

Model No. 2696 Eveready Shot Firing Unit

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The United States Bureau of Mines began to evaluate single-shot blasting machines for use in underground mines in 1919. While prior blasting apparatus could be used to fire a single shot, most such devices were large and bulky, and were intended for firing multiple charges in multiple boreholes. Most importantly, they were not safe for use in places where electrical arcing and sparks could detonate suspended coal dust or volatile gases.

The Bureau tested and approved dynamite, and later other explosives like emulsions, for their emission of heat and flames during detonation. Only explosive compositions that produced small, low-temperature flames were deemed “permissible” in coal and other dusty or gassy mines. Blasting powder exploded with such large and hot flames that it was never approved underground, although many miners used it nonetheless (The Bureau’s recommendations had no force of law until the 1970s.).

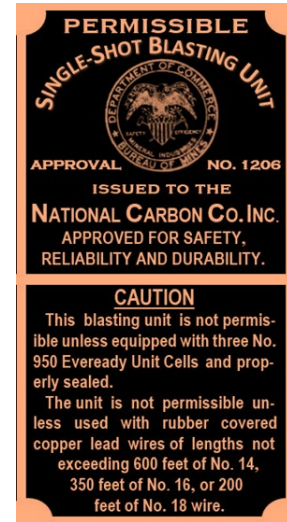
Also tested were a wide range of mining equipment including ventilation systems, electrical generators, drills, air compressors, lamps, flashlights, and telephone systems. There were three main focuses of the tests: safety, reliability, and durability. First and foremost, a device could not spark, arc, or otherwise produce enough heat to initiate the explosion of gases or suspended coal dust in tunnels, shafts, and rooms. Second, the machines had to reliably perform their functions so as not to induce the use of less-safe, fallback substitutes. Finally, devices were required to be durable enough to survive expected rough treatment over a reasonable lifetime of use. Pieces of equipment that passed muster were awarded an approval plate emblazoned with the seal of the Bureau of Mines, and imprinted with a unique approval number, the name of the maker, and warnings as necessary.

There were two basic types of small blasting machines: magneto and dry-cell battery. In 1915 DuPont introduced its five-cap capacity, magneto-powered, Pocket Blaster. Hercules Powder

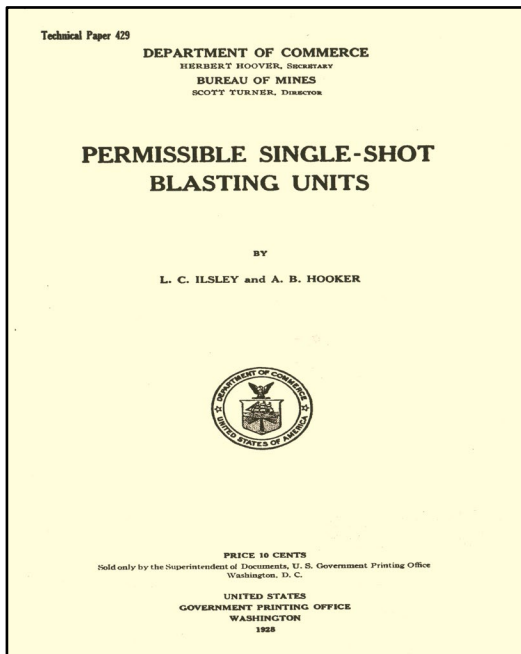
Company followed suit with its four-cap Midget Blaster in 1916. Giant Powder Company’s version of this small machine was ironically named the Giant Blaster. This style of device is actuated by the swift twist of a handle or key. Slightly larger versions with a capacity of ten caps appeared in 1928. None of these machines were deemed safe for underground mining. The Bureau of Mines stated bluntly in 1928 that, at the time, there were “no permissible multi-shot blasting machines.”¹ In fact, all Bureau-approved blasting devices were one-shot units until the 1940s, when the first multi-cap machines were finally certified. The main issue with firing multiple shots is the increased amount of electricity involved and the elevated chance for potentially catastrophic arcing or sparking. (The DuPont Pocket Blaster was granted permissibility in 1924, but only after being heavily modified for single-shot blasting.)

The second type of small blasting machine relied on batteries for power and included the popular Edison cap-lamp-battery shot-firing attachment. However, cap lamp batteries were quite heavy, weighing from three to five pounds.

The No. 2696 Eveready Shot Firing Unit, made by National Carbon Company, was a lighter, more compact



Approval plate issued by the Bureau of Mines.



The Eveready Shot Firing Unit was the only device of its kind approved by the Bureau of Mines.

blasting device that incorporated small, dry-cell batteries. With batteries installed, it weighed one pound.

In this article we will learn about this unusual, small blasting device - the only one of its kind to ever earn the blessings of the Bureau of Mines for underground use. Approval did not come easy; only fifteen shot-firing devices or batteries of all types were approved as permissible by the Bureau in the 1920s and 1930s.

After the introduction of dry cell batteries in the 1890s, miners and farmers would simply tape some batteries together, pole to pole, and touch the lead wires of a blasting circuit to the opposite ends of the stack of batteries. In 1928, the Bureau of Mines wrote that, "Dry cells have been used for years as a means of firing single shots. In general, these cells have been used in groups of two or three cells taped together, with the ends partly exposed to allow contact with the ends of the leading wires. Such an outfit is effective, but the use of any battery with exposed terminals is a potential source of danger from accidental firing."²

That users would rig batteries in this way reflected the need for small devices for accomplishing basic blasting.

Very little current is needed to initiate a single shot, and too much current can melt the wires of a blasting cap together without firing the shot. According to a Hercules Powder Company engineer in 1923, "A current of at least 0.4 amp. is required to ensure certain firing of a single cap. With small currents, the explosion occurs before the wire is fused by the current. With large currents (above 3 amp.) the wire is fused by the current before the explosion occurs."³ (Most of the small, lettered, consumer-use batteries generate 1.5 volts. The current, or amperage, depends on the size of the battery; the larger the battery, the more current it can deliver. A "D" battery can produce up to 8 amps, but the current must overcome the resistance of the wires to the cap in order to deliver adequate amperage. The current is also only applied for a few milliseconds.)

In the 1940s and 1950s, some larger, stand-alone batteries were marketed as "shot-firing batteries." These were ordinary, three- to nine-volt, two-pole batteries, oversized by today's standards, with both poles on top of the cell. Such batteries could also be used for a long list of other uses such as powering radio sets and boat lamps. Atlas Powder Company offered a battery of this type called the Keystone Blasting Battery. National Carbon Company sold one version as the No. 702 Eveready Shot Firing Battery and another as the Columbia Hot Shot Battery.

National Carbon Company was founded in 1886 in Ohio and introduced the first small, cylindrical, dry-cell battery in 1894. Russian immigrant Conrad Hubert founded American Electric Novelty Company in 1898. An employee, British inventor David Misell, was granted US Patent No. 617,702 on January 10, 1899 for a battery-



Eveready No. 950 Unit Cells.



Model No. 2696 Eveready Shot Firing Unit.

operated, electric flashlight. In 1908, American Electric Novelty Company changed its name to American Ever-Ready Company. National Carbon Company acquired American Ever-Ready Company in 1914. After the acquisition, American Ever-Ready Company became a subsidiary of National Carbon Company known as the American Ever-Ready Works. The name on products was shortened to “Eveready.” National Carbon became a subsidiary of Union Carbide Company in 1917, and continued to operate under its own name.

On August 10, 1926, National Carbon Company was granted formal label registration from the United States Patent Office for its new small blasting machine. The entry reads, “30,759 – Title: EVEREADY SHOT FIRING UNIT. For Electric Batteries. NATIONAL CARBON COMPANY, INC., New York, N. Y. Published May 15, 1926.”⁴

The model No. 2696 Eveready Shot Firing Unit originally cost \$3.00 and was powered by three No. 950 Eveready unit cells, now known as D size batteries. (Assigning letters to batteries did not start until 1928.) The device measured 8 1/2" x 1 1/2", just larger than a standard stick of dynamite. The machine had been tested by the Bureau of Mines and approved in August of 1925.

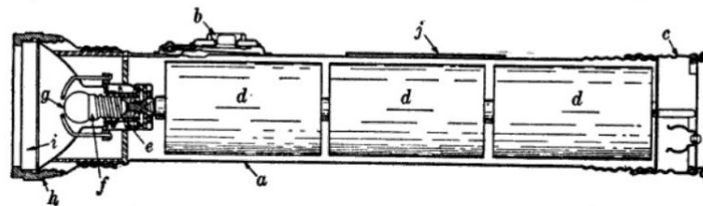


Model No. 2695 Eveready battery-operated flashlight with belt ring extended.

The device was never patented. The Patent Office registered “Prints and Labels” from 1876-1940. This was an early form of copyright for product names and descriptions. The reason the device was not patented is unknown.

The shot-firing unit was modeled on one of National Carbon Company’s other products, the No. 2695 battery-operated flashlight. Eveready was the only manufacturer to get its battery-operated, tubular flashlights approved by the Bureau of Mines for use in underground mines through the 1920s. By 1940, seven producers had flashlights on the approved list, including Justrite, Megolite, Bright Star, Mine Safety Appliance Company, and Stewart R. Browne Manufacturing Company.

In 1926 Eveready wrote, “It will pay you to use this new Eveready Safety Flashlight which has been especially designed for use around explosive vapors and gases in mines, oil and gas plants, etc. It has the official approval of the Bureau of Mines and the Underwriters’ Laboratories.”⁵ (Underwriters’ Laboratories, founded in 1894 and now known as UL Solutions, performs safety tests on a wide array of consumer and industrial



Interior view of Model No. 2695 Eveready flashlight.

products.) Eveready offered a variety of what it billed as “Miner’s Flashlights” and “Safety Flashlights” in both two- and three-cell models. In the 1920s, the lights cost from \$2.00 to \$3.00 each.

According to the Bureau, “All permissible lamps must be so designed that they will not produce dangerous sparking.”⁶ This included electric cap lamps and large, free-standing lamps. “The Eveready flashlight was designed for the use of mine officials, rescue workers, and others where a special safety lamp is required for inspection service,”

per the Bureau. The flashlight featured a special, non-arcing switch and “a safety device which ejects the bulb and extinguishes the filament if the bulb glass is broken.”⁷ The switch also had a raised ring around it and was spring loaded, making it almost impossible to accidentally turn on.

As for blasting units, “The trials comprised safety tests, including both battery sparking and battery short-circuit tests; mechanical tests, in which four complete units are each dropped twenty times from a height of three feet onto a concrete floor; and shot firing-capacity tests, using cells that were at least six months old.”⁸

In 1928 the Bureau, in its bulletin, *Permissible Single Shots Blasting Units*, devoted almost a full page to a description of the Eveready device. Also included was a full-page photograph of the partially-disassembled device, showing its various features, plus another, half-page photograph of the fully-assembled unit. According to the bulletin,

The Eveready permissible-type dry-cell combines the lightness and adaptability of flash-light dry cells with safety. The three cells are enclosed in a nickel-plated brass tube, which is closed at one end and sealed at the other end by sealing wire to prevent tampering with the cells, even though the cap be removed. Bail allows the complete unit to be carried on a belt. Connection between the leading wires and the battery is made by means of the special plug through a receptacle against the action of an ejector spring.⁹



Wires were threaded through housing of the firing plug and attached to the firing pin with screws.

Leading wires were attached to the firing pin, and the pin was inserted into the battery housing to fire. The ring was for hanging on a wall or belt. A safety feature consisted of a spring that prevented the firing pin from engaging unless deliberately pressed home.

The device received brief mention in the journals of the day. An article in *Coal Age* in May of 1927 reported that,

What is said to be the most convenient and the safest battery-operated shot-firing device ever offered has been recently announced by the National Carbon Co., Inc., of New York. This machine, known as the Eveready Shot Firing Unit, has been approved by the U. S. Bureau of Mines. Its unique features also make it suitable for use on the surface, in quarries, in stump blasting and, in fact, whenever blasts are fired one at a time. It is small, compact, and light in weight and, as no fuses are required, dangers from misfires and delayed shots are eliminated. This device, operated on dry batteries which are easily renewed, is said to be safe, as the shots cannot be fired accidentally. The wires leading from the cap are fastened to a special plug and, in order to fire a shot, it is necessary to insert this plug in a small socket in the end of the device and to hold it there against the pressure of a spring. The plug cannot be left in contact, as the spring forces it out of connection as soon as it released by the hand.¹⁰

In July of 1928, *Hardware Age* related that,

The danger of misfires or delayed fires from fuse troubles in individual blasting is done away with by the shot firing unit introduced recently by the National Carbon Co., Long Island City, New York, with the approval of the United States Bureau of Mines. This Eveready Shot Firing Unit No. 2696 is now available for use not only in mining, but for all conditions where shots are fired at one time, on the surface, in quarries, in stump blasting , etc.



EVEREADY SHOT FIRING UNIT

The Eveready Shot Firing Unit is the most convenient and the safest battery-powered firing device ever offered. It is approved by the United States Bureau of mines for use in mining, and its unique features also make it suitable for use on the surface, in quarries, in stump blasting, in fact wherever blasts are fired one at a time.

Nickel plated. Size 8½x-1½ inches. Uses three No. 950 Eveready Unit Cells.

No. 2696—Eveready Shot Firing Unit (Not including Cells)..... Each, \$3.00

One in a carton.

Hardware catalog listing from 1928.

Drawing its power from a dry battery cell contained in its compact light weight cylinder, this product brings the advantage of electric blasting to every blaster. The unit is patterned after the popular tubular flashlights produced by the same company, and has the appearance of a flashlight even in the convenient ring hanger on the bottom cap for hanging on one's belt or a nail or hook on the wall. The ring hanger, when not in use, snaps over the bottom cap, out of the way. The unit contains three standard flashlight batteries, or unit cells, during the lifetime of which hundreds of shots can be fired...Under the United States Bureau of Mines' regulations, the unit cells are sealed in place by the user after he has inserted the cells into the shot firing unit, which is shipped empty. A piece of wire is run through the hole in the end of the tube. The end of the wire is connected with an electric cap which is inserted in a cartridge at the blasting point. The other end of the wire is connected with a plug, which is pushed in the hole at the end of the firing unit to make proper contact and fire the blast.¹¹

(The "end of the tube" is that of the firing plug, not the whole unit.)

References to the device all but disappear by 1930, and today examples only infrequently come up for sale. There are several likely reasons for its scarcity. First,

underground miners favored cap lamp battery attachments over other types of blasting machines for their convenience, which offset their weight. As late as 1955, the Bureau of Mines observed that, "Several single-shot magneto types have been approved but are not actively marketed owing to the widespread use of the electric cap lamp with the single-shot attachment."¹²

The Eveready Shot Firing Unit may have suffered a similar fate. Use of the device came with the added inconvenience of disassembling the firing plug and attaching the leading wires to the internal connecting posts and tightening them with a screwdriver. With a cap-lamp blasting attachment, the wires were simply inserted into receptacles.

Also, the firing plug for the Eveready unit was in practice a separate piece of equipment and would have had to have been carried in a pocket or elsewhere, making it prone to being misplaced.

Finally, cap lamp batteries are extremely robust. But if the Eveready device were hung on a belt as intended, only a firm bump or two against the rough wall of a mine could damage the relatively thin brass tube beyond repair. In short, the Bureau's approval for durability may have been at least somewhat premature, because the drop tests that were performed did not administer stress to the sides of the tube.

Whatever the reasons, examples of the model No. 2696 Eveready Shot Firing Unit are difficult to locate. The marvelous website Hal's Lamppost has several pictures of both the Eveready Miner's Flashlight and the Shot Firing Unit, and characterizes the former as "scarce" and the latter as "rare."¹³ Correct, 1920s, unlettered batteries are also a challenge to acquire. Boxes for the flashlight occasionally come up for sale, but I have yet to see a box for the shot-firing unit.

Notes

1. Lee Clyde Ilsley and A. B. Hooker, US Dept. of the Interior, Bureau of Mines, *Electric Shot-firing in Mines, Quarries, and Tunnels* (Washington, DC: USGPO, 1926), 116.
2. Lee Clyde Ilsley, US Dept. of the Interior, Bureau of Mines, *Permissible Single-shot Blasting Units* (Washington, DC: USGPO, 1928), 19, 20.
3. N. S. Greensfelder, "Shot-firing by Electricity," *Contractors and Engineers Monthly*, January 1923, 62.
4. United States Patent Office, *Index of Patents Issued from the United States Patent Office: 1926* (Washington, DC: USGPO, 1926), 1900.
5. "Adopt This Lamp as Standard Equipment," National Carbon Company, advertisement, *National Petroleum News*, April 7, 1926, 119.
6. Lee Clyde Ilsley and A. B. Hooker, US Dept. of the Interior, Bureau of Mines, *Permissible Electric Mine Lamps* (Washington, DC: USGPO, 1930), 30.
7. *Ibid.*
8. Lee Clyde Ilsley, US Dept. of the Interior, Bureau of Mines, *Permissible Single-shot Blasting Units*, 19.
9. *Ibid.*
10. "Electric Shot-Firing Device Safe and Convenient," *Coal Age*, May 26, 1927, 50.
11. "Eveready Shot-firing Unit," *Hardware Age*, July 12, 1928, 45.
12. US Dept. of the Interior, Bureau of Mines, *Explosives Accidents in Bituminous Coal Mines* (Washington, DC: USGPO, 1954), 11.
13. Hal's Lamppost. halslamppost.com/miningartifacts. Accessed 7/19/23.

All photographs by the author. Hardware catalog listing created after listing in the 1928 Blish, Mize and Silliman Hardware Catalog (Atchison, Kansas: Blish, Mize and Silliman Hardware Co., 1928), 1467. Internal view of flashlight from L. C. Ilsley and A. B. Hooker, US Dept. of the Interior, Bureau of Mines, *Permissible Electric Mine Lamps*. (Washington, DC: USGPO, 1930), 30.