a commission is responsible for the performance of an industry, it is under never completely escapable pressure to protect the health of the companies it regulates, to assure a desirable performance by relying on those monopolistic chosen instruments and its own controls rather than on the unplanned and unplannable forces of competition.

Second, the initiation of extensive federal rate regulation is important because it propelled state regulatory commissions to follow suit by greatly extending the scope of their authority. By 1922, 40 of 48 states were regulating telephone rates (Noll 1991: 180). The public utility commissions at the state level immediately began to mimic federal policies established during World War I. Businesses and urban subscribers were charged more than rural customers to help extend service to distant locations. Likewise, long-distance rates were averaged to ensure a company could not charge more for toll calls of the same distance. Robert Garnet (1985: 152) describes this state-based rate regulation: "Statewide rate averaging would eventually become a distinguishing feature of Bell System subscriber charges and would be embraced

by regulators as a strategy for promoting the extension of telephone service to areas of marginal earnings potential." And that is exactly what happened. By 1925 not only had virtually every state established strict rate regulation guidelines, but local telephone competition was either discouraged or explicitly prohibited within many of those jurisdictions. [2]

Third, by averaging rates geographically to artificially suppress rural rates, policymakers and regulators created a serious disincentive to local telephone competition. Few firms, after all, will seek to enter a market and offer service if they realize it is difficult, if not impossible, to undercut the subsidized service of the incumbent carrier.

After reflecting on the overall impact of the introduction of regulation during this period, Brock (1981: 159-61) maintained,

> The combination of state and federal regulation stabilized the industry and ended the rate wars that had occurred during the early period of competition. Regulation increased the difficulty of new entry. . . . By accepting regulation voluntarily, Bell reduced the risk that unfavorable regulation would be imposed. The system of competing federal and state regulation, together with the complex Bell structure, prevented real regulatory control while providing the protection and legitimacy of a regulated utility. . . . The acceptance of regulation was a risk-reducing decision. It substituted a limited but guaranteed return on capital and management freedom for the uncertainty of the marketplace. It gave the Bell system a powerful weapon to exclude competitors and justification for seeking a monopoly, as well as reducing the chances of outright nationalization or serious antitrust action.

Hence, universal service, the final element of AT&T's strategy to eliminate competition, was in place thanks to the explicit actions of both federal and state legislators and regulators. Once AT&T's motto was adopted as the nation's *de facto* regulatory policy, no other firm was in a position to adequately extend service in accordance with the new federal and state mandated social policy. The Bell monopoly was here to stay.

The FCC and Telephone Entitlement

A few years later, this new unwritten law of the land was codified as the raison d'etre of the Federal Communications Commission (FCC) with the passage of the Communications Act of 1934. The commission was created, "for the purpose of regulating interstate and foreign commerce in communication by wire and radio so as to make available, so far as possible, to all the people of the United States a rapid, efficient, Nation-wide, and world-wide wire and radio communication service with adequate facilities at reasonable charges."

In effect, every American was henceforth found to be entitled to the right to telephone service, specifically cheap telephone service. To carry out this difficult policy objective, the FCC was given sweeping powers. Beside its powers to regulate rates to ensure they were "just and reasonable," the FCC was also given the power to restrict entry into the marketplace. Potential competitors were, and still are required to obtain from the FCC a "certificate of public convenience and necessity." The intent of the licensing process was again to prevent "wasteful duplication" and "unneeded competition." In reality, it served as a front to guard the interests of the regulated monopoly and the FCC's social agenda.

The overall hostility to competition by the FCC and the drafters of the legislation that gave birth to it is best illustrated by a 1988 Department of Commerce report on the development of the telecommunications industry. The report notes, "The chief focus of the Communications Act of 1934 was on the regulation of telecommunications, not necessarily its maximum development and promotion. [T]he drafters of the legislation saw the talents and resources of the industry presenting more of a challenge to the public interest than an opportunity for national progress" (164).

Over time the FCC would come to see the Bell System simply as the implementor of its agenda. Consequently, it would continue to use its power in favor of AT&T when potential competitors threatened the firm's hegemony. Their bureaucratic mismanagement of the radio spectrum (which was nationalized under the Radio Act of 1927) meant the most capable competitor of the era would never be given a chance to compete. Despite the fact that wireless technologies would be greatly developed in the near future, the possibility of serious wireless competition rising up to meet the Bell challenge in the first half of this century became less likely once government forces, instead of market forces, controlled how the spectrum was allocated. Just as the wireline technologies where subject to blatant political manipulation, the wireless spectrum became the tool of regulatory and special interests; competition was again dealt a severe blow.

Thomas Hazlett (1990) has proven that the nationalization of the radio spectrum was a special interest fiasco that was totally unnecessary. Property rights within the spectrum were developing and could have become the norm if not for the intervention of federal regulators at the request of industry leaders. Kellogg, Thorne, and Huber (1992: 19-20) have also pointed out the anti-competitive nature of the 1927 Radio Act:

> A gentlemanly agreement, reached under political pressure, had once again replaced competition with complementary monopolies. It reaffirmed the general prohibition on "monopoly" of the airwaves--meaning that competition over the airwaves was prohibited, at least if it came from Bell. The Act forbade cross-ownership of telephone companies and broadcasting stations, and flatly rejected the operation of radio stations as `common carriers.' None of this could have concerned top officials at RCA or Bell very much. Congress merely cemented and strengthened a division of markets and territories that the parties had already voluntarily embraced.

Likewise, when the cable industry appeared on the scene several years later, it was restrained from entering other market segments. Finally, as mentioned, in those intrastate markets the FCC did not have jurisdiction over, state commissions protected local monopolies by restricting entry and guaranteeing their revenues.

Needless to say, by World War II, the communications industry had become a good old boy network. Regulators and the regulatees realized they had something to gain by allying in opposition to the forces of competition. Alfred Kahn (1971: 46) recognized the cozy nature of the regulator-regulatee relationship: "Responsible for the continued provision and improvement of service, [the regulatory commission] comes increasingly and understandably to identify the interest of the public with that of the existing companies on whom it must rely to deliver goods."

Hence, owing to a federal policy that placed higher value on immediate universal service than competition, the Bell monopoly was solidified.

The Lessons for Today's Legislators

The belief that government intervention substantially decreased competitive opportunities within the telecommunications industry is borne out by the historical record. The actions of legislators and regulators, both deliberate and accidental, led to the creation of the Bell monopoly. The demise of competition within the industry was brought about by three primary forces:

> 1. The removal of "wasteful" or "duplicative" competition through exclusionary licensing policies, misguided interconnection edicts, protected monopoly status for dominant carriers, and guaranteed revenues for those regulated utilities;
>
> 2. The mandated social policy of universal telephone entitlement, which called for a single provider to easily carry out regulatory orders; and
>
> 3. regulation of rates (through averaging and cross-subsidization) to achieve the social policy objective of universal service.[3]

The combination of these government-induced policies, which were introduced in rapid succession, was enough to kill telephone competition just as it was gaining momentum.

Despite this evidence, many economists still argue that in the absence of government control, a monopoly would have developed and consumers would have been exploited to a greater extent in the process. Such an outcome is questionable. Even if the assumption is granted, it is arguable that such an outcome would have proven as disastrous as the monopoly theorists believe. Such a suboptimal market setting would have invited entrepreneurial solutions to the monopolistic practices, encouraging the development of competitive technologies to satisfy consumer demands. [4] This entrepreneurial activity might have taken place much sooner had government not erected legal barriers to competition throughout the industry. Once the government rigged the rules of the game to favor one firm over all others, competition was virtually impossible.

A review of the historical record of American telephony, considered to be the prime example of a natural monopoly

industry, serves as an excellent starting point for a fundamental reassessment of the validity of natural monopoly theory. Some economists have challenged the notion that monopolies are in any sense natural. James R. Nelson (1966: 3) claimed:

> One of the most unfortunate phrases ever introduced into law or economics was the phrase "natural monopoly." Every monopoly is a product of public policy. No present monopoly, public or private, can be traced back through history in a pure form. "Natural monopolies" in fact originated in response to a belief that some goal, or goals, of public policy would be advanced by encouraging or permitting a monopoly to be formed, and discouraging or forbidding future competition with this monopoly.

Hazlett (1985: 21) has also weighed in by refuting many of the obsolete notions upon which natural monopoly theory is based:

> The economists' analysis of the inefficiency of unregulated natural monopoly markets did not spring from a scientific or particularly scholarly research program but in response to "a growing clamor for more government." Indeed many of the early natural monopoly writers had attacked the problem because of personal ideological agendas; their politics preceded their studies.

Finally, economists with allegiance to the Austrian School of economics, such as Dominick T. Armentano (1990), F.A. Hayek (1948), and Israel M. Kirzner (1973), believe that not only are answers to the questions about natural monopoly wrong, the questions themselves are improperly formulated. Competition, these scholars insist, is a dynamic process of constant entrepreneurial adjustment to market signals. The market is never at rest; today's monopoly could be tomorrow's competitive market. A truly competitive marketplace, therefore, will be free of any artificial restraints or barriers to entry that interrupt this dynamic adjustment process. Hence, when examining the development of the telephone market through an Austrian paradigm, it should be obvious that the only "failure" was not of the market, but of legislators and regulators who failed to allow entrepreneurial solutions to develop.

The most important lesson legislators can draw from this study is that government intervention need not be explicit or massive to have serious long-term and deleterious effects on competition within an industry. In the case of telecommunications, the government's simple stipulation that rates be artificially set to reflect certain social policy objectives was the crucial factor that led to the creation of the AT&T monopoly. Other factors, such as interconnection requirements, also illustrate how good intentions can often have disastrous results. In this case, interconnectivity provided a disincentive to built competing systems, tilting the market in AT&T's favor.

Still, legislators demand specific answers for many difficult questions. First, there is the question already addressed briefly above--would not a free market for telecommunications be privately monopolized or oligopolized anyway? To answer this more succinctly, there is no doubt that all businesses would like to capture an entire market for themselves and receive exorbitant profits from the goods and services they produce. But, the beauty of the free market is that it tames such tendencies through competition and entrepreneurship. Every time a producer ignores the needs of consumers, entrepreneurs see the opportunity to step in and fill the market's need. General Motors and IBM can both attest to the truth of this phenomenon. At one time they both sat atop their respective markets, only to find their perfect worlds shattered by innovative competitors. Ironically, both GM and IBM were once targets of federal antitrust investigations. Would the automobile or computer industry be any more competitive today had the government broken up either of these companies? Likewise, would consumers have been better off if either firm was granted the status of a government-regulated monopolist? It would be hard to argue that that would be the case--both industries are now vigorously competitive precisely because the market was allowed to work; consumer power took precedence over arbitrary regulatory power.

But what about universal service? Would a telecommunications free market have guaranteed everyone access to a telephone? At first, definitely not. Competition would have taken time to develop to the point were everyone was provided access. But, just as virtually every American gained access to a radio and television (and many to a video cassette recorder) through free-market competition, telephones would have eventually become ubiquitous without government mandates. The demand for telephone service is too inelastic to image the opposite being the case. Quite likely, innovative products would first have been introduced into lucrative business markets and then slowly spread out to rural, residential areas as consumer demand grew. Thus, the extension of telephone service probably would have progressed much as television and computers have. Competitors would have eventually formulated appropriate interconnection charges to ensure that a spontaneous universal system developed. It would have become virtually impossible for a firm to survive if it did not agree to interconnect with others. As for those citizens in far-off rural areas

that legislators most fear would be forgotten, wireless systems would have eventually arisen to accommodate their needs. Although such service would not have been cheap initially, it would have been available.

Yet, instead of patiently allowing competition to develop within the telecommunications industry, arrogant legislators thought they better understood how to order the marketplace, and intervened to conduct their experiment. Their hastiness allowed AT&T to monopolize one of the most important industries in existence. Their mistakes should make us question the validity of any statements by today's legislators that they better understand how to make the marketplace competitive.

The author is the Alex C. Walker Fellow in Economic Policy at the Heritage Foundation.

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Notes

[1] He had previously served as president from 1885-87.

[2] Many such prohibitions and restrictions still exist today. According to the National Association of Regulatory Utility Commissioners' Summary of Competitive Status by Population, 19 states still have substantial legal barriers to competition, and another 20 only allow partial competition. When population is taken into account, roughly 70 percent of Americans live in a state that either allows only partial or no competition.

[3] This list closely resembles Warren G. Lavey's outline of the "five major public policies which accounted for much of the transition to regulated monopolies." His list is as follows: "(1) efficient supply of services; (2) reasonable revenues; (3) extension of service to remote areas; (4) averaged rate structures; and (5) below-cost pricing for residential services" (Lavey 1987: 171).

[4] This is exactly what began to happen under the government-regulated market anyway as new wireless and computerized inventions gradually eroded the Bell System's technological advantages. Yet, various bureaucratic gaffes and outright regulatory prohibitions continued to limit the extent to which new technologies could have a substantial

impact on industry-wide competition. The result was minor gains for rivals in new market segments, such as microwave communications and resale, but little else in the way of a serious challenge to AT&T's hegemony.

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Records of the Federal Communications Commission [FCC]

(Record Group 173)
1875-1988 (bulk 1910-79)

OVERVIEW OF RECORDS LOCATIONS

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173.1 ADMINISTRATIVE HISTORY

Established: As an independent agency by the Communications Act, June 19, 1934 (48 Stat. 1064).

Predecessor Agencies:

- Interstate Commerce Commission (regulation of telephone, telegraph, and cable companies, 1910-34)
- Radio Service, Bureau of Navigation, Department of Commerce and Labor (1911-13)
- Radio Service, Department of Commerce (1913-27)
- Radio Division, Department of Commerce (1927-32, to Federal Radio Commission)
- Department of State (licensing of submarine cable operations, 1921-34)
- Federal Radio Commission (1927-34)

Functions: Regulates the charges and operating practices of common carriers engaged in interstate or foreign communications. Issues broadcasting licenses. Assigns broadcast frequencies. Classifies radio and television stations and prescribes the nature of their services. Enforces radio requirements for some classes of vessels.

Finding Aids: Albert W. Winthrop, comp., Preliminary Inventory of the Records of the Federal Communications Commission, PI 93 (1956); Forrest R. Holdcamper, comp., "Preliminary Inventory of the Records of the Federal Communications Commission: A Supplement to Preliminary Inventory No. 93," NC 131 (Sept. 1965); supplement in National Archives microfiche edition of preliminary inventories.

Related Records: Record copies of publications of the Federal Communications Commission and its predecessors in RG 287, Publications of the U.S. Government.

173.2 RECORDS OF THE RADIO SERVICE AND THE RADIO DIVISION
1910-34

History: Radio Service, Bureau of Navigation, established in the Department of Commerce and Labor, July 1, 1911, by order of the Secretary, to implement the act of June 24, 1910 (36 Stat. 629) requiring radio equipment on passenger steamships. Transferred with the Bureau of Navigation to the Department of Commerce by the Department of Commerce Act (37 Stat. 736), March 4, 1913. Separated from the Bureau of Navigation, 1927, and became the Radio Division, Department of Commerce, with enhanced power to license radio operators, inspect stations, and monitor broadcast frequencies. Absorbed by the Federal Radio Commission pursuant to EO 5892, July 20, 1932.

Textual Records: Combined general correspondence files of the Radio Service, Radio Division, and Federal Radio Commission, on early radio regulation, 1910-34, with indexes, 1910-30. Correspondence of the Radio Division relating to complaints, station operations, administrative and technical matters, and the radio industry, 1929-32, with indexes, 1929-30. Correspondence of the Federal Radio Commission relating to applications for broadcast station licenses, 1928-32.

Motion Pictures (1 reel): Promotional film, Radio Station WIBO, Chicago, 1930. SEE ALSO 173.14.

173.3 RECORDS OF THE INTERSTATE COMMERCE COMMISSION (ICC)
1907-34

History: Regulatory responsibility for telegraph, telephone, and cable companies engaged in interstate operations vested in the ICC by the Mann-Elkins (Interstate Commerce) Act, June 18, 1910 (36 Stat. 544), subsequently modified by EO 3513, July 9, 1921, which transferred to the Department of State the responsibility for advising the President on the granting of licenses to submarine cable operators. ICC functions transferred to FCC by the Communications Act of 1934. State Department responsibilities transferred by EO 6779, June 30, 1934.

Textual Records: Regulations, 1912-32. "Formal docketed," 1912- 32, "finance," 1921-34, and "valuation," 1918-27, case files. Records relating to depreciation of telephone, telegraph, and cable properties, 1921-34. Minutes of meetings of the Engineering Board of the Bureau of Valuation, 1919-20. Records relating to the Western Union Telegraph Company, 1907-31; and to the Mackay Companies Land Line System, 1919-28. Records of the Chief Examiner of Accounts relating to corporate acquisitions by American Telephone and Telegraph, 1913-29.

173.4 RECORDS OF THE FEDERAL RADIO COMMISSION
1927-34

History: Established as an independent agency by act of February 23, 1927 (44 Stat. 1162) to regulate the broadcast industry, with authority to license stations, allocate frequencies, and control power usage. Absorbed, pursuant to EO 5892, July 20, 1932, functions, records, and personnel of the Radio Division, Department of Commerce. Abolished, 1934. SEE 173.1.

Textual Records: Microfilm copy of minutes, 1927-34 (8 rolls). Docketed case files, 1927-34.General orders, 1927-31. Decisions concerning construction permits for new stations and modifications of broadcast licenses, 1929-34.

173.5 GENERAL RECORDS OF THE FCC
1934-79

History: Commission members initially organized into three subcommissions, styled divisions (Radio, Telephone, and Telegraph Divisions). Divisional structure of commission abolished November 15, 1937, with FCC thereafter functioning as a single unit.

Textual Records: Minutes of Federal Radio Commission and FCC meetings and hearings, 1928-70. Microfilm copy of minutes of FCC meetings, 1934-71 (395 rolls). Docketed case files of the FCC, 1934-79 (4,281 ft.) Orders, 1934-39. Histories of World War II and Korean War activities of the FCC, 1948-52. Records of a special investigation of companies engaged in interstate telephone communications conducted under a joint resolution of the Congress, 1936. Exhibits presented by the National Association of Broadcasters in a hearing on the Communications Act, October 1934. Records of the Network Study Staff, Network Study Committee, consisting of correspondence, questionnaires, and program logs of the Broadcast Network Survey, 1956-57. Deleted auxiliary broadcast station history cards, 1959-63. Technical information conference files, 1946-50. Records relating to the International Telecommunications Union (ITU), United Nations, including administrative council files, 1957-61, 1972-74; circular letters, 1969-70; International Frequency Registration Board (IFRB) circulars, 1971-74; and treaty and conference files, 1972-75. Records relating to the International Radio Consultative Committee (CCIR), 1963-67. Correspondence relating to U.S. directional antenna pattern interference problems with Canada, Mexico, and Cuba, 1956-70. Annual reports by telephone companies on FCC Form M, 1970-79. Annual reports by wire telegraph, ocean cable, and radio-telegraph carriers on FCC Form O&R, 1971-79. Records relating to a survey of radio use in the United States (1940-47), 1950-52. Records relating to the Airspace Panel, Air Coordinating Committee, 1947-57.

Specific Restrictions: As specified by the FCC, no one may examine the microfilm copies of the formal official minutes of the FCC bearing security or other classification mark or be given information from them or copies of them except by permission of the FCC.

Motion Pictures (4 items): Exhibits submitted in evidence relating to cases heard and decided by the FCC, concerning petitions, complaints, or FCC motions, chiefly involving broadcasting stations and pertaining to such matters as rates, facilities, the quality of services, corporate organizations, and ownership transfers, 1953-68. SEE ALSO 173.14.

Video Recordings (10 items): Exhibit submitted in evidence and relating to a case involving Danville Community Antenna Systems, Inc. (docket number 16865), 1968.

Sound Recordings (415 items): Exhibits submitted in evidence relating to cases heard and decided by the FCC, concerning petitions, complaints, or FCC motions, chiefly involving telephone, telegraph, cable, and radio broadcasting companies and pertaining to such matters as rates, facilities, the quality of services, corporate organizations, assignments of radio frequencies, and ownership transfers, 1936-65. SEE ALSO 173.16.

Photographs (995 images): Collected as part of a survey of radio use in the United States and illustrating radio use, the impact of radio technology on the transportation industry, and radio celebrities (1908-47), 1950-52. SEE ALSO 173.17.

173.6 RECORDS OF THE OFFICE OF THE EXECUTIVE DIRECTOR
1927-71

Textual Records: General correspondence, 1927-71. Correspondence of the FCC Chairman, 1941-71. Public reactions to Chairman Newton R. Minnow's criticisms of network television, 1961.

Sound Recordings (131 items): False claims for medical products and cures, from the general correspondence of the Executive Director, 1933-45. SEE ALSO 173.16.

173.7 RECORDS OF THE OFFICE OF THE CHIEF ACCOUNTANT
1900-49

History: Established as the Accounting, Statistical, and Tariff Department in October 1934. Acquired the fiscal records of predecessor agencies, relating to wire and wireless communications. Name changed to Accounting Department in 1944, to Bureau of Accounts, May 12, 1948, and to Office of the Chief Accountant, March 3, 1950. Abolished October 31, 1955, and accounting functions integrated into the operating bureaus. Accounting Systems Division assigned to the Common Carrier Bureau and Economics Division to the Broadcast Bureau.

Textual Records: Completed questionnaires (statistical circulars) from communications common carriers that relate to company histories, corporate relationships, fiscal matters, and operations, 1934-49. Financial summary data for telephone and telegraph carriers, 1920-48. Correspondence relating to the acquisition of physical plant by telephone companies, 1921-34. Records relating to the acquisition and disposal of physical plant by the Chesapeake and Potomac Telephone Company, 1900-37. Records relating to an original cost basis accounting study of American Telephone and Telegraph, 1937-44.

173.8 RECORDS OF THE OFFICE OF CHIEF ENGINEER
1875-1967

History: Initial organization of the FCC in 1934 included Engineering Department, with responsibility for engineering phases of broadcast licensing, common carrier regulation, regulation of special services, supervision of field staff, and technical information engineering and research, including frequency allocation and treaty negotiation. Department redesignated Bureau of Engineering, May 12, 1948. Redesignated Office of Chief Engineer, April 3, 1950, concurrently with separation of common carrier functions as Common Carrier Bureau. Broadcast licensing functions separated from Office of Chief Engineer as Broadcast Bureau, July 31, 1950. Amateur radio, marine radio and safety, and public safety and special services functions consolidated as the Safety and Special Radio Services Bureau, June 4, 1951. Field Engineering and Monitoring Division made a separate bureau, March 2, 1952. Office of Chief Engineer redesignated Office of Science and Technology, May 1, 1979, and Office of Engineering and Technology, 1988. Functions include research, testing and approval of experimental radio equipment, frequency allocation, and treaty negotiation.

Textual Records: North American Regional Broadcast Agreement (NARBA) file, 1939-65. FCC frequency allocation records, 1928-50. Treaty and conference records, 1875-1967.

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* **173.9 RECORDS OF THE COMMON CARRIER BUREAU**
1914-70 X? earlier

ie 1906-10 boxes

History: Common carrier regulation initially assigned to Engineer Department, 1934. Separately denominated Common Carrier Branch under Engineering Department by 1947. Engineering Department became Bureau of Engineering, May 12, 1948, with former Common Carrier Branch redesignated Common Carrier Division. Common Carrier Division separated from Bureau of Engineering (which became Office of Chief Engineer) and designated Common Carrier Bureau, April 3, 1950, with regulatory responsibility for interstate and international common carrier communications (initially telephone, telegraph, and radio, with subsequent addition of satellite communications).

Textual Records: Annual financial reports of communications common carriers, 1914-70, with an index, 1914-45.

Marie at NARA

173.10 RECORDS OF THE BROADCAST BUREAU
1937-73

History: Responsibility for engineering phases of broadcast licensing initially assigned to Engineer Department, 1934. Separately denominated Broadcast Branch under Engineering Department by 1947. Engineering Department became Bureau of Engineering, May 12, 1948, with former Broadcast Branch divided into FM (Frequency Modulation) Broadcast Division, Television Broadcast Division, and Standard Broadcast Division. Bureau of Engineering redesignated Office of Chief Engineer, April 3, 1950. Broadcast divisions separated from Office of Chief Engineer and reconstituted as Broadcast Bureau, June 4, 1951, with responsibility for regulation of broadcasting activity. Acquired licensing function from Bureau of the Secretary, 1952. Consolidated with Cable Television Bureau (which had been established in January 1970) to form Mass Media Bureau, November 30, 1982.

173.10.1 General records

Textual Records: Correspondence and other records relating to the administration, finances, and operations of broadcasting stations and networks, 1939-50. Annual financial reports of broadcasting stations, 1937-71.

Specific Restrictions: As specified by the FCC, the annual financial reports filed by licensees and permittees of standard, FM, television, and international broadcast stations with the FCC in accordance with section 0.417 of the FCC Rules and Regulations are not open to public inspection unless special permission is granted by the FCC upon written request describing in detail the documents to be inspected and the reasons therefor.

173.10.2 Records of the Technical and Allocations Branch, Broadcast Facilities Division

Textual Records: Interference case files, 1954-60. Reports and correspondence relating to field measurement data for FM and television stations, 1941-59. Reports pertaining to stratovision flight tests, 1946-69. Records relating to the development of FM multiplex (stereo) broadcast stations, 1957-59; development of educational television, 1959-60; and development of Community Antenna Television (CATV), translators, and Ultra High Frequency (UHF) boosters, 1950-64. Records relating to synchronous booster transmitter operation of broadcast stations WINX, Washington, DC, and WBAL, Baltimore, MD, 1940-51; to compatible single-sideband broadcast transmission experimental stations, 1958-61; to experimental subscription television stations, 1949-57; and to closed experimental and developmental broadcast stations, 1938- 65; Records relating to the history of color television, 1941-51; history of the development of television, 1938-65; and history of theater television, 1948-49.

173.10.3 Records of the Research Branch, Research and Education Division

Textual Records: Questionnaires for the 1966 political broadcasting survey, 1966-67. Correspondence and reports concerning the 1972 political broadcasting survey, 1964-73.

173.11 RECORDS OF THE RADIO INTELLIGENCE DIVISION
1940-47

History: Established July 1, 1940, as the National Defense Operations Section of the Field Division to investigate and monitor clandestine wireless operations in the United States and its possessions and to train military personnel and intelligence agents in monitoring techniques. Discontinued in 1946.

Textual Records: Subject-classified general file, 1942-45. Reports, correspondence, and other records relating to congressional investigations of the FCC and the attack on Pearl Harbor and to the security classification of records, 1942-46. Files of George E. Sterling, Chief of the Division, 1940-47. Records relating to clandestine stations, intercepted radio transmissions, and cooperation with British and Canadian security organizations, 1940-45.

Maps (52 items): Hydrographic Office tracking charts annotated with dots to show locations of SOS reports and submarine attack sites along the U.S. coasts and in the Caribbean, 1942 (5 items). Diagrams showing the Japanese Navy communications net (28 items) and the German communications net in Europe (8 items), 1942-43. Charts showing German clandestine circuits monitored at North Scituate, RI, 1943 (3 items). World chart and papers relating to American Telephone and Telegraph circuits and censorship instructions, 1942 (3 items). Master call list diagrams, 1943 (4 items). Unidentified chart showing signals converging on a site north of the Spanish coast, 1943 (1 item). SEE ALSO 173.12.

173.12 RECORDS OF FIELD OFFICES
1950-52

Textual Records (in San Francisco): Records of the San Francisco Field Office including affidavits, clippings, letters, memorandums, pleadings, and telegrams, 1950-52.

173.13 CARTOGRAPHIC RECORDS (GENERAL)
1932-42

Maps of the United States, 1932 and 1937, and of Cuba, 1942, showing commercial aviation radio stations, aeronautical stations, and call letters.

SEE Maps UNDER 173.11.

173.14 MOTION PICTURES (GENERAL)

SEE UNDER 173.2 and 173.5.

173.15 VIDEO RECORDINGS (GENERAL)

SEE UNDER 173.5.

173.16 SOUND RECORDINGS (GENERAL)

SEE UNDER 173.5 and 173.6.

173.17 STILL PICTURES (GENERAL)

1974-88

Photographs: FCC commissioners and officials, 1974-87 (CM, 776 images). FCC events and activities, 1981-88 (EV, 355 images). FCC facilities, 1987-88 (FC, 98 images).

Photographic Prints: Documenting renovations of FCC facilities, 1985-87 (RP, 118 images).

SEE Photographs UNDER 173.5.

Bibliographic note: Web version based on *Guide to Federal Records in the National Archives of the United States. Compiled by Robert B. Matchette et al. Washington, DC: National Archives and Records Administration, 1995.*
3 volumes, 2428 pages.

Ordering information

This Web version is updated from time to time to include records processed since 1995.

Page URL: http://www.archives.gov/research/guide-fed-records/groups/173.html

The U.S. National Archives and Records Administration
8601 Adelphi Road, College Park, MD 20740-6001 • Telephone: 1-86-NARA-NARA or 1-866-272-6272

Creation Stage 1876-1896

1876 Bell patents telephone
Original investors included Boston bankers, George Bradley, W.G. Salastonn and G.Z. Salisby

1876 Western Union replies by using their telegraph network

1879 Westernn Union forced to give up its infrastructure and 88 patents

1882 Bell acquires Western Electric and signs an exclusive contract that created uniformity and also proved very profitable for Western

1897 AT& T acquires numerous patents and begins to prepare for competition

1900 Bell culminates a process of constant restructuring by moving the company to New York under
1901 ATT shifts from holding company to centralized management structure

*1899,1900, 1906 the annual rate of growth exceeded 22%

Competition Regulation

The most serious threat to Bell was the American Telephone, Telegraph and Cable company (headed by rival banker, Rockefeller) attempted to consolidate independents. *The Financial History of American Telephone and Telegraph Company;* Stehlman, page 57

1905 Sublicensing becomes a "powerful weapon"

1906 Morgan finances ATT and breaks up consolidation efforts of the competitors

1907 States begin regulation of telephone institute common carrier laws

1907 Vail returns, streamlines company, includes marketing and embraces regulation

1907 Loading coil introduced

1908 Western Union under the control of ATT

1910 Mann-Elkin widens state efforts of regulation but proves ineffective

1911 Radio Act of 1912: the federal government shut down all private radio operations in the United States.

1913 Kingsbury commitment forces divestiture of WUnion, puts ATT under ICC and requires connection/access

1917 First Air-to ground and Ground to Air radio communications developed by Bell

1918 President Woodrow Wilson issued a proclamation assuming control of the telephone and telegraph systems in the United States, placing them under the direction of the Post Office

1919 The Bell System announces plans for the introduction of machine switching (dial telephones) in its exchanges.

1920 Graham-Willis act solidifies the theory of natural monopoly and precludes it from anti-trust suits

1923 Gifford established Bell Labs and reorganized company to "establish organizational principles that lasted into the 1980's"

1926 ATT goes into agreement with RCA
For one million dollars Bell turned over its radio facilities to RCA and withdrew from broadcasting. It also gave up its rights to manufacture receiving sets to RCA. In Return RCA agreed to use Bell wires exclusively and not to compete in the telephone business.

1926 ATT invents and patents sound motion picture

1926 The first simple television shadow images were shown on a standard Western Electric oscillograph tube at Bell Labs.

1927 Radio Act

1926 Transcontinental service becomes an important aspect for the military

1928 Lloyd Espenschied and Herman Affel applied for a patent for broadband coaxial cable, the first broadband transmission medium.

1934 Communications Act

1. Federal-State division of responsibilities
2. Common carrier obligations including interconnection
3. Rate regulation
4. Universal services
5. Creation of Federal Communications Commission (FCC) to assume telecom duties of ICC and FRC (radio)

- Descriptions and rates for various services, features, & options
- Terms and conditions of transaction
- Limits on carrier liability
- A substitute for a contract with customer

- FCC to regulate interstate telephone service
- Regulation of intrastate (wireline) communications left to the states
- No clear division between state and federal
- Can divide individual calls (intrastate/interstate)
- Many network components serves both types of calls and cannot be physically separated
- FCC can preempt state on some issues, but must clearly show why it is necessary
- Carriers must provide (interstate communications) "service upon request"
- Must interconnect with other carriers when FCC decides it is "in the public interest"
- Charges, practices, classifications, and regulations must be "just and reasonable"
- No "unjust or unreasonable discrimination
- Regulators decided when carriers had to interconnect
- Carrier cannot construct facilities until FCC issues "certificate of public convenience"
- Carrier also need FCC approval to dismantle facilities

- Thus, FCC empowered to control entry into and exit from the industry
- FCC used this power (for years) to keep competitors out and retain monopoly status
- In theory, FCC could set rates on each individual service/option (rate elements)

FCC chose a loose approach to monitor overall earnings, especially of AT&T

1939-1945 WWII

On the back of Western Electric, AT&T became not only the major industry player in the United States, but in fact, the largest company in the world. Through its monopoly control, AT&T came to dominate the three major areas of telephone service: local service, long distance service, and equipment. DOD relationship very strong "by 1944 roughly 85% of Western Electric business was defense contracts"

1949 The government sued Western Electric and AT&T charging that they had monopolized the manufacture and sale of telephones and equipment (Civil Action No. 17-49). (Led to 1956 consent decree)

What the government sought was the divestiture by AT&T of Western Electric, the termination of the exclusive relationship Western Electric enjoyed with AT&T, and the total separation of telephone manufacturing from the provision of telephone service, among other things.

1956 Hush-a-Phone decision permitted telephone users to attach a cup-like device to the telephone mouthpiece to make communication more private. (Key in the Carterfone decision)

1956 Consent Decree or "Final Judgement"

AT&T agreed to restrict its activities to the regulated business of the national telephone system and government work. They were allowed to keep Western Electric.

An injunction was issued which barred AT&T from engaging in any business other than the provision of common carrier communication services

Required Western Electric and AT&T to license their patents to anyone who wanted them upon the payment of appropriate royalties.

1956 FCC agrees to hear the "Above 890" proposition-whether the private line business should be change by allowing microwave systems employing radio frequencies above 890 megahertz to be used by private (non bell) parties. TV channels and Motorola were at the heart of this market. AT&T fought this on the basis of eventual forced interconnection "cream skimming" of long distance markets.

1959

In 1959, the anti-trust's subcommittee of the House Judiciary Committee held hearings on the 1956 consent decree The Subcommittee's investigations revealed that AT&T was very active behind the scenes in trying to get the government to suspend its 1949 suit. (Report of the Antitrust Subcommittee of the House Committee on the Judiciary on the Consent Decree Program of the Department of Justice, 86 Cong. First Sess., Jan. 30, 1956).

As a result of AT&T's continuing lobbying of the Defense Department, the Secretary of Defense wrote a letter to the Attorney General asking him to end the 1949 litigation without requiring AT&T's divestiture of Western Electric. The Subcommittee, in its 1959 report, concluded that the Attorney General manifested a willingness to have the Justice Department consider a token settlement.

The Subcommittee also uncovered the fact that AT&T had actually prepared the letter that the Secretary of Defense sent to the Attorney General. (Subcommittee Report, 55)

1961 In response to Above 890, Bell proposed TELPAK, a new service which amounted to dramatic reduction in AT&T's rates for private line services. In 1964 the FCC claimed TELPAK was unlawful due to predatory pricing. This lead to a series of court battles over the next ten years.

1962 President Kennedy signed the Communications Satellite Act, which gave a monopoly on international communications via satellite to a new corporation, called Comsat. (Although AT&T built Telstar) AT&T went ahead with Telstar II anyway to complete its experimental program. It was launched on May 7, 1963. The publicity from Telstar had been very positive for AT&T. AT&T had built six flight worthy spacecraft and launched two of them using company funds. Bell Labs had developed much of the technology required for satellite communications including transistors, solar cells, and TWT amplifiers. AT&T also built ground stations for Echo and Telstar

1963 Bill McGowan establishes Microwave Communications of America and requests a permit to construct a private line from St. Louis to Chicago.

1968 Rostow Report asserted that competition should replace regulation as the norm in telecommunications.

1968 Carterfone Decision
FCC ruling that allowed non-AT&T equipment to be attached to the public telephone network provided the equipment met certain technical and operational specifications. Permitted the connection of a device used to interconnect private two-way radio communication systems with the public telephone network. The Carterfone decision opened the way to competition in connection of customer-owned terminal equipment to the public telephone network. As a result the interconnect industry was born.

1969 "The MCI decision " allowed Microwave Communications, Inc. (MCI) to provide specialized common carrier services in direct competition with existing common carriers.
The MCI decision also required existing carriers to furnish interconnect service to the new carriers.

1971 *Specialized Common Carrier Services Decision* expanded "MCI decision"

1971 *Computer Inquiry I Decision* (CI-I) permitted communications carriers to transport data over their networks on a regulated basis but not to process it.

1973 The Senate Subcommittee on Antitrust and Monopoly, chaired by Senator Philip Hart, held a series of hearings in 1973 and 1974 on the question of competition in telecommunications.

1974 **Anti –trust suit**
The government indicated that it brought the 1974 suit because "the 1956 consent decree had not prevented AT&T from restraining competition in telephone equipment manufacture, nor protected against antitrust violations in long distance telephone service".

The government sought to have Western Electric divested from AT&T and divided into separate companies, and to have some or all of the Bell operating companies split away from AT&T's long lines.

Debutts refused a compromise and took the government head on…….

1. They tried to get the suit thrown out
2. And appealed to Congress for

a. To urge Congress to reaffirm the need for a unitary network.
b. if that course should fail, they would push Congress to adopt legislation that would deregulate most of the Bell system operations.

1982

- AT&T was required to divest itself of its 22 operating companies, the local service providers.

- AT&T would only be allowed to provide long distance service and would have to face competition from other long distance carriers, such as MCI and Sprint.

Local telephone service was now to be provided by seven regional Bell operating companies

Management: Tasks, Responsibilities, Practices
by Peter F. Drucker

1. on Page 74: "... of the Unternehmer-Why a Theory of the Business Is Needed-Especially in Today's Knowledge Organization-"What Is Our Business?" Neither Simple nor Obvious-**Theodore Vail** and the Telephone Company--Top Management's First Responsibility-Failure to Define Business Purpose and Business Mission a Major Cause of Business Frustration ..."

2. on Page 77: "... the right answer is usually anything but obvious. One of the earliest and most successful answers was worked out by **Theodore** N. **Vail** (1845-1920) for the American Telephone and Telegraph Company (also known as the Bell System) almost seventy years ago: "Our business ..."

3. . on Page 88: "... Our Business Be?" Sooner or later even the most successful answer to the question "What is our business?" becomes obsolete. **Theodore Vail**'s answer was good for almost two-thirds of a century. But by the late 1960s it became apparent that it was ..."

4. on Page 109: "... tune of three years of future revenues from him. As one of his last contributions-and one of his most important ones-**Theodore Vail** thought through the problem. He realized, at the end of World War I, that the American capital market was changing ..."

5. on Page 149: "... or a business must have a telephone. Residential phone service may still be an option. Business phone service is compulsory. **Theodore Vail**, as has been said earlier, saw this in the early years of this century. He also saw that the American ..."

6. on Page 161: "... arm's-length basis can provide the means for building into the structure of regulated monopolies the systematic performance of the job **Theodore Vail** built in sixty years ago for the American Telephone Company. Both the Federal Communications Commission in its study of the ..."

7. on Page 475: "... opportunity is important and is likely to vanish unless one acts with dispatch, one acts-and one makes a radical- change. **Theodore Vail**'s contemporaes agreed with him as to the degenerative danger of government ownership; but they wanted to fight it by fighting ..."

8. on Page 478: "... standards for accomplishment, and-their incentives are changed simultaneously. Otherwise, the people will get caught in a paralyzing internal emotional conflict. **Theodore Vail**'s decision that the business of the Bell System was service might have remained dead letter but for the yardsticks of ..."

9. on Page 562: "... misdirect the vision of functional people from contribution and results to efforts and busyness. The first attempt was made by **Theodore Vail** of the Bell Telephone System (see Chapter 13). His "bogeys," that is, the specific goals and measurements which were developed ..."

10. 10. on Page 769: "... company for a large number of small and local telephone businesses. It had to become a large and national company. **Theodore** N. **Vail** saw this clearly. He was then about fifty and the company's general manager, with the title of president. But the ..."

on T.N. vails Business Strategy / Thinking

Skeptical Inquirer, July-August, 1998, by Elie A. Shneour
http://www.csicop.org/si/9807/seed.html

Theodore Newton Vail (1845-1920) was twice president of the pioneering U.S. Telephone company, as the Bell Telephone Company (1878-1887) and again as the American Telephone and Telegraph Company (1907-1919). The story of his life and accomplishments is an extraordinary one, and not relevant to this essay, with but one exception. During his early tenure as president of the telephone company, Vail assembled his management staff to analyze and answer one central question: *What is our business?*[1]

It would seem pretty obvious that the business of a telephone company is communication by telephone. But not for Vail. In fact, answering that kind of a question is perhaps one of the most difficult issues an organization has to ponder, and the right answer to it is far from obvious. Vail's answer was crucial, and its implementation ensured the survival and prosperity of a major American firm for more than three quarters of a century.

Vail's answer to the question "What is our business?" was "Our business is service." Although that answer becomes self-evident as soon as it is uttered, it is in its implementation that its importance is truly acknowledged. When Vail articulated it, the U.S. telephone system was already an anomaly: All telephone companies worldwide were generally nationalized because they were monopolies. And AT&T, like them, was at considerable risk of being nationalized in its turn.

The second part of the answer is more subtle than the first. In order to stay in private hands, the telephone company had to be assured of political support. And ultimately that support had to come from individuals and their communities. In order to achieve that goal, Vail undertook to install telephone lines in all areas, including isolated rural communities, which at the time made no immediate economic sense. But it was an immense service that generated exceptional customer satisfaction. And all of Vail's employees were constantly admonished to emphasize service above all.

The third part of conceptual implementation was to recognize that telephone service was as yet relatively primitive, and had a long way to go, needing extensive and sustained improvements. This required emphasis on research and technology, whose flagship became the Bell Telephone Laboratories, the fountainhead of many major inventions that have transformed our lives, including the transistor. Several of these accomplishments, however, are little known to the general public but are of at least equal importance to the invention of the transistor.

In 1931, for example, Bell Telephone Laboratories hired a young M.I.T. graduate, Karl Jansky, and assigned him to find the sources of all the causes of noise in telephone lines. Jansky spent several years on this work, and meticulously identified all sources of noise but one. He eventually demonstrated that this last source of noise originated beyond the earth, and thus was born the science of radioastronomy.

And all of these favorable consequences, including the political decision of Franklin D. Roosevelt's administration to leave AT&T in private hands, arose directly and indirectly from Vail's inspired understanding that the business of his company was service, and doing something equally inspired about it.

This brings us at last to the question, What is the business, or more properly the mission, of the Committee for Scientific Investigation of Claims of the Paranormal (CSICOP)? Surely, it is far more all-encompassing than debunking UFOs, the Bermuda Triangle, the Loch Ness Monster, health nostrums, astrology, creationism, and the whole ever-expanding gamut of misleading, outlandish, and fraudulent claims made in the name of science. And the right and apt answer to "What is CSICOP's mission?" is likely to have a host of long-term favorable consequences in the same way that Vail's answer had for the fortunes of AT&T, many of them unknowable at the time his answer was suggested and implemented.

Those of us who have been speakers on the regional and national media circuits know in our collective guts that no matter how articulate, witty, disarming, and convincing we may be, in the last analysis we change very few minds. And that is being optimistic! The rest of the time, when we are not preaching to our collective choirs, we converse knowingly with each other, reading our articles and books, and meeting at our conferences, deploring the sad state of affairs beyond our ken. And no one has yet collected James Randi's legendary $10,000 (now more than a collective million-dollar) challenge.

The result is that despite the impressive progress CSICOP and its satellites have made since its founding, collectively we remain a series of small islands of rational thought in the vast ocean of scientific illiteracy. Many reasons have been advanced over the years for this continuing state of affairs.

The polygraph is still being used and widely advertised as a proven method of detecting lies. Astrology columns without CSICOP's disclaimer still abound in periodicals across the country. National television networks still broadcast nonsense about creationism and perpetual motion machines. Roswell, New Mexico, is still a mecca of UFO buffs. If anything, the sheer volume of these and many other myths persist with a commercial vengeance. Billions of dollars in revenue sustain the purveyors of fraud and fairy tales.

By contrast we skeptics have to pinch pennies, put our pitiful fingers in the dikes, and try, without much success, to outshout some sense over the cacophonous clamor. The sad truth is that we cannot possibly compete on an even playing field against this collectivity. We are not likely to do so until science is properly taught in our schools, and until those informed students graduate as writers, editors, publishers, and network executives, promoted through the ranks. This is not likely to happen in our lifetimes, but in the meantime we cannot afford to stand still. We have to fight the good battle regardless of the odds. And I believe that we can make a difference.

The first and foremost criterion of enhanced effectiveness is to devote more time to the uninformed collectivity, and decrease the time speaking to ourselves. We perhaps should focus on the decision makers at the local, regional, state, and federal levels. An excellent model for this is the valiant Eugenie C. Scott and her *National Center for Science Education*, which advances the cause of evolutionary science in response to the creationist threat. But this still leaves the fundamental issue, the reason for this essay, unanswered.

The premise is that no matter what we do and how we do it, we are unlikely to convince enough well-meaning and intelligent people that rational thought is the very foundation of our society and that scientific knowledge has given us the tools to enhance the quality of our lives. But we should perhaps purposefully forego the goal of convincing the unconvinced that we hold the torch of truth illuminating the darkness. We may not think that this is what we are, in fact, attempting to do. But across the chasm that separates the skeptic from the convinced, we too often come across as the self-righteous proselytizer. And in the welter of messages that constantly assail us from every quadrant, a society where fifteen-second sound bites rule, ours is often diminished, laughed away, adulterated, defamed, or ignored, if not lost altogether.

Ultimately it is our benevolent credibility rather than whatever political clout we may possess that will make the difference. And the first step toward that enhanced credibility is to lower our expectations. Most people stand in firm defense of their convictions, because in today's world, where it is difficult to believe anything, there is comfort and safety in holding onto a core of beliefs, whatever their rational merit. "Give me the benefit of your convictions, if you have any, but keep your doubts to yourself for I have enough of my own," wrote Goethe. Of course, education is intended to equip every sentient human being with two fundamental tools for coping with the other social animals of his tribe: The first is the communication tool of reading, writing, counting, and knowing the tribe's history and traditions. The second is the rational thinking tool, without which the first tool cannot effectively be applied.

It is the thinking tool that CSICOP is primarily concerned with. It is inevitable that some of the facts and concepts we absorb as children are either perishable or damaged goods, yet persist into adulthood. Adults are better equipped to filter that intellectual bounty, but the price paid is that established convictions are rapidly carved in stone.

And CSICOP has chosen to challenge some of these unshakable convictions for what it views as the betterment of society. The rational fulcrum of this process is the scientific method, whose power in the affairs of men is difficult to denigrate. If the reader has any doubt on this score, he is invited to try to identify a twentieth century philosopher who has had more drastic impact on our daily lives than a twentieth century scientist such as Albert Einstein.

In the face of this intellectual brick wall of given convictions and scientific illiteracy, what can CSICOP accomplish in a reasonable time with the limited resources at its command? Or, even if CSICOP had these resources multiplied by ten, a hundred, or even a thousand times? The answer is, very little, if the goal is to refashion the given convictions into rational ones. But there is another way to approach the problem, stated witheringly by Oliver Cromwell in a letter he wrote to the General Assembly of the Church of Scotland on August 5, 1650: "I beseech you, in the bowels of Christ, think it possible you may he mistaken. . . ."

" . . . Think it possible you may be mistaken . . ." is exactly what CSICOP ought to aim for as its ultimate goal. To plant a seed of doubt into an unwavering conviction is a vast accomplishment in education as well as in thinking on one's own. To be able to doubt is humbling and constructive because it requires the application of rational thought in weighing alternatives. Once that seed has been planted, it can germinate into a full reexamination of the options, which opens unlimited vistas, or it can remain a dormant seed. In either case, the process cannot help but enrich each human being and make him or her a more effective and a more balanced member of a better society.

To have accomplished this remarkable feat would be the ultimate accolade for any organization. It is within the scope of what CSICOP can achieve, and in all humility, it ought to aim for that attainable goal.

"The Financial History of American Telephone and Telegraph Company" Stehman

On the acquisition of Western Electric page 30,31
"The Western Electric Manufacturing Company (WEMC) was the biggest concern of its kind and a plan was developed to combine it with the Charles Williams Company, of Boston, and several other concerns. To protect themselves, the Bell interests found it desirable to secure control of WEMC. This they did by buying in 1882, in 1882, majority of the shares of stock, which were held by interests associated with Western Union Telegraph. Western electric was formed." WElectric was now the exclusive manufacturing licensee....The exact relationship between American Bell and W-Electric was the subject of a contract drawn up between them on 02/06/82. This contract continued in force until 1908 when it was altered. Under it Bell was permitted to acquire at cost, any telephone patents owned by the manufacturing company, and the latter has the privilege of manufacturing any patents owned by the former."

On Moving to New York and consolidation p33-43
"American bell decided to organize a company under New York laws to take acre of its long distance business. This was done apparently in the hope that, by merely licensing and owning the stock of operating companies and in no case doing any operating, American bell could avoid being classified as a public service corporation."

*Page 43 Forbes describes the consolidation he oversaw as "best to bring a large territory under one management"

Western Union 147-152
Gould, New York Telegraph,

Patents
Investigation of the Telephone Industry in the United States 1939
Page 213
The first major settlement was of the patent suit of the Bell Telephone company etc al, against Peter A. Dowd, a licensee of a subsidiary of Western Union.
"From the standpoint of existing and potential patent control the Western Union settlement was most advantageous to the Bell CO. 42 patents and applications then owned by western Union covering improvements on the telephone itself and useful devices in the field of telephonic apparatus. Over the 17-year period of the agreement, the Bell system obtained exclusive rights in the telephone field under 87 Western Union patents.

Post-Patent Competition

The Financial History of American Telephone and Telegraph Company" Stehman page 57 The most serious threat to Bell was the American Telephone, Telegraph and Cable company (headed by rival bankers, Rockefeller, and) attempted to consolidate independents. See also Vail book…..

The Trust company panic of 1907 Chapter 5 page 83
Wicker, "The Banking Panics of the Gilded Age"
Three Characteristics of the 1907 panic render it unique among the banking panics of the national banking era:

1. The disturbance in New York was largely confined to the trust companies
2. leadership for restoration was assumed by J.P. Morgan and not the NY Clearing House
3. the instrument of voluntary money pooling was used extensively to provide financial support to troubled trust companies and the stock market, and to relieve the fiscal crisis in NY city.

Also,
total liabilities of failed banks were over 20% greater in 1907 than in 1893

Original investors included Boston bankers, George Bradley, W.G. Salastonn and G.Z. Salisby had organized

Quote: In One Man's Life A.B. Paine page 111
"Uncle Joe" Cannon, then a member of Congress said upon hearing news of Vail quitting his Postal job to join Bell remarked, "That's too bad. I always liked Vail. Hubbard tried to sell *me* some of that stock. I am sorry he got a hold of a nice fellow like Vail"

- W.H. Forbes had resigned in 1887,
- He took the company to NY

- to be succeeded by John Howard Stockton, who after a brief two years was followed by (the previous successor to Vail in 1885)

- The Laws of John E. Hudson, Massachusetts were not favorable to a policy of expansion, and it was at this period that AT&T assumed supreme control. This was Hudson's crowing work……

- .President Fish, on the verge of nervous prostration, was anxious to retire. He had put the needed vigor into the business and inaugurated a new era of growth, but he and broken under the strain. He had not sought the place-he never felt suited for it. The bankers recommended making Vail president……

"Charles Gleed of Topeka, at one time president of the bell company in Missouri and Kansas once told the writer of these pages that when he undertook to inaugurate a policy of conciliation his hardest job was to ally the wrath of stockholders."

Throughout his career, J.P.Morgan possessed more power than money, although he had a great deal of both. The key to understanding his influence was that he represented the masses of investors who delegated authority to him and worshiply followed his lead. As the uncontested master manipulator of other people's money, he took the latent power of domestic overseas investors and converted it into an active managerial role, blurring the lines between industry and commerce.

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Vail, Alfred - Collaborator with Samuel Morse in Inventing Telegraph - 1840's

"VAIL, Alfred, inventor, was born in Morristown, N.J., Sept. 25, 1807; son of Judge Stephen (1780-1864) and Bertha (Young) [Other information gives Bethia Youngs - nmt)Vail.

He was graduated from the University of the City of New York, 1836, but was obliged by ill health to abandon the idea of entering the Presbyterian ministry. On Sept. 2, 1837, he attended the exhibition of the telegraph apparatus of Professor S. F. B. Morse at the University, his interest in the invention resulting in an agreement with Professor Morse by which Vail was to receive a one-fourth interest in the invention in the United States, on condition that he construct at his own expense and exhibit before a congressional committee, one of the instruments and procure the necessary United States patents.

Vail persuaded his father to advance the required funds, and began the construction of the new instrument in a locked room of one of his father's shops at Speedwell, N.J., with the aid of his assistant, William Baxter. The first alteration which Vail made in the Morse machine was the substitution of a fountain-pen for the recording pencil; this, however, not proving successful, he invented the armature lever having a vertical motion, so that it could be brought down upon the record strip instead of being carried across it. He also made the entirely new telegraphic alphabet of dots, dashes and spaces, still erroneously called the morse code. On Jan. 6, 1838, a successful demonstration of the machine was made at Speedwell over three miles of wire, "A patient waiter is no loser," being the message sent by Judge Vail and correctly recorded. Exhibitions followed at Columbia college, New York city, and Franklin Institute, Philadelphia, Pa. On Feb. 23, 1843, congress appropriated $30,000 for an experimental line from Washington, D.C., to Baltimore, Md., and on May 23, 1844, the famous message, "What hath God wrought!" was sent by Morse from Washington and received by Vail at Baltimore, the instrument by which the message was taken at the latter city being now in possession of the National Museum, Washington, D.C. Among other important improvements which Vail devised, were the axial magnet, with working drawings of ampère meter, in which its principle was to be utilized, and an original vibrating circuit breaker.

Although the original conception of the electro-magnetic telegraph belonged to Morse, and although he actually constructed a working recording apparatus, the first available Morse machine was the work of Vail, and the modern telegraph is mainly that of Vail and of Professor Joseph Henry.

Alfred Vail was married, first, July 23, 1839, to Jane Elizabeth, daughter of James Cummings of New York city, and granddaughter of John Nugent, an English officer stationed in the West Indies; she died, June 10, 1852, and he was married secondly, Dec. 17, 1855, to Amanda O., daughter of Jonathan Eno and granddaughter of General Eno, who participated in the war of the Revolution. They had three sons: Stephen, James Cummings and George Rochester.

For thirty years Mrs. Vail, who died in Hartford, Conn., in 1894, had endeavored to secure for her husband proper credit for his share in the invention of the magnetic electric telegraph, and at the Chicago exposition in 1893, the name of Alfred Vail was displayed in letters of light among the names of eminent electricians. He received the honorary degree of A.M. from the University of the City of New York in 1848, and is the author of: American Electro-Magnetic Telegraph (1845). He died in Morristown, N.J., Jan. 19, 1859."

The Twentieth Century Biographical Dictionary of Notable Americans: Volume X

The Vail lineage of Alfred Lewis Vail is from Thomas (brother of Jeremiah) Vail and Sarah Wentworth:

1 Thomas Vail 1620 - 1687
.. +Sarah Wentworth 1628 -
. 2 Samuel Vail 1654 - 1695
..... +Elizabeth Hunt 1657 - 1757

.... 3 John Vail 1685 - 1774
..... +Martha Fitz Randolph 1685 -
..... 4 Thomas Vail 1720 - 1807
..... +Sarah Davis 1720 -
..... 5 Davis Vail 1756 - 1816
..... +Hannah Moore 1756 -
..... 6 Stephen Vail 1784 - 1864
..... +Bethia Youngs 1784 -
..... 7 Alfred Lewis Vail 1807 - 1859

Alfred Lewis Vail Links:

See a photo of his telegraph key from the Smithsonian

The History of the Telegraph

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Vail, Henry Hobart - Publisher

HENRY HOBART VAIL, a descendant of Jeremiah Vail, who was one of the early settlers of Southold, Long Island, N.Y., was born in Pomfret, Vt., May 27, 1839. His father, Joshua Vail, was a farmer. Henry was educated at Middlebury College, taught school for several years, and served one summer as a Union soldier in the Civil War. In 1867, he entered the service of a publishing house in Cincinnati, O., and later became a partner in the firm of Wilson, Hinkle & Co., publishers of school books, and one of the partners in their successors, Van Antwerp, Bragg & Co. This house rose to great prominence in the West. When the leading school book publishers of the country united under the name of The American Book Co., the Cincinnati firm joined in the enterprise. Mr. Vail is now a director and chairman of the board in that organization, and has made his home in New York city since 1890. He is president of the Aldine club, and a member of the Grolier, Colonial and Twilight clubs, and The New England, Ohio, and New York Geneological and Biographical Societies and The Society of Colonial Wars.

America's Successful Men of Affairs: An Encyclopedia of Contemporaneous Biography Volume I, page 671.

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Vail, Jonathan Harned - Early Electricity Pioneer

J. H. Vail was general superintendent of the Edison Electric Light Company, in which position he oversaw the design and construction of central stations.

See a description of his accomplishments.

Subject: Direct Line of J.H. Vail
From: "Tami Castro" <dvlwthin@earthlink.net>
Date: Sat, 4 May 2002 09:41:24 -0400

1. Thomas Vail 1620-1687
m. Sarah Wentworth 1628-
2. Samuel Vail 1654-1695
m. Elizabeth Hunt 1657-1757
3. Samuel Vail 1678-1733
m. Abigail Unknown 1685-1724
4. John Vail 1708-1754
m.(2) Margaret Laing 1710-bef.1751

5. Abraham Vail 1744-1824
m. Margaret FitzRandolph 1746-1826
6. John A. Vail 1777-1832
m. Deborah Harned 1788-1861
7. Jonathan Harned Vail 1818-1852
m. (2) Catherine Outcalt 1826-1902
***8. Jonathan Harned Vail 1852-1926**
m. Anna C. Beekman 1853-1938

***Jonathan Harned Vail known to Edison Pioneers as J.H. Vail.**

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Vail, Stephen - Creator of the Speedwell Iron Works

See the Speedwell Home Page - **You will NOT be disappointed with this one. History of the Speedwell factory, information on Stephen and Alfred and more.....**

Vail, Theodore Newton - First president of ATT - Visionary that created the AT&T Monopoly

"THEODORE NEWTON VAIL, born July 16, 1845, in Carrolton county, Ohio, belongs to the Morris county family of Vails in New Jersey, descendants of John Vail, a Quaker preacher, who settled in New Jersey in 1710. The family has always been one of position and influence. Lewis Vail, civil engineer, grandfather of Theodore N. Vail, early went to Ohio and was a pioneer in the building of canals and highways. Stephen Vail, an uncle, founded The Speedwell Iron Works, near Morristown, N.J., at which was built most of the machinery for the first steamship which crossed the Atlantic Ocean, sailing from Savannah, Ga. Here, also, Morse perfected and first successfully operated the magnetic telegraph, Stephen Vail and his sons, George and Alfred, supplying Morse with the money, and Alfred the mechanical ingenuity. Alfred Vail invented the dot and dash alphabet, which has always been used in telegraphing. William P. Vail of this family was a leading physician and church worker in Northern New Jersey at Blairstown, and George Vail represented his section in Congress and was one of the lay Judges of the New Jersey Court of Pardons.

Davis Vail, son of Lewis Vail, and father of the subject of this biography, born in Ohio, came East at an early age, was connected with The Speedwell Iron Works, and married Phoebe Quinby, daughter of Judge Isaac Quinby of Morris county. By this marriage, he became related to three notable brothers in law, General Quinby, a graduate of West Point, a leading mathematician, Professor of Mathematics at the Rochester University, and general in the Civil War; Dr. William Quinby; and Dr. Augustus Quinby, all sons of Judge Isaac Quinby. After marriage, Davis Vail went to Ohio, remaining there several years. His son, Theodore, was born during the stay of the family in that part of the country. When the lad was about four years old, Davis Vail returned to the East and was again connected with The Speedwell Iron Works. In 1866, he removed to Iowa, where he operated a large farm.

Theodore N. Vail was educated in the old academy in Morristown, and then studied medicine with his uncle, Dr. William Quinby, but, having learned telegraphy at the telegraph office in Headly's drug store in Morristown, he left medicine and went to New York, where he became manager of a local office, being afterward attached to the staff of J. C. Hinchman, then general superintendent of the metropolitan and eastern divisions of The United States Telegraph Co. He went West with his father in 1866, and engaged in farming, but in the fall of 1868, went yet farther west and was made operator and afterward agent at Pine Bluffs, Wyoming, on The Union Pacific Railroad. Pine Bluffs was at that time the principal supply point for wood for The Union Pacific, which had not then been completed.

In the Spring of 1869, Mr. Vail received an appointment as clerk in the railway mail service between Omaha and Ogden, and in August, 1869, he married Miss Emma Righter, of Newark, N.J. He devoted himself with great diligence to the improvement of the railway mail service, then in its infancy, and his good work in the perfection of schemes for the distribution of the mails, and especially his services in forwarding the mails during the long snow blockade of 1870, called the attention of the Department to him, with the result that he was assigned to duty between Chicago and Iowa City in the railway post office. On this line, the entire distribution of overland mails was made prior to the establishment of railway post office cars on The Union Pacific Railroad. When the railway post office was established on The Union Pacific, Mr. Vail was assigned to duty as head clerk.

In March, 1873, the Department called Mr. Vail to Washington and assigned him to duty in the office of the General Superintendent of Railway Mail Service, where he was charged with special oversight of distribution of the mails and arrangement of "schemes" or charts of distribution. During this period, the questions of the compensation of railroads and carriage of merchandise in the mails were being agitated in Congress, and the Department placed upon Mr. Vail the responsibility of preparing the post office statements, statistics and answers to Congressional inquiries. His intimate knowledge of the service, energy and capacity were recognized in June, 1874, by his appointment as Assistant Superintendent of Railway Mail Service. In 1875, he was assigned to duty as Assistant General Superintendent, and when, in February, 1876, Mr. Bangs resigned to go into other business, Mr. Vail was appointed General Superintendent. He had thus reached the highest grade in this branch of the Federal employment. Mr. Vail was the youngest of the officers of the Railway Mail Service, both in years and terms of service, and when the final appointment was handed to him by Marshall Jewell, Postmaster General, the latter said that his only objection to Mr. Vail was his youth.

As General Superintendent, Mr. Vail established upon a firm basis the civil service policy, which had been initiated by Mr. Bangs. The superiority of the results attained under the rules adopted for the railway mail service were recognized by all the civil service commissions in Washington, to the extent that until very recently the employés of the railway post offices were not included in the general civil service laws and regulations. Mr. Vail established the system of six months' probationary appointments, which have since been so generally adopted. It was during the incumbency of Mr. Vail that a reduction took place in the pay of the railroads for mail transportation. In the controversy which followed, some of the railroads threw the postal cars out of their trains. Within six months, however, relations were re-established with all the leading lines and increased car and train service obtained. Thereafter, more cordial relations existed between the Post Office Department and the railroad managers.

An incident of this time may be referred to. Senator Beck of Kentucky was much interested in having the southwestern mails go over Kentucky routes, and made many efforts to induce the Postmaster General to order them so sent. Being referred by the head of the Department to Mr. Vail, Mr. Beck accused Mr. Vail of being under the influence of certain railroads. In an interview with Mr. Beck, Mr. Vail explained the situation and gave the reasons which governed him. Mr. Beck left apparently not satisfied. Soon after, however, when a proposition to reduce Mr. Vail's pay was pending in the Senate, Senator Beck took occasion to compliment Mr. Vail very highly, and, in a five minutes speech, said that if there were an honest and efficient officer in the employment of the Government, Mr. Vail was the man.

After the invention of the telephone and its reduction to practice, The American Bell Telephone Co. was organized by Gardiner G. Hubbard, father in law of Prof. Alexander G. Bell. Mr. Hubbard had been engaged against the Post Office Department before Congress on the question of merchandise in the mails and was chairman of the commission appointed by Congress to investigate methods of payment to railroads for mail transportation. Believing Mr. Vail to be the right man for the place, he tendered him the position of general manager of The American Bell Telephone Co. Believing in the future of the "toy," as it was then termed, and against the protest of all his friends, he accepted the position in 1878 and devoted himself to the work with his accustomed zeal and ability. The task was at times discouraging. The public were slow to recognize the great value of the instrument, and strong opposition was manifested by The Western Union Telegraph Co., which denied that Professor Bell was the inventor and set up opposition exchanges at every point. Mr. Vail introduced the methods which have proved so successful and have resulted in The American Bell Telephone Co.'s phenomenal growth. A settlement was finally effected with The Western Union Telegraph Co. after years of fighting and negotiating, in which The Western Union conceded every point of importance.

Mr. Vail established the long distance telephone service, against the opposition of all his associates in the company. The first line which was built to New York was called the "Vail's side show." He also introduced the use of copper wire in telephone and telegraph lines, since so generally adopted, having in this matter the assistance of Mr. Mason of Bridgeport, whom he induced to experiment with drawing copper wire in such a way as to give it the tensile strength necessary to withstand the stretching from pole to pole.

In 1888, Mr. Vail retired from the telephone business after having occupied the managing position for ten years. He has since traveled most of the time abroad and has introduced the telephone in many countries. Farming in Vermont now occupies a part of his time and upon his estate of 1,500 acres, called the "Speedwell Farms," he raises French coach horses, including some of the finest in the United States, Jersey cattle, Shropshire and Dorsett horned sheep, and Welsh ponies. He is a member of the Union League club of New York and the Algonquin club of Boston. He has one son, Davis R. Vail, a student in Harvard Law School in Cambridge."

America's Successful Men of Affairs: An Encyclopedia of Contemporaneous Biography, Volume I, page 671-4

Note: Theodore Newton Vail, creator of the ATT monopoly, was first cousin once-removed from Alfred Vail, co-inventor of the telegraph and inventor of the Morse Code.

The lineage of Theodore Newton Vail from the immgrant Thomas Vail, brother of Jeremiah Vail, both of Long Island, is:

1 Thomas Vail 1620 - 1687
.. +Sarah Wentworth 1628 -
. 2 Samuel Vail 1654 - 1695
..... +Elizabeth Hunt 1657 - 1757
.... 3 John Vail 1685 - 1774
..... +Martha Fitz Randolph 1685 -
..... 4 Thomas Vail 1720 - 1807
..... +Sarah Davis 1720 -
..... 5 Davis Vail 1756 - 1816
..... +Hannah Moore 1756 -
..... 6 Lewis Vail 1780 -
..... +Jane McCune Abt 1780-
..... 7 Davis Vail 1810 -
..... +Phoebe Quinby 1810 -
..... 8 Theodore Newton Vail 1845 -

Theodore Newton Vail Links

Biography at the Energy Page
Telephone History Page - Theodore Vail's role in telephone history in his first stint as president 1878-1887: creation of long distance service.

Telephone H... - Vail's role in telephone history on his return to Bell in 1907, consolidati... the telephone system

History: Va...

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|| MARKETPLACE
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|| NETSTATE.MALL
|| GUESTBOOK
|| WEBMASTER

Connecticut

John Pierpont (J.P.) Morgan

Born: April 17, 1837
Place: Hartford, Connecticut
Died: March 31, 1913
Place: Rome, Italy

John Pierpont (J.P.) Morgan was born in Hartford, Connecticut on April 17, 1837. His father, Junius Spencer Morgan, was a prosperous financier, with holdings in America and Europe, who taught his son from an early age how to manage the family assets that he (J.P.) would someday inherit. J.P. was a willing student. J.P. was educated at Boston's English High School, and then he enrolled in Germany's prestigious University of Gottingen. By the time he was 15, J.P. had traveled throughout much of Europe, and had already begun collecting art, which would remain a passion throughout his life. When he was 20, he graduated from Gottingen, and returned to New York to begin his career in finance. He started as an accountant for Duncan, Sherman & Co. in New York City. This position provided a good base for J.P. Morgan's introduction into the world of banking and finance, especially because of its ties to the powerful London firm of George Peabody & Co. As the Civil War broke out, Morgan joined his father's financial ventures, and operated out of both New York and London, all the time increasing his personal holdings. From 1864 to 1871 he was an increasingly influential member of the firm Dabney, Morgan & Co., and in 1871 he became a partner in Drexel, Morgan & Co. In 1895, this firm became J.P. Morgan & Co., and was recognized here and abroad as one of the most powerful financial institutions in the world.

As J.P. Morgan's fortune grew, he continued to make investments and acquisitions. He funded Thomas Edison throughout the 1870's and 1880's, and laid the financial foundation for Edison Electric Company. When many small companies and railroads ran into tough times after the Civil War, Morgan saw opportunities and acquired those with potential. By the mid 1880's, he had significant railroad holdings, and owned some 5,000 miles of rail by 1900. He consolidated and restructured many of his rail companies, bringing his own regulations and standards to an industry that the government had failed to regulate. Morgan's rail holdings included the New York Central, New Haven and Hartford, Lehigh Valley, Pennsylvania, Reading, Erie, Southern, Chesapeake and Ohio, and the Northern Pacific systems. The rails and trains, of course, required huge quantities of steel. Knowing this, Morgan founded and acquired huge steel-making operations, in effect owning the steel

operations that supplied his rail companies with their steel. In 1901 he established the U.S. Steel Company by merging Carnegie Steel Works and several other steel companies into the dominant steel producer in the country.

Morgan's realm expanded into many other areas in the financial and industrial worlds. He acquired and/or financed shipping interests, coal mines, insurance, and communications industries, and he provided financial backing for the U.S. government itself. He backed an 1895 government bond issue of $62 million dollars, and in 1901 he secured a $50 million dollar American issue for the British war loan. In the early 1900's he provided backing that assisted the U.S. Treasury in stemming a stock market panic. And, of course, anyone with as much power and influence as J.P. Morgan is bound to attract his share of detractors. He was investigated by the U.S. House of Representatives, and he testified in his own defense, denying charges of undue influence in his control of the country's industries and financial institutions. In spite of the allegations of reform-minded crusaders and muckrakers, J.P. Morgan continued to be America's foremost financier throughout his life.

Morgan's personal wealth was enormous, and during his life he used substantial portions of his wealth in philanthropic endeavors. He donated to charities, churches, hospitals, and schools. He also accumulated a huge collection of art. When he died in 1913, much of his collection went to the Metropolitan Museum of Art.

Author Jean Strouse's recent biography of J.P. Morgan is a detailed look at the financier who powered American business expansion and pioneered many of our financial structures. Click here to purchase Morgan: American Financier, available now through our association with Amazon.com.

Another ambitious portrait of the Morgan financial empire that is well worth reading is The House of Morgan: An American Banking Dynasty and the Rise of Modern Finance, by Ron Chernow. This book is a comprehensive look at the Morgan financial dynasty from the early 1800's through the late 20th century. This is a very insightful and highly acclaimed book.

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John Pierpont Morgan

Spartacus, USA History, British History, Second World War, First World War, Germany, Political Figures, Political Events & Issues, France, Slavery, Author, Search Website, Email

John Pierpont Morgan, the son of a successful financier, was born on 17th April, 1837. Educated in Boston and Germany, he trained as an accountant at the New York banking firm of Duncan, Sherman and Company. In 1867, Morgan transferred to his father's banking company and ten years later became a partner in Drexel, Morgan and Company. This was reorganized as J. P. Morgan and Company in 1895, making it one of the most important banking houses in the world.

In 1891 Morgan arranged the merger of Edison General Electric and Thompson-Houson Electric Company to form General Electric, which then became the country's main electrical-equipment manufacturing company. After financing the creation of the Federal Steel Company he joined with Henry Frick to merge it with Carnegie Steel Company to form the United States Steel Corporation.

Morgan had good links with the London financial world and was able to arrange the capital for growing industrial corporations in the United States with money from British bankers. This enabled Morgan to become a member of the board of directors in several of these companies including most of the major railroad companies. By 1902 Morgan controlled over 5,000 miles (8,000 km) of American railroads.

In his final years, Morgan concentrated on gaining control of various banks and insurance companies. This in turn gave him influence over most of the nation's main corporations. Some muckraking journalists began to criticize the enormous power that Morgan now had. John Pierpont Morgan died on 31st March, 1913.

John Pierpoint Morgan

A sickly child, and a sickly adult, but despite his fragile health J P Morgan was one of the greatest financiers of his age. As a child Morgan kept a close account of the receipt and expenditure of his allowance. As an adult he parlayed his attention to cash flow into a large fortune. After an education spread across the globe he joined the firm of Duncan, Sherman and Company, in America in 1857. He saw the American Civil War as an opportunity to make money, which he did. And in 1862 founded his own company Dabrey Morgan and Co. By 1871 he had teamed up with the firm of Drexel, based in Philadelphia, to form Drexel, Morgan & Co. Morgan swiftly established himself as one of the leading financiers in New York. Industrialists and governments regularly turned to him for advice, and he helped avert a US financial crisis in 1895. A Powerful influence in the formation of so-called industry "trusts" his business empire was eventually cut down to size by Theodore Roosevelt.

1837	Born in Hartford, Connecticut.
1857	Joins Duncan, Sherman and Company.
1862	Founds Dabrey Morgan And Co.
1871	Teams up with the firm of Drexel to form Drexel, Morgan & Co.
1879	Puts together stock offering of $18 million for the New York Central Railroad.
1887	US government passes the Interstate Commerce Act.
1895	Helps avert US financial crisis.
1907	Bails out the US Government again.
1912	Appears before Pujo Commitee.
1913	Dies March 31st.

BACKGROUND AND RISE

J P Morgan was born in Hartford, Connecticut, on April 17th 1837. In the year of his birth America was plunged into financial gloom. Morgan, however, was unaffected; his father was a rich commodity broker, who managed to make the most of the financial downturn. When Morgan was still a boy his father moved the family to Boston where he became involved in the cotton trade.

"But obtaining a lasting consensus among the distrusting railroad company bosses proved a task beyond even Morgan's talents."

Morgan took an early interest in business. Spurning childhood games he spent much of this time poring over his accounts (a habit he carried with him throughout his life) detailing the receipt and expenditure of his allowance. He had a bookish nature—partly a result of his interest in business and money and partly a result of a sickly constitution. The young Morgan suffered from a host of ailments including rheumatism and eczema. So concerned were his parents that they sent him to the Azores to recover. Morgan was never a popular child at school. His aloof manner failed to impress his classmates, just as it would later alienate the US public. His habits, such as writing to Paris in fluent French to order a pair of $900 boots, only served to reinforce the impression of arrogance.

Morgan's education was in keeping with his privileged status. When his family moved to London, Morgan was dispatched to private school in Switzerland. He studied at the University of Gottingen, and so impressed his tutors that he was asked to stay on as an assistant to one of the professors. The ambitious Morgan declined, insisting that he had to start out in business.

DEFINING MOMENTS

Returning to America, in 1857 Morgan joined Duncan, Sherman and Company, a firm with which his father had an association. From the very start Morgan showed an innate appreciation of the intrinsic value of objects. It was a quality that served him well. On one business trip he came across a consignment of coffee beans. Acting outside his authority he proceeded to buy the beans, ignoring the main purpose of his visit. By the time he was taken to task he had turned a substantial profit on the coffee.

When the American Civil War broke out in 1861 Morgan treated it not as a calamity but as an opportunity. He avoided enlistment through the accepted practice among the wealthy of paying a "substitute" to take his place. (The going rate was $300.) In 1862, he left Duncan Sherman and founded his own company Dabrey Morgan and Co.. While the war raged Morgan piled up the profits. By 1864 he had amassed over 50,000 dollars. The war ended but Morgan continued to go from strength to strength. By 1871 he had teamed up with the firm of Drexel based in Philadelphia to form Drexel, Morgan & Co based on the corner of Wall Street and Broad Street in New York.

Morgan swiftly established a reputation as one of the leading financiers in America. His salary was in excess of $500,000—an astronomical amount at the time. It was

"You can't pick cherries with your back to the tree." (Attrib)

during the 1870s that his association with the railroads began. The financing of the railways required significant private capital something that Morgan was only too happy to arrange. He acted as a conduit for money from investors both in Europe and the US. In 1879 for example he put together the stock offering of $18 million for the New York Central Railroad owned by William Vanderbilt.

Morgan's importance in the railroad business grew to the point that leading players would turn to him to resolve disputes and offer his opinion. In an industry where railway companies fought increasingly hostile battles to gain supremacy Morgan found himself playing the role of mediator.

When the US government passed the Interstate Commerce Act in 1887 banning price-fixing collusion among railroads, the railroad companies naturally turned to Morgan to organise a response. But obtaining a lasting consensus among the distrusting railroad company bosses proved a task beyond even Morgan's talents. The misguided effort suggests a man whose ego was beginning to run out of control. While he failed to unite the railroads against the government he succeeded in setting himself up as the head of a conspiracy and an obvious target for the US government which were aiming to cut powerful business interests down to size.

By the 1890s Morgan had turned into a figure of hate among the US public. Yet despite this perception Morgan's greatest public service lay ahead of him. In 1893 withdrawal of funds from the US by British investors sparked a financial crisis. As banks failed and the stock market collapsed the US government resorted to shoring up the financial system with the gold reserves. Statute forbade the value of the reserves from falling below a prescribed level. The magic figure was $100 million in gold and in January 1895 gold reserves collapsed to $58 million and the Treasury secretary John Carlisle turn to Morgan to save the day. Morgan proposed a syndicate of investors that would sell gold coin to the US Treasury paid for with newly issued bonds. It was a brilliant solution as it provided not only an economic way out but also a politically expedient one. Morgan went further and guaranteed the scheme to the then president Grover Cleveland. The Morgan syndicate intervention succeeded in stopping the financial slide and made Morgan a considerable profit estimated at between $250,000 to $16 million.

This episode merely reinforced Morgan's already legendary financial prowess. He followed his rescue of the US financial system with a series of breathtaking deals such as the financing of United States Steel the largest Steel Co in the world. From the 1900s onwards Morgan devoted his attention to consolidating the railroad companies through his concern the Northern Securities Corporation and to building a shipping trust. Unfortunately for Morgan the incumbent president Theodore Roosevelt had decided that political advantage could be gained by cracking down on the so-called trusts. With the well-known figure of Morgan behind the Northern Securities Corporation, Roosevelt decided that the company should be made an example of. This time Morgan had met his match. Apart from a brief respite in 1907 when a US President turned to him for salvation during a financial crisis Morgan's power waned.

In his seventies by then Morgan devoted more time to his hobby of collecting art and his private life. In 1913 Morgan left America on his doctor's advice for some rest and recuperation in Europe. He died in Rome at the age of 76.

CONTEXT AND CONCLUSION

JP Morgan was a remarkable businessman. His success owed much to his self-belief and opportunism, and a little to his wealthy and well-connected father. He suffered ill-health throughout his life, particularly the periodic embarrassment of a large red bulbous nose which was the product of eczema, the appearance of which would inevitably send him into a deep melancholia. Yet despite frequent periods of illness-induced rest and recuperation Morgan managed to build a string of business interests in the fashionable industries of the day—railroads, shipping, electricity. He also, on more than one occasion, financed the US government out of a mess.

"He was never a popular child at school. His aloof manner failed to impress his classmates, as it would later alienate the US public."

Although not as wealthy as the likes of Carnegie or the Vanderbilts, Morgan amassed a fortune worthy of Croesus. He also accumulated a fabulous hoard of art treasures, a who's who of the Old Masters including works by Vermeer, Gainsborough, Rembrandt and da Vinci as well as one of the finest libraries in the world. His reputation as a proud, vain, arrogant and greedy man is justified. But he could be generous when it interested him. To an old crone who offered him one of a missing pair of porcelain figures he gave a handsome sum of money and a cottage in Wales.

HISTORY OF JP MORGAN

JAY GOULD: A US FINANCIER, BORN IN 1836

Gould was the most despised and underhanded of the "robber barons". He started out as a map maker and publisher of local history then inveigled his way into tannery business. He gained full control when his partner commited suicide. In the 1860s he took to speculating on the railways. There followed a period of unscrupulous dealings, bribery of officials and dubious financial practices that would rival if not surpass the worst examples in modern times. Gould emerged from the 1860s/1870s with a fortune of some $25 million (many others lost the shirts from their backs).

THE BEST SOURCES OF HELP

Books:

"Morgan the Magnificent: life of JP Morgan" by John Winkler. New York: DD, 1932.

"Pierpont Morgan and Friends : The Anatomy of a Myth" by George Wheeler. New Jersey: Prentice-Hall, 1973.

Website:

http://www.jp.morgan.com

"I'm not in Wall Street for my health." (Treasury of Investment Wisdom, 1999)

BUSINESS HISTORY

EDITORIAL NOTICE

All communications relating to articles to:

Charles Harvey
Department of History
Royal Holloway & Bedford New College
Egham Hill, Egham
Surrey TW20 0EX

OR

Geoffrey Jones
Department of Economics
University of Reading
P.O. Box 218
Whiteknights
Reading RG6 2AA

Reviews to:
Mary Rose, Department of Economics, University of Lancaster, Gillow House, Lancaster LA1 4YX

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33. Bank of England branch letter books, Newcastle, Vol. 15, 5 Dec. 1878, p.144.
34. The main sources are Auditor's Minute Book (X45), and Letter Book (X51), Midland Bank archives.
35. Auditor's Report, Dec. 1878.
36. 24 Oct. 1878, p.20.
37. 24 Oct. 1878, p.17.
38. 25 Oct. 1878, p.20 – Gatecliff to Garbutt, Hull.
39. 21 Feb. 1879, p.178.
40. Auditor's Report, June 1879.
41. Y61/6, Midland Bank archives.
42. In addition to the Middlesbrough branch reports (Y61/6), see Board Minutes, Y9 and Y10, especially 23 Dec. 1878 and 9 June 1879.
43. Annual Report to Proprietors, 16 Jan. 1879 (Y9).
44. BLDR, A51/10, Barclays Bank archives.
45. Although as there was a very strong seasonal element in the size of bill holdings (the December figure being higher than June), the figures used here somewhat overstate the case. For instance, at the end of June 1877, bills holdings at £1.9 million were equal to 55 per cent of deposits and 'liquid assets', at £3.2 million, equal to 96 per cent.
46. The main sources are Board Minutes, M18; Liverpool Manager's Letter Book, M116; and George Rae's Letter Book, M222, Midland Bank archives.
47. 12 Dec. 1878 (M116).
48. S.G. Checkland, *Scottish Banking. A History, 1695–1973* (Glasgow and London, 1975), p.478. Also see R.E. Tyson, 'The Failure of the City of Glasgow Bank and the Rise of Independent Auditing', *Accountant's Magazine*, April 1974, pp.126–31.
49. P. Ollerenshaw, *Banking in Nineteenth Century Ireland: The Belfast Banks, 1825–1914* (Manchester, 1987), Ch. 4.
50. R.S. Sayers, *Lloyds Bank in the History of English Banking* (Oxford, 1957), p.211.
51. Holmes and Green, *Midland*, pp.59–70.
52. Bank of England branch correspondence, Leeds, from Head Office, 22 Oct. 1878. Also see London and County Bank's Board Minutes, 1/12346/68, Nov. and Dec. 1878 *passim*, National Westminster Bank archives.
53. Minutes, T6, especially 22 July 1878, 17 Feb. 1879, 14 Mar. 1879 and 21 July 1879, Midland Bank archives.
54. M. Collins, *Money and Banking*, p.40.
55. London and County Board Minutes, 1/12346/68, 21 Jan., 28 Jan. 1879; *Bankers' Magazine*, Vol. 39 (1879), pp.11–12.
56. Two recent examples are J.R.T. Hughes, 'Comment' in Michael D. Bordo and Anna J. Schwartz (eds.), *A Retrospective on the Classical Gold Standard, 1821–1931* (Chicago and London, 1984), pp.265, 269; and Anna J. Schwartz, 'Real and Pseudo-Financial Crises' in F. Capie and G.E. Wood (eds.), *Financial Crises and the World Banking System* (1986), pp.11–40.
57. The Act introduced 'reserved liability' for bank shares which was shareholder liability over and above nominal share values but to a fixed amount only and it could be called upon only if the company were wound up.

THE STRUCTURE AND PROFITABILITY OF THE US ELECTRIC UTILITY INDUSTRY AT THE TURN OF THE CENTURY

By WILLIAM J. HAUSMAN and JOHN L. NEUFELD

In the early afternoon of 4 September 1882 electric lights in the Wall Street offices of Drexel, Morgan & Co. were switched on for the first time. Power was supplied from a generator situated several blocks away in the Edison Electric Illuminating Co.'s Pearl Street station. Although arc lights supplied with current from central generating stations had been illuminating select streets in numerous cities by this time, including New York's Broadway, the events of this September afternoon have come to signify definitively the birth of the electric utility industry in the US.[1] It was the culmination of a long process of scientific and technological gestation, occurring precisely 80 years after Humphry Davy had observed a galvanic spark 'of a dazzling brightness' in his laboratory at the Royal Institution,[2] and some 50 years after Michael Faraday had produced a primitive electric generator. The key to Thomas Edison's ultimate success was that, along with being one of several to have invented a practical incandescent lightbulb, he alone both conceived and developed an entire system for generating and delivering electric current from a central station to homes and businesses. Within a month of its inception, the Pearl Street station was supplying current to nearly 1,300 electric lights (concentrated, however, in a rather limited service area of one square mile).[3] The Edison 'system' spread quite rapidly to other urban areas. By the end of the year Edison had constructed or licensed over 150 central stations around the country; and within eight years Edison and his competitors had installed over 1,000 stations. Twenty years later in 1902 there were 3,620 'electric light and power stations' in operation in the US.[4]

As impressive as this beginning might appear to be, the rapid spread of central station generation of electricity in the US did not translate easily or automatically into financial success for the operating companies involved in the production of electricity. The raw numbers representing the diffusion of the invention conceal the fact that 20 years after Pearl Street the industry remained small-scale, limited in scope, highly competitive, politically challenged, and with very uncertain prospects for the future. There were several factors contributing to this uncertainty.

The early electric utilities were exclusively urban phenomena whose prime business was providing lighting services to central business and residential districts. They spread only gradually to immediately surrounding and suburban areas. As late as 1904 only 70 per cent of the

total area of Manhattan had obtained service, and the coverage for other large cities was substantially less than this.[5] Furthermore, the need to run distribution lines over (or under) city streets necessitated the acquisition of municipal franchises, which entangled the companies intimately in local (and sometimes state-level) political affairs. Franchises typically were not exclusive and often were granted for time periods shorter than the economic life of the generation and distribution equipment which the utility had to provide.[6] In addition, competition, both between utility companies and from substitutes for centrally-generated electricity, was fierce. The adoption of the Welsbach mantle led to a resurgence of interest in gas lighting, and some customers actually were switching from electricity back to gas. Electric generators at this time were relatively small and easy to operate, so that large commercial or industrial customers could install 'isolated plants' on their own premises. Other firms, such as street railway companies or ice manufacturers sold their excess self-generated electricity in competition with central stations. The US Federal Trade Commission, when evaluating this era from the perspective of the electrical machinery suppliers in the 1920s, reported that 'in so far as the different manufacturing companies were able to supply their licensees with equipment for duplicated service in supplying power for arc and incandescent lighting, motor load, and, in the late 1880s, street railways, the local companies became competitors. The result was duplication of generating and distributing systems, with consequent low efficiency'.[7]

A technological development that was to have a critical influence on the evolving structure of the industry in the 1890s was the introduction of a competing system (promoted enthusiastically by George Westinghouse) based on alternating current. Alternating current permitted higher transmission voltages, which in turn led to the expansion of the potential service area of any central station adopting the technology. It concomitantly stimulated hydroelectric generation, which inherently required longer-distance transmission. The prospects for alternating current were enhanced with the development of practical motors and metering devices. Edison, as is well known, vigorously resisted alternating current, perhaps irrationally, but more likely out of canny self interest.[8] He lost the 'battle of the systems' and effectively was out of the business by 1892 when the Edison General Electric Co. merged with (perhaps more accurately, was absorbed by) Thomson-Houston to form General Electric.[9] These developments involving alternating current served initially to reinforce competitiveness within the electric utility industry:

> Further improvements made it possible not only to generate larger quantities of power from a single machine at less cost per kilowatt but also to supply incandescent and arc lights and direct and alternating current motor loads [using transformers and rotary converters] from the same source of power. There ensued a period of sharp competition between local plants wherever there were two or more in the same distribution area.[10]

Such competition resulted in the more efficient, financially stronger, or perhaps politically more adept companies absorbing or driving their weaker competitors out of business.[11] Many large cities were left with only a single firm supplying electricity by the middle of the first decade of the twentieth century, a condition which contributed to increasing demands by the public for protection through some form of regulation.

Attaining a local monopoly, however, was not always sufficient to guarantee financial success, let alone exorbitant profits. The industry in 1902 has been described in the following terms:

> In place of large power systems, there existed small independent and unrelated companies serving a strictly local market. Service was poor, and rates were high; and customers were constantly complaining. The capital structures of these early companies were very rigid, and made the raising of additional funds very difficult.[12]

The attempt to solve problems of financing improvements and additions to capacity led ultimately to the rise of holding companies which, by the late 1920s, had consolidated a substantial portion of the nation's electric utilities into a relatively small number of large systems (only parts of which were physically interconnected).[13]

Several of the holding companies arose out of the financial practices of the major electrical manufacturers, which accepted the securities of the operating electric utilities as payment for equipment. These securities often were unmarketable elsewhere because of their extreme risk, which reflected the danger of default, in turn caused by the low and uncertain returns in the industry. Yet the electric utilities needed to improve and expand service nearly continuously and were anxious to purchase the most technically advanced equipment. Financing these transactions was a major problem for electric utilities, which had little to offer the much larger equipment manufacturers (other than their own securities). The equipment manufacturers responded by creating subsidiaries to hold the securities issued by their customers and to convert these into cash by then issuing their own securities. These securities were more marketable than the securities of the individual operating companies partly because they represented a diversified portfolio of operating companies and partly because they were associated with the better-known and presumably lower-risk equipment manufacturers. Electric Bond & Share, for example, was created as a subsidiary of General Electric in 1905.

As did most of the other pioneering holding companies, Electric Bond & Share became more than a passive financial intermediary as it developed technical and managerial expertise in the business of

operating electric utilities. This expertise was used to control (or to influence strongly) the operations of the utilities in which Electric Bond & Share held an interest. This control led to standardisation, rationalisation, secure capitalisation, and to more professional management of the electric utilities. The importance of this role is reflected in the fact that a number of other holding companies evolved from firms which originally were in the business of providing management and engineering consulting services. These included Stone & Webster, H.M. Byllesby and Co., Hodenpyl-Hardy, and the H.L. Doherty (Cities Service) group.[14] Holding companies facilitated the consolidation of the industry by enabling member companies to take advantage of potential economies of scale in financing, in the creation of regional networks, or in the provision of engineering services, and possibly by contributing to more efficient operation.[15] Prior to the development of the holding company, the electric utility industry was technologically dynamic, but it also may have been economically fragile.

In addition to problems of financing, the industry faced another 'challenge' around the turn of the century, this time in the political sphere. Although there had been competing utilities in most large cities in the early days of the industry, in the smaller towns of the US the electric company was a monopoly from the beginning. The provision of electric power came to be viewed in many localities as a necessity and a 'public good'. In some cases public provision was the only alternative because dismal expected profits under private operation did not bring forth the necessary capital investment. Public ownership mitigated some of the financing problems of electric utilities since the taxing power of the local government stood behind the bonds issued for construction or expansion of the electric plant.

Of the 3,620 central stations in operation in 1902, nearly a quarter (815) were municipally owned.[16] These were located overwhelmingly in smaller towns, but several cities, including Los Angeles, Detroit, Cleveland, Seattle, and Kansas City had municipally-owned plants, some of which were in competition with private plants. The question of the appropriate form of ownership – public versus private – for firms providing basic services, including water, gas, transportation, and electric light and power, to urban dwellers was a raging issue during the Progressive era of the late nineteenth and early twentieth centuries. For electric utilities it was a political and economic issue that would continue with various permutations into the 1920s (as state regulation was applied), reach another crescendo in the 1930s when the federal government became involved in the industry, and, although muted, is one that remains alive today.[17]

An extensive contemporaneous literature emerged on the issue of public versus private ownership, and a fair share of it related to electric utilities. Much of the literature was polemical, but there also were attempts to address the issue in a more objective and rigorous manner

and a number of empirical studies were produced. The cost of street lighting in cities with municipal firms commonly was compared to the price other municipalities paid to private firms for comparable service. This empirical work failed to resolve or even quell the debate,[18] but it did lead to demands for further study.

II

Responding to a call from an organisation of state-level statistical bureaux to study the issue of municipal ownership, the US Commissioner of Labor supervised an extensive survey of waterworks, gasworks, and electric light plants in 1897–98. The results were presented in the Commissioner's report for 1899. The information collected on electric utilities is extraordinarily detailed. The data were collected with great care and professionalism. As Commissioner Carroll D. Wright noted:

> The Department pursued its usual course in the collection of data, sending its special agents to the various plants throughout the country, and securing the data by their personal inspection of the plants and of the details of their business, the various facts being taken directly from the records of the plants so far as such were in existence. ... Quite a large proportion of both the private and municipal plants were canvassed, and it is believed that the data presented in the tables are fairly representative of the varying conditions found throughout the country.[19]

The report contained information on 632 private plants and 320 municipal plants, which represented 25 per cent of the total number of private plants in operation and 70 per cent of the total number of municipal plants. The plants in the survey, however, tended to be larger on average than those not reporting. The Commissioner estimated that the plants in the report represented 43 per cent of the total capital invested in private plants and 85 per cent of total investment in municipal plants. These data provide an opportunity to test several of the assertions regarding the performance of the industry that were made within the context of the historical discussion presented above.

Table 1 contains mean values of key variables for all firms included in the report and for firms broken down by type of ownership. The average electric utility was of quite modest size in 1897/98. It had a total generating capacity of 340 kilowatts (kw), just over half of which was provided by the more recently developed alternating current technology. On average just 7 per cent of electricity was generated using hydroelectric power, although firms using this technology might have represented some of the more progressive ones in the industry, given the technological challenge presented by longer-distance transmission. Still, the majority of electricity generators were driven by steam boilers (most of which were coal fired). The difference in

TABLE 1

MEAN VALUES FOR FIRMS IN THE COMMISSIONER'S REPORT, 1897/8

Technical Characteristics:	All Firms	Private Firms	Municipal Firms
Engine or waterwheel capacity (hp)	564	735	227
Percent of power capacity hydro	7%	7%	7%
Total capacity of generators (kw)	340	452	121
Proportion of generation AC	51%	53%	48%
Average size of generators (kw)	47	50	42
	$	$	$
Incandescent lights connected (kw)	220 (64)	296 (64)	69 (64)
Arc lights connected (kw)	69 (20)	86 (18)	36 (34)
Motors connected (kw)	57 (16)	84 (18)	2 (2)
Total connected load (kw)	345	466	107
Miles of street served	21	26	12
KW connected per mile of street	18	21	12
Age of firm (yrs.)	7.6	8.5	5.9

Investment:	All Firms	% of Total	Private	% of Total	Municipal	% of Total
Land	$ 6,936	(5%)	$ 9,668	(5%)	$ 1,492	(4%)
Buildings	14,602	(11%)	20,155	(11%)	3,715	(11%)
Power plant	25,052	(19%)	33,594	(19%)	8,251	(24%)
Electric plant	25,252	(19%)	34,084	(19%)	6,685	(20%)
Dist. system	55,169	(42%)	75,957	(42%)	14,481	(42%)
Total investment	$131,114		$180,512		$34,062	
Total investment per KW of capacity	$302		$322		$261	

Costs:	All Firms	% of Total	Private	% of Total	Municipal	% of Total
Wages	$4,856	(21%)	$5,197	(20%)	$2,200	(30%)
Salaries	2,362	(10%)	3,191	(11%)	677	(9%)
Fuel	4,193	(19%)	5,429	(18%)	1,709	(23%)
Maintenance	2,195	(10%)	3,008	(10%)	597	(8%)
Depreciation	5,577	(25%)	7,705	(25%)	1,393	(19%)
Total Cost	$22,534		$30,231		$7,413	

Note: Not all firms reported figures for all categories and some minor components of investment and cost were not included in the subtotals, thus total investment and total cost (and percentages) do not equal the sum of their components.

size between the average municipal electric utility and the average privately-owned firm was substantial. Private firms had on average about four times as much generating capacity as their municipal counterparts.

There also was a large variation in the size of electric light and power plants. The smallest firm included in the report was a private firm with one 4.75 kw DC generator supplying power to three municipal and 19 private arc lights – not exactly a firm of 'Chandlerian' scale.[20] The two largest firms, both privately owned, had in place over 12,000 kw of generating capacity. Although both firms used a mix of AC and DC generators, one had over 80 per cent of its total capacity in AC, while the other had over 80 per cent in DC. Both firms provided arc lighting (used primarily outdoors because of its intensity), incandescent lighting (used primarily indoors), and stationary motor (primarily commercial and industrial) service. Neither firm provided traction service. The largest municipally-owned firm was much smaller than either of these but was substantially larger than the average for all firms, having just over 2,000 kw in generating capacity (about evenly divided between AC and DC generators).

Incandescent lighting comprised the majority (64 per cent) of the connected load for both private and municipal firms.[21] Arc lights and motors contributed the remaining load, with motors being of very little importance for municipal firms. It is especially instructive to compare the figures for total connected load to those for total capacity of generators (the third line in Table 1). It was recognised widely from the earliest days of the industry that one of the main economic challenges to electricity producers was the peak load problem. Capital in place had to be sufficient to meet the evening lighting peak, but the system sat uselessly idle most of the rest of the time. The figures for generating capacity and connected load for 1897/98 imply that on average virtually every light and motor connected to the system could be turned on simultaneously and that the demand could be met (by a substantial margin in the case of municipal firms). Any diversity in demand in the system as a whole (by time of use, for example) was not being exploited. It was possible, of course, that utilities were anticipating rapid growth in demand and were preparing for the future (at the expense of profits in the shorter run). Still, so long as this condition existed the electric utility industry was fundamentally a part-time industry – expensive capital (which was difficult to finance) sat idle for extensive periods of the day.

By 1898, the importance of attracting off-peak users was widely recognised by businessmen in the industry as one of the keys to economic survival and eventual financial success.[22] Policies to attract off-peak users of electricity had progressed by this time. They were being discussed regularly at the meetings of trade associations such as the National Electric Light Association and the Association of Edison

Illuminating Companies, but obviously had not yet had a meaningful impact on the structure of the system.

Consider as an illustration the Four Lakes Light & Power Co. of Madison, Wisconsin in 1895. The station had three Russell compound steam engines with a total capacity of around 900 horsepower (which would have made it of above average size in 1898). One engine was connected to four small Thomson-Houston arc light machines (driving about 50 lights each) and one Westinghouse alternator with a capacity of 750 lights. The second engine was connected to two 90 kw General Electric generators primarily supplying power to the Madison Street Railway Co., but also powering several stationary motors. The third engine was attached to a 300 kw monocyclic alternator used exclusively for incandescent lighting. It cannot be determined from this information whether or not the total connected load exceeded the capacity of the generators, but each generator was tied to a specific use and there was little opportunity for load management. This machinery was operated by:

> [O]ne engineer and one fireman from midnight until noon, and by one fireman, one head engineer, and one assistant from noon until midnight, and one oiler from 6 p.m. until 12 p.m., making a total of six station employees for the 24 hours' run. Each 24 hours during the week, current is furnished to the electric railway and power circuits for 17.5 hours, and to the alternating current circuits for 23.5 hours, except on Sunday, when the alternators are shut down for an additional 12 hours. Current for arc lighting is supplied principally between the hours of dusk and midnight, though certain arc-light circuits are operated all night.[23]

This may have been a relatively well-run company by the standards of the late nineteenth century, but there appears to have been little attempt to exploit any potential diversity in the load.

The difficulty of attracting capital to the industry was one of the key arguments used to explain both the existence of the municipally-owned utility and the rise of the holding company. It is shown in Table 1 that the average electric utility included in the report had a capital investment (or total assets) of just over $130,000 (around $300 per kilowatt of generating capacity), with the private firms having substantially more investment on average than municipal firms. These figures mean little in isolation but would translate roughly into $1.7 million ($4,000 per kw of generating capacity) in terms of today's dollar. Again, the variance was large. The largest private firms had ten times the capital assets of the average firm.[24] The allocation of total investment into its components indicates that over 40 per cent was devoted to the distribution system (line construction, transformers, lamps, and other devices), while land and buildings, the power plant, and the electric plant shared in about equal proportions the remaining 60 per cent.

Table 1 also presents information on costs of production (excluding

taxes). Labor costs (wages and salaries combined) represented nearly a third of the total, capital costs (reported depreciation) around a quarter, fuel nearly a fifth, and maintenance and other minor costs the remainder. There appear to be some differences in the cost structures of private versus municipal firms, with municipal firms having higher wage and fuel costs and lower depreciation (capital) costs on average.

III

The data summarised in Table 1 can be used to examine several issues relating to the structure and performance of the young, and possibly fragile, electric utility industry. We begin by analysing costs, which are a critical component of the overall performance of firms in the industry, and then turn our attention to the more comprehensive issue of the profitability of the privately-owned firms in the industry. We are interested first in examining how costs varied with output to determine if there were advantages to larger size, whether certain technological characteristics provided cost advantages to firms, and whether there were cost differences based on ownership form. To address these questions we specify the following cost function:[25]

$$COST = b_0 + b_1KW + b_2KW^2 + b_3KW^3 + b_4OWN + \Sigma b_iX_i + \Sigma b_jZ_j + u$$

The model was estimated using both total cost and its major components (wages, salaries, fuel, maintenance, and depreciation) as dependent variables. Costs are hypothesised to be a cubic function of output, where output is defined as total kilowatts connected (KW, KW^2, and KW^3 in Table 2). This specification permits a U-shaped average cost curve, although it would not be surprising if most observations were on the downward-sloping portion of the curve. Ownership is measured by a binary variable (OWN = 1 for privately-owned firms, 0 for municipally-owned firms). Strong advocates of private ownership would expect this variable to be negative, indicating lower costs of production in the private sector.

X is a vector of technological or production-related variables including age of the firm (Age), average size of generators installed (AvGenSize), the percent of generating capacity that is AC (%AC), the percent of power capacity that is hydroelectric (%Hydro), and density of service (total kilowatts connected divided by the number of miles of street served). Average generator size and density of service are hypothesised to be inversely related to cost of production. Electricity generators were increasing in size around the turn of the century. Newer generators tended also to be cheaper per kilowatt of capacity.[26] Thus, one would expect a firm that used relatively fewer and larger generators (each one supplying a diversity of needs) rather than a larger number of smaller generators (with a specific purpose assigned to each one, as in the case of Four Lakes Light & Power) to have a cost advantage in producing similar levels of output. The cost advantages of

a compact service area were manifest in this era. If they had not existed, electricity would have spread more rapidly to outlying areas. The direction of the relationship for the rest of the technological variables is less certain. Reliance on water as a source of power would be expected to affect the distribution of costs. Hydro installations tended to be relatively more expensive to install (hence greater depreciation costs would be expected) but would conserve on fuel costs. The effects of hydro on the other components of cost and on total cost of production is ambiguous. Alternating current systems were newer and were displacing direct current systems because of certain technical advantages, but it is not clear that AC had a cost advantage. It is not likely, however, that it had a large cost disadvantage. There also is ambiguity regarding the relationship between the age of the electric utility and costs. The older firms may have located in the most advantageous locations, but these also were probably major urban areas with higher costs. On the other hand, years of experience in the business ought to have enabled firms to achieve cost advantages due to learning by doing, hence it is difficult to predict the direction of the relationship.

Finally, Z is a vector of variables representing output characteristics. It includes the load factor (total kilowatts connected divided by total kilowatts of generating capacity), the percent of total revenues of the utility derived from stationary motor service (%MotorInc), and the proportion of revenues derived from street railway service (%RRInc).[27] Load factor should be negatively related to cost of production. The higher the load factor the more regularly the electric plant was likely to be operating, hence the greater the opportunity to smooth costs (start-up and shut-down costs would be avoided, for example). Motor load and traction service were included because these services tended to be off peak. This was thought to be business worth pursuing vigorously by the electric utilities because of this characteristic. To the extent that the business was off peak, it should have led to lower costs, especially depreciation costs since it represented fuller utilisation of the capital investment.

U is the error term. Given the large variation in size of firms, heteroskedastic errors would be expected. This was confirmed after initial estimation of the model using ordinary least squares.[28] The model consequently was estimated using weighted least squares with output as the weight. Missing values for some of the variables reduced the number of usable observations to 734. The results are presented in Table 2.

The model performed quite well. The estimated coefficients on the output variables (noting, however, that the cubed term was statistically significant only at the 12 per cent level) indicate that per unit (average) costs reached a minimum at around 8,000 kw, an output figure substantially larger than that provided by the vast majority of plants in operation, 90 per cent of which had a connected load of less than 1,000 kw. Thus, for the vast majority of plants, cost per unit declined very

TABLE 2

WEIGHTED LEAST SQUARES REGRESSION RESULTS: COST OF PRODUCTION

	Dependent Variable:					
Ind. Variable:	Total Cost	Wages	Salaries	Fuel	Main.	Dep.
Intercept	1060* (3.8)	532* (6.9)	-69 (1.1)	383* (5.2)	44 (0.7)	73 (0.7)
KW	78* (23.4)	18* (19.5)	8* (11.4)	17* (18.9)	5* (6.8)	19* (16.2)
KW^2	-.01* (2.4)	-.003* (2.8)	-.002* (2.3)	-.004* (3.8)	.001 (1.1)	-.001 (0.8)
KW^3	$6x10^{-7}$ (1.6)	$2x10^{-7}$ (1.7)	$2x10^{-7}$ (1.8)	$3x10^{-7}$* (2.7)	$9x1^{-8}$ (1.0)	$4x10^{-8}$ (0.3)
OWN (Priv=1)	413* (3.1)	-39 (1.0)	279* (9.5)	26 (0.7)	-42 (1.4)	182* (3.8)
AvGenSize	-13* (2.5)	-3 (1.9)	-.56 (0.5)	-2 (1.7)	-1.3 (1.2)	-4.5* (2.5)
Age	198* (9.6)	28* (4.9)	28* (6.2)	21* (3.8)	24* (5.3)	74* (10.1)
%AC	1.9 (1.0)	-.9 (1.6)	.7 (1.7)	.7 (1.5)	1.8* (4.0)	.5 (0.7)
Density	-50* (8.1)	-9* (5.1)	-10* (7.3)	-8* (5.0)	-3* (2.0)	-14* (6.6)
%Hydro	3.1 (0.9)	2.0* (2.1)	1.3 (1.8)	-7.7* (8.4)	.04 (0.0)	6* (4.9)
Load	-13* (5.8)	-3.2* (5.2)	-.7 (1.4)	-1.6* (2.8)	-1.4* (2.8)	-5* (6.0)
%MotorInc	30 (0.4)	-4.3 (0.2)	21 (1.4)	-15 (0.8)	-2 (0.1)	30 (1.2)
%RRInc	185* (2.9)	27 (1.5)	1.4 (0.1)	76* (4.5)	23 (1.5)	34 (1.5)
Adj. R^2	.70	.57	.42	.59	.26	.55
F	141	82	44	90	22	77

Note: t-values are in parentheses; *indicates significance at .05 level; n=734.

gently as output (lights and other apparatus connected to the system) increased. Only for the very largest plants did estimated per unit costs rise. Minimum average cost was estimated to be about $38.50 per kw, while the actual average cost was approximately $88.50 per kw, indicating that substantial per unit cost savings were available.

Privately-owned plants had higher total costs of production than

municipally-owned plants.[29] This result will be surprising to some. Although statistically significant, the magnitude of the coefficient is relatively small and represents a cost disadvantage of around 2 per cent of total costs at the mean.[30] The higher total cost was due almost entirely to higher salary costs and depreciation charges.

Generator size and density had the expected negative signs in the total cost equation. Whereas greater density lowered costs nearly across the board, larger generators appeared to have had their most substantial effect on capital costs. Neither greater commitment to AC generation nor greater reliance on hydro power had a significant impact on total cost of production in this estimation. In the case of hydro generation, significant fuel savings were offset by higher wage and capital costs. Older electric utilities tended to have higher costs across the board. To the extent that experience in the business led to any 'learning-by-doing' advantages, they were not evident in the cost equation.

The load variable was negative as expected and significant. But, contrary to expectations, no significant relationship was found between cost of production and proportion of revenues derived from motor service. Relatively greater participation in providing railway service was associated with a higher total cost of production, with the bulk of the increased cost arising from higher fuel costs.

These results are instructive but illustrate only one aspect of the performance of the industry. Profits and return on investment are the measures of ultimate success or failure of firms (at least in the private sector). Were the privately-owned electric utilities in fact as economically fragile as the historical discussion above would lead one to believe?[31] We now turn to this question.

IV

Table 3 contains summary statistics for revenues and various measures of return on investment for the private firms in the Commissioner's report. Average revenues were just under $37,000 (roughly half a million dollars in today's terms). Sale of lighting services provided the bulk of revenues. Although incandescent lighting comprised 64 per cent of the connected load for private plants (Table 1), it contributed less than half of total revenues, while arc lighting, which comprised only 18 per cent of the connected load, contributed 40 per cent of total revenues. This can be explained in part by the fact that arc lights tended to be operated for longer hours than incandescent lights and thus generated more revenue per kilowatt connected. Stationary motor and electric railway service contributed 10 per cent of total revenues, although they comprised 18 per cent of connected load. This low return per kilowatt attached can be explained at least partly by the fact that rates for these services were generally the lowest offered by the utilities.

TABLE 3
REVENUES, RATES OF RETURN, AND PRICE-COST MARGIN: PRIVATE PLANTS, 1897/98

Revenues:	Mean	% of Total Revenue
Total Revenue	$36,766	
Incandescent Lighting	17,440	47%
Arc Lighting	14,785	40%
Stationary Motor Service	2,731	7%
Electric Railway Service	965	3%
Other	845	2%

Rates of Return on Total Investment:	Mean	Standard Deviation
Gross Return (before depreciation and tax)	10.68%	9.39
Pre-tax Net Return (after depreciation)	4.93	9.75
Net Return (after depreciation and tax)	4.02	9.65
Price-cost Margin: (Revenues - Operating Costs)/Revenues	28.35	23.28

The gross rate of return on investment (defined as revenues minus operating costs as a proportion of total investment) was 10.68 per cent on average. This figure excludes capital costs. After depreciation charges were deducted from revenues, the 'net' rate of return became 4.93 per cent on average. Deducting property and franchise taxes caused the net rate of return to drop further to 4.02 per cent on average. The return on sales (or price-cost margin, which will be discussed more fully below) was just over 28 per cent. These returns on investment had to support both interest payments and dividends. This appears to be a rather anaemic return on investment on average, but it is helpful to put the figure in context.

The relatively poor showing of the industry cannot be explained by an adverse phase of the business cycle; the economy was expanding in 1897/98, stimulated in part by the Spanish-American War. In terms of alternative long-term investments available, high-grade railroad bonds, presumably much less risky than either the equity or debt of the electric utilities, were paying from 3.9 per cent to 4.2 per cent in 1897/98.[32] It appears that, based on the simple mean return, the arguments of those who believed the electric utility industry at the turn of the century was earning 'subnormal' returns was correct.[33] Another prominent feature of the information presented in Table 3, however, is the high

variance of returns. Focusing exclusively on the simple mean return may obscure potentially interesting differences in performance. It is important to identify characteristics that made individual firms successful. There is then the question of the extent to which these were subject to managerial control.

V

Two basic empirical models have been used previously to address issues of profitability across firms or industries. For example, the effects of market concentration, advertising expenditures, or unionisation on profits have been examined by estimating either a rate of return on investment equation or a price-cost margin (rate of return on sales) equation.[34] Operationally, the two approaches are similar, and we have employed both measures of profitability as dependent variables (as well as differentiating between gross and net rates of return). We used a set of explanatory variables that is quite similar to that used in the cost model estimated previously. There is, of course, no ownership variable since the model was estimated only on privately-owned plants. In addition, we used generating capacity (in kilowatts) as a measure of size or scale in place of an output variable. In the estimation of the price-cost margin equation, the total investment per dollar of sales was used to control for relative capital intensity, as is suggested in the theoretical derivation of the model. The explanatory variables are identical otherwise. Expectations regarding the direction of relationships in most cases are simply the opposite of those for cost: anything expected to lower cost would be expected to increase the rate of return. It is especially unfortunate in this case that the locations of the plants were not provided in the report. We do not know which utilities were subject to direct or indirect competition, which may have had an important impact on profitability.

Heteroskedasticity again was found in ordinary least squares residuals, so the model was estimated using weighted least squares with generating capacity as the weight.[35] Results are presented in Table 4. The model performed quite respectably overall. The gross return and net return equations produced virtually identical results, although there are some differences between these two equations and the price-cost margin equation.

The following attributes were consistently associated with higher rates of return: larger generators (not to be confused with larger generating capacity), age of firm, and relative reliance upon hydro-electric (as opposed to steam) power. Also associated with higher rates of return, but less consistently, were firm size, commitment to AC generation, and load factor. There was a consistent negative relationship between reliance on motor income and rate of return. Neither density of service nor participation in railway service were related statistically to profitability in these estimations. In the profit margin equation, firms with high investment/sales ratios had lower rates of return.

Size (scale) alone could not be related unequivocally to higher rates of return, although it is not likely that the relationship was negative. But the fact that firms with larger generators captured higher returns indicates that some form of economy of size likely existed in the industry and that it related to the form and configuration of the generating equipment rather than simply to the amount of generating equipment.

Older, experienced firms tended to be more profitable than younger firms (in spite of the fact that they had significantly higher costs, as was shown above). The reason for this result is not obvious but tempts speculation. A strong possibility is that 'learning-by-doing' was driving the result. Experience in selling electric power led to enhanced revenues, perhaps through the adoption of more appropriate or effective pricing policies, which offset the higher costs of the older firms. Another possibility is that older firms simply were wielding the monopoly power which they were gaining over time. It also is possible that no learning whatsoever was taking place but that the first firms to enter the industry simply went to the most profitable (even though higher-cost) locations, leaving the less fertile areas for later entrants.

Hydro-generation also was associated with greater profitability. This was a technical option that to a great extent was geographically determined and usually was not subject to managerial discretion. Higher density of service did not appear to translate into higher profits, even though it was associated with lower costs. By far the most surprising result is the negative relationship between motor income and rate of return. Capturing off-peak business was felt by the leading executives in the industry to be the pathway to success, and motors were thought to have particularly good load characteristics (likewise for street railways). So the result here is the opposite of what one would expect. It is tempting to try to explain it away. Central stations were just beginning to go after this type of business. It is known that promotional rates were used to try to attract customers that were using isolated plants. It is possible that rates were below even marginal costs in the early days, which may explain this peculiar result as well as contribute at least a partial explanation for the low average rate of return in the industry.

The US Census Bureau examined the electric light and power industry in detail for the first time in 1902. After noting that the average return on investment in the industry appeared to be meagre, the writers of the report commented:

> The rate of return on the capital stock and investment of some of the oldest central station companies was and has remained far larger than is indicated by the average figures which have been

TABLE 4
WEIGHTED LEAST SQUARES REGRESSION RESULTS:
RATE OF RETURN

	Gross Return	Net Return	Price-cost Margin
Intercept	-6.43* (4.1)	-11.3* (6.8)	4.1 (1.1)
Generating Capacity	.005 (0.4)	.005 (0.3)	.09* (3.2)
Average Generator Size	.18* (3.9)	.19* (4.0)	.56* (5.9)
Age of Firm	.55* (3.4)	.35* (2.0)	1.2* (3.4)
% Alternating Current	.04* (2.5)	.03* (1.9)	.04 (1.2)
% Hydro-electric Power	.13* (4.2)	.13* (4.1)	.33* (5.0)
Density of Service	.004 (0.1)	.03 (0.8)	.07 (0.9)
Load	.04* (4.1)	.03* (3.1)	.02 (0.9)
% Motor Income	-.67* (3.2)	-.76* (3.5)	-3.6* (8.1)
% Street Railway Income	-.18 (0.3)	-.16 (0.3)	-.57 (0.5)
Investment/Sales Ratio	-	-	-6.2* (15.0)
Adj. $\bar{R}^2$	.19	.16	.48
F	16.5	13.9	56.0
n	595	595	595

Note: Rates of return are as defined in Table 3; t-values are in parentheses; *indicates significance at .05 level.

cited above, figures which, if accepted as the only criterion, might well act as a deterrent against venturing into an industry generally so unremunerative. It must be remembered, however, that in some cases qualifications and explanations would forbid a pessimistic view being taken. With barely two decades of continuous

existence, the industry is still so young that, taken as a whole, it may be spoken of as being even yet in its formative period, and a nascent period is almost invariably one of unavoidable waste and extravagance.[36]

Our empirical investigation of the profitability of the industry around the turn of the century provides evidence that is consistent with the Census Bureau view. Returns were low on average, but some firms managed to do better than others. Longer experience in the business and certain aspects of size and choice of technology conferred advantages on individual electric utilities. It is not at all clear, however, that the low overall returns were due to 'waste and extravagance' (or to managerial incompetence) in the operation of individual firms. The low returns may have been due to such unavoidable conditions as small firm size or limited ability to attract off-peak loads at remunerative prices. We found that most firms were on the downward-sloping portion of the industry's average cost curve, and that larger firms enjoyed enormous potential per unit cost savings over actual firms. These are exactly the conditions which would be expected to presage a major period of consolidation. The ability of holding companies to engender consolidation within the industry probably contributed to enhanced economic performance and helps to explain their eventual dominance of the industry.

College of William and Mary
University of North Carolina at Greensboro

NOTES

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1. The first commercial Edison incandescent lighting station actually was the Holborn Viaduct station in London which began operation in January 1882. See P. Jones, *A Power History of the Consolidated Edison System, 1878–1900* (New York, 1950), p.152.
2. H. Davy, *The Collected Works of Sir Humphry Davy*, Vol. II (1839; reprinted New York and London, 1972), p.211.
3. T.P. Hughes, *Networks of Power* (Baltimore, 1983), Ch. II. Also see R. Friedel and P. Israel, *Edison's Electric Light* (New Brunswick, NJ, 1986), Ch. 7.
4. US Bureau of the Census, *Central Electric Light and Power Stations, 1902* (Washington, DC, 1905), p. 7. In addition, there were 739 electric street railway companies in operation in 1902, of which 112 offered some commercial electric service as a by-product. US Bureau of the Census, *Street and Electric Railways, 1902* (Washington, DC, 1905), p.12.
5. C. E. Neil, 'Entering the Seventh Decade of Electric Power,' (Edison Electric Institute, 1942), p.2.
6. D. F. Wilcox, *Municipal Franchises*, Vol. I (New York, 1910), Ch. VII.
7. US Federal Trade Commission, *Supply of Electrical Equipment and Competitive*

From ***Biography of America***

John Pierpont Morgan and the American Corporation

By 1900, tough-minded journalists like Lincoln Steffens and Ida Tarbell were waking up to the fact that politicians no longer ran America; big business did. Tammany's power was nothing compared to that of Morgan's.

Morgan was physically imposing: a massive man, with a ferocious glare and a purple, hideously disfigured nose, the result of a childhood skin disease. He smoked Havana cigars so big they were called Hercules' Clubs. And he had a tremendous physical effect on people. One man said that a visit from Morgan left him feeling "as if a gale had blown through the house."

Unlike Carnegie, Morgan was born rich. He grew up in a prominent banking family and got his start in his father's London business at the age of 19. After the Civil War, Morgan began investing in railroads and soon ruled the transportation empire. He didn't build roads; he took over or consolidated, under his control, railroads that had run into financial trouble, a process that came to be called Morganization.

Morgan was a different type of capitalist than Andrew Carnegie. Carnegie built a business and loved competition. Morgan took over other people's businesses and hated competition. Morgan wanted to stabilize the boom and bust American economy, to prevent price wars between business rivals from destroying big corporations and unhinging the economy.

Morgan's program was compatible with many corporate titans, who wanted to absorb their competition by forming giant trusts and monopolies. John D. Rockefeller had done this by creating the greatest monopoly of them all, the Standard Oil Company, which brought order to a wildly chaotic industry. But no other capitalists in the country, except Carnegie, had money to form such gigantic combinations.

So empire-building industrialists were drawn into the arms of Morgan and other formidable Wall Street bankers.

This began the great corporate drift to New York. Powerful capitalists like Philip Armour, the meat king, and Collis Huntington, the railroad king, moved to New York in the 1890s to be near big investment houses like Morgan and Company, Lehman Brothers, and Kuhn, Loeb.

By 1895, New York was the headquarter city for American corporations. Almost half the American millionaires lived in the New York metropolitan region. And Morgan controlled a Wall Street syndicate that the financial writer John Moody called "the greatest financial power in the history of the world."

At the peak of his powers, in the early 1900s, Morgan dominated a hundred corporations with more than $22 billion in assets. Among them was the first billion dollar corporation in history, U.S. Steel. Morgan had formed this giant steel trust in 1901 out of mills he'd purchased from Carnegie in a colossal cash deal. This transaction marked the high tide of banker power in America.

Morgan's defenders said he never abused his power. But the question was: should any person in a democracy have this much power? Morgan saw himself as a force for the good. His banks, he thought, had helped to transform America into the world's most powerful nation; and privately, secretly, he gave money to the urban poor.

His partners claimed he could have made a lot more money than he did. Well that's true, but only because he lived a life of self-indulgence, spending time collecting paintings, rare books, tapestries, tremendous houses, ocean-going yachts, and high-spirited mistresses. When Morgan died in 1913, he had as estate of $80 million, that's $1.2 billion today, as compared to Rockefeller's worth of nearly a billion, that's $190 billion today. When Rockefeller read this in the papers he supposedly said, "And to think, he wasn't even a rich man."

But Rockefeller's remark misses the point. Morgan's power wasn't in the number of his millions, but in the billions he controlled. Senator Beveridge called Morgan "the greatest constructive financier" in the history of mankind. But not everybody agreed.

In 1900, the greatest opponent of corporate consolidation was Nebraska's William Jennings Bryan. Bryan was preparing for another run for the presidency against the Republican incumbent William McKinley, whose 1896 campaign Morgan had bankrolled. To Bryan, Morgan was a predator whose banks and corporations were

destroying competition, manipulating prices, buying and selling politicians. While several hundred millionaires lived in luxury, 80% of American families earned less than $500 a year.


Instructional Resources Corporation

In no other country in the world was such power held by men of wealth. In his campaign, Bryan hit hard on this theme of corporate injustice, but his message reached very few people in the coal fields of northeastern Pennsylvania. There, miners and their families lived like serfs in an industrial fiefdom that Morgan had helped create.

for simultaneous use of telegraph and telephone. The joint use of such lines and operatives would be a source of economy. At busy offices and on busy circuits, the circuits could be "composited" for the simultaneous use for telegraph and telephone purposes. Each service would require its distinct operating force and its distinct offices, as the services rendered by the telegraph and the telephone are functionally and fundamentally different although both use wire circuits. The telephone makes up a circuit and places it at the use of the customers, who do the communicating; *i.e.*, it leases its circuits to others for personal communication. The telegraph by its own operators performs all the services of collecting, transmitting and delivering messages; *i.e.*, it transmits over its circuits, for others, personal communications.

The great economy and advantage would come from the "compositing" or simultaneous use of one system of circuits for the two services, eliminating entirely one of the wire systems. The advance in the state of the art of "compositing" lines for joint use of the telephone and telegraph has been very marked in the very recent past.

The accompanying diagram illustrates a small section each of the telephone and the telegraph system. It is self-explanatory.

The diagram shows that the existing wire mileage of the present telephone toll circuits and telegraph plants, brought up to standard construction with some provision for deficiencies or extensions, if "composited" or used jointly, would for all practical purposes be the equivalent of two plants each of the same mileage, one for telephone and one for telegraph; or to put it another way: the wire mileage necessary to give the same service need be about half the combined wire mileage of the two systems separately operated as now.

The annual gross revenue from either a telephone or a telegraph system should be approximately 33 per cent. of the total cost of, or the investment in plant. If in two

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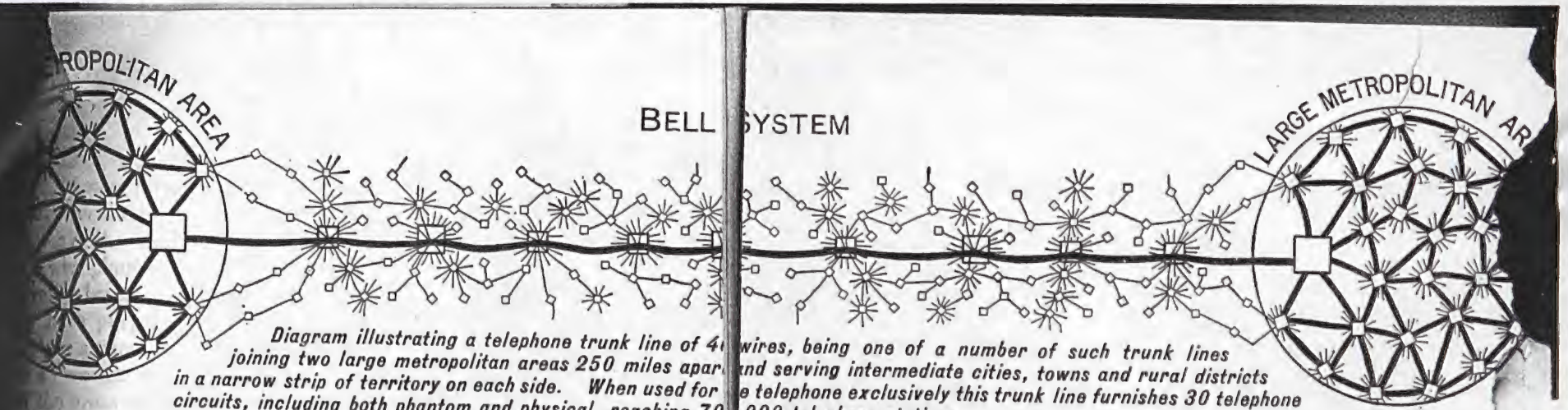


Diagram illustrating a telephone trunk line of 4(wires, being one of a number of such trunk lines joining two large metropolitan areas 250 miles apar nd serving intermediate cities, towns and rural districts in a narrow strip of territory on each side. When used for e telephone exclusively this trunk line furnishes 30 telephone circuits, including both phantom and physical, reaching 70 ,000 telephone stations.

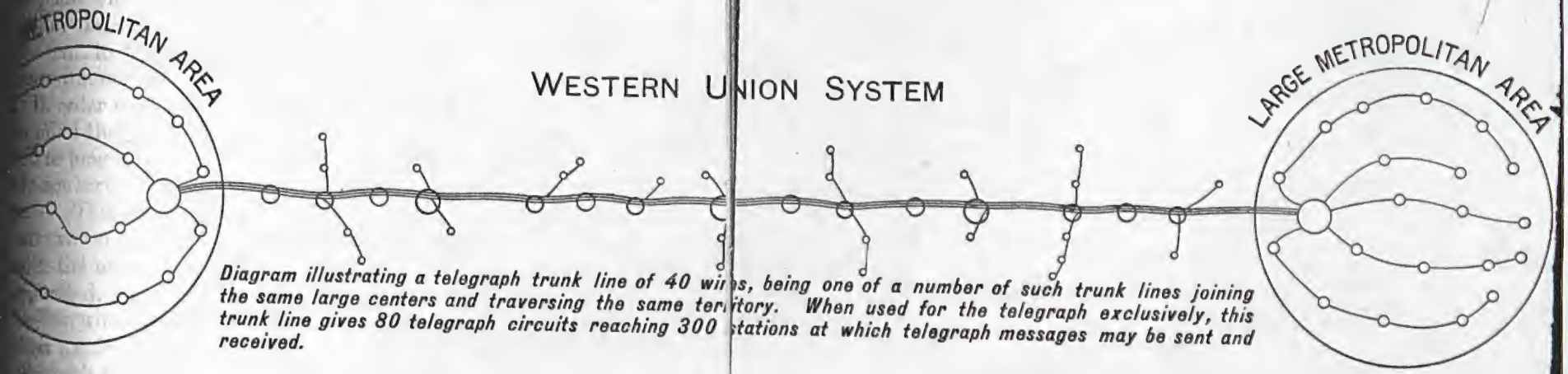


Diagram illustrating a telegraph trunk line of 40 wi s, being one of a number of such trunk lines joining the same large centers and traversing the same ter itory. When used for the telegraph exclusively, this trunk line gives 80 telegraph circuits reaching 300 stations at which telegraph messages may be sent and received.

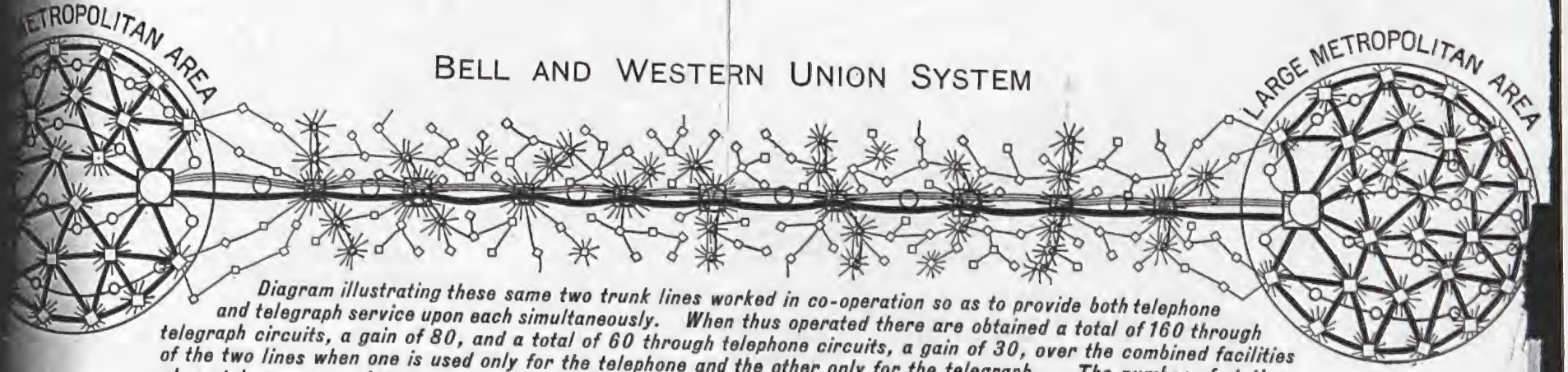


Diagram illustrating these same two trunk lines worked in co-operation so as to provide both telephone and telegraph service upon each simultaneously. When thus operated there are obtained a total of 160 through telegraph circuits, a gain of 80, and a total of 60 through telephone circuits, a gain of 30, over the combined facilities of the two lines when one is used only for the telephone and the other only for the telegraph. The number of stations where telegrams may be received and sent is increased from 300 to 700,000.

Telephone Central Office *Telephone Toll Station*

Telegraph Office

systems of equal size one plant were eliminated and both services were performed over the other, the percentage of joint revenue to plant would be substantially doubled, or 65 per cent. To put it in another way: The maintenance of a wire plant costs about 30 per cent. of the annual gross revenue from that plant. The simultaneous use of a plant for both purposes would mean maintenance of one wire system against the doubled revenue from both services, or a decrease in maintenance alone of about 15 per cent. of the gross revenue. In addition to these savings there would be the savings of the capital charges and of taxes on plant which would be made unnecessary. This brings within the realm of possibility a reduction of from 20 per cent. to 25 per cent. in the gross charges or gross revenue without affecting the profits of the business.

In order to avoid confusion it must be distinctly borne in mind that the telephone service referred to here is the toll or long-distance service and not the circuits of the exchange service which could not be used for any other purpose. This toll or long-distance service is so intimately interwoven and interdependent both in operation and use with the telephone exchange service that it could not be separated, but the operation of the toll circuits in connection with the exchange circuits would not interfere with their use for telegraph purposes by a regularly organized telegraph staff.

These are the possibilities, fraught with all sorts of advantage to the public. Some of them are so clearly without the "restrictions" of business operation that they can be put in operation as fast as the physical changes can be made in the plant, but those of the greatest advantage, prudence would dictate postponing until after these business restrictions are made clearer or more definitely interpreted.

For the Directors,

THEODORE N. VAIL,

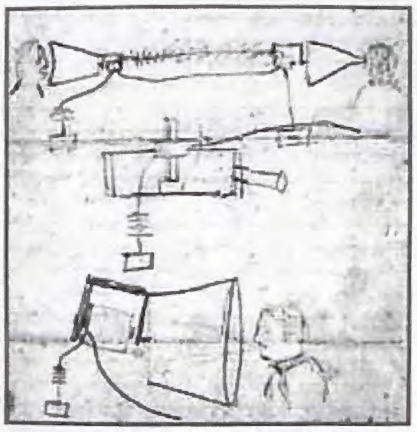
President.

The Alexander Graham Bell Family Papers: The Telephone and the Multiple Telegraph

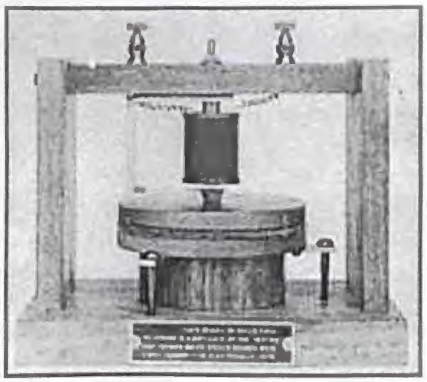
The telegraph and telephone are both wire-based electrical systems, and Alexander Graham Bell's success with the telephone came as a direct result of his attempts to improve the telegraph.

When Bell began experimenting with electrical signals, the telegraph had been an established means of communication for some 30 years. Although a highly successful system, the telegraph, with its dot-and-dash Morse code, was basically limited to receiving and sending one message at a time. Bell's extensive knowledge of the nature of sound and his understanding of music enabled him to conjecture the possibility of transmitting multiple messages over the same wire at the same time. Although the idea of a multiple telegraph had been in existence for some time, Bell offered his own musical or harmonic approach as a possible practical solution. His "harmonic telegraph" was based on the principle that several notes could be sent simultaneously along the same wire if the notes or signals differed in pitch.

By October 1874, Bell's research had progressed to the extent that he could inform his future father-in-law, Boston attorney Gardiner Greene Hubbard, about the possibility of a multiple telegraph. Hubbard, who resented the absolute control then exerted by the Western Union Telegraph Company, instantly saw the potential for breaking such a monopoly and gave Bell the financial backing he needed. Bell proceeded with his work on the multiple telegraph, but he did not tell Hubbard that he and Thomas Watson, a young electrician whose services he had enlisted, were also exploring an idea that had occurred to him that summer - that of developing a device that would transmit speech electrically.
Original drawing of the telephone



Alexander Graham Bell's design sketch of the telephone.
Sketches, undated; handwritten text top and bottom of page, 1876. Box 273, "Subject File: The Telephone--Drawing of the Telephone, Bell's Original." *Alexander Graham Bell Family Papers, Manuscript Division,*

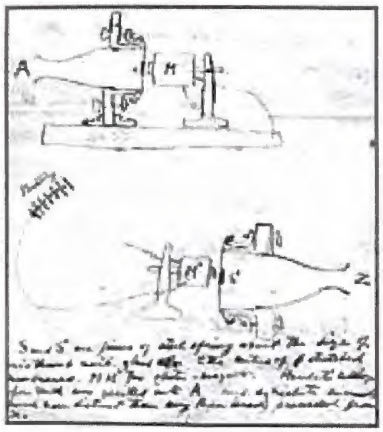


[Model of Bell's telephone]
"This model of Bell's first telephone is a duplicate of the instrument through which speech sounds were first transmitted electrically, 1875" on phone. Created/Published between 1915 and 1925. Reproduction Number LC-D420-2586. *Detroit Publishing Company, Prints and Photographs Division, Library of Congress.*

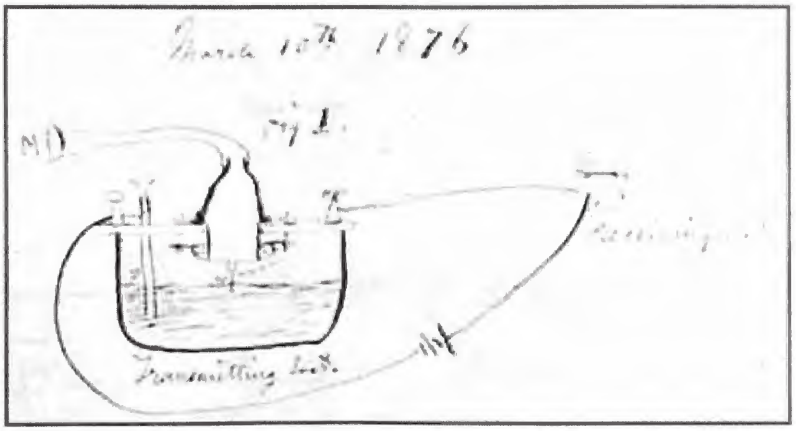
Library of Congress.

While Bell and Watson worked on the harmonic telegraph at the insistent urging of Hubbard and other backers, Bell nonetheless met in March 1875 with Joseph Henry, the respected director of the Smithsonian Institution, who listened to Bell's ideas for a telephone and offered encouraging words. Spurred on by Henry's positive opinion, Bell and Watson continued their work. By June 1875 the goal of creating a device that would transmit speech electrically was about to be realized. They had proven that different tones would vary the strength of an electric current in a wire. To achieve success they therefore needed only to build a working transmitter with a membrane capable of varying electronic currents and a receiver that would reproduce these variations in audible frequencies.

Bell's great success, achieved on March 10, 1876, marked not only the birth of the telephone but the death of the multiple telegraph as well. The communications potential contained in his demonstration of being able to "talk with electricity" far outweighed anything that simply increasing the capability of a dot-and-dash system could imply.



Letter from Alexander Graham Bell to Alexander Melville Bell and Eliza Symonds Bell, May 5, 1876
Box 5, "Subject File: Bell, Alexander Melville--Family Correspondence--Bell, Alexander Graham, 1876."
Alexander Graham Bell Family Papers, Manuscript Division, Library of Congress.



Bell's Experimental Notebook, 10 March 1876
Box 271, "Subject File: Scientific Notebooks, 1876."
Alexander Graham Bell Family Papers, Manuscript Division, Library of Congress.

Bell Family Papers Home >> The Telephone and the Multiple Telegraph

Special Commission on Railway Mail Transportation,

Cambridge Mass

Sept. 9th 1879, 187

Dear Papa

Your telegram received. I spoke by telephone to the Telephone Co this morning and find that they are preparing to make you an offer for the Canadian Patent - I told Mr Vail that I had just heard you were in negotiation with the Dominion Telegraph Co - and Jay Gould — and asked what had better be done. He said "Telegraph to your father to do nothing till he has time to hear from us." I accordingly sent you per Atlantic & Pacific & Dominion Line — the following message.

"Make no arrangement about Patent until you hear from Bell Telephone Co. They mean business. Shares fetch three thirty-seven." Mr Vail says that the Company will make a proposition to you that he thinks will be mutually satisfactory. It will do no harm if you can manage to get a counter proposition from Jay Gould or the Dominion Co — without fettering your free action. I have no doubt that — at the present time — while people are wild about Telephone shares — that you & Williams could realize ~~at least~~ two hundred thousand dollars if you don't seem too anxious to make a sale. The great thing - I think - is to get some interest shown in the matter by Jay Gould & the Dominion. In that case I am sure you will

B. 2.

GARDINER G. HUBBARD,
President.
THOMAS SANDERS,
Treasurer.
THEO. N. VAIL,
General Manager.

BELL TELEPHONE COMPANY,
66 & 68 Reade Street.
P. O. BOX 130.

ALEX. GRAHAM BELL,
Electrician.
THOS. A. WATSON,
General Superintendent.

New York, Dec. 20, 1878.

We take pleasure in announcing to our agents, customers, and to the public, that we are now ready to furnish a battery-transmitting Telephone, in addition to, and to use in connection with our ordinary Magneto Telephone.

In the Magneto Telephone, the sound waves are thrown against, and vibrate, a diaphragm which acts as the armature of a permanent magnet, and disturbing its magnetic field, produces in the helix, or coil, surrounding the magnet, undulatory currents of electricity, which are conveyed over the line, and corresponds to and reproduces the articulation in the Receiving Telephone. Any Magneto Telephone can be used either as transmitter or receiver.

In the battery-transmitting Telephone, a voltaic current is passed through conductors which are connected to the diaphragm. These conductors offer a certain resistance to the current, and are so arranged that the vibrations of the diaphragm caused by the sound waves vary this resistance with every wave, thus producing undulations in the current which correspond to and reproduce the articulation. This however requires a Magneto Telephone as receiver.

The battery-transmitter acts more powerfully, for the reason that voltaic electricity is a force much stronger than the magneto electric current when ordinarily produced by the Telephone, and on that account the faintest articulation can be transmitted with the utmost distinctness.

It is not probable, however, that the battery-transmitter will take the place of the Magneto Telephone, for the latter is simple in its construction, durable and reliable under all circumstances, can be used for both transmitting and receiving, costs nothing to maintain, is sufficiently loud and distinct, and will probably be the most popular instrument for general use.

The battery Telephone, though possessing the advantage of louder articulation, and not being liable to get out of order under ordinary circumstances, is more delicate and complicated in its construction, requires the maintenance of a battery in connection with it, the attention occasionally of an electrical expert, and can only be used as a transmitter, thus requiring a Magneto Telephone as a receiver. It will be used principally in the large cities where the induced currents from telegraph or other wires interfere materially with the weaker currents of the Magneto Telephone, also in the transmission of messages over long distances, or where, for special reasons greater volume of sound is necessary to be obtained.

Very respectfully,

THEO. N. VAIL, *General Manager.*

B[32]79.

TO THE PUBLIC.

The National Bell Telephone Company, under patents granted to Alexander Graham Bell, claims the exclusive right to use, or to license others to use, speaking telephones.

The introduction of the Bell telephone has been pushed energetically forward from the first moment that the invention was perfected, and no rival claimant appeared until the great commercial value of the invention had been practically demonstrated by the owners of the Bell patents.

The statement of Mr. Elisha Gray, that Prof. Bell is the first inventor of the speaking telephone, and the first man who made a speaking telephone, has been confirmed by all the scientific bodies who have examined the question.

Suits are pending, and more will undoubtedly be brought, in which the claims of the owners of the Bell patents and the owners of the inventions of Gray, Edison, Dolbear, and others will be legally determined.

Meantime, the Company will protect its customers in the use of telephones rented by it, against any proceedings which may be brought against them for infringement, by assuming, upon notice and request of such customers, the defence of such proceedings, and all expenses incident thereto.

THEO. N. VAIL,
General Manager.

EXECUTIVE OFFICES NATIONAL BELL TELEPHONE CO.,
BOSTON, May 23, 1879.

[OVER

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Interstate Commerce Act (1887)

In 1887 Congress passed the Interstate Commerce Act, making the railroads the first industry subject to Federal regulation. Congress passed the law largely in response to public demand that railroad operations be regulated. The act also established a five-member enforcement board known as the Interstate Commerce Commission. In the years following the Civil War, railroads were privately owned and entirely unregulated. The railroad companies held a natural monopoly in the areas that only they serviced.

Monopolies are generally viewed as harmful because they obstruct the free competition that determines the price and quality of products and services offered to the public. The railroad monopolies had the power to set prices, exclude competitors, and control the market in several geographic areas. Although there was competition among railroads for long-haul routes, there was none for short-haul runs. Railroads discriminated in the prices they charged to passengers and shippers in different localities by providing rebates to large shippers or buyers. These practices were especially harmful to American farmers, who lacked the shipment volume necessary to obtain more favorable rates.

Early political action against these railroad monopolies came in the 1870s from "Granger" controlled state legislatures in the West and South. The Granger Movement had started in the 1860s providing various benefits to isolated rural communities. State controls of railroad monopolies were upheld by the Supreme Court in *Munn v. Illinois* (1877). State regulations and commissions, however, proved to be ineffective, incompetent, and even corrupt. In the 1886 *Wabash* case, the Supreme Court struck down an Illinois law outlawing long-and-short haul discrimination. Nevertheless, an important result of *Wabash* was that the Court clearly established the exclusive power of Congress to regulate interstate commerce. (See Gibbons v. Ogden.)

The Interstate Commerce Act addressed the problem of railroad monopolies by setting guidelines for how the railroads could do business. The act became law with the support of both major political parties and pressure groups from all regions of the country. Applying only to railroads, the law required "just and reasonable" rate changes; prohibited special rates or rebates for individual shippers; prohibited "preference" in rates for any particular localities, shippers, or products; forbade long-haul/short-haul discrimination; prohibited pooling of traffic or markets; and most important, established a five-member Interstate Commerce Commission (ICC).

The law's terms often contradicted one another. Some provisions were designed to stimulate competition and others to penalize it. In practice, the law was not very effective. The most successful provisions of the law were the requirement that railroads submit annual reports to the ICC and the ban on special rates the railroads would arrange among themselves, although determining which rates were discriminatory was technically and politically difficult. Years later the ICC would become the model for many other regulatory agencies, but in 1887 it was unique. The Interstate Commerce Act challenged the philosophy of laissez-faire economics by clearly providing the right of Congress to regulate private corporations engaged in interstate commerce. The act, with its provision for the ICC, remains one of America's most important documents serving as a model for future government regulation of private business.

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Sherman Anti-Trust Act (1890)

The Sherman Antitrust Act of 1890 was the first measure passed by the U.S. Congress to prohibit trusts. It was named for Senator John Sherman of Ohio, who was a chairman of the Senate finance committee and the Secretary of the Treasury under President Hayes. Several states had passed similar laws, but they were limited to intrastate businesses. The Sherman Antitrust Act was based on the constitutional power of Congress to regulate interstate commerce. (For more background, see previous milestone documents: the Constitution, *Gibbons v. Ogden*, and the Interstate Commerce Act.) The Sherman Anti-Trust Act passed the Senate by a vote of 51–1 on April 8, 1890, and the House by a unanimous vote of 242–0 on June 20, 1890. President Benjamin Harrison signed the bill into law on July 2, 1890.

A trust was an arrangement by which stockholders in several companies transferred their shares to a single set of trustees. In exchange, the stockholders received a certificate entitling them to a specified share of the consolidated earnings of the jointly managed companies. The trusts came to dominate a number of major industries, destroying competition. For example, on January 2, 1882, the Standard Oil Trust was formed. Attorney Samuel Dodd of Standard Oil first had the idea of a trust. A board of trustees was set up, and all the Standard properties were placed in its hands. Every stockholder received 20 trust certificates for each share of Standard Oil stock. All the profits of the component companies were sent to the nine trustees, who determined the dividends. The nine trustees elected the directors and officers of all the component companies. This allowed the Standard Oil to function as a monopoly since the nine trustees ran all the component companies.

The Sherman Act authorized the Federal Government to institute proceedings against trusts in order to dissolve them. Any combination "in the form of trust or otherwise that was in restraint of trade or commerce among the several states, or with foreign nations" was declared illegal. Persons forming such combinations were subject to fines of $5,000 and a year in jail. Individuals and companies suffering losses because of trusts were permitted to sue in Federal court for triple damages. The Sherman Act was designed to restore competition but was loosely worded and failed to define such critical terms as "trust," "combination," "conspiracy," and "monopoly." Five years later, the Supreme Court dismantled the Sherman Act in *United States v. E. C. Knight Company* (1895). The Court ruled that the American Sugar Refining Company, one of the other defendants in the case, had not violated the law even though the company controlled about 98 percent of all sugar refining in the United States. The Court opinion reasoned that the company's control of manufacture did not constitute a control of trade.

The Court's ruling in *E. C. Knight* seemed to end any government regulation of trusts. In spite of this, during President Theodore Roosevelt's "trust busting" campaigns at the turn of the century, the Sherman Act was used with considerable success. In 1904 the Court upheld the government's suit to dissolve the Northern Securities Company in *State of Minnesota v. Northern Securities Company*. By 1911, President Taft had used the act against the Standard Oil Company and the American Tobacco Company. In the late 1990s, in another effort to ensure a competitive free market system, the Federal Government used the Sherman Act, then over 100 years old, against the giant Microsoft computer software company.

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The Boston City Club

acknowledged
Feb 3 1916
CDM

BOSTON. January 31, 1916.

My dear Prof. Bell;

The Boston City Club, the largest civic organization in the world, has recently completed a new home at a cost of about a million dollars and we are now in occupancy. The organization has a membership of 6,500.

We desire to arrange for a reception in the city of Boston to yourself, Thomas A. Edison and Theodore N. Vail, on Monday evening, March 12. This reception is planned in order that not only the members of the Club, but the citizens of Boston, may pay their tribute of respect to you.

I trust you will find it possible to accept and upon receipt of your letter, full details of the reception will be sent you.

Yours very truly,

Addison L. Winship

Prof. Alexander Graham Bell. Civic Secretary.

arrangement), to pay towards the support of a Laboratory of this Kind. And then too, if we either supported, or aided in its support, should not the inventions in Telephony and Photophony be turned over to the Co., at a nominal price? If it is to be left, as a matter of bargain, after the inventions are made, taking it from the stand point of the Co., could not as good a bargain probably be made, whether we aided in the support of the Laboratory or not?

As to the release you speak about, that is a matter, which rests entirely with the Board of Directors, and they not having expressed themselves, of course I cannot give you any information regarding it. Changing your position from that of Inventor of the Telephone, to that of a large Stockholder in the A.B.T.Co: do you not think it would be unwise to release the Inventor from his obligation to give the Co. all improvements that he might make, for the

BELL TELEPHONE COMPANY,
66 and 68 Reade Street,
P. O. BOX 150.

New York, Dec 20th 1875

My Dear Mr Bell.

I enclose by mistake my Copy of Nature with letter from Prof Watson —

I think we could circulate about 5000 copies of this letter to very good advantage & I wish you please write the Prof and ask if he would object. I would do so — & can have it printed in Circular form and put in hand of our agents.

Yours respy
Thos. Sanders

95 Milk Street,

Personal. Boston, Mass., Feb: 18th 1882

Alexander Graham Bell Esq
Scott Circle. Washington D.C.

Dear Mr Bell,

Since my return, I have been thinking about the new Transmitter which is being invented by Mr Chas: Bell. I understand you are getting it patented. Do you intend also to patent it in Europe? I think so far as England is concerned, that my connections there would probably enable me to do better for you with the instrument, than you could do yourself - though I may be mistaken. At all events, I wish you would let me know, whether you would give me the right to handle it for you. I do not care about making any thing

out of it, as the advantage I will derive will be in other directions. So that as far as that goes, I would be perfectly willing that you should receive the full consideration.

Let me hear from you.

Yours truly

Leonard

as soon as I am free from my difficulties I shall send you a cable.

Bell Telephone is doing very well indeed, we are increasing our rentals daily last month we rented 1593 instruments & 858 in the first Eleven days of this month - Watson was here on Sunday on his return from a trip west & Chicago he brings very good reports from all our agencies except at Chicago there but little is doing, our agents take no interest in their work - I dare not take to turn them off for fear they might do us great injury, before I could find a suitable person to replace them

We are however in want of money as we are in debt $25.000 we have an offer from Mr Bradley to form a new Company with a capital of 7000 shares -

3000 to be issued to the N. E. Tel Co
1000 to be sold for $50.000 cash
3000 to be issued for the remainder of our patents. I do not like the proposition, but have agreed to accept it, if I cannot do better within a month -

V In full 1678 Bell Tel.

Washington March 13

Dear Alec-

Your comforting telegram was rec'd on Monday with ten thousand thanks. I trust I shall not have occasion to accept it, but I cannot vote as present, & have not therefore telegraphed you-

Mr Conover has made an offer to the creditors of the Caledonia Coal Co. which he understand they will accept. If so I think I can raise the money required to meet my portion here. If so it will be returne me of many troubles the Caledonia Co has for years been an annoyance to me, because I could not know anything about it, that is I have been away from home a large part of the time & when at home was too busy to spend the time necessary to go into its affairs. I was also satisfied that Mr Conover attended to his duties, & kept perfect accounts-

It is a very great sacrifice on our part, & if you could raise for us $25.00 we could get on without doing anything more -

Mr. Sanders & my brother Curtis came on here me last Friday to urge my acceptance of the Bradley offer; finally we arranged by my agreeing to accept it if I could not obtain a better offer within thirty days -

Yesterday I went to Philadelphia to meet our agent from Pittsburg & spent the day with him & with our Phil. agent - The latter is one of the best agents we have, he began the first of October & has rented over 400 telephones, & has more orders than ever now on hand - On Thursday I closed an arrangement with the St Louis Bis. Tel. Co - for telephones for their business, & tomorrow I meet one with the Albany Bis Tel Co - The West-Union Co - are very busy but we cannot learn that they are placing many

I do not think they have 50
rented in the whole country, &
the majority of those are on
lines they own, & on which
they would not allow our
Telephones to be used —

I am expecting a
capitalist to meet me this
evening with a view to
purchase an interest in the
Bell Tel. Co.

I propose to make our
Capital $700.000

To reserve for 1/2 N. E.	$100.000
To sell for $50,000 cash	$100.000
To take for bal. of our patents including other half of New Eng	500.000
	$700.000

If any of your English friends
would like to come in on this
basis, cable me & if not too late
they shall have a portion —

With much love to you
& Mabel I am ever
Your loving
Papa in law
Gardiner G. Hubbard

P.S. Your mama says do not get any more bedding for her & sister as they will get it, when they arrive

L.
G.G.H. to A.G.B.
Mch.13
Wash.

1878

Bell Telephone -
Caledonia Mines -

Your comforting telegram was recd. on Monday, with ten thousand thanks. -- I trust I shall not have occasion to accept it, but I cannot tell at present and have not heretofore telegraphed you.

Mr. Converse has made an offer to the creditors of the Caledonia Coal Co., which I understand they will accept, if so I think I can raise the money required to meet my portion here. -- If so it will relieve me of many troubles. The Caledonia Coal Co. has for years been an annoyance to me because I could not know anything about it, that is, I have been away from home a large part of the time and when at home was too busy to spend the time necessary to enquire into its affairs. I was also satisfied that Mr. Converse attended to his duties and kept perfect accounts. As soon as I am free from my difficulties I shall send you a cable.

L. 1878 2
G.G.H. to A.G.B.
Mch.13
Wash.

Bell Telephone
858 in 11 days—

Bell Telephone Co. is doing very well indeed. We are increasing our rentals daily. Last month we rented 1,593 instruments and 858 in the first eleven days of this month. Mr. Watson was here on Saturday on his return from a trip west to Chicago. He brings very good reports from all our agencies excepting at Chicago; there but little is doing, our agents take no interest in their work -- I do not like to turn them off for fear they might do us great injury, before I could find a suitable person to replace them. We are, however, in want of money, as we are in debt $25,000. We have an offer from Mr. Bradley to form a new company with a capital of 7,000 shares:

3,000 to be issued to the N.E.Tel.Co.
1,000 to be sold for $50,000 cash
3,000 to be issued for the remainder of our patents.
7,000

L. 1878 3
G.G.H. to A.G.B.
Mch. 13
Wash.

Bell Tel
Reorganization

I do not like the proposition, but have agreed to accept it, if I cannot do better within a month.. It is a very great sacrifice on our part, and if you could raise for us $25,000 we could get on without selling anything more.

Mr. Sanders and my brother Rustis came on to see me last Friday to urge my acceptance of the Bradley offer; finally we arranged by my agreeing to accept it if I could not obtain a better offer within thirty days.

Yesterday I went to Philadelphia to meet our Agent from Pittsburg, and spent the day with him and with our Phil. agent. The latter is one of the best agents we have, he began the first of October and has rented over 400 telephones and has more orders than ever now on hand. On Thursday I closed an arrangement with

L.
G.G.H. to A.G.B.
Mch. 13
Wash.

1878

Bell Telephone 4
Reorganization

the St. Louis Dis.Tel.Co. for Telephones for their business, and tomorrow I make one with The Albany Dis.Tel.Co. -- The West. Union Co. are very busy, but we cannot learn that they are placing many. I do not think they have 50 rented in the whole country, and the majority of those are on lines they own, and on which they would not allow our telephones to be used.

I am expecting a capitalist to meet me this evening with a view to purchase an interest in the Bell Tel. Co.

I propose to make our capital $700,000

To reserve for 1/2 N.E.	$100,000
To sell for $50,000 cash	100,000
To take for bal. of our patents including other half of New Company	500,000
	$700,000

If any of your English friends would like to come in on this basis, cable me and if not too late they will have a portion.

The Alexander Graham Bell Family Papers

Circulars, from December 20, 1878 to May 23, 1879 - Transcription
(Series: Subject File, Folder: The Telephone, American Bell Telephone Company, 1877-1880)

Image 3 of 4 Turn to image 3 PREV IMAGE | NEXT IMAGE

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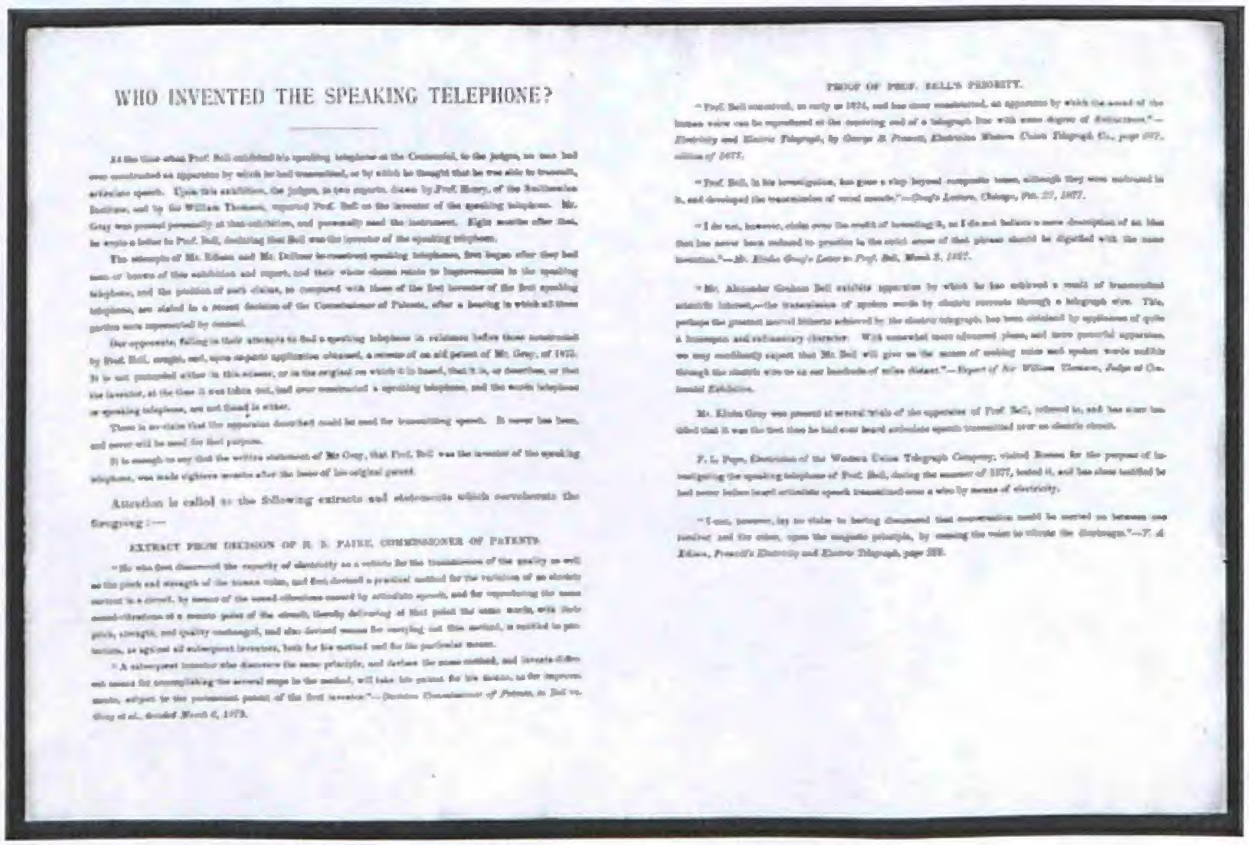

WHO INVENTED THE SPEAKING TELEPHONE?

At the time when Prof. Bell exhibited his speaking telephone at the Centennial, to the judges, no one had ever constructed an apparatus by which articulate speech could be transmitted, or by which he thought that he was able to transmit, articulate speech. Upon this exhibition, the judges, in two reports, drawn by Prof. Henry, of the Smithsonian Institute, and by Sir William Thomson, reported Prof. Bell as the inventor of the speaking telephone. Mr. Gray was present personally at that exhibition, and personally used the instrument. Eight months after that, he wrote a letter to Prof. Bell, declaring that Bell was the inventor of the speaking telephone.

The attempts of Mr. Edison and Mr. Dolbear to construct speaking telephones, first began after they had seen or known of this exhibition and report, and their whole claims relate to improvements in the speaking telephone, and the position of such claims, as compared with those of the first inventor of the first speaking telephone, are stated in a recent decision of the Commissioner of Patents, after a hearing in which all three parties were represented by counsel.

Our opponents, failing in their attempts to find a speaking telephone in existence before those mentioned by Prof. Bell, sought, and, upon ex-parte application obtained, a reissue of an old patent of Mr. Gray, of 1872. It is not pretended either in this reissue, or in the original on which it is based, that it is, or describes, or that the inventor, at the time it was taken out, had ever constructed a speaking telephone, and the words telephone or speaking telephone, are not found in either.

There is no claim that the apparatus described could be used for transmitting speech. It never has been, and never will be used for that purpose.

It is enough to say that the written statement of Mr Gray, that Prof. Bell was the inventor of the speaking telephone, was made eighteen months after the issue of his original patent.

Attention is called to the following extracts and statements which corroborate the foregoing :—

EXTRACT FROM DECISION OF H. S. PAINE, COMMISSIONER OF PATENTS

"He who first discovered the capacity of electricity as a vehicle for the transmission of the quality as well as the pitch and strength of the human voice, and first devised a practical method for the variation of an electric current in a circuit, by means of the sound-vibrations caused by articulate speech, and for reproducing the same sound-vibrations at a remote point of the circuit, thereby delivering at that point the same words, with their pitch, strength, and quality unchanged, and also devised means for carrying out this method, is entitled to patents, as against all subsequent inventors, both for his method and for the particular means.

"A subsequent inventor who discovers the same principle, and devises the same method, and invents different means for accomplishing the several steps in the method, will take his patent for his device, as the improvements, subject to the paramount patent of the first inventor."—*Decision Commissioner of Patents, in Bell vs. Gray et al., decided March 6, 1879.*

PROOF OF PROF. BELL'S PRIORITY.

"Prof. Bell conceived, as early as 1874, and has since constructed, an apparatus by which the sound of the human voice can be reproduced at the receiving end of a telegraph line with some degree of distinctness."—*Electricity and Electric Telegraph, by George B. Prescott, Electrician Western Union Telegraph Co., page 107, edition of 1877.*

"Prof. Bell, in his investigation, has gone a step beyond composite tones, although they were cultivated in it, and developed the transmission of vocal sounds."—*Gough Lectures, Chicago, Feb. 27, 1877.*

"I do not, however, claim even the credit of inventing it, as I do not believe a mere description of an idea that has never been reduced to practice in the strict sense of that phrase should be dignified with the name invention."—*Mr. Elisha Gray's Letter to Prof. Bell, March 3, 1877.*

"Mr. Alexander Graham Bell exhibits apparatus by which he has achieved a result of transcendent scientific interest,—the transmission of spoken words by electric currents through a telegraph wire. This, perhaps the greatest marvel hitherto achieved by the electric telegraph, has been obtained by appliances of quite a homespun and rudimentary character. With somewhat more elevated plans, and more powerful apparatus, we may confidently expect that Mr. Bell will give us the means of making voice and spoken words audible through the electric wire to as vast hundreds of miles distant."—*Report of Sir William Thomson, Judge at Centennial Exhibition.*

Mr. Elisha Gray was present at several trials of the apparatus of Prof. Bell, referred to, and has since testified that it was the first time he had ever heard articulate speech transmitted over an electric circuit.

F. L. Pope, Electrician of the Western Union Telegraph Company, visited Boston for the purpose of investigating the speaking telephone of Prof. Bell, during the summer of 1877, tested it, and has since testified he had never before heard articulate speech transmitted over a wire by means of electricity.

"I can, however, lay no claim to having discovered that conversation could be carried on between one receiver and the other, upon the magnetic principle, by causing the voice to vibrate the diaphragm."—*T. A. Edison, Prescott's Electricity and Electric Telegraph, page 228.*

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Sept. 30, 1911.

Mr. Theodore A. Vail,
The House,
Speedwell Farms,
Lyndon, Vermont.

Dear Mr. Vail:

Many thanks for your note of Sept. 23, and for your courtesy in having me made a director of the American Bell Telephone Company for the purpose of giving me the privilege of a telephone and telegraph frank. I can assure you I appreciate your thoughtfulness in this matter and would gladly accept the frank if I could do so conscientiously.

I learn, however, from your note that it is impossible, under the laws governing inter-state companies, to give such franks to those not having official connection. As I do not have any official connection with telephone or telegraph companies, I am not entitled to the frank, and cannot accept it.

In order to give me an official connection which would enable me to accept the frank, you have had me made a director of the American Bell Telephone Company, a Company which is practically defunct, although I understand from your note that the old organization is still kept alive, at least upon paper. I must thank you very much for

the kind thought that led you to do this but I cannot accept a directorship in the Company; for the reason that I do not wish to put myself in the position of appearing to evade the law for the purpose of getting a telegraph frank, and I conceive that this would be my position were I to accept a directorship in a Company that is practically non-existing.

Yours sincerely,
Alexander Graham Bell

P.S. I return the Western Union Telegraph Company frank A 2 with my best thanks for your courtesy in the matter. A.G.B.

Copy

Feb 2 1912

Mr. H. C. Kingsbury,
American Telephone & Telegraph Company,
15 Dey Street, New York.

Dear Sir,

Many thanks for your note of Jan 29 enclosing for my use a book of coupon franks of The American Telephone and Telegraph Company, for the year 1912, issued to me as "Director"

In former years I was always shown this courtesy by your Company in recognition of my position as the inventor of the telephone; but I understand that on account of some change in the law it is only possible for you now to issue franks to persons who are officials of the Company.

I was very much touched by the action of President Vail and the Board of Directors in electing me a Director of The American Bell Telephone Company but found myself unable to accept. I am not, therefore, now qualified to receive franking privileges as "Director".

If I cannot lawfully be given the franks on the grounds that I am the inventor of the telephone, I would rather not have them at all. I therefore return them to you with many thanks for your kind intentions in the matter.

Yours sincerely,

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The Eastland

1889

Bell Syste Memorial

Bell Logo History

The Creator of the Bell and AT&T Logos

"The [Bass & Yager] design firm had created the famous bell symbol fc nationwide phone monopoly in the late 1960s. This icon--which achiev remarkable **93 percent recognition rate in the United States** *[emp added]* --aspired to the simplicity and directness of a sans serif letter In 1984, the familiar bell symbol was transferred to the divested " Bells," and Bass & Yager designed a striated sphere for AT&T, aimi signify the corporation's international stature and the ascendance of c communications." - AT&T

"The design development of the AT&T globe symbol began in late with the agreement between AT&T, the U.S. Department of Justice, Federal District Court Judge Harold M. Greene that AT&T would c itself of the 22 Bell Operating telephone companies as of January 1, Initially, the globe symbol was shown in conjunction with the logc "American Bell" to identify an AT&T subsidiary providing ter equipment and enhanced service on a unregulated basis. Later, J Greene ruled that the 'Bell' identification must be assigned exclusive operating companies. Thus, the symbol was joined with the new name logotype 'AT&T' to form the identification signature for the restruc AT&T.

The globe symbol was designed by Saul Bass of Bass/Yager & Associ Literally dozens of symbol concepts were explored. The concepts presented to the highest levels of AT&T management along with the d firm's recommendations as to which concepts should be considere most promising candidate designs. It was from this group that the

Disaster
Western Electric Products (other than telephones)
Bell System Employee Stories
Bell System Property - (Not) For Sale
Bell Logo History
1957 AT&T Annual Report
Trading Post - Bell System stuff wanted, for sale, for trade, etc.
"The Day the Bell System Died"
The Rape of Ma Bell
Life in the Bell System
The Decision to Divest
Bell System Advertisements
Don Lively's Essay and More
Miscellaneous
Retirees Info
Trademarks and Copyrights
Visitors Comments
Dew (Distant Early Warning) Line Project
"Yellow Pages" for old phones and parts

symbol was chosen to become the keynote graphic identification for AT

The globe symbol symbolizes a world circled by elect communications. More specifically, the symbol is made up of very car delineated 'highlight' and 'shadow' elements. As a result, the symbol be reproduced to give the impression of a three-dimensional sphere tl lighted from a distance source." ***From the AT&T Logo History web page (th a neat Bell logo to AT&T logo animation on that page worth viewing as well).***

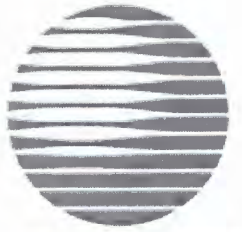
The AT&T Corporate Signature web page (which links to the a mentioned History page) contains detailed information about the n applications, appearance, and standards that should be followed fo AT&T logo/name.

The new AT&T logo (post divestiture) started out with 24 versions a complex set of rules for its proper usage. This became a real proble AT&T to deal with and so in the October 6, 1987 issue of the corp magazine called "FOCUS", they published an article that discusse logo issue with the employees. To view this article click **HERE**.

Later, in about 1999, AT&T decided to use a constant eight lines in the regardless of the size of the logo in printed form.

Bell System

Bell Logo, 1969
Designer: Saul Bass (19201996)
Firm: Bass & Yager



AT&T Logo, 1984
Designer: Saul Bass
Firm: Bass & Yager

CLICK ON A LOGO BELOW FOR FULL SIZE VIEW OF LOGO CHANGES THAT TOOK PLACE DURING THE LIFE THE BELL SYSTEM:

1889
The first Bell logo is adopted.

1900
The second Bell logo is introduced.

1921
The third Bell is institute

1939
The fourth Bell logo is inaugurated.

1964
The fifth Bell logo is installed.

1969
The sixth and Bell logo is un

Along with the modern-day Bell logo, the Bell System also unveile famous yellow/gold and "**process blue**" color stripes in 1969 (simil what you see at the top of this paragraph.) The stripes appeare company vehicles, hard hats, etc. What people think is gold is act "ochre" (their form of yellow/gold) which was developed from a derivati the old gold that was used in the earlier decals. The blue is also ur and both are still manufactured to the original specs. The blue is a fo process blue

Bell was always an innovator, reflective sheeting material was use them on their original 1939 bell decal and on every vehicle ever since, though today. It has been reduced to one white reflective stripe on Ve vehicles but BellSouth still has the famous Bell System stripes on trucks and vans.

The 1969's new look was all about visual communication. Blue was the new symbol of telecommunications (the future) as well as the chan

the Bell logo. The ochre represents a remembrance of the past (notice Blue is atop the ochre) and then there was the gray/green bottom also so the public could recognize the truck as a telephone company vehicle. That color would also carry through to many other company pieces of equipment such as cross boxes, protector housings etc. That was so it would be recognized as telephone company equipment.

By branding all vehicles with the new look was to bring about a friendlier appearance to the company and get away from that military look. Today visual communication has turned to red and black for telecommunications; just look at the many smaller telcos such as Sprint, Cablevision etc.

The above information on the stripes was contributed by John Stallone (ATCA member #3315)

A scan is downloadable/viewable of the AT&T logo changes (similar to above but with the additional change in 1984 of AT&T's logo since the courts prohibited them to use the Bell logo after divestiture.) The original copy I received from AT&T was not of high quality - looked like a copy of a copy of a copy! So there is a lot of distortion in the logo dimensions (some look egg-shaped!). Click HERE to view or download the PDF file or **HERE** to download the GIF file format.

Another scan of a Bell logo history document dating back to sometime between 1939 and 1963 can be viewed **HERE** (thanks to Ross Hamilton).

The Bell symbol History

The Chronology

Reference: http://www.bell-atl.com/bellcom/chron.htm

In Boston, on ***March 10, 1876,*** Alexander Graham Bell transmits the first complete message - "Mr. Watson, come here, I want you!" - with the use of his invention, the telephone.

About two years later during the period from **July 30, 1878 to April 17, 1880**, a series of Massachusetts corporations controlling Mr. Bell's patent rights are organized. Bell Telephone Co., is the first of the corporations and is soon superseded by National Bell Telephone Co., which is replaced with American Bell Telephone Co. These firms supply telephone instruments to Bell-licensed exchange companies across the country. The Bell-licensed exchange companies then rent the telephone instruments to local subscribers.

Then on **March 3, 1885**, the American Telephone and Telegraph Co. (now

known as AT&T) is established as a subsidiary of American Bell Telephone Co. Because the firm connects remote exchanges, it is popularly called the long-distance company.

1889 - First Bell logo.

Alexander Graham Bell's original telephone patents expire during the years **1893 and 1894**. Many independent telephone companies were formed after the expiration of Bell's patents and there is fierce competition for the next 20 years.

On **December 30, 1899**, AT&T succeeds American Bell as the parent of the Bell System. In general, the system's division of labor is as follows: AT&T provides overall support and direction for the other companies in the Bell System, its Long Lines Department manages long-distance service, Bell Telephone Laboratories (formed in 1925) conducts research and development, Western Electric Co. manufactures communications equipment and the Bell operation companies provide local telephone service.

1900 - Second Bell logo.

The Interstate Commerce Commission (ICC) assumes jurisdiction over interstate telephone companies on **June 18, 1910**.

The U.S. Department of Justice files an antitrust suit against AT&T on **July 24, 1913**. The complaint charges AT&T with conspiracy to monopolize and restrain trade in the northwestern states of the USA. Then later that year on **December 19th**, AT&T Vice President Nathan Kingsbury agrees to provide long-distance connection of Bell System lines to independent phone companies in a letter to the U.S. attorney general. He further agrees not to purchase competing independent without prior ICC approval. This letter is commonly known and the "Kingsbury Commitment". A consent decree ends the antitrust suit against AT&T on **March 26, 1914**.

The U.S. government runs the telephone system during the only time in American history from **July 1, 1918 to June 30, 1919**. The postmaster general serves, in effect, was a super-chief executive officer, although Bell System personnel handle daily operation.

1921 - Third Bell logo.

The first broadcast of a football game (University of Chicago v. Princeton) is sent in **October of 1922** over telephone wire from Chicago to New York City.

President Franklin D. Roosevelt signs the Communications Act on **June 19, 1934**. The law places interstate telephone business under the regulation of the newly formed Federal Communications Commission (FCC).

1939 - Fourth Bell logo.

The U.S. Department of Justice files suit against AT&T on **January 14, 1949**, charging that it conspired with Western Electric to monopolize trade in telephone equipment. The lawsuit attempts to separate the Bell System's manufacturing arm from its research and operating functions.

Over two and one third trillion - 2,300,000,000,000 - telephone calls go through Bell Systems central offices from **1950 to 1975**.

A consent decree on **January 24, 1956** bars AT&T from engaging in unregulated businesses, brings to a close the Justice Department's antitrust suit against the company. Western Electric remains AT&T's largest single subsidiary.

1964 - Fifth Bell logo.

The FCC reaches its Carterfone decision on **June 26, 1968**. Carter Electronics of Dallas sought to interconnect its two-way radios with the nationwide phone system. The ruling strikes down interstate tariffs that prohibit attachment or connection of non-Bell System communications equipment to the public network. And it opens the way for competition in the customer-owned equipment market.

1969 - The sixth and current Bell logo.

On **August 13, 1969** the FCC approves the application of Microwave Communications, Inc. (MCI) to build a private line microwave communications system between Chicago and St. Louis. The action ultimately stimulates full competition in the long-distance phone business.

In **1971**, Illinois Bell introduces Call Waiting, Three-Way Calling, Call Forwarding, and Speed Calling.

The Justice Department files a final antitrust suit against AT&T on **November 20, 1974**, charging monopolization of the telecommunications service and equipment markets.

In **May of 1977**, the test of the world's first network application of fiber optics begins in Chicago. The test proves that customer calls can be transmitted using light waves.

On **January 8, 1982** [webmaster's note: I believe there is an error on the bell.com website which states the month and date as **August 8**] a federal court approves a consent decree breaking up the Bell System into local and long-distance telephone companies. AT&T agrees to divest itself of all Bell operating companies. The issue of which companies would retain rights to the Bell mark and logo is later decided in favor of Cincinnati Bell, Southern New England Telephone Co. (SNET) and the new holding companies, also called Regional Bell Operating Companies (RBOCs).

The Bell System came to an end on **January 1, 1984**. As a result of divestiture, the seven RBOCs - Ameritech, Bell Atlantic, BellSouth, NYNEX, Pacific Telesis Group, Southwestern Bell Corp. and US West - become the parents of 22 local Bell companies. Cincinnati Bell and SNET, which were not wholly-owned subsidiaries of AT&T, carry on as distinct firms. 1984 coverage map.

President Clinton signs the **Telecommunications Act of 1996 on February 8th**. The law calls for the opening of local and long-distance telephone and cable television markets to full competition. [Webmaster's note: This 1996 law has probably done more harm to the consumer and the telecommunications industry than the breakup of the Bell System]

A scan of the old Southern Bell logo can be viewed/downloaded by clicking HERE.

The AT&T Long Lines Department was responsible for connecting the local Bell companies together to provide long distance telephone communication between each Bell company. Here are two logos representing the time period between 1939 and 1963 and the time period after 1969. The one on the left was derived from an original scan by Reynolds Hedland and the one on the right was scanned by Bill Lynam:

Click on image above for full-size view

Bellcore

We've changed our name...

recently became...

An SAIC Company

Telcordia™ Technologies

Performance from Experience

(click on image above to view full-page advertisement for the Yellow Pages)

recently became...

GET AN IDEA.™

American Bell
Advanced Information Systems
899-0170

American Bell was a trial subsidiary of AT&T in 1984 but did not last six months! Thanks to Ted Kowalik for this logo and information. This was scanned from a very small notepad page which had the logo in the upper right-hand corner so the image quality is not as good as it could be if the original were larger.

Western Electric

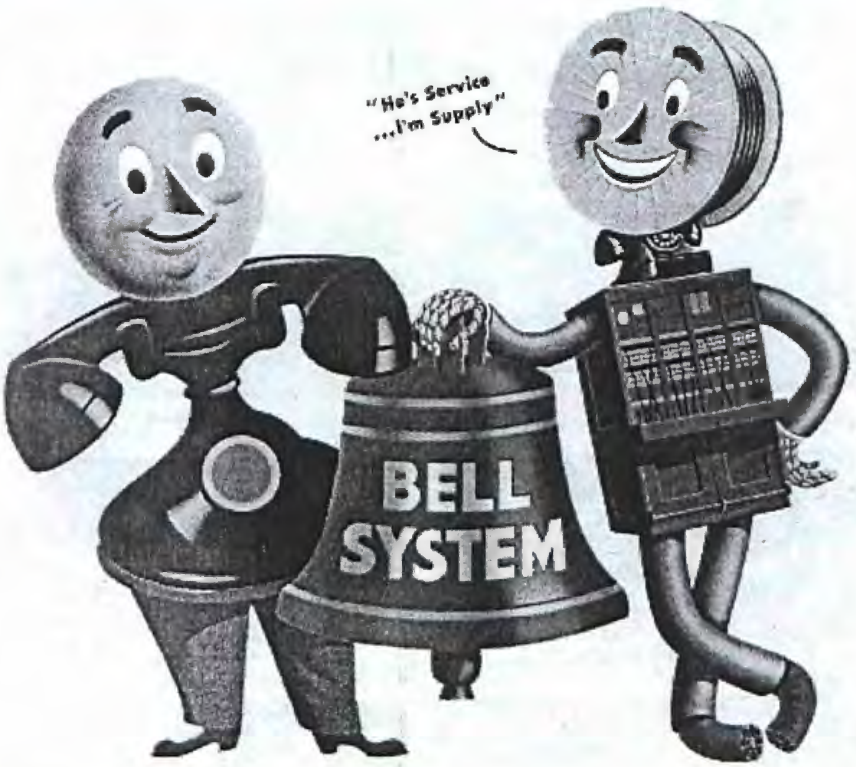
Click image above to see enlarged view

Bell Canada's Logo

What does this current Bell Canada logo design mean? The following explanation is from their web page.

"A visual and distinct design that captures who we are as an organization in a single accessible image. The Bell logo is composed of a human profile, representing not only the human side of our company but the very heart of all our efforts: the customer. The profile, turned toward the future, is surrounded by two open rings, symbolizing the dynamic future of global communications."

A history of the Bell Canada logo can be found on their website by clicking HERE.



For a great assortment of PORCELAIN TELEPHONE SIGNS, see Tom Vaughn's web site at: http://www.pcpages.com/phoneman/signpage.htm

T. N. Vail Archives

Records 5 through 5 of 7 returned.

Author: Paine, Albert Bigelow, 1861-1937, addressee.
Title: Letters to Albert Bigelow Paine, 1875-1934 (bulk 1891-1934).
Description: 2,083 pieces.
28 boxes.
Notes: Albert Bigelow Paine (1861-1937) was an American editor and author. He established and directed the Combined Press, edited the children's page of the New York Sunday Herald and the League Department of St. Nicholas Magazine, and was reader and solicitor general for the Henry Altemus Company. Designated by Mark Twain as his official biographer, Paine wrote a three volume biography of Twain which was considered the finest work of its kind in his day.
The collection consists almost entirely of letters addressed to Paine (there are only nine letters by Paine himself). The correspondence provides a picture of the literary and newspaper field of Paine's time. In addition to Paine's professional correspondence, there are also family letters in the collection.
Persons in the collection represented by ten or more pieces include: Josephine Dodge Daskam Bacon, George Fisher Baker, John Kendrick Bangs, Daniel Carter Beard, John Bennett, Carsten Egeberg Borchgrevink, Edward Breck, David MacGregor Cheney, William Fayal Clarke, Richard Harding Davis, Mary Eleanor Wilkins Freeman, Charles Harvey Genung, Arthur Colfax Grissom, Ewing Herbert, Edward Mandell House, Mildred Howells, William Dean Howells, Alfred Henry Lewis, John Luther Long, Orson Lowell, Louise Kirby Paine Benjamin Moore, Tom P. Morgan, Sarah Edwards Nast, Frederick Burr Opper, Bradley S. Osbon, Samuel Esterbrook Paine, Bernard J. Rosenmeyer, Joshua Slocum, Pamela Colman Smith, Julian Street, Ruth McEnery Stuart, Sophie Miriam Swett, Mary Virginia Hawes Terhune (Marion Harland), Frank Ver Beck, Eugene Fitch Ware, William Allen White, and Caspar Whitney.
Other persons represented in the collection include: Irving Bacheller, John Kendrick Bangs, Edward William Bok, James Bryce, Andrew Carnegie, Mary Hallock Foote, Helen Keller, Dora Paine, John Russell Pope, Margaret Elizabeth Munson Sangster, Upton Sinclair, Charles Warren Stoddard, Mark Twain (copies only - no originals), and Theodore Newton Vail.
American Autograph Shop, Purchase, 1938.
Parke-Bernet sale, Purchase, 3/17/1945.
Cyril Clemens, Gift, 5/27/1980.
Unpublished finding aid available in repository.
Guide to literary manuscripts in the Huntington Library (San Marino, Calif. : H. E. Huntington Library and Art Gallery, 1979)

for copy contact Sue Hodson, curator shodsn@huntington.org

finding aid requested 3/8

Subjects: Paine, Albert Bigelow, 1861-1937.
Paine, Albert Bigelow, 1861-1937, addressee.
Combined Press.
St. Nicholas (New York, N.Y)
Authors, American -- 19th century -- Correspondence.
Authors, American -- 20th century -- Correspondence.
Periodical editors -- United States -- Correspondence.
Letters (correspondence) -- United States. aat
1875-1934.
1934.
Other authors: Bacheller, Irving, 1859-1950.
Bacon, Josephine Dodge Daskam, 1876-1961.

Baker, George F. (George Fisher), 1840-1931.
Bangs, John Kendrick, 1862-1922.
Beard, Daniel Carter, 1850-1941.
Bennett, John, 1865-1956.
Bok, Edward William, 1863-1930.
Borchgrevink, C. E. (Carsten Egebert), 1864-1934.
Breck, Edward, 1861-1929.
Bryce, James Bryce, Viscount, 1838-1922.
Carnegie, Andrew, 1835-1919.
Cheney, David MacGregor.
Clarke, William Fayal.
Davis, Richard Harding, 1864-1916.
Foote, Mary Hallock, 1847-1938.
Freeman, Mary Eleanor Wilkins, 1852-1930.
Genung, Charles Harvey.
Grissom, Arthur C. (Arthur Colfax), 1869?-1901.
Harland, Marion, 1830-1922.
Herbert, Ewing.
House, Edward Mandell, 1858-1938.
Howells, Mildred, b. 1872.
Howells, William Dean, 1837-1920.
Keller, Helen, 1880-1968.
Lewis, Alfred Henry, 1857-1914.
Long, John Luther, 1861-1927.
Lowell, Orson.
Moore, Louise Kirby Paine Benjamin.
Morgan, Tom P.
Nast, Sarah Edwards.
Opper, Frederick Burr, 1857-1937.
Osbon, B. S. (Bradley Sillick), 1827-1912.
Paine, Dora.
Paine, Samuel Esterbrook.
Pope, John Russell, 1874-1937.
Reid, Whitelaw, 1837-1912.
Rosenmeyer, Bernard J.
Sangster, Margaret Elizabeth Munson, 1838-1912.
Sinclair, Upton, 1878-1968.
Slocum, Joshua, b. 1844.
Smith, Pamela Colman.
Stoddard, Charles Warren, 1843-1909.
Street, Julian, 1879-1947.
Stuart, Ruth McEnery, 1856-1917.
Swett, Sophie, 1858-1912.
Twain, Mark, 1835-1910.
Vail, Theodore Newton, 1845-1920.
Ver Beck, Frank, 1858-1933.
Ware, Eugene Fitch, 1841-1911.
White, William Allen, 1868-1944.
Whitney, Caspar, 1862-1929.

626-405-2100

Location: Huntington Library Manuscripts Dept. 1151 Oxford Road, San Marino, CA 91108.
CSmH mssAP 1-2083
Control No.: CSHV01-A4

Tagged display | Previous Record | Next Record | Brief Record Display | New Search

Records 7 through 7 of 7 returned.

Author: Vail, Theodore N., 1845-1920.
Title: Papers, 1962.
Description: 0.1 c.f. (1 folder)
Notes: Brief biography and anecdotes concerning a former president of the American Telephone & Telegraph Co. (1907-1920).
Presented by Arthur A. Marsten, New York, N.Y., 1962.
Subjects: American Telephone and Telegraph Company.
Humor in business.
Manuscript collection. local
Location: State Historical Society of Wisconsin. Archives Division. 816 State Street, Madison, Wis. 53706.
MAD 3M/23/I2
WHi U.S. Mss 8AF/29
Control No.: WIHVV100-A

608-264-6460

Tagged display | Previous Record | Brief Record Display | New Search

This display was generated by the CNIDR Web-Z39.50 gateway, version 1.08, with Library of Congress Modifications.

Vail Genealogy 4 page bio

2 pg letter to WHi Society for Arthur Marstens for NY

letter 21 March 1962 + bio = not signed or dated

6 pages total - askarchives@wisconsinhistory.org

refer to T Vail papers

8AF = call #

returns.[13] One of the institutions crucial to this new strategy was the industrial laboratory, but the structural and ideological components of the new approach were much broader than the lab.[14] They involved all of the operating companies. The Western Electric Company—Bell's manufacturing subsidiary—played a central role in this transformation. Together these organizations and ideas gave the Bell System a momentum that would last long after Theodore Vail had retired as AT&T's president in 1919.[15]

Two Modes of Innovation

In spite of Vail's extensive experience in telephony, neither the new ideology nor the new institutions emerged full grown in 1907. They developed slowly, shaped by circumstances inside and outside AT&T—first by the fact that the Bell empire was tottering. The costs of rapid expansion had been too high, the returns too low to continue on that course over the long term. Vail began immediately to cut costs.[16] He abandoned the effort to occupy the entire field of telephony, promoting instead a selective policy of expansion and consolidation that would leave to Bell-connected independents the task of developing many of the country's less lucrative rural and semi-rural areas. These independents were for the first time given the opportunity to buy Bell telephones and

[13] In this regard the business strategy was similar to the ideology of the modern academic professions, all of which assume that progress in the development of their particular body of knowledge will continue forever. The spirit of this ideology was later captured by Vannevar Bush in his famous report, "Science: The Endless Frontier" (U.S. Office of Scientific Research and Development, 1945).

[14] The development of the industrial laboratories in the Bell System is described and analyzed in Leonard S. Reich's excellent book, *The Making of American Industrial Research: Science and Business at GE and Bell, 1876–1926* (New York, 1985).

[15] The idea of technological momentum is discussed in Thomas P. Hughes, *Networks of Power: Electrification in Western Society, 1880–1930* (Baltimore, Md., 1983).

[16] See, for instance, Reich, *Making of American Industrial Research*, 151–52. Reich emphasizes more than I do the role of J. P. Morgan in directing the reorientation of AT&T. Vail was clearly Morgan's choice to run AT&T, and during the fiscal crisis that accompanied the change in leadership, Vail stayed in close touch with Morgan. The records in AT&T's archives suggest, however, that Morgan's input was general rather than specific, transitory rather than lasting. In part, this outcome was no doubt a result of the decisive manner in which Vail took hold of the Bell System. On the Vail-Morgan ties, see the following letters from Theodore N. Vail: to John I. Waterbury, 18 July, 13 Aug. 1907; to J. P. Morgan, 11 Nov. 1907, with enclosure; to Charles Steele, 19 Nov. 1907; to Robert Winsor, 12 March 1908; to Messrs. J. S. Morgan & Co., 12 March 1908; to Charles W. Amory, 19 March 1909, with accompanying list. I could not find in the AT&T Archives the letter from Morgan to Vail that Reich cites on p. 151.

industry and fostered intense price competition and rapid expansion. Bell licensees had slightly more than 300,000 phones in use in 1895; ten years later the figure was 2,284,587. Vail missed the early years of competition, having left the Bell enterprise in 1887 to promote his fortune in a number of other ventures.[9] Out of the country much of the time, he lost contact with the industry. By the time he returned to AT&T, first as a director and then as the firm's president, telephony had experienced a dramatic change. About half of the telephones in service were supplied by independents—that is, non-Bell companies.

In an effort to meet this competition, AT&T (now the central holding company for the entire System; see Fig. 2) had overextended itself financially without, however, having succeeded either in blocking the progress of the independents or in maintaining a particularly high quality of service.[10] The struggle against the independents had further tarnished the Bell System's public reputation and weakened its political position (which was already precarious insofar as federal antitrust policy was concerned). In 1907, when AT&T was unable to sell its bonds, a J. P. Morgan–led banking group took control of the company and gave Vail the task of putting the Bell System back on its feet. Vail was thus under considerable pressure to develop a new firm strategy.

The Vail Strategy

Two of the three major elements in that strategy are well documented and understood. Under Vail's forceful and intense leadership, AT&T gradually strengthened its position in its two primary markets: those for local and for long-distance telephone service. Along the way, the firm's manufacturing subsidiary became the dominant producer of telephone equipment in the United States. Initially, this drive for monopoly (or as Vail often put it, "control") came at the price of a further weakening of AT&T's political position, but Vail made peace with most of the public officials who

[9] Vail seems to have left Bell under unpleasant circumstances. He had apparently objected vigorously to what he thought was the short-sighted business strategy of the Boston investors who then controlled the System. Brooks, *Telephone*, 84–85.

[10] On the competitive era, see Federal Communications Commission, *Investigation of the Telephone Industry in the United States* (Washington, D.C., 1939), part 1, 129–46; and Brock, *The Telecommunications Industry*, 109–25. Vail's presidency marked the end of the dominance of the Boston investors in the Bell enterprise.

C
O
P
Y

~~Sept 1910~~

July 1, 1901 ±

T. N. VAIL - "Copy of his views on the general policy which should govern the Company, etc., etc., - as written to Gov. Crane about the time Mr. Fish became President."*

Fish - president A.T.&T. July 1901 - April 1907

1. Consolidation - of prins of ATT p3
2. Financial certainty p5
3. Information for mgt p7
4. Strategy against competition p8

*This note is pencilled on the covering sheet to Mr. Vail's memorandum - exact date not noted.

These views on the general policy which should govern the company I recognize are, for the most part, plans which have been discussed and recognized by all who have devoted thought and attention to the business, -- all that is new arises from the new conditions.

The policy of short-term licenses for small territories was found best for the development of the business, the policy of consolidating the small exchanges and connecting them by the extra-territorial lines was the natural sequence.

The financial policy of the company has been recognized as deficient from the time when the financial requirements of the company first covered extensive subscriptions to the stocks of the licensed companies, and the construction of extensive systems of lines.

The existing hand-to-mouth policy results wholly from a dread that the managers of the company had of acknowledging either to themselves or to the Public, the full requirements of the business, and the responsibilities of the company for these requirements. The results have been unfavourable to the business. There has also followed a lot of surprises in the raising of new money which have affected the prices of our shares, sometimes favourably, and sometimes unfavourably. This, while it may be good for the speculator, is bad for the investor. It is the investor that we want with us. To get the investor, the Public should have been so educated and informed that they would have recognized that an increase of $100,000,000 in our authorized

stock was needed in the business in the immediate future, and was not to be used in the acquisition of any other company.

The knowledge that $250,000,000 would be required in the natural development of our business in the next five years, coupled with the fact that it would be used in the necessary and legitimate extension of the business, and that it would all be revenue producing would not affect the shares of the company half so unfavourably as an unexpected issue of $10,000,000, each year.

Many things that are important and necessary have been and are postponed until further postponement is absolutely impossible, or are abandoned, to the real detriment of the company's interest, for fear of some unfavourable temporary results.

All this is wrong. If unfavourable results temporarily follow a necessary action, the sooner the action is taken, as a rule, the less unfavourable will be the permanent result.

If postponement avoids the necessity, it only shows an error in judgment, as to the supposed necessary action, and this should not occur often.

Another thing -- a hobby of mine -- is the more rapid extension of the toll-line business.

This has hardly been done to keep up with the demands, and new facilities would always create new demands. By extension, I mean not only the duplication of existing facilities, but also, the extension into new fields. Wherever there is a daily mail, there should be a toll-line, and even beyond this.

The time is coming, and very rapidly, when the exchanges, with few exceptions, will do little more than pay expenses of operation, including the connecting and operating of the toll-lines. The toll-lines revenue will make the dividends.

Of course, above all, is the necessity of our keeping always a thoroughly-organized and efficient administration, which can and will handle all questions with the utmost promptness possible, consistent with proper consideration.

(1) CONSOLIDATION

All the Bell Telephone interests should be as soon as possible consolidated into an operating company.

Fully one-half of all the thought, effort, and work, and more than one-half of all the differences and irritation connected with the business is the result of present conditions, -- conditions which were absolutely necessary in the origin and development of the business, but which have been outgrown.

Consolidation would eliminate all questions as to rentals, relations between sub-companies, and relations between sub-companies and the Company, -- all the irritation arising from honest differences of opinion as to rights, traffics, etcetera.

Consolidation was one of the principal purposes for which the A. T. & T. Co. was organized. Consolidation would render the actual operation of the business much more simple, as, with proper organization, there would be one central authority with its direct lines of representation and responsibility, from the centre to the very furthest limits of the business.

Consolidation would systematize and harmonize and simplify all the executive and administrative acts.

The Public would have but one company to deal with, for all classes of business, no matter how extended.

In fact, there are so many advantages, and they are, in view of modern methods, so very well recognized, that it is hardly worth while to enumerate them.

The difficulties of the Consolidation are more apparent than real.

That plan which it was originally intended to follow is probably the simplest, especially as the merger of the A. T. & T. Co. and the American Bell, -- the first contemplated step, -- is already taken.

Have a proper appraisement of all the various companies made by a committee of the Board, or other tribunal constituted by the Board, aided by experts from every department of the business.

This appraisement should take into consideration the present earnings and future prospects of the property, franchises, licenses, rights of way, etc., with regard to their value to the business, physical conditions, restrictions, limitations, encumbrances, difficulties of duplication or paralelling, -- in fact, everything which adds to or takes from the value of any of them for the business for which it is intended and used. When this is done, offer an exchange of the Company's stock for the Sub-Companies' stocks, on the basis of ascertained value, and let the holders accept or not, as they choose. The advantage of one central

security with a broad market, such as will come, and the absolute impossibility of any attempt to obtain better terms would soon bring in enough to enable the local companies to be either liquidated or merged for all operating purposes.

All telephone securities suffer in the general market from the miscellaneous variety and the difficulty of recognizing the particular ones, and the lack of real knowledge about all. The consequence is, that each particular security, not excepting the securities of the Company, have a local, and in most cases, a very narrow market.

The merging of all the different companies with one set of securities would, without doubt, change for the better all the conditions affecting telephonic investments, while it would not appreciably increase the burden of the Company.

(2) INCREASE OF BUSINESS & FINANCIAL POLICIES.

The expansion of the business must increase each year, there being two sources contributing, one, the national growth and more general use; the other, the introduction of new features. The Company must not only take care of this increasing growth, but a much wiser policy would be to anticipate it, for in the past, no anticipations have equalled the results.

The worst of the opposition has come from the lack of facilities afforded by our companies, -- that is, either no service, or poor service. For this, circumstances beyond control are to a great extent responsible, as it was, in the early days, very difficult to provide money.

To meet these increasing demands, increasing amounts of money will be needed each year. A low estimate for the next five years would be $200,000,000, -- every probability points to a larger sum.

These demands necessitate a broad financial policy covering a period of no less than five years. The Public should be informed of and educated up to these requirements as part of the policy.

Without a policy, the securities of the Company will be at the mercy of every rumour, and without it, they will never command the position in the market to which they are entitled. Considering the surplus revenue of the Company, the actual value of the property owned and controlled, and the prospective earning capacity, it should be possible to provide this money at a minimum rate.

It would be manifestly unfair to the present stock-holder to reduce the dividends which they have been getting and which they have been led to believe would continue.

As the price at which any security can be issued depends on the surplus after its requirements and its permanency as an investment, it would seem as if the most practical method would be to provide for equal amounts of debenture, preferred stock and ordinary stock.

This would, without increasing the ordinary stock, enable the Company to provide for a very considerable period, all the required money at a minimum rate, -- say, not exceeding four and five percent.

This plan would also maintain the present dividend and value of the existing stock, with probably increasing surplus.

Admitting that there are objections to making any preferences, these objections are more than offset by the impossibility of indefinitely so investing new money as to meet the present rate of dividend, or if that were possible, by the fact that the saving in rate paid for new money would largely increase the surplus over the present ordinary stock.

It is, however, very probable that the expansion of the business, the necessary concessions to the Public, and to the employees, the increasing corporate and other restrictions will tend to reduce by degrees the margin between revenue and expenses, making necessary all the savings in every direction which are possible.

And finally, the policy of the Company should be -- Anticipation of and preparation for business to come, rather than providing for business which is forcing itself upon it.

The Company, having a tendency toward and desire for a monopoly, should be abundantly prepared to assume the obligations, and discharge the responsibilities of its position.

(3) INFORMATION.

There no doubt exist the most complete and detailed statistics of the business, such as will give the fullest information as to the lines, property, condition, etc., not only of our own Company and Sub-Companies, but of the Opposition.

These should be made available for the quick and easy reference and study of the Board of Directors, and all those who have to do with forming and directing the general policy and business of the Company.

No policy nor business can be properly discussed or decided, unless each participant in the discussion not only has the information, but also, has it in shape that admits of ready study and comperison; therefore, all this information should be tabulated, diagramed, mapped, in a simple and complete form, all deficiencies supplied, and the whole corrected at least, quarterly. To do this, a small but efficient permanent force would be needed. The advantage following would be almost inestimable.

(4) ORGANIZATION OF OPPOSITION.

Much has been done, and is being done in respect to overcoming the "Opposition", but in spite of it, the Opposition has increased, not, in all cases, as fast as our companies, but sufficiently to demonstrate that in spite of theories, it has come to stay, and must be respected and considered in the general policy of our business.

Such things have been known as the weaker opposition absorbing the stronger original.

The original Bell Company, in spite of the wealth, prestige, position and power of the Western Union at that time, and without any aid from the patent holding, succeeded in getting possession of the telephonic field.

With the growth of opposition, will come, in fact, has come, to a certain extent, connection, cooperation, consolidation or absorption with or by each other. Steps should be taken at once to anticipate and prevent any further work in that direction. Doubtless, different methods will be necessary in different sections, but generally, steps should be taken to control absolutely important central positions, to consolidate in the interests of our own Company sections which naturally gravitate to each other, either by an independent organization, representing toll or connecting lines wholly in our interests; or one with natural affiliations, working in harmony with our Company, either with or without an understanding. In all these cases, care should be taken that a maximum of control be obtained by a minimum of concession.

There are many difficulties in the way, there are none however, which prompt, intelligent action, based on a full knowledge and consideration of all the conditions cannot overcome.

Doubtless, all this would temporarily strengthen the opposition, but the disadvantage would be more than offset by the future advantages derived from even an indirect control of all opposition, or at the least, by the absolute block to any extensive concerted action on the part of the opposition.

would you

... to

At written to ...

about the time Mr Peck ...

...ached papers are securi...

...ure - to go to Mr Thayer later - on which the following type written memo appears."

"This was written and sent to Mr.
"McLrane (Crane?) about the time Mr Fish
"was made President. I also wrote a letter
"much on the same line to Mr Coolidge. Possibly
" he has a copy of this letter. T. N. Vail "

Recd Nov 1923

at JHU; what has he done?
what resources do they have / Tom thinks he may be keeper of some archives
did a lot of work on history of AT+T + breakup
get together w/ him?

Louis Galambos

Louis Galambos is Professor of Economic and Business History; Editor, The Papers of Dwight David Eisenhower; and Co-Director of the Institute for Applied Economics and the Study of Business Enterprise at Johns Hopkins University. He has taught at Rice University, Rutgers University, and Yale University and has served as President of the Business History Conference and the Economic History Association. A former editor of The Journal of Economic History, he has written extensively on U.S. business history, on business-government relations, on the economic aspects of modern institutional development in America, and on the rise of the bureaucratic state. His books include Competition and Cooperation: The Emergence of a Modern Trade Association; The Public Image of Big Business in America, 1880-1940; America at Middle Age; The Rise of the Corporate Commonwealth; The Fall of the Bell System; Networks of Innovation: Anytime, Anywhere: Entrepreneurship and the Creation of a Wireless World; Medicine, Science, and Merck; and The Moral Corporation. He is president of the Business History Group, a consulting organization, and has been an historical consultant to Merck & Co., Inc., Pacific Telesis Group, AT&T, and the World Bank Group.

In addition to editing The Papers of Dwight David Eisenhower, Galambos has edited (with Robert Gallman) the Cambridge University Press series Studies in Economic History and Policy: The United States in the Twentieth Century. He is currently co-editor (with Geoffrey Jones) of the Cambridge Studies in the Emergence of Global Enterprise and (with Franco Amatori) Comparative Perspectives in Business History.

In recent years Galambos's major interest has been the process of innovation and its links to the growth of large-scale organizations, professional institutions, and new government programs in the twentieth century. He began this line of inquiry in his analysis of the Bell System and is continuing his research and writing on this subject in a series of studies of the pharmaceutical firm Merck & Co., Inc. His recent publications include: "The U.S. Corporate Economy in the Twentieth Century," in vol. 3 of The Cambridge Economic History of the United States; and "The Monopoly Enigma, the Reagan Administration's Antitrust Experiment, and the Global Economy," in Constructing Corporate America.

Professor Galambos, who has an A.B. from Indiana University and a Ph.D. from Yale University, is a former Senior Fellow of the National Endowment for the Humanities. He was a Business History Fellow at Harvard University's Graduate School of Business Administration and a Fellow at the Smithsonian's Woodrow Wilson Center and later at the Shelby Cullom Davis Center for Historical Studies at Princeton University. He has recently held the Maguire Chair in American History and Ethics at the Library of Congress.

AT+T