

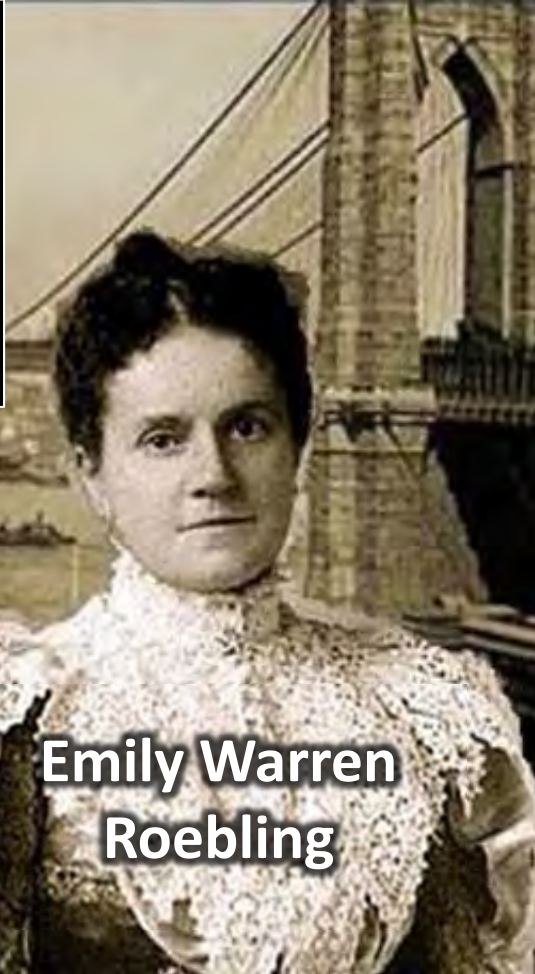
# *Promote STEM as a living STEM-historian*

by Barry Thacker, PE

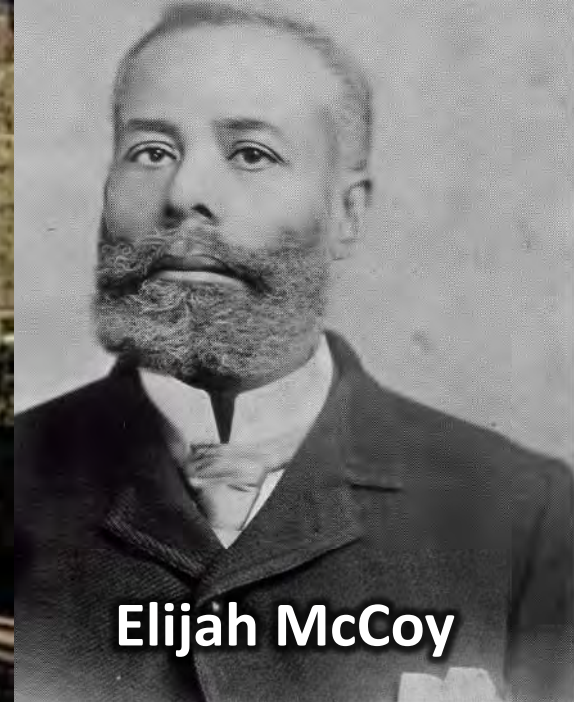


**Schnabel**  
ENGINEERING

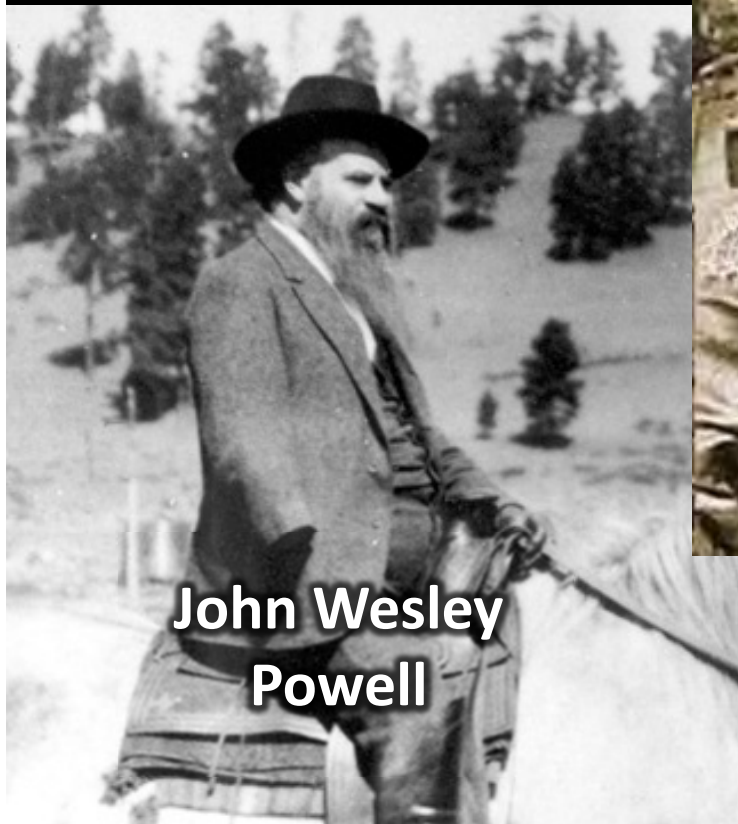
Knoxville, TN 37909



Emily Warren  
Roebling



Elijah McCoy



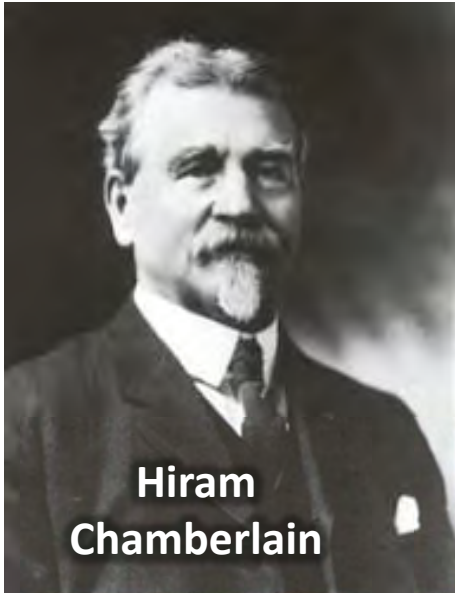
John Wesley  
Powell

**Fellowship of  
Living STEM-  
Historians**

**East Tennessee Geological Society  
Meeting, 14 March 2016**



**Welsh mining engineer/time-traveler, David R. Thomas teaching students about the Coal Creek Labor Saga, which is now part of Tennessee's education curriculum.**



Hiram Chamberlain



David Richards



Joseph Richards

## Mills of the Knoxville Iron and Coal Company (KICC) in Knoxville



Those of us who lost our jobs to convict labor in 1877 found prominent positions in other mines, teaching new job skills to native Tennesseans.

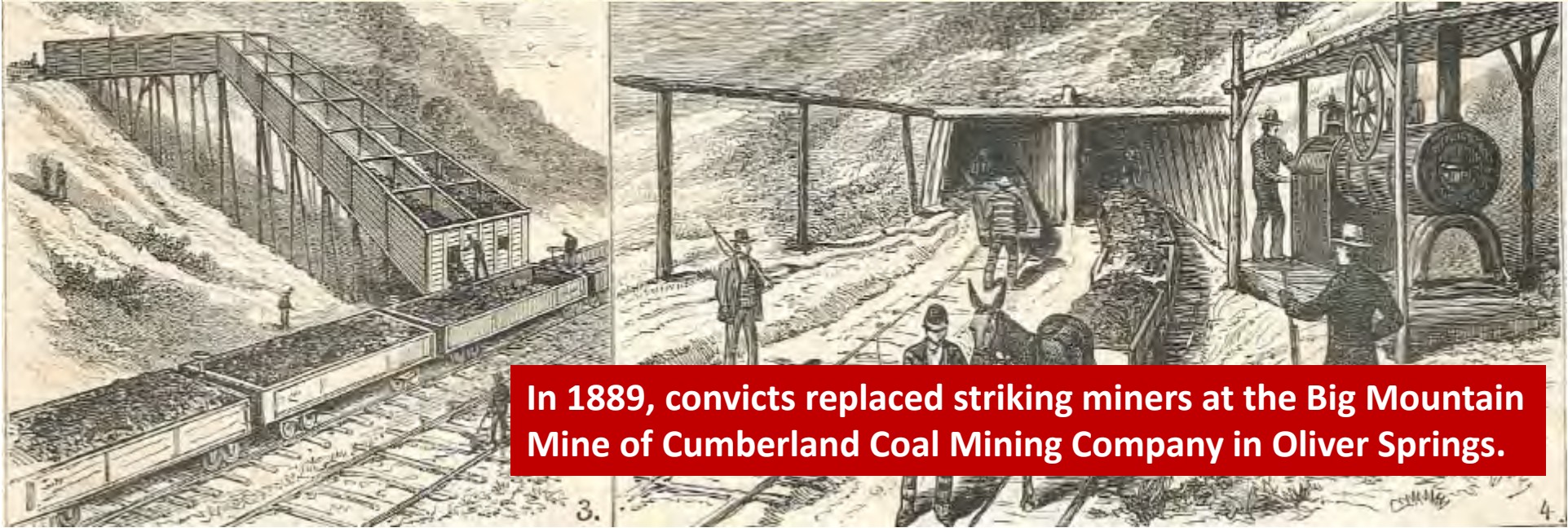
Illustrations from a May 1881 article about the Knoxville Iron and Coal Company convict mine in Coal Creek...



1. Within the Mine. 2. The Ventilating Furnace. 3. Loading Cars by the Chute. 4. The Entrance to the Mine.

THE MINE AT COAL CREEK, WORKED WITH CONVICT LABOR.

INDUSTRIAL LIFE IN TENNESSEE.—FROM SKETCHES BY WALTER GOATER.



In 1889, convicts replaced striking miners at the Big Mountain Mine of Cumberland Coal Mining Company in Oliver Springs.

**Meeting of miners and business leaders at Thistle Switch in July 1891 to plot a course of action to end convict leasing after the Tennessee Coal Mining Company (TCMC) replaced striking miners with convicts at its Tennessee Mine in Briceville.**

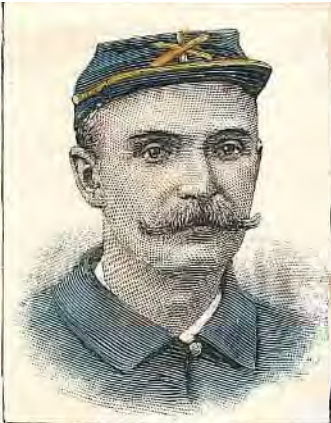


*David R.  
Thomas*

**Do you know why we  
are all wearing  
waistcoats and  
jackets in July?**



**Convicts returned to Briceville after first removal, accompanied by Tennessee National Guard**

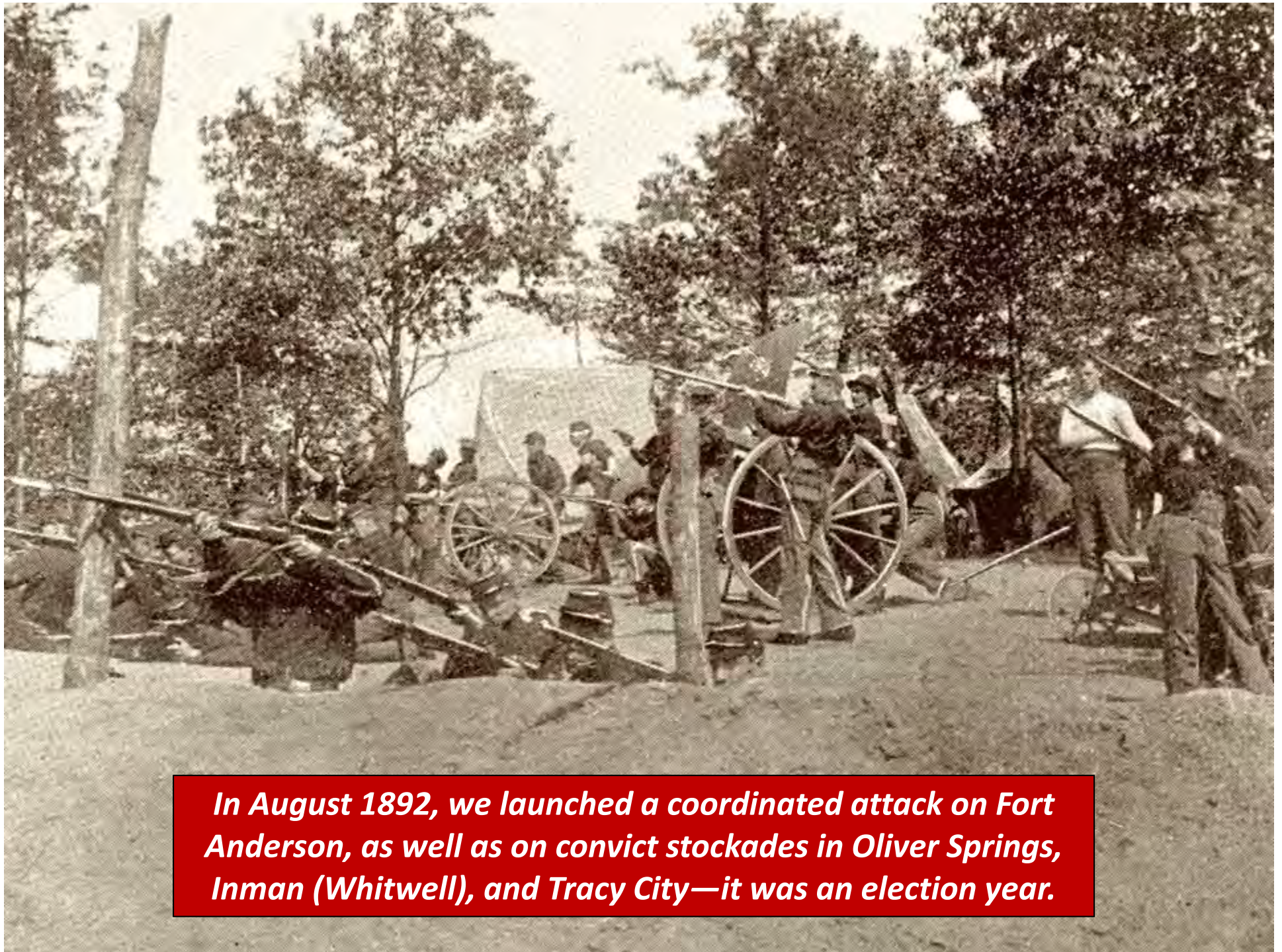


**Col. Keller  
Anderson,  
Commander of  
Fort Anderson  
on Militia Hill**









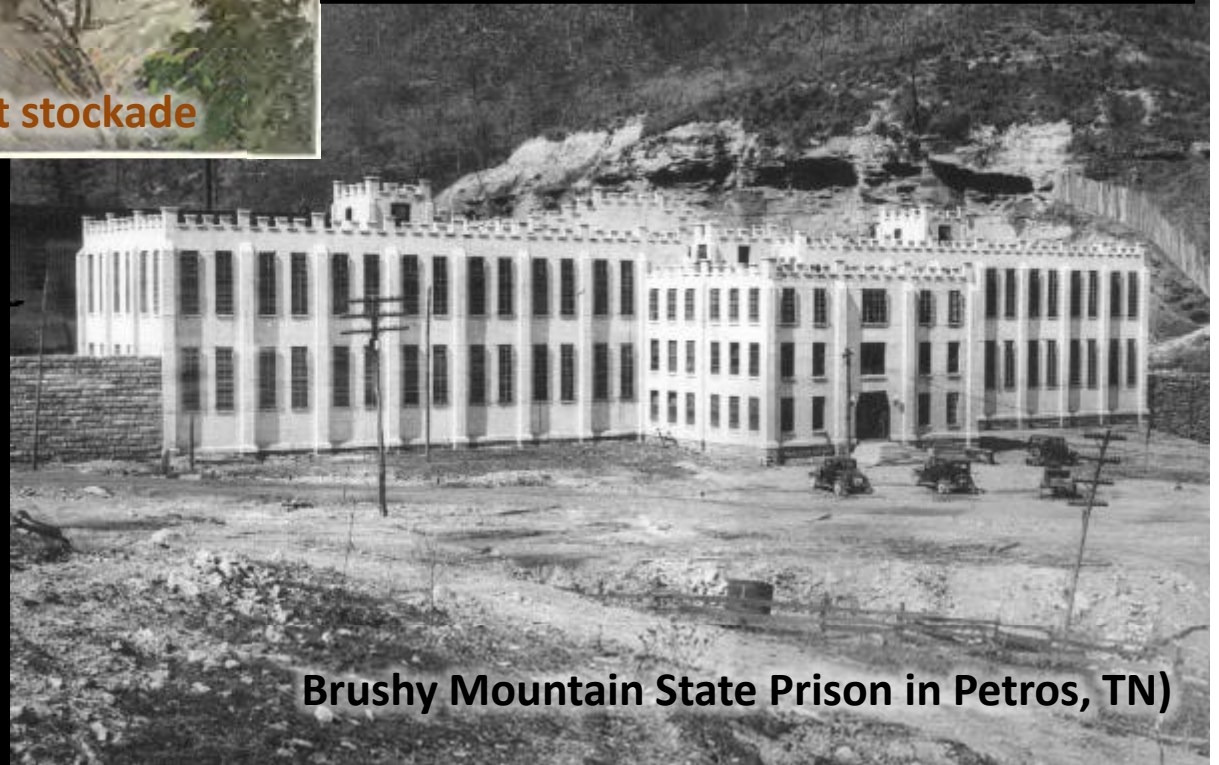
*In August 1892, we launched a coordinated attack on Fort Anderson, as well as on convict stockades in Oliver Springs, Inman (Whitwell), and Tracy City—it was an election year.*



**Miners firing on the KICC convict stockade**

**Coal Creek miners lost the final battle, but won the war when newly-elected Gov. Peter Turney convinced the legislature to appropriate money to build Brushy Mountain State Prison in Morgan County with a coal mine and coke ovens operated by convicts, thus eliminating the need for convict leasing by replacing that revenue stream...**

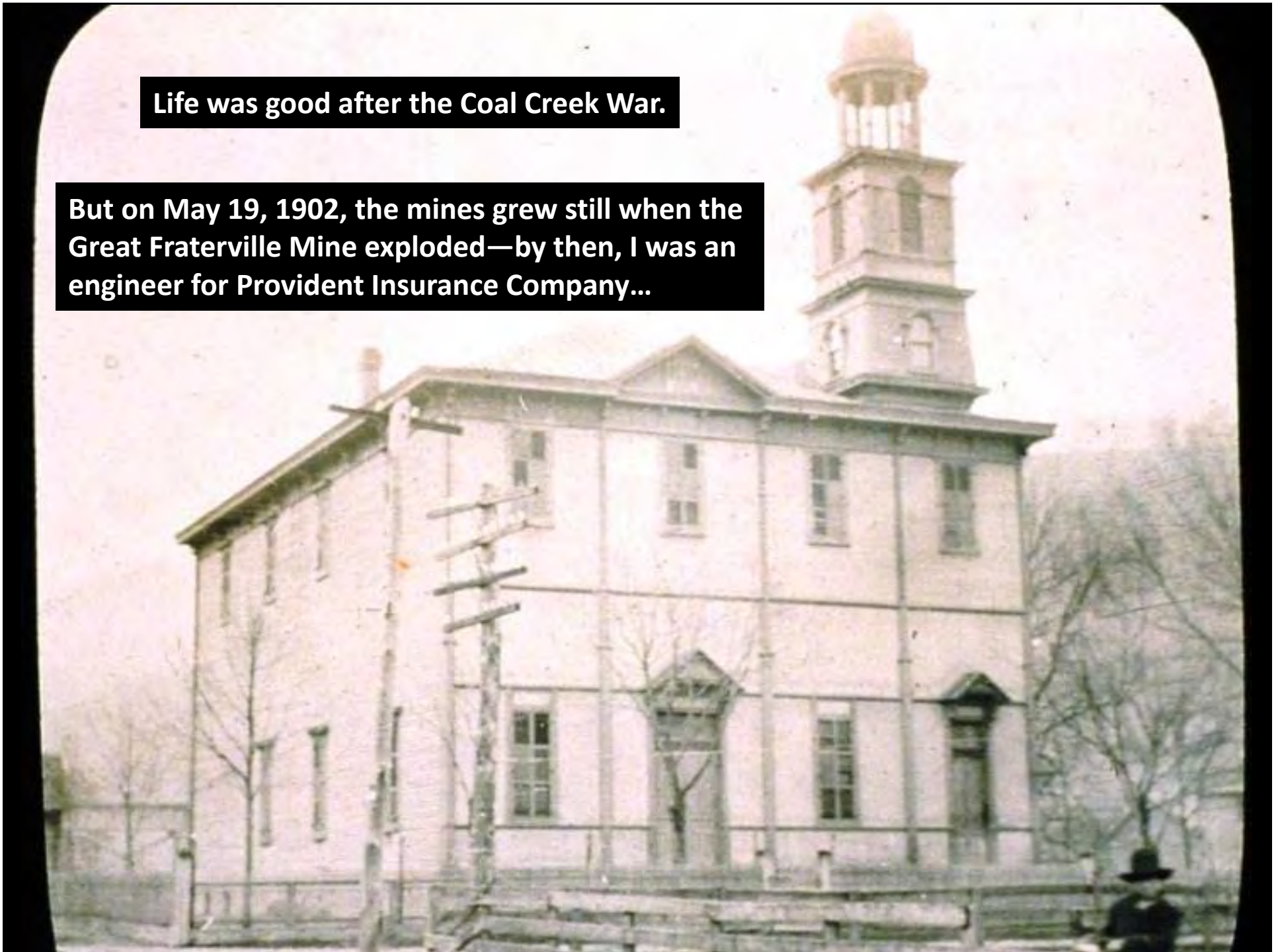
**The Brushy Mountain Mine continued to yield substantial profits for the state each year until it closed in 1938 when coal reserves were depleted.**



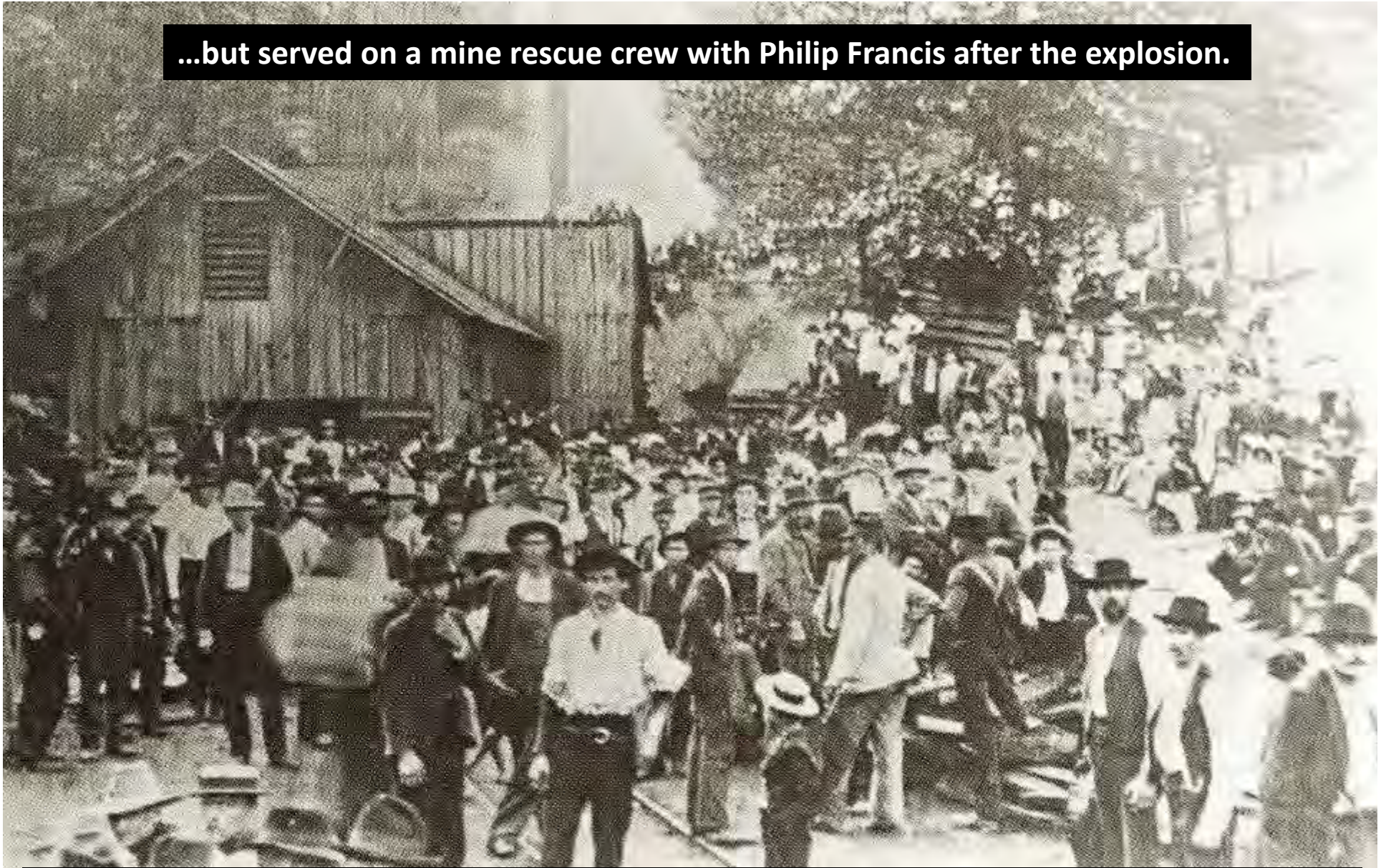
**Brushy Mountain State Prison in Petros, TN)**

**Life was good after the Coal Creek War.**

**But on May 19, 1902, the mines grew still when the Great Fraterville Mine exploded—by then, I was an engineer for Provident Insurance Company...**



**...but served on a mine rescue crew with Philip Francis after the explosion.**



**Friends and relatives gather to await word of the miners at the entrance to the Thistle Mine where many of the bodies were brought to the surface after the Great Fraterville Mine Explosion of 1902.**



Raise the children  
the Best you can  
O how I wish to  
be With you  
good Bye all of you  
good Bye  
Burry me and  
Elbert in the  
same Grave  
by little Eddie  
Good Bye Ellen  
Goodbye Lillie  
Goodbye Jimmie  
Good bye Murrel  
Good bye Horace  
We are to Bethia

216 fatalities including 26 miners  
found suffocated behind a barricade...

25 minutes  
of us there is  
God alive yet  
Good Bye  
Jack & Elbert  
more God for one  
Breathe  
Remember  
me as long as you  
live  
Good bye  
Darlings

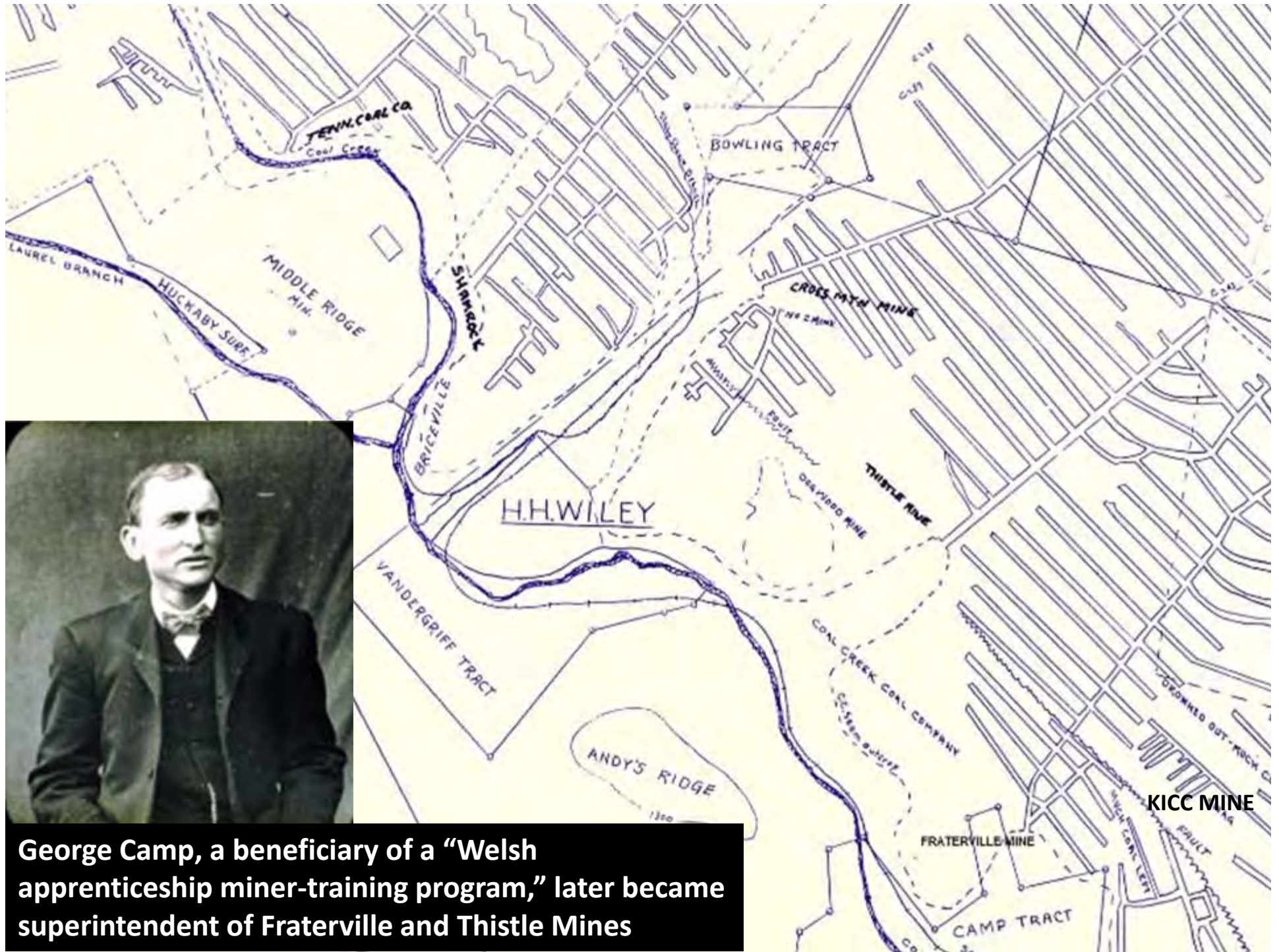
We are all  
Praying for air  
to Sup out us but  
it is getting so bad  
without any air  
Horace & Elbert  
said for you to  
wear his shoes and  
it is now half past  
one  
Ellen & Har  
you to live &  
and come to



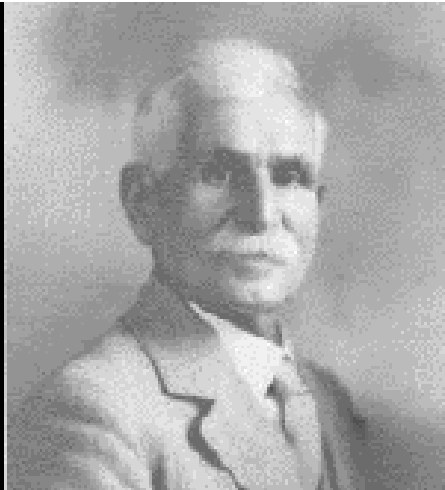
**Jacob Vowell's farewell letter to his wife Ellen  
and children—Oh, God for one more breathe**

**Each of the ten farewell letters is about God and family, which  
tells you all you need to know about life's priorities in 1902.**





**George Camp, a beneficiary of a “Welsh apprenticeship miner-training program,” later became superintendent of Fraterville and Thistle Mines**



**Welsh mining  
engineer Philip  
Francis from Jellico**

***Cross Mountain Mine in Briceville exploded on 9 December 1911...***

***On arriving at the mine, the same sorrowful scene greeted us. Women and children were weeping and all in great distress. Once again I must control myself and not let my sympathy weaken me for I had a duty to perform to a fellow miner. So I went into the mine with forty men. It was a drift opening... I met a man with a small cage with a dead canary in it. I met another man with a gas mask on and carrying his oxygen with him.***



**Engineers and apparatus crews from the U.S. Bureau of Mines (USBM) led the rescue effort at the Cross Mountain Mine**



Don't shut this door  
Men in 16.2 left

Don't shut this door  
men of 18.16.2

18.2. MEN IN  
16.2

# Coal Creek



# Labor Saga

Although 84 miners died, Cross Mountain was the first successful mine rescue, first use of canaries to test air quality, and first use of self-contained breathing equipment by engineers and apparatus crews from the U.S. Bureau of Mines.

Rescuers found that barricade walls had been built with slate and straw between 16 Left and 17 Left entries. They tore down the barricade wall and tested the air with one of their canaries. Headlines the next day read, "Five alive in Cross Mountain Mine."



Retake of the famous 1911 photograph, this time with rescuers wearing their USBM-approved hard hats.



1912

**CANARY BIRDS IN MINE-RESCUE WORK**

That canary birds are destined to play an important part in mine-rescue work was proven for the first time to the United States government in its rescue work recently at the Cross Mountain mine explosion at Briceville, Tenn., in which 89 miners were killed.

It was the first chance for the government rescue workers to test the value of canary birds in connection with their work, and for the first time the rescue cars each had from one to three dozen birds on board

gasp for breath it was realized that the traces of the deadly "afterdamp" were present and the unmasked volunteer rescuers with no oxygen equipment had reached the place for them to stop, for no one but the men with the oxygen machines could penetrate into the death-dealing atmosphere beyond.

The canary birds drew the line of safety. At no time were the rescuers exposed to the dangers of the afterdamp. It was the first time in mine-rescue work where rescuers were not brought forth overcome with gas and afterdamp.



**TREATMENT OF CANCER BY FULGURATION**

The apparent increase in the number of cancer cases has led physicians to put forth the greatest efforts to find a cure for that dread disease. Many methods of treatment have been devised and much study has been given to determining the cause. No definite cause has been established, and the great number of methods of treatment employed shows that no absolutely successful one has yet been found.

Worker, Equipped with New Mining Machine and Canary, about to Enter a Mine after

Dr. De Keating-Hart, a noted cancer authority, of the Hospital Saint Luc, Paris, has originated a treatment which he believes is the most successful yet employed, and in New York recently he explained and demonstrated his electro-surgical method which he calls "fulguration." The word means flashing, lightning-

**Historical U.S. Coal Mining Fatalities**



Donated an extensive collection of  
Welsh language books to Harvard  
University in 1915.

Rees R Thomas  
Coal Creek, Tennessee  
Amrhe gwylt gan  
Ryf. Ardwr  
... 0 9 1/2

Y frawdoliaeth;  
neu, Bigion o  
weithrediadau  
y Cyngor Bach  
(clwb siarad) ...

Harvard College Library  
—  
David R Thomas  
Coal Creek, Tenn

lan na bydd ...  
na thram gwyddiaidau o'r ...  
Mi chyfarfyddwn mwyon y



[www.coalcreekaml.com](http://www.coalcreekaml.com)

# PRINTS OF WALES

Welsh immigrants may not have discovered America, but they did leave their mark on our history and culture

**BRICEVILLE** — Did the Welsh discover America?

Well, probably not, but don't snicker. There are those in lofty positions of academe today who think the Welsh might have landed on American shores long before Columbus found the place.

Regardless, there is little doubt but that Welsh immigrants wielded significant influence over American history and culture, whether or not they were among the first who stumbled into here. They went quietly about their business across the centuries and appeared at strategic moments in U.S. history.

**FRED BROWN**  
Appalachian Journal

Eirug Davies, an associate member of Harvard University's Department of Celtic studies — in his other life, he was a physicist with a doctorate in electrical engineering and worked for the U.S. Air Force in solid state electronics — has uncovered some rather fascinating facts from letters, diaries and newspaper accounts written in this country in the Welsh language. Some of the information has been locked up for years in Harvard University's enormous library. And some of the volumes were provided by Welshmen who lived in Briceville, where Welsh coal miners accumulated in the latter half of the 19th century and the early part of the 20th.

Davies was here last weekend at the invitation of the Coal Creek Watershed Foundation Inc., a nonprofit foundation in Knoxville formed to improve quality-of-life issues in the Coal Creek Watershed in Anderson County.

Davies was born in Llanon, Cardiganshire, Wales, on the crescent-shaped coast along Cardigan Bay. Here, he says, there were "more sheep than people." In his youth, he could walk from green sheep pastures to luminous seaside surf in a matter of minutes.

Just what year he was born he won't say, but his hair is short-cropped and white as cotton, and the edges of his eyes have the crinkled look of wisdom from years of reading and studying.

One of his particular interests is



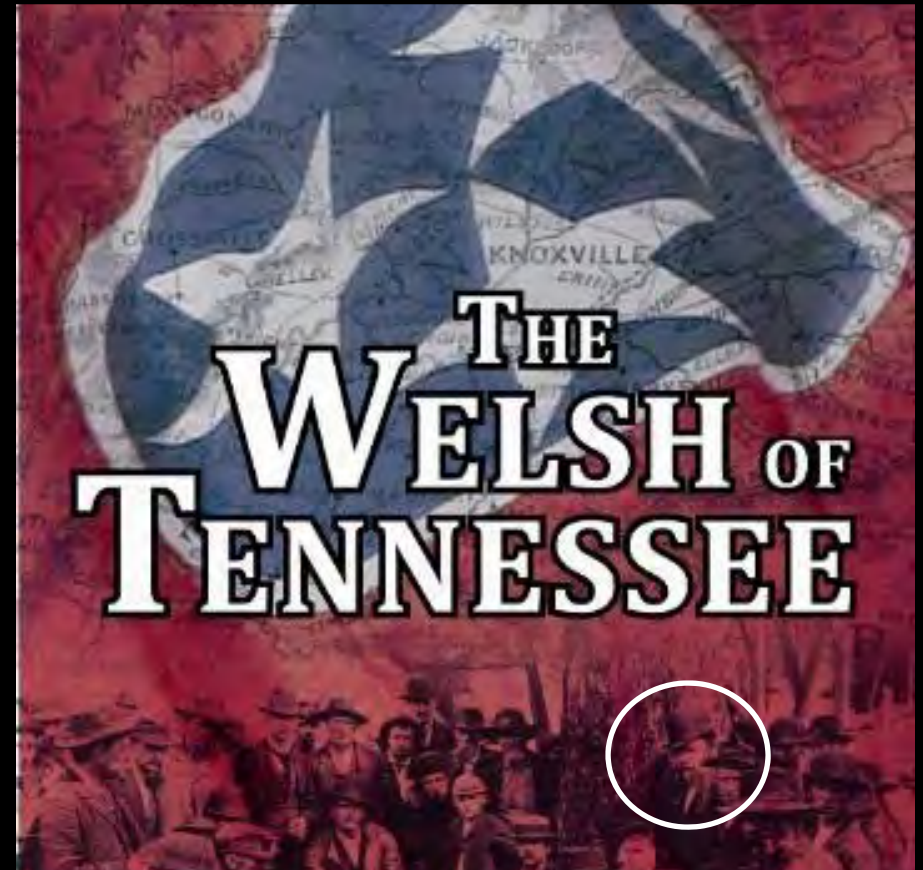
PHIL EPHRONE  
Welsh scholar Eirug Davies, right, and Briceville Elementary School fifth-grader Bailey, 11, visit the Community Church in Briceville. Davies, a retired electronics engineer with the Air Force who is now with Harvard University, taught these Welsh coal mining heritage. The church was built in 1898 by immigrant coal miners, and its churchyard contains the graves of 22 miners killed in Briceville and Cross Mountain coal mine disasters.

Welsh literature in America. That led him to Briceville with Barry Thacker and Caryl Moore of the Watershed Foundation and Gev/Environmental Associates Inc., a consulting firm providing geotechnical and environmental engineering design services to mining and industrial

clients. While Davies was conducting microelectronics research and writing technical papers for the Air Force, he spent his off hours ferreting out Welsh literature written in the United States.

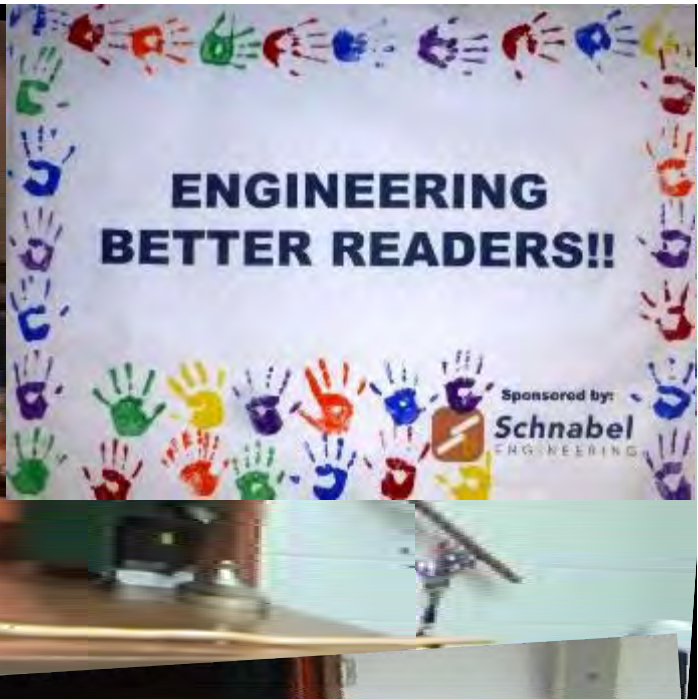
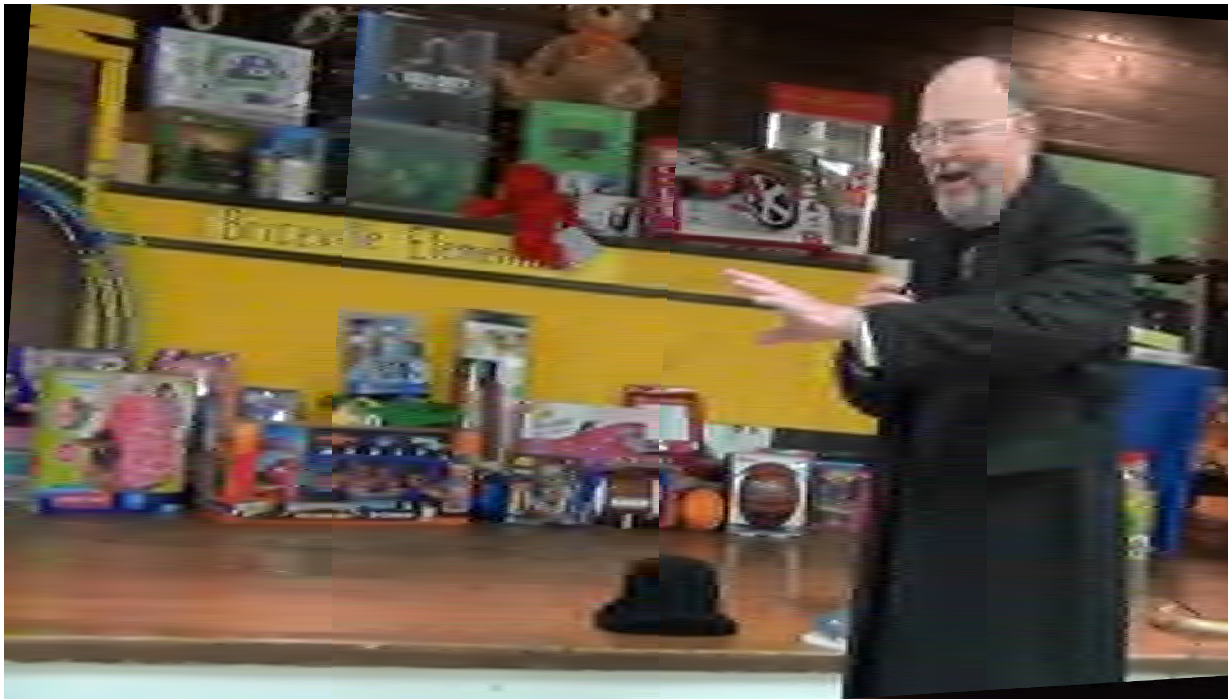
See JOURNAL on B2

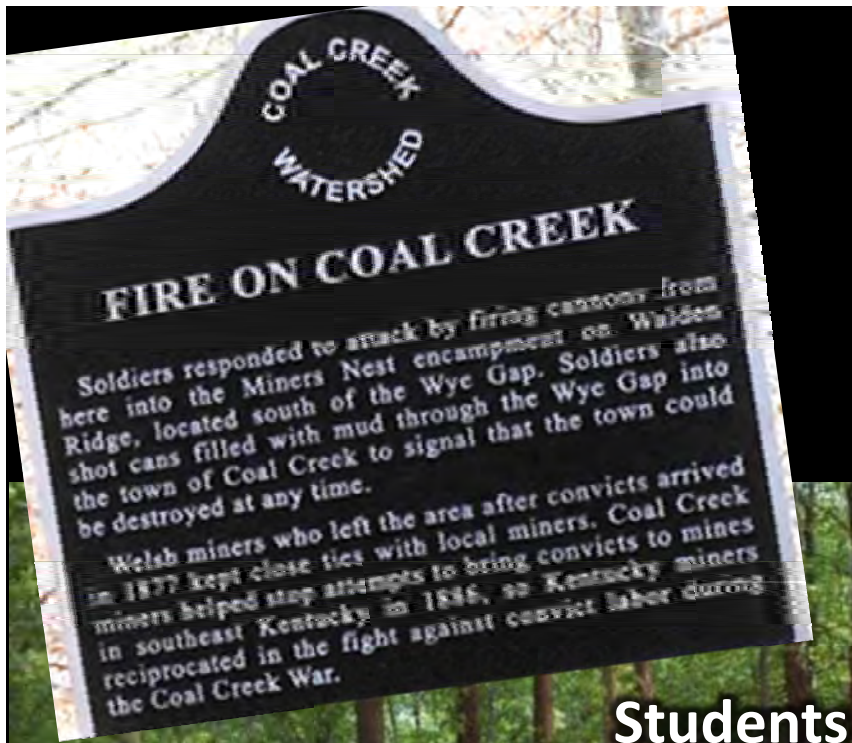
This book tells how the Welsh helped develop Tennessee's fledgling iron, coal, zinc, and copper industries after the Civil War...



...and how Tennessee miners preserved Welsh literature for posterity in the last half of the 19th century, while assimilating into American society.

Eirug Davies





Students say,  
*"This is the best field trip ever!"*



In addition to being a living STEM-historian in the classroom, I serve as a tour guide to historic Coal Creek Labor Saga sites...

**Four sites listed on the National Register of Historic Places**

Is embracing STEM heritage an effective way to motivate students to pursue careers in STEM?

This year is Janis Bishop's first year at Briceville. As the technology coordinator she knows the importance of computers, but as a descendant of coal miners she knows the importance of heritage...

"The Coal Creek Watershed Foundation came in and showed these students why they should be proud of their heritage," Bishop says. "When you have confidence, when you know you have a heritage to be proud of, that makes a world of difference on your outlook..."

(Principal Sandra) Patton beams when talking about former students... "Our former students are nurses, teachers, engineers, and technicians with one now in medical school...and they are all Coal Creek Scholars.

# Education in our community — Briceville

Ken Leinart  
editor@hometownclinton.com

There's something going on at Briceville Elementary School.

There is a sense of excitement that comes from setting goals and accomplishing them.

Principal Sandra Patton says it's more than having a dedicated staff. There is the dedication of the community and the commitment of private organizations that is shaping the outlook of this small school nestled in the former coal mining region of North Anderson County.

On this particular day students are busy working in the school's computer lab, taking in traditional instruction, and trying out new ChromeBooks the school received with a grant from Oak Ridge Associated Universities.

"They're learning," Patton beams. "These students come in here and there's an enthusiasm about them."

There are many reasons, many heroes of education, when you talk about the educational strides of Briceville Elementary School — one of three county schools to reach a 5 for its TCAP scores.

"It comes in layers," Patton says. "You reach one point, achieve one goal, and build on that."

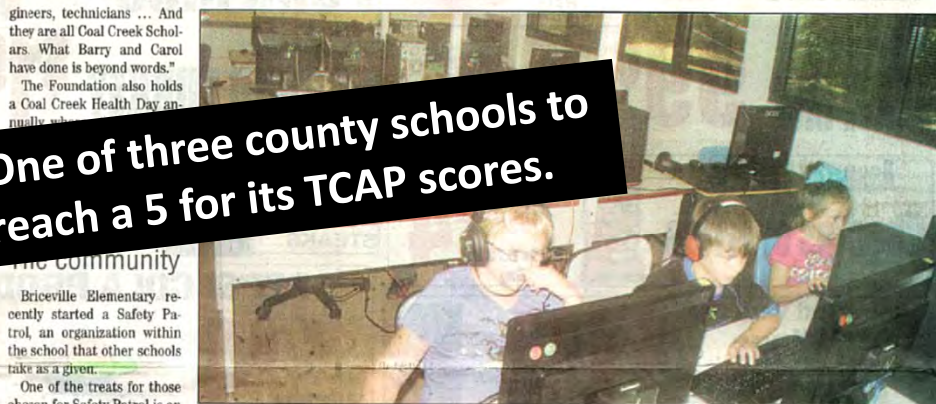
Coal Creek Watershed Foundation  
Education in our community

This year is Janis Bishop's first year at Briceville. As the technology coordinator she knows the importance of the computers and ChromeBooks, but as a descendant of coal miners she knows the importance of heritage ... And that is a large factor for Briceville students.

"The Coal Creek Watershed Foundation came in and showed these students



Madison Daugherty, Jimmy Smallwood, and Alex Harris, 5th graders in Jackie Byrge's class use ChromeBooks to complete assignments. — Photos by Ken Leinart



From left, second graders Tessa Dawson, Dalton Jobe, and Crimson Brannam make use of the computer lab.

One of three county schools to reach a 5 for its TCAP scores.

Briceville Elementary recently started a Safety Patrol, an organization within the school that other schools take as a given.

One of the treats for those chosen for Safety Patrol is an annual trip to Washington, D.C.

Patton says discussion about funding this trip for students kind of hit a snag

we appreciate what they do for us, how much our students appreciate it."

She took the time to reach out to the student, she est, to learn

fleurished," Patton notes. "Sometimes you have to give that extra attention, show an interest."

There's books, pencils, trip to the nation's capitol. But in the end ...

There are test scores, there is technology and heritage

"It's all about the students, Patton says.





# A STUDENT'S GUIDE TO THE TENNESSEE SENATE



*The Tennessee Senate uses Coal Creek Scholars as role models for all students in the state to emulate.*

nity in which you live, you will find people who need help and causes that need help.

- **Obey the laws.** As you grow older, you will decide whether to be a law-abiding citizen or a person who chooses not to obey the laws. This is a decision no one can make for you.

The things you do are already beginning to indicate whether you intend to be a law-abiding citizen or not. For example:

Do you follow the rules at school?

Does it matter to you what types of grades you make?

Are you the kind of person who litters, or the kind of person who picks up trash?

Are you honest with your parents and your teachers?

Do you do things halfway, or do you do your best?

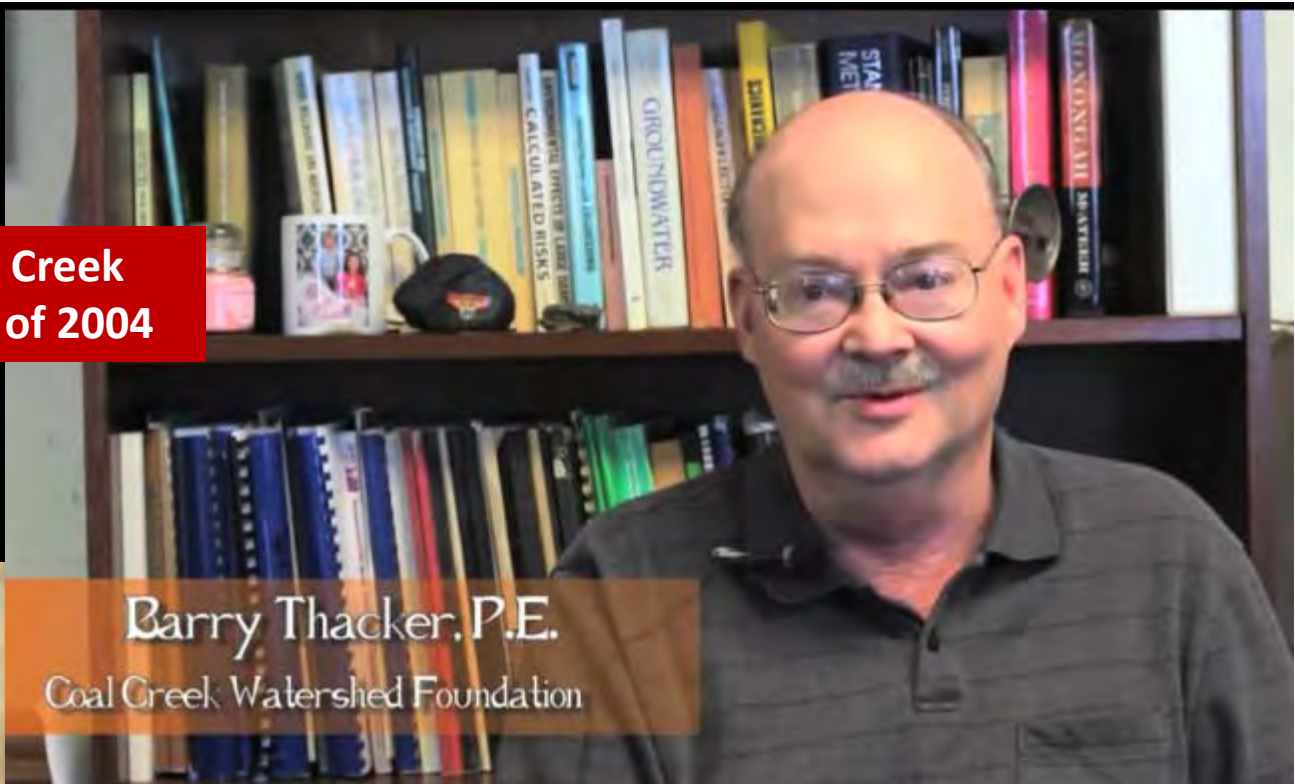
These are questions every citizen should ask themselves.



Volunteers in Briceville, in Anderson County, fix up a local landmark called Millitia Hill. (Coal Creek Watershed Foundation photo)



From DVD produced by Coal Creek Scholar Andy Harness, Class of 2004



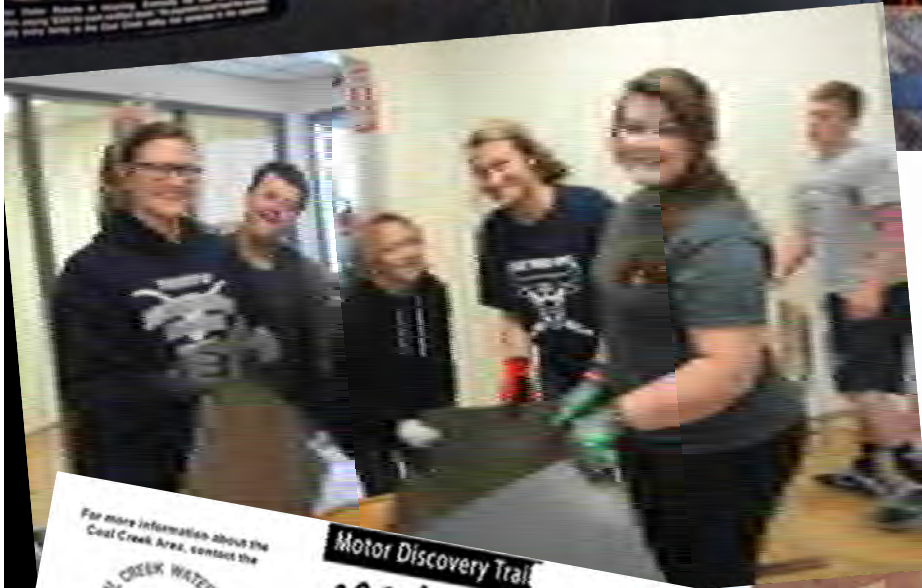
Barry Thacker, P.E.  
Coal Creek Watershed Foundation



Terry Frank  
Anderson County Mayor  
Daughter and Granddaughter of TN Coal Miners



Louise Nelson  
Granddaughter of Fraterville Miner David Dezern



...Education still matters...

For more information about the Coal Creek Area, contact the

**COAL CREEK WATERSHED FOUNDATION, INC.**  
2802 Overlook Circle  
Knoxville, TN 37909  
888.201.2096  
www.coalcreekand.com

**Motor Discovery Trail**

*Oh Gals for our more friends*  
Remember to bring it on the line

**Anderson County Tourism Council**  
www.yalocoma.org  
800-524-3002

**The History of Coal Creek Tennessee**



## Haslam calls for record boost for education

Joel Ebert and Jason Gonzales, [jagonzales@tennessean.com](mailto:jagonzales@tennessean.com) 9:27 p.m. CST February 1, 2016

Gov. Bill Haslam announced the largest investment in K-12 education without a tax increase in Tennessee's history during his sixth State of the State speech on Monday. The governor's \$34.8 billion budget proposal for fiscal year 2016-17 includes \$261 million in new money for public education, including \$104.6 million dedicated to giving teachers raises.



Out of the \$261 million for public education, \$247 million would be recurring funds. That tops what he put into the system last year, when education in Tennessee received a \$170 million budget increase.

The investment in education is one of historic proportions and allows Haslam to work toward a goal he set several years ago when he sought to make Tennessee the fastest-improving state in the nation when it comes to teacher pay. This year's pay increase is the second in two years. The Republican governor gave teachers a \$97 million pay raise last year.

## McQueen calls shortage of STEM graduates a crisis

Brian Wilson, [bwilson@dnj.com](mailto:bwilson@dnj.com) 6:12 a.m. CST February 12, 2016



MURFREESBORO — The ability to find and educate qualified workers in science, technology, engineering and mathematics has become a state and national crisis, said Tennessee Commissioner of Education Candice McQueen.

"We have too many jobs that require a STEM education that remain unfilled in Tennessee and across the nation," McQueen said at a STEM education conference organized by Middle Tennessee State University at the DoubleTree by Hilton Hotel in Murfreesboro on Thursday.

Tennessee is below the national average in producing graduates in science, technology, engineering or technology backgrounds.

That average, combined with a lack of interest in STEM fields among potential employers in the state to choose to create new jobs elsewhere, she said.

To change that, McQueen said students must earn their high school diplomas and receive post-secondary credentials or degrees while schools continue to foster interests in STEM fields as early as elementary school.

**...foster interests in STEM fields as early as elementary school.**



**So, you say you might be interested in teaching history to students as the living STEM-historian who made that history, but don't know where to start.**

- Do an Internet search for “Social Studies TN standards” to find which subjects are taught at the various grade levels. For example, American history is taught in 5<sup>th</sup>, 8<sup>th</sup>, and 11<sup>th</sup> grades.**
- Study the standards to get ideas for which historical STEM characters could teach various topics.**
- Research those historical characters to refine your selection.**

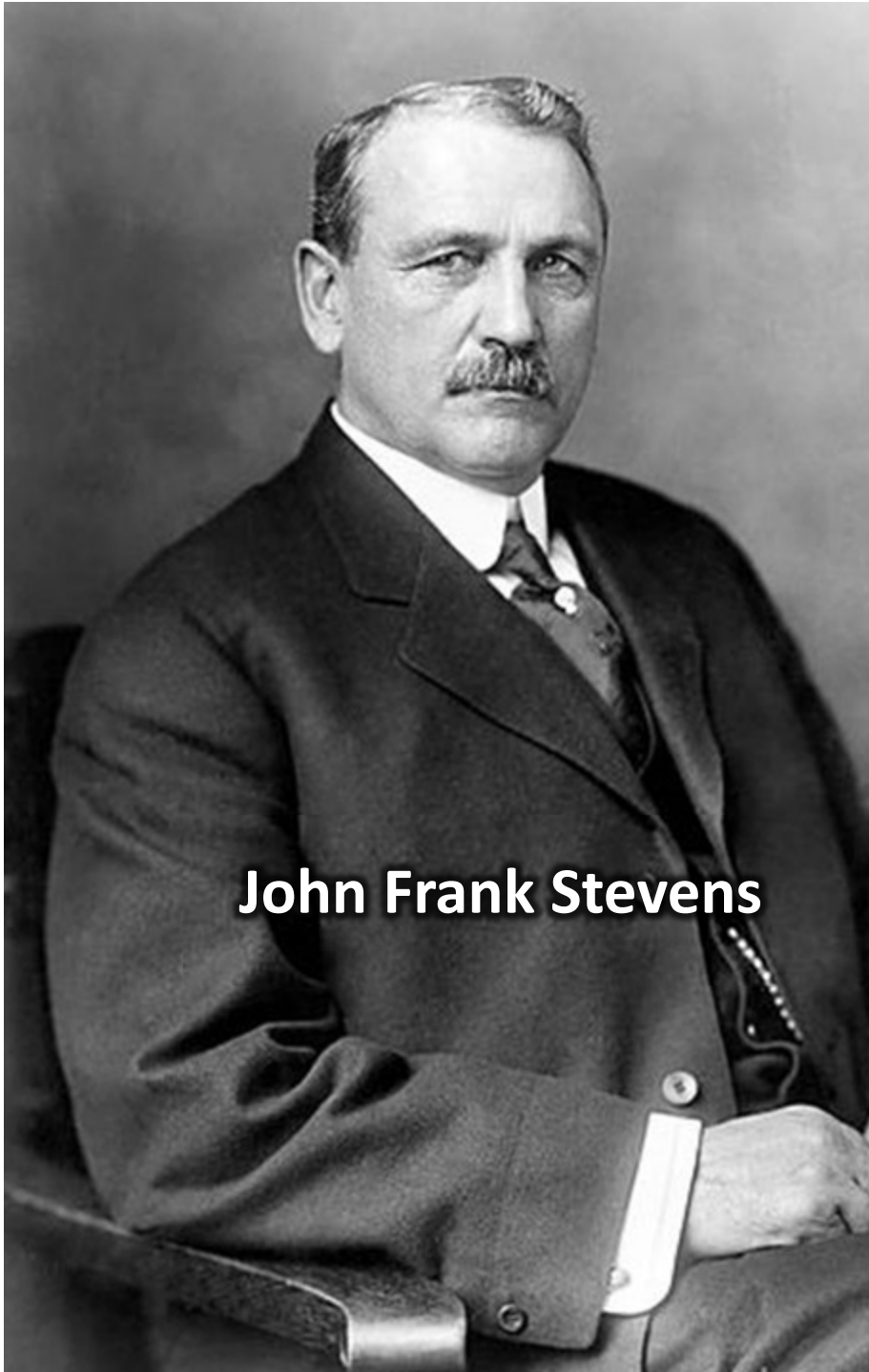


**Harrison (Jack) Schmitt**

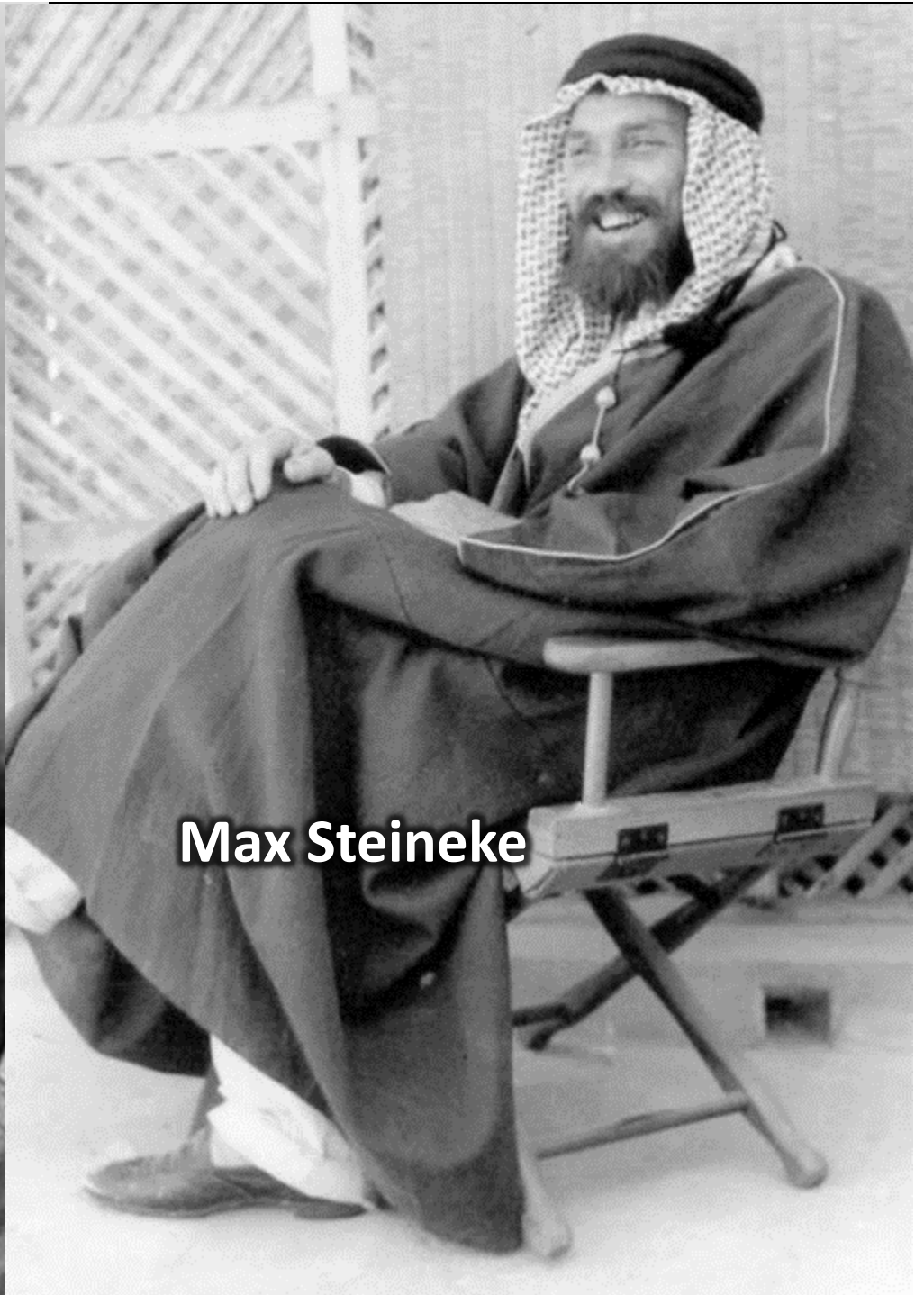


**Mae Jemison**

**A career in STEM is not just a job, it's an adventure!**



**John Frank Stevens**



**Max Steineke**




[www.historicalemporium.com](http://www.historicalemporium.com)

Invite today's students to be part of our STEM heritage...

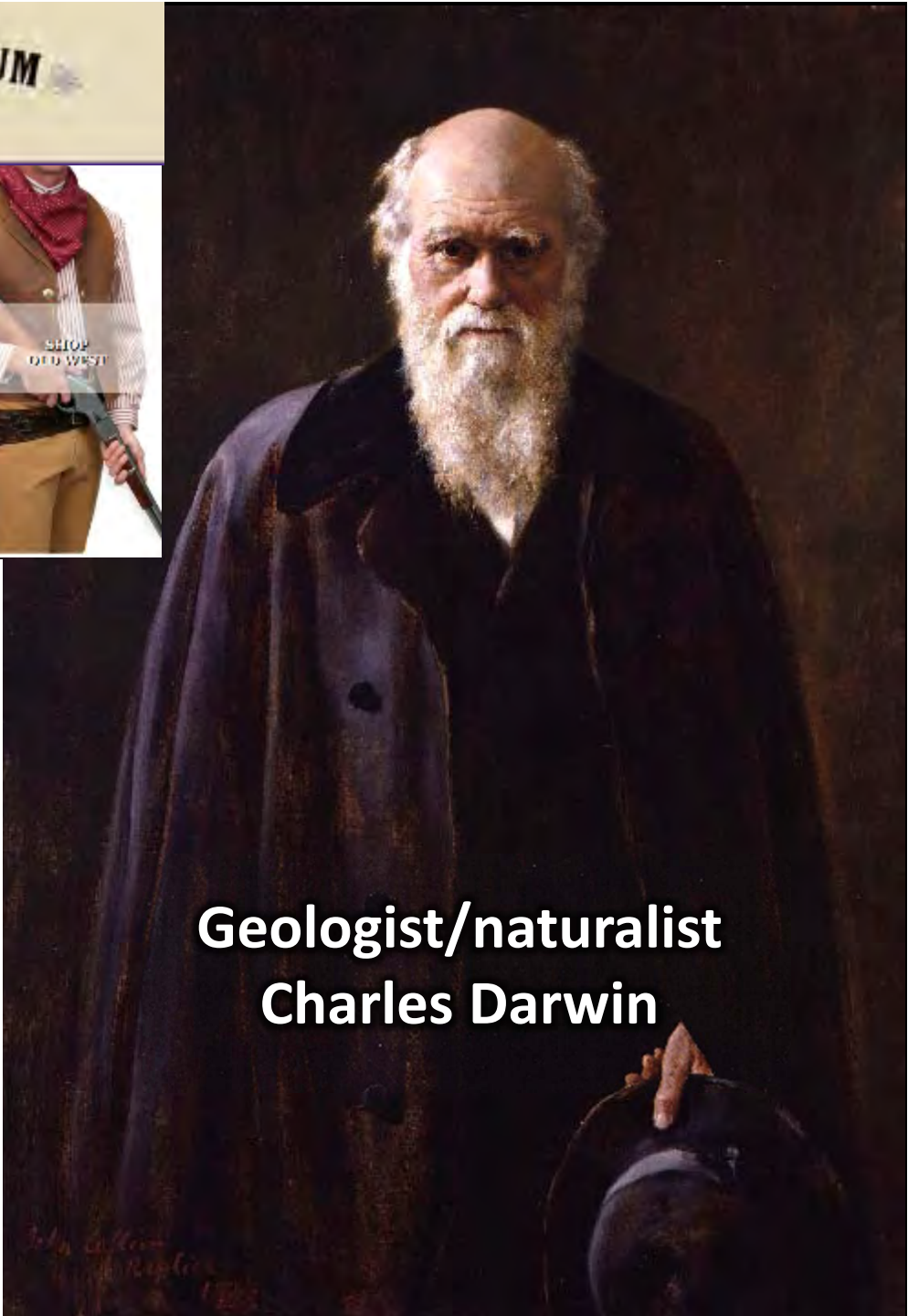
Florence Bascom

Herbert Hoover

“When you have confidence, when you know you have a heritage to be proud of, that makes a world of difference on your outlook...”



**HISTORICAL EMPORIUM**  
*Authentic Products  
and Old-Fashioned Service*

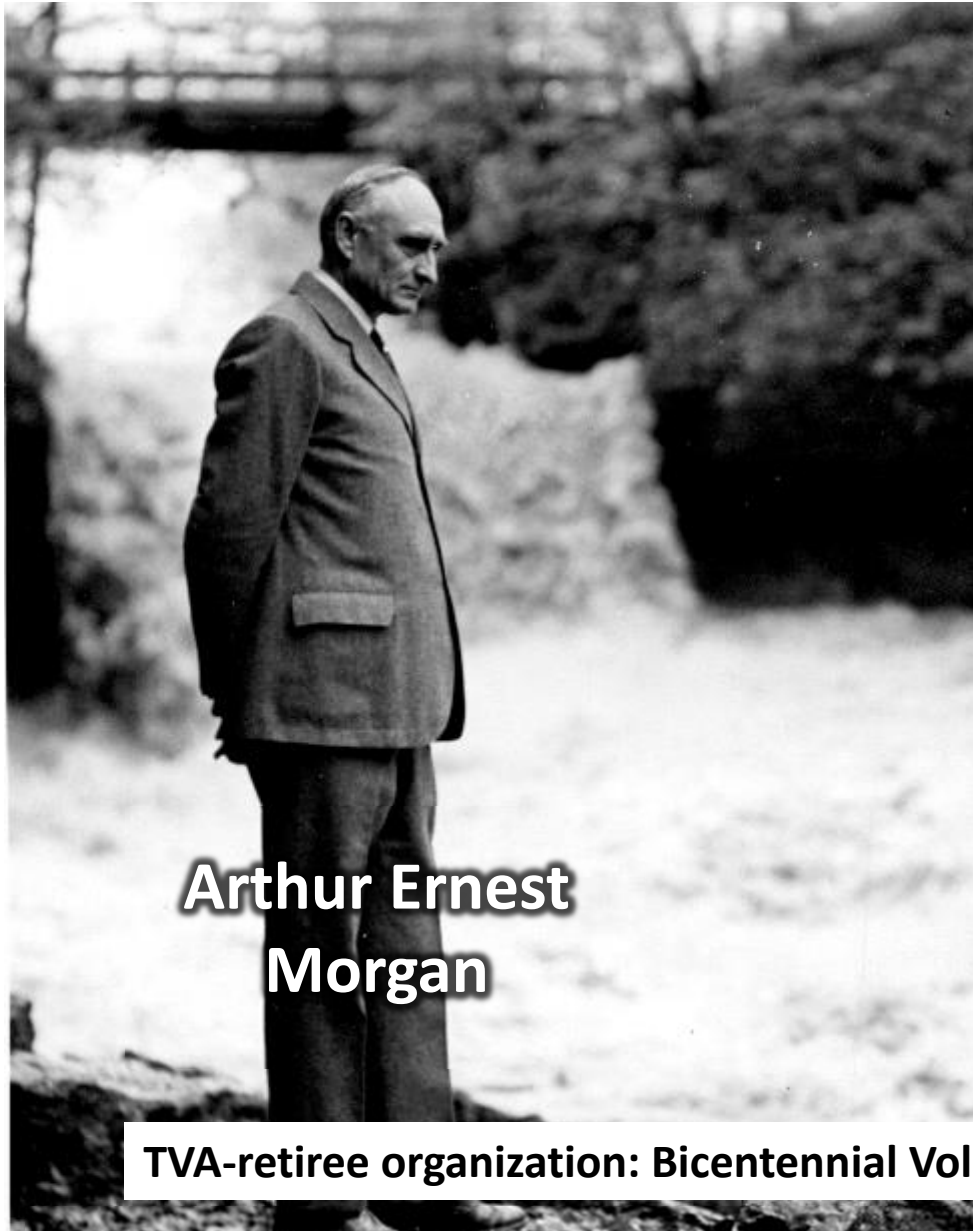




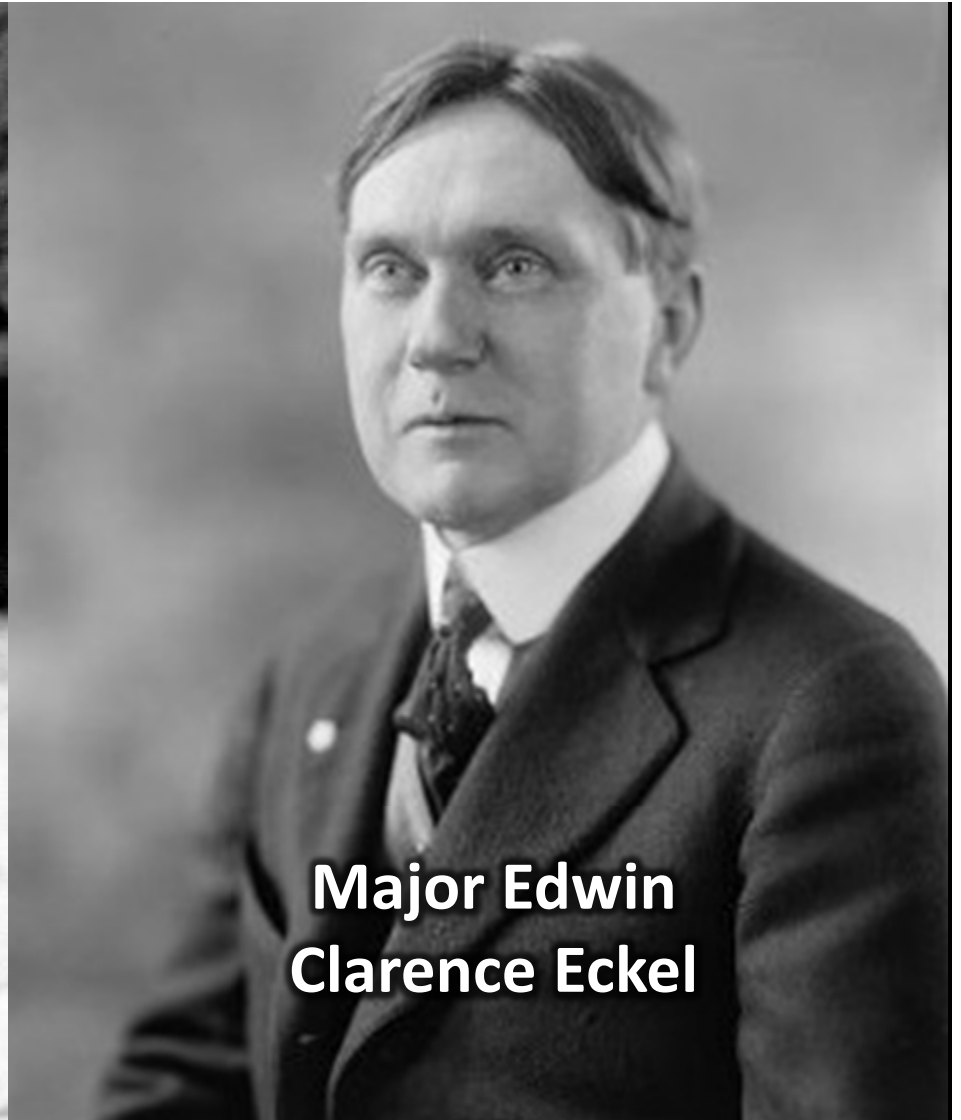
# BRINGING HISTORY TO LIFE

Ronald VAUGHAN MORRIS





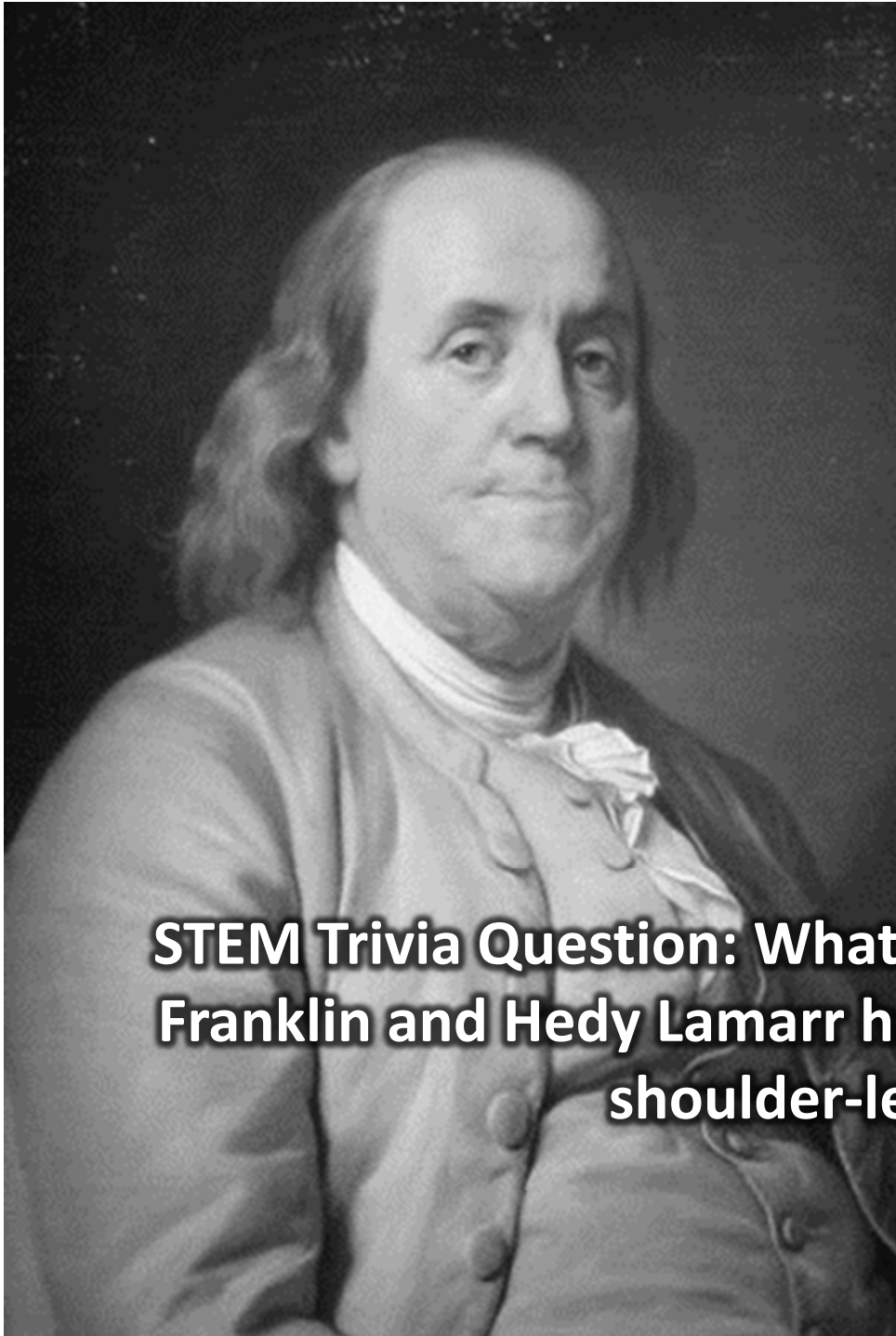
**Arthur Ernest  
Morgan**



**Major Edwin  
Clarence Eckel**

TVA-retiree organization: Bicentennial Volunteers Inc. <http://currentsofchange.net/>

**The science coach at Norris Middle School says she would love for a living TVA/STEM-historian to perform at her school...**



**STEM Trivia Question: What do STEM-professionals Ben Franklin and Hedy Lamarr have in common, and it's not shoulder-length hair?**



**Do you know that General Grant didn't go to the U.S. Military Academy to be a soldier, he went to get an engineering degree so he could build railroads as part of the Great Western Expansion?**

**If we don't inspire the next generation to pursue careers in STEM, who will?**

**Barry Thacker, PE, 865-584-0344,  
bthacker@schnabel-eng.com**



**Schnabel**  
ENGINEERING