
Alexander Graham Bell

By James W. Essex

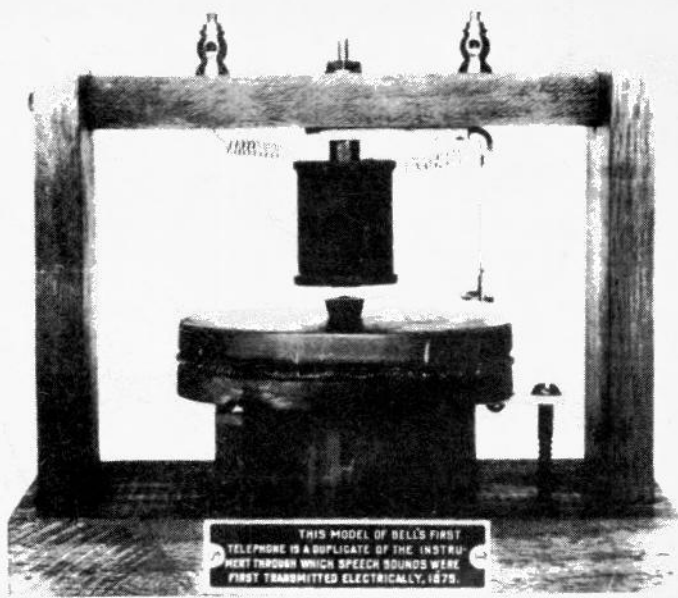


***Pioneers in Communication:
Alexander Graham Bell's
inventiveness and scientific
creativity went far beyond the
telephone; he was one of
Canada's great pioneers in
technology.***

EVER get up in the morning with an idea, only to admit by evening it wasn't such a good idea after all? Perhaps some had better been left in limbo. History is strewn with men like Napoleon of whom it was once said "he was an able chess player and the human race was the opponent to who he proposed to give a checkmate."

But Alexander Graham Bell was different: He not only had an idea and stuck with it, but he opened the frontiers of a

whole new world that men like Napoleon never even dreamed about and conquered the world without a revolution, bringing about unprecedented social change. Bell's telephone was the dawn of modern communications, taking us forever from the mundane world where man could only communicate as far as his voice carried through air. The semaphore and telegraph were an improvement, but the invention that allowed talking many miles over a thin strand of copper wire was Bell's, even



THIS MODEL OF BELL'S FIRST TELEPHONE IS A DUPLICATE OF THE INSTRUMENT THROUGH WHICH SPEECH SOUNDS WERE FIRST TRANSMITTED ELECTRICALLY, 1876.

though recently a popular American electronic magazine failed to even mention Bell's link with Canada. The cradle of the telephone was Brantford, Ontario, not far from where I live. And further, Paris, Ontario is located only seven short miles from Brantford. It was between those two centres, in August of 1876, that Bell's first noble experiment carried the human voice the farthest it had ever been, even before the feat was successfully duplicated in the U.S. the following autumn in Boston.

Inventive Genius

Bell's inventive genius has so often been overlooked, and not just with regards to the telephone. For example, this is the anniversary year of Canada's first flight, the project Alexander Graham Bell initiated and J.A.D. McCurdy flew to bring Canada to the forefront of scientific development, even if that memorable flight at the Bras D'Or Lakes in Cape Breton by the "Silver Dart" in 1909 was eclipsed by the Wright Brothers who did it first in 1903 at Kitty Hawk in the U.S.

Not many today know Bell was nearly eclipsed in the invention by which he is better known, the telephone, this time not by a half-dozen years but by a mere two hours and also by an American, Elisha Gray. It was so close, in fact, that it prompted the question in that same American magazine: "Who Really Invented the Telephone?"

For Canadians, the real question has always been "where" and not "who", for it's generally accepted that it was Bell and not Gray. Ironically, the Bell Homestead at Tutelo Heights, situated on a knoll of land just outside Brantford where Bell himself claimed it all started in 1874, has this fact conveniently omitted. Brantford itself lists the old homestead today in tiny lower-case letters, difficult to discern in a telephone directory.

Scientist Extraordinaire

Bell, of course, was a scientist extraordinary. Besides the telephone, which Bell himself always maintained started in Brantford even against opposing claims, he gave us the hydrofoil, an achievement that in 1919 gave Canada the fastest waterspeed world record of 70.86 mph; this stood for 10 years until abandoned because of Naval Disarmament after World War I. The telephone, of course, was the culmination of many men's dreams, but it was Bell who recognized early what all the proponents elsewhere failed to see; that was the relationship between sound waves and their effect upon the diaphragm within the eardrum.

Bell was also a humanitarian who said at one point in his career that teaching the deaf, at which he had become an expert, "... makes my heart ache to see the difficulties the little deaf children have to contend with!" Perhaps this was the real motivation for the telephone and, if so, gives the lie to that recent American publication; it was Bell alone who doggedly pursued the idea of "electric speech", inspired by his immense sympathy for those who couldn't hear at all. And it was Alexander Graham Bell's own father, Melville Bell, who proved indispensable in patiently listening to his early ideas, and who subsequently gave the younger Bell the head start so necessary to beat Gray by providing the family home in Brantford for his first crude lab.

Bell was no elite icon. This was symptomatic of the man himself, admitting as he did that he knew little about electricity. By comparison, his rival in the U.S., Elisha Gray, was recognized as one of the best electricians anywhere. But Bell knew, as Goethe once said, "that talent is best nurtured in solitude" and Bell's practical dealings with the deaf led him to

recognize the parallel that Gray, despite his knowledge of electricity, hadn't yet seen: that the human ear's ability to respond to sound vibrations was not unlike an electromagnet's ability to respond to the same vibrations provided that some way could be found to hook a diaphragm to it. This alone gave Bell the unquestionable head start he surely needed, capitalized with his subsequent friendship with Thomas A. Watson in Boston in 1874.

Speech Research

Both Melville Bell and son, Alexander Graham Bell, together headed up a School for Speech Impairment in England where Bell Sr. had developed "Visible Speech." Word on this development reached distant Boston, and a Miss Sarah Fuller believed it could help teach the deaf to talk in her School for the Deaf. Influential people in the person of Mr. Gardiner G. Hubbard and Mr. G. Sanders, both of Boston, also prevailed upon the younger Bell to come. Both had deaf children: in the case of Hubbard, a daughter Mabel, and Sanders, a son named George. Mabel had been left deaf following scarlet fever at age four, while George was born deaf and had never learned to speak. His was a special case for Bell, and Alexander hit it off with young George, so much so that Mr. Sanders had Alexander Bell move into his mother's home in Salem, Mass., where he set up his laboratory in 1874 following their arrival in the New World, ostensibly for health. He would commute between their new home in Brantford and Boston.

Bell's original aim was to develop a "Harmonic Telegraph" by which several signals could be sent along a single pair of telegraph wires. Strangely enough, the pursuit of the "Harmonic Telegraph", whereby several reeds activated by an electro-magnet responded to a different tone for each, brought Bell to the threshold of the telephone. It also brought a near collapse in health.

Dr. Melville Bell trained his son to not only write "Visible Speech" but to also identify any symbol of the voice in their school in London which they operated after leaving their home in Scotland. They had plotted the elements of the larynx and the relationship between the throat muscles and speech. This was to prove invaluable in correcting speech impediments, for which the school became a mecca. However, Professor Alexander Melville Bell, when he was a young man, had to leave the indifferent climate of England and go to the new World to regain his health. Grandfather Bell earlier had taken Melville to Newfoundland; now Melville in turn had to take his own son,



The Bell Homestead in Brantford, Ontario. All photos courtesy of the Bell Canada Historical Collection.

Alexander, to the New World after losing two other boys to consumption. They chose Canada, and they arrived in Brantford, Ontario in 1870 at Tutelo Heights, recommended by a family friend, the Rev. Thomas Henderson, who had earlier gone to Canada. They called their first home "Melville House" and put down roots in Brantford, choosing to reside in Boston only as work with the deaf progressed. At the same time, Bell became caught up in his quest for the telephone, a work which was to be seen by some as merely an aberration. Acquaintances in Brantford who had curiously watched Bell make "OOs" and "AHs" in front of the mirror, dubbed this frail and earnest man as peculiar.

The Telephone

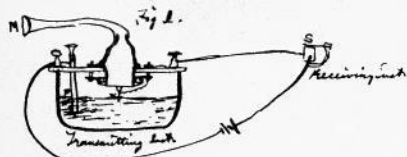
Supported by funds from both the Hubbard and the Sanders family, Bell pursued his dream aided by Thomas Watson. He met Mr. Watson in Boston, during one of his several incursions into the machine shop of a Mr. Charles William, where Watson was employed since his apprenticeship at the age of 18. Alexander Graham Bell entered Watson's life as dramatically as the telephone entered ours. He ignored the company rules by passing the office and entering the machine shop to gain Watson's bench without prior permission.

This was the stance of this oft-times nervous man, brimming with ideas which needed expression which only a gifted journeyman could give. Watson made this

possible. The only practical use of electricity then was in telegraphs, something which was to vault Bell into fame and fortune. However, unlike many of us who might have a good idea but which dies, Bell kept his and drove himself until he found an answer. This was the phenomena which occurred when Watson in another room "plucked" at an armature on the telegraph and Bell heard it distinctly. The simple step which followed made the armature "vibrate" to voice sounds, set out roughly in Bell's first Patent application, and describing their hookup in mother Sander's home. The famous words, "Mr. Watson, come here; I want you" ... have been emblazoned on our minds in the lexicon of Bell memorabilia ever since, even if prompted by an accident when Bell spilled some of the dilute sulphuric acid liquid used in the experiment, resulting in the first recorded "call for help" using the telephone. Initially it was the crude vibrations of a simple telegraph armature. Next would come the diaphragm.

Developing the Telephone

If you recall your own childhood experiences with a string drawn taught between two tin cans to transmit sound, you can get some idea of Bell's excitement doing it electrically. In fact, the burden of the excitement on top of a heavy teaching assignment was so great that he faced a near nervous collapse. Compounding his problems was the Western Electric Com-



1. An improved instrument shown in Fig. 1 was constructed this morning and tried this evening. P is a brass pipe and W the platinum wire M the mouth piece - and S the armature of the Receiving Instrument.

Mr. Watson was stationed in one room with the Receiving Instrument - He pressed one ear closely against S and closed his other ear with his hand. The transmitting instrument was placed in another room and the distance of both rooms was closed.

I then shouted into M the following sentence: "Mr. Watson - Come here - I want to

see you" To my delight he came and declared that he had heard and understood what I said.

I asked him to repeat the words - He said He answered "You said 'Mr. Watson - come here - I want to see you'." He then changed place and I listened at S while Mr. Watson read a few passages from a book into the mouth piece M. It was certainly the case that articulate sounds proceeded from S. The effect was loud but indistinct and muffled.

If I had read beforehand the passage given by Mr. Watson I should have recognized every word. So it was I could not make out the sense - but on occasional words here and there were quite distinct. I made out "to" and "out" and "further" and finally the sentence "Mr. Bell do you understand what I say? So - You - un - der - stand - what - I - say" came quite clearly and intelligibly. The sound was audible when the armature S was removed.

A facsimile of Bell's original patent application.

pany which had just turned down his idea to send more than one message over a telegraph line using his harmonic telegraph, although eventually this was resolved with Bell's invention permitting up to 40 messages simultaneously. But his mind was on the "autograph telegraph" or talking telegraph. Although, his future father-in-law, Hubbard, threatened to pull out his main source of support, Bell persisted in his dream against Hubbard's wish to focus on the telegraph.

At one point Bell said "If only I had a human ear", mentioning this quite casually to his friend Dr. Clarence J. Blake. Before he left Boston for Brantford, seeking a much-needed rest, Blake provided the ear from a cadaver where he worked. For Brantfordites, Bell's arrival with an ear in his travel case proved their growing claim that he was eccentric. Bell, although ostensibly home for a rest, studied the movement carefully, especially the "anvil" and "hammer" bones, intrigued by the fact that such a tiny membrane as the eardrum could move them.

As he'd done a year earlier, he again confided his idea to his father, where in the summer of 1874, he first conceived the idea of a telephone. Now, Bell said, "What if I were to substitute a thin iron disc for the membrane and let it act upon a much heavier lever of metal and set it vibrating?" According to Bell, the idea came to him "like a flash." Substituting the now successful multiple reeds of his telegraph for one single reed attached to a metal diaphragm proved successful when he returned to Boston. Thus, the "idea" of the telephone was born in Brantford, even if consummated in his lab in the United States. It was in the following year, again in Brantford, that Bell drew up his first patent specification for what he'd accomplished in September of 1875.

It was also his chance meeting with George Brown, a neighbour who was also the influential publisher of the Toronto Globe. Bell could not approach Mr. Hubbard again for money, so Brown was the obvious choice for financial backing, especially as he was now betrothed to Hubbard's daughter, Mabel, now 17.

Brown not only offered money, but a convenient way to pay it back. However, hardly had the agreement run its course when Bell found that Brown had failed to take his patent to England (necessary at that time, in order to have the device patented in both Britain and America, as Britain would not do it the other way around) and had also welched on the money. Bell received only \$25.00 out of a possible \$300. Brown had had second thoughts about Bell's "toy", even though Bell had been more than generous in offering Brown both British and foreign rights to his invention in return for a mere \$300.00. In the entire history of patents, perhaps never was so much relinquished for so little. But such were the times in which the telephone was born. It was fortunate that it did fall through, however, as Bell was able to maintain full rights and become a millionaire.

What was important for Bell happened now. While he was engrossed with patents and invention, but failing to register, his father-in-law had carefully filed a patent on his behalf in Washington, arriving just two hours before Gray's claim to the telephone. Meanwhile, Bell perfected his "Gallows" type transmitter which provided quantum leaps over Bell's first halting steps towards "electric speech." Thus followed ever-increasing telephone feats, first one-way transmission, then two-way, with improvement in both transmitters and receivers, heralded by the famous

telephone call between Brantford and Paris, Ontario in 1876 below where I live, and whose pastoral countryside still reflects the aura of expectancy which Alexander Graham Bell found while living here, but now over a hundred years removed in time. The first telephone was linked between the Prime Minister's office and the Governor-General's residence in Ottawa in 1877; Canada's first telephone exchange followed in 1878 at Hamilton, Ontario. Even today, the chronological events of the telephone's birth in Graham Bell's own hand-writing is mute witness to his achievement.

The Brantford Monument

For Alexander Graham Bell, in 1917, on the occasion of unveiling a monument in the City of Brantford, marking the historic invention of the telephone there, said himself: "Much of the experimental work of the development of the apparatus was done in Boston. Still I am glad to be able to come forward and say that the telephone was invented here."

The monument itself had been nine years in the making; but the labour and enterprise in developing the telephone had been far longer, over four decades, from 1874 when first conceived in Brantford to 1917 when Bell was thus honored. Bell had first come for health reasons, given 6 months to live, in order to recover. He did, and lived to the age of 75, leaving Canadians a legacy of achievement hard to emulate.

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Alexander Graham Bell - Dreamer, Thinker, Inventor

“The inventor is a man who looks around upon the world and is not contented with things as they are. He wants to improve whatever he sees, he wants to benefit the world; he is haunted by an idea. The spirit of invention possesses him, seeking materialization.” – Alexander Graham Bell

by Chuck Ander

“**T**his is my dreaming place!” wrote young Alexander Graham Bell of his home in Tutelo Heights, near Brantford Ontario. “Miles of country lie extended below me like a huge map. When I lived here I used to take a rug, a pillow and an interesting book, and dream away the afternoon...” But young Alex was also an inventor, capable of transforming his dreams into reality. The man who is known to everyone as the inventor of the telephone, was also a teacher of the deaf. He was one of the first who had the compassion to let deaf individuals develop to their fullest extent. The popular belief was that nothing could be done for the deaf. Wrote Alexander Graham Bell, “Nature has been kind to the deaf child, man — cruel. Nature has inflicted upon the deaf child but one

defect — imperfect hearing; man’s neglect has made him dumb and forced him to invent a (sign) language, which has separated him from the hearing world. Let us then remove the afflictions which we ourselves have caused.”

After inventing the telephone at the age of 28, Alexander Bell did not rest upon his laurels. Besides his contributions as a humane and compassionate teacher of deaf children, Alex Bell developed the basic method for making phonograph records on



Alexander Graham Bell with his pupil, Helen Keller, John Hitz of the Volta Bureau for the Deaf, Alexander Melville Bell and a friend, Braddeck, Nova Scotia, 1901



Mr. and Mrs. Melville Bell (parents of Alexander Graham Bell) and family at the Bell Homestead, Brantford, Ontario, in the 1870's

wax disks. (It is interesting to note that Alexander Bell improved the phonograph of Thomas Edison, and Edison improved the telephone by inventing the carbon microphone, still in wide use today.) Alexander Bell founded and was active in the Aerial Experiment Association. This group of dedicated aviators built and flew its own aircraft. A very important invention of this Society was the aileron. Previously, the lateral stability of aircraft (or flying machines as they were called) was controlled by "wing warping," a technique developed by the Wright Brothers. Ailerons were far superior to (and much safer than) the previous practice of selectively bending the outer

portions of the wings. Other developments pioneered by Alexander Graham Bell include a paper in which he described a device having the same purpose as today's iron lung. He devised an electrical apparatus to locate bullets or other metals in the body. In 1885, he advocated a method of locating icebergs by detecting echoes from them. Years later he concerned himself with condensing fresh water from vapour in the air, for people adrift at sea in an open boat. In the construction of houses he made suggestions to aid air conditioning. For 30 years he directed experiments in breeding sheep, trying to develop ewes that would bear more than one lamb at a time. He developed

a hydrofoil that, in 1919, set a world speed record of 71 mph (114 km/hr.) Such a brilliant life had, unhappily, very dark beginnings...

As late as 1920, the dreaded, infectious disease, tuberculosis, was still rampant, often wiping out entire families of twelve or more children. Cemeteries were full of tombstones denoting this pathetic fact.

It was small wonder, then, that terror struck the hearts of Dr. Alexander Melville Bell and his wife, recently arrived in London from Edinburgh, when they learned that their youngest of three sons, Edward Charles, was apparently stricken with the disease. Before they fully realized it, he had slumped into the advanced stages of the disease. Nothing the doctors could suggest helped. Within the year he was dead.

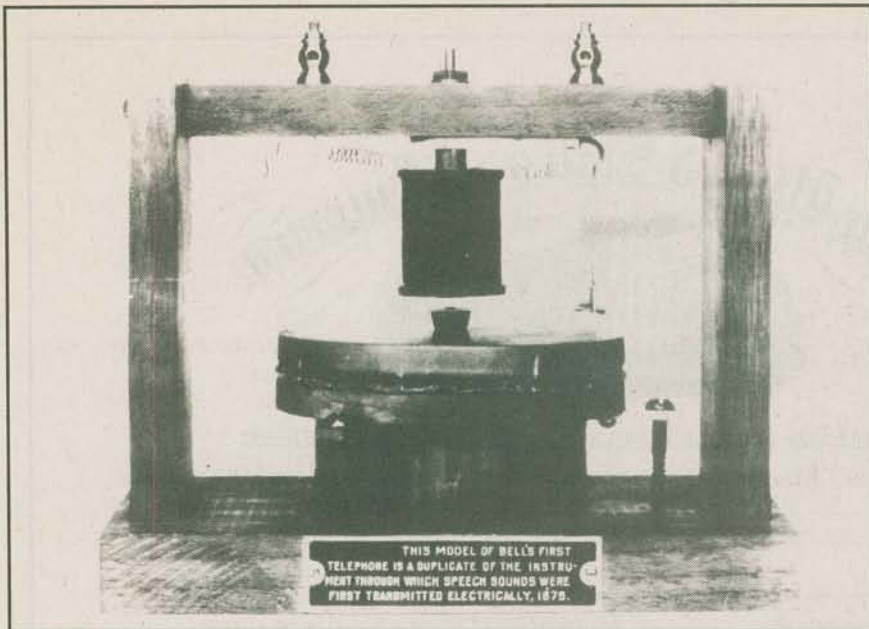
Alexander Graham Bell was at his brother's bedside when he died. He wrote in his diary, "Edward died this morning at ten minutes to four o'clock. He was only eighteen years, eight months old. He literally 'fell asleep'. He died without consciousness and without pain while he was asleep. So may I die."

Tragedy was not finished with the Bell family. Alexander's elder brother, Melville James, caught an extremely persistent cold. It soon developed into a nasty hacking cough. He became pale and feverish. He too, eventually succumbed to his illness. He died in May, 1870 at the age of 25.

As if this wasn't enough, Alexander had become thin and pale and a telltale flush sometimes appeared on his cheeks. The doctor who examined him warned that he was dangerously ill.

The family knew they must delay no longer. To save their one surviving son, Dr. Bell and his wife, Eliza Grace did not hesitate to give up their life in London and move to Canada where the air and climate were more conducive to good health.

While still in London, young Alex had worked along with his father to



Alexander Graham Bell's first telephone was the "Gallows Frame," through which speech sounds were first transmitted electrically on June 3, 1875 in Boston.

develop his ability as an expert on speech. Alex and his brothers constructed a model of a human skull, complete with vocal apparatus that was worked with a bellows. They were able to make their model wail "Mama" in such life-like imitation of a baby that the neighbours turned out to search for the child in distress. At about this time, too, Alex trained his Skye terrier to growl steadily while he manipulated the dog's mouth and vocal cords, trying to shape the growls into words. At the peak of the terrier's career, it was able (with its master's help) to say "Ow ah oo, ga-ma-ma," meaning, "How are you grandmother?" Before long, neighbours were dropping by to see the talking dog!

Alexander's father gave him a book called *Sensations of Tone*, by Hermann von Helmholtz. In this work, Helmholtz reported experiments in combining the notes of electrically driven tuning forks to make synthetic vowel sounds. Alex tried to read the book, which was printed in German, and got the wrong impression that Helmholtz had managed to "telegraph" the vowel sounds, or send them from one point to another over a wire. Although Alex learned of his mistake, he could not get the idea of telegraphing the human voice out of his mind.

Alexander Graham Bell moved to Boston to continue his career as a teacher of the deaf. He was quite successful at it. At the Clarke School for the Deaf in Northampton, he was able in a few weeks to teach the children to use more than 400 English syllables, some of which they had been unable to learn in two or three years under other methods of teaching. One of Alex's most famous pupils was Helen Keller, who came to him as a child, unable to see, hear, or speak. She was later to say of Alexander Graham Bell, "Hearing is the deepest, most humanizing sense man possesses, and lonely ones all over the world have been brought into the pleasant ways of mankind because of Dr. Bell's efforts."

While in Boston, Alex was able to set up a laboratory in the basement of one of his pupil's homes. Bell was not attempting, at this stage, to transmit speech. He was trying to send several telegraph messages over a single wire at the same time. He had been interested, as we have seen, in Helmholtz's work with tuning forks. He knew also that others had transmitted musical tones over a wire by using the "make and break" current of telegraphy. Would it be possible, by using several forks, to send *more* than one tone over the same wire simultaneously, and then separate the tones at the receiving end? Bell

thought he could do it, and the apparatus he devised for the purpose he called the "harmonic telegraph."

He soon found that he lacked the time and skill to make the necessary parts himself, so he went for help to an electrical shop. The man assigned to assist him was Thomas A. Watson. They not only became good friends, but eventually Watson received a share in Bell's telephone patents as part pay for his work.

It was through his experiments with the harmonic telegraph, plus his knowledge of music, human speech and hearing, that Bell found the way to the telephone.

Bell set up his first telegraph so that pressure on a telegraph key would send current from a battery through an electromagnet. The electromagnet would cause a tuning fork mounted over it to vibrate like the clapper of a bell. Each vibration of the fork would cause one of its prongs to make a connection that would send a pulse of current from another battery along a wire. As long as the telegraph key was held down, this intermittent current would cause another electromagnet to vibrate another tuning fork at the receiving end, in resonance with the sending fork. Therefore you could send a Morse message with the key and, according to Bell's theory, only a receiving fork of the same pitch as the sender could receive the sender's message.

The problem, however, (which Bell never quite succeeded in solving was to get each of *several* pairs of transmitting and receiving forks of different pitch to vibrate in resonance with each other — and only with each other — at the same time. Bell found the tuning forks unsatisfactory and decided to try steel organ reeds instead. Next he decided that the reeds would give better results if they were magnetized. When he reached this point in his thinking, he had to pause to consider a fact of fundamental importance, long known to electrical experimenters — that when a magnet is moved toward the pole of an electromagnet, a current is generated in the latter's coil, and when the magnet is moved away from the electromagnet a current in the opposite direction is induced.

Now Bell's mind leaped beyond the thinking of previous experimenters — for he perceived that his rapidly moving

No 144,465



TO ALL TO WHOM THESE PRESENTS SHALL COME:

Whereas Alexander Graham Bell, of Salem, Massachusetts

has presented to the Commissioner of Patents
a petition praying for the grant of LETTERS PATENT for an alleged new and useful
Improvement in Telegraphy

a description of which invention is contained in the Specification of which a copy
is herewith annexed and made a part hereof, and has complied with the various
requirements of Law in such cases made and provided; and

Whereas upon due examination made the said Claimant is adjudged
to be justly entitled to a Patent under the Law:

Now therefore these **LETTERS PATENT** are to grant unto the said
Alexander Graham Bell, his heirs or assigns
for the term of seventeen years from the seventh day of
March one thousand eight hundred and seventy six
the exclusive right to make use and vend the said invention throughout
the United States and the Territories thereof

In testimony whereof I have hereunto set my
hand and caused the seal of the Patent Office
to be affixed at the City of Washington;
this seventh day of March
in the year of our Lord one thousand eight
hundred and seventy six and of
the Independence of the United States
of America the one hundredth

Committed by me

B. Chandler
Secretary of the Interior
Commissioner of Patents

Patent for the Telephone, awarded to Alexander Graham Bell, March 7, 1876.



Alexander Graham Bell — 1874.

magnetic reed would generate a current that would be alternately stronger and weaker, from instant to instant, as the vibrations of the reed varied. Next he asked himself this: If many reeds of different pitches were vibrating simultaneously over the electromagnet, would they not generate one complex varying current — the resultant of the combined motion of all the reeds?

Bell reasoned correctly that they would. Now, from his experience with music he knew that when you sing into the sound box of a piano when the strings are not damped, several strings will respond. If then, a "harp" transmitter were built with enough strings or reeds, properly tuned, it would pick up every sound of the voice. Therefore, the combined vibrations of the reeds, mounted over an electromagnet, would generate an electrical current which would vary in intensity just as the reeds were vibrated by the varying sound of the voice. And this current would vibrate a receiver harp at the distant end so that the sounds would be repeated.

He was on the right track, but this "harp" transmitter seemed too complicated to be practical.

When Bell went to Brantford for his summer holidays in 1874, he talked long into the night with his father about his ideas. Resting from his arduous duties, Bell found that his ideas crystallized in the clear atmosphere of the heights overlooking Brantford. He pondered: The harp transmitter, now, — why could not a single diaphragm catch all the sounds, instead of using individual reeds? The human ear did it, and managed to move the comparatively large bones that have the sensation of hearing. If the end of one magnetized reed were attached to the centre of such a diaphragm, it would generate a current that would vary in intensity just as the air varies in

density when a sound passes through it!

There he had it. At Brantford, the basic concept of the telephone became complete in Bell's mind: a membrane telephone as a transmitter, a similar instrument as receiver. Melville Bell was keenly interested as his son explained it to him in July of 1874. Joseph Henry, [see *Electronics and Technology Today*, Jan. 1991] secretary of the Smithsonian Institute in Washington, to whom Bell explained it, was also alert to the possibilities inherent in it. Bell doubted that he had the electrical knowledge to reduce his thinking to practice. Henry, then dean of American electrical scientists, said simply, "Get it!" Back in Boston, Bell worked on, and got it.

The First Phone Call

On June 2, 1875, came the "break" in telephone history. Bell and Watson were tuning the reeds of the harmonic telegraph. One of Watson's reeds was screwed down so tightly that it "froze" to the pole of its electromagnet. Watson plucked it to free it. Bell, at the other end of the line heard the twang of a

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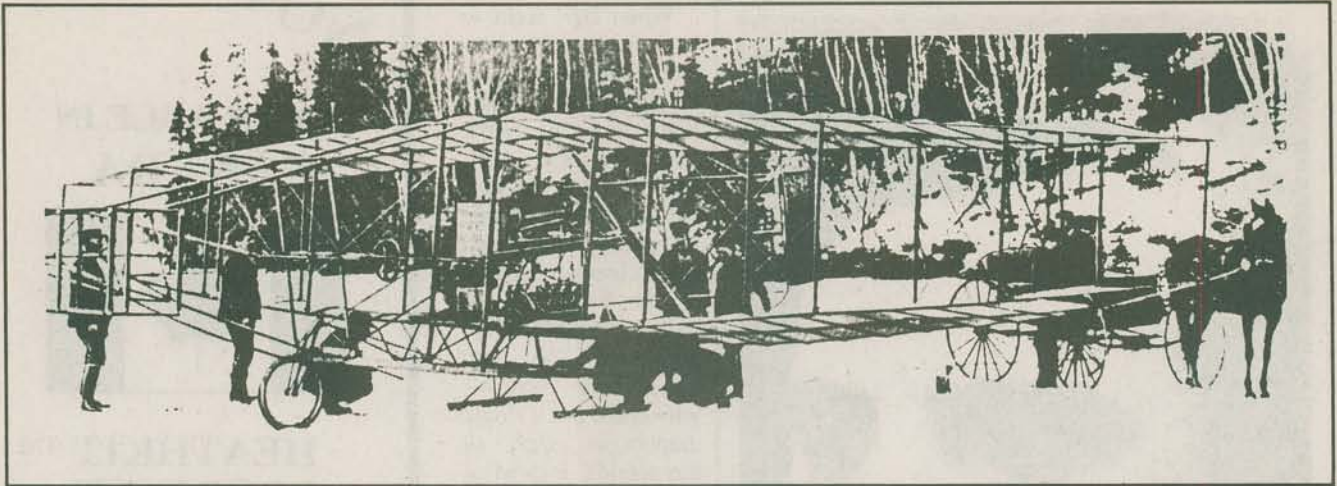
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Alexander Graham Bell's "Silver Dart" on ski-like runners awaiting flight at Baddeck, Nova Scotia, 1909.

plucked reed, a sound with tones and overtones, coming to him over the wire. Quickly he ran to Watson, shouting, "Watson, what did you do then? Don't change anything. Let me see."

It soon became apparent that the reed had acted as a diaphragm and sent an induced, undulating current over the line — a current that varied in intensity precisely as the air was varying in density within hearing distance of that spring.

After an hour or so of plucking reeds and listening to the transmitted sounds, Bell gave his assistant instructions for making "the first Bell telephone," and on the next day the primitive instrument

transmitted the sound of Bell's voice to Watson.

The two men went on experimenting all summer, and in September, back in Brantford, Bell began to write specifications for his first telephone patent.

For more than 45 years after inventing the telephone, Bell lived a vigorous and creative life, most of it in Washington and at his summer home, Beinn Bhreagh, on Cape Breton Island in Nova Scotia. He gave years of unselfish service in behalf of the deaf. He became tremendously interested in aviation, foresaw its importance, and did much to foster its progress. He produced other communication devices

and carried on constructive studies in eugenics. His mind was ever-inquiring, and his range of interests wide.

Alexander Graham Bell can truly be called a citizen of the world. Born in Scotland, he worked in Canada and the United States. He died at Beinn Bhreagh, in August, 1922, and was buried on his beloved Cape Breton hillside overlooking the Bras d'Or Lakes.

Enthusiastic and tireless, he was apt in his younger days to wake others in the middle of the night to share with him the excitement and adventure of progress on some experiment. And teachers of the deaf tell of watching Bell communicate to large audiences his own enthusiasm for the teaching methods he advocated.

Bell was impulsive and generous too. Soon after he had invented the telephone, when he had little money, his first public lecture brought him \$85. He spent it all on a sliver model of the telephone for his fiancée.

In his thinking, as well as in his works, Bell left much for others. In speaking to a group of children, he encourages all of us as he says:

"Don't keep forever on the public road, going only where others have gone. Leave the beaten track occasionally and dive into the woods. You will be certain to find something you have never seen before. Of course, it will be a little thing, but do not ignore it. Follow it up, explore all around it; one discovery will lead to another, and before you know it you will have something worth thinking about to occupy your mind. All really big discoveries are the results of thought." □



Alexander Graham Bell demonstrates a device invented to condense fresh water from vapour in the air, Baddeck, N.S.