THE FARNSWORTH CHRONICLES

Introduction:
The Boy Who Invented The Future

"While the great minds of science, financed by the biggest companies in the world, wrestled with 19th century answers to a 20th century problem, Philo T. Farnsworth, age 14, dreamed of trapping light in an empty jar and transmitting it, one line at a time, on a magnetically deflected beam of electrons."

The image above is displayed on a video screen – perhaps the most ubiquitous instrument of the 20th century. But do you have any idea who invented video?

It seems ironic. Inventors are such a big part of the American Legacy. The Information Age began when Samuel B. Morse tapped out "What hath God wrought?" on the first telegraph; the music business began when Edison spoke the words, "Mary Had a Little Lamb" and heard them played back moments later from a tinfoil drum. The telephone arrived when Mr. Bell spilled some acid on his pants and shouted, "Mr. Watson, come here, I need you!" -- and Mr. Watson heard him on a contraption in another room. Hollywood began when Edison filmed a sneeze.

Television, represents the culmination of all the inventions that went before it: the marriage of movies and radio; sight and sound merged with the electromagnetic spectrum. The crowning achievement of an age of invention.

But who among us can name the man who invented it?

Video, in all its forms, is the most pervasive medium ever conceived. It's not just television, which is so omnipresent now that you can't even wait to board an airplane without being compelled to watch CNN or a soap opera. It's computers, too, which are now turning into a mass medium in their own right. And every computer in the world uses video as its primary display device.

But how many of us whose lives are shaped by this device have any knowledge of the noble spirit that delivered it to us?

The corporate doctrine handed down by the communications industry would have us believe that television was far too complex a concept to have been "invented" by a single individual working alone, in a garage perhaps, in the manner of Edison and Bell (or Hewlett & Packard and Jobs & Wozniak....). They would rather us believe that the medium evolved over a period of time, finally emerging whole in the late 1940's from the great laboratories of the industrialized world - just in time for Uncle Milty, Marshall Dillon and Lucy.

That television ever was an invention is a notion that seems to surprise most folks. It just seems like it's always been there, like God and McDonald's. There is certainly no folklore associated with its origins. This void in our popular mythology is unfortunate, because in fact, the true origin of electronic video is one the most fascinating stories of the 20th century...and features one of the era's most intriguing and enigmatic characters: Philo T. Farnsworth.

Farnsworth was a 14-year-old Mormon farm boy from Rigby Idaho with virtually no knowledge of electronics when he first sketched his idea for electronic video on a black board for his high-school science teacher in 1922. 15 years later, that teacher would re-create that sketch as part of his testimony in patent litigation between Farnsworth and the giant Radio Corporation of America. Farnsworth eventually won all of his extensive litigation with RCA, and became the first Independent Inventor EVER awarded a royalty-paying patent license from RCA.

But that's just PART of the story.

The material in this manuscript was compiled during the 1970's, from exhaustive interviews conducted with Farnsworth's widow, Elma Gardner "Pem" Farnsworth, and the inventor's oldest son, Philo T. Farnsworth III - himself an inventor cut from the same cloth as his father - and other members of the Farnsworth family and associates. Their accounts were reconciled against the existing historical record to produce this narrative, which was first published in 1977 in a now defunct "alternate media" journal called TeleVisions. The entire effort to recreate Farnsworth's story and integrate it with the "historical" record was part of a larger effort to

produce a "movie for television about the boy who invented it" which has yet to be funded or produced.

The illustrations that accompany this material are mostly taken from the personal archives of Mrs. Farnsworth, who has survived her husband since his death in 1971 and lives today (2002) in Fort Wayne, Indiana. In 1990, she completed her own extensive biography of her late husband entitled "Distant Vision: Romance and Discovery on the Invisible Frontier" which is can be purchased through the "official" Philo T. Farnsworth website <http://philotfarnsworth.com>. The book's release was timed to coincide with the unveiling of a statue of Farnsworth that now stands in the Statuary Hall of the Capitol Building in Washington DC, one of two such statues dedicated by the State of Utah; the other is a likeness of Brigham Young.

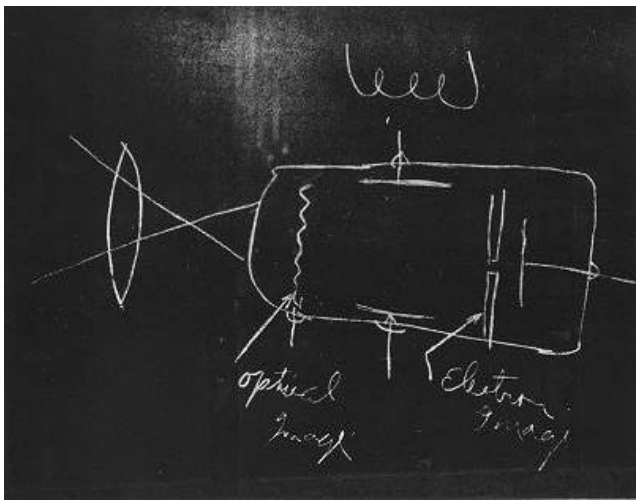
This material is presently being expanded and edited for publication later this year in a hardcover book that will be released by TeamCom Press of Silver Spring, Maryland. The book will include material that has come to light in the past few years about the “Second Chapter” of Farnsworth’s life, when he was experimenting with a promising approach to nuclear fusion – a clean, and potentially unlimited source of industrial power. This greatly enlarged version of “The Farnsworth Chronicles” (unless a better name comes to light before we go to press…) will attempt to trace the full arc of Farnsworth’s life, and identify the threads that tied his career together. The book is schedule for a release date of September 7, 2002 – the 75th Anniversary of Farnsworth’s first successful electronic television experiments – and should be available in bookstores in early August.

If you would like to be notified when the expanded, hard-bound version of “The Farnsworth Chronicles” is available, please write to thebook@farnovision.com

In the meantime, let us begin with...

Part One: "This Place Has Electricity!"

1. This Place Has Electricity!



The story of television begins in Rigby, Idaho in the spring of 1919, as a small wagon train reaches the crest of a hill overlooking a humble, turn-of-the-century homestead. The family of Lewis and Serena Farnsworth has arrived at their new home, after an arduous journey over the mountains from their native Utah.

Seated at the reins of one of the three covered wagons was the oldest child, Philo, age 12 and named after his grandfather, who came west with BrighamYoung. As the boy surveyed the scene before him he noticed one detail that the rest of the family missed: on the farm below, he could see wires running between the different buildings and shouted excitedly, "This place has electricity!"

With this discovery, the family left the ridge and began their descent into a new life on the frontier of the Twentieth Century. Little Philo was about to come face-to-face for the first time with the mysterious force he had only read about in books, that invisible power that could drive great machines and turn darkness into light. Though he was about to encounter electricity for the first time at age 12, he would prove to be one of the great masters of that mysterious force before he was 21.

A few weeks after his arrival in Rigby, Philo had figured out all by himself what made the electrical system work. Lewis Farnsworth realized that his son had a natural affinity for the system when Philo stepped in one day to repair the disabled generator while all the adults stood around wondering what had gone wrong. Thus, the boy-electrician became officially installed as the chief engineer of the Farnsworth farm, and the electrical system became his own very special domain.

With encouragement from his father, Philo found a dozen new uses for his invisible friend. He built motors from spare parts and used them to run his mother's washing machine and some of the farm machines. The time he saved by automating these chores he spent thinking about better things. In the attic above the house, Philo created his own world to explore electricity in whatever books or journals his father could afford. The loft became his hide-away, where with each succeeding page, his imagination was fired by stories of science and the modern day sorcerers who unraveled its mysteries. To Philo, inventors of all kinds seemed to possess a special power that allowed them to see deep into the mysteries of nature and use her secrets to ease the burden for all mankind. He confided in his father his own heart's desire: that he, too, had been born an inventor.

In the fall of 1920, Philo entered high school as a freshman but soon found the material too dull, and cajoled his way into the senior chemistry class. When even that advanced course proved inadequate for the youngster's thirst, the chemistry teacher, a bespectacled and slightly passed-middle-age gentleman named Justin Tolman, took extra time after class each day to tutor his young prodigy. It became quickly apparent to Tolman that he was tutoring perhaps the smartest student he would ever meet in his life.

One cold night in January 1921, Philo was particularly anxious to finish his chores after school and hurry back to the books and magazines in his attic hideaway. As he turned the pages, he stumbled upon an article about something very new: "Pictures That Could Fly Through the Air." The writer described an electronic magic carpet, a marriage of radio and movies, that would carry far-off worlds into the home in a simultaneous cascade of sight and sound. Philo was instantly captivated by the idea. He reread the article several times, convinced that he had stumbled onto a problem that he was uniquely equipped to solve.

When Philo determined to learn everything he could about the subject, he stepped into a Jules-Vernian world where scientists were trying to convert light into electricity with the aid of whirling discs and mirrors. Farnsworth realized right away that those discs and mirrors would never whirl fast enough to transmit a coherent image, and searched for a device that could travel at the speed of light itself. He found the solution in his invisible new friend, the electron.

In the summer of 1921, while the great minds of science, financed by the biggest companies in the world, wrestled with 19th century answers to a 20th century problem, Philo T. Farnsworth, age 14, was chained to a horse-drawn tilling machine, crisscrossing the fields endlessly, row by row, turning the soil and dreaming about television to relieve the monotony. As the open summer sun blazed down on him, he stopped for a moment and surveyed the afternoon's work. At that moment, a daring idea fermented in this boy's brain: As he had plowed the field one row-at-a-time, he suddenly imagined trapping light in an empty jar and transmitting it one-line-at-a-time on a magnetically deflected beam of electrons.

This principle still forms the heart of modern television. Though the essence of the idea is extraordinarily simple, it eluded the most prominent scientists of the day. Yet here it had crystallized in the mind of a 14-year-old farm boy.

It seems quite unlikely that an unknown boy with little education, no money, and no equipment could steal the race from the greatest electrical companies in the world, but that is precisely what Farnsworth set out to do. His father advised Philo not to discuss his idea with anyone. Ideas, he reasoned, are too valuable and fragile, and could be pirated easily. But Philo had to talk to someone. He needed to hear from somebody besides his father that his idea would work

Late one afternoon in March of 1922, Justin Tolman was startled to see a complicated array of electrical diagrams scattered across the blackboard in his classroom. At the front of the room stood his gangling young prodigy, chalking in the last few figures of the last equation and turning to his teacher.

"What has this got to do with chemistry?" Tolman asked.

"I've got this idea," Farnsworth calmly replied. "I've got to tell you about it because you're the only person I know who can understand it." The boy paused and took a deep breath. "This is my idea for electronic television."

"Television?" Tolman said, "What's that?"

Farnsworth spent many hours with Tolman elaborating upon his idea. Weeks later, when the semester ended, both Farnsworth and Tolman were convinced that the scheme would work. Neither one would venture a guess when or how he could get a chance to prove it.

Hard times forced the family to leave the farm in Rigby in 1923 for more fertile soil near Provo, Utah. Philo's father found work hauling freight over the mountains in mule-driven wagons.

Philo employed the same tenacity that had marked his career in high school in order to be admitted as a special freshman to Brigham Young University. With the vast resources of a major university at his disposal, he did his own private research about cathode ray tubes and vacuum tubes. Still, with no money at his command there was little he could do to build an operative model of the device that he could see so clearly in his mind's eye

On one of his jobs just before Christmas 1923, Lewis Farnsworth was caught in a violent snowstorm and contracted pneumonia. Philo was beckoned to his father's deathbed and charged with the responsibility for taking care of the family. Now calling himself "Phil" (the onslaught of manhood had compelled him to start using a more conventional spelling of his name) he was forced to leave BYU and take whatever jobs he could find. The likelihood of developing his television ideas seemed remote at best.

The Farnsworth family moved into half of a two family house in Provo. The other half of the house was occupied by the Gardner family. Cliff, the oldest of the Gardner boys, was nearly the same age as Philo and since the two boys shared a common interest in radio and things electrical, they became close friends.

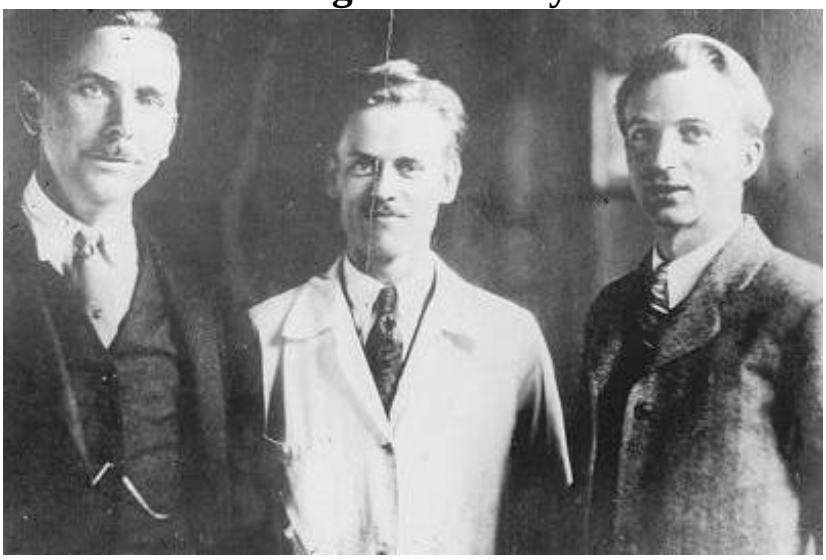
Along with two brothers, Cliff's family included six daughters. The prettiest of them was Elma -- everyone called her Pem-- who was only a year younger than Phil.

What time Farnsworth had to himself in the following months he spent with Pem. It soon became apparent to both that they were meant to spend their lives with each other. Phil proposed to Pem on her birthday in February 1926, but their youth and the uncertainty of their lives forced them to postpone setting a wedding date.

Phil and his future brother-in-law, Cliff, both subscribed to a correspondence course in Radio maintenance, and in the spring of 1926 the two boys ventured off to Salt Lake City to start their own business installing and repairing radios.

Unfortunately, in what was perhaps a precursor of things to come, Farnsworth's first attempt at running his own business did not fare well Out of desperation, Phil told Cliff that he was thinking about writing up his television ideas and submitting them to Popular Science Magazine. He thought that he might be able to make $100 if he worked it right. Cliff was familiar with Phil's daring ideas and shocked that he would consider disclosing them so publicly. He cautioned Phil that publishing might be a mistake he would regret. So Cliff returned to Provo and Phil signed up with the University of Utah placement service in hopes that they might find him work.

2. The Daring of This Boy's Mind!



In the Spring of 1926, George Everson and Leslie Gorrell were driving from Los Angeles to Salt Lake City by way of the Mojave desert when Everson's car, a 1922 Chandler Roadster, burned out a main bearing. Abandoning the car at St. George, Utah, Everson and Gorrell proceeded by bus and train to Salt Lake. The mechanic promised to drive the car on to Salt Lake when he was finished with the repairs.

Everson was a professional fundraiser on his way to Salt Lake City to organize a community chest campaign. His career had led him into some of the West Coast's tightest financial circles, as he traveled from city to city organizing a good cause. In each city, he hired native college students to staff his operation. In Salt Lake City, he contacted the University of Utah placement service, and one of the applicants was 19-year-old Philo T. Farnsworth, present occupation -- none.

Farnsworth interviewed for one of a number of jobs conducting a community survey, but as usual he had better ideas. He volunteered himself right away to be the Survey Manager and assured Everson that he was so familiar with the territory that he was indispensable. Everson, who possessed the instinct of a gold rush gambler with his nose too close to the ground, hired Farnsworth immediately. Everson always knew when he had detected a good scent in the wind.

Farnsworth's first responsibility was to complete the job of hiring the campaign staff. Among his first appointments were Cliff and Elma Gardner. Until now Pem and Phil had only spent time together on occasional weekends in Salt Lake City when Pem's mother would permit her to go. When Pem's mother died, she became responsible for the rest of the Gardner brood and the visits became less frequent. Now with the prospect of a good job, Pem left Provo and took her own room in the boarding house where Cliff and Phil shared one.

Some weeks later, as the survey was winding up its operation, George discovered that an important mailing had not gone out on time. The entire staff stayed after dinner to help Phil finish the job. Afterwards, George, Les Gorrell, Cliff Gardner, and Phil paused for a casual bull session. George asked Phil if he planned to go back to school. "No," Phil replied. "I can't afford it. I've been trying to find a way to finance an invention of mine but it's pretty tough. I've been thinking about it for about five years, though, and I'm quite sure it would work. Unfortunately, the only way I can prove it is by doing it myself; but I don't have any money.

"What's your idea?" Les Gorrell asked. Phil paused before he answered. "It's a television system." George, who had never heard the term before asked curiously, "Tell a who?"

When Phil began to talk about his ideas, his manner changed from what George described later as that "of an office clerk too closely confined to his work." As he spoke that night, a special power came to him. His bright blue eyes became dark and intense as he spoke of the ideas that had occupied his brain for the last five years. His speech found new eloquence as he became charged with the energy of his own genius.

George remained the skeptic. He suggested that GE or Bell Labs must already have accomplished what Phil proposed to do. Phil countered with a detailed treatment of just what was going on around the world. He talked of Baird and Jenkins and Ives and their wonderful, spinning wheels. "They're all barking up the wrong tree," he said.

In the early hours of the morning, George finally asked Phil how much it might cost to build a model of the machine. Taking a shot in the dark, Phil said it might cost about $5,000. "Well," George said, "Your guess is as good as any. I surely have no idea what is involved. But I have about $6,000 in a special account in San Francisco. I've been saving it with the idea that I'd take a long shot on something and maybe make a killing. This is about as wild a gamble as I can imagine. I'll put the $6,000 up to work this thing out. If we win, it will be fine, but if we lose, I won't squawk."

In short order, the association of Everson, Farnsworth and Gorrell was formed. Farnsworth insisted on nominal control of the association, and for the contribution of his invaluable genius he was awarded half the equity in the company. In exchange for raising the money, Everson and Gorrell would split the remaining half.

The only hitch was, George wanted Phil to set up his operation in Los Angeles. Phil agreed that it was a good idea --- the resources of a vast metropolis like L.A. would be much more suited to finding and fabricating parts for his exotic apparatus. There was only one detail left to be worked out.

Neither Phil or Pem could face the thought of being separated by the distance between California and Utah. If Phil was going to the coast, Pem had to go to. The wedding date could be postponed no longer.

The families were a little surprised by the sudden change in fortunes and skeptical that a marriage conceived in such haste could survive. Phil was 19 at the time. Pem was 18. Undaunted by the parental objections, the young couple set out for Provo in George's Chandler and were married by a Mormon bishop.

They spent their honeymoon night driving back to Salt Lake City, where Phil made a late night appearance at George's apartment. The reason for this nocturnal visit was Phil's concern about his lack of immediate cash. The visit developed into a long discussion of the future of TV. Pem was very disappointed to see her wedding night diminished and fell asleep. Phil awakened her later. Trying to get on his bride's good side, he jokingly told her that there was this "other woman" in his life and her name was "television"

The newlyweds rode the Pullman train from Salt Lake City to L.A. It was the first time that Pem had even been out of Utah, so of course her parents had dutifully admonished her about the sins of the Big City. Their honeymoon consisted of an afternoon spent strolling the beach in Santa Monica. The rest of their time was devoted to finding a suitable place in which to set up housekeeping and an electronics laboratory. Eventually they found a cozy one-bedroom apartment with a small yard at 1339 New Hampshire Ave., in the heart of glamorous, Roaring Twenties Hollywood. Phil set up his shop in the dining room.

Phil's task was a doubly difficult one. Before he could build his marvelous machine, he had to design and build many of the tools necessary to proceed. It was not as though he could run out to a TV parts store and pick up whatever he needed. This was new territory and virtually everything had to be made from scratch. He acquired a whole new education: electrochemistry, radio electronics, and the ancient art of glass blowing. Most of the glass blowers he met said that the tube he wanted was impossible to make, but Phil typically ignored their opinions and proceeded to do what had to be done.

George soon realized that Farnsworth's first estimate of $5,000 would not bring him close to completing a working model of his invention, and that more money would have to be raised.

George considered it prudent to get involved in the enterprise at the outset because he was taking the chance alone. Once it became necessary to bring other investors into the scheme, then his reputation in the financial community was at stake. He could not afford to jeopardize his standing by acting too prematurely. Lacking the technical background to make a sound judgment on these matters, George sought the assurance of a more reliable source. He called the firm of Lyon and Lyon, local patent attorneys, for advice.

Leonard Lyon's reaction was quick and unequivocal: "If you have what you think you have, you've got the world by the tail. If lot, then the sooner you find out, the better." Arrangements were made for Farnsworth to meet with Lyon and Dr. Mott Smith of Cal Tech, who would pass judgment on the merits of Farnsworth's idea.

A week later, when Dr. Smith arrived for the session, he left only a nickel in the parking meter, fully expecting that he would dismiss the scheme and leave in less than an hour. The meeting however, wore well into the afternoon. Lyon paced excitedly around the room as he listened to the scheme unfold.

"It's monstrous!" Lyon said. "Just amazing . . . the daring of this boy's mind!"

After more than four hours of intense questioning of Farnsworth, George summed it all up with three terse questions:

"First," he asked, "is this thing scientifically sound?" Dr. Smith answered a bit bemused: "Yes."

"Is it original?" George continued.

"I'm pretty well acquainted with recent electronic developments," Dr. Smith replied. "I know of no other work that is being carried out along similar lines."

Finally George wanted to know: "Is this thing feasible? Can it be worked out to make a practical operating unit?"

In his answer, Dr. Smith could only imagine the road that lay ahead: "You will encounter great difficulty in doing it, but I see no insuperable obstacles at this time."

That was all George needed to hear.

Phil had told George that he thought $1,000 a month for twelve months would be enough to come up with a working model of his television. Observing that Phil had a knack for underestimating the financial needs involved, George thought it would be more prudent to seek twice that amount, and set about to raise $25,000.

George called on all his contacts in the world of high finance to find the individuals who might have the surplus capital to back the project. In the process he met a colorful cross section of California's wealthiest society. He was turned down for the strangest reasons. It seemed that every rich man had a special interest that absorbed his "extra" money. One industrialist, who was personally obsessed by color photography, expressed interest if the television were in color instead of black and white. Another was interested only if the idea had some application to bacteriology.

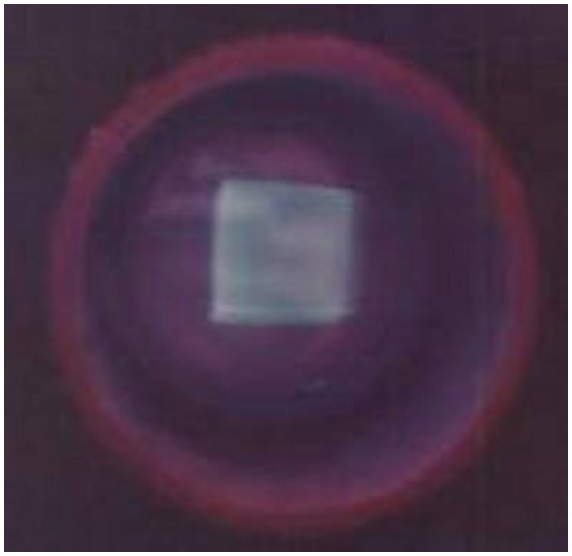
While George learned about the eccentric whims of the California gentry, Phil, Pem and Les Gorrell spent the summer of 1926 scavenging Los Angeles for parts. At the end of each day's foraging they returned with mysterious bundles to the little apartment in Hollywood. When it was time to start winding the first electromagnetic coils, George, who happened to be in town, volunteered for the messy job.

Given that this all occurred in the middle of prohibition, it must have seemed a bit suspicious, all this unusual activity. Now, here was this total stranger to the neighborhood, sitting out in the back yard winding, copper wire around a cardboard tube. Certainly someone noticed, for one day in August, Pem opened the door to find her porch filled with a small squad of blue LAPD uniforms, demanding to search the house. They had received a report that a still was being operated on the premises. The squad proceeded to ransack the apartment despite protests from the Farnsworths. Nothing alcoholic was found, but the sergeant was amazed by the things that he did find, and began to wonder if he had stumbled onto something even more sinister than a still.

With carefully guarded words, he asked Phil what all the stuff was. Phil looked around at the strange gear he had collected in his dining room, stared the sergeant straight in the eye and answered, "This is my idea for electronic television."

The sergeant shook his head, took another look around and said, "Tell a what?"

3. An Eerie Electronic Hue



Sometime late in August, 1926, George Everson appeared in the offices of the Crocker National Bank in San Francisco looking for one Jess McCargar. McCargar, whom George had met some years earlier on a community chest campaign, was an officer of the Crocker Bank. George was disappointed to learn that McCargar was on vacation and would not return for some weeks. Fortunately, another officer, known affectionately as "Daddy" Fagan, observed George's disappointment and asked if he could help.

"I don't think it is anything that would interest you in the least," George told Fagan. "It's not an investment, it's not even a speculation. It is wildcatting, and very wildcatting at that."

George's response served only to intrigue Mr. Fagan, who at the time was considered the most conservative banker on the West Coast. He was a wizened, tobacco-chewing veteran of the California Gold Rush. His steely judgment on investment matters had earned him the reputation as a "cold-hearted, glassy-eyed guardian of the moneybags." Whatever the reasons for his interest, "Daddy" Fagan prevailed upon George to explain why he had come looking for McCargar.

With his crusty banker's sixth sense, Fagan listened as George described the genius he had stumbled onto. When George finished explaining Farnsworth's ideas, Fagan drummed his fingers together and spat a wad of tobacco at the solid gold cuspidor in the corner of the room: "Well, that's a damn fool idea, but somebody ought to put money into it," Fagan said, adding, "Someone who can afford to lose it."

Two days later, W.W. Crocker himself suggested in the strongest terms that George summon his young genius to San Francisco to meet Roy Bishop, a successful capitalist and engineer of some standing.

When Farnsworth arrived, he looked every bit the part of the struggling inventor: frumpy, frayed, and preoccupied. So, George took his protégé shopping, outfitted him in a new powder-blue suit, hat and haberdashery, and together the two set to meet Roy Bishop for lunch.

Bishop listened intently as Farnsworth described how his idea would work. As the conversation wound down however, Bishop seemed to be somewhat reluctant. "I am convinced that the idea is sound," he told Phil, "but I doubt your ability to work it out commercially."

Sensing Bishop's hesitation and the negative drift of the conversation, Farnsworth prepared to play his hand. For the moment he was holding all the cards. He knew what needed to be done to create television and he was confident that he could do it. But he could not afford to be involved with people who did not have equal confidence. Putting his papers in his briefcase and rising from his chair, Farnsworth courteously thanked Bishop for his kindness and time. As he turned toward the door he said, "I am sorry that you are unable to see the possibilities that I see for this invention." Stunned, George quickly gathered up his things and caught up with Phil at the door. As they were about to leave, Bishop said, "Wait a minute!"

The strategy had worked; Bishop demanded only one final stipulation. He wanted to consult with another "hardboiled" engineer, a man named Harlan Honn. "If you can convince him that your proposition is sound, then I think we can find a way of backing you."

Honn was summoned and arrived in less than half an hour. He looked over the specifications, asked some questions, and turned to George with a simple pronouncement: "Why sure this system will work. I think very well of it."

Bishop reported all of his findings to the people at Crocker Bank, and the matter was held in abeyance until McCargar returned from vacation.

The meeting with McCargar and the other principals of Crocker Bank took place in the part of the inner sanctum that George sarcastically called "The Throne". While the bankers huddled in a far corner of the Directors Room talking the matter over, George and Phil sat on a marble bench at the foot of the "Throne" waiting to be called. Within a few minutes, McCargar came over and put his arm around George, saying, "I think we are going to back you, boys." and ushered Phil and George into the oak and marble laden boardroom.

The circumstances of the meeting were unlikely at best, for this was a place where many requests were entertained but few were granted. What could this unproven, self-educated 20-year-old farm boy possibly say to these crusty robber barons that would compel them to cut loose enough cash to start something as far-fetched as television?

We can only imagine the atmosphere that must have prevailed that day, what cosmic forces had to converge on this room for this moment to happen; for happen it did: Philo T. Farnsworth swept in with another dazzling display of his unbridled genius and before the session ended he had been staked to the then-substantial sum of $25,000, and given the use of half of the second floor above a garage in San Francisco where he could set up a laboratory and begin working in earnest on his ideas.

Roy Bishop underscored the unusual nature of the event when he turned to Farnsworth with some admiration in his tone of voice and said, "Young man, you are the first person who has ever gotten anything out of this room without putting up something in return." Then Bishop addressed the rest of the group and delivered an ironic benediction: "We're backing nothing here but the ideas in this boy's mind. Believe me, we're going to treat him like a race horse." Phil was so excited about having a real chance to test his ideas that he accepted readily the terms that Bishop and Crocker had proposed. He knew little of the dealings of high finance, and he trusted that George would protect his interests. Phil was confident that everything would work out all right.

With all the papers signed, Phil returned quickly to L.A. in George's Chandler to pick up his bride and his little dining-room laboratory. Pem could tell the moment he stepped through the door that things had gone well in San Francisco. With his classy new suit he seemed to radiate success. Phil swept Pem off her feet and they danced around their little living room while he told her of the exciting things in store for them.

The pace of life quickened once again as Phil and Pem packed ail their belongings in the Chandler and drove up the coast, singing "Rose Colored Glasses" as they cruised through the cliffs of Big Sur.

Meanwhile Pem's brother and Phil’s best friend, Cliff Gardner, was folding cardboard into boxes on an assembly line in Oregon when a telegram from Phil and Pem arrived. The message mentioned cryptically that Phil had found financial support, but the remaining instructions for Cliff were a little fuzzy. Nevertheless, Cliff finished folding his last box and walked out to board a train for San Francisco.

Cliff waited everyday at noon for Phil and Pem to meet him near a corner specified in the telegram. He found a boarding house near the designated intersection and waited expectantly for five days before Phil and Pem found him, hungry, nearly broke and happy as hell to see them.

Together the reunited trio went off to find 202 Green Street, the empty loft that the bankers had provided for Farnsworth's new laboratory. Phil knew the moment he set foot in the place that he had arrived at the birthplace of television.

Later that night, with the Dempsey-Tunney long count fight playing in the background, Phil and Pem took the ferry to Berkeley to find a home. They were lucky and on the first day discovered a perfect apartment. Pem started to set up housekeeping while Phil began setting up his laboratory.

Cliff Gardner was officially installed as chief glass blower. His training for the job included a high school diploma, boldness comparable to Phil's--and absolutely no previous knowledge of the subject.

When Farnsworth had finalized the plans for his television system and drawn detailed diagrams, he filed for his first patent. The application was submitted on January 7th, 1927, and to the extent that these documents disclosed an invention that would work, that date is the official date that television was invented.

Still, the patents could not be officially granted until the device had been proven to work, or "reduced to practice." And that was still a long way off.

After a few months, Cliff had mastered the fundamentals of his new craft and he began building the world's first electronic television camera tube. Farnsworth called this device the "Image Dissector" because it would transmit an image by dissecting it into individual elements and convert the elements --one line at a time-- into a pulsating electrical current.

A very rare substance called cesium was chosen for the photoelectric surfaces that would perform this miracle. The only way they could acquire sufficient cesium was by purchasing cases of radio tubes which used small cesium pellets to absorb any gasses that remained after all the air had been pumped out of the tubes. Consequently, all the tubes had to be smashed in order to retrieve the pellets.

For the receiving end of his system, Phil used a standard Erlenmeyer flask, like the flat-bottomed bottles he had used in his high school chemistry class, for the first "picture tube," which he dubbed the "Image Oscillite."

Phil and Cliff spent a year laying the foundation for television. Late in summer, 1927 they rigged together a rudimentary apparatus and began testing it to see if the system could send an image from the camera to the receiver. The first few tests revealed very little. The receiver glowed when the current flowed through the cathode ray tube, but Phil couldn't see anything except electronic interference on the screen. Ignoring his discouragement, he analyzed the results from each test and redesigned parts of the system.

On September 7, 1927 the system was ready to be tested again. This time Phil was so confident that he invited George and Pem to the lab to see his first "transmission".

For his test that day, Phil chose the simplest of images. He painted a thick straight line onto a glass slide. While this seems like a rather arcane choice of subject for such an important occasion, it was in fact exactly what Farnsworth needed: if he could tell by looking at the receiver whether the line was vertical or horizontal, then he could be certain that information was being transmitted from the bottom of one bottle to the bottom of the other.

In one room, Cliff Gardner dropped the glass slide between the Image Dissector and a hot, bright, carbon arc lamp, and the Information Age was born: In the other room Phil, Pem and George watched the face of the receiver as it flickered and bounced for a moment. When the system settled down, all present could see the straight-line image shimmering boldly in an eerie electronic hue on the bottom of Farnsworth's magic tubes. When Cliff rotated the slide, everybody could see the image on the receiver rotate as well, clearly proving that they were witnessing visual intelligence being transmitted from one place to another.

Later that evening, Philo T. Farnsworth recorded the arrival of true video with a simple scientific statement in his laboratory journal when he wrote, "The received line picture was evident this time."

But in a telegram to Les Gorrell in Los Angeles, George Everson put it much more succinctly: "The damned thing works!"

4. Something A Banker Will Understand

In the fall of 1927, Philo T. Farnsworth and his friends became the first humans to gaze into the shimmering eye of electronic television. Who could have guessed then that the rest of the world would not share the experience for another twenty years?

For Farnsworth himself, the moment of triumph quickly passed as he considered the magnitude of the job that now lay before him. The crude, flickering image proved that the idea that struck him when he was 14 would work; it also proved that a great deal more would be required to take this fragile invention from the laboratory to the living room.

There were occasional callers at 202 Green Street during this period. Some of the backers took a keen interest in the venture and dropped by from time to time to see what, if anything, had become of this curiosity they'd launched. Invariably, the equipment was disassembled, strewn across the tabletop and "temporarily inoperative." The backers had only George Everson's eyewitness accounts to assure them that Farnsworth had indeed produced meaningful results.

Work continued for another year, funded for the most part out-of-pocket by the Crocker group. The group grew steadily, as new investors were enlisted to raise additional capital in order to meat the escalating monthly expenses. The financing arrangements called on all the original partners to contribute proportionately in accordance with me size of their holdings. Most of the backers were experienced investors with enough cash on hand to meet their obligation without diluting their equity, but Farnsworth was both the largest single stockholder and the least able to draw on personal cash resources. Consequently, most of the stock that was sold to new investors was Phil's.

Along with the roster of investors, the work force at 202 Green Street grew steadily as well. All of the men Phil hired got caught up in the pioneering spirit of their work, and shared a special

camaraderie. In the next year, Phil and Cliff Gardner and the "lab gang," as they called themselves, rebuilt the video system dozens of times in a tedious, time consuming process designed to bring me rudimentary system up to some acceptable standard. Farnsworth concentrated his attention on increasing the number of scan lines, and set his sights on a minimum of 400 lines per frame. For comparison, the mechanically scanned television devices everyone else was experimenting with at the time were capable of 50 lines per frame at best.

Farnsworth continued using geometric shapes like crosses and triangles for his experimental transmissions. One night while looking at the receiver, Phil unexpectedly saw a moving line that looked like . . . uh oh . . . smoke. The moment he realized what he was seeing, he thought the lab was on fire. In the next instant, Cliff's hand waved in front of the camera--holding a cigarette. Phil sighed gratefully and peered closer at the swirling patterns. He could clearly see the delicate spirals of vapor; the whole effect was conveyed with startling definition. When George Everson saw it, he declared it was a sign of real progress.

In the spring of 1928, Roy Bishop pulled George into his office and handed him some figures that showed that more than twice the original limit--nearly $60,000-- had been spent to meet lab expenses. Confronted with these figures, George agreed with Bishop that it was time for Farnsworth to show his invention to the people who were paying for it.

Phil was just as surprised as George at Bishop's figures. Still, he was hesitant to make a formal presentation of his work; the system was still very fragile. Its reliability was tenuous at best. Besides, he felt that he was on the verge of producing a really fine picture, one that would be clearer and much more stable. He pleaded with George for just a few more weeks, but George reminded Phil of the serious tone in Bishop's voice, and a date was set for a demonstration.

The Crocker group reassembled at 202 Green Street in May of 1928, together for the first time since that unlikely day 16 months earlier when they first met a 20-year-old boy who told them that he could invent television -- whatever the hell that was. They really understood very little of what Philo Farnsworth told them that day, but for some unexplainable reason it smelled like a winner, so they went for it. Now, 16 months later, as they were ushered into the quiet, darkened lab, they had no idea what to expect. None of them had ever seen television before.

"This is something a banker will understand," Phil said to George as he switched on the system. When the little round screen hummed and flickered to life, Fagan and his friends gazed in hushed bewilderment as an apparition of a dollar sign ($) materialized out of the darkness.

Roy Bishop was the first to speak after the demonstration, which included a variety of geometric shapes and the swirling kinetic patterns of cigarette smoke. Bishop warmly congratulated Phil for delivering "his end of the bargain" and then set a more sober tone for the weeks, months and years to ahead: "It will take a pile of money as high as Telegraph Hill to successfully conclude this work," Bishop declared. Phil listened on anxiously as Bishop added; "I think we should take immediate steps to sell this invention to one of the large electrical companies that can afford to provide more adequate capital and facilities."

Bishop's proposal came as no surprise to Phil. He fully expected all along that once he had proven that his idea would work, the backers would try to sell it quickly, hoping for a handsome cash return on their original investment. Similar scenarios were common to the stories of many other inventors, and Phil was determined not to share their fate. He had done all he could to forestall this moment of reckoning by postponing the demonstration as long as possible. Still, nothing quite prepared him for the lack of foresight he detected in Roy Bishop's remarks, and for a moment he was speechless.

When he did speak, Farnsworth's carefully chosen words concealed his true anxiety; instead, he outlined what had been brimming through his own mind, his own scenario for the future.

As Farnsworth figured it, he and his men were in the enviable position of having broken ground in fertile new territory. If they stuck together and followed through on their initial success, many more patent-worthy improvements would follow. Indeed, it was obvious from the initial results that there were many problems to be solved. By continuing at their present pace, the clever men of Farnsworth's Lab Gang would find the problems first, solve them first, and file patents on those solutions. As they worked out the bugs, they would build a broad patent portfolio, gradually wrapping a hammerlock of patents around the new art as it marched inexorably toward a mass commercial market.

In the end, Phil reasoned, everybody who wanted to get into the television business would have to come to Farnsworth to license his patents Thus, the patents would earn from royalties many times more than what they could get if they tried to cash out now.

Phil couldn't argue Bishop's premise -- the real work of refinement and engineering was just beginning and the work would be costly. But this was not a tangle of tubes and wires lying on a workbench -- this was true television, the ultimate fulfillment of decades of science fiction fantasies about "pictures that could fly through the air."

Perhaps Farnsworth's youth enabled him to see farther into the future than his backers, who were many years his senior. Phil believed that the long-range return from his invention would dwarf the initial outlay of capital. It seemed like only a matter of time and perseverance before the world beat not just a path but a veritable highway to their door.

With some verbal assistance from George, the matter of selling the venture was tabled -- temporarily -- and the Crocker group agreed to continue finding money to support Phil's work.

But there was little time for comfort. Farnsworth realized now that there was a genuine disparity in the level of his own commitment and the level of commitment he could expect in the future from his present backers.

After Bishop and Fagan and their friends left the lab that night, Phil and Cliff Gardner sat down together for a moment to think about what had happened. As they talked, Phil contemplated the

implications of what Roy Bishop had proposed; the prospect of selling out left him numb and cold. Phil felt that he was the only one who could perfect his invention. He didn't want to do it while he was working for someone else. He wanted to work for himself, be his own boss, set his own pace and exercise the freedom in the years ahead to follow his own imagination.

Thus, the aftermath of the first demonstration for his backers signaled a new phase in Philo Farnsworth's career: A boy's dream to make an idea work had become the classic struggle of a young inventor as he tried to continue his pioneering work while also maintaining the very independence that nourished his original thinking.

5. A Beautiful Instrument

The readership of the San Francisco Chronicle added a new word to their vocabularies when they read the feature headline spread across the morning edition on Sept. 3, 1928:

SF MAN'S INVENTION TO REVOLUTIONIZE TELEVISION

The accompanying text described Phil's invention as a "queer looking line image in a bluish light which smudges and blurs frequently, but the basic principle is achieved and perfection is now a matter of engineering."

The Image Dissector was described as being the size of "an ordinary quart jar that a housewife uses to preserve fruit." The article was accompanied by a front-page photo of the newly mustachioed Philo T. Farnsworth, posing as he would a hundred times with his magic jars in hand.

The sudden flurry of publicity surprised no one, least of all the backers, some of whom had begun courting the press in anticipation of a refinancing deal. Unknown to Phil at the time, George Everson and Jess McCargar were quietly negotiating to cash out the rest of the Crocker Group, including Crocker, Fagan and Bishop.

Not long after the Chronicle article appeared, fire swept through the second floor of 202 Green Street, charring all of Farnsworth's equipment. The disaster underlined the hazards involved in Phil's research: some of the chemicals they used, like potassium, were highly volatile; vacuum tubes were still very fragile, and would occasionally implode without warning; and there was always the lingering possibility that someone would touch the wrong terminal and get a blast from the strong currents and high voltages that were always present.

Phil and the "lab gang" rebuilt quickly after the fire, hardly losing a stride in their frantic pace to make their invention commercially viable. Natural disasters could not stop Farnsworth, but the uncertainty of human nature could. In 1929, the activity backstage began to come to a head. Phil knew that changes were imminent when his funds were unceremoniously shut off. Under these

conditions, he was faced with the unpleasant task of dismissing some of his men. Farnsworth rose to the task reluctantly, for he was being asked to lay off the only people in the world who really understood what he was doing and the way he was doing it. He had trained most of these men personally, and felt that, as an investment, they were worth much more than the wage that they were paid. The "lab gang" was an invaluable resource, the driving force that could make all the magic happen. Phil assured everybody that he would rehire them just as soon as the financing was straightened out.

When the smoke finally cleared at Crocker Bank, Jess McCargar was no longer employed there, for reasons that have never been explained. Nevertheless, either in spite of losing his job -- or because of it -- McCargar and George Everson succeeded in buying out the remainder of the Crocker Group. Leaving Bishop, Fagan and the others behind, George and Jess reincorporated the venture as Television Laboratories Inc. and Jess was declared president and chief executive. George was named treasurer and Farnsworth, who continued to own a substantial share of the enterprise, was named the Director of Research.

After squaring with the Crocker Group, Jess McCargar proposed to raise new funds for research by floating a stock issue. The task suited McCargar perfectly. This was, after all, the age of "beautiful nonsense" in the financial world and Jess McCargar was a creature of the times. He was a stock peddler by trade, and had amassed a small fortune as a promoter of speculations and fancy ventures. Television seemed to McCargar like a high promotable affair. The simple mention of the word in his circles seemed to evoke tremendous curiosity. Prospective investors always asked to see it for themselves, and once they came face to face with the electronic marvel, they were invariably impressed with what they saw. Television sold itself right from the beginning, so McCargar had no trouble finding an adequate market for his stock.

Farnsworth accepted the new circumstances with cautious enthusiasm. He was immeasurably grateful for the opportunity to resume his work, and he was certain that the threat of a sell out had been averted, at least for the time being. Still, the situation seemed far from perfect. There was a lingering aroma around all these financial shenanigans. But Phil concealed his ill ease from his friends and colleagues by assuring them with hollow confidence that "everything would work out all right."

Back East, the news of a breakthrough on the West Coast spread quickly among the giants of the electronics industry. However, the important details of Farnsworth's work remained a closely guarded secret while the patents were still pending. Most of the old professors were content to wait for further developments while they continued to experiment with their spinning wheels.

But one interested party wasn't taking any chances: David Sarnoff, the recently appointed vice-president and General Manager of the vast Radio Corporation of America, wanted to know exactly what was happening at 202 Green Street.

Sarnoff was a feisty Russian émigré who reputedly got his first taste of the power of modern communications the night he reported the sinking of the Titanic to the world from his post on the

wireless for American Marconi -- just one of the many Sarnoff legends that have since been debunked. Regardless of the credibility of the story, Sarnoff's star rose quickly after Marconi was absorbed by the government during World War I and spun off into the Radio Corporation after the armistice. I.

Sarnoff built his career on a reputation for predicting the future of the electronics business. He was instrumental in shaping radio broadcasting along the lines of a memo that he wrote predicting a “radio music box” long before the word "broadcasting" became common usage. In the 1920's, he managed his company's patent portfolio to the point that it was virtually impossible to manufacture or sell radio equipment without paying royalties to RCA.

In the late 1920's, Sarnoff realized that most of the fundamental patents covering radio would soon reach the end of their seventeen-year terms and expire. He also reasoned that some new kind of radio device would be invented that would eventually make the existing patents obsolete. Sarnoff concluded that RCA should get a handle on that new kind of radio before anyone else, and manage the introduction of the new invention in such a way as to maximize RCA's return on the old radio patents before they expired. In other words, if he controlled the new development as well as he controlled the old ones, then he could stall the new developments long enough to milk the existing radio patents for every day of their seventeen-year term.

It comes as no surprise then that the new development which seized Sarnoff's ambition was not radio at all, but radio-with-a-picture. Sarnoff observed that every time there was a flurry of publicity about television, radio sets sales softened slightly, as consumers held onto their money in anticipation of something better. What Sarnoff saw was enough to convince him that visual broadcasting would one day dwarf its sound-only predecessor.

Consequently, in order to head off the threat that a new industry would obsolesce his own, Sarnoff proposed to sire the new industry himself. He began in 1930 by acquiring the services of one Vladimir K. Zworykin, a research engineer who had some experience with mostly mechanical television experiments. Zworykin -- like Sarnoff, a Russian émigré – had been introduced to the concept of television by a Russian scientist named Boris Rosing, who proposed a partially electronic television system as early as 1906. Zworykin carried Rosing's ideas with him when he fled Russian in the early 1920's and came to America, where he found work with Westinghouse as a researcher. While working for Westinghouse in 1923, Zworykin applied for a patent for a completely electronic television system, but the patents were never granted and Westinghouse failed to see much promise in the work so it was dropped.

In 1930 Sarnoff learned of Zworykin's experience and arranged for Zworykin to resume his work with RCA's blessing at their well-equipped research facility in Camden, N.J. Zworykin was packing his bags, preparing to move from Pittsburgh, PA to Camden in the early spring of 1930 when Sarnoff suggested he "stop off" in San Francisco first, to see if this upstart young inventor had invented anything that RCA would need to advance their own research. Sarnoff included one notable detail in his instructions: Zworykin was to approach Farnsworth on his own, in his

present capacity, as an engineer for Westinghouse, investigating the possibility of a patent license. Zworykin's next destination after San Francisco -- Camden -- was not to be discussed.

Why Sarnoff wanted to know what he was dealing with before Farnsworth learned whom he was dealing with is not completely clear. The answer no doubt lies in a tradition which Sarnoff intended to maintain with television, a bold, but unwritten, policy which supplied the cornerstone of RCA's impenetrable patent portfolio: "The RCA doesn't pay patent royalties," Sarnoff allegedly told a colleague once, "we collect them."

This policy served successfully throughout the 1920's, as RCA acquired control of the patents of Marconi, Armstrong, Deforest and others and guided RCA's legal forces through a long string of successful litigation that put dozens of small companies out of business for failure to pay patent royalties to RCA. Knowing that Sarnoff was bound to this policy, it is easier to understand that he might not want this new competitor to know that RCA was entering the arena on an all-or-nothing basis.

As it is difficult to accurately interpret Sarnoff's motivations, it is equally difficult to assess whether Zworykin would have received a similar reception were he flying his true colors. Farnsworth tended to accept anyone who was articulate in the subject as a fellow traveler on the new frontier. Zworykin took full advantage of Farnsworth's hospitality.

A formal examination of new patents and the work that they cover is common practice in negotiating for a patent license. But according to witnesses, Zworykin "prowled around" Farnsworth's lab for three full days, during which time he had ample opportunity to avail himself to most of the secrets that made 202 Green Street the only address in the world with true television. Zworykin's response to Phil's work was for the most part cautiously complimentary. He was familiar with Phil's cathode ray tube receiver: Zworykin himself produced some noticeable results with a similar receiver in 1929, two years after Farnsworth--but the absence of a suitable electronic camera device confined him to the use of spinning wheels on the input end during the early '30's. His work on the picture tube was retarded by all the limitations inherent in the spinning disc approach: The system could not produce any more than 40 or 50 lines per frame because the receiver could produce no more detail than was sent by the transmitter.

Reassembling an image on a photo cathode in an evacuated bottle--converting electricity back into light -- was the easy side of the equation. Converting values of light into values of electricity was the missing ingredient that had eluded Zworykin and his contemporaries for so long. The stroke of true genius was required to solve that one. Now Philo T. Farnsworth -- twenty years Zworykin's junior -- showed him what he'd been missing.

Zworykin dropped his tone of guarded praise for a moment when Farnsworth finished explaining the Image Dissector. His response revealed genuine admiration, which is not often shared between competing inventors. And numerous eyewitnesses were present to hear Zworykin concede, "This is a beautiful instrument. I wish I'd invented it."

Despite such honest sentiments, at the end of his visit, Zworykin's mood changed. Though he had been clearly impressed with Farnsworth's invention, he was now reluctant to discuss the matter of a license any further. The entire matter was left up in the air.

There was an ominous tone in Zworykin's sudden reversal that rattled everyone in the lab. He seemed so impressed one minute, so disinterested the next. Later that night, Phil wondered aloud to Pem if perhaps he had shown Zworykin too much.

6. Nothing Here We'll Need

Perplexing as the Zworykin visit was, the matter was set aside when the Bell Labs announced that they had discovered a new form of cesium with a higher photoelectric output than the formula that Farnsworth was using. Farnsworth was worried about the low output of his photoelectric surfaces, and the new cesium sounded like something that would noticeably improve the performance of the Image Dissector. Phil went east to see if the new substance would be useful.

While Phil was out of town, George Everson received an unexpected request for a visit to the Farnsworth labs: David Sarnoff wanted to see Farnsworth's invention for himself.

It's hard to say why a man with Sarnoff's preoccupations would seek out an obscure address clear across the country; perhaps he felt that if there was anything important on Farnsworth's bench, then his own imposing presence would be sufficient to execute deal on his own terms. It seems more likely that he could no longer suppress his own intense curiosity, that he went to San Francisco to see something that he could not see anywhere else in the world.

Once inside the lab, Sarnoff looked all around to get his bearings, but as the system hummed to life, his gaze settled on the face of the receiver. Sarnoff studied the image with the chilling silence of a man who had confronted his own chosen future. It was startling enough that he was seeing true television for the first time; what concerned Sarnoff more was that he had expected to see it first under his own roof.

When he had seen all that he needed to see, Sarnoff drew Everson aside and quietly offered to buy the entire enterprise for an unthinkable figure, something on the order of $100,000. Sarnoff

insisted however that the deal include the services of one Philo Farnsworth. George assured Sarnoff that such a deal was not possible.

"Well, then," Sarnoff said, confidently dismissing the entire matter, "there's nothing here we'll need." With that, Sarnoff quickly departed, before George could ask him why he'd offered $100,000 if he didn't really need it.

Television Laboratories found an established ally on more favorable terms in the spring of 1931, when the Philco Radio Corporation in Philadelphia, PA became their first bonafide licensee. Philco was a respectable firm that did a fair share of the radio business during the twenties for which they paid the usual patent royalties to RCA. Still, Philco survived on the periphery of the "Radio Trust," in which large companies like RCA, AT&T and General Electric all pooled their patents for their mutual benefit. Perhaps hoping to surmount this junior partner status in the big leagues of radio, Philco agree to pick up me tab for Farnsworth's ongoing research. In exchange, Farnsworth agreed to move his entire operation to Philadelphia to get Philco started in the television business.

The job of breaking Philco into television was supposed to take six months. Pem hated the idea of leaving their new house in San Francisco, but Phil eased her anxiety by assuring her that they would be back in San Francisco in the fall.

The lab in Philadelphia was very different from the familiar homespun loft of San Francisco. The delicate necessities of life under the wing of a large corporation presented quite a change for the Farnsworth lab gang. Among the starch-collared, book-educated Philco engineers, Phil and his boys were regarded as mavericks, a gang of crazy cowboys from California. Patience often wore thin, as when the intense summer heat turned Farnsworth's un-insulated top-floor lab into a virtual oven. On one extremely uncomfortable day, Phil and his men abandoned protocol, and their ties and shirts, a circumstance that drove the well-heeled executives downstairs to a point of hysteria.

Despite the difficulties of adjusting to their new environment, the lab gang continued to perfect Phil's invention. The image rendered in Farnsworth's tubes improved steadily as the work continued, emerging as you might expect from a crystal ball -- first misty and blurred, slowly focusing, the haze burning off until the picture seems to jump out of the screen vivid and real as life itself. Six months turned into two years.

In that time, Farnsworth obtained an experimental license from the FCC to conduct over-the-air television transmissions. He set up a prototype receiver in his home, and little Philo III became the first charter member of the "television generation." His usual program diet consisted of a Mickey Mouse cartoon, "Steamboat Willy" which ran over and over again through the film chain at the laboratory several miles away. While little Philo watched, his father and the engineers at Philco made adjustments and tuned the circuits.

The problems that worried Farnsworth the most involved the sensitivity of the Image Dissector tube. He devoted a lot of his time and money into testing new materials for the photoelectric surface. In the back of his own mind, Phil was devising a radical new way of boosting the power of the feeble output. He was interested in an electrical phenomenon called "secondary emissions," and was certain he could find a way to make some use of this effect. But his thinking, which was ordinarily original and accurate, was distracted by other matters.

Phil realized that the original agreement had dragged on much longer than intended when Philco began to "manage" his research budget. It was clear that Philco had grown tired of paying all the bills without owning any of the patents, and suddenly it dawned on him that Philco and McCargar must have been renegotiating the arrangement behind his back.

All of the troubles with Philco took a back seat when a personal tragedy struck the Farnsworth family. In the winter of 1932 Phil and Pem's second son, Kenny, was stricken with a virulent case of strept throat and died, these being the days before penicillin and sulfa drugs. The anguished parents arranged to have their child buried in Salt Lake City and Phil informed his superiors at Philco that he would need time off to accompany his wife to the funeral. Philco flatly refused Phil's request for a short leave of absence. They claimed "he was too essential to their investment and could not be spared." And so Pem was forced to make the tearful trip to Utah alone.

This insensitive treatment convinced Farnsworth that he could no longer depend on either McCargar or Philco to protect his interests. His suspicion became so intense that he felt compelled to stop taking notes in his journal, so that no one at Philco could claim that they owned any new work that he described in his notes. Consequently, he was forced to work out his complex amplification ideas without the aid of any written records.

When he could stand the strain of a restricted operation no longer, Phil called Jess McCargar in San Francisco and simply told him that he was leaving Philco. McCargar responded with rage.

Regardless of what clever behind-the scenes deal had been killed by Farnsworth's departure, McCargar was less than thrilled by the prospects of peddling stock in a speculative venture in the midst of the Great Depression. Making things even worse, Phil refused to move his lab back to San Francisco as Jess suggested, because he felt that the East Coast was closer to the center of the action.

As the seriousness of Farnsworth's intentions became apparent, McCargar thought that he could discourage Farnsworth by refusing to raise funds, threatening to cut him out altogether. "Where are you gonna get the money?" McCargar's voice crackled over the wires.

But a good inventor, like any good card player, is not easily separated from his principals. "If you can't find the money, then I will," Phil answered firmly and hung up.

No sooner did the line go dead than Jess and George piled onto the transcontinental express and headed for Philadelphia. By the time Jess and George arrived, Farnsworth had already removed what equipment he could from Philco's facility and was looking for a new place to set up shop. The equipment was scattered chaotically about the Farnsworth living room, where George, Phil and Jess assembled in the early summer of 1933.

When the emotions were all played out and the discussion settled down to business, McCargar agreed to resume raising operating funds so that the job of perfecting Phil's invention could proceed. Phil reluctantly accepted the concessions that McCargar demanded, the most painful of which meant mat Phil would have to pare down his staff. That meant letting go of some of the men who had come with him from San Francisco when the Philco arrangement began. Some of those people had been fired before, in San Francisco, the first time the funds were shut off, when McCargar had first taken over the enterprise. Farnsworth hated to let those people down again. But most everyone agreed to stick it out in Philadelphia until Phil got back on his feet and rehired them again.

Shortly thereafter the venture was reincorporated once again, this time under the name of Farnsworth Television. Phil found a suitable location at 127 East Mermaid Lane, in a suburban neighborhood near Philadelphia, and with the underpaid help of Cliff Gardner and Tobe Rutherford, began rebuilding. Their task was formidable. Most of the important equipment that they needed for their work was the property of Philco and had to be left behind. They were building from scratch again.

This time the system that Farnsworth was building was a far cry from the crude wooden boxes he built back in the days of 202 Green Street. This system incorporated all the ingenious improvements that Phil and his "lab gang" had invented over the years: an electron multiplier coupled to the output of the Image Dissector greatly increased its sensitivity and signal strength; the nagging persistence of smudge and blur was overcome by inventing a new wave form, the now familiar "saw tooth." A horizontal blanking signal eliminated ghosting; and the magnetic deflection coils improved to the point that camera and picture tube were each producing an impressive 220 lines per frame.

As a result of these and many other patented inventions, the Farnsworth patent portfolio grew rapidly; the stable clarity of the picture that took shape at 127 Mermaid Lane proved that all the work had been worthwhile. Even the cabinetry had taken on the air of precise sophistication that made the advent of full-scale commercialization look like just another step away.

Unfortunately for Farnsworth, the Radio Corporation was not so favorably disposed. The competition began intensifying early in 1934, when RCA began demonstrating their own new electronic television system which Zworykin succeeded in producing three years after his visit to Farnsworth's lab.

RCA's praise of Zworykin's contribution was extensive, although parts of his camera device can be traced to work done in Europe by Kalman Tihanyi, J.D. McGee and others. RCA went on to

claim that this new camera tube, dubbed the "Iconoscope" was essentially the same device that Zworykin tried to patent in 1923. RCA stood by this assertion despite the fact that Zworykin worked with spinning discs and mirrors all through the late 20's--right up until the time he visited 202 Green Street.

RCA's praise for Zworykin exceeded the limits of corporate chest beating when they further claimed that the Iconoscope and the Image Dissector performed the same function in a similar manner. RCA was, in effect, asserting that Zworykin had invented the Image Dissector in 1923, and that Farnsworth was violating Zworykin's priority. To Farnsworth, this was the opening salvo in a barrage of legal maneuvers aimed at crushing the very heart of his work -- the patent portfolio.

As a result, in 1934, the giant Radio Corporation of American and little Farnsworth Television, Inc. became engaged in the same sort of patent interference litigation that had reduced dozens of similar fledgling companies to rubble in the previous decade. David Sarnoff was clearly maneuvering to bring Farnsworth's patent portfolio under RCA's domination. In other words, the very art that Sarnoff said he "didn't need," which he had tried unsuccessfully to obtain under his own untenable terms, he would now try to wrestle away through the Byzantine procedures of the U.S. Patent Office.

7. Suspended Animation

In 1933, after Farnsworth abruptly terminated his arrangement with Philco and struck off once again on his own, he resumed his efforts to find another company willing to support his research with a patent license. Much to his consternation, there were no takers. This seemed odd, since clearly, Farnsworth's television system was light years ahead of the competition, most of who were still experimenting with variations on the Nipkow Disk systems that were developed in the 1920's.

Through contacts in the industry, Farnsworth and his backers learned why none of the most likely candidates would offer Farnsworth a license for his patents. All these companies were actively engaged in the manufacture of radio equipment, and so were dependent on patent licenses with the Radio Corporation of America for their livelihood. As RCA chief David Sarnoff liked to say in closed quarters, "The Radio Corporation does not pay patent royalties, we collect them," and the companies that Farnsworth was approaching were the very companies that paid RCA those royalties. And through their sources, Farnsworth's people learned that RCA had issued another unwritten edict to their licensees: work with Farnsworth, and their radio patent licenses would be terminated.

RCA apparently based its position on a deepening relationship with Vladimir Zworykin and his 1923 patent application, and the cumbersome new camera tube he called the “Iconoscope.” Regardless of its questionable origins, the Iconoscope was the device upon which Sarnoff was determined to extend his empire and go down in history as the man who gave television to the world. Even though there was not yet an actual patent for the Iconoscope -- only the still-open patent application from 1923 -- RCA's attorneys went so far as to assert behind-the-scenes that the Iconoscope had priority over the Image Dissector, and that Farnsworth's patents infringed on Zworykin's application. On the basis of this flimsy claim, RCA threatened behind the scenes to put any body that did business with Farnsworth out of business.

Realizing the bind they were in, Farnsworth and his backers did the only thing they could do: they mounted a challenge before the examiners of the U.S. Patent Office.

Accepting Farnsworth's challenge made perfect sense from Sarnoff's point of view: Not only did RCA have a perfect record of defeating lesser adversaries in patent litigation, but the company was spending money on television at ten times the rate that Farnsworth was spending. Sarnoff needed a quick return on all that investment in order to preserve his reputation and calm the rumblings on his board of directors. Surely, the fledgling Farnsworth organization seemed like yet another easy target for the formidable legal forces of "the Radio Corporation."

The ensuing interference proceedings focused primarily on Claim 15 of Farnsworth's 1930 patent #1,773,980, which describes the simple, elegant concept of an "electrical image," which is the critical step in the process of converting light into electricity. There is something slightly intangible embodied in the precise wording of Claim 15 which reveals the indispensable process of creating an electrical counterpart of an optical image, in which values of electricity correspond to values of light. Claim 15 calls it:

> An apparatus for television which comprises means for forming an electrical image, and means for scanning each elementary area of the electrical image, and means for producing a train of electrical energy in accordance with the intensity of the elementary area of the electrical image being scanned.

This paragraph, first composed in 1927, announces the arrival of television on this planet, and is essentially the idea that 14-year-old Philo T. Farnsworth pictured in his mind's eye that hot afternoon five years earlier while he cris-crossed the fields in Rigby Idaho. This paragraph describes the essence of Farnsworth's invention, the missing ingredient, which, once found, paved the way for television as we now know it. Yet in 1934, RCA's attorneys tried to prove that Zworykin had the idea first.

Farnsworth spent many weeks answering an endless inundation of questions posed by a battery of RCA's biggest legal guns. Literally reams of testimony were taken. Every stack of depositions meant another week that Farnsworth was kept out of his laboratory, another week of progress lost to the competition.

The champion of Farnsworth's case was a sharp young attorney, Donald K. Lippincott, who was every bit as much an engineer as he was a lawyer. Lippincott held Phil and his abilities in great esteem; for his part, Phil regarded Don as "urbane without being Eastern." Together the two saw right through RCA's semantic charades and chipped away at RCA's case. They built clear concise and uncompromising arguments that methodically demolished RCA's claim.

Farnsworth and Lippincott delivered a dramatic tour-de-force when RCA challenged Phil's claim that he had first thought of his approach to electronic television while he was a high school

freshman in Rigby, Idaho. RCA's attorneys greeted this assertion with a laugh - how could a mere child possibly dream up something as intricate as electronic television? Certain that Farnsworth couldn't possibly support this bold contention, the opposition pressed the point.

RCA's disbelief started to crumble when Lippincott and one RCA attorney went to Salt Lake City and tracked down Justin Tolman. Tolman recalled clearly the day that his young student drew a series of diagrams on the blackboard in Rigby. Then to the amazement of both Lippincott and the RCA lawyer, Tolman drew from memory a simple sketch of an electronic tube, which turned out to be a precise replica of an Image Dissector. The RCA attorney shook his head in silence as he handed the drawing back to Lippincott.

Despite the gravity of the case at hand, RCA's case was surprisingly weak. There was no effort to produce into evidence a tube from 1923 that would substantiate Zworykin's claim to have had an operable television transmitter at that time. There were some vague verbal accounts, and those were dismissed by the examiners as unreliable, having been "influenced by later events and knowledge." In other words, when it mattered most, RCA was either unwilling or unable to produce the evidence that would today support Zworykin's claim to have invented the Iconoscope -- or something like it -- in 1923.

In April of 1934, the United States Patent Office delivered its first milestone decision in the case of Zworykin vs. Farnsworth. In its final ruling in case #64, 027, the patent examiners summarily dismissed RCA's claim in terms that spoke almost derisively of RCA's entire presentation, saying in conclusion:

> 1. That Zworykin has no right to make the count by virtue of the specific definition of the term "electrical image" given in the Farnsworth patent;
> 2. Zworykin has no right to make the count because it is not apparent that the device would operate to produce a scanned electrical image unless it has discrete globules capable of producing discrete space charges and the Zworykin application as filed does not disclose such a device {note: this clause basically states that the device disclosed in 1923 could NOT have been an Iconoscope... but we'll come back to that later...}
>
> 3. That Zworykin has no right to make the count even if the device originally disclosed operates in the manner now alleged by Zworykin because this alleged mode of operation does not produce an electrical image that is scanned to produce the television signals.

After a few more pages of legal discourse, the decision ends with an unequivocal declaration:

> "Priority of invention is awarded Philo T. Farnsworth."

Unfortunately, this resounding proclamation was followed by one more little sentence: "Limit of Appeal: August 22, 1935. In other words, RCA had sixteen months to appeal the decision. With

no money left to carry on the fight if RCA did appeal, Farnsworth and his backers waited, holding their breath everyday of those sixteen months. On the last possible day, RCA filed their appeal. This appeal was eventually denied, but the die was now cast: Farnsworth's entanglements with RCA went on for years, and placed the future of television in a state of suspended animation.

Things took a brighter turn in the summer of 1934, when the prestigious Franklin Institute of Philadelphia invited Philo T. Farnsworth to conduct the world's first full scale public demonstration of television.

Encouraged as he was by the steadily improving performance of the Image Dissector, Farnsworth accepted the invitation, and disregarded for the time being his stalemate with RCA. After all, the future of television belonged not with any single corporation, but with the people, the audience that would buy television sets and watch television programs. Farnsworth hoped to score some points with the public by being the first to show them what they could expect.

While Farnsworth was preparing for the Franklin Institute exhibit, he was introduced to Russell Seymour Turner, known to his friends as "Skee." Turner was an engineer and businessman whose wealthy father had acquired a healthy chunk of the Farnsworth stock that George Everson and Jess McCargar continued to sell to raise funds for the ongoing research. Skee was sent in to see what he could do to push the enterprise closer to some sort of payoff. Skee was smitten immediately with the Farnsworth charm, and began to take a strong personal interest in Phil and the things that he had to offer.

Turner saw to it that Farnsworth had enough funds to build a completely new system for the Franklin Institute exhibit. The picture tube that Cliff made was the size of a ten-gallon jug and the camera was compact even by today's standards. So equipped, Farnsworth was handsomely prepared to introduce his invention.

The exhibit was an unprecedented success. There was little advanced publicity - only word-of-mouth - but people were lined up for blocks when the doors opened in August 1934. The response was so strong that the event, which was originally scheduled to last ten days, went on day and night for three weeks.

Farnsworth placed one camera unit near the door, and the power of his invention was instantly driven home to anyone who entered, as they were immediately confronted by their own disembodied image flickering across the bottom of a ten gallon bottle.

Programs were thrown together spontaneously and transmitted from the roof to an auditorium downstairs. Thousands of Philadelphians poured through the auditorium in 15-minute intervals to see what ever was appearing. Vaudeville acts, popular athletes and a swarm of politicians volunteered to appear before Farnsworth's cameras.

The crowds were totally ambivalent to the content. They came to see the image on the screen, whatever it was. They came to witness the ancient dream of seeing at a distance. For the Depression-weary populace, this was something really new - something that spoke of a future, an oracle of better times to come.

Their success at the Franklin Institute was a terrific morale booster for Farnsworth and his men. It was their first contact with so large an audience; their first undeniable proof of how big television was going to be.

The Franklin Institute demonstration attracted considerable international attention, and marked the beginning of a steady flow of foreign visitors to Farnsworth's lab at 127 Mermaid Lane in the Philadelphia suburbs. Scientists and dignitaries from all over the world came to see the miracle in Farnsworth's living room. Phil and Skee Turner learned a great deal from their guests about the state of television around the world. They were particularly interested in stories about England, where the BBC had been conducting experimental video broadcasts for some years.

The system that the BBC was using was a mechanically scanned device that was invented by a Scotsman named John Logie Baird. Baird's first successful visual transmissions occurred in 1926, when he sent some semblance of the head of a dummy from one room to another. Some years later Baird convinced a reluctant BBC to permit him to use their channels in the evenings to broadcast blurry programs to a handful of receivers. By 1934, Baird had sold more than 20,000 "Televisor" receivers in kit-form all over Europe. Still, the BBC was disappointed in the quality of Baird's picture and started looking for something better.

In the early Thirties, Baird's fortunes fell into the hands of a large British holding company called British Gaumont. Feeling that they had a considerable investment to protect, British Gaumont pushed Baird to abandon his mechanically scanned Televisor in favor of electronically scanned video. British Gaumont reasoned that if the BBC wanted electronic video, then Baird should be the one to provide them with it, even if that meant taking a license with another inventor.

As providence would have it, Baird's people learned of a young inventor in America who was offering just such a license, and quickly dispatched a group of engineers to Philadelphia to see what the boy had to offer.

Philo Farnsworth and Skee Turner received the news of a possible license from Baird with tremendous excitement - a license in England could be the prelude to a whole series of licenses all over Europe. On arrival in Philadelphia, the English engineers were instantly impressed with Farnsworth's system, and at their invitation arrangements were made to take Farnsworth and his invention to England, where negotiations would be concluded.

Phil and Skee reveled in the unexpected change of fortunes. At last it seemed there was new hope for television. So Philo T. Farnsworth carefully crated up his circa 1934 television "mobile

unit" and sailed for Southampton, hoping to accomplish in Europe what he could not accomplish in America.

8. We Want Cash

In the dark and starry nights he spent on the deck of the S.S. Bremen, Philo T. Farnsworth, now 28 years old, had ample time to reflect upon the unlikely chain of events that found him sailing on a luxury liner enroute from New York to London.

By the fall of 1934 Philo's daring invention of electronic television should have placed him at the vanguard of the new emerging communications industry. However, RCA, world's largest radio manufacturing and broadcasting concern, was committing formidable manpower and vast sums of money to fight tiny the Farnsworth Television Company over the fundamental patents for electronic television. But for Philo, his "lab gang," and the scattering of patient investors he had attracted over the years, the litigation with RCA had a twin edged effect. As long as Farnsworth's patents remained under contention, his company could neither sell licenses nor collect royalties on the inventions he had discovered. Without these funds, Farnsworth was hard-pressed to maintain his legal defenses.

Pressure was building from some backers who would have had Farnsworth accept RCA chief David Sarnoff's one-sided terms, which amounted to a total sell-out of the inventions to RCA. Consequently, investment money that could have been used to begin new areas of scientific inquiry was diverted into the ongoing legal battles.

Nevertheless, Farnsworth knew that his portfolio contained many patents that were unavoidably essential to the art of turning light into electricity by means of a pencil-thin, rapidly deflected electron beam. Subsequent developments by other companies, like RCA, proved that this was indeed the direction that the rest of the industry would follow. But owning the patents alone was not sufficient to guarantee Farnsworth's personal or professional prosperity.

Since domestic markets were forestalled indefinitely by the cloud of litigation, Farnsworth had no choice but to seek foreign alternatives for money. When Baird Television of England invited him to bring his invention to England to be considered for a patent license there, Farnsworth was certain that he had found a timely solution to the costly delays at home.

Baird Television was named for John Logie Baird, an inventor of Scottish descent whose mechanically scanned television device made him the first independent inventor to earn any money from sending pictures through the air. This was possible in part because broadcasting in Britain was almost entirely controlled by the government sponsored British Broadcasting Corporation. During the early 1930's the BBC permitted Baird to use their radio channels at night to broadcast pictures on a temporary, experimental basis. Using one radio channel for his low frequency, low-resolution pictures, and another channel for sound, Baird managed to sell several thousand "Televisor" receivers in kit form throughout Europe. The radio amateurs who assembled these kits were rewarded for their diligence with a fuzzy preview of the ages-old dream of seeing from a distance.

Unfortunately for Baird, the costs of tooling up for production forced him to seek financial assistance and in the process he lost control of his company to a large conglomerate called British Gaumont. This arrangement worked fine for Baird until 1934, when the BBC expressed dissatisfaction with Baird's system and invited him to conclude his experiments. This development came as quite a surprise to Baird's backers, and they urged him to develop an electronic television system in order to stay competitive.

Baird was steadfast in support of his own invention, but the Directors of British Gaumont were not about to let a potentially lucrative business slip through their fingers. So British Gaumont ignored the objections of the inventor in whose name they acted, and compelled John Logie Baird to seek a license from a young American inventor named Philo T. Farnsworth.

The shift in Baird's fortunes began some time in 1933 when scientists at the EMI Corporation in London demonstrated the rudimentary capabilities of an electronic television system to the BBC brass. The receiving end of this system was a familiar cathode ray tube; the camera tube, which EMI modestly dubbed the "Emitron" is a much more intriguing development.

What is curious about the Emitron tube is its unmistakable resemblance to another device, the Iconoscope, which Vladimir Zworykin had first demonstrated for RCA during the same period. Both tubes employed the same lopsided geometry, built around a single-surface photo cathode composed of discrete photoelectric islands, and an unusual triangular scanning configuration. There is no question that the Emitron and the Iconoscope were virtually identical devices. The only question that stands unanswered is "which laboratory really produced it first?"

J. D. McGee, one of the EMI scientists who developed the Emitron, when interviewed in London in the spring of 1976, insisted that it is possible for the same scientific development to occur simultaneously in different places because there is frequently only one viable solution to a

problem. However, better evidence suggests that RCA enjoyed a long-standing, mutual cross-license arrangement with EMI in which these two giants shared their information and patents.

In other words, in the fall of 1934, as Farnsworth sailed for Europe hoping to form an alliance that would enable him to overcome his difficulties at home, his principal domestic adversaries were already operating a trans-Atlantic alliance of their own.

Of course, Farnsworth knew nothing of all these backstage machinations. As his boat arrived in Southampton, he was unaware that the struggle to bring television to Europe would be drawn along exactly the same lines as his struggle in America.

The ship that carried Farnsworth and his precious cargo arrived in Southampton in the fall of 1934. Farnsworth was accompanied by two laboratory assistants, Tobe Rutherford and Arch Brolly, and Skee Turner, who was on board to assist Farnsworth in the negotiations for a patent license.

While Farnsworth and Turner went off to meet their hosts from Baird, Tobe and Arch stayed on the ship to keep an eye on the equipment as it was unloaded from the cargo hold. This turned into an unexpectedly tricky maneuver, because a British maritime labor dispute prevented the Bremen from unloading directly onto the British dock because it was a German ship. Consequently, all the cargo had to be transferred to a smaller, British vessel, before it could be unloaded onto the dock. Gusty winds and choppy water caused the crate holding Farnsworth's irreplaceable equipment to sway precariously as it was hoisted out of the hull of the Bremen.

Tobe and Arch held their breath as the crane swung out over the edge of the big ship and the crate began a controlled descent toward the bobbing deck of the smaller ship. The crate was only inches from a safe landing when a sudden wave caught the smaller ship; instead of the crate being lowered gently to the deck, the deck rushed up to meet the crate, smacking it with a force equivalent to a fall from several feet.

Farnsworth and his men were unable to assess the damage until several hours later, when the crate was unsealed at Baird headquarters in London. John Logie Baird stayed alone in his office, but his representative hovered about restlessly while Phil and Tobe lifted the lid. The sudden change in their expressions when they peered into the crate was a dead giveaway that things inside looked grim.

Indeed, three racks of electronics had sheered away from their mountings and fallen into a heap at the bottom of the crate. Baird's men smiled to each other when they saw the mess for themselves - now they could report to their boss that the American machine was wrecked.

Less than an hour later, Baird's cause for celebration was interrupted. Skee Turner appeared at the door, inviting Baird and his men to come back downstairs for their first look at electronic television. The Baird contingent followed Turner, accompanied now by representatives of British Gaumont.

Farnsworth had placed both the camera and the receiver near the door, and the instant the British Gaumont people entered the room they were confronted by their own disembodied image, rendered in stunning clarity and detail.

The Britons were startled by the experience. After years of financing Baird's mechanical television system, the most resolution that the British Gaumont people ever saw was 60 lines per frame. Now they were confronted with an image composed of more than 300 lines per frame, rendering detail they had always been assured was quite impossible. Confronted by Farnsworth's obvious accomplishment to the contrary, the British Gaumont people realized that they'd bet on the wrong horse.

The stunning effect of this demonstration did little to ease the shock of Farnsworth's terms when they were finally presented. The Board of Directors of British Gaumont sat in bemused tolerance while Farnsworth explained that in addition to the customary continuing royalties, he wanted a $50,000 down payment to accompany the license, as a sort of opening fee, a royalties-in-advance payment.

What British Gaumont had envisioned was more like a mutual exchange, a sort of our-patents-for-yours proposition, with no cash involved. But actually, Farnsworth couldn't think of anything in the British Gaumont patent portfolio that he really needed, certainly none of John Logie Baird's mechanical television patents. It seemed to Farnsworth that he was the only one holding any cards in this game, and he stood firm: $50,000 cash or no license. The negotiations quickly bogged down.

Farnsworth asked for a short recess to confer privately with his associate Skee Turner. Once alone, they hardly needed to speak; the determined looks in their eyes were mutual. They would not go home empty-handed.

Skee Turner was first to notice a bottle of Scotch and one small glass standing on a mantle, and with a compulsive, defiant flourish, he poured himself a shot and choked it down. Turner then handed the bottle and glass to Farnsworth, who hesitantly did the same. Taking a brief moment to recompose themselves, Farnsworth and Turner returned to make their final stand before the British Gaumont Board of Directors.

It's not hard to envision the subsequent encounter: The spokesman for British Gaumont leans forward, confident that these young, inexperienced bargainers were about to propose a clever Yankee "compromise". Instead, Farnsworth firmly reiterated his earlier terms: "We want cash," he declared, speaking now with a tone of finality in his voice, assuring the Board of Directors that the negotiations were about to conclude, one way or another.

The Board of Directors stiffened in surprise, mumbled among themselves for a few moments, and then conceded to Farnsworth's demand.

Exciting as their cruise across the Atlantic to Britain must have been, the return voyage with $50,000 in their pocket must have been truly exhilarating for Farnsworth and Company. That sum represented the first genuine reward for nearly 10 years of concentrated effort.

Motivated by such sudden success, Farnsworth and Skee Turner spent the entire week at sea daydreaming about ways to parlay their windfall into even greater success.
The first public demonstration of Farnsworth TV had been a few months earlier at Philadelphia's Franklin Institute, where thousands lined up to see the new electronic marvel. The next step, Philo and Skee decided, was to demonstrate the day-to-day feasibility of television broadcasting, something which could be done immediately by investing the British license fee into a fully equipped television studio that could sustain a regular schedule of experimental broadcasts.

However, the $50,000 license fee was not entirely Farnsworth's property. The money, as well as all of Farnsworth's patents was actually the property of Television Limited, the holding company that Jess McCargar formed to raise money when Farnsworth had walked out of the Philco Radio Company back in 1933. Farnsworth still owned a significant portion of the equity in the enterprise, but he was by no means the majority stockholder.

Instead, the numerous investors who had acquired chunks of stock were represented by their own Board of Directors, and that august body, not Farnsworth would determine the disposition of the Baird license fee.

Farnsworth realized how the power in his life had shifted almost the moment he stepped off the gangplank: Jess McCargar demanded that the $50,000 be forwarded immediately to the business offices in San Francisco, and that the matter of building a studio be tabled until the Board of Directors could consider it. In the meantime, Jess figured that $50,000 would serve nicely to pay off some old bills, for example, the $30,000 tab for legal services contracted during the patent litigation with RCA.

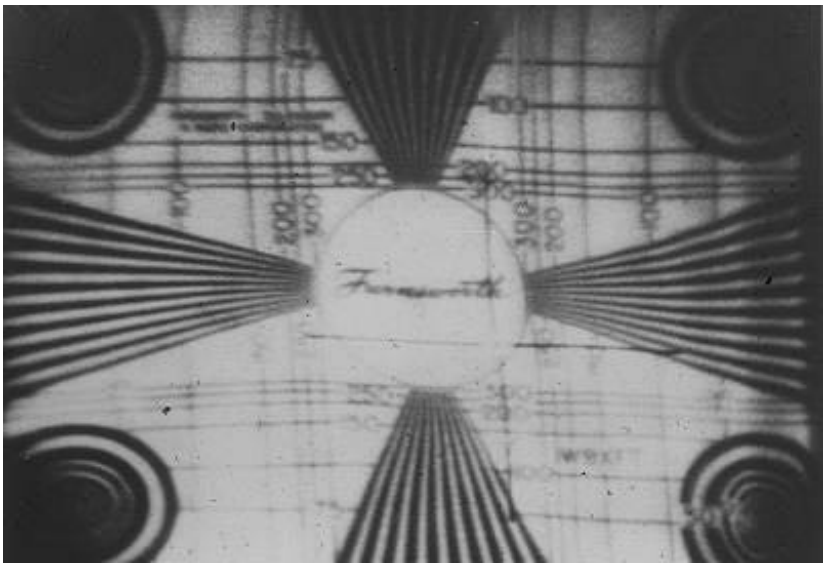
Farnsworth and Turner saw their dream of a studio facility that would give them an entry into the lucrative broadcasting business dissolve in the face of McCargar's single-mindedness.

What Farnsworth feared more than anything was that his benefactors would choose to take the conventional approach, and attempt to secure the future of Farnsworth Television by doing what Farnsworth called "tacking on the shipping room door," i.e. following in the pattern established by giants like RCA and opening their own factory to build and sell merchandise.

Farnsworth felt that a more lucrative future could be found in the field of television broadcasting, as radio broadcasting had already proven to be massively profitable. Building a studio facility seemed like a logical step in this direction; in his dreams, Farnsworth would let others worry about the manufacturing. His company would collect royalties for the use of his patents, and that revenue would free Farnsworth to devote his own energy to new lines of research, to explore the curiosities that appeared in his observations every day.

However, this issue never really surfaced when confrontations began to erupt with Jess McCargar. For his own part, Jess was only questioning the wisdom of taking on another sizable expense when they could hardly meet current expenses. But when the Board of Directors sided with McCargar, Farnsworth realized that the odds were no longer in his favor. As much as he hated to admit it, this denial of a studio left Farnsworth numb with the realization that not unlike John Logie Baird, he had lost control of his destiny to men who would not always share his vision.

9. You're All Fired!



Farnsworth and his partner, "Skee" Turner, decided to go ahead with their plans to build a television studio separate from the laboratories at Mermaid Lane, regardless of the response of Farnsworth's other backers. Skee Turner felt so strongly that such a facility was essential if Farnsworth was ever to surmount the day-to-day problems of commercial television, that he put up enough money himself to erect a prefabricated structure on a hill in the Wyndmoor section of Philadelphia.

While the empty building was fitted with a stage and lights, Farnsworth and the lab gang devoted their time to building two state-of-the-art Image Dissector cameras. These cameras were built for durability as well as high resolution. All the equipment was engineered so that camera and picture tube would both be capable of producing 441 lines per frame - well in excess of the 400 lines per frame that Farnsworth had established as his objective back in 1928.

Farnsworth's crew created and built a special transmitter and a 100-foot tower that could blanket the Philadelphia metropolitan area with experimental television signals. They also designed and built the world's first electronic video switcher, which allowed instantaneous intercutting between the two cameras as programs were broadcast. While all the equipment was under construction, the FCC granted Farnsworth a license to conduct experimental television transmissions under the call letters W3XPF.

One big job for the new broadcasters was finding artists to perform before the electronic eye. Farnsworth had learned during the Franklin Institute public demonstration in 1934, that he could rely on an endless supply of amateur singers, dancers, musicians and magicians willing to trade their time for a little exposure and the undeniable thrill of being televised.

What programs they were able to assemble were broadcast to a handful of receivers that were beginning to appear around Philadelphia. By now there were three companies in the area experimenting with electronic television: Farnsworth, RCA and Philco. Many of the engineers who worked for these companies had receivers in their homes that they used to monitor transmissions from their laboratories. The few dozen homes that were actually equipped with TV became focal points of the neighborhood, truly the first on their block.

For the time being at least, television was getting started in much the same way as radio, in the hands of a few clever enthusiasts who could build their own receivers to catch whatever was in the air.

Some amusing peculiarities were discovered in the Image Dissector tube as it began the routine of transmitting television programs on a daily basis. The characteristics that caused the most headaches arose from the tube's unusual infrared sensitivity, which caused red, which normally photographs black, to televise as white.

The Max Factor Company in Hollywood contributed their expertise from early color movies, and the coloration problems were solved by applying blue makeup around the lips and eyes. Consequently, performers who appeared perfectly normal on the TV monitor looked ghoulishly blue to the unaided eye.

The Image Dissector also displayed a peculiar sensitivity to certain fabrics, which rendered them transparent, as was graphically illustrated the day a pretty ballerina appeared to be dancing naked on the video screen.

Video broadcasts from the Farnsworth studios not only proved the feasibility of television, they gave Farnsworth a public image, and the boy genius from Utah became a minor celebrity. Though fewer than 50 homes in the Philadelphia area were equipped with video receivers, the activity was enough to add the word "television" to the language.

For a few months, Farnsworth enjoyed the attention; it was a welcome change after nearly 10 years of hard work in total obscurity. But eventually the obligations of even minor celebrity status became too pressing a burden on his time. What with meetings and interviews and visits from foreign dignitaries all hoping to spend a few minutes with the great Farnsworth, being famous became a job in itself, entirely apart from the work that made him famous in the first place.

The flood of publicity peaked in 1936 when the Paramount Newsreel Service, the Eyes and Ears of the World, ran two stories about the coming of television and the remarkable man who put it all together. One story described Farnsworth as the man who made "mankind's most fanciful dream about to become a startling reality."

By raising the visibility of the company, nationwide publicity raised the value of the stock, and the value of everybody's holdings swelled appreciably. Some accountant with a sardonic wit told Farnsworth that at current prices, his own holdings were worth more than $1,000,000. These figures made Farnsworth a living example of the American dream-a millionaire before his 30th birthday. Of course, this was only a "paper" fortune. The fact was, Jess and George McCargar continued having difficulty finding investors willing to buy into a company that still could not sell its only product.

In October 1936, Colliers Magazine ran a feature story about "Phil the Inventor," that said that television seemed destined to find its way into many American homes by Christmas, 1937. This prediction reflected a common feeling of the time, that commercial television was "just around the corner." But Farnsworth knew that as long as his patents remained under contention, turning corners would have to wait for another day.

With the job of perfecting and promoting electronic television off to a strong start under its own roof, life at Farnsworth's Mermaid Lane Laboratory took on a new dimension. The smell of new work permeated the air as Farnsworth and his loyal "lab gang" began to look back on what 10 years of refining television had taught them.

Many of the men still working for Farnsworth had joined him years earlier in San Francisco. Under Farnsworth's youthful guidance, this unlikely group managed to turn the tangle of wire and glass that produced the first electronic television picture into the total fulfillment of "mankind's most fanciful dream." Others before them had failed, crying that it could not be done without massive infusions of capital, but Farnsworth and his lab gang proved them all wrong. They not only invented TV, they overcame the limitations of their financing and delivered their invention to the marketplace, ready for the start of commercial broadcasting.

After so many successful years together, the lab gang began to take on the air of scientific invincibility. The unwritten motto for the entire operation was: "The difficult we do right away. The impossible takes slightly longer."

In 1935, Farnsworth's attorney, Donald K. Lippincott, filed applications for 32 new patents that covered improvements in television as well as some new work that was not directly related. Farnsworth was proud of these submissions because some of them embodied original discoveries he had made over the years. But what excited him most about this batch of patents was that 14 of them were attributed to members of the lab gang other than Farnsworth himself.

This score reflects the collective spirit that Farnsworth instilled in his coworkers. This straightforward approach to his work provided an incentive that tied the lab gang together. Their hours were long, the work was sometimes tediously painstaking, and the pay was never abundant, but Farnsworth never had any trouble finding capable men who were not only willing but also eager to work with him.

As the lab gang grew, Farnsworth chose new men very carefully, watching closely for people who displayed both compatibility and trainability. Admission to the lab gang was predicated primarily on an applicant's willingness to take chances. What kept the lab going was men who could, by following Farnsworth's example, find their own way of doing whatever they'd been assigned, and make it work. In this manner, Farnsworth built a well-organized team that could deliver the specific ingredients of his designs.

"I'm building men, not gadgets," Phil once said, and the extraordinary results of his unique style of work and leadership was a testimony to that philosophy.

Once accepted, a new employee found himself welcomed into what Tobe Rutherford called, "one big happy family." Indeed, many lab workers were members of his immediate family: his brothers Carl and Lincoln were both members of the lab gang. His sister, Laura studied with Max Factor, and became the resident make-up consultant. And his chief tube-builder was his brother-in-law.

This extended family became a collective unit that was the extension of Philo's incredibly creative scientific mind.

At the same time that he was directing members of his research team to solve particular problems that grew out of the day-to-day television operations, Philo concentrated his own attention on dozens of problems in basic science, which his instincts led him to explore. It was the solid back up of his laboratory group, which provided the support necessary for him to begin explorations in the outer stratosphere of electronics and physics.

Farnsworth became convinced that there was no limit to the things he could get electrons to do in a vacuum bottle. He turned to his lab gang to construct the tubes and circuits that could prove his point. Electronic television, which began as a dream in the mind of a child, was now a virtual reality, but the lab gang was the fulfillment of an even grander dream. Television was as much the product of their sweat as it was the gift of his genius. Farnsworth was the dreamer, and the lab gang was the instrument of his dreams. With these men at his side, whatever Farnsworth wished of the future was at his command.

Throughout 1935 and 1936, Farnsworth carried a considerable workload. He spent long mornings at the studio, personally demonstrating his invention for the daily tide of visiting dignitaries and scientists who felt they were entitled to a few minutes of Farnsworth's time. The afternoons he spent at the laboratory on Mermaid Lane, working on solutions to problems that came up at the studio. The evenings he spent either at the lab or at home, working on his new ideas and developing the mathematics for his own theories.

These jobs alone were enough for three men, but there was no end to the distractions that kept Farnsworth away from what he considered the important work. Most disturbingly, the people who were primarily responsible for funding Farnsworth's enterprise did not share his enthusiasm for opening new lines of research. After all, there was still no settlement in sight from RCA, and

the dream of video broadcasting remained indefinitely postponed. Until the RCA litigation was cleared up, all this talk of advanced science struck Jess McCargar as more than a little premature.

In fact, McCargar was beginning to display impatience with the whole affair, and suggested on more than one occasion that maybe accepting RCA's offer for a complete sell out wasn't such a bad idea after all. The suggestion only proved to Phil that Jess would never understand how a patent was something that could earn money from licensing, without ever being sold. McCargar could only make judgments based on how much things cost, and now, as usual, they cost too much.

In the closing months of 1936, these pressures began to exercise a noticeable effect on Farnsworth's delicate physiological balance. He began to show the signs of growing tired each day, and his disposition sometimes turned sour. After pushing himself relentlessly for 10 years, he was finally beginning to reach the limits of his endurance.

As if life on Mermaid Lane wasn't already intense enough, Farnsworth learned in the autumn of 1936 that his only licensee, Baird of England, was in trouble. The BBC was all set to award its television contract to EMI, but Baird and his backers raised such a fuss that the matter came up in Parliament, where the Selsdun Committee was appointed to make certain that the BBC conducted competitive testing between EMI and Baird before awarding the contract. As the tests got underway in 1936, Baird started having a bit of a problem with his Image Dissector tubes. He couldn't get a picture.

Unfortunately for Farnsworth, there was no one else in the world Baird could turn to for help. Aside from being tired, he was understandably reluctant to leave the lab. But since his only industrial ally was on the verge of collapse, he had no choice. He agreed to go, with two stipulations: he insisted on taking a slow boat, so that he could have a few days to rest; and he insisted that passage be provided for his wife, Pem. Baird accepted these conditions, and Mr. and Mrs. Farnsworth sailed for Europe, making a honeymoon of it 10 years after their wedding.

In London, Farnsworth found Baird's equipment set up in the elegant Crystal Palace in Kensington Gardens, the remarkable glass and steel edifice that Queen Victoria had built in the 19th century to house an industrial exhibition. Farnsworth was shocked to discover the real source of Baird's problems: two years after taking a license from Farnsworth, Baird was still using the scanning disc for certain components of his system. True, Baird had pushed his mechanical creation to the point that it could deliver some 200 lines per frame, but the competing system offered by EMI produced 405 lines per frame, and clearly left Baird standing in the cold.

Baird was using his Image Dissector tube for his "cinefilm" transmitter, which is the British euphemism for a film-chain, but even in this capacity he was not taking full advantage of the Dissector's capacities. In fact, Farnsworth found the chassis for the Dissector only partially built; Baird and his men simply didn't know how to finish it.

Once he was on the scene at the Crystal Palace, Farnsworth plunged into an around-the-clock schedule to put Baird back in business. When he was done, Farnsworth and his wife drove with Baird and members of the Selsdun Committee to a small pub outside London where a cathode ray tube receiver was set up to catch Baird's over-the-air transmission. Everybody saw the crisp detail and subtle contrasts in the picture delivered by the Farnsworth Image Dissector.

Still, there was really little Philo T. Farnsworth could do to help John Logie Baird as long as the Englishman hung onto his spinning discs. Evidently, British Gaumont, Baird's backers, felt pretty much the same way as Farnsworth. It seemed that Baird's chances of winning the BBC contract were doomed even before Farnsworth arrived at the Crystal Palace.

Having done all that he could for Baird, Farnsworth disappeared with his wife for three weeks on the French Riviera. Conversation during their train ride across France centered on the recently exposed intrigue of Edward VIII's illicit romance. The Farnsworths arrived on the Riviera at almost the same time as Wallace Simpson, the object of Edward's affections, who was forced to flee London as word of her relationship with the King leaked out.

Phil and Pem spent three well-deserved weeks on the beach, during which time Edward announced his abdication. Those three quiet weeks provided a much-needed period of rest for both Phil and Pem, their first real vacation after more than 10 years of hard work. It was also the first opportunity that Phil and Pem had in as many years to spend a period of time alone together. The backdrop of the French Riviera provided just the right romantic touch to reawaken the fire of their affection.

While they were on the Riviera, the Farnsworths were shocked to read one morning that the Crystal Palace was leveled by a fire of mysterious origins, which destroyed all of John Logie Baird's equipment, including Farnsworth's Image Dissector. The fire brought almost total ruination to John Logie Baird, and all but guaranteed that EMI would win the contract to put BBC into electronic television.

The news was a set back to the energy that this trip seemed to be gathering. Before sailing home, Phil and Pem made one more stop in London to survey the damage. Sifting through the rubble of the Crystal Palace, Phil found a macabre souvenir of the tragedy-the charred, melted remains of his Image Dissector tube, which he carefully placed in one of his bags, to be carried home with him as a grim reminder of what was left of the British hope.

After six weeks absence Philo looked forward anxiously to returning to his laboratory to see what had become of the patents that were filed prior to his departure. He had left the work in capable hands before he left, and hoped to see that some interesting results had been produced while he was away.

Instead of hopeful signs of progress, Farnsworth was dismayed to discover that some of the patents that seemed most valuable had been abandoned while he was away only because they

had no direct applications to TV. But more importantly, Farnsworth discovered discontent coming from everybody in the lab over the way that things had been handled during his absence.

Phil learned that Jess McCargar had sent Russ Pond, one of his buddies in the stock-peddling business to Philadelphia to take over the management of the lab. Pond was cut from the same fabric as McCargar, and had no prior experience with anything that involved electronics or engineering. Nevertheless, he took his role very seriously, but showed little regard for the delicacies of science. The result of his arbitrary management was a badly demoralized lab gang. Farnsworth found everybody grumbling about how things had fallen apart in the six short weeks while he was in Europe. The entire lab gang was suffering from a case of badly damaged esprit de corps.

Russ Pond was sent back to San Francisco immediately, but it was too late to prevent the rapid chain of events that would lead to a confrontation with Jess McCargar. That encounter became inevitable when Jess decided that Phil should reduce the payroll by dismissing some of his staff, and then decided to come east to deliver the ultimatum to Farnsworth in person.

This, Farnsworth decided, was the place to plant his feet. We would not allow McCargar's shortsightedness to jeopardize his most valuable asset. Every one of his men performed some essential role and none could be spared without affecting numerous phases of the total operation. Nor could he face the emotional stress of deciding who should go and who should stay. It would have been too much like choosing between his children.

McCargar was adamant. "Well," he scowled, "If you can't fire some of them, fire all of them, and hire back the ones you need."

Farnsworth refused to fire a single man, so Jess McCargar took matters into his own hands, as if to show Farnsworth who was really the boss. McCargar stormed defiantly out of Phil's office and announced to everyone present with gloomy finality, "You're all fired."

Farnsworth sat alone in his office while his men filed out, quiet and perplexed. Waves of anger and despair seized him as he tried to assess what McCargar had done to his life. The spirit left the room when Farnsworth walked out of the lab alone that night. Pem already knew what had happened when Phil walked in the house, looking beaten and depressed. She tried to talk about it but Phil was still too overwhelmed and confused to articulate his feelings. They went to a movie instead.

Later that evening, Phil called some of the men to see if they would come back, but every call met the same response. Even Tobe Rutherford had taken all the static and interference he could from Jess McCargar and refused. He just didn't have the stomach for it as long as Jess McCargar remained in charge.

Hard as it was for Tobe and the others, it was even harder for Phil. As the full impact of McCargar's blind ruthlessness became apparent, Farnsworth realized that the foundation of his

future lie in ruins, and felt that all of his struggles had been in vain. It seemed senseless to continue to stand up in the face of external threats if he was only going to be knocked down in the end by the people who were supposed to be on his side.

10. Caught In The Crossfire

By 1937, the extended Farnsworth family-the "lab gang" Philo had built- had turned "mankind's most fanciful dream into a startling reality." The collective spirit that motivated their work was shattered when company president and financier Jess McCargar fired everyone after arguing with Philo about reducing expenses in the laboratory. The dream of television was a reality, but as long as Jess McCargar remained in control of the finances, Philo Farnsworth's personal dream of creating a self-sustaining research lab by licensing patents instead of selling them seem doomed.

Simply stated, Farnsworth wanted to be in the inventing business. McCargar seemed to think that they were only in the television business. After 10 years of promises and predictions, McCargar, who was getting on in years, began to wonder if his investments in television would pay off in his own lifetime. As time passed, Jess's outlook soured to the point that his influence became an unpredictable threat to the entire enterprise.
The emotional stress that accompanied these issues peaked during the summer of 1937, when a group of Farnsworth intimates convened a special meeting in the living room of the Farnsworth's home on Crescham Valley Road outside Philadelphia.

The meeting was arranged to discuss alternatives to the company's current method of raising money, which had remained basically unchanged since 1929 when McCargar began selling stock in the venture to meet lab expenses. Now the assemblage thought it was time to obtain more substantial underwriting for the company, both to improve its financial standing and to minimize McCargar's destructive influence.

McCargar understood that the meeting was a challenge to his leadership and stayed away to avoid a confrontation. This tacit acknowledgment of his slipping power confirmed what had been

happening for years. Although he had been titular head of the company during the 30s, financial support for Farnsworth's research had increasingly been raised on Wall Street. Philo's first backer, George Everson, enlisted the aid of a former associate, Hugh Knowlton, who was now with Kuhn, Loeb, one of the most established Wall Street investment firms.

Once Kuhn, Loeb became involved in raising funds to support Farnsworth's research, the firm and the investors they represented began to acquire significant equity in the venture. By the spring of 1937, when he fired the entire lab gang, Jess McCargar was serving at the pleasure of a Board of Directors that he had not handpicked. This shift in the power behind the company carried even more serious implications for Philo, who was still clinging to the last remnants of his dream that success in television would pave the way for success in whatever line of research he chose to follow in the future.

In the past, most of Farnsworth's problems erupted in the form of confrontations with Jess or George Everson, or a Board of Directors largely under their control. By the time the Board of Directors came to meet in Farnsworth's living room, the focus of power in the company was not so readily identifiable. Instead of dealing with just George and Jess, Farnsworth was forced to contend with unfamiliar faces. He knew that behind each face was a man with his own ideas about how Farnsworth should run his business.

Farnsworth did everything in his power to make the Board understand his point of view, but the Wall Street types were adamant about following a more predictable and conventional approach for securing the company's profitability. By dinner the ingredients of a serious proposal started taking shape. Using the services of Kuhn, Loeb, to arrange the necessary financing, the Farnsworth enterprise would acquire a factory and engage in the manufacture and sale of radios until the market was ready for television.

Farnsworth’s was not the only company that was trying to fortify its position in the industry as the final battles over television approached. The list of entries into the television sweepstakes grew longer each day as companies like Zenith, DuMont, Philco, Crosley, Emerson and others began circling the territory to stake out claims.

As the growth of the new medium accelerated, the focus of interest began to shift from the research labs in New York and Philadelphia to the political corridors of Washington, D.C., where the recently formed Federal Communications Commission was expected to orchestrate the chaos by setting universal signal standards and clearing space in the electromagnetic spectrum for television.

A single set of specifications for all broadcasts, covering scan rates, frame rates, and the like, was essential for all broadcasts in a given area to be compatible with all receivers. Without such standards it would have been necessary to own a different receiver set for every station a viewer wanted to receive. While standards seemed inevitable, it would be difficult to exploit the invention commercially until they were adopted.

The FCC, however, moved cautiously, realizing that once standards were adopted, the industry would have to live with them for decades, if not centuries, to come. In addition, the FCC was forced to contend with numerous factions that opposed the momentum that television was gaining. Radio broadcasters and set manufacturers joined forces in an alliance with the movie industry and lobbied to stall TV's progress in Congress and the FCC.

In addition to signal standards, the FCC was responsible for locating television within the electromagnetic spectrum. Because it utilizes extremely high frequencies and much greater bandwidth than radio, television broadcasting threatened to gobble up an inordinate amount of finite spectrum space; one TV channel would need as much as a dozen radio channels, thus limiting the number of available channels in any geographic region. Even more spectrum space would be required, it first seemed, for radio relay of TV signals if a national TV network were to be established along the lines of existing radio networks.

Without question the company that was in the strongest position to capitalize on television was the Radio Corporation of America, whose patent domination in the field of radio transmitting and receiving was almost impregnable. All though the 20s and 30s it was virtually impossible to manufacture any kind of radio apparatus without paying royalties on RCA's patents, which included most elements of vacuum tube technology. Those that attempted to infringe on RCA's patents would have to contend with the company's formidable legal department, which more often than not put the competition out of business.

By reserving for itself the right to license or not license whomever they chose, RCA placed itself in the enviable position of determining who and how big its competition would be.

As a result, most observers assumed during the 30s that RCA would extend its domination to the new field of television, into which company president David Sarnoff had already poured millions and staked his personal legacy.

Besides RCA, the American Telephone and Telegraph Company (AT&T) was the only other serious contender. AT&T staked out its claim in 1935, when Bell Labs introduced a wired solution to the problem of sending television transmission from city to city. Their invention was called a "coaxial cable" owing to the fact that one conductor was threaded through the center of a flexible copper tube. With this development, AT&T placed itself in perfect position to give itself the job of wiring together television networks. The FCC tentatively gave AT&T permission to experiment with their cable, and one was strung almost immediately from New York to Philadelphia to begin testing. In the meantime, the FCC opened an inquiry to make certain that AT&T was not about to create another communications monopoly.

Such investigations were familiar territory to AT&T, who along with RCA, GE and Westinghouse, had experienced previous governmental inquiries into their affairs. The inquiries revealed that these giant companies entered into a series of secret agreements during the 1920's upon which the entire structure of the communications business became predicated.

These agreements were ostensibly broad patent cross-licenses. Each company granted the others the use of their vast patent portfolios. Stipulations within the agreements had even greater ramifications, for they established specific restrictions on how each company could use their part of the patent pool. Thus AT&T was able to use all of RCA's patents so long as AT&T stayed out of the radio business, and RCA was able to use all of AT&T's patents so long as RCA stayed out of the telephone business. Conversely, RCA was assured dominance of the radio business as long as AT&T received all the long-lines business from wiring together RCA's radio networks.

These cross-license agreements became notorious during the 1920s and early 1930s as "The Radio Trust." The original cross licenses were modified -- after the threat of anti-trust proceedings -- in the "consent decree of 1932," which essentially allowed RCA and AT&T to stick to the same terms, albeit couched in less monopolistic terminology. The basic structure of the early cross-license agreements still stands today.

However, even after the consent decree of 1932 was signed, the agreements omitted one important consideration: television. The AT&T/RCA cross-licenses covered audio transmissions only. There were no provisions at all regarding which company would use what patents in television. In other words, in a field where everything else was sliced up and nailed down, television was up for grabs. Whoever got there first would call the shots.

Updating the cross-licenses to include television was essential to David Sarnoff's plan for RCA to extend its domination of radio broadcasting into the field of television. With such patent control at its command, RCA would have a lock on virtually the entire electromagnetic spectrum: it would have been impossible to transmit or receive any kind of information via the spectrum without employing some sort of RCA-covered device. RCA would truly become THE Radio Corporation and David Sarnoff would become the undisputed Emperor of the Airwaves.

Only one man stood between David Sarnoff and his dreams of an ethereal empire -- Philo T. Farnsworth. Sarnoff knew that in order to add television to the existing cross-licenses, each side would have to have patents central to the new art to exchange. AT&T was well prepared to begin negotiating around its contribution, the coaxial cable, and apparently RCA was expected to deliver its end of the bargain in the form of patents that covered the art of sending and receiving video signals. But as things stood in the middle of 1937, RCA didn't own any of those patents. They belonged to Philo Farnsworth.

Despite the fact that RCA and Farnsworth had been litigating over his patents for years, the RCA portfolio covering TV camera tubes lay in ruins. After nearly 15 years of consideration the U.S. Patent Office had still not issued a patent for the Iconoscope on the basis of Vladimir Zworykin's 1923 patent application. In numerous decisions the Patent Office held that the tube disclosed in 1923 and the Iconoscope were not the same tubes. Furthermore, engineers who had been working with the Iconoscope in the field reported that the tube was a nightmare to use. The signal was noisy and needed a lot of filtering. Shading the picture never ceased to be a source of

anguish. The RCA research philosophy -- if they couldn't own an invention, they would engineer their way around it-was finally coming back to haunt them.

Sometime early in 1937, some of the men working at the RCA Labs in Camden gave their boss something new and exciting he could report to the increasingly nervous RCA Board of Directors. The engineers had re-designed the Iconoscope in such a way that it would soon be capable of producing much sharper, cleaner picture than any of its predecessors. The legal department assured Sarnoff that the development was completely original to RCA, and moved quickly to file patents. Mean while, the trademarks department came up with a name for the new tube: the "Image Orthicon." His confidence restored, David Sarnoff told the RCA Board of Directors that he had chosen a date for launching commercial television service-at the New York World's Fair in April 1939.

Meanwhile, Philo Farnsworth stepped directly into the crossfire between the giants in 1937 when the Federal Communications Commission invited him to express his opinions on the future of television. Farnsworth's appearance was scheduled as part of the ongoing investigation into the growth of monopolies in the communications business. As usual RCA and AT&T were the targets of most of the Commission's concern. Specifically, the FCC was trying to determine if AT&T was employing monopolistic practices by its apparent failure to issue any licenses for the use of the coaxial cable. It seemed that AT&T was reserving use of the cable for itself and this would clearly be restraint of trade.

Farnsworth had appeared before the FCC on several previous occasions, as when he applied for a special license to conduct on-the-air experiments with his invention. Philo felt he had been treated fairly by the commission in the past, and was at ease.

Unknown to Farnsworth, AT&T President Walter S. Gifford sat quietly in the hearing room that day, listening intently as the Commissioners began to question Farnsworth about his experiences in obtaining licenses for his patents. Philo told them that he did not hold a license for use of the AT&T coaxial cable, nor had he tried to obtain one.

At this point Gifford, hoping to prove a point in front of the Commission, rose to his feet, interrupting the next question, and introduced himself. He then asked Farnsworth if he would care to enter into a cross-license agreement with AT&T. Farnsworth, a bit stunned, responded that, of course, he would welcome an exchange of patents with AT&T. "Then see me after you are through here," Gifford said, as he sat down, leaving the rest of the room in silence.

Unlike RCA, which had staked its entire future on developing electronic television on its own, AT&T had nothing to lose from offering Farnsworth a cross license, and everything to gain. By making the offer in the presence of a Commission that was investigating the company's business practices, Gifford seemed to contradict the charges of monopoly, and his clever staging cast AT&T as the champion of free enterprise.

It took more than six months for AT&T and Farnsworth to iron out the specifics of their cross-license agreement, but when the deal was finally announced, it sent shock waves through the industry.

If David Sarnoff was reading Business Week on August 14,1937, he would have discovered the truth in print: The AT&T-Farnsworth deal "means that the grip which the Radio Corporation was generally assumed to have on the future of television was relaxed," because "Farnsworth now obtains access to the basic broadcasting patents. In other words, he is now able to compete with RCA on more equal terms. The road is no longer blocked should Farnsworth decide to enter manufacturing."

In effect, Farnsworth had sneaked in through the back door and raided Sarnoff's kingdom. If they wanted to, AT&T and Farnsworth could have launched commercial television themselves, and left RCA standing in the cold.

The Farnsworth deal with AT&T had immediate implications for the rest of the industry, which greeted the news as a major coup for Farnsworth. The announcement gave others the confidence to begin purchasing equipment from Farnsworth without fear that RCA would interfere with the transaction. The Columbia Broadcasting System was one of the first companies to buy Dissector tubes from Farnsworth for TV experiments they were conducting from the Chrysler Building in New York City.

All this activity was a clear signal to Sarnoff that the industry was beginning to accept Philo T. Farnsworth on his own terms. Still, Sarnoff continued to play his own hand, confident that the Image Orthicon would provide his ace in the hole. Tests with the new device showed that the tube out-performed all its predecessors. Almost the moment the Orthicon was proven, RCA junked its research on the Iconoscope, with a quickness that suggests the only reason the Iconoscope ever was developed by Zworykin was to get around Farnsworth's patents. Having failed to accomplish this purpose, RCA moved rapidly on to something else.

Sarnoff was probably not too worried about the AT&T-Farnsworth deal until the day his lawyers informed him that their patent search had encountered U.S. patent #2,087,633, which revealed that Philo T. Farnsworth had been issued patents that covered important features of the Orthicon design, in 1933, four years before the tube was developed at the RCA labs.

The legal department initiated interference proceedings with the U.S. Patent Office over the conflicting claims but this effort met the same result as every previous RCA challenge. Priority on claims relating to the Image Orthicon tube were awarded to Farnsworth. The only ingredient on which the Patent Office would award priority to RCA was the name itself, "Image Orthicon," which RCA had registered as a trademark. So, the Orthicon tube, the workhorse upon which the television industry was built in the 40s and 50s, was basically a Farnsworth invention wearing an RCA name.

(*Author's note*: Ever wonder where the name of the "Emmy" awards came from? It was derived from the "Immy" Orthicon tube. Which means that every year, the television industry honors its patron saint with its most prestigious award -- and hasn't got a clue that they're doing so.)

By 1938 David Sarnoff had spent nearly $10 million for research in television, but RCA was unable to obtain a single patent that was essential to the new art. On the other hand, Farnsworth's research had cost less than $1 million, and his portfolio controlled the art. Sarnoff was outspending Farnsworth by 10 to one, and had nothing to show for it. Such is the difference between trying to engineer an invention and inventing one.

About this time Sarnoff began to change his tune. In public addresses, he mentioned Farnsworth several times by name and acknowledged his contributions to the art of television, although he was always mentioned in the company of other inventors, particularly Zworykin. Nevertheless, as Farnsworth's people learned about such utterances, the Wall Street grapevine confirmed their conclusion: RCA's change of heart was real. So in the early months of 1938, lawyers for Farnsworth and RCA sat down to begin negotiating the long-awaited cross licenses.

11. Tears in His Eyes

Prologue to the Conclusion:
Sometime in 1927....

One night, going home on the ferry, Phil led me out on the deserted back deck. The sky was clear for San Francisco, and the stars were brilliant. Phil put an arm around me as shelter from the ever-present wind. Looking skyward, he asked if I thought there was life out there.

"I haven't thought much about it," I confessed.

"Don't you think it pretty egotistical to think that we, on this tiny planet we call Earth, are the only intelligent creatures in this immense universe?"

"Now that I think about it, I guess it is."

"I think there are beings out there who have far surpassed us in development, mentally and otherwise. I intend to take an expedition out there some day and find them."

"That sounds very ambitious to me."

"It is ambitious. We would need a carefully picked group of people, hopefully couples, each well trained in some phase of science or medicine. The spaceship would have to be large enough to be entirely self-sufficient. We would take animals for food and grow our own vegetables in hydroponic gardens, because we would be gone for a very long time. In fact, it might be up to our children or even our grandchildren to bring the ship back."

"You keep saying "we"; I hope you aren't expecting me to go along."

"I had hoped you would. I hate to think of going anywhere without you." I was glad he felt that way. Certainly, if he left this earth, I didn't want to be left behind.

"I get goose bumps just thinking about it, but when it comes right down to it, I'd rather die with you in space than live on earth without you."

"That's my girl. I knew I could count on you. Anyway, we have much to do before we could take on such a project-it may take longer than we think to get television to the commercial stage."

"Trust you to think big."

--from Distant Vision: Romance and Discovery on the Invisible Frontier
by Elma G. (Pem) Farnsworth

It took nearly two years to hammer out the details of the deal that would put Farnsworth in the electronics manufacturing business. George Everson and other officers of the company spent most of that time in New York, working closely with Kuhn, Loeb, and other Wall Street contacts, while Phil monitored the progress from the lab in Philadelphia, where he had picked up the new work that preoccupied him when the lab gang was fired.

The deal began to take shape when Kuhn, Loeb learned of a plant in Fort Wayne, Indiana, that was being sold as part of the liquidation of the Capehart Company, once regarded as the most elegant name in automatic record changers and jukeboxes. The company slid into bankruptcy when one of its most expensive mechanisms developed a habit of breaking the records it was supposed to change.

Once Capehart's creditors accepted the Farnsworth offer, other components of the deal began to fall into place, and new faces began to play an increasingly important role in Farnsworth's life. Curiously enough, many of the men who joined Farnsworth as executives of the new company were defectors from RCA. For men like E. A. Nicholas, who left a lucrative post as a marketing manager with RCA to accept the position of president in the new company, the move provided opportunities that could never exist at RCA so long as David Sarnoff remained in command.

Though the move presented obvious risks, Nicholas felt that they were justified, since working with Farnsworth presented him with a chance to build from the ground up an enterprise that could conceivably rival his former employer.

As much as ironing out the business affairs of his company was now the province of financiers, so too the remaining technical chores were the province of engineers and product designers. As an inventor, Farnsworth thrived on the more rarefied atmosphere of conceptual research, where an invention is not so much an end in itself as a way of proving something, in order to advance the theoretical base of scientific knowledge.

At the laboratory, Farnsworth engaged himself in taking a mental inventory of all the work he was doing in hopes of resuming where he left off, once things were rolling in Fort Wayne. In the meantime, he spent a good deal of time with Pem and Cliff and his wife, Lola, trout fishing in streams from the Carolinas to Maine.

Both Cliff and Pem felt that Phil needed the rest, for he had never fully regained his health since the debilitating days after his second trip to Europe in 1936. He never seemed to exhibit quite the same vitality of years before, and especially since the firing, he was tense and edgy and found it quite difficult to relax. Forever the man possessed by his work, Phil was reticent about spending so much of his time on the end of a fish pole. Still, with the realization that there was not much to do until the lab was set up in Fort Wayne he decided to take off and spend sometime with his wife and family. To his pleasant surprise, he found that fishing put him in just the right frame of mind for the time, and presented an unhampered opportunity to reflect at length on what had transpired during his many years on the frontier of modern science.

It was during these fishing trips in 1938-39 that Farnsworth began seriously thinking about what should come next. After nearly 10 years of devotion to a single pursuit, his internal compass seemed to tell him that it was time to do something different.

After one of their fishing trips in the northern reaches of the Appalachian Trail, Phil and Pem stopped in Brownsville, Maine to look in on a property that George Everson had acquired in a foreclosure deal during the Depression. The house was a little run down, but Phil became instantly captivated by the place and wasted no time burning up the wires to San Francisco, asking George to sell enough of his stock so that he could buy the eighty acre farm.

In the ensuing months, the Farnsworths returned to Maine several times, and Phil began devising big plans for the place. In the back of his mind, he began building the nest that would hatch his next great idea.

All the contracts and notes that would finalize the plans first outlined in Farnsworth's living room were ready to be ratified in March 1939, and comprised, in George Everson's words, "a volume somewhat thicker than the New York telephone directory."

Among other things the papers included provisions for an initial public offering of $3,000,000 worth of Farnsworth stock for the purchase of the Capehart facilities and for initial operating capital for the new corporation.

The papers were held in abeyance for weeks, while the Wall Street people waited for weak market conditions to subside before floating their issue. When the market stiffened, March 31 was set as the closing date. In the final moments before closing, everyone involved knew that the slightest last minute failure could bring the carefully planned deal toppling down on them. When the documents were all signed, George was handed a check for $3,000,000, and the Farnsworth Television and Radio Corporation was open for business.
The following day Hitler invaded Czechoslovakia.

Phil and Pem stayed in Maine while the Philadelphia lab was crated and hauled to Indiana. Meanwhile, new pages in the history of television were written every day, and public interest in the imminent arrival of the new medium continued to intensify.

In a display that was designed both to capitalize on the public's curiosity and lend historical credence to the event, David Sarnoff arrived at the opening of the New York World's Fair on April 30, 1939. His entourage included Franklin D. Roosevelt, who became the first President of the United States to appear on television in a ceremony staged especially for the benefit of RCA's television cameras.

In his opening remarks, Sarnoff announced the arrival of a new epoch: "Now we add sight to sound," he proclaimed, though there was no mention of any of the individuals who were directly responsible for that accomplishment. The event was televised to an audience on the fairgrounds, and was broadcast to a handful of receivers in the New York area.

Later that week, television receivers went on sale in limited quantities at a few department stores in New York. These first commercial sets used the 441-line/30-frame standard proposed to the FCC by the Radio Manufacturers Association, a group that numbered virtually all major contenders in the marketplace. Other companies announced that they would soon be selling receivers as well. The industry was anxious to follow RCA's plunge. Ignoring the FCC's delay on formalization of signal standards, they also overlooked the FCC's denial of licenses for anything other than the experimental use of television.

Not even the mighty RCA had permission to sell commercial time to advertisers to support television broadcasting. Sarnoff wanted the World's Fair opening to go down in history as the arrival date for commercial television. Knowledgeable observers regarded the event in more sanguine terms: rather than opening the market for commercial television, the event only signaled the beginning of another phase of experimentation, one in which the public would be allowed to participate through the availability of a handful of receivers that were sold at retail. Television's commercial payoff was still years away. Fortune Magazine published a broad assessment of television to coincide with the Fair opening, which described the new medium as Sarnoff's "Thirteen Million Dollar "IF."

Meanwhile, RCA and Farnsworth were still at loggerheads in their negotiations for a patent license that would permit RCA to put its market power behind Phil's invention. RCA had already conceded that it was not possible to produce electronic video without employing techniques that were covered by Farnsworth's patents. That portfolio included all phases of electronic scanning and synchronization, electrostatic and magnetic focusing, electron multiplication, the saw-tooth wave, blacker-than-black horizontal blanking -- in short, all the fundamentals of manipulating electrons to send pictures through the air. By 1939 Farnsworth had obtained more than 100 patents. But RCA was still unwilling to pay Farnsworth a continuing royalty for the use of his patents.

The negotiations bogged down when RCA proposed a clever variation of its now familiar trading philosophy. Instead of paying a continuing royalty, RCA proposed to pay all the royalties in advance, and then proceeded to insist on a rather meager figure, something in the low six figures. Farnsworth's lawyers flatly rejected the proposal and sent RCA back to the drawing boards.

Shortly after the opening of the World's Fair, Philo and his family set up housekeeping in Fort Wayne, where he assumed his position as Vice President and Director of Research for Farnsworth Television and Radio Corporation. Despite his own misgivings about assuming such a role, Farnsworth became actively involved in assembly line engineering and product design.

It wasn't long, however, before his mind went back to the subjects with which he was preoccupied earlier. Once again his mind veered toward the unknown. Product engineering became tedious and boring, but he considered it part of his personal obligation to finish what he had started. So he spent most of his days working with engineers at the plant, and his evenings working over the ideas and equations that had always been his primary interest.

The final chapter in the struggle for television was written in December of 1939 in a conference room high above the sidewalks of Rockefeller Center. A handful of relative strangers were assembled to finalize the long awaited cross license between RCA and Farnsworth.

Ironically, none of the principals in the story were present. Neither Sarnoff, Zworykin, nor Farnsworth was on hand. Instead, the transaction was conducted by lawyers for both sides, who had included in the agreement a historic precedent: after Donald Lippincott, Farnsworth's

longtime patent attorney, authorized the agreement. Otto S. Schairer, RCA's vice president in charge of patents, sat down to affix his signature to the first contract that ever required RCA to pay patent royalties to another company.

Legend has it that Mr. Schairer had tears in his eyes as he signed the document.

The importance of the occasion was accompanied by very little fanfare. It passed virtually unnoticed except within the industry. It is understandable that RCA was not particularly anxious to publicize the terms of the agreement, lest the industry be given the impression that RCA was handing out licenses and royalties for the asking. To the contrary, RCA's capitulation to Farnsworth strengthened the company's resolve that such a license would never happen again.

If television was just around the corner -- as David Sarnoff started saying back in 1936 -- then the corner turned out to be World War II, which provided the sort of economic and technical mobilization necessary to support television on a large scale. Development of most domestic communications -- including television -- was suspended during the war as the electronics industry geared its assembly lines to produce radar equipment and military communications gear. When the war ended, those factories converted easily to producing television receivers, which the commodity starved public was eager to buy in mounting numbers.

The remainder of Farnsworth's life could fill another volume. This one ends at the point where the inventor and his first invention begin to travel separate paths.

While the public became preoccupied with an invention that had first appeared 20 years earlier, the inventor was now projecting his own imagination 20 years farther into the future.

Even as the RCA license was being finalized, Farnsworth was drawing up plans for new lines of research which he first proposed to the Board of Directors of Farnsworth Television and Radio in the summer of 1940. The Board rejected his proposals, saying that the company was too involved in gearing up for mass production of televisions to devote arty resources toward unrelated research.

Phil sympathized with the Board's point of view, but he could not go back to fitting all the tubes into a cabinet and reducing the number of knobs. In the spring of 1940 he packed his journals and retreated to the pastoral isolation of his farm in Maine. Almost the moment he arrived he started pacing out the foundation of a laboratory he was going to build adjacent to the house, which served as his private retreat throughout WWII.

Farnsworth Television and Radio did quite well on defense contracts during the war, and seemed to be in an excellent position to capitalize on the market for television receivers that was booming after the war. But clumsy – perhaps even crooked -- management caused the company to falter. Farnsworth returned to Fort Wayne in 1948 in hopes that his presence might keep the company afloat, but even he was surprised when he learned the true severity of the company's position.

Ironically, the company lost its footing at just the time that demand for its principal product was beginning to soar. The company was sold to International Tele phone and Telegraph in 1949 for an exchange of stock, and Farnsworth Television and Radio disappeared from the New York Stock Exchange.

Farnsworth remained in Fort Wayne until 1967, when he resigned from his position with ITT and moved back to Salt Lake City, where he died in March, 1971.

In its obituary on March 12, the New York Times described Philo T. Farnsworth as "a reserved, slender, quiet and unassuming man tirelessly absorbed in his work. At the age of 31 he was rated by competent appraisers as one of the 10 greatest living mathematicians."

In the course of the past two centuries, many names have been associated with the inventing of television - Nipkow, Baird, Jenkins, Zworykin, and dozens of others. None of these names would be remembered today if Philo Farnsworth hadn't breathed life into the dream that obsessed them all. Recalling Farnsworth's place in the process provides a point of demarcation between the dream of sending pictures through the air and the reality that now occupies living rooms around the world.

Television seemed like a logical extension of all the technological developments that preceded it. Modern communications began with the telegraph and the telephone. Radio made it all wireless, and film made it possible to record images. Television was the long awaited, much anticipated culmination of these developments. Early attempts to transmit images tried to use existing technology. The leap from photomechanical processes to magnetic deflection and electron scanning, however, was not a matter of mechanics, but of theory; not a matter of degree but a full order of magnitude.

Farnsworth's direct involvement in the development of television dropped off after 1940, largely because of his interest in moving on to higher levels of theoretical research. Nevertheless, he always kept a watchful eye on his brainchild as it swept across the nation and the world. Although he was absorbed in his own work in the 50's and 60's he saw enough of commercial broadcasting to be disappointed in what he viewed. He felt that the medium's more constructive applications had been neglected, and wondered aloud at times if all the energy he'd spent on television was worth the effort.

Such uncertainty ended in July, 1969 when Philo and Pem Farnsworth sat in their living room in Salt Lake City and watched along with the rest of the world as the first blurry pictures flickered down to Earth from the surface of the moon. They smiled knowingly at each other when the near-speechless Walter Cronkite regained his composure long enough to comment that, amazing as the lunar landing itself was, even more amazing was the fact that the entire world witnessed the event on television.

That night, Philo's invention turned one man's lunar stroll into an expression of global awakening, a moment in which the entire planet became involved in the unfolding of its own evolution. For Philo Taylor Farnsworth, the event provided a long-absent moment of personal triumph, which erased any doubts about the value of his contribution. Just seeing with his own eyes that his invention made it possible for the entire world to witness those historic steps was enough to make him turn to his wife and say:

"This has made it all worthwhile."