THE ECONOMIC CLUB OF NEW YORK

EIGHTY-SIXTH MEETING

TUESDAY EVENING, NOVEMBER 27th, 1928

HOTEL ASTOR.

MR. ELY: At the last moment Governor Miller, to his great regret, was summoned out of town by a call of professional duty which he found it impossible to gainsay. But in his absence, much as we regret it, we are most fortunate in having one of our vice-presidents, General Harbord, who will preside, and whom it now gives me great pleasure to present to you (applause).

GENERAL HARBORD: Gentlemen of the Economic Club; I share your regret at Governor Miller's inability to be here, and I predict that before the evening is over you will be even sorrier about it than you are now. But nobody could possibly miss him as much as I expect to (laughter).

The subject for discussion this evening is "The New Age of Radio". None of the technical products of this electrical age has wider applications or deeper significance to our industrial, educational and cultural life than the radio. Within the last fifteen years a system of wireless has made of the world a vast communications unit, indestructible by agencies of war

or even by the accidents of peace.

The far-sighted vision of American industry, cooperating with the experts, has made of the United States, and of this particular city, the hub of a great world-wide system of wireless. Our leadership can be challenged only by the great mergers of wires and wireless taking place abroad, to which our laws prevent us from making the only reply that would be effective.

There is no passenger ship which sails the seas these days without being bound to the distant shore by invisible strands of communication. In ten million homes radio is giving a daily service of music, entertainment and news through near or distant broadcast stations. An industry amounting already to approximately $500,000,000 annually has been created to provide the agencies for the reception of radio in the home. The progress of acoustics and other electrical improvements has challenged -- revolutionized, indeed -- the phonograph industry. The electrical reproduction and recording has made an entirely new type of talking machine.

So, too, the progress extends to the motion picture industry and we have now the synchronization of sound and sight on the same motion picture screen.

All of these things have required tremendous organization, the record of which has been written so anyone who will may read it. It has meant the charting of new channels of approach to the home. It has meant the call for a new kind of public service, the creation of new combinations, of very great initiative in the matter of public entertainment. Nor has the destiny of radio yet been fulfilled.

We are fast approaching the era of transmission of sight by radio. This, in its turn, will call for other agencies and new combinations. It is not strange that in such an industry as this, and in such an era as this, that it has been inspiring to all of those men who have had a part in it.

The first speaker of the evening is a native of Kentucky; educated in Indiana and in Germany; a graduate of Purdue University, member of the American Institute of Electrical Engineers, one of the original radio commissioners appointed from this Northeastern area by the President at the initiation of the Radio Commission. Last Winter, last March in fact, in an address which I had the honor to deliver before one of the clubs of this City, I made this expression:

"When Congress finally created the Federal Radio Commission it found a state of chaos in the air which most emphatically testified to the timeliness of such Legislative action. The Commission itself, working unpaid, with no staff, technical or otherwise, and with the certainty of its efficiency being cursed by those whose pernicious radio activities have so long gone unfettered, deserves the esteem and respect of all the understanding public who have, through its efforts, enjoyed nightly programs of high merit and constantly increasing quality. Republics are undemonstrative in their gratitude. Some have even doubted if they have it. But it is high time that someone pinned a rose on the Federal Radio Commission."

Since that time when I pinned the rose on the Federal Radio Commission there have been some who probably have been inclined to substitute a cabbage for the rose.

We have with us a commissioner, this evening; he is a New Yorker; he is in his home town and he is among friends. I introduce to you Commissioner Caldwell (applause).

HON. O. H. CALDWELL: Mr. Chairman and Gentlemen; your committee on arrangements asked me to define the necessity for the Federal Radio Commission and to describe its functions.

The Federal Radio Commission, let me explain, has been a sort of combination riot squad, fire department and traffic cop of the other. We were summoned to Washington by President Coolidge in March, 1927, to put out the conflagration then raging in the broadcasting band, as General Harbord has told you, and to suppress the anarchy which broke out with the failure of the 1912 Radio Law.

So we grabbed our grips, we kissed our wives a temporary goodby and we went to Washington confidently expecting that in three to six months the troubles would all be over and we would be back in the vocations of peace. But already months have dragged into years, and the radio warfare still seems to be going on, being merely transferred to some new front. Indeed, as I inspect some of the comments and cartoons referred to by the General in the press the past two weeks, and read some of the letters which probably burned holes in the mail bags on their way to the Commission's office, it

would almost appear that the conflagration has broken out all over again. The Radio Commission does get a lot of letters from the appreciative public. One writer in commenting on the reallocation, Mr. Roxy, wrote us, "Before the November 11th change I used to get only one station at a time. Now since reallocation I find I can get two stations at every point on my dial (laughter). Many thanks for your splendid work (laughter)."

We wrote back to the gentleman, General Harbord, and told him to buy a new radio set, for the new radio sets, designed by some of the experts who are here tonight, are extremely selective. For example, using one of these latest sets I understand that if you are listening to a banjo and mandolin duet, the set is so selective that you can tune in on the banjo and tune out the mandolin (laughter).

But, confidently, I can report to you tonight that I believe that the riot is now suppressed, that the fire is about out, and, except in Brooklyn, that the chalk lines are once more painted neatly on the ether pavement. And from this time on the Commission's only cares, except for a few lawsuits, injunctions, appeals, and threats by the Chicago gunmen, will simply be to

exercise our function as traffic cop, to magnificently wave the white gloved hand, and to steer traffic down one ether lane and up the other.

Tonight you will hear about some of the miracles ahead in radio, and you will hear them directly from the lips of several of the real miracle workers in radio. In the presence of these true prophets, prophets of an art where prophecy materialized over-night, I think a Radio Commissioner who is honest with himself must feel very humble. For these radio miracle men are builders, creators, and pace-makers, and sometimes, alas, I fear that the Radio Commission is merely the police officer on the motorcycle who slows down progress to twenty miles an hour. Certainly, here in radio is one place where sympathetic cooperation on the part of the supervising governmental authority is of the greatest importance to the public interest in the long run. I believe we must encourage and not hamper the great developments these gentlemen are conceiving and carrying out. Certainly, no public official will be carrying out his public duty if he puts obstacles in the path of progress.

So, leaving the future to later speakers,

perhaps I can best serve this audience, by outlining to you the radio picture of the present, tell you something about the radio art today in its existing applications that come under government regulation.

Let us start with your own home radio set. As you turn your dial back and forth you tune in different broadcasting stations. But now suppose you turn it to the right, past WEAF, on past WNYC -- finally you come to a dead stop.

What is beyond that barrier?

If your home set could tune further in that direction, you would find yourself listening to airplanes communicating with their ground stations; then would come ships calling each other at sea, even perhaps a faint S.O.S., and radio compasses, airplane beacons, and other aids to navigation. Then turn the dial further and you would listen in on the great trans-Atlantic circuits communicating with Europe, and also the trans-Atlantic telephone conversations linking New York with London and Paris. These are all the so-called "long waves" -- beyond the WNYC end of your dial.

Now turn back your imaginary dial (for no single radio set will actually listen to all these widely

different wavelengths), once more swing down through the broadcast band -- way down -- down past WHAP, and the warring Brooklyn stations, and WWRL, and you enter the unclaimed stretches of the "short-waves". Here is a new wide field for which a variety of commercial applicants are now contending. Once the playground of the amateur only, some of the most valuable parcels of the whole radio spectrum are now believed to be numbered among these short-waves or high frequencies. Television, when it comes, will probably be quartered here. Some of these short-waves are transoceanic in reach, and are wanted by the regular communication companies, by newspaper services, and others. Some are most suitable for shorter distances, and are in demand by a host of public-service and private interests. The simple if paradoxical rule to remember here is that while the shorter waves work best over longer distances, the longer short waves are good for the shorter distances. Telegraph companies, railroads, bus lines, airplane corporations, movie producers, oil-well prospectors, navigation companies, farm cooperatives, mining industries, lumber people, have all appeared before the Commission applying for channels in this short-wave field.

While no licenses have yet been granted in the short-wave region, except to trans-oceanic companies and to the amateurs and experimenters, the Commission will shortly take up the licensing of some five hundred channels in this new field. These short-wave assignments will be in addition to the existing station licenses on other frequencies now in force under the Commission's authority, for we have, already licensed, operations on all the various waves of the spectrum:

600 Broadcasting stations
2166 Ships
65 Shore-to-ship stations
85 Transoceanic stations
280 Point-to-point, Continental
17000 Amateurs
203 Experimental
31 Trade and technical schools

Thus it will be apparent that although the broadcasting field may occupy the center of public interest, it is in the other divisions of the radio spectrum that the responsibilities of the Radio Commission are greatest, both in number, and undoubtedly in economic importance.

Some important policies yet, remain to be decided, before proceeding with the licensing of these short-wave applicants.

Shall radio be encouraged or permitted to compete with existing overland wire-line facilities? Where a land-wire investment is already established and working, shall radio be authorized to go in and start into rate competition? We have seen the benefits of this to the public in the reduction of cable rates by the coming of transoceanic radio. Yet in the case of land communication, with only a mere handful of radio channels available, that is, a total wholly inadequate in comparison with the hundreds of wire lines in use -- will it be in the best public interest to let the radio channels be utilized as competitive instruments in already highly competitive fields?

Or should the radio waves be reserved for vital applications where wires do not now exist or cannot be employed. The policy of both this Government and Canada's, in the past, has been to issue no radio communication licenses where wire lines would serve the purpose. Whether this or the reverse policy will best serve the general public interest presents an

economic dilemma, with sincere adherents on both sides whose views are largely shaped by whether this approach is engineering or legal.

Again, shall radio communication service be preserved purely as a public utility, and all private interests be outright excluded from operation in the ether unless they will consent to set up actual bona fide common-carrier subsidiaries, purposed to accept and transmit the messages of the public at large, with all the responsibilities of common carriers, filing of rates, inter-connection, and so on?

Or shall the Commission indicate an order of priority by which license applications may be granted, so that if the topmost or public-service niche is not filled in any locality, that wavelength may be meanwhile assigned to some other applicant, to the end of putting the other channel to work? For example, a private fruit company desires to operate radio between several islands in the American South Sea archipelago. This application is for private commercial use; yet there is no likelihood of any utility having the temerity to enter that field in the next twenty years, and the radio wave which the fruit company would use would otherwise stand empty in the vast

reaches of the South Pacific. Surely the fundamental policy decided upon by the Federal Radio Commission should not be narrow or exclusive, but broad enough to cover all the many diverse demands which will put radio into humanity's service.

Nor has it yet been demonstrated to me that the acceptance and transmission of messages for the general public is necessarily the highest public service to be expected of a given radio channel. For there are other uses of radio which come into play when wires are lacking, which may exert very profound influences on the general good. Emergency communication by power companies when transmission lines are down, well illustrate this point. For when power lines are carried down in storms, the telephone systems are invariably also destroyed, and restoration of power service must wait on communication. Meanwhile, cities may be in darkness with attendant crime dangers; water supplies may be interrupted, menacing health; and factories and street cars may be at a standstill, involving a social and economic upset to the whole community. Private radio facilities here mean the security of a vital service to the whole community.

Now, among all of the short-wave uses television

is perhaps the most fascinating. That has been referred to here tonight and I know that Mr. Sarnoff and Mr. Hogan are going to tell you something about television later. But I believe they will probably overlook telling you about one of the most important and far-reaching economic results of television, and that is this: Television seems destined to upset the economic balance between blondes and brunettes. You gentlemen as students of economics and of other things have undoubtedly taken scientific notice of the way a gentleman acts when a pretty blonde is in sight. But not so with this new race of television men. Television men, distinctly prefer brunettes. Black eyes, black arching eye-brows and black hair make the best contrast for the television eye, and whereas if you put a blonde in front of the television screen the picture comes out a blank (laughter).

Last Summer at Washington Mr. Hogan and I attended one of these television demonstrations during the hot weather, and the all efficient telephone company had one of its prettiest operators serving as a model, and I noticed Mr. Hogan lingering thoughtfully before the neon screen where the television image was radiating bright smiles, and finally he turned to me and said, "Mr.

Caldwell, why is a kiss over the radio like a straw hat?" That was an unusual question for a man of Mr. Hogan's dignity to ask. "Well, Mr. Hogan," I replied, "why is a kiss over the radio like a straw hat." "Why, simply because it is not felt." (Laughter).

Communication with airplanes and dirigibles, in shaping safe courses and effecting landings, presents another field where so-called private licenses may exert a useful public service.

But it is in the field of radio broadcasting that popular interest seems to concentrate right now. The public wants its nightly radio, and the Commission has been making heroic efforts to preserve a fair degree of radio broadcasting service to this section, even in the face of the redistribution of wavelengths ordered by Congress earlier this year.

For this equalization clause or Davis amendment represented a great experiment by Congress in communizing the very ether itself -- setting up an equality of radio service both transmission and reception to all persons. Whether they had radio sets or not -- whether the proportion of radio listeners was 60 per cent as in New York or New Jersey, or 2 per cent as in certain southern

States where the dark majority has neither radio sets nor votes.

The Commission, beginning November 11th, is now faithfully carrying out this mandate of Congress that the nation's radio broadcasting facilities shall be redistributed equally among the zones, and proportionately among the various States according to population. Such redistribution had become necessary in the opinion of proponents of the act, because in certain States and sections of the country enterprising broadcasters had constructed and were operating a disproportionate number of stations, occupying so much of the radio spectrum that the other States and regions could not obtain their share of radio.

With a general redistribution of wavelengths thus ordered by Congress, and with a general upsetting of the broadcasting situation inevitable as a consequence of this 1928 Radio Act, the efforts of the Federal Radio Commission were turned to seeing that in carrying out this behest, the fundamentals of the maximum possible radio reception be incidentally given the American people.

That is, we insisted that if the radio listeners were to go through all the discomforts of another

reallocation, this time the public's reward should be really good radio. The "equalization" has therefore been seized upon as the occasion to bring back to the whole nation, and particularly to the farmers and other millions of people who live at some distance from any broadcasting station, good listening conditions over a very large part of their dials.

In other words, with the radio listeners literally "handed a lemon" in the equalization clause of last March, the Commission has undertaken to "turn it into lemonade", for the listeners.

So that while the equalization clause will as predicted bring much unnecessary hardship to certain sections of the country, and will inflict time reductions, while in sections like the Pacific Coast, wavelengths stand idle, still its enforcement has presented the occasion for a general clean-up of the radio broadcasting situation by the application of scientific principles, and so, I suppose, has proved a blessing in disguise.

Already we are getting many expressions from pleased listeners who contrast former conditions of heterodynes with the clear reception which they say they are now getting on the new clear channels. One man wrote

us that he was going to rechristen his receiving set. He said he used to call it affectionately the Old Empire State Express. We asked him why he called his radio set the Empire State Express. He explained that prior to November 11th it merely whistled at each New York station. (Laughter).

Of course, this has meant that from certain sections, such as the East, heretofore enjoying an excess or high degree of radio service, provided by enterprising broadcasters, wavelengths have had to be withdrawn, and these transferred to less favored States and sections. The Eastern Zone has thus particularly suffered, while the Southern Zone, for example, has benefited. In other words, the Radio Commission is asked to provide an acceptable standard of radio service here on the Atlantic Seaboard utilizing the wavelengths which remained after taking away 50 per cent from as many as we can now employ. The housewife who is required to maintain the standard of her table, while her budget is cut from 90 cents to 60 cents per person, can sympathize somewhat with the Radio Commission and its present problem of November 11th, as far as the Eastern Zone is concerned.

The reallocation of November 11th faithfully

carried out this redistribution and all parts of the nation now have their proportions of the radio total, based on population, in strict compliance with the mandate of Congress. Each State and section, moreover, now also has its appropriate share of the various positions on the dial, from 200 meters to 545 meters.

The resulting reduction of local radio service in certain parts of the Atlantic Seaboard will occasion some inconvenience, as compared with the former excess of broadcasting enjoyed by Eastern listeners. But is is believed that citizens thus deprived will cheerfully accept this equalization and redistribution, knowing that the facilities thus lost by them are, by Act of Congress, being made available, to other American citizens in those other parts of the country which formerly had little or no radio service, and in this way we are approaching the great goal of laying down radio broadcasting, adequate volume, and diversified as to programs, into every home on the North American Continent (applause).

GENERAL HARBORD: I am so little accustomed to speaking in a frame of this sort that I am liable to ask you if my pulpit is on straight (laughter). I think the Commissioner wabbled a little off his wavelength when he

made that discriminatory ruling against blondes. I get the idea that the ideal place for a television station would be Harlem (laughter).

The next speaker is a very distinguished product of the new art of electrical communications, With a very great gift for management, a very wide experience in communication, he combines an extraordinary knowledge and comprehension of the technical, scientific and commercial factors of radio communication. His own career is a constant proof of the opportunity and individualism in which our country stands above every other country of our time. Barely thirty-seven years of age he has never failed to make good in every opportunity that he has had. He has encouraged and developed the radio art in its infancy. He is keeping in step with its present and its future development for the whole period of his life. Very much of it will be entrusted to his competent hands. I have very great pride in introducing to you David Sarnoff, vice-president and general manager of the Radio Corporation of America (applause).

MR. DAVID SARNOFF: General Harbord, Ladies and Gentlemen; the embarrassment which faces every speaker

who would presume upon the time and patience of a distinguished audience is multiplied for me several times this evening. First, because I am to speak in the presence of my friend and chief, General Harbord, the head of the Radio Corporation of America which I serve. Secondly, because I am to speak in the presence of true experts and leaders of the radio art, men who have been with it from its very inception. And, finally, because I can think of nothing new to say on the subject.

I know of no subject upon which the public has received more information, and certainly more conversation, than it has received in the case of radio. I have sinned myself in that direction, and as I tried to collect my thoughts today in preparation for this evening's address I could not think of a single thing that has not been said before on the subject by somebody. And so I shall not take your time to review the things you already know, and will hope to merely take you a little distance along the path of the future, as those of us in the radio art are enabled to envision it today.

No longer is anyone thrilled by the mystery of radio, or of its origin. And yet it is a strange truth that even those of us who have been in the art for many

years, and those of us who have had daily contact with it, still don't know what radio really is. That is a confession that I as a radio man make only in the confidence of this room.

Recently a learned Court in deciding an important patent case involving radio technique, after listening to the experts on both sides and after spending days and weeks of study on the subject of radio, inserted in its written opinion the following text: "Of course," said the Court, "we shall not presume to say what radio really is, for no one has told us and so far as we can learn from an independent study of text books on the subject no one knows." (Laughter). But we do know some of the things that radio has accomplished, and we think we know some of the things that are still before radio. The real question, therefore, is whither bound? Where are we going, and it seems peculiarly fitting that under the auspices of this club, the Economic Club, that that phase of the subject should be discussed.

And so I will not delve into the mysterious technical discussions about which I don't know too much myself, but will indicate to you, as briefly as I can, the influence that radio has had and will continue to

have upon other industries.

Radio, briefly, is divided into three parts, like ancient Gaul. There is the marine side of radio, the transoceanic side, and the broadcasting department of radio. All that can be said so far as marine communication is concerned is that no ship on the high seas equipped with a radio set is out of communication with the shore. Whereas only ten years ago it was a matter of uncertainty as to where a ship could be reached, or how quickly she could be reached, today it is a matter of moments to reach a ship anywhere on the high seas. Marine communication has become as regular an occurrence as the ordinary telegraph between two cities.

In the transoceanic end, which involves international communication, the United States leads all the rest of the world in that field of development. We are in daily communication with twenty-eight different countries of the world, across the Atlantic, across the Pacific and across the Carribean Sea. In one place in New York City, in a central telegraph office, you can, within the time of a few moments, communicate with any of the twenty-eight countries. And only today, at a luncheon which General Harbord and I attended with some of our

staff, department heads, projects were laid before us involving twelve additional countries which are to be added to the list of international communications within the next twelve to fifteen months. And men speak as glibly of establishing communication between New York and Chile on the one hand, and Moscow on the other, and Tokio across the Pacific as you would speak of taking a ride in your automobile from New York to any of its suburbs.

Whereas a few years ago, not many years ago, distance was a great problem in radio communication, today distance is virtually annihilated. In fact, and this is one of the anomalies of the development of radio, it is easier to communicate across a longer distance than it is over a shorter distance.

In May of this year I visited London and there spent some time with Senator Marconi, who is still among the world's leaders in the field of radio communication, and I inspected the various beam stations built by his company, and from one room communication was had with Australia, with Tokio, with Egypt, with New York and Canada, and in the last case, with the use of one transmitter and a single wavelength, two telegraph

messages and one telephone message were transmitted simultaneously, and we could hear in broad daylight music coming from Canada and received on the other side of the water, while on each side of that music a telegraph message at a speed of some two hundred words a minute was being transmitted.

During that same visit I had the great privilege of spending two weeks with Senator Marconi on his yacht, The Electra, which is really a floating laboratory, and at no time on that yacht did we fail to receive any international radio station in any part of the world, and we were merely cruising along the coast of England. In fact, these developments extended not only to communication of messages and the receipt of telegrams, but the yacht was actually navigated by means of direction finders through radio, without the aid of the usual nautical or maritime instruments by which ships navigate. And so radio is as broad as all out-doors and may be said to be still at its beginnings.

In the broadcast field you have already heard that some ten million homes are equipped with radio receivers. No one has exactly counted those receivers. It is perhaps a fair estimate, but I should say, if I were

guessing, that it is more nearly twelve million than ten million at the present time, and an interesting observation in connection with the number of receivers is the fact that it took some fifty years after the invention of the telephone and the electric light to have as many homes equipped with electric light outlets and with telephones as radio equipped within the first five years of its existence. Within five years, to repeat, radio had as many homes equipped as the electric light and telephone industry had within fifty years.

The audience listening to radio is hard to estimate, but such estimates as are made indicate that there are some thirty-five million to forty million listeners in this country alone, to say nothing of those who can hear our programs across the water. There are some seven hundred broadcasting stations transmitting daily programs in the United States alone. There are over three hundred thousand persons employed in the radio industry at the present time, an industry that has grown within the last five or six years.

From an annual volume of business in 1921 or 1922 of some $2,500,000 a year, the present annual volume of the radio business is well in excess of half a billion

dollars a year. This growth, interesting as it is by itself, is made more so by the comparatively brief period of its development and, of course, it is natural that in any development which proceeded with that speed there should have been developed a great many problems and a great many difficulties. But the outstanding problems of the radio industry were those to which prior experience and economic precedents could not be brought.

For example, there was no service ever developed that did not entail corresponding charge for what it delivered. The telephone has a direct means of collecting its monthly subscriptions. The electric light likewise. Gas and water the same. But in the case of radio there is no way to deal with the subscribers directly, and many there were who prophesied a brief existence for radio broadcasting on account of the fact that there was no way by which the receiver could be charged for the programs delivered, and yet an industry has been founded despite that fact. Today broadcasting, by and large, can be said to be self-supporting, and strange as this may sound, I will tell you another secret in the confidence of this room: It is the public that pays (laughter). Which, perhaps, after all is as it should

be. In the same way as the public pays when it buys a newspaper, and the advertiser helps to support that newspaper, so in radio the advertiser helps to support the broadcast program, and that, in turn, is undoubtedly charged by the manufacturer into the product which the consumer purchases. And so, after all, there was no mystery in that complexity, and it worked again in the same old way.

The title which has been chosen for this occasion, "The New Age of Radio," seems to me to have broader implications than merely those of radio. Or perhaps it is proper to say that we are in a new age in a great many respects. Many industries are facing problems of the new age. Distance between the scientific laboratory and the workshop has become almost imperceptible. The spirit of research is now a part of a great many industries. Radio has perhaps developed that point so that it is more apparent. You know that Emerson, I believe it was, said that he who makes a better mouse-trap and so on will have the public beat a path to his door. I am not sure that that philosophy is entirely correct now. It may be partly true, but only partly true, for whereas in the old days Jones and Smith who

were engaged in the business of making mouse-traps were concerned about the volume of business that each was receiving, and that was called the old competition, the competition between Jones and Smith, there arose in this country particularly, and of recent years, a new situation where Jones and Smith suddenly had to forget their difficulties as between themselves and face the new situation created by the American Mouse-Trap Company which was manufacturing mice traps on a quantity basis, under-selling them and so on. That was called the new competition, and many tons of ink have been spilled by economists and industrialists in the last few years on the subject of the new competition, and it is a subject that does deserve careful consideration on the part of business men. But there is a third competition coming, in fact it is here, and little has thus far been said upon this third element of competition which, for the want of a better name, I call supplantive competition, the competition which makes it comparatively unimportant as to whether Jones or Smith are making the best mouse-traps, or whether the American Mouse-Trap Company is selling most of the traps; the competition which enables another man in the laboratory to discover a means of

exterminating mice without the use of the mouse-trap at all (laughter).

That is supplantive competition, and it has both its good and its bad sides, depending entirely upon the breadth of view and the vision exhibited by those in important industrial positions, and the spirit with which they embrace this new day of scientific research and technical development.

Perhaps it is not proper for me to give you illustrations of that thesis by mentioning the names of companies, but I think you will not be in doubt as to the particular companies that might be mentioned when I tell you that in this country for a great many years there was a tremendous element of competition between two distinguished telegraph and cable companies. Each vied with the other, quite naturally, for a larger share of the business. Each group was headed by a successful American business man, capitalists, captains of industry, whose main ambition was to increase the volume of their business, and great feeling had grown up through various parts of that development as between the two organizations, and while they were engaged in that activity and in that effort along came a little fellow called radio and decided

that the way to send a message between two points is to eliminate the wire and to send it through the air, and the competition between the two wire companies became unimportant to each of them, compared to the competition which radio was producing in this new field of communication.

And so a new situation was created, again with great possibilities of development.

There is another illustration of two famous phonograph companies which held forth in that industry for a great many years, engaged in competition, patent warfare, and so on, and I cite this illustration with no criticisms whatever because their activities were perfectly proper so far as I know. But while they were competing with each other for a larger share of the phonograph business along came a new development known as the radio broadcast receiver, and the public for the nonce forgot all about the phonograph and became interested in radio. So the question of how much business or what percentage of the business one phonograph company did as against the other became relatively unimportant as compared to the effect of radio upon the phonograph industry. The motion picture industry might be cited as

an illustration. Where for a number of years great strife and intensive competition obtained as between a few companies in the industry, each properly going after their share of the business, and while they were engaged in that activity, this germ, bred in the laboratory, suddenly announced itself in the form of the speaking movies, and it became no longer important, or comparatively unimportant, as to the volume of silent pictures that one was able to produce. The real question was, and still is today, how quickly can we make sound movies, and what is the position of each company in this new development of talking pictures in the motion industry.

These illustrations, and many more could be cited, serve to emphasize, I feel, the importance of considering this new element of supplantive competition and the effect of the laboratory upon industry generally.

Now, let us consider for a moment the effects of radio upon these older industries to which I have called attention. In the case of the telegraph and telephone wire communication systems it is gratifying to be able to report that the radio developments instead of hurting those industries, as a matter of fact helped them,

helped them only because those at the head of those industries were able to adapt their systems to the new devices created by the radio art.

It may be interesting to you to know that it would not be possible to have a commercial telephone service, say between New York and San Francisco, over a wire without the use of radio devices such as the vacuum tube and the amplifier. And so here the new art developed instrumentalities, made them applicable to an old art, and extended the usefulness of both. Radio, as a matter of fact, was the only method known, and is still the only method known, by which the human voice may be carried across the ocean. And so today we are able to speak with London and the other cities of Europe with the same ease that we can speak over a domestic long line of telephone wire. That too radio made possible, extending the range of the human voice practically to all corners of the earth.

In the case of the cable and telegraph, radio devices and radio competition has stimulated that industry, resulting in the development and use of new forms of cable, using new types of metals, increasing speed and multiplying the number of channels of communication, and so on.

In the case of the phonograph industry the electrical method of recording and reproducing practically created a new talking machine, as General Harbord has said in his opening remarks. The phonograph of the pre-radio age is dead. The phonograph of today not only reproduces music with fidelity and with greater volume entirely than the old mechanical phonograph was able to do, but what is more, with a slight addition or slight modification the same instrument is capable of doing both jobs, the phonograph and the radio.

In the case of the motion picture, we are just at the beginning of the development of the talking picture, and I shall refer to it later in the discussion of future developments.

What are the possible social effects of all these developments? That I suggest as a topic for discussion on another occasion when, perhaps, an evening may be given to it, if not here, elsewhere, because that is a pretty long story. After all, all of these inventions are only as important as their human and social effects, because instrumentalities by themselves are merely a means toward an end, and not the end in itself. Well, we do know that having a radio broadcast

receiver in the home means something more than merely furnishing a program or a little dance music. We know that it has extended the ears of the individual to practically the entire continent and ultimately I believe the entire world. The walls of the home, so to speak, have been spread out. Home has been made a more interesting place to live in.

The educational effects of the radio are untold. Dr. Damrosch, who I believe is here, and whom you will have the pleasure of hearing, will be able to tell you more on that phase of the subject. But I know of nothing which has happened in recent years that has been as thrilling as the program which Dr. Damrosch has been sending to the school children over the radio. Educationally radio has a service to perform, and until it does perform that service it will not have fulfilled its full mission.

Politically you have had the example of the meaning of radio broadcast in the last campaign. I think that the campaign of the future will perhaps be an entirely different one as the result of the radio. I heard General Harbord make a suggestion which appealed to me, that campaigns might be cut down to one month, instead of

three or four or five months, of discussion of the subject. No longer is it necessary to debate the issues piece-meal. The ears of the nation are attuned to candidates who would ask the public's vote, and I think, too, that when the candidate realizes that he is talking not to twenty-five million or thirty million people simultaneously, but that he is talking to one family in one place, at their fireside, to two or three receivers and gets that mental view of it, rather than a great audience, and will eliminate the aspects of mob psychology and confine the discussion to the basic facts, and will deal with logic, and radiate light instead of heat (laughter), I think that the campaigns of the future will have much to commend themselves.

Now there have been those who, when the subject of music and education has been discussed, called attention to the fact that we are living in a mechanical age, that no longer is there an urge for a person to himself learn to play or sing. He depends upon his machine to do that for him. While there may be something in that, to my mind that is secondary to the great benefits bestowed upon mankind generally by the fact that radio is a democratizing institution. To my mind

it is far more important to lift the sum total of musical appreciation of the nation as a whole even by one-half of one per cent, than it is to have two or three outstanding geniuses in the period of a generation. That, certainly, radio is doing. The demands for better music and better programs have come from places least expected, and if you are listening to the programe you are undoubtedly able to observe for yourself constant improvement in the character of music and lectures which are now being made. And so while much may be said in favor of the individual genius, an intellectual aristocracy is not quite as important as a general lifting up of appreciation on the part of the public generally.

Now as to the future. I think within the few moments left for me I can only say that as we see the developments of radio there will be a new means of telegraph communication in the form of the fac-similie, which would seem reasonable to expect. It would seem reasonable to expect that as time goes on you will be able to photograph the image of a message completely, rather than merely break up the sentences into dots and dashes. In a limited way that is being done today both by the wire and through the air. But there is intensive

development going on in that field and it is reasonable to expect that messages of the future will be photographed instead of telegraphed, and not only messages, but documents, contracts, legal papers and so on, to all parts of the world. It is not inconceivable that these ether channels or ether lines, which Commissioner Caldwell has painted in such picturesque language, may become the carriers of tons of mail, of photographic messages throughout the world, and we think will cut down the time it now takes to deliver a document from one part of the world to another.

There will also come, I believe, and not too far away, a service in international broadcasting where it will be possible for you to hear the programs of other countries of the world, as well as those emanating from the stations in this country. In an experimental way we are now building up, with reasonable regularity, programs coming from Germany, England, France and Holland. It is not yet ready as a service, but it is not very far off, and that surely will have great importance as an international agency of better understanding between the peoples of the world.

In the field of the talking motion pictures I

believe that the answer to the question which I hear on all sides, the question, "Is the talking picture here to stay," that the answer to my mind is yes, it is here to stay, because the talking picture really means something more than mere talk. It means the addition of a musical accompaniment to every picture. It means the reproduction of sounds naturally, and, finally, it means dialogue, talk. I don't think that it will completely supplant the silent drama or the silent picture, because that has cut a place for itself, but I am convinced that before very long the talking picture will be the predominating element and the silent picture the subsidiary one in that industry. Of course much remains yet to be done in order to reproduce sound with naturalness and fidelity that the public is entitled to have if they are to accept a mechanical reproduction instead of the original.

And, finally, so far as television is concerned all I can say about that is that great development is going on in the laboratory. It is possible now to transmit and to receive, but it is not yet perfected to a point of service. Much more remains to be done in that field. It is difficult to estimate time. No one can say with definiteness whether that service will come within two

years, three years or five years. But as a guess I should hazard the thought that between three and five years from now you will have a television service in the home comparable to a sound broadcasting service such as you have at the present time (applause).

But all of this is not to sing a song of victory so far as radio is concerned, for the sum total of our ignorance is still vastly greater than our knowledge. We know fairly well how to make transmitting sets. We also know fairly well how to make a receiving set. But what goes on between the transmitter and receiver is still very largely a matter of mystery. You can engage eminent scientists in great controversy on both sides, but the mere fact that there is no general accord, no general agreement as to what actually happens to the electro-magnetic wave as it leaves the sending antenna and goes out into space is perhaps the best justification for not accepting any one theory.

As we learn more about the production of the electric wave in space, we will overcome the difficulties which to us now come in the form of static or fading or interference. The answers to those problems are fundamental. They require physical research, scientific

discoveries of major order. It is not merely a question of refinement in the radio receiver or the radio transmitter. It is learning more about nature's secret. Nature is challenging man to send messages not with brute force, but with intelligence, so that we may be able to reach points separated by the widest distance with a minimum of energy, the natural way. To do that now we have to use more energy, and that is the reason for these higher powers and super powers. In fact, the short-waves that are travelling over the earth and through space have a habit of going around the world three to five times at the rate of 186,000 miles a second, and each time that they come back to the original point they create what is called in radio as a radio echo, and Marconi said to me during the period that I previously mentioned that the trouble with the world is that it is too small (laughter). That if this world was a little larger these waves would not be able to come back within that period of time and so there would not be any echoes or any interference. So whereas we were worrying five years ago about the great distances that we had to traverse, today we are worrying about the fact that the world is too small for these radio waves to go unimpaired.

No one who is interested in radio need weep with Alexander that there are no worlds to conquer. The future of radio is ahead, not behind us, and those in the industry who are in any manner affected by scientific developments will do well, I believe, in this new age of radio, new age of industry, to consider sympathetically the products of the laboratory even though they may not, for the moment, be directly translatable into the particular business that they have.

I think that rather than regard these scientific developments and inventions as an admission of obsolescence whose touch means decay, and whose breath means extinction, I think that perhaps they might be better regarded as messengers of progress whose purpose is life itself, and whose promise is opportunity (applause).

GENERAL HARBORD: I was very much impressed by what Mr. Sarnoff said about our inability to peer into the future in radio. It is one of the favorite sayings of the Chairman of the corporation for which I work that our greatest asset is what we don't know about radio. It was said of one of the great legislative leaders on radio in this country that that man must have been born ignorant because no man could ever acquire that much

ignorance in one life time (laughter).

We are fortunate in having with us this evening one of the great musicians of our time. He is a musician by birth and inheritance, a conductor of great orchestras since 1881, founder of the Damrosch Opera Company for the production of Wagner since thirty-four years ago; director of the New York Symphony Orchestra for twenty-five years. At the request of General Pershing he formed and organized the bands of the American Expeditionary Force; founded the first American school for bandmasters at Chaumont under French instruction in 1918, and in these later days the great apostle of music by radio, Dr. Walter Damrosch. (applause).

DR. WALTER DAMROSCH: This is a most embarrassing introduction that our very kind chairman has given me, undeserved, and your very friendly greeting as well. And besides that, to follow such a masterly discourse on the wonders of radio as you have just heard from that master hand of the Radio Corporation, Mr. Sarnoff (applause).

I listened to it with envy and shame, because during his entire discourse he never used the personal pronoun "I" once (applause). And I, alas, have got to base my little talk on that pronoun, because I have been

asked to give you something of my personal experience with the radio within the last two years. Therefore I apologize humbly in advance and beg you to consider that every time that I say "I", I am like Lindbergh; I really mean "we", or, rather, I mean the radio and its miracle, and its, to me, its eternal mysteries. Because, after all, I am in, what I like to think of as the high noon day of my life of music. I have been conducting the New York Symphony Orchestra for over forty years, and for some time have felt that I could not do much more than repeat myself as well as I was able and continue to interpret for audiences in New York and elsewhere, for I used to travel a great deal with my orchestra, the works of the great masters that I have helped, done my best, to make familiar to our musical public. Because, after all, we have lived in the age where Wagner and Brahms and Liszt, and Debussy and Ravel have come up, first, as novelties, as revolutionaries, over whom people fought and expressed their violent opinions for and against, but who gradually won their way to proper recognition. In fact, some of them have become that dreadful thing that we call "classics", which means that they are bound in gold embossed letters and put into our

libraries there to rest (laughter).

I, unfortunately, did not find, since these great giants of the already past have gone their way, any very great interesting, to me, new developments in ultra-modern art. It may be there and I lack the perspicacity, the perception, but it seems to me that perhaps partly owing to conditions, partly compulsion of the great war, the world has not yet regained that tranquility of soul, that philosophic perception of life which enables the artist to spin his threads into new creations of glory, into new wonderful perceptions of life, perhaps based on newer methods, because, after all, the emotions for creating art must always remain the same. They are as eternal as those feelings which God has put into our hearts, and which have got to be the basis for great art work (applause).

And unless that emotional basis is there, no matter how clever the brain, how acute the perception of new tonal accords, or as we have it today, atonal dissonances, if the feeling is not there, if it is striving for a new perception of the old God, for a new effort to pierce somewhat further the mysteries of the Divine, why it cannot become an art work sufficiently

great to fill our souls and to make us believe in the future of the art perceived (applause).

So that having perhaps felt a little bit as if my very active period of participation in the music of our country was halted, suddenly I was thrown pell-mell into contact with a new invention which gave me a new zest, a new desire and, if I may say so, a new youth, and that invention is the radio.

My personal acquaintance with it dates back not more than two years. I shared the prejudice at first of many of my colleagues. I heard over it what was to me inconsequential music, trivial tinklings, more or less boresome reproductions of jazz tunes, commonplace ballades, and one day I received an invitation to give an orchestral concert of short symphonic works, and just before the concert one of the members of the National Broadcasting Association suggested to me that I treat this concert the same way that I have the young people's and children's concerts which I first started over thirty years ago and which I have been giving since then. My brother conducted them for twelve years and then I took them up again and have continued them for the last fifteen or sixteen years, and in which I tried to put my young

audience into the mood of the music by a few words of more or less sympathetic explanation. In other words, to assume that the radio audience that I was to play to was an audience of young people, and so they were, as far as music is concerned, because we more or less live in our own musical world and we sometimes flatter ourselves, or as my children would say, kid ourselves, into thinking that all New York City is musical because the people we meet are interested in our concerts and in everything that tends toward development of the art.

But if we look into it closely we realize that this great City of New York, which now has, thanks to the war and poverty of Europe, every great artist in the world coming here to get acclaim, and to make his living, has perhaps an audience who are interested in symphonic music of, let us say, generously sixty thousand people. Sixty thousand out of a population of over six million; in other words, one per cent at the most.

How about the other 99? As far as what we call music is concerned they dwell in Egyptian darkness (laughter). I know many business men in New York, friends of mine, who say, "Mr. Damrosch, I believe in music. I want my wife and my daughter to have the best of it. Of

course I never go to a concert" (laughter).

Well, that has produced, that same feeling of mind, a one-sided development in our country. Music has become to a certain extent feminized, because if it were not for the American women there would have been no development of music at all. We owe the greater part of it to their efforts (applause). Gradually this feeling has spread. These women have determined that their children shall learn something of music, the boys as well as the girls, and at my concerts for young people I have had large audiences. I have also flattered myself that I was contributing largely to the development of music in New York, the audiences at Carnegie Hall holding twenty-eight hundred and odd seats. Wonderful. I have travelled with my orchestra, and I have been delighted when we have had audiences of twenty-five hundred people. I have gone with my orchestras to the Coast. Twelve weeks we have been on tour, at enormous expense and at terrible fatigue, because that means every night in a different city. I get so at the hotels in our country -- they all look alike; they have all been standardized; you never know which one you are in; all with these long corridors and nice imitation mahogany doors; everything very clean;

vacuum cleaners; perfectly wonderful; comfortable bathrooms. They all look alike, of course. So that sometimes when I was to go out on the stage and conduct at one of my tours I would ask myself, "Let us see, where am I conducting? Is it Rochester or Oswego?" (Laughter). You cannot tell by the audiences; the audiences are all alike in appearance, in their appreciation. There is a genuine sympathy.

But still, compared to what the radio has done for me, it was small pickings, and yet it is what all we musicians have done.

This concert that I gave over the radio, I was told, had an audience of six million people. They told me, "You are connected with this network which carries the sound of your orchestra as far West as the Rocky Mountains." And then I started in, at the invitation of the National Broadcasting Company, to give a series of concerts every week to audiences of eight million, and ten million people every Saturday. And then to me the miracle grew. I suddenly found myself in a position to help along the cause of music in a way that I never thought possible for an individual.

It was not I. I had not changed. I have tried

to give as good concerts always. But it was the radio that had done the miracle. Among my listeners there were just as many men as women, and I got over a thousand letters every week. My secretaries were kept busy, but it was a delightful task. I would get the hundred most interesting letters every week, and it was fascinating to read them and to read the points that they came from; the country, the farms, the ranches, people frozen in in the Winter, in the woods away up in Canada; the hunters would write to me; lonely people in hospitals would write to me, and because they could not see me, they could not know what I looked like, they got to know the tone of my voice. It is not a remarkable voice to listen to, but it is what they call a radio voice, whatever that may be (laughter). I have contributed very little toward that. I have tried all my life to enunciate clearly, but by some miracle of the Almighty's fashioning of my vocal chords, the voice carries well. For many would write me, "Your voice sounds to us as if you were in the same room, and we look on you as a friend who visits us every night." And they were sitting, mirabile dictu, in their own homes, listening to me.

At a meeting of the Advisory Council of the

National Broadcasting Company, to which I have the honor to belong, one of the members said, "We think the radio has become a great home maker because it makes the family stay at home in order to hear something they are interested in." Whereupon I pointed out, "Yes, you ought to make your slogan, 'That which the motor car has destroyed the radio again upbuilds.'" (Applause).

Whereupon one of the officials of the company said, "Yes, that is an excellent slogan, and we will get the General Motors Company to sponsor it." (Laughter).

Well, a great many of my distinguished colleagues were dead against the radio. I had long discussions with my friend, Paderewski, about it. He thought that it ruined the business of the artist. He said, "People would sit at home and hear for nothing that which they ought to go to the concert halls and pay for." Well, I explained to him, and I think he saw the justice of it, that that is not what will happen. I thought that the radio advertises the good artist to an extraordinary extent, and that people, on the contrary, will be the more anxious to see the artist whom they have enjoyed over the radio (applause), and will come to his recitals.

On my tour,- I may bore you, and if so please make the usual sign that you want me to stop -- but last year on my last tour with my New York Symphony Orchestra, we had a Sunday afternoon concert in Cincinnati. I used to go a great deal to Cincinnati, but owing to the war and the fact that we travel less and less with orchestras because all these cities now have splendid orchestras of their own, while years ago mine was the only travelling orchestra that brought symphony music to them -- so it had been fourteen years since I had been there. The house was crowded, very enthusiastic, a kindly audience, and after the first part the manager came to my room and said, "Mr. Damrosch, you know there are hundreds of people in this hall who have never seen you before but who hear you every Saturday night on the radio. Would you mind saying a few words to the audience after you come out?" I said, "I shall be honored." So I came out, was again received in a very friendly way, and then I turned to the audience and just said, "Ladies and gentlemen," whereupon the whole house burst out into a loud guffaw of laughter. They recognized my voice. They knew it was I (laughter).

So there is proof that the radio does not kill

the usual concert. On the contrary it builds up an audience and in fact makes audiences.

Well, I immediately thought, "If that is possible on Saturday nights for a grown-up audience, what could we not do with the children of America in giving them an artistic outlet and an artistic language for those emotions, those feelings that they are all born with and that should have something of the mind in order to lay a proper foundation for their own culture and mental and emotional development?" (Laughter).

I said, "Would it not be possible to give such children's concerts for all the public schools in America, especially gunning for the little red school house in the country districts."

The gentlemen of the Radio Corporation and of the National Broadcasting Company with whom I talked were all delighted with the idea. But the question was to find a sponsor because, after all, it is an enormously expensive undertaking, and as you know the air is free. Anyone that owns a radio can pick up anything from the air that he likes. It is not as it is in Great Britain where each radio owner pays a tax to the Government for the entertainment that is furnished, because it is all a Government

monopoly.

So the question how to find a sponsor to give these concerts was always one that was debated back and forth, and one day this real head, the manager, the genius of the Radio Corporation, Mr. Sarnoff, came to me and said, "Mr. Damrosch, we think that your idea of giving concerts for the school children of America is so fine that we don't want it to go to any commerical company to be exploited at each concert for the purpose of advertising the company. We are willing to underwrite this for you, with no immediate idea of using it for commercial purposes. We want you to go ahead and do everything that you think is proper in order to carry this scheme through and you may consider all the facilities of this company at your disposal." (Applause).

The result was that this Summer at my place in Bar Harbor I locked myself up every day, so many hours, with a very able assistant, and I worked out four series of programs, twelve programs in each series, which meant forty-eight concerts, each one of which was graded to suit the age and intellectual capacity of certain school grades. One grade for children from eight to ten years of age; another one up to twelve; the third group for the lower

high school students, and the fourth group for the upper high schools and colleges of America. Not only that, but I prepared for each one of these series, for each one of the concerts of the series, about twelve questions and answers, which comprised to a certain extent the gist of what I told the children at each concert about the instruments of the orchestra that I demonstrated for them, how the great composers have used them, and the various musical forms, couched in language which they can understand.

The Radio Corporation created a separate educational department. They printed a teacher's manual containing not only the programs which go through the air, but one of these series of questions and answers and all kinds of other information, and these they send to the schools of America as they write for it.

This movement, which was first an experiment of three concerts last Winter, which the Radio Corporation permitted me to give, has spread like a snow ball rolling downhill. Thousands of schools all over the country have provided themselves with radios and it is amusing to see how they got those radios. Many of them were bought by the children themselves who subscribed ten cents each in

order to be able to hear my concerts. Others were donated by women's music clubs. Others were bought by the Board of Education. Cities like Nashville and Kansas City have provided all their schools with radios. All of these thousands of children are listening in every Friday morning at eleven or 11:30 to my concerts. Others, again, were donated by public spirited citizens. Others, again, the children repaired across the street, in these small country towns, to the parlor of some friend of the school who had a nice radio, and these forty or sixty children come there at the appointed hour to hear these concerts.

The letters that I received from the teachers and from the children are wonderful beyond words. Some of them are touching, this perception that here is something which is theirs for the asking, that here is music, this wonderful art, which is not something so abstruse or far off that they cannot understand it. These children all take it naturally. They can recognize joy in a piece of music, or the sorrow or the humor. Children have a great perception of humor, and they are fascinated by the different instruments of the orchestra which I try to explain to them. The results will be beyond our belief.

I think that if we can continue this for three years longer we can, thanks to this miracle of the radio, transform the civilization of an entire people (applause).

In other words, it is a question of a few years when good music will, by its own strength, by its own nobility and beauty, quietly but surely supplant and take the place of the vulgarities that preceded it (applause).

These beauties and mysteries of music are now penetrating, thanks to the radio, to the furthermost corners of the United States. Children from Texas, from Missouri, from Iowa, from Colorado, from the Northern Provinces of Canada are all listening in and getting, naturally and easily, what a year ago would have been an impossibility. Who knows what great musical genius will in this way find the talent that is inborn in him quickened so that it will sprout forth into something that will truly be born on our soil and will partake of our soil.

Just before coming here I had a few excerpts from this week's letters. We receive thousands of them. I don't know that they are so particularly interesting to you as they would be to me, but just to show you, one is from Burlington, Iowa, another from Quincy, Illinois,

another from Council Bluffs, Iowa, another from Galveston, Texas, another from Muskegon, Michigan, another from Omaha, Nebraska. That shows you how these schools are listening in.

Here is one pupil who writes, "You would like to know how we got our radio. The town had offered a prize of $50 for the best kept school yard," which these children determined to win in order to buy a radio and hear our concerts, and they put up a slogan, and he says, "All during the Summer we worked and we heard the good news that we had won in the contest. The $50, added to a sum which we collected from an entertainment meant enough to buy our radio. Your description of an overture was very interesting and I am sure now that I know what one is I will never forget it."

That reminds me of the man who told his friend, "Yes, I only go to educational movies." His friend said, "I saw you at a vamp movie the other day." Whereupon this man said, "Now that is just it. Now if I ever meet a vamp I will know how to treat her." (Laughter). Here is a touching one where a teacher writes, "The children even voted to sacrifice their recess play time to come over and listen to your concerts. Also our boys get a

penny for each selection of music they recognize over the radio. This they save for their own education."

That reminds me of another story. A friend of the family comes into the house and sees four children around the dining table drinking a medicine from a large bottle and he says, "Children, what are you taking there?" And they said, "This is Cod Liver oil." "Oh, how can you take that horrid stuff." "Oh, but my ma gives us twenty-five cents every time we take it." "Oh, that is different. What do you do with that, all that money?" "My ma buys more Cod Liver oil with it." (Laughter).

Here is a little boy who wants to be funny. So he says, "You and your entertainers sure do give the schools of the United States a dandy opportunity to hear a lovely program every Friday. I suppose that the New York buildings are so high you hear the birds singing right over your heads, and I suppose it gives you a still greater inspiration for music. Well, tell all of your orchestra that they sure put on a fine program and you yourself included." (Laughter).

And here is a little girl who evidently wants to write in a poetic vein, for she says, "Your music has been one of the brightest hours of sunshine in our young

lives, even if the sun does shine three hundred and sixty-five days a year in our wonderful State." (Laughter). Needless to say, Texas, of course.

And here is one more from Michigan: "You held the attention of our fourteen hundred junior high students all in one room, which I defy anyone else to do, so that they came back from your concert bubbling, the only word that fits, with enjoyment, information, and whereas a layman like myself will perhaps get enjoyment across to a few, but certainly not in the way that you have succeeded in doing."

Another one writes, a little boy, "Last Friday our whole school of three hundred pupils listened to both your concerts. We shall never forget them or your musical family. It was raining and we did not like it because we could not use the play ground, and then you played the 'Dance of the Raindrops'. They seemed to patter right into the room. We clapped and were glad that it rained." (Laughter and applause).

GENERAL HARBORD: I am sure the whole Economic Club thanks Dr. Damrosch for that very inspiring and interesting address (applause), just as some day our whole country will thank him for what he is doing for its

musical advancement.

The next speaker is an expert of experts, and a high class engineer, a native of Pennsylvania, product of Yale, of the Sheffield Scientific School, and identified with radio in one form or another since 1909; a research engineer, an executive and consultant highly honored by various engineering bodies, an able lecturer and inventor and, as I said, an expert of experts on radio, Mr. John V. L. Hogan (applause).

MR. JOHN V. L. HOGAN: Mr. Chairman, and Gentlemen of the Economic Club, and the Ladies, too, to whom we must look up again this evening; I feel that if I can put before you anything of the engineer's problem and of the reasons for his work in radio, and if in so doing I can catch even a bit of your interest, after the inspiring and even moving talks that we have so far heard this evening, I shall be extremely gratified.

You have heard the story of the growth of a wonderful new industry. It has been told you from the viewpoint of those who have to keep the cogs in mesh; from the viewpoint of those who drive the cogs, and from the viewpoint of those who supply much of the inspiration that lies behind the whole work. You have heard how

intensive cultivation of the radio field has produced a business of $500,000,000 a year and has placed radio receivers in ten million homes in our country, and we all must recognize that to make such progress in so short a time, and particularly when the advances have not merely been made but are continuing at greater and greater rate in all three of the directions I have mentioned, there is certainly in that situation something of which any industrial organization, any regulatory, any inspirational source may well be proud.

Now, gentlemen, I come before you with the difficult proposition of expressing to you in a rather feeble way the fact that we perhaps should also consider how such an industry, such an inspirational force, came into being and what is necessary for that industry and that force, if it is to continue to grow. Onthat point would it not be fair for us to think a moment of the contribution of the inventor and the engineer? Is it not fair to say that except for the work of those men who set out for themselves the problems of an industry and then proceed to work toward the solution of those problems, we could never have had any such public services of the types that are being offered, and we could not hope to have the

services which we expect will be offered.

In fact, one might even go further and say that except for the inventive pioneers we would be in grave difficulties in attempting to solve many of the economic, social and ethical problems that have grown so complicated in our latter day life. Please do not misunderstand me in thinking that I fail to appreciate the advantages of huge industrial developments. We must all recognize that when an invention is ably commercialized and is thus put to work, its value to the public is usually enormously expanded and increased. When an invention not only gives service, but does so in such a way that it is profitable to the originator and to those who are working with him, there follows, perforce, the desirable result that further invention both on his part and on the part of others, is encouraged and stimulated. New facilities are almost invariably made available to the inventor himself, facilities without which his work would be retarded or perhaps even stopped, and these most excellent things occur because of that business development of the invention, and not absolutely because of the creation of the new thing in itself.

Nevertheless the novelty, the new thing on which

both the service and the tremendous organization are based must have been produced; it must have been invented before the rest can follow. And therefore, perhaps, we should depart a bit from the tendency that is strong in some quarters and give some place, therefore, in our thoughts to the silent but none the less essential partner in these great enterprises.

Perhaps it would be interesting to ask why radio has grown so rapidly and so far as we can judge, so soundly. What is the strong impelling force that is responsible for any great human accomplishment? I suppose it would be very difficult to get a general agreement on that point. Some people might say that love was what made the world go round; some, the desire for profit; some, mere curiosity. But I think we can all agree that the human animal does not do very much for a very long time, nor do it very well, unless he is interested in what he is doing.

For radio to grow as it has grown there must have been an inevitably vast amount of interest in radio. For it to continue to grow as it is doing there must still be a tremendous interest in it. Also there must necessarily have been an unusual combination of public

interest, business interest and scientific or engineering interest, for without anyone of those three elements what has been done would hardly have been possible.

If I may, I will leave the questions of why the public is interested in radio and why business is interested in radio for other times. You may hear many answers on those questions, for there may be some differences of opinion with respect to them. But I would like to, if I may, attempt to tell you why the engineer is interested in radio. Perhaps I should preface that by saying a word as to what an engineer is supposed to be. We have all heard many definitions of engineering, and of the men who work in engineering. But I think the best one that has ever come to my attention is that an engineer is a scientist who is not afraid to spell the word science with a dollar mark instead of an "S".

Some years ago there was, as we all know, an inclination on the part of the academic scientist to decry the work of the engineer because it was not pure science. Now I believe it is recognized that what we call engineering must go hand in hand with research on the one side and with business on the other. The more a man knows about scientific matters, the more he knows about business

matters, the more likely he is to be a useful engineer. That thought, perhaps, tends to divide the engineer's interest in radio into two parts. One is the business interest and the other is scientific interest. As to the former, we may say does radio answer the engineer's requirements? that any scientific matter to which he turns his hand must have a practical and economic side? Must have a capability of utility that will support both a scientific and industrial effort. It is quite clear that radio does answer that requirement and therefore we need go no further to understand that perhaps subordinate part of the engineer's interest.

But why does it appeal to him from the scientific point of view? That is the larger and the more important question, and perhaps it can best be answered by considering what the subject called radio really comprehends.

Let us take for a moment a typical broadcasting system of today. Except for the fact that it is rather elaborate, has much attention to detail, it is very like the radio telephone of twelve years ago. In fact, in its fundamentals it is very like the wireless telegraph of thirty years ago. If we start with the voice of the artist in the broadcasting studio we find, of course, that

the sound waves of his voice travel through the air to a microphone pick-up system. In controlling and utilizing those air waves the radio engineer must use a knowledge of the science of acoustics. If he does not use it he does not get results. When the voice reaches the microphone, in the system of the microphones the impulses are converted into telephone currents. In handling those telephone currents the radio engineer finds that he must have a pratical knowledge of many if not most, of the problems of wire telephony. The sound current in those telephone wires pass next into the transmitter.

It is in the transmitter that high frequency electric currents are generated, and a knowledge of the transmitter involves a great part of electrical engineering, including power transmission and power conversion. At the transmitter the incoming voice currents are bombined with the separately generated high frequency currents and are delivered to a radio antenna or an aerial wire system.

From the aerial wires electro-magnetic waves are shot off in all directions into space, and those waves show similarities to light waves and heat waves.

They show absorption, reflection, refraction -- in fact they are quite like the phenomena observed in the laboratory, but on a far grander scale.

At any receiving points these waves must be intercepted and in their condition of utter feebleness, resulting from their travel over a huge distance, they must be converted into electric currents and nursed back to appropriate strength by the use of electrical amplifiers. That particular part of the radio man's job involves a knowledge of the peculiarly difficult part of electrical engineering.

Finally, the radio currents in the receiver must be turned into actual sound, to be heard by the listener as it issues from the loud speaker, and there we have further problems in acoustics.

Thus, in the simplest radio system there are embraced phenomena from the entire field of physics; our whole scheme of natural philosophy, as we used to call it, is being combed for contributions to the applied science of radio, and it is just the immense scope of these radio problems that constitutes the challenge to the engineer, by arousing and maintaining his scientific interest.

Now, gentlemen, as to the future of radio, what can we see? There is the increasing coordination between sight and hearing, which is reflected in the talking motion picture development. There is the transmission of sight by radio and, of course, there is the certainty of further improvement in the communication, educational and entertainment services that are so familiar to many of us today.

That much we can safely predict. It is guaranteed to us in the future by what has been done in the past. But when we itemize those more or less natural lines of improvement and growth, have we exhausted the potentiality of the radio? Is this new and technical achievement to be limited by the accomplishment of ends that we can now see, even though we see them only dimly in the future? When I think of a question of that sort I am reminded of the famous attorney of fifty years ago who advised his son not to take up the patent branch of the law, because he recognized in the marvelous achievements of his own older generation, everything that he thought could be invented or devised, and he felt that the sphere of the patent attorney would soon be an empty one. I am also reminded of the famous

engineer of ten years ago who advised his young engineers not to specialize in the radio, because the art was so limited in its economic scope that it could not possibly support a man who would be attracted by its fascination.

So the answer is today, as it should have been then, that the useful application of radio and its coordinate sciences are literally endless. They should be limited -- they doubtless are limited -- only by the ambition and the imagination of the men of tomorrow.

Ben Johnson I think it was, who is not without recognition in his gustatory exploits said that he would first eat heartily and then prophesy. We have dined generously. But it is always dangerous to attempt the part of a seer. If we allow our imaginations to take full rein we may easily conceive of a world in which all communication and all motive power is delivered by wireless, and consequently one in which the every day limitations of geography, for example, no longer exist. We might go further and dream of inter-planetary signalling or even inter-stellar travel.

It is much safer to keep our feet somewhere nearer to the ground, and therefore to limit our glimpse of the future to stating something of the ideals that

perhaps may be striven for with a possible chance of success.

Suppose, then, for the moment we imagine the broadcast receiver of some day hence. On a table top, perhaps in the center of the room, will appear a solid looking accurately colored and moving reproduction of some scene that we have chosen to be reproduced for us. Perhaps it is a great athletic stadium; perhaps an opera house. Along with our view of the image we hear the sounds, beautifully reproduced. If the object, possibly, displayed is of a suitable character -- suppose for example it were a play -- we should be able to walk around our solid image and look at it from all sides and all angles. If we are interested in examining more closely any particular section of the object, we can enlarge the reproduction of that part of the image, so getting, for example, a close-up of a singer on the stage or an instrumentalist in the orchestra, and simultaneously and automatically altering the sound apparatus to deliver to us the appropriate tones corresponding to the more refracted but enlarged view.

Surely, a thing of that sort, combining tone and color and motion and the effect of solidity, coming

to each of us at home, and giving such intimate contact with distant sights and distant views, and distant sounds, does make a charming picture. One might say that after this particular thing is accomplished by an inventor, he could properly sit down and rest for a time. But, gentlemen, he won't rest, for by then he will have newer dreams and greater ambitions and out of his dreams and his ambitions will come new services and new powers for all the rest of us (applause).

GENERAL HARBORD: The next speaker was the first man to sponsor the broadcast of a program from the stage of a theatre. Born in Minnesota, he has had a career that reads like a romance; cash-boy, book agent, seven years in the Marine Corps, motion picture theatre man, inventor of daylight projection and of the idea of introducing films with a proper prologue. He is president of the corporation which built and operates the largest motion picture theatre in the world; once a private in the Marine Corps he is now a Major Rothafel of the U. S. Marine Corps Reserve. He has a place in the hearts of thousands of disabled veterans as the chief of Roxy's Gang which several years ago carried on a campaign which supplied a radio receiver set, with ear phones, to every

disabled war veteran in every Government hospital. Major Rothafel (applause).

MR. S. L. ROTHAFEL: General Harbord -- hello everybody (laughter). My showman's sense tells me that I am in a very hard spot, and if you are not already tired you soon will be.

It was six years last Sunday when we were introduced to the radio, and on that occasion we transmitted from the stage of the Capitol Theatre, which I had the honor to direct at that time, a presentation of Richard Strauss's "Helden Leben." Strange as it may seem I have never heard it on the air since. The response from that experiment was quite remarkable. I think even more so than the response that Dr. Damrosch has received, and it inspired us to the effort to organize a little group to make up the time allotted to us at that particular time, and we organized a few of our artists into what is known as "The Gang".

Well, at first we were quite mystified. Letters began to pour in from all corners of the country, just as Dr. Damrosch has told you. But they were very remarkable; they were very intimate, and they wanted more of us. The first thing we did was we tried to

eliminate as much as possible the stereotyped form of announcement. Dr. Damrosch said that he has a radio voice. I don't think I have any, but when we started this work there was an aspect of commercialism in the back of our heads. But when this response began to come in commercialism flew out of the window and something very beautiful flew in.

We began receiving these letters in such quantities, that when I tell you in six years time we have received between three and four million letters, you will understand what I am trying to get at. And I believe that we have in the archives of our theatre today the greatest human documents possessed by any man living. These letters come from people in all walks of life, from little children who write us on their lettered stationery and always say "Dear Roxy," and sometimes in their little childish manner they try to convey to us how much they have enjoyed what we have tried to give them, and always end up with "Love and kisses."

These letters come from all kinds of people in all walks of life, from the presidentsof corporations to the clerks, and it is quite remarkable. Well, anyway, we wanted to see what this was all about and we organized

for the first time a tour with the Gang, in which we went to Providence, Pawtucket and the City of Washington. I believe I see a gentleman in the room who is connected with the National Broadcasting Company, in fact he is vice-president of it, Mr. McClelland, who took that trip with us.

When we appeared at the Outlet Stores in Providence, Rhode Island, there was a crowd so great that the entire police force was absolutely powerless to control it. People stood there in that huge store, one huge city block, for hours with children in their arms just to get a glimpse at the Gang. We went to Washington and there we were met at the station by the entire Marine Band and a troop of cavalry, and about thirty-five thousand people, and you can imagine my feelings when I came out of that station and heard that big band, which I had marched behind many times with a musket on my shoulder, playing "Hail, Hail, The Gang's All Here," and "Semper Fidelis." We paraded up Pennsylvania Avenue just exactly as though we were some foreign dignitary, and we gave our performance at the Poli Theatre, at which the President and Mrs. Coolidge attended.

And then we went up to the Walter Reed Hospital

and conceived the idea that it would be a good thing to put a radio head-set at the bedside of these fellows who were lying there in those respective wards (applause). We went to the President and to several Governmental officials. We came back to New York and told our plan to the American Telephone & Telegraph Company, and with their cooperation and the cooperation of the New York Sun, I believe in one day less than a year we did, by appealing to our radio listeners, putting this great force to some practical use, we did put a radio head-set at the bedside of every disabled soldier in the United States (applause).

And in addition to that we had an amount of money left over, some $90,000, which we gave to the American Legion to perpetuate a fund for all time. We were also instrumental in having the plans of Government hospitals so altered that now no Government hospital can ever be built without radio equipment.

And I want to say just this one thing. I am not going to tire you. There is no commercialism in our work on the air. Each time we go on the air our imagination carries us, just as Dr. Damrosch has told you, to the most remote corners. These letters come back to us and they say something in the voice, something in the manner, I don't

know what it is, I am powerless to tell you, seems to have performed almost miracles. I have met many strong men that I had never seen in my life before, and yet, without one single word, they would come to me and grasp my hand until it actually ached, and I have seen at times the moist eye, and they would try to tell me how something that we had said or done had made the lives of someone dear to them just a little happier (applause).

We have oftentimes been called by doctors to the bedside of patients that wanted to see us and hear us, and we have made these trips sometimes under great hardship and stress, and we would sit down, and I cannot tell you what has occurred. I might tell you of one incident.

This just happened here recently. Dr. Keller of the Walter Reed Hospital phoned me and asked me to come to Washington, that a boy there had not but a few hours to live and wanted to see us. So we went. We dropped everything and we went down and we sat down at the bedside of that boy and leaned over and whispered into his ear and tried to give him some word of comfort and cheer, and we sat there for about seven or eight hours until he fell asleep. We left the next day, and we received a telephone call from Dr. Keller that the patient had greatly improved.

We then began transmitting songs and we talked to him and advised him to keep his chin up, that they could not lick him. He became better and they sent him to Denver in a plaster cast. He remained in Denver for four months and in that period he had received twelve major operations. They returned him to Walter Reed about five weeks ago, still in the plaster cast, and I went down to see him again after his two final operations, and sat with him for a whole day, and only last week Dr. Keller informed me positively that the boy would live and would come through all right and be himself (applause).

You have heard all this scientific talk, this remarkable display of radio. There is something more remarkable, my friends, than anything that you have heard; some indefinable thing that comes back to us to transmit over the air twice each week; something that comes back on a wave that is far greater than any radio wave, and I want to tell you that we have discovered something far more beautiful than anything we ever dreamed of in our lives before. We have found service.

You know as you look down a road, if converges toward the horizon. We have kind of placed at that point an imaginary light. We want to travel down that road toward

that light, knowing full well that when we get to where the light ought to be it is going to be just as far away. But somehow or another there has been born in us the idea that somehow, some day, we are going to reach that light and when we do we are going to be rewarded a great many more times than any effort that we have ever made would ever call for.

I want to tell you that as I stand here before this distinguished audience that we in a measure feel the great responsibility that has been given to us and we are going to try awfully hard to live up to it, knowing full well that we are not worthy or ever could be. It has changed our whole lives. I cannot go anywhere, in the smallest hamlet, without being instantly recognized, and some very funny experiences have happened.

Only the other day in Atlantic City, where we sometimes go for a little rest, we were sitting on the beach in front of the Ritz, and it always happens that someone delegates himself to bring people all around to introduce them to Roxy. As I was sitting there, sure enough one of those people did come around, and he gathered them from all corners of the beach, and would say, "Mr. So-and-so, meet Roxy," until the rest became a thing of the

past, and eventually he came with an individual by the name of Levinson. Mr. Levinson came down the stairs to the beach and this man said, "Mr. Levinson, meet Mr. Rothafel;" and Mr. Levinson said, "Pleased to meet you, Mr. Rothafel." The gentleman who brought him evidently was not very much impressed by his enthusiasm. So he said, "Levinson, don't you know who that is?" He said, "No, you introduced him as Mr. Rothafel. I don't know who he is." He said, "My God, Levinson, that is Roxy." And the old man's face lightened up immediately and he said, "Why didn't you tell me it was Roxy. I am very pleased to meet you. I always wanted to meet you. So you are the fellow that gives two pair of pants with every suit." (Laughter).

GENERAL HARBORD: The Economic Club now signs off. Stand by for taxicabs and late suburban trains.

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