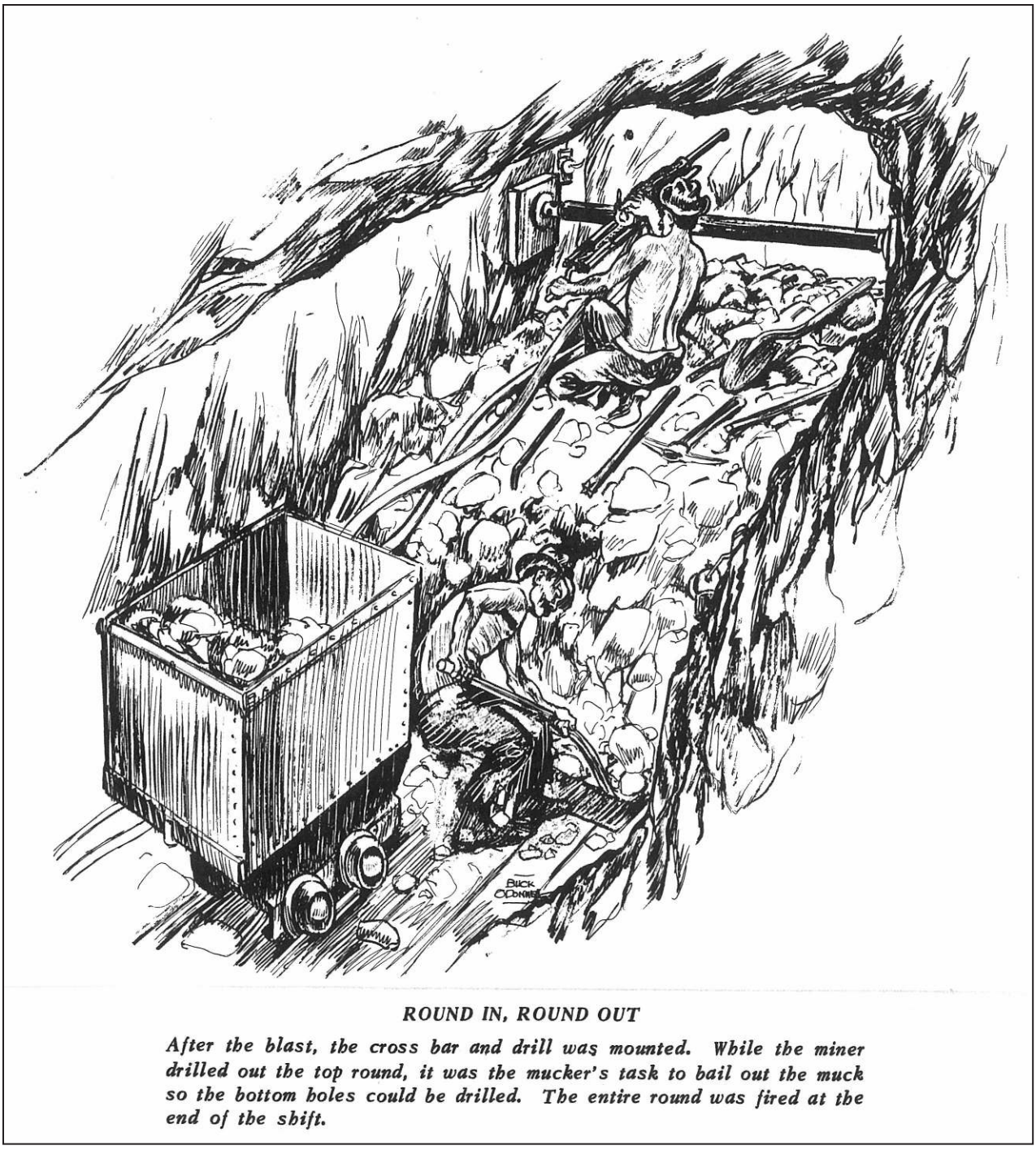
A Monument Should Be Built Honoring These Guys: The Invention of the Mucking Machine

By William Hawes

Few inventions or innovations in mining equipment have made such a significant contribution to the betterment of life for the underground hardrock miner as the invention of the overshot mucking machine. The effects on productivity were likewise significant. Until this invention, the process of removing the broken rock, called muck, following a blast was almost invariably done by shoveling it into an ore car. Occasionally, conditions permitted use of a scraper, known as a slusher, but this was rare.

Articles appearing in technical journals in the days before the mucking machine told of the efficiency gains to be made by placing a sheet of metal close to the drift face prior to blasting to create a slick surface off of which to muck, as opposed to mucking "rough bottom." But anyone who has worked underground in a mine using rail haulage will readily appreciate the value of the overshot loader, especially when driving a drift in a hot or poorly ventilated mine.

Prior to the overshot mucker, the closest thing to mechanized muck removal was provided by a device called a Butler shovel, built by Nordberg. However, this machine was essentially a miniature open-pit type shovel, requiring a minimum working cross-section of eight feet by eight feet. Those dimensions exceeded the accepted underground practice of the day: a cross section about four-and-a-half feet wide by six feet high, just enough to accommodate an ore car. Small underground cross-sections lowered expenses by reducing the labor and blasting supplies required and the amount of rock that needed to be handled.[1]



ROUND IN, ROUND OUT

After the blast, the cross bar and drill was mounted. While the miner drilled out the top round, it was the mucker's task to bail out the muck so the bottom holes could be drilled. The entire round was fired at the end of the shift.

A Buck O'Donnell drawing, "Rounding In, Rounding Out," from Yesterday's Mining, 1966. (Author's collection.)

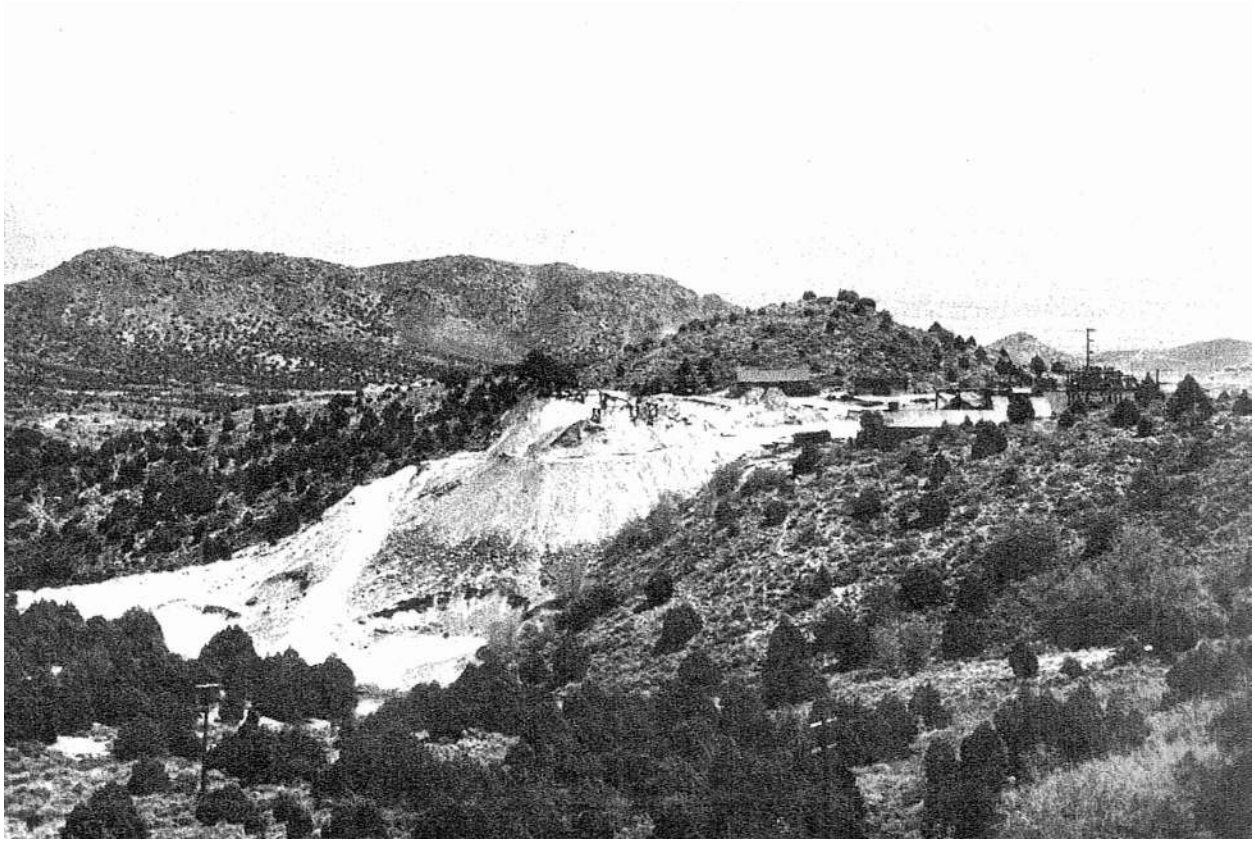
Inventing the Overshot Mucker

The Tintic Mining District, located some eighty miles south of Salt Lake City, is one of Utah's major mining districts. The Anaconda Copper Mining Company, through its subsidiary International Smelting Company, controlled the North Lily Mine, one of the significant lead-silver mines of the area. John Spence "Jack" Finlay—a native of Port Stanley, Ontario, who immigrated to the U.S. in 1890 and had been a supervisor in the Butte, Montana, mines—was the mine superintendent of the North Lily.

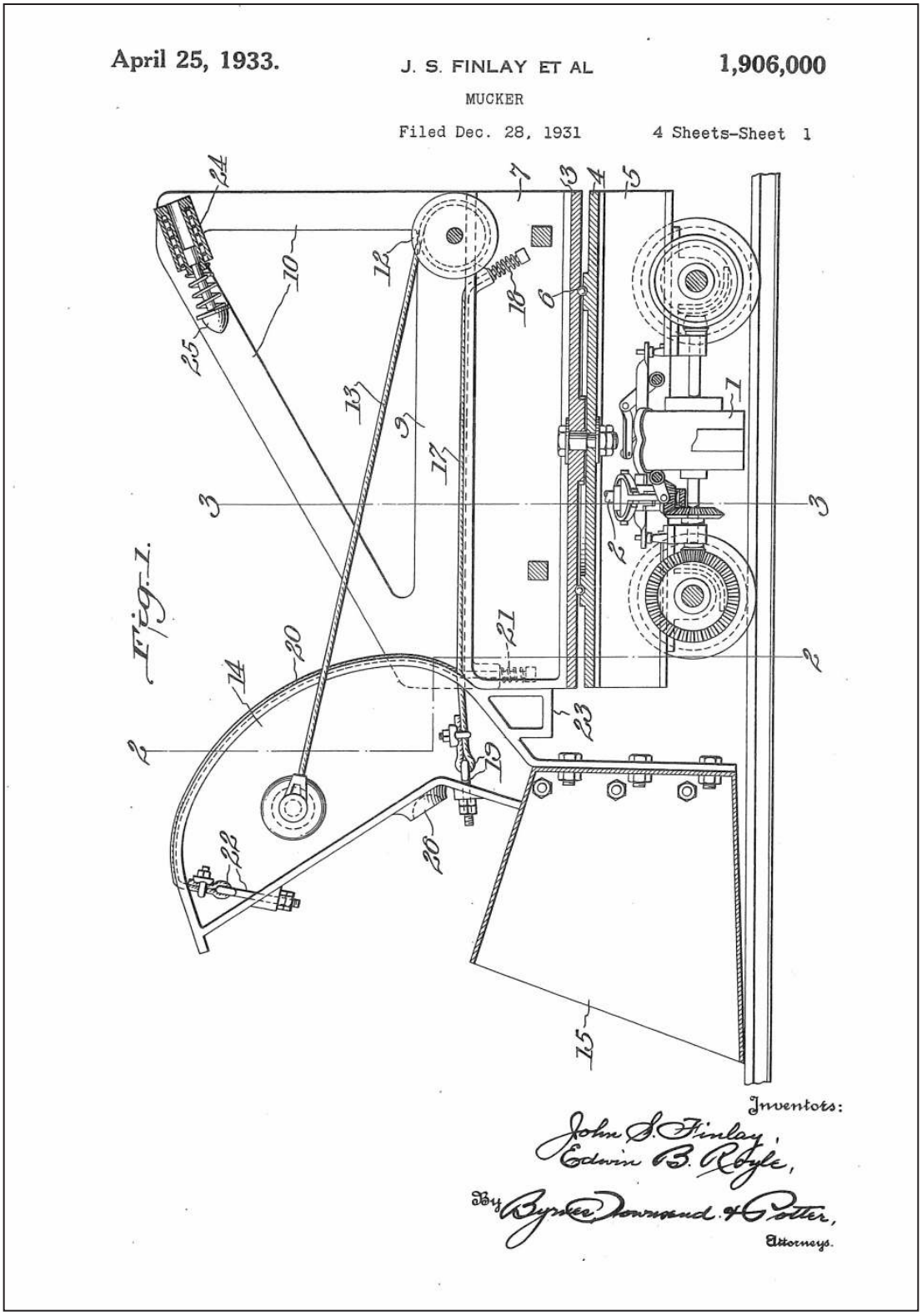
About 1930, Utah native Edwin Burton "Burt" Royle, a young, mechanically talented hoistman at the North Lily, had an idea for a machine to load broken ore into ore cars. He based the overshot loader on the action of the human arm in shoveling rock. Royle, talented in many ways, produced clear drawings of his idea from which a shop could construct a prototype.

Finlay wanted to develop a likely gold zone that required a lengthy drift to explore, but his funding was inadequate. He saw that Royle's idea could save much money and speed up the drifting process. He encouraged Royle to finish his drawings so that the machine could be made in the mine's shop. In those "good old days," the mine superintendent was basically "Lord God Almighty" at the mine, so Finlay had no problem getting Burt Royle's machine built. The mine's scrap pile was liberally used, including some parts from a wrecked Ford, to make the machine and minimize its cost.

This first machine was highly successful. On October 15, 1931, the *Eureka Reporter*, the local newspaper, recorded that advances of twenty feet per day were being achieved in driving the



The North Lily Mine. (From USGS Professional Paper 1024, "General Geology and Mines of the East Tintic Mining District," 1979.)



One of the patent drawings of the first mucker. (Courtesy of J. Kent Royle.)

Burt Royle and Jack Finlay. (Courtesy of J. Kent Royle.)

"Big Hill Drift," the high-priority drift exploring the likely gold-producing zone. The same article stated that fifty cars of muck had been handled in four hours, "which is considered phenomenal," and that the machine had not suffered any breakdowns after two weeks of use.[2]

Anaconda officials—who could have claimed rights to the machine, since both Royle and Finlay were Anaconda employees and the machine was built in Anaconda's North Lily shops—decided that the two inventors should share in whatever benefits their invention could bring. Anaconda did want to be the first to break the news of the invention to the mining world, however. Presumably, the company was the source of the article "New Mine Loader Promises Wide Application" in the April 1932 issue of the *Engineering and Mining Journal*.[3]

Manufacturing the Overshot Mucker

Not long after the success of the first mucking machine, at the end of 1931 or early in 1932, Finlay and Royle met with Joe Rosenblatt. Rosenblatt headed a Salt Lake City foundry known as the Eastern Iron and Metal Company (EIMCO), which, at the time, made air filters and generators.[4] Rosenblatt obviously recognized the potential of Finlay and Royle's mucking machine and agreed to manufacture it. With the

Jack Finlay on the first mucking machine. (From the Engineering and Mining Journal*, April 1932.)*

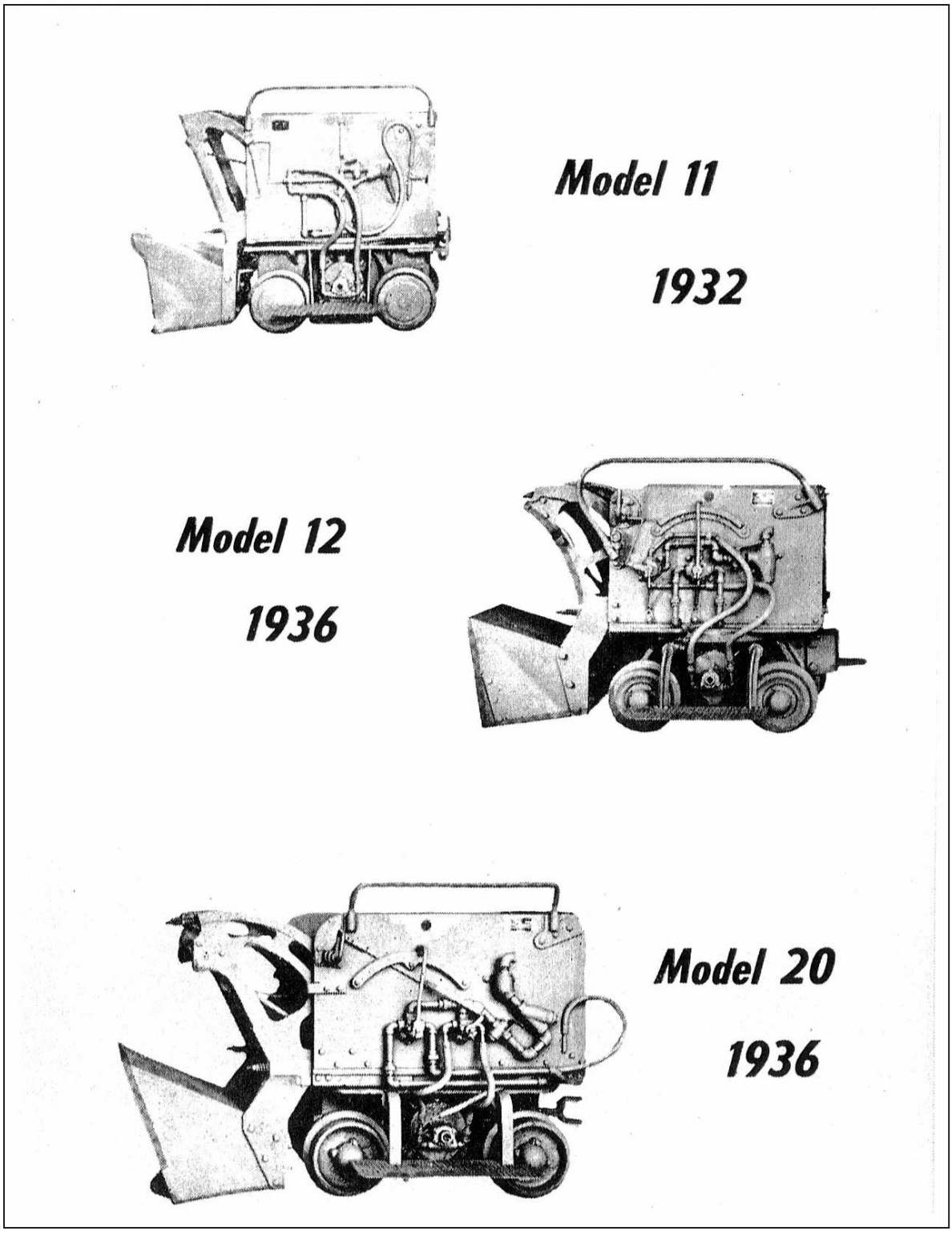
economic depression of the time, larger mining equipment companies were unwilling to invest money in making a new product, leaving EIMCO to undertake the project. The mucking machine gave the company a unique product line and was apparently responsible for EIMCO's subsequent growth and success.[5]

In 1932, EIMCO produced the Model 11 overshot mucker. The company built hundreds of these, although the exact number is not known. Four years later, in 1936, EIMCO began manufacturing Model 12 and Model 20 muckers. The Model 12 was a beefed up version of the Model 11 that incorporated features to eliminate wear points; the Model 20 was designed for use in larger headings. Later modifications of these types were known as models 12b and 21.

With the Great Depression's low demand for most metals and abundant cheap labor, sales of the mucking machine were initially a challenge; however, EIMCO sold the muckers with a two-week, money-back guarantee. If the machine failed to live up to its promise, it could be returned with a full refund. None were returned. A headline in an August 1932 issue of the *Eureka Reporter* declared: "Mucking Machine Proving Popular". The article reported that a machine was then being crated for shipment to the Philippines, two had been sent to Alaska, and six were in use in Utah, five in California, and one in Nevada—a good record for a new machine in production for only a few months during a depression![6]

After the agreement granting EIMCO the exclusive right to manufacture the overshot mucking machine, the company hired Burt Royle as a consultant and assigned other EIMCO engineers to assist him in designing other mucking machines. Jack Finlay retired. Both men received royalties on each mucker sold. Royle probably received a larger royalty, but Finlay's name appeared on the mucking machine's nameplate for several years. Finlay died in 1935 in Salt Lake City.

Royle worked for EIMCO at their Salt Lake City headquarters until arthritis caused him to move to California, where he consulted on mining machinery with EIMCO and other clients



EIMCO product sheet showing models 11, 12, and 20. (From the EIMCO catalog, 1945.)

until his death in 1957. Royle had several patents issued to him throughout his life, not only for overshot mucking machines, but also for a shaft mucker and for a system for ventilating automobile interiors. He obviously had a very active and productive mind.

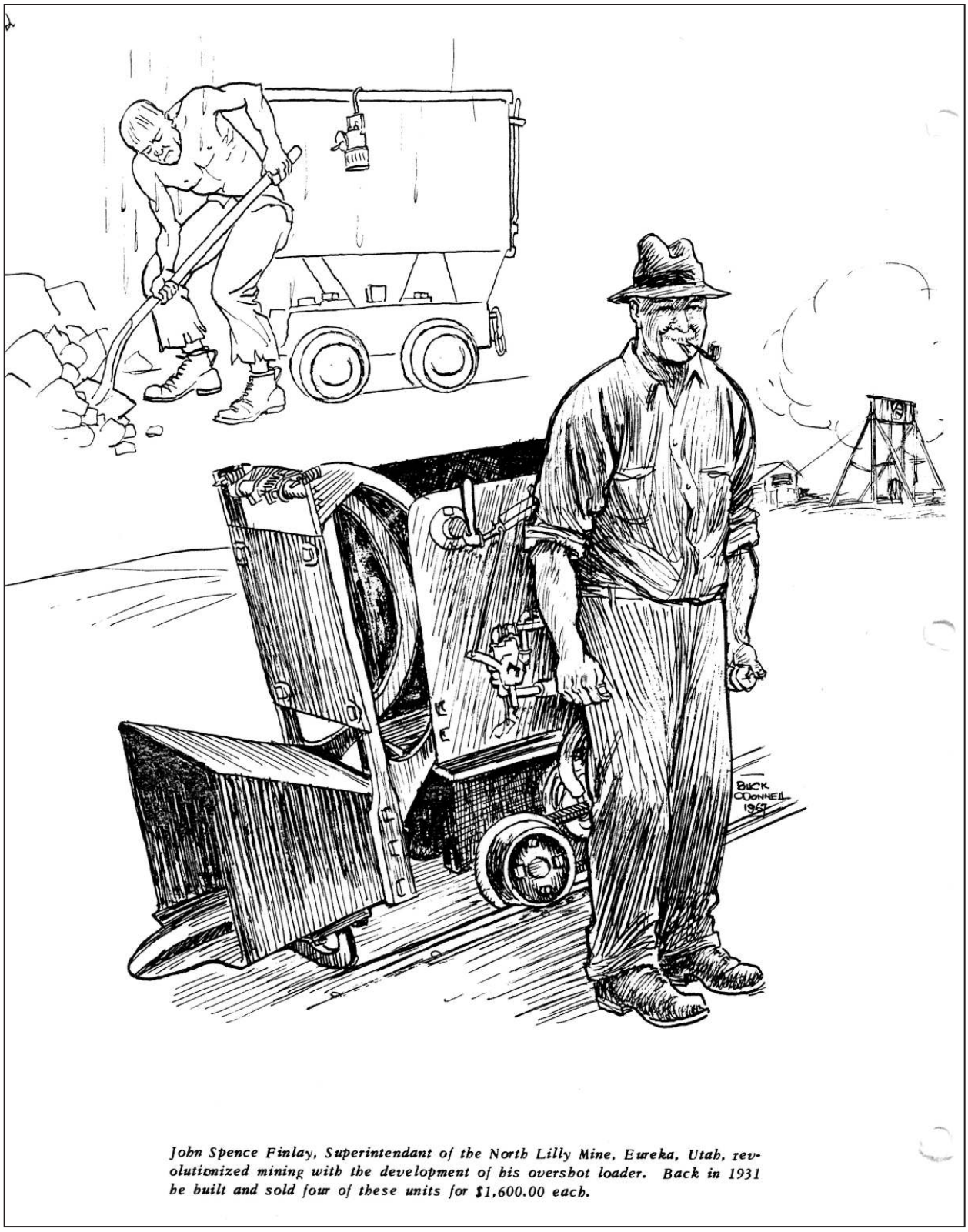
Burt Royle and the Overshot Mucker

In researching who invented the overshot mucking machine, Finlay's name always came up. Royle's place in the process emerged after the late Harry Spencer, president of Centennial Development Company of Eureka, suggested contacting Joe Rosenblatt, the retired president of EIMCO. It was Rosenblatt who said that Burt Royle actually had the major role in inventing the overshot mucker.[7]

Finlay seems to be credited with inventing the overshot mucker, however, for several reasons. One was that the nameplates on early muckers bore the words "EIMCO-FINLAY LOADER". Another was that one of the few books on the history of the Tintic Mining District—*Towns of Tintic*, by Beth Kay Harris (Denver: Sage Books, 1961)—has a picture of Finlay operating the mucker with the caption: "Jack Finley [*sic*], inventor of the mucking machine used in the Tintic mines."[8] A third element detracting from Royle's role was one of Buck O'Donnell's drawings, which attributed development of the overshot mucker to Finlay.[9]

Two problems in researching the invention of the mucking machine have also contributed to Royle's obscurity. Both Royle and Finlay were unassuming men who left few records. Compounding this is the rash of corporate buy-outs and mergers, in which many records of great value to

An EIMCO-Finlay nameplate. (Author's collection.)



*Buck O'Donnell's drawing of Finley. (*The Old Timers*, 1967; author's collection.)*

historians have been discarded or otherwise lost.

As one of a vanishing generation of underground miners who had to wield a shovel to muck broken rock, even if just spillage, I know that the industry became vastly better and safer as a result of this invention. Once in my younger years, when I was an eager mining engineer—young and dumb might be a more fitting description—I was going through a mine looking at places that needed updated surveying. I came upon a drift crew whose mucker had broken one of the cables on its arm. The crew, only about a carload of muck from having a clean face so that they could set up to drill and blast, were hand mucking the remaining ore into a car. I grabbed a shovel and soon realized what a great invention the mucking machine was. One of the miners commented: "I don't know who invented the mucker, but he should have a monument erected to him." Those words have always stuck with me, and led me to find out who was responsible for this breakthrough in mining.

Bill Hawes is a retired mining engineer who worked at numerous underground mines, primarily in the Rocky Mountains, in all facets of mining from entry level to management. He has always been interested in mining history and belongs to several other mining-history related organizations besides the Mining History Association. *He gratefully acknowledges the help of June and Coleen McNulty of the Tintic Historical Society, Eureka, Utah; Kent Royle of North Las Vegas, Nevada, whose photos, patent drawings, copies of old newspapers, and personal information about his father made this article possible; the late Joe Rosenblatt, through personal communication and his oral history; Larry Hoffman of Butte, Montana, for his suggestions and knowledge of the matter; and Paul Pierce, for his suggestions on technical writing.*

Notes:

1. It should be remembered that powder consumption was carefully tracked, explosives being one of the more expensive consumables in mining, as these were usually shipped in from distant locations.
2. *Eureka [UT] Reporter*, 15 Oct. 1931, 1.
3. "New Mine Loader Promises Wide Application," *Engineering and Mining Journal* 133 (1932): 233. My assumption, from personal experience, is that *E&MJ* used information provided by a company spokesman. There is no author of this article listed, which is consistent with my experience when company information has been provided.
4. Kent Royle (son of Burt Royle), interview with the author, 18 Apr. 2013.
5. Joseph Rosenblatt (1903-99), oral history interview by Eleanor Swent, "Western Mining in the Twentieth Century," Regional Oral History Office, Bancroft Library, University of California, Berkeley, 1991. Until it started making muckers, EIMCO was a fairly small foundry. By 1937 the company was doing well enough to send Burt Royle and his wife to Europe on a sales trip, paying their passage on the *Queen Mary*. (Kent Royle, interview, 18 Apr. 2013.) Ingersoll-Rand and Gardner Denver indicated that they were not interested in tooling up to produce the mucker due to economic conditions. (Rosenblatt, oral history.)
6. "Mucking Machine Proving Popular," *Eureka [UT] Reporter*, 4 Aug. 1932.
7. Rosenblatt credited Royle as the primary inventor of the overshot mucker in a phone call with the author in 1988. He repeated this opinion in his oral history, Bancroft Library, University of California, Berkeley.
8. Beth Kay Harris, *Towns of Tintic* (Denver: Sage Books, 1961), 121.
9. Buck O'Donnell, *The Old Timers* (Salt Lake City: Shaft and Development Machines Co., 1967).