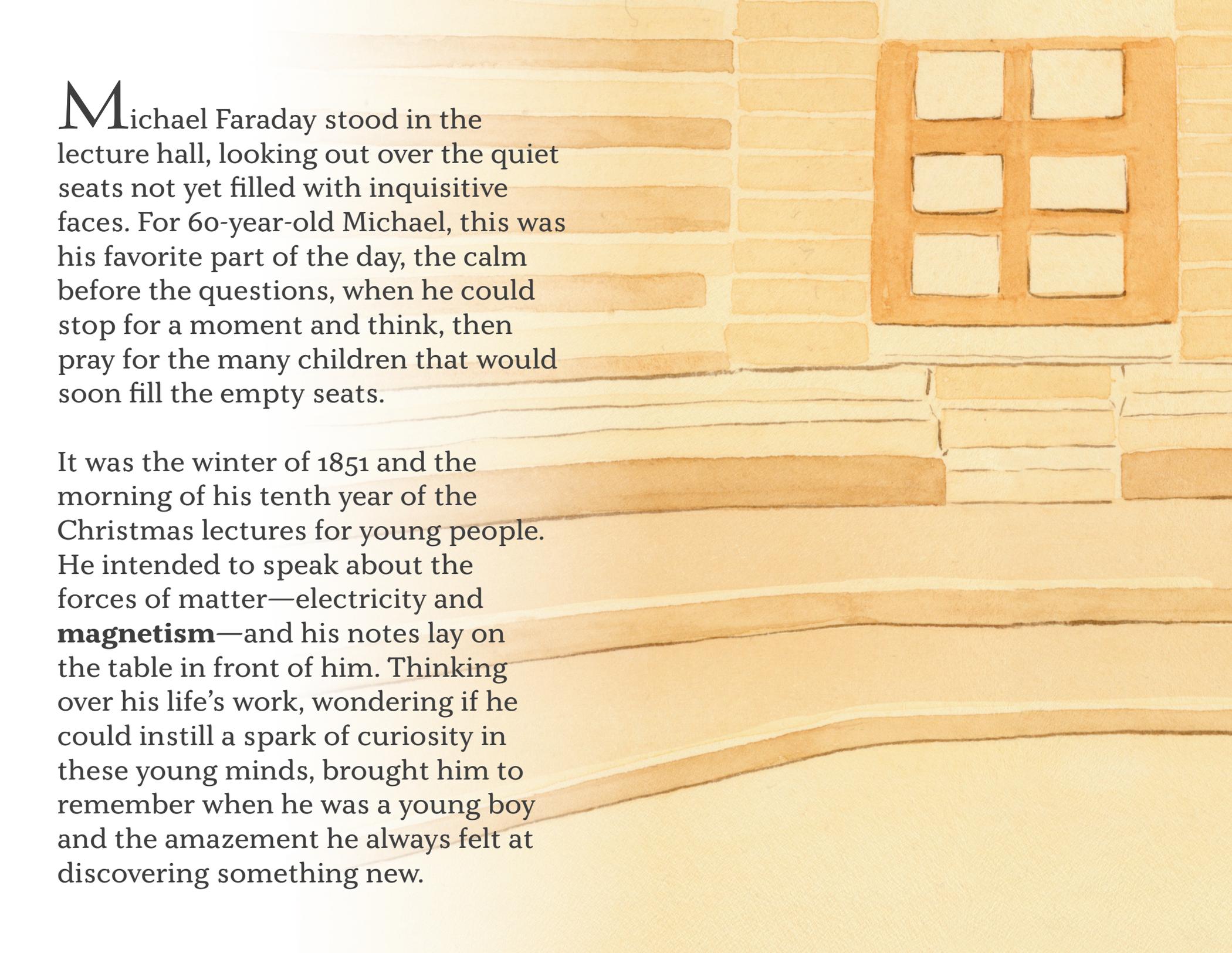


... THE ...
SPARK

by Shannen Yaeger

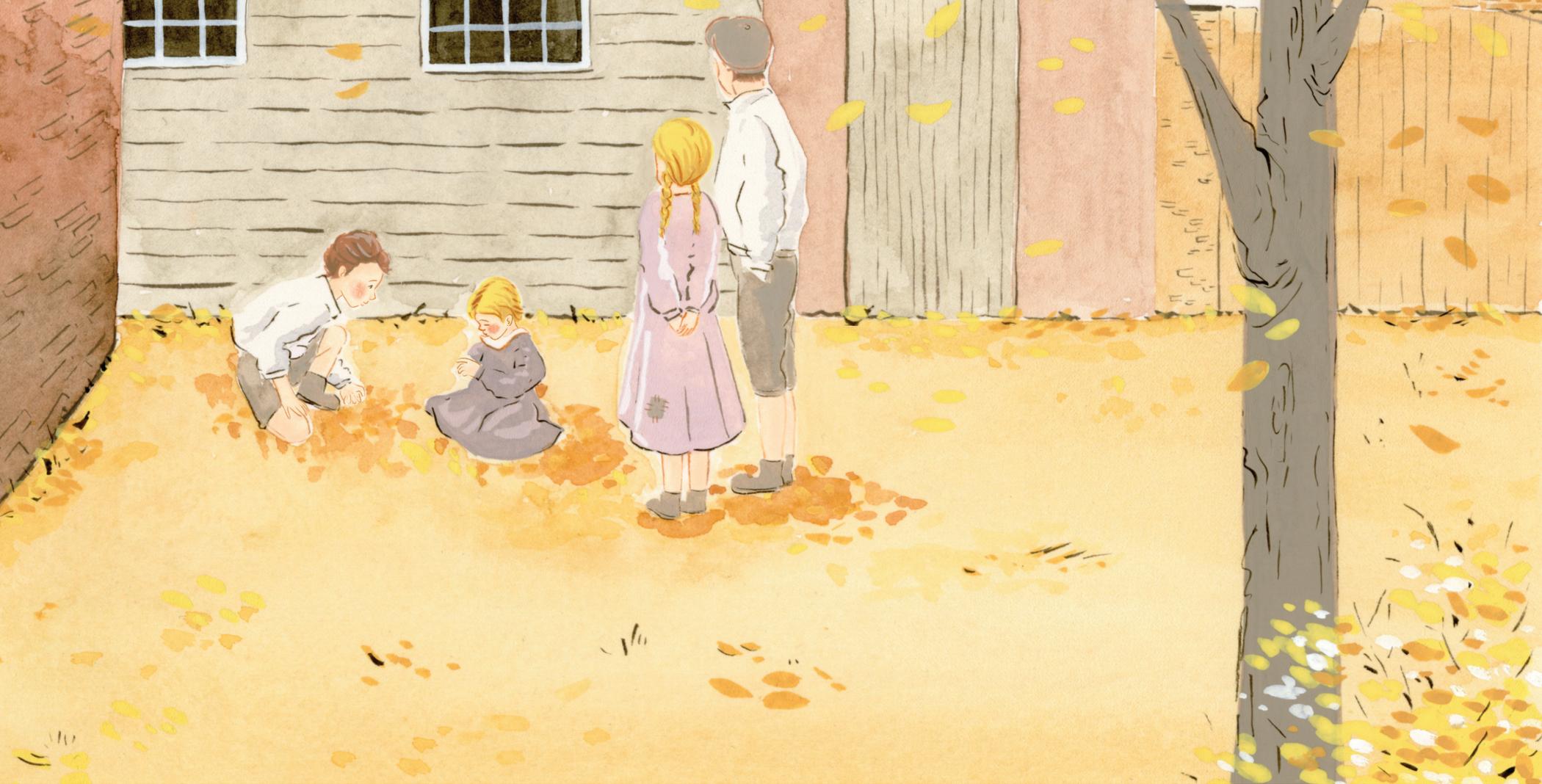


THE GOOD AND THE BEAUTIFUL LIBRARY

A watercolor illustration of a brick wall. The bricks are rendered in various shades of light brown and tan, with some darker brown mortar lines. On the right side of the wall, there is a window with a dark brown frame, divided into six rectangular panes. The overall style is soft and painterly.

Michael Faraday stood in the lecture hall, looking out over the quiet seats not yet filled with inquisitive faces. For 60-year-old Michael, this was his favorite part of the day, the calm before the questions, when he could stop for a moment and think, then pray for the many children that would soon fill the empty seats.

It was the winter of 1851 and the morning of his tenth year of the Christmas lectures for young people. He intended to speak about the forces of matter—electricity and **magnetism**—and his notes lay on the table in front of him. Thinking over his life's work, wondering if he could instill a spark of curiosity in these young minds, brought him to remember when he was a young boy and the amazement he always felt at discovering something new.

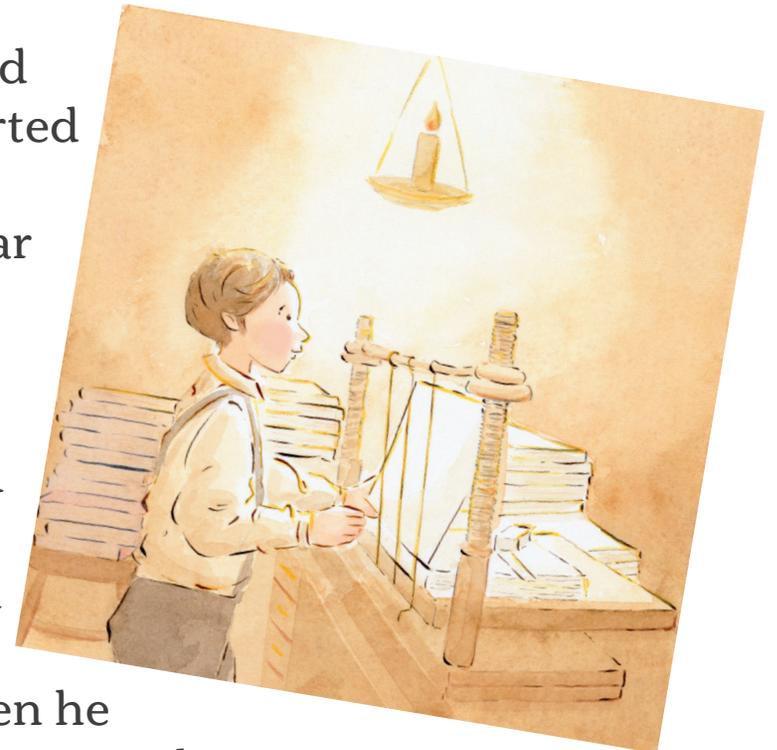


Michael grew up with very little money. As a boy he could often be found playing with his younger sister, Margaret, while his older siblings, Robert and Elizabeth, looked on. While food was often scarce—sometimes only a loaf of bread for the week—their faith in God sustained them. The children cared for and looked after one another, entertaining themselves out of doors so that their weary mother could rest while their father worked as a blacksmith. Financially the family struggled, but their home was rich in love and compassion.



Unable to receive a formal education outside of rudimentary arithmetic, reading, and writing, young Michael had to find a way to learn on his own. When he was fourteen, he became an **apprentice** to a local bookseller by the name of George Riebau. Michael remembered how hard he had worked. He started

off delivering newspapers as an errand boy, and after a year he was made an apprentice bookbinder and stationer. For the seven years that he was an apprentice, he bound and read scientific books of every kind. He could still feel the excitement that would course through his body when he would open a book and begin to work.

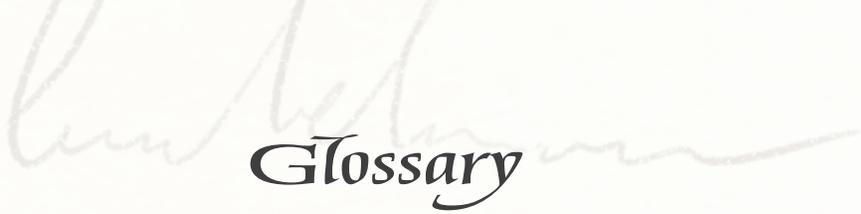


He used all that he learned in these books to carefully perform experiments. Laughing a little to himself, Michael remembered one of his first inventions. Using old bottles and lumber, he had managed to build a basic generator. How proud he had been of his accomplishment! It was these early experiments that first sparked Michael's interest in electricity and magnetism, which was one of the joys in his life's work and his focus for today's lecture.



The book of nature
which we have to read is
written by the finger of
God.

Michael Faraday (1859) "Experimental Researches in Chemistry and
Physics"



Glossary

apprentice—a person who is learning a trade from a skilled employer, having agreed to work for a fixed period at low wages

animal electricity—electricity generated in the bodies of animals; the ability of living cells, tissues, and organisms to produce electrical fields

electromagnetism—a branch of physics studying electromagnetic force; is one of the four fundamental interactions (commonly called forces) in nature

electromagnetic rotation—the ability to plot a graph for induced current on a wire against the produced magnetic force as it changes at different points on the wire. This gave birth to the early generators and motors.

electromagnetic induction—the production of voltage across an electrical conductor in a changing magnetic field; has many uses, including electrical components such as inductors and transformers, and devices such as electric motors and generators

electrostatics—the study of electric charges at rest; involves the buildup of charges on the surface of objects

galvanometer—an instrument for detecting and measuring small electric currents

magnetism—the force of electric currents in magnets. Electric currents and the magnetic movements of certain particles will create a magnetic field.



THE
AMAZING MIND OF
GRANVILLE WOODS

Written by
Maggie Felsch

Illustrated by
Kessler Garrity

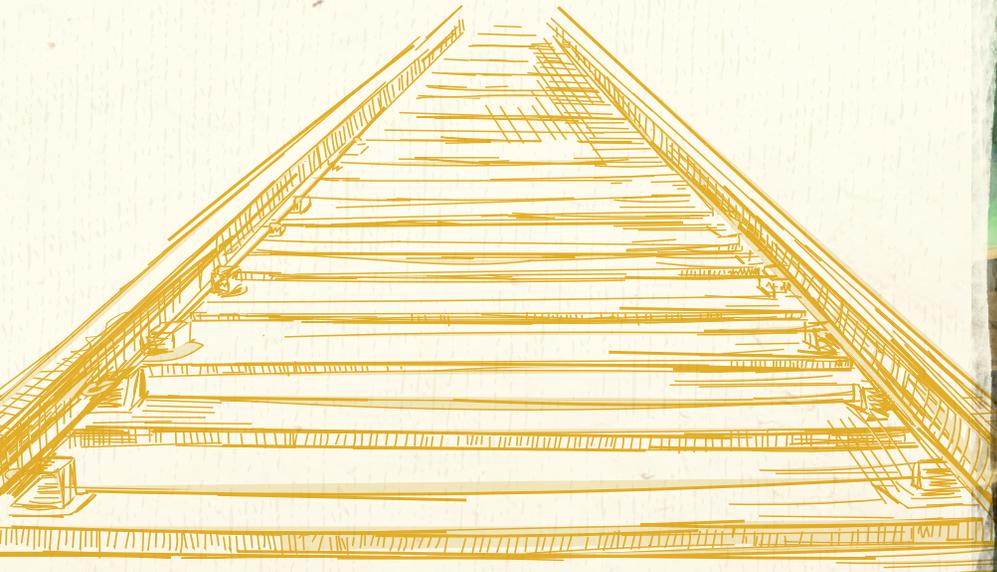


THE GOOD AND THE BEAUTIFUL LIBRARY

Have you ever walked along a railroad track and noticed the two rails running side by side for miles and miles?

When railroad tracks were first laid on the ground in the 1800s—mile after mile of parallel iron rails—there was no engine connected to the rail cars; the cars had to be pulled by something else. Can you guess what pulled them down the railroad track?

Horses did!





Unfortunately, new technology sometimes comes with new dangers. The train engineers conducting the high-speed steam locomotives had no way of knowing if there was another train on the track. Of course, the engineers always looked ahead, and train stations carefully scheduled which trains were allowed on the tracks at which time to avoid any accidents. Sadly, because there was no way to communicate between trains, collisions still happened far too often.

The Great Train Wreck of 1856 happened in Pennsylvania. One train, pulling ten boxcars, got started late. The engineer decided to go extra fast to make up time. Another train, headed in the opposite direction, started right on schedule. The trains were on the same track headed right toward each other! When both trains came around a curve at Camp Hill, they collided, causing the deadliest railroad tragedy in the world up to that time.





When sad things happen, there are always beautiful miracles to be noticed if we just look. The same year of the tragic train wreck, 1856, a beautiful baby boy was born in Columbus, Ohio, who would grow up to make trains one of the safest forms of transportation in the world!

This precious baby was named Granville T. Woods.





He invented something called the *synchronous multiplex railway telegraph*. That's a huge term, but, simply put, Granville Woods invented a way for trains and train stations to communicate with each other through telegraph lines. That meant no more wondering if two trains were headed straight for each other on the same track! The railway telegraph made train transportation an incredibly safe way to travel.



Granville also invented much-improved electric train brakes, increasing the safety of railway travel even more.



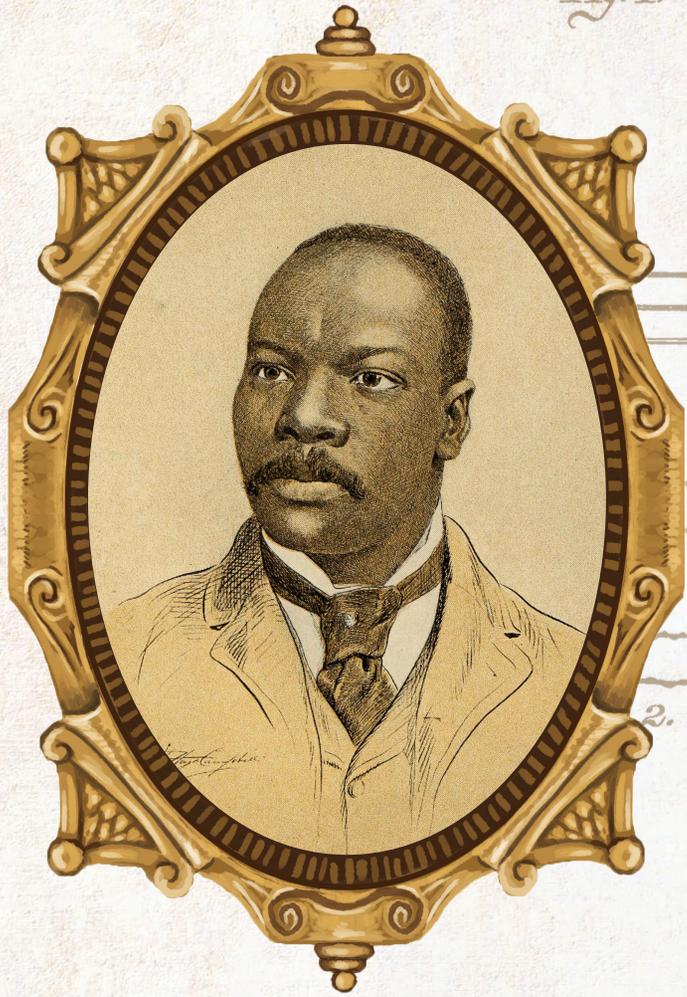
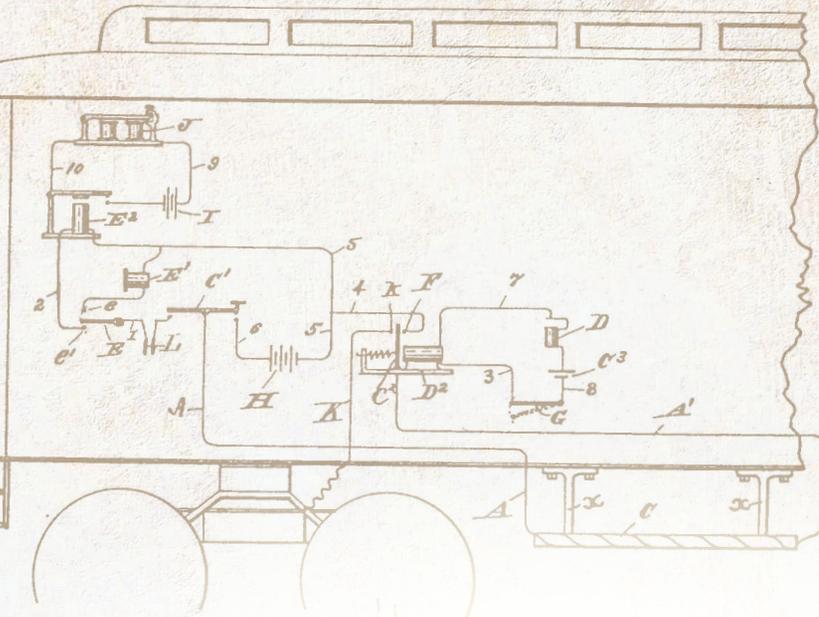


Fig. 1.



GRANVILLE T. WOODS

1856-1910

Fig. 3.



Fig. 4.

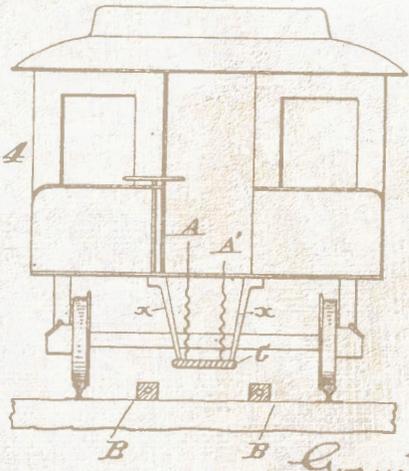
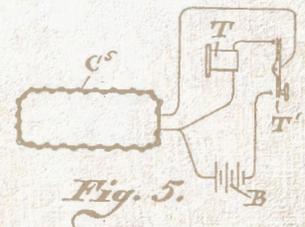


Fig. 5.



WITNESSES:
 G. M. Cassatt.
 Abram May

INVENTOR
 Granville T. Woods
 By *W. H. H. H. H.*
 ATTORNEY