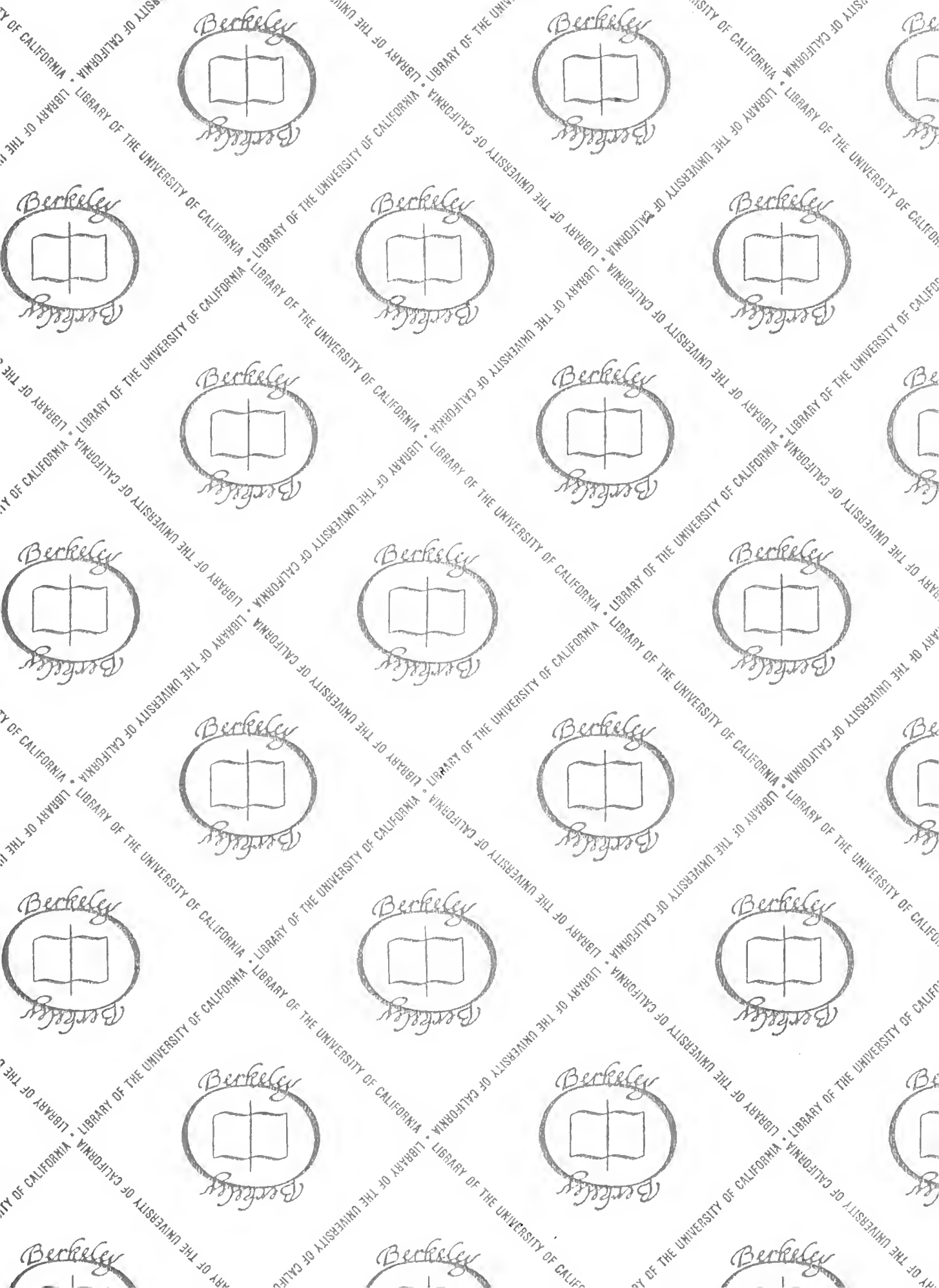




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KURT E. APPERT:

ELECTRICAL ENGINEERING AND THE LENKURT ELECTRIC COMPANY

An Interview Conducted by Arthur Lawrence Norberg

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Kurt E. Appert





Kurt E. Appert, Frank Lloyd Wright, and Lennart G. Erickson



## TABLE OF CONTENTS -- Kurt E. Appert

ACKNOWLEDGMENT	ii
INTRODUCTION	iii
CURRICULUM VITAE (Appert)	v
Training for Entrepreneurship	1
Founding of Lenkurt	8
Lenkurt Equipment and Patents	10
Contributing Elements to Company's Success	18
Contact with Local Universities	22
Lenkurt's Contributions to the Industry	23
Growth of Lenkurt	24
Mark of a Thriving Company	32
Operating in the 1950s	34
Partners' Relationship	40
Financing and Merging with GTE	40
Interest in Mark Twain	43
Early Retirement	44
INDEX	48
CURRICULUM VITAE (Norberg)	51





## ACKNOWLEDGMENT

This interview with Mr. Kurt E. Appert is one of several dealing with the development of electrical engineering and electronics within the larger series of oral histories produced by the History of Science and Technology Program of The Bancroft Library.

Besides these interviews, the Program assembles other primary source materials, including the papers and personal memorabilia of scientists and engineers, and the papers of certain organizations with which they were associated. The information in the papers and interviews helps to demonstrate the development of science and technology not only in the western United States, but also in the nation as a whole.

The project was made possible initially by the generosity of Messrs. William R. Hewlett and David Packard. Mrs. Calvin K. Townsend established the Doreen and Calvin K. Townsend Fund to provide ongoing support of the Program. The University Endowment Fund, National Science Foundation, and National Endowment for the Humanities have assisted diverse aspects of the Program with a series of grants. Further aid has come from the Marco Francis Hellman Fund, established to document science and technology and their relations to business in California. Other donors have included the Woodheath Foundation, the California Alumni Foundation and the Watkins-Johnson Company.

James D. Hart  
Director  
The Bancroft Library



## , INTRODUCTION

This interview with Kurt E. Appert was recorded on September 25, 1974, as part of a series dealing with the development of electrical engineering and electronics. The interview focuses on Mr. Appert's career in engineering and activities of Lenkurt Electric Company, a firm he helped found. It was conducted and edited by Arthur L. Norberg.

The final document was prepared with care from the original tape-recorded interview. A preliminary transcript was edited for clarity and sense, and the original tape checked against the resulting draft. Occasionally it was necessary to rearrange paragraphs and/or eliminate repetitive sections and superfluous questions. The edited transcript was then submitted to the interviewee for further clarification, identifications, and, in some cases, additions. The index was prepared by Ann L. Pfaff-Doss. Mark J. Haas, Marie L. Herold, and Ann L. Pfaff-Doss aided in the final production of the transcript.

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Oral history can frequently provide useful information on subjects not easily retrieved from published sources. Hence the questions often dwell on family history, social and economic conditions affecting research, interactions with colleagues and peculiarities of institutional organization. They can also elicit useful data on scientists' perceptions of themselves, their colleagues, and their discipline. With respect to the historical record, oral history ought therefore to be taken as a retrospective first approximation, a starting point to organize research for corroborating data in sources contemporary to the events described or to gather hints about possible relationships, influences and sources that might otherwise be overlooked. It should be borne in mind that the interview records what the interviewee remembers during the interview about what happened at a given place and time. Typically, many years have passed since the events occurred; selective memory (and sometimes wishful thinking) may have had ample time to operate. In general, information obtained in response to broader questions is more likely to be accurate, albeit more difficult to corroborate, than answers on specific events, influences, and accomplishments.

The user wishing more detailed contact with this or other interviews in the History of Science and Technology series may consult the rough edited drafts of the typescripts and/or listen to the original tapes.



Tapes are located in The Bancroft Library's Microforms Division; draft transcripts, in the papers of the History of Science and Technology Program. Either may be ordered through the Heller Reading Room.

Robin E. Rider  
Head, History of Science  
and Technology Program



## CURRICULUM VITAE

KURT E. APPERT

- 1911 Switzerland, born April 29, Switzerland  
father: Eugene Charles Louis Appert  
mother: Marie Strobel Appert
- 1928-29 Machine tool operator in furniture mill
- 1930s Employed by DuFrane Company (later partner and then director  
of corporation)
- 1944 Founded Lenkurt Electric Company (with Lennart G. Erickson)
- 1944-59 Executive Vice President and Director of Engineering, Lenkurt
- 1959 Lenkurt merged with General Telephone & Electronics Company
- 1959-1980 Semi-retired
- 1980 Died February 21, Carmel, California





Kurt E. Appert

Date of Interview: 25 September 1974

Training for Entrepreneurship

Norberg: I am in the home of Mr. Kurt E. Appert, the co-founder and former co-owner of the Lenkurt Electric Company, now a fully owned subsidiary of General Telephone and Electronics Company. Mr. Appert, can you begin by telling me something about your family background? For example, where you lived, who your parents were....

Appert: Birthplace and so forth?

Norberg: Yes. The date of your birth would be nice, too.

Appert: I was born in Switzerland in 1911, April 29. In 1914, my father, who was in the hotel business, got an offer to manage a hotel in California, in Brentwood, Contra Costa County, for Balfour-Guthrie Company, who at that time, I believe, were a subsidiary of Shell Oil. He decided to take the offer and we came here in 1914, June.

We came directly west. My father had the job as manager of this hotel for a couple of years and there was some disagreement with the management--European and American hotel practices don't always agree--so he had left the job. After a while, we moved to San Francisco. After a couple of years, he got into the insurance business and he remained in that vocation for the rest of his working career.

I grew up, to all intents and purposes in San Francisco, since I was about five or six years old, I guess. I went to school there, or at least started it. I went to Mission High School and after about two years I dropped out.

I had a series of jobs; I worked fairly steadily. I left school in '26 and worked at various odd jobs, including such things as working as a machine tool operator in a furniture mill, things of this nature until the crash in '29. That cost me my job, along with a number of other people's and from there on for about two or three years, things were rather spotty. I was just able to get an odd job once in a while.



One day, we heard--and by we I mean the young fellows I grew up with in the Mission district in San Francisco--that the Union Iron Works was putting on a number of new apprentice welders at the then munificent pay of something like a dollar and a half an hour and also found out that there were evening classes at the Samuel Gompers Evening School on Capp Street in San Francisco on welding.

So, everybody walked down there and when we got to the school that particular evening the classes were absolutely jammed and a long waiting list. So, everybody went home again, up the hill, except myself. I wasn't going to make a two or three mile round trip for nothing, so I wandered around the place and finally found myself in one of the electric classes. And I was interested; I'd always had a bent, since before I was a teenager, for things electrical and had interest in them, so I enrolled.

After a period of time, I became acquainted with a young fellow who was sitting in the seat behind me. This was Len Erickson. We got into conversations, became interested in each other. A further development was that his boss, who had just left his former job, and he, that is Erickson, were starting a small business of their own. This was a business--and his boss was a manufacturer's agent, one Frank DuFrane, a much older man than either Len or I--for apartment house telephones, public address systems, railroad signaling equipment, things of this nature....

Norberg: What year was that?

Appert: I would say about '34. Well, there was an increasing interest in electronics at about that time. In fact, that's just about the time the word was coined, I believe. And this would have been Len's part in the picture, who was very good at this sort of thing. I had quite a grasp of it myself and this is why we got interested in each other. He felt that I would be an adjunct to the firm and talked to his partner about me and I was invited in.

Norberg: Before we go further, can we go back?

Appert: All right.

Norberg: First of all, I'd like to ask what insurance company your father worked for?



Appert: Prudential Life.

Norberg: Was he some kind of district manager or salesman?

Appert: No, he was a salesman.

Norberg: Okay. Now you mentioned that you had generated electrical interests early. How? Was this from reading magazines like Popular Mechanics, or....

Appert: Well, that's a good question. I'd never thought about it, it's been so long. I would have said it was practically by osmosis, but you're probably right in that suggestion because I've always been a great reader and good at getting things out of books. This is undoubtedly what acquainted me first with the science.

Norberg: You don't remember any high school courses that you may have taken?

Appert: No.

Norberg: How about teachers, neighborhood people....

Appert: No.

Norberg: Were you interested in Ham Radio?

Appert: Yes, to a degree, but that came long afterwards.

Norberg: Long after?

Appert: Yes. Actually, I got interested in electricity well before I was in my teens, so it was a long time ago.

Norberg: How about brothers and sisters?

Appert: One brother, Richard.

Norberg: Did your family have a car?

Appert: No.

Norberg: Did you have access to a car?

Appert: No.



- Norberg: Do any mechanical playing around with a car?
- Appert: To a degree. In later years, my contemporaries had cars and fixed them themselves, by necessity and....
- Norberg: When you say later years, what years are you referring to?
- Appert: Oh, late twenties to mid-thirties, I think.
- Norberg: Okay, late 1920s or your late twenties?
- Appert: Late 1920s.
- Norberg: Now, I assume that because you left high school that you gave no thought to going to college at all.
- Appert: That's right.
- Norberg: Can we be a bit more specific about the early work experience that you had prior to the crash in 1929?
- Appert: Well, most of that was put in at the furniture mill.
- Norberg: In the furniture mill, doing what?
- Appert: Running machine tools like trim saws and shapers and things of this nature.
- Norberg: So you did have some mechanical abilities and you did exercise them at least in this case.
- Appert: Yes. I would say so.
- Norberg: You mentioned that the Depression did affect your standard of living and there was some great difficulty in finding jobs, during that....
- Appert: Well, it was rough for everybody, especially relatively inexperienced kids at that time. What with the 25 percent unemployment rate and that sort of thing, you know, in the early '30s....
- Norberg: Right. Did you live at home during that period?
- Appert: Yes, that's right.





Norberg: What technical literature, if any, were you reading during this period, prior to that night school occurrence and your meeting with Len Erickson?

Appert: About the only thing I can single out was that we lived up in Corbett Avenue on the side of Twin Peaks, a rented house, and there was a small library, which had in it, among other things, some mining-engineering texts owned by the landlord who was a former mining engineer. And, I remember going through some of these with some interest. Now, at that stage of my development, I simply can't remember where I picked up anything about electricity, per se, except what I might have found in these particular books.

Norberg: Did you have any indication that you might want to start a business of your own?

Appert: No.

Norberg: Did you have any contact with people in the electronics business or what was then radio communication businesses in the late 1920s, early 1930s period? No contact with people like Ralph Heintz....

Appert: No.

Norberg: Then, now we can go back to your meeting with Len Erickson. What did that business do? You mentioned a few things about providing railroad signaling equipment and things like that. What was the product line and what was your responsibility within that?

Appert: Len had just completed the development of an electronic tachometer for use in automobile engine tune-up, for the account of the Echlin Mfg. Co. Echlin was a manufacturer of automotive test equipment in San Francisco, and apparently part of the deal was that they would give us production orders for these tachometers. I was hired for the specific purpose of assembling and testing this gear, under Len's supervision.

DuFrane's agency lines were standard factory catalog equipment involving no engineering, only selling with which I had nothing to do. Consequently, I had little working contact with DuFrane.



As time went on I was able to make contributions to other developments (mostly initiated by Erickson), i.e., component testing equipment, loudspeaking intercom equipment, etc.

As far as "responsibility" is concerned, I did not assume my full slate of engineering and management responsibility until about middle 1940s. Up until that time, I would say that Erickson was undoubtedly the main spring of the enterprise, as far as innovation and growth were concerned.

Norberg: Now, were there just the two of you in what we can call development?

Appert: That's right, just Len and myself.

Norberg: And was DuFrane the third person, or were there more?

Appert: No, just DuFrane. Occasionally we were able to afford to hire somebody to do routine work. Well, for two or three years things went fairly good, considering the times. Then the Echlin people developed their own line of test equipment and manufactured it and we lost that account. It was an important one to us and the rest of that decade was rather unpleasant.

Then came World War II. Now, by this time, Len and I had learned a great deal about all kinds of technology as it applies to electronics.

Norberg: How did you learn that?

Appert: Well, by trying to develop new methods of loudspeaking intercom systems without the push-to-talk key on it, things of this nature, which involves all kinds of special circuitry. We made quite a study of this and learned a good deal about characteristics of specialized amplifiers for such purposes, with a result that we knew more about this type of thing toward the end of the '30s than most public address firms did that had years more experience just because there was no call for such a type of thing, except for a very specialized market, you see. Unfortunately, that also means there was not very much sales for it, which is why we had a tough time, you see.

But here, fortunately, having very little money, we had very little to lose, so we survived. Nevertheless, come 1941,



we were pretty close to being on the ropes. And then, as I say, came World War II, and within a month after December 7th, we had what to us was a very sizable contract for this special paging equipment designed to get P38 pilots off the ground rapidly.

Norberg: How did you get that contract?

Appert: Through the Army engineers. It was a connection of DuFrane's somebody in there, one Captain Sumner. He came around and took a look, talked to Len and myself, decided we could handle it. Then we got it and we were able to handle it. The job was a big success.

Norberg: How sizable was this contract? How many production units per month for example?

Appert: Oh, I don't remember, but the total contract came to something like about 300,000 dollars. So one thing led to another and we got some more special purpose paging contracts, for example, for Alameda Naval Air Station, so forth. And then somewhere along the way in there, in the early '40s, we'd gotten into the telecommunications business by picking up an unfinished contract from one of the Army agencies for some carrier equipment.

Norberg: Carrier meaning carrier current?

Appert: That's right. This was our brief indoctrination into such a thing, into the equipment that actually was finally the real start of the business. All the rest of this is just background to it. Well, we finished this, and it worked. It was clear it had commercial possibilities.

The only supplier of any stature in the business at that early date was the Western Electric Co., at least in the United States. Western Electric was the manufacturing arm of A., T. & T., and, as such, it's principle activity and purpose was to supply suitable equipment to the Bell System associated companies.

Well, broadly speaking, the operating companies had two types of application for carrier equipment: (1) for integration into the national toll network, involving multi-link circuits up to several thousand miles long; and (2) for use in their individual territories, usually single-link and as short as fifty miles. The difference in the two



classes of service from the standpoint of equipment requirements can be considerable, for technical reasons which I will explain more fully later.

Consequently, it would appear there were two choices; to develop and manufacture two types of equipment, or alternatively, to provide one grade, suitable for all purposes. Bell Labs and Western, for reasons of standardization and flexibility, I would suppose, took the latter course.

This opened the door for someone to supply equipment of medium grade, i.e., for tributary circuits of relatively moderate length. And, ultimately, this is what we did.

Norberg: Now, are we still talking about DuFrane and his company, or....

#### Founding of Lenkurt

Appert: Well, just about, yes, but we're coming to a turning point. In the early '40s sometime before, oh, '44, somewhere in there as near as I can recollect, Len and I bought DuFrane out, because we wanted to concentrate entirely on this other business--telecommunication. As I say, DuFrane was a much older man than either one of us, approaching 60 or something like that, so we made a deal and bought him out and he kept his particular agencies and so forth, and we went on with carrier business.

Norberg: Now, let's go back to the war contracts when you were still with DuFrane, was this a very profitable operation, first of all?

Appert: The war business?

Norberg: That's right.

Appert: I would say not. But, at least, it paid us more in the way of wages than we got in the ten years prior. No, I would say as a result of war work that most of the money was drawn out in the form of salaries actually, to the best of my recollection.

Norberg: You didn't have to go into renegotiation with the government or any problem like that for excess profits?





- Appert: Well, it always came up as a matter of course, you know, but as there was no money there, there was nothing to negotiate back and they never objected to the wages we drew and so we had no problem on that.
- Norberg: Can you tell me something about the Automatic Electric Company, before we go on to Lenkurt? In 1948, for example, and I realize this is jumping ahead, but I know that Lenkurt was chartered as a Delaware corporation, its stock was divided equally between yourself, Mr. Erickson, and the Automatic Electric Company.
- Appert: Yes. Automatic Electric had been in the business for many years making telephone central office equipment, telephone instruments, things of this nature. They also had a subsidiary branch called Automatic Electric Sales, subsidiary of Automatic Electric Manufacturing. Automatic Electric Manufacturing, by the way, was the inventor of the dial telephone, not Bell, which not many people know. It's Strowger, one Almon P. Strowger, who first conceived the idea of the dial telephone. Anyway, Len somehow or other made contact with some of the principals in Automatic Electric Sales and Automatic Electric, somewhere in the mid-forties. Automatic Electric Sales became our sales agents to the independent telephone industry. A contract was worked up and then several years later, and I think you're right, in '48, community interest was such, it looked like a good idea that Automatic would get a piece of the equity for Lenkurt Electric, which they did.
- Norberg: Now, you started off with Lenkurt, in San Francisco?
- Appert: Yes.
- Norberg: In the same building? No necessary moves to other plant facilities?
- Appert: Not at the moment. We had to pick up some extra space, this was at Howard between 7th and 8th, 1138 Howard Street, and then we picked up some space over on 9th Street, an old warehouse loft, where we had a few employees. And then finally, in '47 we moved to San Carlos where we put up a 20,000 foot square plant, and that's the main plant that's been up ever since.
- Norberg: Now, you were making equipment right from the bottom up, were you not?



Appert: What do you mean by that?

Norberg: That is, you were not buying the equipment from someone else and selling it.

Appert: Oh, no, no. We developed it and manufactured it. We bought most of our components, of course, at least to start with, though there was a gradual shift in that over a period of years, of course. It gradually became to our interest, as the volume grew larger to make more and more of our components and Lenkurt today, I guess, makes practically all of their own components. But that's a long process, it has to be justified by volume, for instance.

Norberg: How many people worked for Lenkurt in those early years? Just before the war ended and shortly after, '44 to '47 say.

Appert: As I recollect, I would say about 10 in '44 to perhaps 75 in '47.

#### Lenkurt Equipment and Patents

Norberg: Specifically, what kind of custom equipment were you manufacturing in 1944 and '45? Was it all government work?

Appert: No. There was some carrier telegraph for railroads, and some telephone carrier for telephone companies and for railroads and utilities like pipelines and things of this nature.

Norberg: So, this had all come about during the 1940s then? You had established these contacts with electric utilities, with the railroads, and obviously with the government during those years, so in 1944 you were just continuing on with things you had already begun to do....

Appert: Well, in 1944 we were on the threshold. I'm not sure exactly what point you're trying to establish.

Norberg: All right. I'm trying to establish when it goes from a sort of a custom-designed piece of equipment for Man A to a production line where Man B through X can buy the thing, just off the shelf.

Appert: Well, that's a matter of degree.



Norberg: I agree, but one would think that for a while, there, maybe you were just producing a piece of equipment for someone who had ordered it, whereas you were not expecting that the piece you made today would be sold three months from now, regardless of (cross talk).

Appert: Yes, I see what you're getting at. As I say, our principal competitor--and there were two or three other small companies, hole-in-the-wall companies about the size of Lenkurt, too, in the same boat, an outfit in Chicago and another one, Southern Electric Transmission, somewhere down in Texas, who all made small quantities of carrier equipment which they sold here and there--the competitor in every case actually was--that is when they chose to be competitor, though they took no more notice of this kind of competition than the lion does of the mouse, until we got into their system and loused it up--Western Electric, of course. So, this equipment we sold and our contemporaries sold, meaning the other small fry, really was not custom equipment in the sense it was built to the customer's specifications. It was built to do at least after a manner what Western equipment did, you see. Not as well and not as reliable, but a hell of a lot cheaper, which was the only reason we had a market.

Norberg: How about patent infringements? Any?

Appert: Not at that stage of the game.

Norberg: How about after the war when you really were on the threshold of (cross talk)?

Appert: Well, do you mean when we got into the carrier business properly? Well, then we had to have a license agreement with Western Electric, of course. And we had patents of our own by that time. Not many, but some.

Norberg: Were these patents the result of development work that you or Mr. Erickson had done?

Appert: Yeah, most of it.

Norberg: Most of it?

Appert: Most of it. In the early years, practically all of it. I don't know, we had maybe 10 or 15 patents between us, I would guess.



Norberg: How extensive were these patents? Were they simply innovations on, let's say, the Western Electric system? Or were they new devices entirely?

Appert: You can get a patent on anything, you know that. It doesn't have to be much good, all it has to do is be different and you get a patent on it and then you have something to trade with or at least talk about. We had some innovations that were of some value, but it was hardly anything to keep the WE licensing division awake nights worrying about whether they have to cut the royalty rate in half or any such matter. Later on, there was a question of patents and we had a standard royalty contract with the Bell System, which took into account, of course, what they had and what we had in the way of patents.

Norberg: When did that licensing agreement come about?

Appert: Late '40s or early '50s, I don't remember.

Norberg: That late?

Appert: Oh, yes.

Norberg: So, they didn't consider you to be a really strong competitor until then?

Appert: I think the first time we amounted to anything is when we developed a short-range, three-channel system that was highly useful to the Bell System and sold large quantities of it to the System. And I would guess, though this was years and years ago--about 1947--that about this time they took some notice and we came to some kind of patent agreement and sales agreements too, because, everything that was sold to the Bell System had to go through the Western Electric Company sales arm. We had a sales contract with WE, you see. We had a tie there for years, and I guess Lenkurt still does sell some equipment to Bell.

Norberg: Why would, do you think, and I'm asking you to speculate here, why do you think that the Bell System would turn around and buy from you, when they're, at least loosely at that time, connected with Western Electric?

Appert: Well, first of all, the associated companies, that is the operating companies, of which there are some 30 now, there were 28 in my day, I think, operate quite independently and





and some of them had a very capable bunch of engineers and so they bought from whom they liked and nobody ever objected in the A. T. & T.--perfect freedom to do this.

The only requirement was that when they bought equipment that was interconnected into the national network, it didn't louse up the national network. This placed the basic responsibility on the particular operating company who bought foreign equipment, you see. And this worked out very well, and never caused any trouble. The reason, of course, that they bought it is, like I said at the outset, for tributary equipment, that is for equipment not designed to go into the main toll branches. Our equipment was a great deal cheaper, because it was not designed to be patched into the main network, you see. So they could save themselves large amounts of money for stuff that they never intended to use in the toll network in the first place. So there was quite a market.

Norberg: Can you be somewhat specific about the technical differences between the system that you people designed and the Western Electric system? How would you compare those two systems in construction, component parts, and characteristics?

Appert: Well, this gets highly technical....

Norberg: Please, go right ahead.

Appert: If you have a carrier system going from here, let us say, to San Jose, and has to go no place else, and is only designed to transmit conversations between here and San Jose, then you have one piece of terminal equipment in each end. Say it's a three-channel system; it provides three channels, and maybe about two or three repeaters. Now, if that's all that's involved, you can get very intelligible voice and signaling over this with equipment that would be totally unsuitable if you used this identical equipment and tried to go from here to New York, because each element you put into the system, each successive element, always degrades the circuit a little bit. It narrows the frequency band; it weakens the signaling margins and things of this nature. A requirement in the Bell System is that you can patch from anywhere to anywhere in



the toll network, so that you're likely to find all sorts of stuff linked up in the transcontinental link, which means that they had to go to extraordinary lengths in their basic equipment to be sure it's suitable for integration into the toll link.

Norberg: I realize that, but now, what is the difference between a piece of equipment you would use from here to San Jose and a piece of equipment you'd put in the line that would probably connect between here and New York?

Appert: Well, all right. Reflection coefficient, for example, which is an element that has to do with certain characteristics of wave filters. Reflection coefficient is a measure of the energy that a wave filter does not absorb, but reflects instead, because of certain inherent design characteristics. Reflection coefficients can run as little as one percent, which means it absorbs 99 percent of the energy and transmits it through, which is considered quite good and suitable for long-distance transmission with multi-links. Or it can be as high as 20 or even 25 percent, which is considered lousy, because by the time this happens four or five times you have tremendous difficulties with cross talks with this reflected energy bouncing around. Now, that's a typical example.

Now to get low reflection coefficients into electric wave filters calls for very, very expensive networks. So to provide wave filters which will have as little as one percent reflection coefficient and then use them on a link from Oshkosh to Podunk is an economic waste, do you see? When, as a matter of fact, you cannot tell the difference for a short circuit like that in actual practice, when you can use a much cheaper network. And that's only one example.

The same type of principle applies in signaling circuits, which on long links have to be connected in tandem, each one of them, which degrades the signaling impulses a little bit, and things of this nature. So Western, right from the very beginning in its equipment, simply designed its gear so that it could be universally used, either as part of a total network, or on isolated circuits. That opened the door to people like ourselves and others, like Lynch Communications, for example, to come in and provide equipment which was designed only for the short links, for the tributary circuits. Two different applications entirely.



- Norberg: Now, that's the second company that you've mentioned that I don't know really much about, though I've heard the names before. The first one was the Lake Manufacturing Company in Oakland. Can you say something about the Lake Manufacturing Company? What exactly were they doing, and how big were they?
- Appert: Oh, it was a small outfit. And I had such limited contact with it. Like I said, they made signal bells for traffic, for railroad use, things of this nature.
- Norberg: How about Lynch Communications....
- Appert: They were in the carrier business.
- Norberg: They were in San Francisco, as I remember.
- Appert: Yes, that's right. I think they're in Reno now; they were in San Francisco for years, and then the last few years they've been in Reno.
- Norberg: Did you have close contact with them at all?
- Appert: No. We knew the principal years ago, the guy who founded the company. He wound up in Puerto Rico, was the last I heard of him. But he hasn't been with the outfit for years and years.
- Norberg: How about contacts with the electronics people in the 1940s, during war time?
- Appert: Like who, for example?
- Norberg: Hewlett-Packard and Eitel-McCullough.
- Appert: Very little. I've met Bill Eitel and Jack McCullough a few times. I've met Bill Hewlett once, I think. I've talked to Dave Packard on the phone once--this was about a hundred years ago when they were first starting in business too. I was working at night up on Howard Street, on some piece of gear where I needed a frequency standard that Hewlett-Packard had just come out with, their first frequency standard, a 100 kc Standard. It went sour or something went maladjusted. So I thought nothing of calling him up on the phone about 11 o'clock at night at home and explaining this thing to him, and he thought nothing of getting a call. I got a chair, and took the phone with me and got up there with a screwdriver



and followed his instructions, and got it to work again. I'd say that was about '44, '45, something like that. I think that's the only time I ever talked to Dave Packard.

Norberg: I see. Then you people didn't become involved in this West Coast Electric Manufacturers Association in the wartime period?

Appert: WCEMA? Well, not during that time. Hell, I don't know whether.... We must have joined it. Everybody else belonged to it, they....

Norberg: Well, you did after the war, that I know.

Appert: Well, fine. You see, your memory is better than mine. Our former public relations man who came to us in the early '50s and was with us for some years--you may know him, Ed Ferry?

Norberg: I know the name, I've corresponded with him.

Appert: Executive director, I guess he still is. He's still with WCEMA, isn't he?

Norberg: Yes.

Appert: Yes. But no, we had no contact with them during wartime. In fact, I didn't even know it was in business during wartime. Was it?

Norberg: Well, there was a small group formed to encourage the government to give contracts to West Coast manufacturers. And that's the origin of what's now called WCEMA.

Appert: That's the genesis of that thing, you're right. I'd forgotten that.

Norberg: And I'm trying to see who was involved as a motivating force besides Hewlett and Packard. Eitel-McCullough claimed they weren't involved either, because they already had enough business. They didn't need to ask for anymore.

Appert: Well, we were not interested in government business right at that particular stage, anyway.

Norberg: Let me ask you another type of question, which will probably show my own ignorance in the matter, but it's been troubling me, and I think you might be able to clear it up very easily.





And that is, my conception of carrier-current equipment dates back to the 1920s, that the electric companies were trying to put a current onto the electric power lines, to be able to transmit a conversation let's say from the Pitt River or the Feather River station back down.

Appert: Yes, yes. That's a very special application.

Norberg: Now, how would you distinguish your carrier-current device from theirs?

Appert: Well, basically, there's really no difference in the telephone end of it. The big trick in power-line carrier, the important component is the coupler you use to connect the telephone gear to these high-tension lines. And it's something to tie a piece of telephone equipment where at some point a guy has to pick up a handset and put it to his ear, and the other end is connected to a 300-kilovolt line. So that really is a job for a power utility itself to design, not for somebody outside of it; it takes real high-voltage savvy for safety and other reasons. And then it operates in an entirely different frequency range, too. You've got to get way up into the kilocycles to get so far away from this high voltage and its harmonics to be sure you don't get interference. That's a very special purpose, that stuff. We never got into it.

Norberg: You never got into it. Okay. But yet you were selling equipment to the electric utilities?

Appert: Oh, yes, but not for use on power lines. On use for their telephone lines. Most of the communication by utilities and pipelines, the like, is for, or a good part of it at least, is telemetering and the like for operation of their control devices and so forth. And they have separate circuits for that entirely. Usually they don't hang that stuff on their high-voltage feeders.

Norberg: I see. How much work were you doing for broadcasting and T.V. companies, if any, in the '40s?

Appert: None.

Norberg: None. So does that come later than the war?

Appert: It comes after my time.

Norberg: That's one of the areas that GTE is now involved in.



Appert: Well, yes, so is everybody now.

Contributing Elements to Company's Success

Norberg: Let's try and be a little philosophical for a few minutes, and go back to 1944 and '45 when the two of you were just beginning this business or, at least, just beginning your own business. What did you see as the element of success? How did you think you could direct this company and make it a success?

Appert: Well, ... I really don't think we gave a great deal of thought to it in that fashion. At about that stage, Len and I sort of split responsibilities; he did virtually all of the outside contact work--the selling and the travelling--which I detest by the way. I stayed home and ran the plant, such as it was at the time, and did the developing. I had to call frequently for help from Len in this area, who was very competent technically, needless to say. But by and large that's the way we split it up, and we were both engrossed in day to day operations--going out, getting orders, developing equipment, and putting it together and shipping it.

Mr. Norberg, this is what I've been trying to say and nobody ever really believes me: I doubt very much whether businesses are very often built because somebody has a brilliant idea and a brilliant foresight, and he gets in there and he says, "By God, this is the way it's going to go, and I'm the guy that's going to send it there." It's been my experience that more often these things just happen, and they happen by accident. People don't make "opportunities"; the best they can hope to do is to see them or have some grasp of them when they're there to be grabbed and then grab them, or what part of them you can.

Norberg: But at the same time, one doesn't develop a production line, and think that two months from now we'll be out of business and all this is wasted.

Appert: Oh, no, no, well, but....

Norberg: There are some expectations for the future, and I can somehow manipulate those expectations once I've decided to take that route.



Appert: Yes. But somebody had already done that for us: Western Electric.

Norberg: Western Electric. So you did have a model.

Appert: You bet we did. How would we have gotten through the ins and outs of this business without Western in the picture? Our first voice carrier system was a thing we called the type-12 carrier. It was a carbon copy almost of the Western Electric H-1, except for limited application, somewhat cheaper in ways I've explained to you, like less expensive filters and this type of thing. But the market was there, Western was using it. Other people like railroads and utilities were buying it from Western; we could come out there with a cheaper model.

Norberg: Where did the number 12 come from?

Appert: I haven't any idea. After that we decided on a companion piece to go above it in the next frequency range to provide two channels, that we called the 17. Now, don't ask me where 17 came from.

Norberg: Okay. Can you detail any of the technical problems that you may have encountered in the early years with this equipment?

Appert: Oh, boy.... Oh, you mean in the field?

Norberg: Yes.

Appert: Oh, I would say that fundamentally our start was really in what you could call the radio end of the business, like public address and office intercommunication, or this type of thing. And this has with it a certain connotation of degree of reliability. We carried with us this background into the telephone business where the reliability that is demanded is an entirely different matter, because when telephone equipment fails the companies are losing toll revenue, which is quite another matter if your T.V. set gets kaput, you see. And so we did not put probably, just to pick out like I say one generality in the early years, sufficient reliability as far as trouble-free performance was concerned into our equipment, by using perhaps components of radio grade when we should have been more careful. That type of thing, you see. But that period didn't last long, because we were very speedily educated by the telephone companies, by the operating people.



Norberg: In what way?

Appert: By being told about it and expecting to be called out there to fix it, whether it was at the other end of the country or not. And we did learn this lesson and learned it well. One of the episodes I like to think back upon is years later, when we were a good-sized company, we quoted on a good-size job for a big telephone company in the Southeast. The chief engineer of that company, who passed on the qualifications of the bidders, passed the job to us and promptly got called on the carpet by the president of the company. He says, "What the hell did you give this job to Lenkurt for when they weren't the low bidder?" And the chief engineer replied that the difference is, "When it doesn't work, Lenkurt comes down and fixes it." So we did learn that not only you had to build reliability in the equipment in the first place, but in this business when you did fail, when it did fail, you had to get out there and fix it no matter what, you see. But I would say that was probably one of our principal early problems.

Norberg: What about early problems in development? Or were there none because you were just copying....

Appert: Oh, no. There were plenty.

Norberg: Can you give some examples?

Appert: Well, one for instance, core material, powdered metal core material which is a requisite for inductances that are used in wave filters. We didn't have access to the type of core material that Western Electric did, who made their own permalloy, i.e., an alloy of nickel, iron, and cobalt. So we had to use powdered iron, other types of powdered core material, which produced inferior results. We had to engineer our way around that as best we could, that type of thing.

Obviously we had a host of development problems: that goes along with being green as grass in a new field. I don't know of anybody who escapes that, so that types would be just too numerous to mention.

Norberg: Well, please do, though. I'd like to carry back some more examples than the one you've just given.

Appert: Well, as I said earlier, using radio-grade components and engineering with that type of thing, radio-grade vacuum tubes. This was long before the days of solid state, of course.





Generally circuit design tended to be somewhat too marginal in performance. The type of thing that would be expected by anybody who was familiar with the development of telephone equipment and knew what could be expected from somebody who had nothing but radio experience in that sense, you see.

Norberg: Well, the only persons then that did not have just simply radio experience would be those people with Western Electric.

Appert: In those days that would be ... yes, that would be virtually absolutely so I would say, that is, in the U.S.

Norberg: Yeah, I think that's right, because I think it's really only after the war that you begin getting better trained engineers in high-frequency techniques.

Appert: Well, that's right, to say nothing of the fact that later on, too, we got quite a few people from the Bell System itself, both field engineers and people from Bell Labs, who for one reason or another wanted a change. Some of them because they wanted to come to the West Coast; they didn't like it at Murray Hill, for instance, in New York, and ... but that came later.

Norberg: Well, did you build up then a sizable research and development staff?

Appert: Well, you mean ultimately?

Norberg: Yes.

Appert: Well, it depends what you call research, of course, and that's subject to interpretation. But I would say as far as development is concerned, oh, at the time I left, well, we had product planning engineering development, mechanical engineering. Some two or three hundred professional engineers I would think scattered around in various functions.

Norberg: That was 1959.

Appert: That's right.

Norberg: I'd like to ask three questions about the war, and I'd like to relate them. Let me ask this one first, what type of technical literature were you reading then? 1942 let's say to 1946 or '47.



Appert: Well, there was quite a bit of it. First and foremost, at the top of the heap, that unparalleled, the Bell System Technical Journal, which is considered the bible, or was at that time, in telecommunications. There's a magazine Electronics. There were various engineering texts, engineering handbooks.

#### Contact with Local Universities

Norberg: Very interesting. Did you have any contact with the universities at that time? Stanford? Cal? That is, the engineering staffs of those....

Appert: No, for a limited, a very limited period of time, until we got entirely absorbed with work, and this was sometime in the '40s, I don't remember when exactly now--or was it the late '30s--gee, it was so long ago. Anyway we attended your U. C. extension outfit that was down on Powell Street or somewhere, wasn't it?

Norberg: Could be.

Appert: That was before your time too.

Norberg: Oh, yes. I just came here a year ago so....

Appert: Oh, is that right? Well, there was some classes in electrical engineering. I remember that we were in a class of one Dr. Lester Reukema.

Norberg: Reukema. Very interesting.

Appert: Yes. Is he still in existence?

Norberg: Yes, he is. He's still living. He is probably the best they had at that time at Cal.

Appert: I shouldn't wonder. He had quite a reputation, yes.

Norberg: In fact, Poniatoff went deliberately to Cal to take a course from him.

Appert: Oh, is that so?

Norberg: In the late 1930s. Surprising. Why not go and take courses



from someone like Terman who was equally well if not more well known?

Appert: Well, we were in San Francisco.

Norberg: You had the element of closeness.

Appert: That's right. And in the late '30s I didn't have a car, and it was a question of either walking or taking the streetcar. Stanford could have just as well been off on the moon someplace in those days.

Norberg: Do you remember some of the details about Reukema's course?

Appert: No, no, we were only there briefly and besides, I really was not equipped for it, you see. To absorb that Poniatoff is the right type of a candidate, who is a trained, formally trained engineer. I only got a little bit out of it. I'm glad I went. I liked the man. But that's the only contact I had with any university.

#### Lenkurt's Contributions to the Industry

Norberg: Do you think that Lenkurt Electric made any innovations in the industry in the late 1940s or 1950s?

Appert: Well, again, it's a matter of interpretation; it depends on what you call an innovation.

Norberg: Then you do the interpreting, please.

Appert: Well, ... not to any greater degree than I've already outlined, which is that we developed equipment that was of sufficiently good quality as far as reliability was concerned for widespread use in the Bell System, but not for certain specific uses. So we sold a large quantity of it to the System--stuff that Western didn't have. When we first started our developing, not only could it not be used widespread in the Bell System as part of a national toll network, it didn't have good enough reliability probably to be used in any part of the System in the very early days. But if you define innovation in the current sense of a major technical breakthrough, I would say not. I think there's probably been a good deal more of this since '59, but since '59 has come solid state and integrated circuitry and all that. This is a new world as far as I'm concerned.



Growth of Lenkurt

Norberg: How quickly did production expand from 1945 on?

Appert: That is to say, how quickly did the company grow, really.

Norberg: Sure, same question.

Appert: Well, I think a better year probably would be to start with '47, because that's the first time we had an integrated company physically, really, when we had one location down in San Carlos in that 20,000 square feet I told you about. Well, in the early years--you'd have to go to the records for this--I would guess that maybe '47 or '48 we might have done a million dollars worth of gross sales in a year, and we got up, I don't know, somewhere in the middle '50s or thereabouts, I would guess somewhere between 10 and 15 million, that sort of a rate, and a....

Norberg: Okay, can I rephrase the question and it might be a bit more specific then. Were there cycles of business, or was it a continually rising curve?

Appert: Oh, no. There were periodic dropoffs in business.

Norberg: What factors influenced those dropoffs? The general financial climate of the country....

Appert: Well, a part of the financial climate of the country, but more specifically, the capital planning of the utilities, depending on, of course in large measure, on the general economic planning, but also on how well they're getting on with various rate commissions in getting their rates raised. Things of this nature can have quite a bearing on how much plant expansion there's going to be in the telephone business. So it would be cyclical, and then too, about 25 or 30 percent of our output was going to the Bell System, and very often the volume would be up as much as a year or two at a time to the Bell System, while they were in a process of developing something for that specific purpose themselves that was better suited. But in the meantime, their development lead cycle being much longer than ours, because of their size and other relevant factors, we were able to capitalize on these gaps. But we were aware that the danger of that business fluctuating was there. In fact, we were warned about it by the Western Electric purchasing agent, "Just don't think





you're going to sell this to the System forever, because something's in the works," at Murray Hill, he meant. So, yes, there were ups and downs for that reason, and occasional cut-backs.

Norberg: Did you have any contact with the military after the war, making equipment for them?

Appert: Oh, yes, to a degree. I would say perhaps 10 or 15 percent, maybe somewhat more than that, of the business was government business, but not necessarily military. We sold stuff to the Forest Service, and things of this nature. But generally off the shelf equipment not specifically designed for government use.

Norberg: What kind of distribution system did you use for getting your equipment off your loading dock to consumer?

Appert: Well, most of it through Automatic Electric Sales.

Norberg: Continuously right up until 1959?

Appert: Oh, yes. The government we sold direct. Western we sold direct. The bulk of it--the rest of the business--went through sales, I would say.

Norberg: What kind of contract did you have with them? Was it pure commission on their part for distributing this?

Appert: Yes. Plus, of course, they had the equity in the company. But the actual sales contract was on a commission basis with A. E. Sales. Automatic Electric was the one that owned a piece of Lenkurt, not the sales company.

Norberg: I realize that, yes. Now, did you ever buy them--Automatic Electric--out?

Appert: No, no. General Tel picked up Automatic Electric and inherited the 30 percent.

Norberg: You've mentioned San Carlos a couple of times. Do you recall what factors made you decide to locate in San Carlos as opposed to somewhere else, let's say, on the Peninsula or in the East Bay?

Appert: Well, Len had a friend down there, one Tim Moseley, who used to run Dalmo Victor, or own a large part of it. He had some



two or three acres of spare land down there right opposite Old Country Road, and we were shopping around for a likely location. We could get this at 15¢ a foot, and grabbed it; 15¢ a foot--that would be \$6000 a commercial acre ... yeah. Yeah, today that's going for about \$100,000 an acre.

Norberg: Who else was in that vicinity at that time manufacturing electronic goods, or....

Appert: Well, Dalmo Victor practically across the highway. They were in an old furniture warehouse--Brooks Furniture Warehouse, some such ... and I don't remember offhand anybody within stone's throw. There was Hewlett-Packard, of course, down the Peninsula, and Eimac up in San Bruno and Varian in Palo Alto.

Norberg: Where was Ampex at that time?

Appert: There wasn't any at that time. Ampex was a spinoff, wasn't it, as a result of the original Dalmo Victor, really....

Norberg: That's true.

Appert: Well, Ampex came in afterwards. They would have been in Redwood City.

Norberg: Well, he started in the loft above Dalmo Victor, which is why I wondered whether you had any contact with him?

Appert: Poniatoff, you're talking about now? That's right, yes.

Norberg: Then he bought a piece of land close by there I thought. But maybe you're right, maybe it was in Redwood City.

Appert: Well, maybe he did. Maybe he bought it in Redwood City. Well, Redwood City, Charter Street is not very far from where they were, from El Camino. So that could be the original location.

Norberg: Did all your business come to you, or did you have to go out and seek it in the 1940s?

Appert: Well, no, you had to sell.

Norberg: And you say that Mr. Erickson was the person who was going out doing the selling.



Appert: That's right.

Norberg: Can you give a percentage of how much of the year he might be out on the road for example?

Appert: Oh, it would vary widely from time to time, but he was away a good deal. After we had affiliations with Automatic Electric, he was back to Chicago often, and then of course there was dealings with Western Electric and Bell Labs in New York, and then he was acquainted with foreign carrier manufacturers. Incidentally, when I say there was nobody in the picture in the carrier business until the '40s, except Western Electric, I mean of course in the United States.

Now, in Canada there's a Northern Electric, which is exactly the same thing, which serves Canadian Bell the same way. And there are at least three or four highly reputable outfits in the European Area, which like L. M. Ericsson in Sweden and Philipps in Holland and Siemens-Halske in Germany that have been in the business for years and years, who made just as good equipment as Western Electric. In fact, some argue, better. That Europe was ahead of some of the American development.

Norberg: Did they have any effect on the American market?

Appert: No, not in the shape of competition except that they influenced it finally in the way the equipment was developed, because they had to deal with problems of interconnection not only in a much more densely populated area, but also between different nationalities, and so they had to get amongst themselves and agree on certain standards, these different countries. It's only in recent years, relatively speaking, that the United States has gotten aboard and adopted many of these same standards. But in our day the equipment really wasn't interchangeable, U. S. equipment even of high grade and European equipment.

Norberg: Wouldn't that possibly have prevented you from coming out with new equipment as well, because you couldn't sell to, for example, Southwestern Bell if you were selling them different equipment than they could hook into the line with the Bell System eventually, could you? You would have to use the same standards as Western Electric was using.

Appert: But limited to specific purposes.



Norberg: True.

Appert: And you must make a distinction technically between reliability, which has got to be basically as good as Western's if you expect to sell in the Bell System because the operating companies just expect this stuff to work around the clock seven days a week without having a maintenance man sitting over it. That's one thing. The other aspect of it is, is it good enough, or not, for certain technical reasons to integrate on a multi-system basis in tandem over very long distances. This is quite another matter, and it wasn't until relatively recent years--and by recent years I mean the late '50s--that we came up with equipment that was good enough to do that, that met the standards so that you could sell to somebody like Bell, and they could put a piece of our equipment right in the middle of a circuit going from San Francisco to New York, the middle of it in Kansas City, for example.

Norberg: Okay, then you could use different standards than Western Electric.

Appert: In the early years. It limited the market, of course, to where that could be used. We just didn't begin by ... we knew at least what we didn't know, let me put it that way, and we knew we weren't capable in the early stages of developing equipment that would meet the standards for unrestricted national use in the Bell System. So we didn't attempt it.

Norberg: Let me ask another question again which you partly answered before, and that is, did you know Professor Terman in the 1940s and 1950s?

Appert: No.

Norberg: Then he could have had no effect on your company.

Appert: Except through his books.

Norberg: How about through possibly students?

Appert: Oh, yes. Yes, sure....

Norberg: Did you go about seeking engineers....

Appert: Particularly from Stanford?





Norberg: Or from Cal for that matter?

Appert: Well, we got engineers where we could find them.

Norberg: Were they hard to come by in the late 1940s?

Appert: Well, up until the late 1940s Len and I did most of the engineering ourselves, so that wasn't much of a problem. When we got into the '50s we hired some people--this is while we were still making solely carrier equipment--and then we hired engineers, and most often we got them from somewhere out of the Bell System, people who had had telephone experience. Then somewhere towards the middle of that decade, toward the middle of [the] '50s, we got into the microwave business, and then we began to hire microwave engineers. At this point we started to get the people that had primarily high-reliability microwave experience, but not necessarily any telephone experience, you see, and younger engineers for that purpose we would get out of university. And we had quite a number of Stanford people, and Cal, and elsewhere too. That's when the business got more diverse, you see. And then we got into components engineering, like making crystals and things of this nature, and transformers, condensers.

Norberg: How did you get into the microwave business?

Appert: Well, our stuff was beginning to be used on microwave. We started out by buying some special studio-link equipment, microwave equipment, from an outfit in New York--R. E. L. We did that for a while, and then finally we started developing and making our own.

Norberg: For what purposes?

Appert: To put carrier on. Except for cable systems now, you know, practically everything is on microwave as far as telephone is concerned. And so if you're going to furnish an integrated system, then you not only needed the carrier end of the business, you also needed the radio terminals. Finally this led to what is known as E., F. and I., which means engineer, furnish, and install, and by engineering is meant engineering the entire circuit. You send field engineers out, plot sites for microwave and then you furnish the equipment, and then your own crew, the factory crew, goes out and installs it and lines it up--a true turnkey job from beginning to end. And this was developed to be practically



a necessity, because everybody was doing it and the various operating companies wanted it, both telephone and utilities.

Norberg: Well, who were the first people into microwaves? Was it the Bell System who began using microwaves?

Appert: Oh, yes. That is, for telephone use in the U.S.

Norberg: So you were almost forced, to continue being competitive, to get into the microwave business.

Appert: Well, yes, you can put it that way. It was a definite trend. Well, hell, with labor and material costs going up steadily, the proven points for microwave as against putting up pole lines and stringing wires grew steadily shorter. That is, it was proven for shorter and shorter circuits to get a couple of expensive radio terminals, even at the cost of running maybe a wire line 50 miles, 50 miles or less. And I suppose 40 years ago you could put a telephone line by hiring a few laborers for a dollar an hour. Well, those days are gone forever, and in fact they've been gone for a long time.

Norberg: How long did you remain in development work with the company and what factors encouraged you to get out of development work, if you did?

Appert: Well, I was in it till pretty close to the end, really. In fact, I had a considerable hand in the development of the last major system that was developed when I was still there, a personal hand in it. But business got more complex as it got larger, and I was carrying a dual title of Executive Vice President and Director of Engineering. And I was dividing my time by having engineering committee meetings and fiddling around with development and so forth, and trying to take care at the same time of general management duties, which became more burdensome as the company grew larger too, because Len perforce was forced to be away more on business elsewhere as things became larger and more involved. And besides this wearing of two hats, both head of engineering and also the executive vice president and general manager, sometimes it caused certain upsets, because technically looked on in an organizational chart engineering, sales, manufacturing, and finance should be on equal levels, approximately, see, all reporting to one general manager. Well, this worked out all right most of the time, except that occasionally I got into arguments--I remember one day, just as an example--with my sales manager who reported to me



directly--Phil Patton--and he was in a fret because something wasn't coming out of engineering fast enough. And I got a little irritated, and I says, "Well, hell, you're not going to get it out when you want it, and that's the end of it. Do you understand that?" And he says, "Well, hell, that's easy for you to say. You're the general manager."

Norberg: One point that sort of drifted away: most companies you said would have sales, engineering, finance, mostly reporting to the general manager, so they would all be, essentially, on equal levels.

Appert: Well, that's what we did at least.

Norberg: Well, I had the impression that you didn't do that because you were head of engineering and therefore....

Appert: What I mean is, that's what we attempted to do. Ultimately, we had to change this, for reasons I have mentioned. At the time of the merger we had a separate vice president of engineering.

Norberg: I see. I had the impression that that's what you were trying to imply. In the 1950s, who else was providing you substantial competition besides maybe Western Electric?

Appert: A troublesome competition, you mean....

Norberg: What I'm trying to find out here is what percentage of the market did you have versus your competitors?

Appert: Well, we had very little competition. These people who were at our level, there were three only that I can recall, which would be an outfit run by a guy named Clark in Chicago, Southern Electric Transmission run by a fellow named Adler in Texas, and Frank Lynch's gang, who we knew. Of those three, the two Chicago and Texas outfits never did go beyond where they were and in all likelihood, they disappeared from the scene long since, I would guess. Lynch Communications grew, but not nearly as fast as Lenkurt and this was after Frank Lynch was out. There was somebody else in there running it. Some individual named Campbell, I think. They have maybe a hundred, no more than a hundred or two hundred people now, I would think up in Reno.

In the '50s there were occasional, what I would call, sporadic efforts of some big industrials to get into this



business who set up separate divisions really to which headquarters probably didn't pay much attention, figured, well, let them go out there and try for a while, what the hell. That type of a basis. I'm talking about outfits the size of General Electric Company, and RCA, but they didn't provide much competition, not because they weren't capable of it if they really made up their minds to, rather obviously, but because they probably didn't have any great interest in making a big thing out of it.

Norberg: So, this basically left the market open for you people to just move right in and as long as you kept advancing product lines, you could keep them open.

Appert: That's right.

#### Mark of a Thriving Company

Norberg: Could you say something then about the mark of a thriving company? How could you tell if you were looking at a given company, and I don't really care which one it is, provided it's in the same field that you were in, what marks would you look for that would suggest to you that this might be a good company to buy?

Appert: For its common stock? Maybe I should answer your question this way. If it were that simple, I don't think the Dow-Jones would be flat on its back. All you can do, isn't it, is that you take a look at its current profit-loss statement, at what it has been for some time in the past, what its record of growth is and make some sort of an educated guess as to what its possibilities are for the future. But aside from that, what can you guess, and especially in current times.

Now, there was a time, you know, and not so many years ago when the rule of thumb was that the market value of the company should be twelve times the average of its last five year earnings. Now, nobody, today, nobody, up until recently, seemed to give a damn until about a couple of years ago or so, what the company did the day before yesterday just so it looked as if it would do it the day after tomorrow and the result is that some stocks were going at something like hundred times current earnings, you know that.





Norberg: Yes, I do.

Appert: Now, in a situation like this, I don't know what you look for. Speaking for myself, I stay out of the stock market, or out of buying companies at a time like this and ... look at what happened to Memorex.

Norberg: Don't remind me.

Appert: That's a classic case of what can happen.

Norberg: Yes, yes. Well, I've heard other entrepreneurs, for example, say that: "Well, you can look at the advances made by the company from a technological point of view, take Hewlett-Packard and the pocket calculators and things like that, as an example."

Appert: Which is a great device, yes.

Norberg: "Or you can look at the rate at which they do new things, get into either new product lines or expand their facilities and these things may not necessarily be reflected in profit and loss statements." At least not in a short term, perhaps you have to wait for the long term to see those. And what I'm trying to, I think, elicit from you is some remarks about the effect of your engineering staff on the growth of Lenkurt. Now, this would have to be the 1950s, after you get a sizable engineering staff for the company.

Appert: Or, to put it another way, if I follow you correctly, what bearing did new product development have on the growth?

Norberg: Yes, the same question I asked you before about innovation in the 1940s.

Appert: Yes. We left that one on the basis of how do you define innovation, it was never clearly answered, now we can get back to it.

Norberg: Right. Now, I think in the 1950s it can be defined a bit better for your purposes.

Appert: All right. Well, I would say, new product lines, that would include the various new carrier lines for new applications or getting into the microwave field, this type of thing. Well, I would say it was the single biggest element.



- Norberg: Now, in this period, you were no longer copying Western Electric or places like that.
- Appert: No.
- Norberg: You were actually doing your own product development.
- Appert: Yes, I would say so.
- Norberg: What new problems did your company encounter as a result of that? First of all, let's take just the technical problems-- we'll get to the management problems, if any, later on.
- Appert: Well, there's a pro and con to that. First of all, this is not a thing like flipping on and off a switch, you sort of migrate into it, or whatever the word should be....
- Norberg: That's a fine word.
- Appert: Yes, it's a gradual changeover. But as you start branching further afield, and getting into foreign territories, of course, you stumble more often. That's whether you walk down a new dark hallway at night or engage in developing a new product, same thing. And so, there were more mistakes and they cost us money. Obviously, mistakes always cost money. Partial offset to this factor is we got much more qualified engineering help. People of this nature, because they brought with them years of experience, of knowing the needs of the system from a development point of view. But, other than that, just the generality that as any company grows and expands into new product fields it can expect more or less development headaches.

#### Operating in the 1950s

- Norberg: Well, now, this, it seems to me, is a perfect occasion for us to make a contribution about just what problems a company encounters as it is developing, because this is something that we only see analyzed from profit-and-loss statements, from some knowledge perhaps of Board minutes, but we really never get down to talking about the details. And I'm now speaking about the literature in business administration, in economic development of industry in the United States. Now, could you sort of detail some of the problems that you encountered in the 1950s as the company was developing, just from whatever you remember?



Appert: Outside of money, you mean?

Norberg: Yes. Well, no, (cross talk).

Appert: Well, that's very difficult to do, for the simple reason that in the end, every mistake you make, it costs you money. However, you're perfectly correct. By looking only at a profit-and-loss statement gives you no information at all as to what future money headaches you're generating for yourself, which indeed might send you into sub-chapter 11 next year. When you're expanding into new fields, and at the same time are growing fairly rapidly in the field you're already in, you're faced with physical expansion, more employees, which in turn means organizational changes, doesn't it?

Norberg: Yes.

Appert: Usually. All right, so you're up against, for example, you create new organizational positions because [of] the increased size and you have to make choices between getting some new people from the outside sometimes and sometimes promoting people from within. In both cases, you occasionally make mistakes and while this can't be translated into an inventory item, it certainly has a definite effect on profit and loss, if you pull a boo-boo over a period of time. And you can misjudge your rate of growth, and overexpand your physical facilities.

Norberg: Did you do that?

Appert: Yes. At least once and probably twice.

Norberg: When?

Appert: Oh, sometime in the middle fifties.

Norberg: Can you give the details?

Appert: Yes, we built too much plant. We had a whopping year, \$36 million, I think, went way up....

Norberg: What had it been the year before?

Appert: I don't remember what it was.

Norberg: 20, 18?



Appert: Well, it was about 20, I would guess. I remember that figure 36. Everybody got starry-eyed and forecasts were coming out, 36 million this year, well, let's apply this, draw a curve through what's gone on in the past and project it out and what does this yield next year? Well, 50 million and then 60 million and five years from now, we'll have to buy San Mateo County, you know the reasoning.

Well, one of the things that we overlooked is that particular year we had the 36 million dollars, 40 percent of our output went to the Bell System. On the basis of 20-20 hindsight afterwards, it was clear that that should have been a hallmark of warning, because it had been running only 20 or 25 percent. So we built, expanded the facilities considerably, bought some more land and built some fancy offices, and next year, business went down instead, substantially. It was still pretty good, a little over 30 million, something like that, but quite a little ways from the projection. And there of course you sit with unused facilities and you know what that does to the profit-and-loss statement.

Norberg: Did you also bring in new staff, both management and production line people?

Appert: Well, I don't think, to the best of my recollection, we expanded administration and development, the professional end too much. Production people are generally hired on the basis of the orders when they're there. There was a cutback in production afterwards, but not because of the outlandish projection, but because actual volume dropped from about 36 million to about 30 or 32 from the year before and of course that left an excessive production capacity. No, I would say that the main beating we took there was overexpansion in physical plant.

Norberg: Did you ever have the opportunity later on to use that expanded physical plant, though? Let's say, four, five years after that?

Appert: Oh, yes, that's right. But in the meantime it was sitting there eating up interest and profits 'cause it wasn't being used. In the end, I suppose, it's the old story, you know, if you live forever, if you started out with one penny, in the end you'd have all the money in the world, so that timing is important. I don't know of anybody that can afford to build a lot of plant and then have it lay idle for five years without putting quite a dent in profits.





- Norberg: Did you ever have occasion to hire research staff who would be not physicists or chemists, I mean, who would not be engineers, but would be physicists or chemists or some such people like that?
- Appert: To a minor degree.
- Norberg: Did you ever hire Ph.D.s?
- Appert: Oh, yes.
- Norberg: What was the relation between Ph.D.s on the staff versus the management? Now, what I'm driving at here, and maybe I should be specific, when you hire someone with a doctor's degree who has been doing research in a lab, maybe like Bell Labs, and comes into your company where the basic research is de-emphasized and really product development is what you're after, the people are not necessarily happy under those circumstances. Some are; some take right to it and work very well. Others do not. Did you ever have situations like that around you?
- Appert: Oh, yes.
- Norberg: When?
- Appert: To a very limited degree, we had some use for people who were physicists. I'm not talking about just having the degree, now, but whose talents as a physicist could be employed by Lenkurt. Like when we got to the crystal development business, which is a highly specialized type of thing, [it] requires a good grasp of certain physical sciences. But for the most part, that's right. Regardless of whether they were just graduate engineers, masters, or Ph.D.s, the emphasis was on basic development, product development, and we attempted to make this clear to them before they came to work for us, what their position would be and what the job was. And, like you implied, some of them, well, it falls into three categories: some of them decided they didn't want it, and some of them took it and knew what they were getting and were satisfied enough, and some of them, after they tried it, didn't like it and quit.
- Norberg: Did you find it difficult to work with people like that, who really were not satisfied with doing other than basic research?
- Appert: Well, that depends on the individual personality. I would say that probably in any endeavor, when a profession, or



perhaps it had better be called an art, becomes so demanding that it demands everything from you, from the individual, the absolute, it tends to the exclusion of everything else, you have a potential personality problem. And that applies to every one of us as an individual. This does not occur for Ph.D.s as a class, this exists with artists, like musicians for example or painters. Great talent all funneled in one direction seems to shut everything out, which makes them somewhat different to deal with as ordinary persons. The rest of us less-talented creatures, so to speak, it's a different world. I don't know whether I'm putting this....

Norberg: Well, I realize what you're driving at, you're trying to generalize it, it seems, to show that it happens in all fields, but I was trying to get at your specific experience rather than trying to philosophize....

Appert: Well, there was a cross section of it. Some were more difficult to deal with than others.

Norberg: Did this ever cause problems for the engineering group and its product?

Appert: Well, I wouldn't know about its product. But there were occasional wrangles about that and about other things too, for that matter.

I sort of get the impression that you're trying to fish out something, for lack of a better way of putting it, in trying to determine whether in some way there's something different going on in Lenkurt than goes on elsewhere. Maybe we're not communicating very well, because, to me, this type of question relates to all the industries, I mean, to all companies.

Norberg: Sure it does. I agree, but by my asking you the question in that way, as I would ask Bill Eitel, or Poniatoff, or Ed McMillan, who headed the Radiation Laboratory at Berkeley, asking the same question, I elicit different responses perhaps. Or I show that there is a general trend which happens in all the companies.

Appert: Well, whether this is going to make life any easier for you is debatable, you know, Mr. Norberg: It's like going to ten economists today and asking them what's going to happen to inflation, huh?



Norberg: That's even worse. But at least you can give some specific examples, you see. [Let's say you responded:] Here was a case where man A and I didn't see eye to eye on this particular development project because he wanted to investigate thin films and I wanted to investigate crystals. Well, the crystals are more beneficial to our company than the thin films.

Let me give you another example. I once interviewed for a job at United Aircraft Research Laboratories, in East Hartford, Connecticut, when I was just coming out of master's work in graduate school. I talked to this man who was working on thin films--and that's why it happened to come to mind. He was trying to build thin films one on top of the other, until he would get a structure that would approximate the size or the thickness of an airplane wing. He was selling the company--he admitted to me that he was selling the company--on the idea that if he could build larger and larger thin films then he could show that you could build aircraft wings by layering one part of the crystal on another, and that this would make aircraft wings stronger. He said, "I know that that's probably absurd. But they don't know it." So I'm trying to see how often this happens, and whether management really isn't being fooled by that kind of thing.

Appert: Oh, yes. This specific example that you're talking about, and I see now why you brought up the previous question, would be much more likely to crop up where there is basic research. The closer you get to product development, [and] the more you get down to nuts and bolts and things, then the less chance there is to sell anybody a bill of goods, whether it happens to be your boss, or somebody in the sales department, or anybody else, you see.

No, the inherent nature of the business was--it wasn't what you would call a glamour business by any means--it was a putting together things largely by known methods, with really very little basic research. As a result, this type of a problem very rarely arose. The people knew what had to be done, and just did it. But I guess if you went to one of these highly-oriented basic research outfits, you would get a whole series of examples of this type of thing. But we didn't have it, you see.



### Partners' Relationship

Norberg: Now, you have talked about your responsibilities in the company and Mr. Erickson's responsibilities, can you say something about the personal relationship between you and him?

Appert: It was fine. Our personal likes and dislikes dovetailed very well into each other. This fundamental business of one partner likes to travel, the other stay at home; one partner likes social contacts, the other one is more of a loner, which I certainly am, complement each other very well. There was plenty of controversy on all sorts of subjects, but a partnership without controversy is absolutely meaningless, is non-productive. If you don't have any arguments, that only means that one or the other is not producing anything, perhaps both, you see.

Norberg: What kind of arguments did you have?

Appert: Oh, on every subject under the sun. Technical, and sales policy and financing, and whether we should borrow long term or short term, who should have equity or not, any number of things. One point that was once made by one of the fellows, he says, "It's amazing to me how you and Len can be at odds in the morning, when it looks like you're absolutely 180 degrees out, with one going north and the other south, and you get together for a half an hour, and then you come out of the office, and you're both going either north or south." And the only thing I added to that was "Yeah, or west." When we couldn't work out the thing exactly the way we wanted, we'd come to a compromise, and that's what the organization went by then. No, that was a good working arrangement, between Len and myself. And I bet you'd find the same thing with these other duos--Dave Packard and Bill Hewlett, and Eitel and McCullough, and that sort of thing.

### Financing and Merging with GTE

Norberg: The whole area of financing has not been discussed yet, except when I asked you about the finances in 1944.

Appert: Yes, well, that's when we didn't have any money, so that's relatively unimportant. You mean when we grew to be good sized?





- Norberg: Right. Now, for example, how did you go about financing the San Carlos plant?
- Appert: Borrowing it.
- Norberg: Just simply going to one of the banks in San Francisco or....
- Appert: That's right. Operating capital was internally generated by earnings, and short-term borrowing--90-day notes. Inventory financing was handled on a 90-day basis, and we never sold any stock, except Automatic in 1948; that was the only equity transaction. Oh, except, and this has really no bearing on raising money for the plant, except when we made available 10 percent of the stock to the five operating vice-presidents. And the intent was not for the company to raise capital, it was to get some equity into the hands of the vice-presidents.
- Norberg: I see. Now, these would be the vice-presidents outside of yourselves?
- Appert: That's right. There would be five of them.
- Norberg: What gave rise to the decision to sell your shares in the company to GTE?
- Appert: Ah, the merger decision, you mean, eventually?
- Norberg: In 1959.
- Appert: Yes. The classic case. Two fundamental reasons which every growing business gets up against. You get to a certain point, and you cannot make enough money by retained earnings to take advantage of the expansion potential, and the principal holders, simultaneously practically, they tend to occur very close together, the principals have got to worry about death taxes. And so you've got to make a market value for the stock; so you either have got to go public, or else you got to merge with somebody. Neither Len or I were willing to go public--we didn't want to work for somebody else--and General Tel had 30 percent of the company already anyhow, and would have wound up by controlling it if we went public.
- Norberg: Did you each have the remaining 70 percent equally?
- Appert: No, remember 10 percent went to the other officers.



Norberg: Oh, that's right.

Appert: That left 30 percent apiece all around, Len, myself, and GTE. So they had a third--well, 30 percent, but they had a third of the total between Len and myself and them. So, that's what did it. Len and I made an effort in the early years to make an agreement to buy each other out from the estate in the event of one of us dying, and carried term insurance for a while on each other's lives to pick up control of that equity, and ... but it got out of hand very quickly, because of the growth of the company. Insurance just got too expensive, and then it was only at book value, and at death, of course, it would be appraised at fair market, and we would be stuck anyhow. So we had to give that up. But I don't know of any closely held company that hasn't had that problem. Take probably the biggest one in the business up there, Hewlett-Packard, well, they worked that by going public, but they still retain control between Dave and Bill, as far as I know. So that would have been an option that Len and I would have had, but we elected not to take it.

Norberg: Now, what was your position with the company after selling your interest in it to GTE?

Appert: Temporarily, a director. As with Len, neither of us wanted to work for somebody else in the first place, which was probably a determinant in getting us into business and going through those tough times in the early beginnings. And then, by and large, with that type of a situation, too many of the decisions are made elsewhere, back East, either in New York or Chicago. So I was a director for a limited period of time, until we moved down here, and then it got to be too much trouble to make the 200 mile round trip to attend a director's meeting, which was over in about 15 minutes. Because, like I say, all the decisions had already been made someplace else, and you'd spend a couple of hours in a social meeting, and so I resigned after a couple of years.

Norberg: How have you occupied your time since 1959?

Appert: Taking care of my affairs. And especially in recent years, needless to say, things have been rather unsettled in the investment community, and so retired is a misnomer as far as I'm concerned. I don't have office hours--in a sense--I don't have to go there at 9 o'clock in the morning and stay till 5, but, on the other hand, business is really [never] off my mind. That H.P. computer you mentioned, that pocket computer has been a godsend, actually. Have you used that, at all?



Norberg: Yes.

Appert: Yes. That's ... up to that time it was a slide rule, but this thing has been a real benefit.

Norberg: We're fast approaching the end, as you can see. Can you tell me something about your personal life during all those years?

Appert: During working years?

Norberg: Yes, from 1933 or 4 when you met Len Erickson up to the time that you retired. You didn't mention marriage, or the family.

Appert: Well, all right. From, say, '33 to '40, '41, I spent most of my time at work simply because I didn't have any money to do anything else. We were so close to broke much of the time, I couldn't afford to get married. My father had become ill, and my brother had left home, and so I was the sole support of my father and mother on a rather minimal salary for about six or seven years, which obviously leaves a wife, to say nothing of children, out of the picture. In '41 came the war, and we were busy night and day for about four years with defense pressures, war pressures.

[In] '45 we hired our first woman employee, outside of some assembly girls, to do drafting. She stayed with us about--let's see, that was '45--she stayed with us until about June of '46, and left to get married. And see, you can't depend on these women--that's my wife. That's how I met her. We have two daughters, the first one born in '48, the second in '50.

Personal life ... we did the usual things, I guess. I was always rather not easily approachable, because I was tangled up in these business affairs here, and so I was somewhat separated from my family, even though I didn't do too much travelling. But what you might expect, tied up in business problems and things of this nature.

#### Interest in Mark Twain

Norberg: How did you become involved with an interest in Mark Twain?

Appert: Oh, this place I told you about where they had the library, the little library with the engineering, the mining engineering



books--well, the lady at that house had quite a select little library. It included a set of volumes of De Maupassant, and several other well-known writers of the last century, including bound copies of the old Century Magazine. It had in it the serialized form of Twain's Puddenhead Wilson. And I read that, and became engrossed in it, and ever since then ... Clemens got to me, somehow.

Norberg: Did you keep this interest alive, though, all those years?

Appert: Yes, yes. I learned to read at a very early age, when I was three years old, I think. In fact, I could read before we left Switzerland. I was taught by my aunt who later went on to be a teacher and had a Ph.D., with a string of degrees this long, long as your arm. She was interested, has been interested in kids for about the last 70 years or so, I would say. So I learned to read, and I've always been able to get a lot out of books, and it stuck with me.

This has helped me a good deal in business, by the way. One thing you get out of reading, especially things of an historical nature, is you find out eventually that everything that's been done, basically, has really been done before. Like somebody says, the wheel turns and the same old spoke comes up.

#### Early Retirement

Norberg: During the years since your retirement, have you been involved with the electronics community at all?

Appert: One or two sporadic attempts. There was an outfit that made metal detecting equipment--Fisher Research Labs--that's been around since the middle '30s, I think. Did you know Mr. Fisher?

Norberg: Yes, I've talked with him. What was your involvement with him?

Appert: Not with him. I got involved with a group of people that bought the place from Fisher, here some years ago, [the] principal reason being that the president and a member of the board of directors was one Bill Heflin, who was with Lenkurt a long time; a fellow about 15 years younger than I am. So I got into the company as a director, and was there for





a while. That didn't prosper too well, and finally, here about two or three years ago, they merged with a Southern California outfit, Cohu Electronics--I don't know if you're familiar with that or not. They make environmental equipment--things of this nature. So there's been that. And I've had contact with Farinon Electric Company, because so many of the people, key people in it are Lenkurt graduates--Bill Farinon himself.

Norberg: Was there much spinoff of that kind from Lenkurt--people leaving Lenkurt and starting their own companies?

Appert: Quite a bit.

Norberg: Can you name a few besides Farinon?

Appert: Oh, well, I would have to go quite a ways back--Alan Culbertson for one. This was since my time. He was a vice president of engineering at Lenkurt--this was after '59--and left to start his own company. There have been others, before and since.

During the time I was there when people left I felt that this was proper, because this is the way Lenkurt grew. Lenkurt grew with people leaving other, bigger companies. As a company grows, it virtually always generates more talent than it has particular spots for, and it's a waste just to keep them trapped up in one spot when they can get out and do something else and benefit the economy generally. And this is one of the reasons I say A. T. & T. is a good outfit to deal with, because this is the way they look at it. We have lots of Bell, and always have had Bell alumni with Lenkurt. This is growth. Growth isn't that you just get a bunch of people and bottle [them] up in one company like in a sardine can, and solder the lid down, and then that company just magically expands. In fact, the whole theory is self-defeating in my opinion.

Norberg: But can you name some others besides those two?

Appert: Oh, not offhand.

Norberg: I'm trying to draw the connections.

Appert: In what manner? Maybe I can....

Norberg: Well, just trying to find out who came from Lenkurt to found



a new company. You've mentioned two people, and I'm wondering if you can think of more.

- Appert: No. There've been others. There was one individual whose name I can't remember, and besides he has since died, who was in charge of building and supervising our test equipment, who finally started his own business. Called himself Western Scientific Company, or something like that.
- Norberg: The reason I tried to press the point a little bit is that we hear so much about the influence of Stanford on the San Francisco Peninsula and the growth of electronics here. Well, that may be a very viable theory, but it seems to me there are others. One of the most important ones is the one you suggest that people do come out of companies. They've given their talent to that company, the company's used as much as they can, the man sees a new opportunity...
- Appert: Yes.
- Norberg: ...and takes it. Well, now you say it happened in Lenkurt. It obviously happened with Beekman Associates. Many of the semi-conductor companies came out of their operation when Shockley started it.
- Appert: Yes.
- Norberg: And Eitel-McCullough can point out a couple of cases where people from their company have gone out and formed others, where they had no previous relationship with Stanford. Now, these people that you are talking about some of them came from Bell Labs, some of them came from Stanford, some of them came from Cal, and other places. I would like to be able to plot the influence, and show all the factors, not just the Stanford factor.
- Appert: Yes.
- Norberg: Because a large myth builds as a result of such things. So that's why I was trying to get you to be a little more specific.
- Appert: Well, I'm sorry I can't be more specific, but I can definitely assure you that in as volatile a business as the electronics industry, this goes on all the time in large amounts, and is a big contributor to the growth of the industry as a whole,



without question. I think they get carried away a little bit with that other theory, but I think they would like to think so.

Norberg: Well, I think there's a lot of reason to believe in such a point of view, but I also think....

Appert: I think it's a contributor, but it's not all of it.

Norberg: Yes. I think that's true. I've sort of worn you out here with all these questions. We have covered quite a lot of ground, and I appreciate the tolerance you have shown. Thank you very much.



INDEX --Kurt E. Appert

- Adler, , 31.  
American Telephone and Telegraph Company, 13, 45. See Bell Telephone System and Western Electric Company, Inc.  
Ampex Corporation, 26.  
Automatic Electric Company, Chicago, 9; part owner of Lenkurt, 25, 27.  
Automatic Electric Manufacturing, 9.  
Automatic Electric Sales, 9; distribution of Lenkurt equipment, 25.
- Balfour-Guthrie Company, 1.  
Beekman Associates, 46.  
Bell Telephone Laboratories, inc., 8, 21, 37, 46; contact with Lenkurt, 27.  
Bell Telephone System, 21; telecommunications equipment, 7-8; royalty contract with Lenkurt, 12; communications network, 13-14; uses Lenkurt equipment, 23, 24; standards for equipment, 27-28; Lenkurt hires engineers from, 29, 45; first in U.S. to use microwaves for telephone transmission, 30; Lenkurt sells to, 36.  
The Bell System Technical Journal, 22.
- California. University, Berkeley. Extension division, 22; engineers from, 29, 46; Radiation Laboratory, 38.  
Campbell, , 31.  
Canadian Bell (Co.), 27.  
carrier-current equipment, 7-8, 17, 19; Lenkurt makes, 29; use of microwaves in, 29-30.  
Clemens, Samuel Langhorne ("Mark Twain"), 43-44.  
Cohu Electronics (Co.), 45.  
Culbertson, Alan, 45.
- Dalmo Victor Corporation, 25, 26.  
DuFrane, Frank, 7; partners with Len Erickson, 2; Appert's contact with, 5-6; Appert and Erickson buy out, 8.
- Echlin Manufacturing Company, 5, 6.  
Eitel, William W., 15, 38, 40.  
Eitel-McCullough, Inc. (Eimac), San Carlos, Calif., 15, 16, 26, 46.  
Electronics, 22.





Erickson, Lennart G., 25, 41, 42, 43; Appert meets, 2;  
Appert works for, 5, 6; buys out DuFrame, 8; share in  
Lenkurt, 9; early Lenkurt patents, 11; duties with  
Lenkurt, 18, 26-27, 29, 30; relationship with Appert,  
40.

Ericsson, L. M. (Co.), (Sweden), 27.

Farinon, Bill, 45.

Farinon Electric Company, 45.

Ferry, Ed, 16.

Fisher Research Labs, 44-45.

General Electric Company, 32.

General Telephone and Electronics Company, 17; and Lenkurt,  
1, 41-42; buys Automatic Electric Co., 25.

Heflin, Bill, 44.

Heintz, Ralph M., 5.

Hewlett, William Redington, 15, 16, 40, 42.

Hewlett-Packard Company, 15, 26, 33, 42.

Lake Manufacturing Company, Oakland, Calif., 15.

Lenkurt Electric Company, San Carlos, 1, 9-10, 27-28, 44;  
equipment made by, 10, 13-14; patents, 11-12; elements  
of success, 18; technical problems, 19-20; personnel,  
21, 29, 36-39; going on to begin own companies, 45-46;  
innovations, 23; post-'47 growth, 24; distribution of  
product, 25; San Carlos plant, 25-26, 41; makes micro-  
wave equipment, 29; competition in the 1950s, 31-32;  
effect of new product development on growth, 33-34;  
operations in the 1950s, 34-36; crystal development,  
37; merger with General Telephone and Electronics, 41.

loudspeaking intercom systems, amplifiers for, 6.

Lynch, Frank, 31.

Lynch Communications, San Francisco, 14, 31.

McCullough, Jack A., 15, 40.

McMillan, Edwin Mattison, 38.

Maupassant, Guy de, 44.

microwaves, 29-30.

Moseley, Tomlinson I., 25-26.

Northern Electric (Co.), (Canada), 27.



Packard, David, 15-16, 40, 42.  
 Patton, Phil, 31.  
 Philipps (Co.), (Holland), 27.  
 Poniatoff, Alexander M., 22, 23, 26, 38.  
 Prudential Life Insurance Company, 2-3.

R. E. L. (Co.), New York, 29.  
 Radio Corporation of America, 32.  
 reflection coefficients of wave filters, 14.  
 Reukema, Lester Edwin, 22, 23.

Samuel Gompers Evening School, 2.  
 Shell Oil Company, 1.  
 Shockley, William Bradford, 46.  
 Siemens & Halske, Berlin, Germany, 27.  
 Southern Electric Transmission (Co.), (Texas), 11, 31.  
 Southwestern Bell (Co.), 27.  
 Stanford University, 22, 23; engineers from, 28-29; influence on growth of Bay Area electronics, 46.  
 Strowger, Almon P., 9.

Terman, Frederick Emmons, 23, 28.

Union Iron Works, San Francisco, 2.  
 United Aircraft Corporation, Research Laboratories, East Hartford, Conn., 39.  
 U.S. Army, contracts, 7.  
 U.S. Naval Air Station, Alameda, Calif., 7.

Varian Associates, 26.

West Coast Electric Manufacturers Association, 16.  
 Western Electric Company, inc., 21, 23, 24; as part of A. T. & T., 7-8; competition with Lenkurt, 11, 12, 31; carrier system different from Lenkurt's, 13-14; as a model for Lenkurt, 19, 20, 34; Lenkurt's dealings with, 27-28.  
 Western Scientific Company, 46.  
 World War, 1939-46, 21-22; contracts, 6-7, 8-9.



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