Core Knowledge VOICES IN HISTORY™

# Alexander Graham Bell

## Voice of the Future

by Katy S. Duffield

illustrated by Christopher Thornock

We are pleased that our materials in the Core Knowledge Curriculum Series™, Core Classics® Series, Voices in History™ Series, Collection of Tales™ Series, and Adventures in History™ Series available on our **website**, are made available through a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.


Through the license, the user is free:

- To share: to copy, distribute, and transmit the work
- To remix: to adapt the work

Under the following conditions:

- You must attribute the work in the following manner:

  This work is based on an original work of the Core Knowledge® Foundation made available through licensing under a Creative Commons Attribution-NonCommercial- ShareAlike 4.0 International License. This does not in any way imply that the Core Knoweldge Foundation endorses this work.

- You may not use this work for commercial purposes.

- If you alter, transform, or build upon this work, you may distribute the resulting work only under the same or similar license to this one.

With the understanding that for reuse or distribution, you must make clear to others the license terms of this work. The best way to do that is with a link to this web page:
**https://creativecommons.org/licenses/by-nc-sa/4.0/**

# Alexander Graham Bell

## Voice of the Future

by

*Katy S. Duffield*

illustrated by *Christopher Thornock*

Voices in History: Biography Series™

ISBN 979-8-88970-328-0



PRINTED IN CANADA

Editorial Director:
Rosie McCormick

Managing Editor:
Sophie Nunnally

Design:
Ivan Pesic

CORE KNOWLEDGE FOUNDATION
801 EAST HIGH STREET
CHARLOTTESVILLE, VIRGINIA 22902

www.coreknowledge.org

# TABLE OF CONTENTS

# 1

## The Speaking Machine

As boys, Alexander Bell (called Aleck) and his older brother, Melville James Bell (called Melly), had spent most of their lives in Edinburgh, Scotland. By the time they were teenagers, they were starting to get restless. Their minds buzzed with the possibilities of the wider world. They yearned to explore, to discover. But their father, Alexander Melville Bell (called Melville), wasn't ready to let his sons go, so he came up with an idea to keep their excited minds occupied. He challenged the boys to invent something—a machine that could talk.

**invent:** create something new

Creating a speaking machine might have sounded impossible, but Aleck knew it could be done. He and his father had once visited a scientist who had invented such a machine. The sounds that came from the scientist's machine weren't very clear, but the device could speak simple words and sentences. Could Aleck and Melly build a speaking machine of their own? Could they make theirs even better? The boys were ready to find out!

Both boys enjoyed science and inventing things, so they jumped right into their work. First, Aleck and Melly pored over a book the scientist had lent their father. Then they divided up the work. Aleck would create the machine's tongue and mouth parts. Melly would make the lungs, throat, and voice box.

To find the parts they needed, the boys dug through their neighbors' trash. They gathered wood, wire, and other materials. Aleck also borrowed a human skull from his father's study.

Aleck wrapped pieces of rubber around the skull's jaws, teeth, and nasal cavity. He made a model of their exact shapes. Then he used wood, wire, cotton, and a softer rubber to make a tongue and lips.

Melly created a voice box from rubber. He added a tin tube to serve as the machine's "throat." When the device was almost finished, Aleck had a funny idea.

He considered adding a face and a wig. But his father talked him out of it.

Finally, the time came to try out their machine. Melly blew into the tin tube. Aleck worked the lips and mouth. But those first sounds? They were disappointing. They didn't sound like words at all. But Aleck and Melly didn't give up. They made adjustments. And soon, the machine cried out its first word: "Mama!"

The boys couldn't wait to try the machine again. They carried the contraption from their bedroom to the stairwell of their building. Over and over again, they made the machine yell, "Mama! Mama!" They knew they were on the right track when their neighbor ran out of her door. She was coming to check on the crying "baby"!

The speaking machine invention taught the boys to think deeply about things. It showed them that not every invention works the first time. It also helped them learn how mouths, lips, and tongues work together to create sound. Aleck Bell would carry these early lessons with him for the rest of his life. And they would lead him to create one of the most important inventions of all time.

But before we find out what made Aleck famous, let's start at the beginning—on the day Aleck Bell was born.

---

**contraption:** device

# 2

## A New Life, a New Name

A baby boy came into the world in Edinburgh, Scotland, on March 3, 1847. Like his father and grandfather before him, the boy was given the first name Alexander. But his family called him Aleck.

Aleck's father and grandfather were speech teachers. They studied how people use their lips, mouths, and tongues to make sounds. They worked with people who had speech problems to help them speak more clearly. Aleck's father worked to help deaf people, too—and with good reason.

Aleck's mother, Eliza, was almost completely deaf. But she didn't let that stop her. She taught Aleck and his brothers, Melly and Edward (called Ted), how to read and write and how to play the piano. She also taught the boys to draw and paint.

To help her hear, Aleck's mother used a tube called an ear trumpet. She put one end of the tube to her ear, and the boys spoke loudly into the other end. The horn-shaped tool helped block out other noises. It guided the boys' words into their mother's ear.

The ear trumpet worked pretty well. But Aleck soon figured out another way to communicate with his deaf mother. He would lean in close to her forehead and speak in a low, deep voice. His mother could feel the vibrations of Aleck's words, which helped her understand what he said.

From Aleck's earliest days, sound was a big part of his life. He quickly became a much better piano player than his brothers. He became so obsessed with music that he sometimes couldn't even sleep at night—too many tunes racing around in his head. When Aleck faced these sleepless nights, his mother said he had "musical fever."

It also wasn't unusual for Aleck to hear strange sounds coming from his father's study. If Aleck peeked inside, he might see his father making odd faces into the mirror. Melville Bell was working on a new kind of alphabet, one based on how the human mouth makes sounds—a system that would one day be used to help deaf people learn how to talk.

When the Bells weren't learning or working, they retreated to a nearby cottage and spent their days roaming the Scottish countryside. The boys made pets of dogs, cats, frogs, rabbits, and other animals. Watching birds fly fascinated Aleck. So did the eggs he found in their nests.

**vibrations:** small, fast movements back and forth

Sometimes, Aleck found a dead rat or other animal, and his curiosity got the best of him. He'd open up the animal to see what its insides looked like!

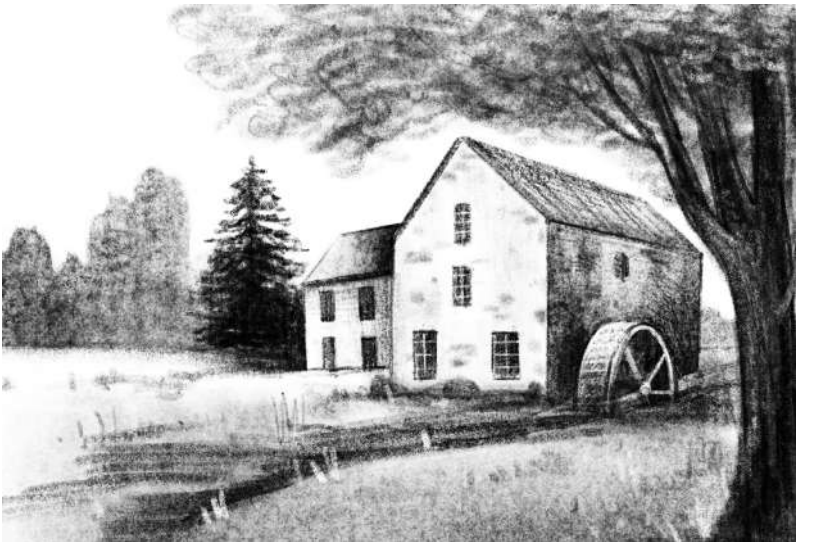
Aleck had a strong sense of independence, too. He wanted to be his own person and make his own decisions. He didn't want to share his name with his father and grandfather. Three Alexander Bells just didn't make sense to him. He wanted a middle name to set himself apart. So, when he was eleven years old, Aleck made a decision. One of his father's students whom Aleck admired was named Alexander Graham. Aleck thought the name had a nice ring to it. So Alexander Graham Bell he became.

# 3

## A New Invention!

Throughout Aleck's childhood, his head was full of ideas. He wondered about the things he saw around him. Sometimes, he even wondered how he might make things better.

One day, Aleck and his friend Ben were goofing off at a flour mill that Ben's father owned. The boys raced back and forth. They darted in and out of the work areas. They made it quite difficult for the workers to get their jobs done.



***Flour Milling***

*Flour is a powder that is made by grinding grains such as wheat. We use flour for cooking and in baked goods such as cakes and bread. But before we can bake with it, the flour has to be milled. After wheat is harvested, the outer layer, or husk, is removed. Then the wheat is cleaned, processed, and milled. During milling, the processed wheat is ground into a fine powder.*

*In the 1860s, many flour mills used stones and water to grind flour. These mills, called grist mills, were located next to swift-flowing rivers. The river's current turned a waterwheel that then turned heavy stones, which pressed on and ground the wheat into flour. Today, wheat passes through a series of machines in huge factories to be milled into flour.*

Soon, Ben's father had had enough. He called the boys into his office and told them to find something useful to do. When Aleck asked what that might be, Ben's father picked up a handful of grain. Before the flour could be milled, the husks on the grains needed to be removed. Ben's father challenged them to find a good way to remove the husks.

First, the boys tried a small nail brush. Back and forth, they rubbed and scraped. The dry outer coverings of the grains came off. But it wasn't an easy process, and it took far too long. There had to be a better way.

So Aleck thought about the problem. He remembered a machine made up of a large vat with rotating paddles that he'd seen at the mill. Because the stiff nail brushes removed the thick husks, Aleck wondered what would happen if the machine was lined with big brushes. As the machine's paddles turned, would they press the wheat grains against the brushes lining the sides of the vat? That should remove those pesky husks—and it would be a lot easier than doing it by hand. Aleck shared his idea with Ben's father, and when they gave it a try, it worked. Aleck's invention was a success!

Aleck liked solving problems. He liked figuring things out—especially through hands-on discovery. But what he didn't like was going to school at Edinburgh's Royal High School. Aleck was a good reader and speller, but he didn't care about learning things like history and geography. Math was okay, but Latin was the worst.

Instead of keeping his nose in a book, Aleck wanted to be out seeing new things, picking them up and examining them. He was happiest when he was working with his mind and his hands.

Aleck's attitude about school did not please his father. He wanted Aleck to focus on his studies. He wanted him to get good grades. So Aleck's father and grandfather had a talk and made a decision—one that would bring big changes to Aleck's life.

**vat:** a large container

# 4

## From Boy to Man

In the fall of 1862, fifteen-year-old Aleck boarded a train. The Scottish countryside faded behind him. Aleck was headed to London, the capital city of England, where he would live with—and learn from—his grandfather for nearly a year.

The bustling city life of London was very different from life in Edinburgh. London streets overflowed with people—and with dirty, smoggy air. The lovely green hillsides of Scotland had vanished. Now, when Aleck wanted to be outside, his only choice was to pace in a small garden next to his grandfather's house.

***London, England***

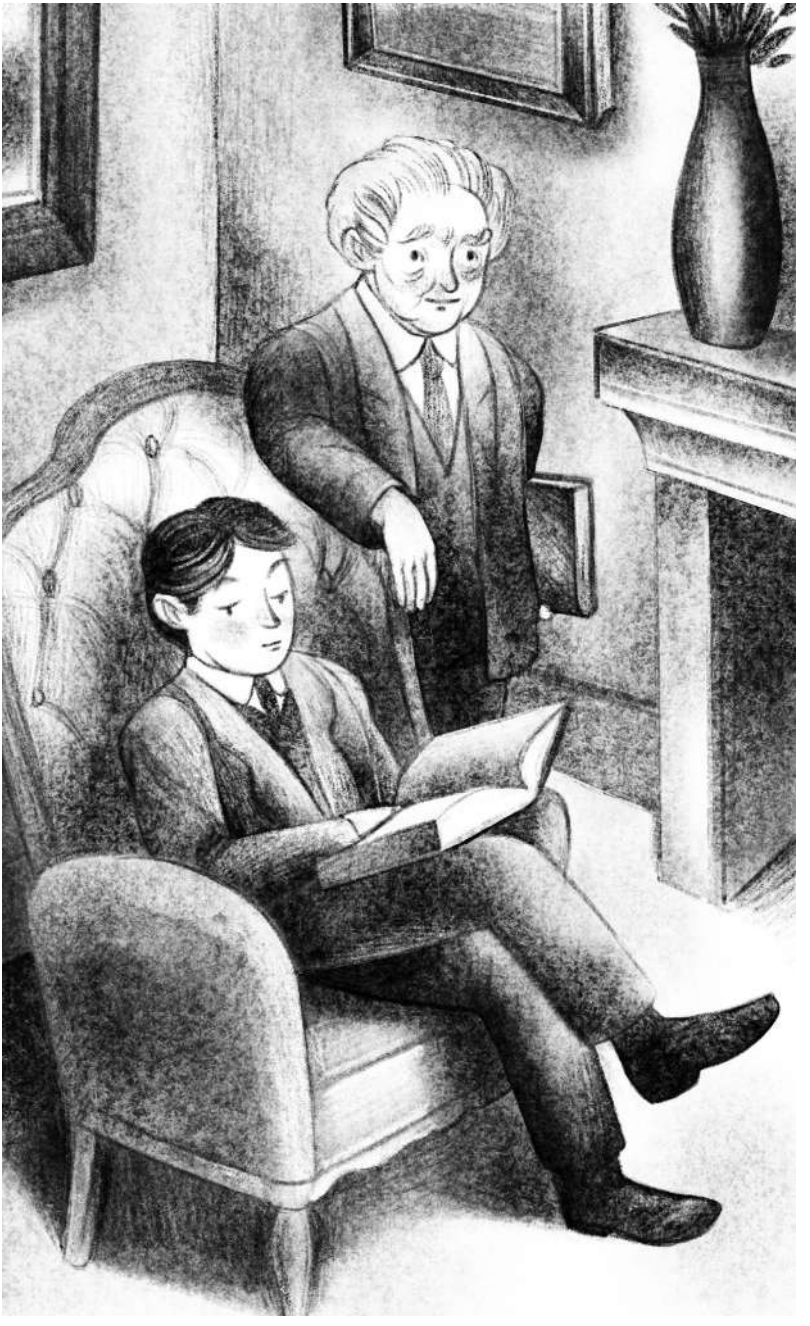
*England is a country that lies within a region called the United Kingdom, or U.K. Wales, Scotland, and Northern Ireland are also part of the U.K. In 1862, when Aleck arrived in London, the capital city of the U.K., it was the largest city in the world by population. More than three million people lived there.*

Aleck was expected to behave differently in London. No running. No jumping. No mischief. Not at his grandfather's house. Aleck's grandfather expected him to be a gentleman, starting with his clothing. Aleck's country-boy clothes were put away, and his grandfather called on a tailor to fit Aleck with a fancy jacket and gloves. His grandfather even insisted on a shiny black top hat and a gold-topped walking cane. How very strange that was for fifteen-year-old Aleck!

Aleck's grandfather believed that education was important. He expected Aleck to read lots of books. He wanted Aleck to dedicate himself to his studies. Some days, Aleck and his grandfather read plays by William Shakespeare together. Reciting speeches from the plays helped Aleck learn how to speak well. Aleck's grandfather also taught him how to clearly communicate his ideas, a skill known as the art of rhetoric.

Wearing strange clothes and putting a lot of effort into his studies were difficult and uncomfortable. But Aleck came to enjoy the time with his grandfather. He also discovered that he liked learning things that he had once thought were boring. The time spent with his grandfather made him more confident in himself and in his abilities, too.

**rhetoric:** the art of speaking or writing well



During his year in London, Aleck grew up a lot. He became more serious and felt ready to leave his carefree boyhood behind. Now sixteen, he believed he was on the brink of manhood. But when he got back home, not much had changed. Aleck's parents still treated him like a boy.

Aleck got so frustrated, he decided to run away. He packed a small suitcase. He tried to figure out how to stow away on a ship. But before the ship sailed, Aleck changed his mind. There had to be a better way. Maybe he could get a job. This would prove to his parents that he was mature enough to be on his own.

At home, Aleck scanned newspapers for job listings. If he and Melly found jobs, they could be in charge of their own lives. A notice from a boarding school in the northern part of the country caught their attention. Weston House needed teachers.

Aleck applied as a piano teacher. Melly applied to teach English and speech. To improve their chances of getting the jobs, the boys listed their father as a reference. But there was one problem—they didn't tell their father! He soon found out, and he wasn't happy about it.

The Bell family gathered for a meeting. Aleck's father knew his sons wanted to live independent lives, but he believed that independence should start with a college education. However, the Bells couldn't afford to send

**brink:** edge or beginning
**boarding school:** a school at which students live during the school year
**reference:** someone who gives information about a person's character or abilities

both of them to college at the same time. So Aleck's father made a deal with them. Aleck would take the teaching job at Weston House to earn money for tuition. Melly would enroll at the University of Edinburgh. Then, after one year, the boys would swap, and Melly would teach to earn money while Aleck would attend college.

In August 1863, Aleck packed his bags. He left his family home and headed north to Elgin, Scotland. When he walked through the doors of Weston House school, Aleck could hardly believe he was on his own. He had been accepted for two jobs—he was a music teacher *and* a speech teacher!

Aleck enjoyed teaching. He liked working with students. Most of them had no idea that Aleck was only sixteen years old. His sophisticated manners, fancy London clothing, and serious air made many of his students think he was older than he really was. But Aleck's age didn't matter. Mr. Alexander Graham Bell taught his students well.

Aleck's time at Weston House wasn't all work. He took time to play, too. When he wasn't teaching, Aleck explored the countryside. He clambered over rocks and stood on cliffs overlooking the sea. Once, he even got stuck in a cave! A whole new world stretched out before Aleck. And he learned something important: independence suited him.

---

**tuition:** money paid for instruction
**sophisticated manners:** mature and well-informed ways of behaving

# 5

## Sound and Sorrow

While Aleck taught at Weston House, his father was finishing an important project at the family's home. For years, he had been working on creating a new kind of alphabet. Instead of being made up of letters, this alphabet used different combinations of symbols. Aleck's father called his invention Visible Speech, a universal method of teaching speech.

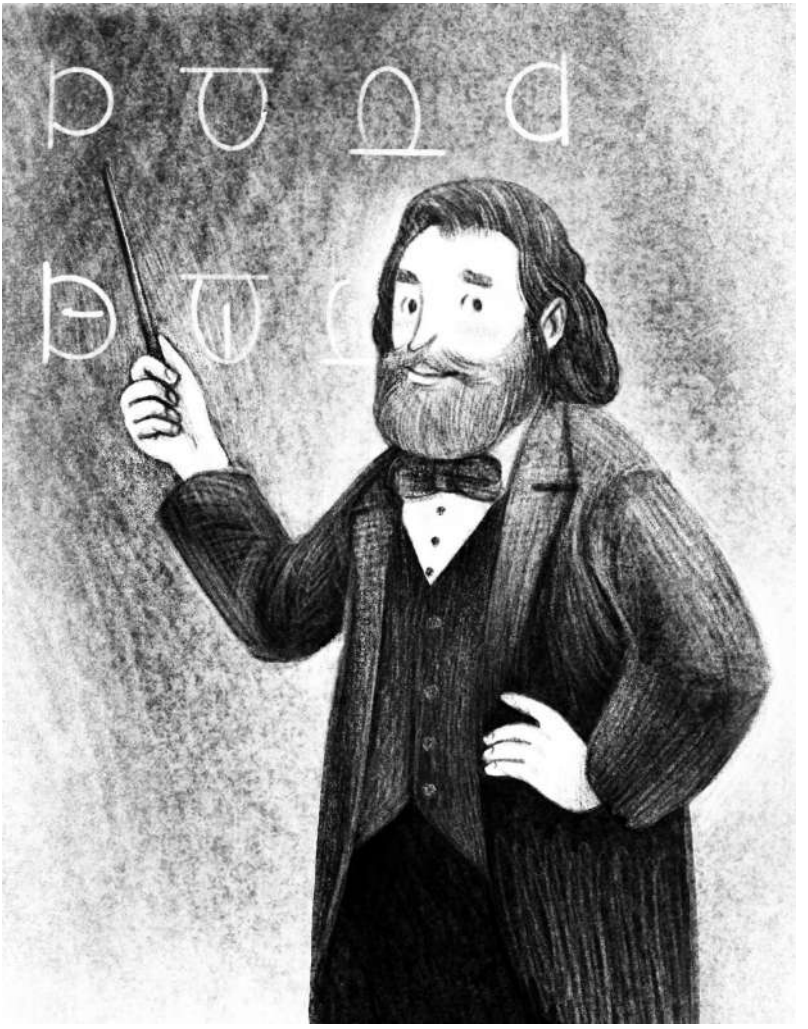
When Aleck and Melly came home for summer break in 1864, their father taught them and their younger brother, Ted, the Visible Speech system. Then the four traveled around Scotland and England to show people how this new alphabet worked.

During their demonstrations, Melly, Aleck, or Ted would leave the room. Then their father would ask someone in the audience to say a word. Next, their father would write the word on a blackboard. But he didn't use letters to write the word. He used Visible Speech symbols instead.

---

**symbols:** signs or marks that represent ideas or parts of words

Then Aleck or one of his brothers came back to the room. They moved their mouths and tongues to match the symbols on the blackboard and said the word aloud. And they got it right every single time!



**blackboard:** a dark, smooth surface used for writing on with chalk

Sometimes, people in the audience tried to stump the boys. They didn't just give the boys' father simple English words. They gave him sounds, too. Sounds like a sneeze, a yawn, or a cough. They even tried words in foreign languages. But the boys always figured it out. By using the symbols, they could move their tongues and mouths to produce the exact sound or word. People were amazed!

Aleck enjoyed his teaching job and his work with his family, but as planned, he and Melly later switched, and Aleck attended university while Melly taught. But by the spring of 1865, more changes came to the Bell household. Aleck's grandfather died, and Aleck's father decided to move the family to London. Money was tight for the Bell family, and Aleck's father thought living in London would help him introduce more people to his Visible Speech system.

When fall rolled around, Aleck returned to his teaching job at Weston House. To build on the work he'd started with his father, Aleck also started conducting sound experiments on his own. For those experiments, Aleck used a metal instrument shaped like a long, skinny *U*. The instrument was called a tuning fork. Aleck would hit the tuning fork on a surface. Then he'd listen to the sound it made and study the way it vibrated. Aleck also

**stump:** ask someone a question they can't answer or give them a problem they can't solve

compared the sounds of the tuning fork with the sound of his voice. He experimented with instruments that had tight coverings called membranes, too. He used these instruments to measure the vibrations that occurred in the air when he spoke. These experiments helped Aleck better understand speech and how sounds are made.

At Weston House and during holidays in London, Aleck continued working with sound. He read book after book about sounds and how they are made. One book explained a tuning fork experiment a German scientist had done. The book was written in German, but Aleck wasn't too good at reading the German language. He thought the book said that the scientist had sent vowel sounds over an electrical wire. But that's not what the book said at all. The scientist's book stated that the machine could generate vowel sounds, not that it could transmit them. Even though Aleck misunderstood the scientist's words, an idea was planted in his mind. Could a machine send spoken words over telegraph lines? Was this something *he* could invent?

Aleck taught during the day, but his nights were consumed by his experiments. Aleck was always hungry to learn more and would stay up all night reading by the

**vowel:** a speech sound made without blocking any part of the mouth
**generate:** produce
**transmit:** send
**telegraph lines:** wires that carry telegraph signals

light of the gas lamps in his room. He worked so long and hard that his eyes hurt, he lost weight, and sometimes he got bad headaches. His parents worried about him. His mother told him to put cold water on his eyes and to stop reading. She also told him not to eat pickles! Aleck may or may not have done those things. But one thing Aleck certainly did—he kept working.

***A Talking Dog?***

*Aleck was a hard worker, but he liked to have a little fun, too. As a young man, he used scraps of meat to teach his family's dog, Trouve, to growl on demand. As Trouve growled, Aleck moved the dog's lips and jaws. The sounds that came out sounded like* ow, ah, oo, ga, *and* ma. *Soon, Aleck had Trouve sitting up on his hind legs and, with Aleck's help, saying, "How are you, Grandmama?"*

Aleck's parents had reason to worry. Aleck's younger brother, Ted, had been quite sick. In May of 1867, Ted died of a lung disease called tuberculosis. Three years later, Melly died of the same disease. Their deaths shook the Bell family. Aleck's parents worried even more about him. They did not want to lose the only child they had left. So they made a decision—a *big* decision that would, once again, change Aleck's life.

**gas lamps:** lamps that produce light by burning gas
**tuberculosis:** an infection of the lungs that causes fever and difficulty breathing

# 6

## A New Life

Aleck and his parents packed their bags, and on July 21, 1870, they waved goodbye to life in London. They climbed aboard a steamer ship headed for the other side of the Atlantic Ocean, bound for a new home in Canada.

On the voyage, a dark gloom settled on the twenty-three-year-old Aleck. He didn't want to leave London. He wanted to make his own decisions and be his own man. But Aleck's heart wouldn't let him. He was the only son his parents had left. He wouldn't leave them when they needed him most.

The family eventually settled on a farm in Brantford, Ontario. Aleck breathed in the clean country air. It was so different from the smoggy London skies. Under bright blue skies, apple, plum, and cherry trees dotted the family's property. Aleck spent much of these first summer days resting. But he never stopped learning. It wasn't unusual to find Aleck stretched out on a blanket beneath some birch trees, always with a book in his hand.

---

**steamer ship:** a ship powered by steam

Over time, Aleck's health improved. His energy came back. He helped workers pick apples. He explored the countryside. It wasn't a bad life. But it wasn't the life Aleck wanted. He grew bored and restless. As always, Aleck was ready to be out on his own again.

In April 1871, Aleck left his parents behind and moved south to the United States. He got a job at the School for Deaf Mutes in Boston, Massachusetts. On his first day of class, Aleck drew a face on the blackboard, complete with the inside of the mouth. He pointed out the lower lip, three points on the tongue, and the voice box. These were the parts the children would use to learn to speak.

Next, Aleck taught some Visible Speech symbols. It didn't take long for the children to catch on and begin to produce some of the sounds. The principal and teachers were thrilled!

***Life for the Non-hearing and Non-speaking***

*A person who is deaf has trouble hearing or cannot hear at all. In the 1800s, people who could not hear or speak were called deaf-mutes. Today, they are referred to as deaf or hard of hearing. Mute is no longer used because there are many ways to communicate, including sign language, lipreading, and vocal sounds. But in those days, people didn't understand much about deafness and the inability to speak. Many thought that people who couldn't hear or speak weren't smart. They didn't believe they could be helped or taught. Thankfully, over time, people realized that non-hearing, non-speaking people are as smart as anyone else. They just need to be taught in different ways.*

During his time in Boston, Aleck began working with a new student—five-year-old George Sanders. George was born deaf. He had never spoken a single word. To help him communicate, Aleck invented a special glove with letters written on it.

Aleck then created cards. On each card, he wrote the name of a toy in George's playroom. Then he attached a card to each toy. This helped George learn how to spell the names of things he wanted. If George wanted his doll, for example, he would touch the letters on Aleck's glove to spell out "d-o-l-l." To the delight of his family, George learned quickly.

Aleck found teaching the deaf to be a rewarding job. But he didn't want to give up on his sound experiments. So once again, after teaching all day, he'd stay up most of the night reading, thinking, and conducting sound experiments.

Aleck spent a lot of his time thinking about how people speak and communicate. This led him to ponder how messages were sent from place to place. Early telegraphs were limited to sending only one message at a time. But Aleck had an idea to improve on that. He believed that the same wire could carry different tones.

**conducting:** designing and carrying out
**ponder:** carefully consider something

And if that were true, many messages should be able to be sent on a single line at the same time. If Aleck could make this happen, it would be a huge breakthrough for communication.

***What Is a Telegraph?***

*In 1872, there was no such thing as a telephone or a cell phone. If someone wanted to send a long-distance message, they would visit a telegraph office. A telegraph operator used a metal lever on the telegraph machine to tap out the message using a special code of dots and dashes. Electrical pulses transmitted the coded message through wires that stretched from one location to another. The message would then arrive at the receiving telegraph office, where it would be decoded and delivered to the proper person.*

**breakthrough:** sudden, important progress
**electrical pulses:** brief changes in electrical currents

# 7

## The Race Is On!

Aleck the inventor was back! When he wasn't teaching, he would find the time to invent a multiple or "harmonic" telegraph that would be able to send multiple messages over the same line at the same time. Aleck knew other people might be working on similar projects. But he planned to be the first inventor to the finish line.

Each day, after George Sanders and his other deaf students left, Aleck hurried to his study. He unlocked his specially designed worktable—where he kept his work and ideas locked up tight—and pulled out tuning forks, spools of copper wire, electromagnets, and more. He looked at this and studied that. He tinkered with screws and cones. Aleck was determined to figure out how to make the multiple telegraph work. But the process wasn't going well. Just as he would fix one problem, another would pop up.

---

**tinkered:** made small changes in order to fix or improve something

Teaching during the day and staying up working most of the night wore Aleck out. It made his headaches come back. Aleck's parents were worried about him again. His father wrote him a letter, encouraging him to give up on his project and focus on his health. But the ideas that danced in Aleck's head could not be quieted.

As much as Aleck liked teaching, he sometimes wished he could spend every moment inventing. But Aleck wasn't making any money from his inventions yet, so he had to have a steady job to pay the bills.

In 1873, twenty-six-year-old Aleck was hired for a new job. Professor Alexander Graham Bell began teaching at Boston University. He taught speech classes at the university, read books, and attended lectures. He kept thinking about and working on his invention, too. He also continued teaching George Sanders and other deaf children. Aleck was a busy man!

Around this time, Aleck took on another new student. Fifteen-year-old Mabel Hubbard had been deaf since she was five. A disease called scarlet fever had destroyed her hearing. But Mabel had learned to watch a person's lips closely as they spoke. This helped her understand what the other person was saying. Mabel was so good at lipreading that many people had no idea she was deaf. She wanted to learn how to speak just as well.

**lectures:** educational speeches
**scarlet fever:** an infection of the throat that causes fever, sore throat, and rash

At first, Mabel wasn't sure about her new teacher. He was polite, but she didn't think he would be able to teach her anything. She didn't like his frumpy clothing. She couldn't believe his shoes hadn't been shined! But over time, Mabel noticed Aleck's passion and enthusiasm for teaching. She responded to his kindness and fully believed he could help her improve her speech. She became fond of her teacher.

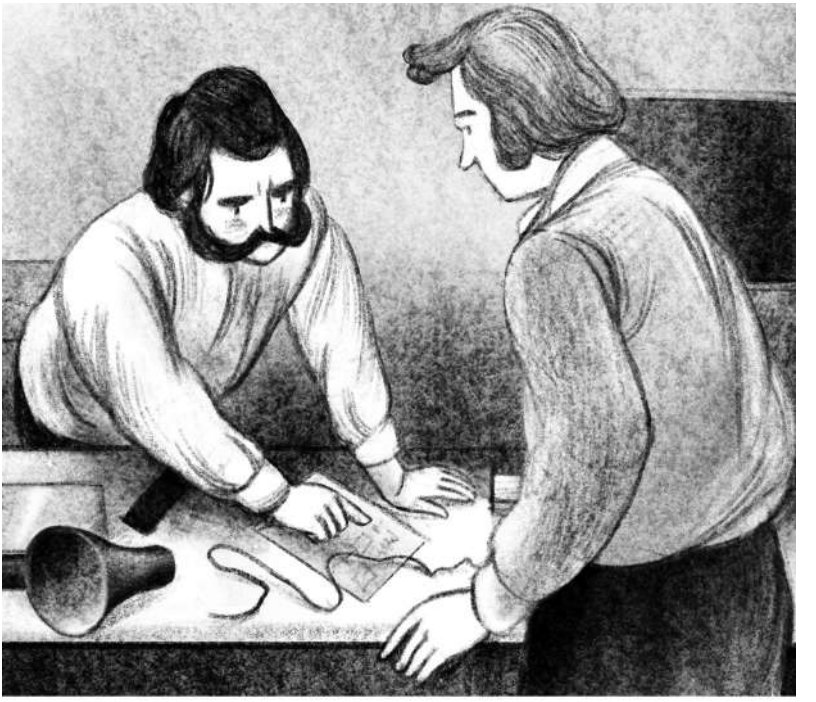
Over the next year, Aleck continued teaching and fussing with his telegraph. He also began spending more time with Mabel and her family. Mabel's father knew Aleck's telegraph work was important. He believed it could make a lot of money. He warned Aleck that another inventor, Elisha Gray, was working on a multiple telegraph, too.

Mr. Hubbard wanted Aleck to win this race, so he offered to become Aleck's partner. He would help out by paying for all of Aleck's expenses for the project. Eventually, George Sanders's father became a partner, too. Money was tight for Aleck, but with these financial investors on board, he would be able to move forward. He was excited, but he was also nervous. He wanted the multiple telegraph to be a success. But Aleck's mind

**frumpy:** not fashionable or flattering
**financial investors:** people who put money toward a goal in hopes of receiving more money when the goal is reached

kept drifting in another direction. Aleck hadn't forgotten about the book written by the German scientist. He realized that what he most wanted to do was invent something that could send people's voices over wires.

In 1875, Aleck took on an assistant to help him with his work on the multiple telegraph project. Thomas Watson worked at a local machine shop that made electrical devices. He was good at building things. Aleck and Thomas spent many late nights working in a stuffy attic above the machine shop. Some nights, they made progress. Other nights—failure.



Over time, the young men became friends. And Aleck shared his wildest dream with Thomas—inventing an instrument that could send voices over wire. But Aleck knew Mr. Hubbard wanted him to focus on the multiple telegraph. Mr. Hubbard didn't think Aleck's idea of sending voices over wire was worth pursuing at that time. He was more interested in making money, and he believed that the multiple telegraph was the best way to do that. Still, Aleck couldn't let go of his dream.

# 8

## A Dream Coming True?

Aleck and Thomas fiddled and fine-tuned. They sketched and pondered. Over and over again, they tested their multiple telegraph. And finally, they began to have some success. Aleck demonstrated his invention for the president of a big company called the Western Union Telegraph Company. The machine wasn't perfect, but it performed well. Even with this success, though, Aleck knew the machine needed to be tweaked even more, so he and Thomas headed back to their workbenches.

On a scorching-hot day in June 1875, Aleck crouched over his worktable in the attic workshop. Long wires stretched across the workshop, connecting transmitters and receivers in one room to additional receivers in the next room.

Aleck pressed transmitter keys to send signals to Thomas. Two signals went through fine, but when Aleck

**fine-tuned:** made small adjustments
**transmitters:** devices that send signals
**receivers:** devices that pick up signals
**signals:** information sent over distances

sent the third signal, Thomas didn't hear anything. Aleck was frustrated!

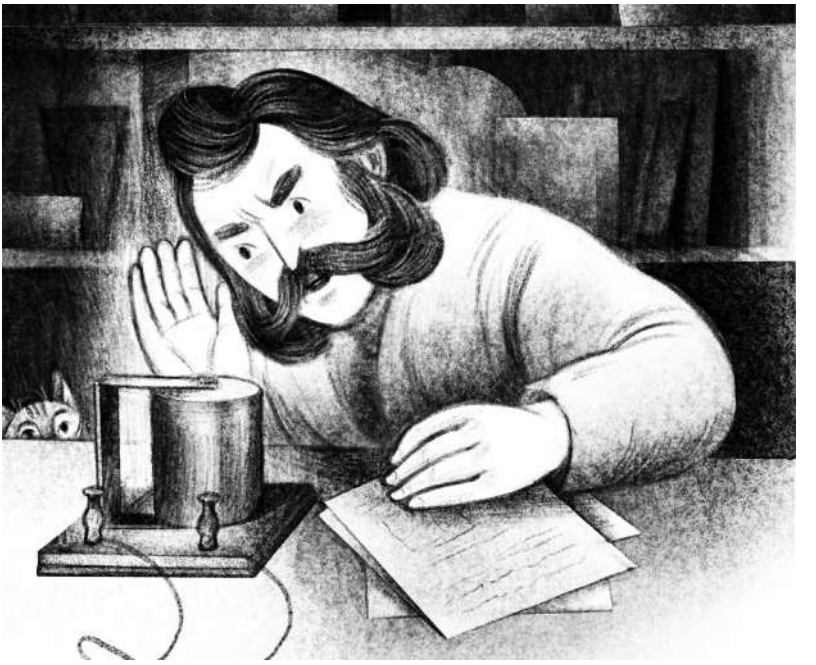
Aleck called out to Thomas. He asked him to make some adjustments to a metal strip called a reed. And all of a sudden, something astounding happened. Aleck heard a sound. Twang! How could this be? Aleck wondered. The transmitters weren't even hooked up to the batteries while they were making adjustments.

Aleck rushed to the next room to see what Thomas had been doing when the sound occurred. Thomas told him he had plucked the reed while adjusting it. Aleck excitedly told Thomas to do it again. Then he ran back to the other room. Aleck wanted to see if he could hear the twang again. And he did!

Sound! If this sound could travel over wire, Aleck believed, then a person's voice could travel across it, too. Aleck and Thomas repeated the experiment over and over again. Aleck knew he was on to something. He grabbed a pencil and paper and started sketching. Before the night was over, Aleck handed the paper to Thomas and asked him to get to work.

Soon, Thomas brought in the newly built invention. The men placed it in the attic workshop. They ran a wire

**batteries:** power sources for electrical devices
**occurred:** happened



to a receiver downstairs. When everything was ready, Aleck breathed in a deep breath. Then he started to speak.

Seconds later, Aleck heard a commotion on the stairs. It was Thomas. Even though he wasn't able to make out exactly what he said, he had heard Aleck's voice over the wire!

Aleck and Thomas continued testing the machine. They took turns shouting and singing into it. The words weren't completely clear, but they could hear each other's voices. This first "speaking telegraph" would need a lot more work, but Aleck's dream was in sight.

# 9

## Calling Mr. Watson!

Aleck's future looked bright. His work life was moving in the right direction. And his personal life was changing, too. In November 1875, on Mabel's eighteenth birthday, she and Aleck became engaged. Mabel's parents didn't want them to marry right away, but Aleck was thrilled to know that Mabel would become his wife.

Mabel still thought Aleck worked too hard—something she didn't think she could change. But there was one thing she did want him to change. Mabel asked Aleck to start spelling his name in a different way. She thought "Alec," without the *k*, looked better. So Alec he became.

All of this happy news renewed Alec's energy. He and Thomas spent as much time as they could working on what they believed could become a groundbreaking discovery. Alec often stayed up all night, checking on this and changing that. Mabel knew these late nights weren't good for Alec's health. She wanted him to rest, but she

**renewed:** made like new

knew he wouldn't stop until he made progress on his speaking telegraph.

One day, a package arrived at Alec's workshop. A note inside said that it was a gift from Mabel. She had painted a picture of Alec that she wanted him to have. But when Alec unwrapped the painting, he laughed. It was not a picture of him at all. It was a picture of an owl—a night owl!

Around this time, Mr. Hubbard's thinking began to change. Maybe Alec's speaking telegraph was a worthwhile project. Alec wasn't always good at keeping up with paperwork, so Mr. Hubbard decided to take matters in his own hands. On February 14, 1876, he filed for a patent for Alec's apparatus that could transmit vocal sounds telegraphically—and he filed it just in time. Two hours later, inventor Elisha Gray tried to patent a similar device. But it was too late.

***Protecting Ideas***

*When an inventor is working on an important project, they often keep it a secret. They don't want other people using their ideas. To keep his work private, Alec had a special table made. When he finished his work for the day, he placed a cover on top of the table and locked it.*

*A more official way that inventors protect their work is by obtaining a legal paper called a patent. A patent is a document*

**filed:** made a formal request on paper

*issued by a government agency that proves the inventor came up with the invention's idea and design. Patents prevent other people from making, using, or selling the invention for a certain number of years.*

On March 7, 1876, the United States Patent Office issued Patent Number 174,465. Alexander Graham Bell now held the rights to make and sell the world's first device to transmit and receive vocal sounds telegraphically. If anyone else wanted to patent a similar device, they would have to prove that their idea was very different from Alec's.

The patent was a big win for Alec. But his invention still needed work—a lot of work. When Alec spoke into the transmitter, his voice still didn't come through clearly. So back to the workshop he and Thomas went.

At Alec's lab in Boston, the two men worked as hard as they ever had. Thomas made a new transmitter. Alec tried different batteries. And on March 10, 1876, they were ready to see if the changes helped. In one room, Thomas pressed the receiver to his ear. In another, Alec leaned over the mouthpiece and shouted, "Mr. Watson—come here—I want to see you."

No sooner did the words came out of Alec's mouth

than Thomas's footsteps echoed in the hallway. Thomas had exciting news. He'd heard Alec's words—and he'd heard them clearly! The men had just made the world's first telephone call.

***What's in a Name?***

*Like many of our favorite inventions, the telephone was not always called by the name it has today. When Alec filed the patent for his invention, he described it as a device able to transmit and receive vocal sounds telegraphically, but he didn't have an exact name for it yet. We can't be sure when Alec first used the term* telephone*, but it makes sense that he would eventually use that name (which literally means distance sound) because he discovered it while working on a* telegraph *(literally, distance writing). It is also fitting that one of the earliest records*

*we have of Alec calling his invention the telephone is a letter to his dearest Mabel in 1876. Alec sent the letter from Philadelphia when he was attending the Centennial Exposition and worrying over his broken equipment and the success (or failure!) of the demonstration of his device. On June 22, 1876, he wrote:*

My darling May:

I am going to send you only a line tonight that you may know that I am thinking of you. I am so tired out that I am by no means in letter-writing condition. I have been hard at work all day upon my exhibits. All is in readiness to try tomorrow—but I must say I feel very nervous about the result. If I can only make the transmission of vocal sounds a success—I am sure of notice—but my apparatus has been injured . . . . Seven of my glass cells were smashed to pieces. The cones of my telephones were completely flattened—and nearly all the instruments injured more or less. However I think I have succeeded in putting them into some sort of shape.

. . . I shall go off to bed to dream of you . . . and hope for the best.

Your loving,

Alec.

**exhibits:** objects put on display
**apparatus:** a complicated device

# 10

## Happy Successes

In June 1876, a gigantic fair called the Centennial Exposition was taking place in Philadelphia, Pennsylvania. Millions of people from all over the world would be visiting. Mr. Hubbard thought this was the perfect place for Alec to show off his new invention. But there was one problem. Alec didn't want to go.

***Philadelphia's Centennial Exposition***

*In 1876, the United States had something to celebrate. One hundred years before, the nation's founders had signed the Declaration of Independence in Philadelphia. To honor the signing, Philadelphia hosted the Centennial Exposition, the very first world's fair to be held in the United States.*

*Visitors from all over the world made their way to the fair. They snacked on sugar-coated popcorn next to a fancy fountain as organ music played. A giant steam engine towered above them. They viewed orchids, cacti, banana trees, and other flowers and plants they'd never seen before. Huge buildings housed furniture, clocks, paintings, sculptures, and many other new inventions, creations, and art from around the country and the world.*

*The most notable exhibits and promising innovations shown at the fair received bronze medals. Medals were*

**organ:** a keyboard instrument that makes sound by pushing air through pipes

*awarded to recognize a wide variety of items, such as preserved fruit, fisher's clothing, umbrellas, children's carriages and wooden horses, a passenger elevator, buttonhole sewing machines, pianos, farm equipment, and hundreds of others.*

Alec had too much work to do! He was an inventor—but he was a teacher, too. He needed to finish a speech course. He had exams to grade. But Mr. Hubbard wanted Alec at the fair. If Alec wanted the telephone to be a success, he had to show people how it worked. So when Mabel finally insisted too, Alec boarded the train for Philadelphia.

At the exposition's main building, the hot summer sun shone through the glass roof and walls. Alec sweated. His head ached. His telephone equipment had been damaged on the trip. He had to put everything back together, and the judges would arrive soon!

Piece by piece, Alec made progress. Wires connecting Alec's transmitter and receiver stretched from one end of the main building and up some stairs to the building's east gallery. He finished the work just in time.

A group of about fifty people, including judges, other

**preserved fruit:** fruit that is cooked with sugar to make it last longer

notable scientists, and the emperor and empress of Brazil, looked on as Alec explained the theory behind his invention. Then the head judge and the excited emperor both climbed up to the gallery. Once settled, the judge pressed the receiver to his ear.

In a distant room, Alec sang into the mouthpiece. After singing, Aleck said, "Do you understand what I say?" The stunned judge shouted, "Yes!" and then raced back to Alec's side to tell him directly that he had heard his voice and to ask him to speak some more. The judge returned to the gallery and listened on the receiver as Alec recited some lines from Shakespeare's play *Hamlet*. As Alec continued to speak, the excited emperor took his place at the receiver and listened, too. He could not believe his ears!

One by one, each judge took their turn, and each time, Alec's voice came through clearly. At first, they wondered if Alec was playing a trick on them. But after trying the invention over and over again, the emperor and the judges knew it was real. The human voice transmitted over wire! The judges awarded Alec a medal for his invention.

---

**emperor:** the male ruler of an empire
**empress:** the female ruler of an empire

Alec felt relieved. He felt honored. But this was only the first step in a long journey. The telephone still needed more testing. So Alec headed back home to Mabel—and to his workshop, where he could keep working to make the telephone even better.

***How Did Alec's Telephone Work?***

*Alec's telephone went through many changes over time. To make the device the best it could be, Alec and Thomas had to continually look for ways to make it work better. One of the first versions of Alec's telephone was made up of two main parts—a transmitter and a receiver. The transmitter looked a little like the top of a drum. When Alec spoke into the open end of the "drum," the sound waves from his voice made the tight covering vibrate. Those vibrations were then converted into electrical energy, which traveled along the wire to the receiver. On the receiving end, the electrical energy was converted back into sound waves, which were heard by the person on the other end of the line.*

People wouldn't want to use the telephone to call someone in another room. They would want to call a friend across town. They would want to call family in another state. Alec needed to figure out how the telephone could be used over longer distances.

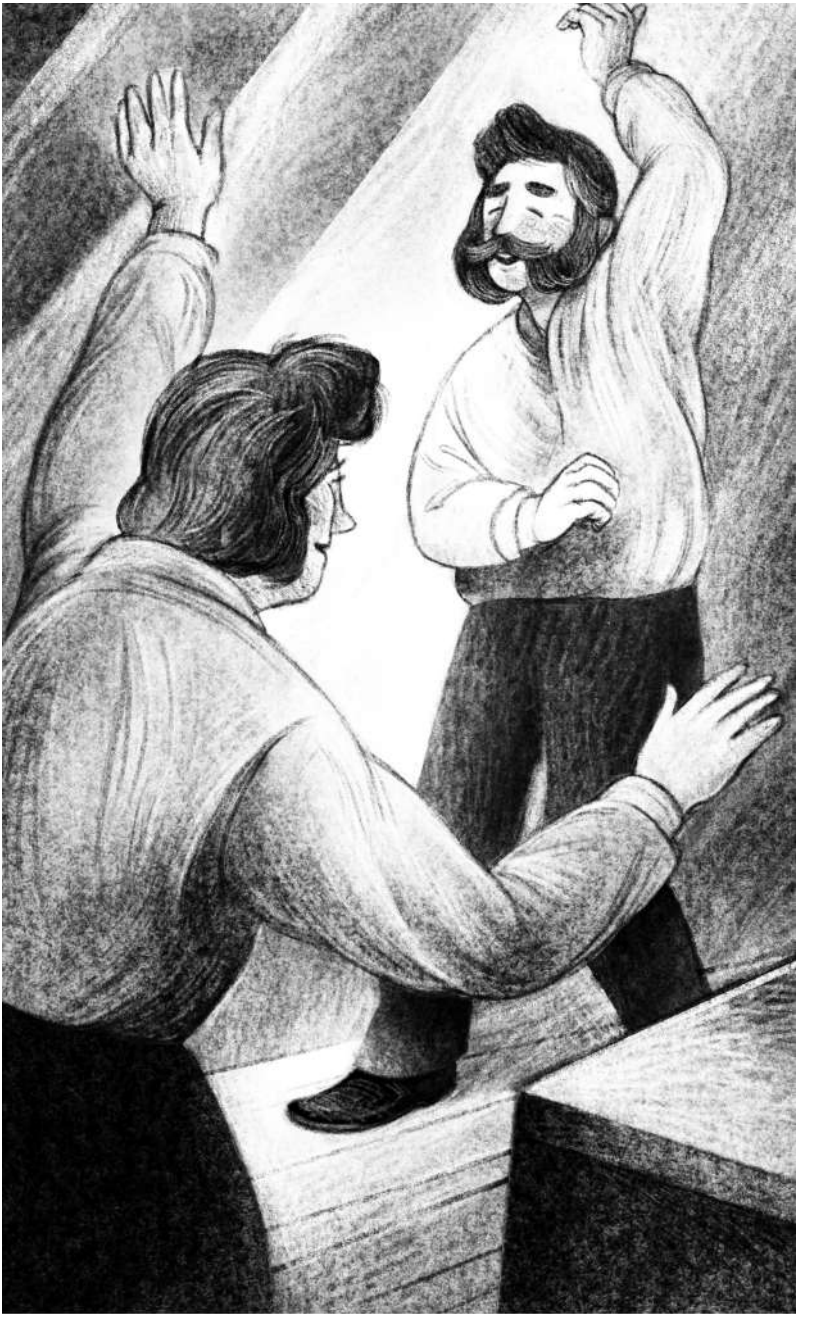
When Alec visited his parents in Canada, he stretched a wire between the house and the barn.

**sound waves:** vibrations that travel through a material such as air and disturb it in a way that can be heard

Later, he attached a telephone to a telegraph line at a general store in a village five miles away. Back in town, his uncle spoke into a transmitter attached to another telegraph line, and Alec heard his voice! Using telegraph lines, he could transmit speech over multiple miles. But when he tried the same trick over a greater distance, there was a problem. A loud crackling sound came across the wire. But Alec figured it out: a stronger battery stopped the crackle.

Little by little, Alec made progress. Clear calls took place over longer distances. And on October 6, 1876, Alec tested out a new feature. For the first time, Alec and Thomas *both* talked. Two miles away from each other, the men held a back-and-forth conversation—the first ever two-way call. And when it worked, boy, were they happy! Alec and Thomas celebrated that night by hollering and dancing around the attic of their boardinghouse. This was the moment Alec knew he'd done it. He knew the telephone would be a great success.

Soon, word began to spread about Alec's amazing invention. Newspapers and magazines reported on Alec's work. Reporters wrote about what it might be like to sit on a sofa in your home and call a friend in the next city, or maybe even in another state. Alec's new invention was ready—and the world was, too!



# 11

## From High to Low and Back Again

There were two things Alec loved very much—inventing things and Mabel Hubbard. What he didn't love was business. But Alec needed to take care of business if he wanted to take care of Mabel. He was going to be married soon. He needed to sell his telephone to make the money he needed to support his wife. So on July 9, 1877, Alec, Thomas, Mr. Hubbard, and Mr. Sanders formed the Bell Telephone Company. They would be in the business of selling telephones.

The new company was a big event in Alec's life, but two days later, something even bigger happened. Alexander Graham Bell and Mabel Hubbard became husband and wife.

Later that summer, Alec and Mabel set sail for Scotland and England. The couple enjoyed time together, but Alec used the trip as an opportunity to work, too. If people were going to buy telephones from the Bell Telephone Company, they needed to know about them and see how they worked. Over and over

again, Alec demonstrated his "talking telegraph." He visited businesses and gave private demonstrations. So many people showed up for his talk at the Society for the Encouragement of Arts, Manufactures, and Commerce in London that he had to add a second demonstration a few days later.

One morning in London, something unexpected happened—a telegram arrived. Queen Victoria wanted to see Alec and his telephone! On January 14, 1878, Alec arrived at one of the Queen's many homes. He set up a pair of telephones.

The Queen listened as others spoke into the phone's mouthpiece. At the time, it was hard to tell if the Queen was excited by Alec's invention, but she later wrote in her journal that it was "most extraordinary." Her secretary asked Alec if they could buy the telephones. Instead, Alec sent the Queen a gift—a pair of fancy telephones decorated with gold and ivory.

By the end of the year, Alec, Mabel, and their new baby daughter, Elsie May, had returned to the United States. Alec hoped for a happy return. But that wasn't the case. The Western Union Telegraph Company had hooked up telephones to its extra telegraph lines. It was trying to take over the telephone-selling market. It even said that

Alec had stolen Elisha Gray's idea for the telephone!

Alec and the Bell Telephone Company fought back. Alec showed his patents. The documents proved he was the inventor of the telephone. He shared other evidence, too, including a letter Elisha Gray had written him. In the letter, Elisha stated that he did not invent the first telephone.

It took more than a year, but in November 1879, the Bell Telephone Company and Western Union reached a settlement. Alec had won! The Bell Telephone Company was the only company at that time that could make and sell telephones—and Alec planned to make the most of it.

# 12

## Never Stop Inventing

Over time, the telephone became more and more popular. People wanted this useful invention in their homes. By 1880, Alec's company had installed more than thirty thousand miles of wire. There were more than three thousand telephones in the United States. And that was just the beginning.

***Telephones!***

*In 1900, there were 356,000 telephones in the United States.*

*By 1970, that number had risen to more than 120 million!*

*In 2023, most people used cell phones, but more than 40 million U.S. households still had traditional landline phones.*

It had been a long, hard fight, but Alec's vision had come true. Alec was proud of what he'd done, and his telephones had made him a lot of money. But he had become tired of focusing all of his efforts on this popular invention.

**installed:** put in place
**landline phones:** telephones that communicate through wires

Throughout his life, Alec had a passion for helping deaf people. So he decided to spend some time refocusing on them. In 1883, he opened a private school in Washington, D.C., for deaf children. The school's teacher helped students learn to speak using Visible Speech. A few years later, Alec helped form the American Association to Promote the Teaching of Speech to the Deaf.

***Help or Harm?***

*For all the good that Alexander Graham Bell did in helping deaf people, his views on teaching the deaf had a harmful side, too. Alec didn't like that some teachers taught deaf students to communicate using their hands. He strongly believed in oralism—the idea that people who were deaf from birth or from an early age should be taught to speak. Alec didn't stop to consider that there were benefits to both methods of teaching. He just insisted that his way was right.*

*Additionally, in 1883, Alec wrote that if two deaf people married and had children, there was a possibility that their children would be deaf, too. Alec thought this could lead to a broader deaf society, so he wrote that more study should be done to consider if marriage between two deaf people should be prohibited by law.*

*Alec's views belittled deaf people, and Mabel even commented on their hurtfulness. In one of her letters to him, she wrote, "You are very tender and gentle to the deaf children, but their interest to you lies in their being deaf not in their humanity."*

Alec kept inventing, too. New ideas crowded his head. So Alec did what he always did. He closed himself up in his lab. He worked through the night—but now he could afford to snore away the next morning.

Over the next forty years of his life, Alec worked on many inventions, including different kinds of telephones. One of them, the photophone, could send sound over a beam of light! It was an exciting new invention, but it didn't take off at the time.

Another of Alec's inventions was used to try to save a president. In 1881, President James Garfield was shot in the back. Alec created a machine that would use an electric current to help doctors locate the hidden bullet inside the president's body. Sadly, the invention didn't work, and the president died. But after his death, Alec discovered the reason why. His machine wasn't faulty. The metal bedsprings had interfered with the machine's signal.

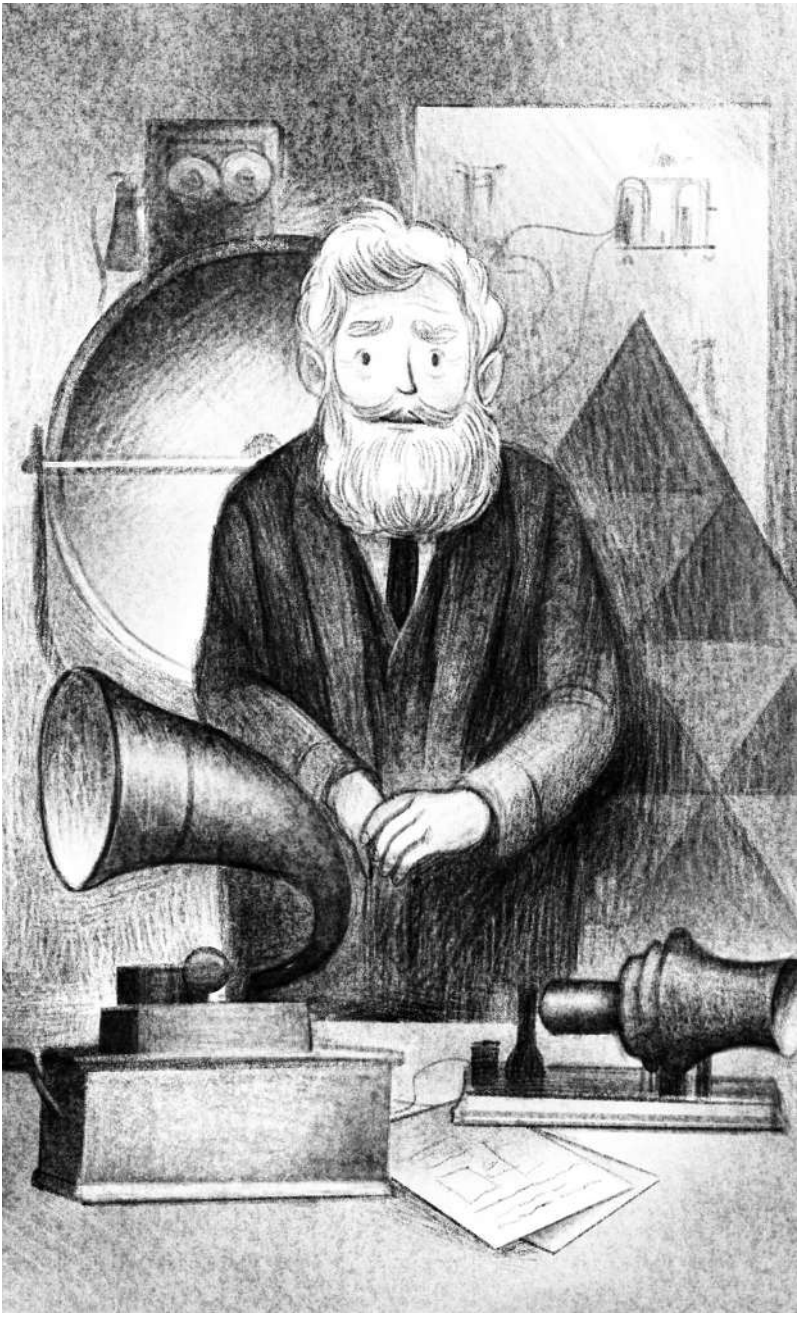
Flight also fascinated Alec. For many years, he worked on an unusual kind of kite called a tetrahedral kite. These kites are made up of triangle shapes. Some of Alec's kites looked like boxes. Some were shaped like pyramids. Others were huge circles. Later, Alec turned to designing airplanes, too.

Alec worked on many different projects throughout his life. But the telephone would always be his most famous invention. Alec's telephone continued to improve over the years, and on January 25, 1915, something exciting happened.

Even though sixty-seven-year-old Alec didn't like getting dressed up, on this day, he did. He sat at a long table in New York and picked up a telephone receiver. His friend and partner, Thomas Watson, waited in San Francisco, California, for Alec's call. When Thomas answered, Alec cried, "Hoy! Hoy! Mr. Watson, are you there? Do you hear me?" And once again, Thomas told Alec that he came through loud and clear. This was the first transcontinental telephone call. Alec's big dream had made it from one side of the United States to the other.

Alexander Graham Bell was a gifted inventor. All his life, he worked hard to bring the visions in his head to life. And he created a device that changed the world. On August 2, 1922, with Mabel by his side, seventy-five-year-old Alec died. And on the day he was buried, the nation found the perfect way to honor the independent dreamer. For one full minute, phone service in the United States was stopped so that not a single call went through—a fitting end for this important communicator.

**transcontinental:** going across a continent



# Discussion Questions

1. The title of this book is *Alexander Graham Bell: Voice of the Future*. Why do you think the author chose that title? Name three ways Alec was a "voice of the future."

2. Why do you think Alec wanted a middle name? Would you want to change your first or middle name? Why or why not?

3. What do you think made Alec interested in sound? Think about his personal life as you consider this question.

4. How do you think Alec felt when he first moved in with his grandfather in London? Do you think he liked the fancy clothes his grandfather made him wear? Do you think he liked having to study a lot? Why did Alec end up enjoying his time with his grandfather?

5. Alec was a hard worker, but he liked to have fun, too. Name at least two times in Alec's life that showed his sense of humor.

6. How would you feel if your parents wanted to move across the ocean to a new country—somewhere you'd never been before? Would you be excited? Unhappy? Nervous? Why? If you have moved to a new country, how did you feel about it?

7. If you had invented the first telephone, who is the first person you would have called? What would have been your first words to that person?

8. For all of his inventing life, Alec didn't always get everything right on the first try. What did he do when things didn't work quite right? Have you ever worked on something over and over again? If you failed at first, did you keep trying? Why or why not?

9. If you were going to invent something, what would it be? Do you think people would buy your invention? Why or why not?

10. What are at least three ways that Alec helped deaf people? How did some of Alec's views harm deaf people?

11. What are some qualities that helped Alec become a successful inventor?

12. Alec's head always swirled with new ideas. Sometimes he stayed up too late and worked too hard. Was that a good thing? Why or why not? What are some things that interest you that you want to spend too much time on? Can you think of ways to balance the things you want to do with the things you have to do?

# Meet the Author

When **Katy Duffield** was young, she loved talking on the phone. Back then, cell phones hadn't been invented yet. Katy's family had the kind of phone that hung on the wall with a receiver to listen and speak into and a rotary dial where, instead of tapping numbers on a screen, the user would put their finger in a "hole" by the number to be dialed and rotate the dial around to input each number.

Any time the phone would ring, Katy would race to the kitchen to try to be the first person in the family to grab it. It was always exciting not knowing who would be calling (phones didn't show who was calling back then!).

Katy knew Alexander Graham Bell as the "father of the telephone," but she didn't know his full story until she started working on this book. Now, instead of simply thinking of him as an inventor, Katy thinks more about who Alec was as a person. She loves thinking about the day Alec and Thomas made that first two-way call and how they danced around the attic celebrating. And she giggles whenever she thinks about Mabel's "night owl" painting and about Alec's talking machine yelling "Mama!"

Today, Katy spends more time emailing than she does talking on the phone, but she still runs to grab her cell phone if it rings—especially if it's one of her grandkids calling!

Katy is the author of more than forty children's books. For more information, visit *www.katyduffield.com*.

# Meet the Illustrator

**Christopher Thornock** is an illustrator, artist, and educator living in the Mountain West with his family, two cats, and a dog named Archie. Drawing is his passion, and he is often found with his nose in a sketchbook. When not making art, he is teaching at a local university or out walking the dog.

# Credits

**Cover Illustration by**

Christopher Thornock & Ivan Pesic

**Title Page Illustration by**

Christopher Thornock

**Text Illustrations by**

Christopher Thornock / 1, 5, 8, 13, 17, 22, 29, 33, 37, 44, 47, 53

In Courtesy of Christopher Thornock / 58

In Courtesy of Katy Duffield / 56

Ivan Pesic / 20

Voices in History is a Core Knowledge Biography Series that encourages young readers to learn about real superheroes in history. As a result of acts of extraordinary bravery, ingenuity, strength, and determination, these people made a difference and changed the world. Perhaps their remarkable stories will inspire young readers to become the superheroes of the future.

**Core Knowledge Voices in History™**

**These books are suitable for readers aged 8 and up.**

ISBN: 979-8-88970-328-0