

Electric Cap and Hand Lamps for Miners

by Dave Johnson

Most American collectors of miner's lamps concentrate first on carbide cap lamps, followed fairly equally by safety lamps, oilwick lamps, and candlesticks, with hand held carbide lamps lagging far behind. Two types of lamps that get little attention from most collectors are electric cap lamps and hand held electric lamps. They tend to be rejected as "too new".

Actually patents for electric hand lamps preceded those for carbide cap lamps by several years. The earliest U.S. patent for an "Electric Safety Lamp for Miners" was granted to

Theophilus Coad of Forest Gate, County of Essex, England on October 29, 1889. He was granted a British patent for the same lamp January 5, 1884. This was rather heavy affair with the removable battery alone weighing over 6 lbs. One early English electric hand lamp, the Wilson-Swan, had a battery that weighed more than 9 lbs.

Numerous unsuccessful electric lamps were patented early on. The first U.S. patent for an electric miner's cap lamp was granted to Lewis Cogswell and James Abel of Taylorville, Illinois on September 1, 1908. This was followed by a patent for an "Electric Lamp for Helmets" issued to Johann Drager of Lubeck, Germany issued on October 27, 1908. These patents appeared during the first decade of carbide cap lamp use.

Lewis Cogswell received patent number 985,660 on February 28, 1911 for a lamp considerably different than his earlier patent. Harry Becker of Baltimore, MD received a patent for a similar cap lamp on March 12, 1912, closely followed by Victor Patton, of Tollarburg, Colorado on May 21, 1912.

Steve Koroby, of Smithdale, PA, received a patent for an electric miner's lamp on June 17, 1913. This lamp featured a battery pack attached to the miner's cap, undoubtedly making this a rather heavy and uncomfortable device, if it were ever produced and used.

Perhaps the most unusual design was that patented by Richard Harris, of Bearden, TN, on September 1, 1914. This patent shows what appears to be a flashlight stuck through the top of a hardhat. The following year, Angelo Tolen received a patent for a lamp with a headpiece that bears a resemblance to what we think of as electric lamp headpieces today. None of these aforementioned patents achieved anything approaching commercial success. They all failed to address the problem of a reliable rechargeable battery system and an efficient filament bulb.

The patent for the first miner's electric cap lamp to achieve commercial success was filed by

Miner's Safety Lantern
ABSOLUTELY SAFE



Cannot cause fire or explosion. Burns 12 hours on one charge. Easily recharged by any one. Simple—Compact—Durable. Price and Leaflet on application.

**Portable Electric Safety
Light Company**

37 N. J. R. R. Ave. NEWARK, N. J.

Paul D. Payne, of Irvington, New Jersey, assignor to the Edison Storage Battery Company of West Orange, New Jersey, on May 17, 1923. Although filed in 1923, the patent was not granted until July 24, 1928. As can be seen on the photo of this early Edison lamp, the lamp was being manufactured and sold prior to 1928 since it is stamped Patent Applied For.

While Payne was waiting for his patent, Grant Wheat filed for a patent for a miner's electric cap lamp on November 22, 1926, he was assignor to the Koehler Mfg. Co. of Marlboro, Massachusetts. On May 6, 1930, Wheat received patents 1,757,887 through 1,757,889 filed on June 23, 1929, November 22, 1926 and December 16, 1926, respectively.

Edison and Koehler were to be the two major manufacturers of American electric cap lamps in the early years of production. However, foreign manufacturers tried the American market. On May 26, 1931, Paul Wolf, of Zwickau, Germany received two patents for a miner's electric cap lamp. With Edison, Koehler and Wolf setting the pace, the future of the electric cap lamp was ensured and the carbide lamp slowly declined until today they are used only by some miners in third-world nations and by cavers.

Many attempts to devise a reliable portable electric lamp for miners' use were made by inventors, the first of which was in England in 1883. It was apparent that a practical lamp would have many advantages over the oil lamp.

But the first commercially produced electric lamps all had three common defects; first, they were too heavy, second, they used a liquid electrolyte, which proved undesirable for several reasons and, third, they were unable to hold a charge for an entire shift underground. A portable lamp is necessarily composed of two parts, the battery which furnishes the current, and the bulb. The latter was quickly brought to a high perfection; the former became the troublesome element.

The Sussman electric lamp was the first to receive favorable notice in England, and was introduced about 1894. Instead of a liquid electrolyte, paper paste, impregnated with sulfuric acid was used, the total weight being 4 1/4 pounds. The illumination was twice that of a safety-lamp. The Sussman lamp was placed in regular use at the Murton Colliery, near Sunderland in 1897 and eventually had 1,500 lamps in daily use. The Sussman lamp weighted 3 1/4 lbs. And had two 2-volt cells and a capacity of 5 1/2 amperes and maintained a charge for

The Edison Model E Electric Cap Lamp

Lead wires are only back cap lamp so assembly and previous tampering.

See Solid steel spring cap hook.

Cap lamp is much simplified, is used with maximum material.

Laminated "Safone" glass lens is non-astigmatic and does not break readily.

Diffusers are 1.50 diameter in size and have a much longer life than the requirements for an equal by the Bureau of Mines.

Cable is braided on battery end to prevent slipping or coming at cable connection in battery.

Non-spilling of solution assured by specially designed patented rubber approved safety cap by the U. S. Bureau of Mines.

Practical Key Lock mechanism. Key is required to open.

No. 14 Cell will show a new increase in life in use of 12 hours more than Model G Lamp Cell. Cells are constructed so further straining the cell can.

The No. 14 Glass Cells have a diameter of 1.50 inches and a length of 2.5 inches. Each battery normal use has a capacity of 5 1/2 amperes and maintains a charge for a full 12-hour period.

Edison Storage Battery Co.

Thomas A. Edison's famous Nickel-Iron Alkaline Battery is used as part of this Lamp. Light in weight, with the strength of steel and the non-corroding long-life of Nickel.

Specifications:

Type of Battery.....	M-14
Number of Cells.....	2
Rated Capacity.....	
Ampere hours.....	12
Hours illumination after full charge.....	12
Normal Charging Rate.....	
Amperes.....	1.5
Length of Charge, hrs.....	8
Weights:	
2 Cells Assembled, ozs.....	52
Metal Container, ozs.....	13
Headpiece, ozs.....	20
Total ozs.....	84
Capacity BM-18 Bulb.....	1.30 Amps.
List Price BM-18 Bulb.....	45c

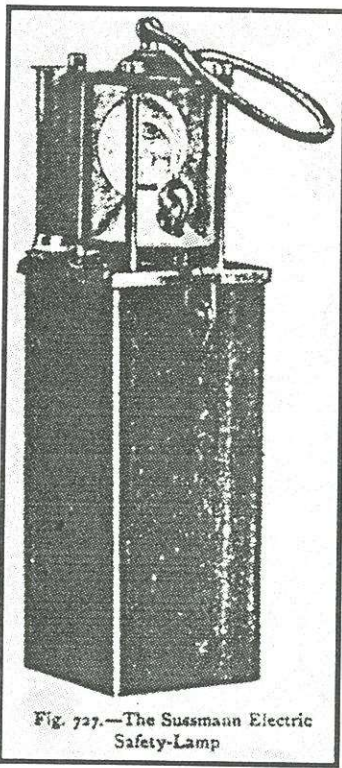


Fig. 727.—The Sussmann Electric Safety-Lamp

8-12 hours. Several thousand of these lamps were employed in English and Belgian collieries in 1904, the Bracquegnies colliery, Belgium, being reported as using 2,000 of them, and an English colliery 1,400. The cost of the lamp, including all repairs and renewals of the incandescent filament, was found to be 1/4cent per day of 12 hours. The life of the lamp was stated as five years. It was charged by connecting the battery to the wires of a dynamo for nine hours, the current for charging not exceeding eight amperes. At an English coal pit a record of the lamp's performance was kept for one month, and showed that, out of 504 lamps in use, an average of 96.73 per cent completed the shift, the remainder being rendered unusable from various causes.

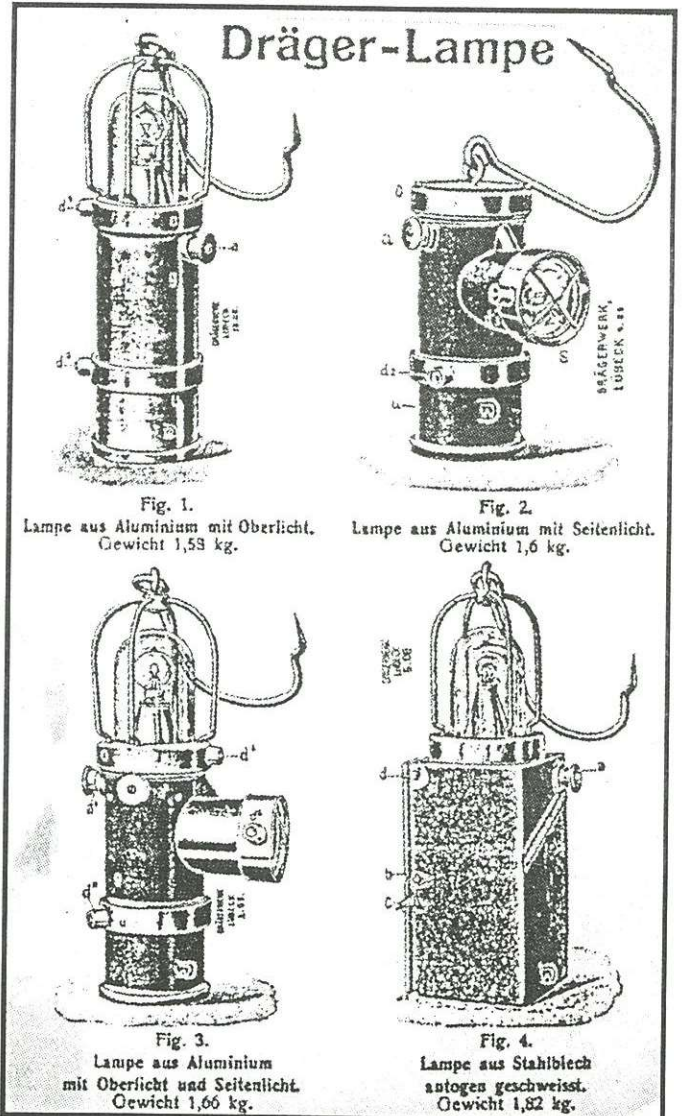
The Neu-Catrice, another miners' lamp, was used at the Bruay collieries, France, and the Float lamp was introduced in Wales.

In the United States electricity as a lighting medium also received much attention. In 1896 it was suggested that arc lights be used in headings in place of incandescent lamps, and that the light be reflected so as to light the face. In 1901 the Pennsylvania legislature seriously considered making it compulsory for all mine owners to electrically light the entire underground interior of the mine.

Electric lamps were placed on the market as early as 1902 in the U.S., but, on account of the objections common to all the earlier types, were not favorably received. Early types were experimented with by the Philadelphia & Reading Coal & Iron Company, the Lehigh Coal & Navigation Company, and the Lehigh Valley Coal Company in the East, and the Colorado Fuel & Iron Company in the West.

None of the early experimental lamps proved successful. One of the principal difficulties lay in the inefficient carbon filament bulb which required a storage battery of too considerable a weight to be carried on the body with comfort. It was also soon demonstrated that the leakage of acid was a serious problem, as it was impossible to prevent the acid from seeping out around the cell connections and vent plug when used in a stooping position or when jostled. It attacked every metallic part of the battery with which it came in contact, destroyed the men's clothing and even burned the bodies of the miners.

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Dräger-Lampe

Fig. 1. Lampe aus Aluminium mit Oberlicht. Gewicht 1,53 kg.

Fig. 2. Lampe aus Aluminium mit Seitenlicht. Gewicht 1,6 kg.

Fig. 3. Lampe aus Aluminium mit Oberlicht und Seitenlicht. Gewicht 1,66 kg.

Fig. 4. Lampe aus Stahlblech autogen geschweisst. Gewicht 1,82 kg.

In 1909 the Tungsten filament lamps were first placed on the market in America for limited or special commercial uses. The efficiency, or watts per candle, was about three to four times better than the carbon filament lamp. The effect of this improvement was to stimulate the search for a battery of sufficient lightness to enable it to be worn about the body.

The next two years were given to testing and developing lamps under actual working conditions and in trying to overcome the obstacles usually associated with the introduction of a new and novel product. Fully a dozen makers devised lamps during this period, the foremost cap lamp being the Hirsch, while the Ceag was the best known of the hand type. In March 1911 Thomas Edison became interested in the development of a practical miner's lamp and in May 1912 the first lamps made by the Edison Storage Battery Company were tried out in the mines of the Philadelphia and Reading Coal and Iron Company.

Concurrently the Wico lamp was introduced and tried out by the same company.

During the latter part of 1913 the Bureau of Mines, through H. H. Clark, became interested in the electric cap lamp, and after a personal tour of inspection and investigation at the Philadelphia and Reading Company's mines, took up the work with the view of standardizing its various features. Their chief concern was safety, thus making the lamp acceptable for general mine use. All available makes were studied and tested, and as a result a schedule of official tests were prepared which were used in establishing a list of permissible electric safety lamps for use in mining. This step was the means of bringing home to the manufacturers the realization that the electric cap lamp was here to stay and created not a little competition to produce the best lamp possible.

By the 1920's we find the cap lamp comprising a non-spillable battery mechanically protected by an aluminum or steel case having the cover locked and arranged to be carried on a belt, a

KOEHLER MFG. COMPANY, INC

Factory and Main Office
MARLBORO, MASS. U S A

BRANCH OFFICES
1634 Jefferson Avenue, Scranton, Pa. 530 Fernando Street, Pittsburgh, Pa.

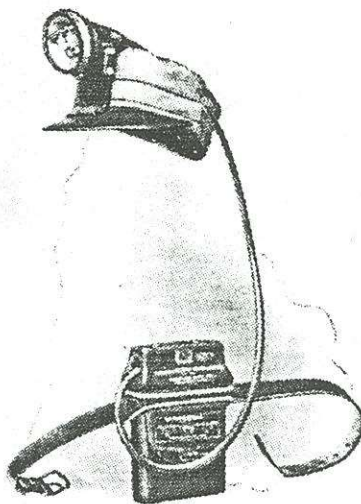
Wheat Electric Mine Lamp

"WHEAT" FOR LIGHT "KOEHLER" FOR TESTING

The Important Features

Two Bulbs in Headpiece—A bulb always in reserve. Eliminates lost time and accidents through being "left in the dark."

More Lighting Power—The bulb gives a clear white light and will burn from 12 to 16 hours on one charge.



U. S. Bureau of Mines Approval No. 17

Headpiece Always Sealed—The headpiece is provided with a locking and sealing device which prevents its being tampered with, and keeps out dirt and can be quickly opened or sealed by the lamp attendant.

Absolutely Safe—Should the lighted bulb be broken its electric current is instantly and automatically disconnected.

Lamp Burns with Battery in Any Position—The battery casing is so constructed that it can be carried in any position without leakage, or affecting the lighting capacity of the bulb.

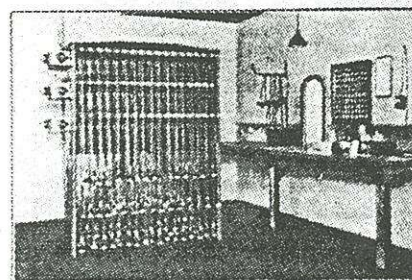
Easy Charging—The Wheat Electric Mine Lamp does not have to be taken apart for charging, but goes into the charging rack completely assembled.

Durability—The headpiece and battery casings are made of a special vulcanized material that is as strong and light as cast aluminum, and is absolutely unaffected by acid fumes or water.

Lamp Cord Cannot Bend Short—An improved cord connection, without springs, prevents short bending and breakage at entrance to battery case—gives greater security and longer life to lamp cords.

Greater Comfort to Wearer—The two belt connections to the battery case are as far apart as possible, thus greatly increasing the wearer's comfort.

Superior Construction—All parts are specially designed for convenient removal and assembling. This saves time and labor, and insures perfect condition of lamps at all times.



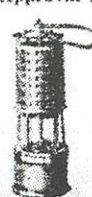
Layout of Lamp House

Repairs

All replacements and repairs on this lamp can be made in your lamphouse by your lampmen. This advantage is recognized by all our users.

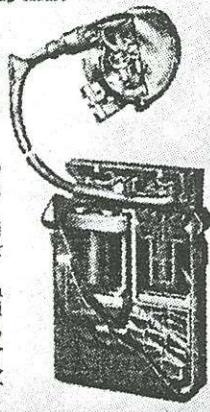
Koehler Flame Safety Lamp

U. S. Bureau of Mines Approval No. 201.



The ideal lamp in testing for gas.

Made in steel, brass and aluminum, either magnetic or key lock, with round or flat wick.



special twin flexible conductor conveying the current from the battery to the lamp on the cap, encased for a short distance at both ends by flexible steel armor, serving as an anchor and preventing sharp bending. The lamp consisted of a parabolic reflector equipped with safety features, in which is mounted a tungsten lamp, the opening supporting a glass lens cushioned on gaskets held in place by a cap or spring, and provided with a hook to fit into the miner's cap.

When wearing this setup a man could exercise a full range of motion without restraint. He could use all tools and perform any desired work with as much freedom as when wearing the oilwick cap lamp, without the spillage of oil being a problem, as was the case with an oilwick cap lamp.

Special combination charging stations were provided with facilities for charging, cleaning and filling both the electric lamps and the oil safety lamps.

Advantages of Electric Cap Lamps

The advantages to be gained in the use of the electric cap lamp, approved by the United States Bureau of Mines as "permissible" for use in gaseous mines, are enumerated by the Bureau of Mines from a 1920's bulletin as follows:

- (1) It reduces, to the lowest possible, the hazard of gas explosions.
- (2) It reduces the danger of getting burned by lighting gas which may accumulate from a feeder found by drilling a hole.
- (3) It reduces the possibility of a serious dust explosion which may easily start by an open light igniting a pocket of combustible dust.
- (4) It reduces the great danger of mine fires which are so frequent in mines, due to setting off a gas pocket at the face of the advancing narrow work in nearly all mines.
- (5) It reduces accidents from handling explosives in the magazine, also during transportation and preparing shots at the face, etc.
- (6) It gives a much greater chance for a miner to escape for his life after a local explosion or through smoke from a fire due to having a light to travel by.
- (7) Reduces accident to drivers, motonnen, rope-riders and shotfirers, as the electric light is more dependable against any velocity of the air-current, windy shots, etc.

The electric hand lamp differs from the cap lamp only in detail. The battery and bulb are brought together into one unit and thus the cord is eliminated. As with the oil safety lamp it is carried by means of a bale and when at the working face can be hung on a post conveniently close to the workings. While the weight of the hand lamp is frequently cited as an objection it must be borne in mind that this weight is not continually carried as is the case with the cap lamp.

Anyone collecting electric mine lamps will quickly notice that electric hand lamps were most popular in Europe and cap lamps most popular in the U.S.

Many of the earlier electric lamps are quite unusual looking and quite attractive, especially when produced in copper or brass, or a combination of both. Early electric mine lamps are one field that I feel has been too long neglected and deserves more attention and respect than it has been accorded.

SOURCES:

Keystone Mining
 Catalog - 1916, 1922,
 1923, 1925 and 1927
 Practical Coal Mining,
 W.S. - Boulton
 U.S. Bureau of Mines
 Bulletins

Proceedings of the Coal Mining Institute of America 1916, Article by J. T. Jennings

Edison Storage Battery Company

Factory and Main Office
 316 LAKESIDE AVENUE, ORANGE, N. J.
 Manufacturers of the
Edison Electric Safety Mine Lamp



NEW YORK
ATLANTA
NEW ORLEANS

BOSTON
CLEVELAND
DETROIT

Distributors in
PHILADELPHIA
PITTSBURGH
WASHINGTON

CHICAGO
ST. LOUIS
MONTREAL

SAN FRANCISCO
SEATTLE
LOS ANGELES

General Distributors
Mine Safety Appliances Co., Pittsburgh, Pa.

The Edison Electric Safety Mine Lamp
 The Edison Mine Lamp is a permissible portable Electric Mine Lamp. It is the first to be approved by the Bureau of Mines for Safety, Practicability, Efficiency and General Durability in Mine Service.



Unassembled View Edison Mine Lamp

Standard in over 1,000 mines, over 175,000 in use in Metal and Coal Mines of the United States. Older installations show uninterrupted service over five years.
 Burns 12 hours without recharge.
 Fire Protection for your valuable operation.

Method of Attaching
 The miner straps the battery case to his back by an ordinary belt. The lamp is attached to the



Method of Attaching

leather support in his cap, leaving his arms entirely free of lamp, cord and battery case.
 Described in Bulletin No. 300.
 See Page 695 for details of the Edison Battery.

The Edison Electric Shot-Firing Battery
 Showing cover for M-8 Mine Lamp Battery arranged for shot-firing. Shot-firing cable is attached to a key furnished with cover. Key is then inserted in receptacle on cover, and detonation accomplished by pressing key into contact. Cover is furnished with or without fittings for lamp attachment.

It is simple, lightweight, strong and durable. One charge of the battery is capable of firing a great many shots.



Edison Shot-Firing Battery.
 Showing how special cover for shot-firing is attached to regular Edison Mine Lamp.

Edison Electric Safety Trip Lamp
 Consists of M-8 (Mine Lamp) Battery in steel case with special cover and lens. The case is provided with hook for attaching to mine car as "head" or "tail" light. This device is approved by the Workmen's Compensation Insurance Inspectors.



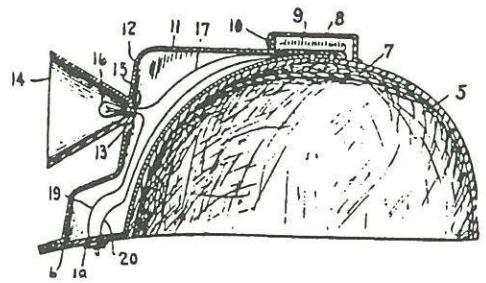
Edison Trip Lamp—Hooks
 Over Either End of the Car

Edison Electric Safety Hand Lamp
 Illustration shows arrangement of Edison Safety Mine Lamp as a hand lamp. This consists of a standard M-8 Battery in steel case with special cover. The lamp is attached directly to cover and the cover provided with bails for attaching leather handle. Largely used as Inspector's, Official's and Visitor's lamp.

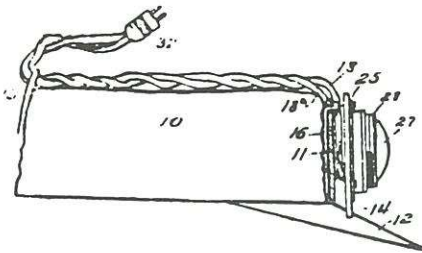


Electric Safety Hand Lamp

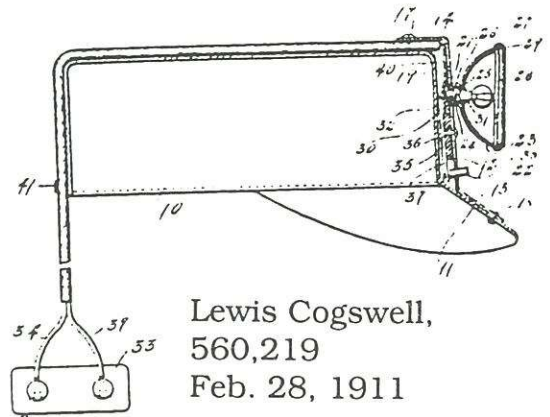
Electric Cap Lamp Patents



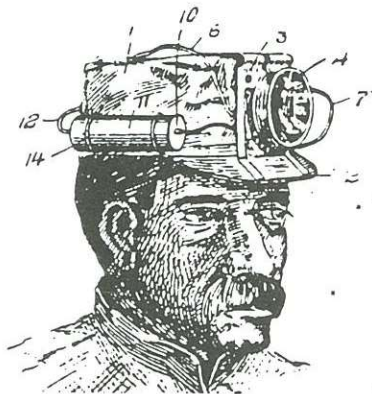
Lewis Cogswell and James Abel
413,710
Sept. 1, 1908



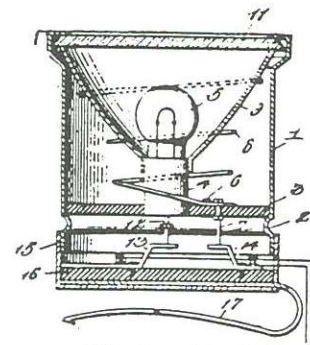
Harry Becker
621,220
March 12, 1912



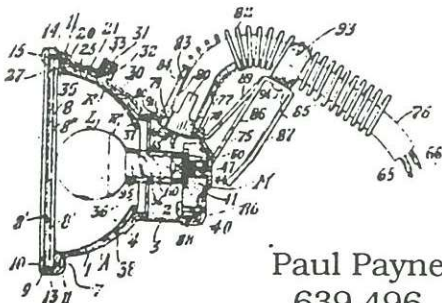
Lewis Cogswell,
560,219
Feb. 28, 1911



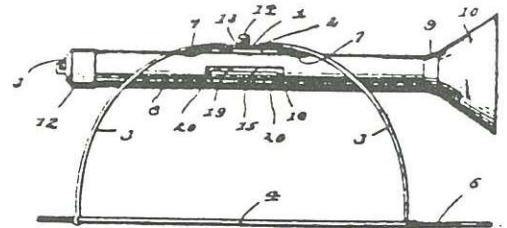
Steve Koboly
741,087
June 17, 1913



Victor Patton
594,760
May 21, 1912



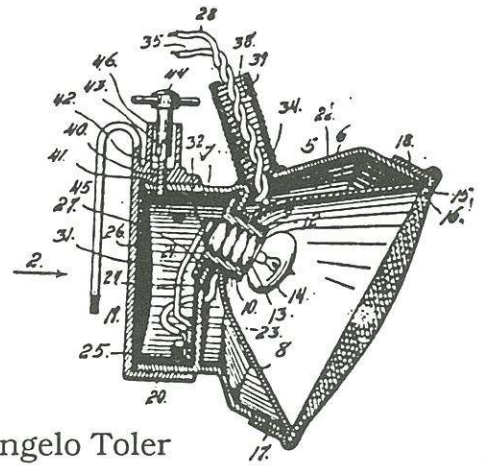
Paul Payne
639,496
July 24, 1928



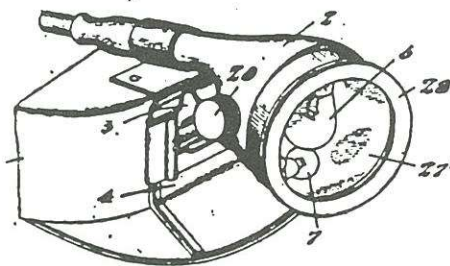
Richard Harris, James Hill, Ira Hill
806,614
Sept 1, 1914



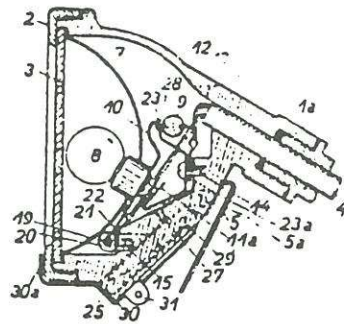
Grant Wheat
1,757,887
May 6, 1930



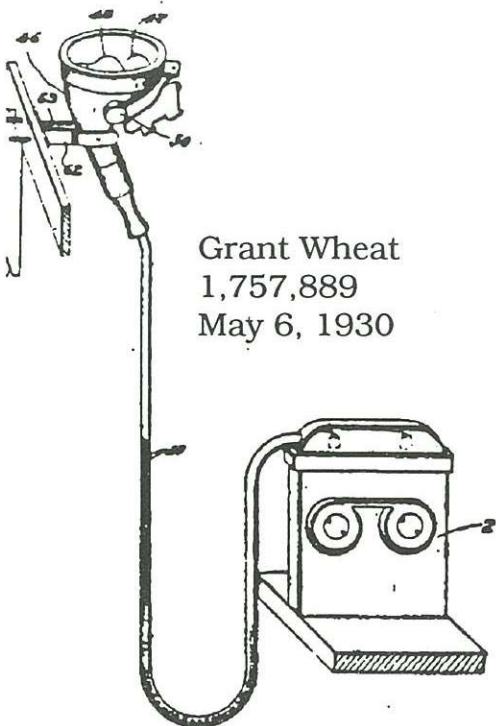
Angelo Toler
23,745
June 6, 1916



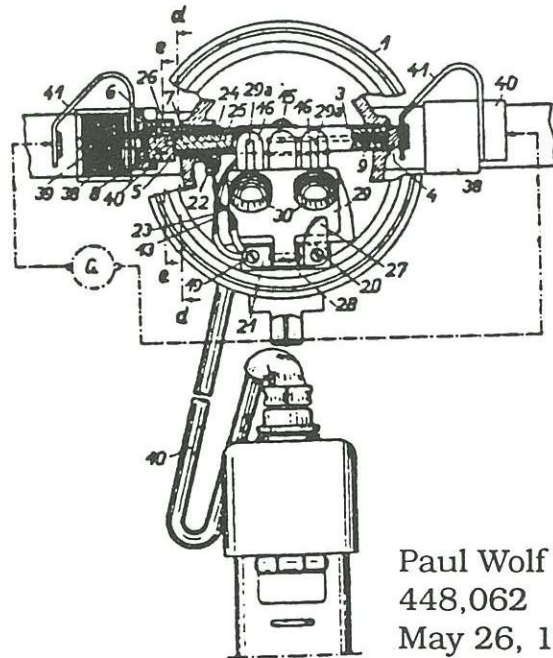
Grant Wheat
149,890
May 6, 1930



Paul Wolf
448,061
May 26, 1931

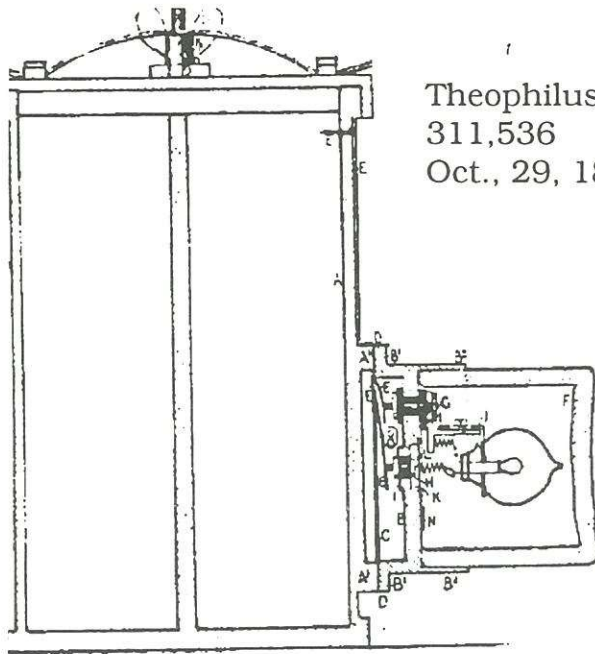


Grant Wheat
1,757,889
May 6, 1930

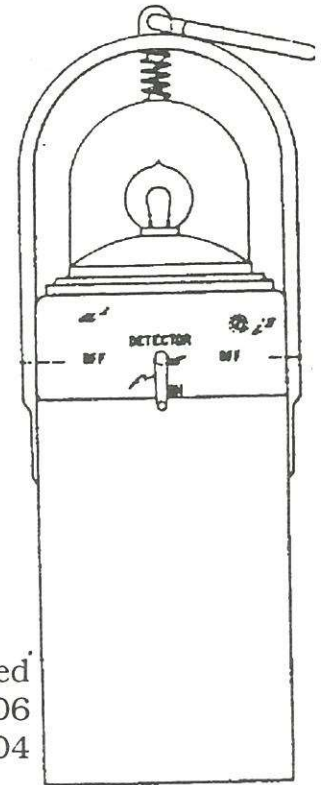


Paul Wolf
448,062
May 26, 1931

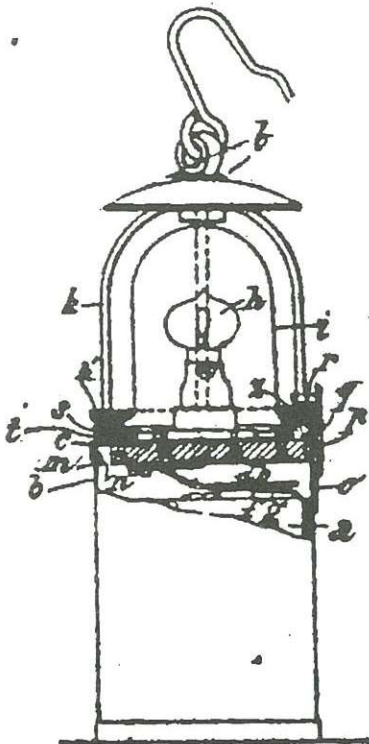
Electric Hand Lamp Patents



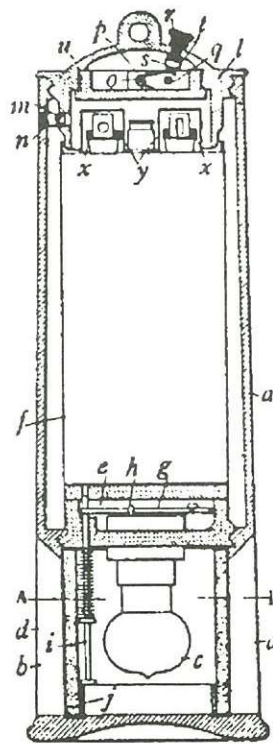
Theophilus Glad
311,536
Oct., 29, 1889



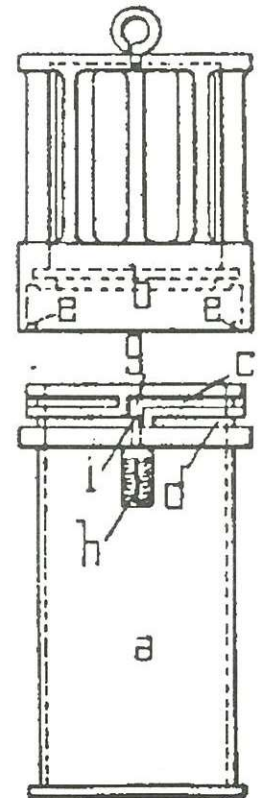
Henry Prested
142,406
Jan 12, 1904



Hermann Remane
434,254
Nov. 9, 1909

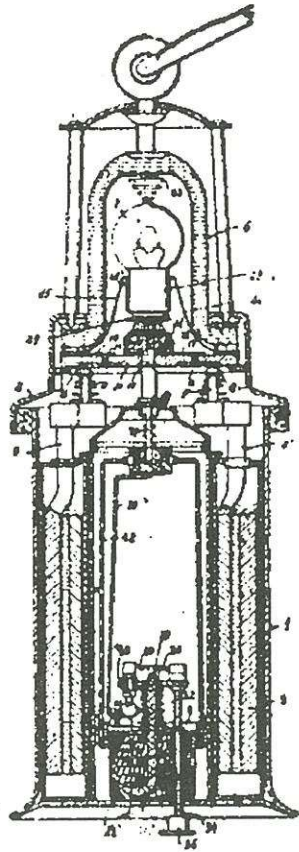


Charles Eley and Thomas Patrick
528,833
Apr. 4, 1911

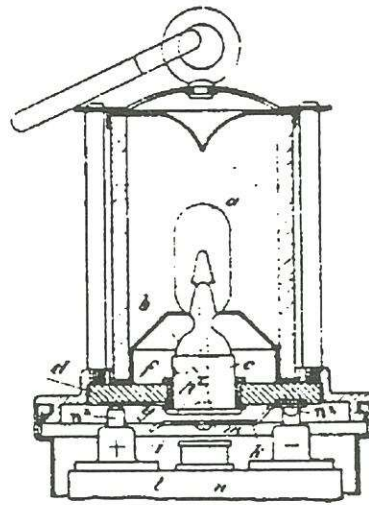


Paul Rennert
539,291
Mar. 28, 1911

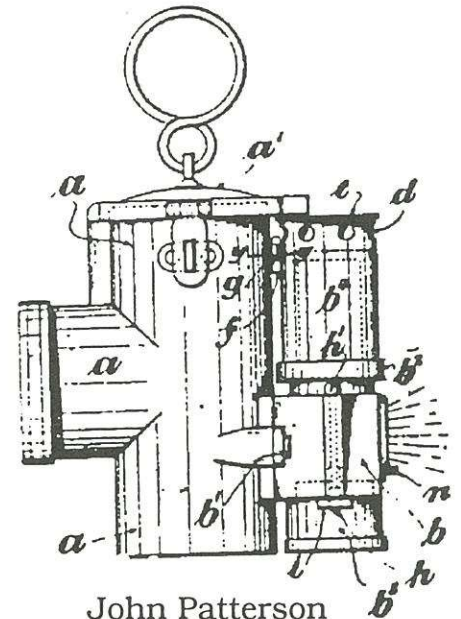
EUREKA! August 1999



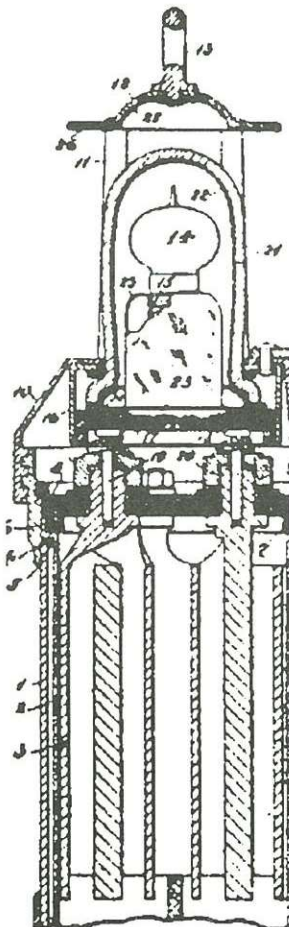
Fritz Farber
1,116,048
Nov 3, 1914



Paul Wolf
745,206
June 16, 1914

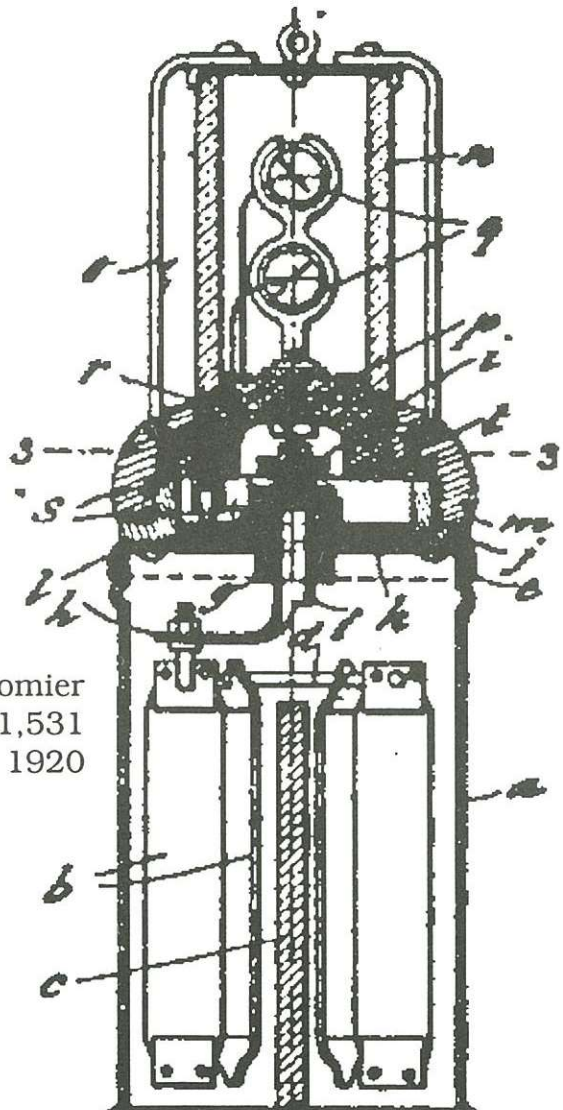


John Patterson
1,070,522
Aug. 19, 1913

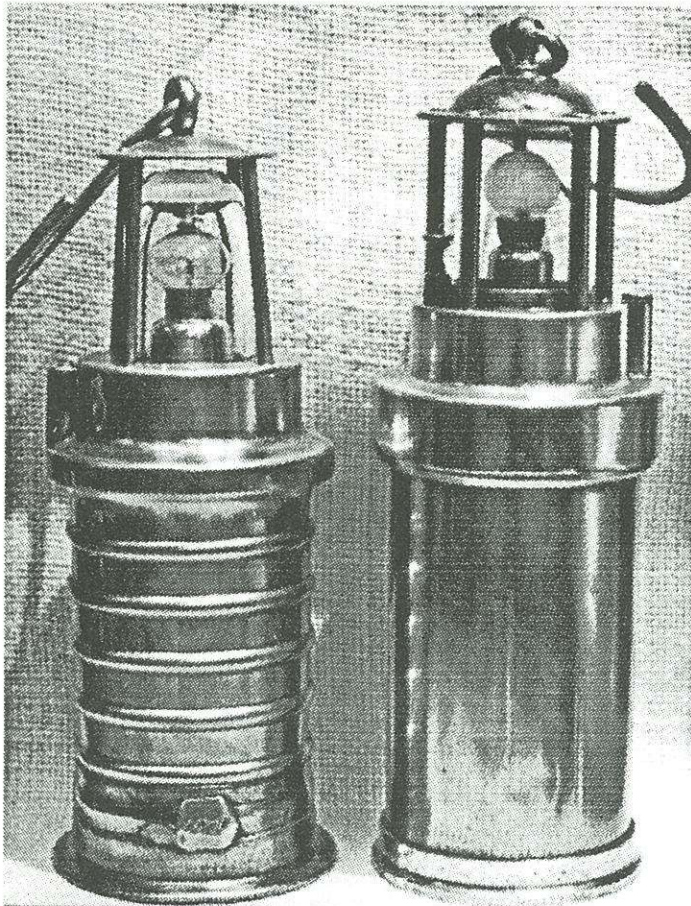


Louis Chomier
261,531
Feb. 17, 1920

No. 1,947,022
Feb. 13, 1934



Electric Lamp Photos



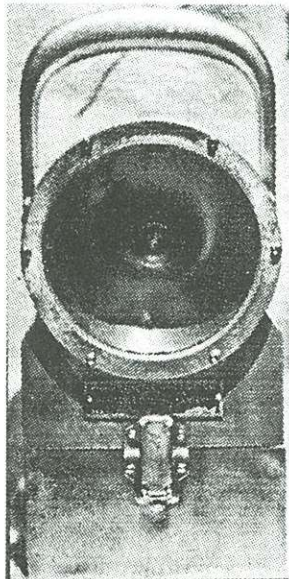
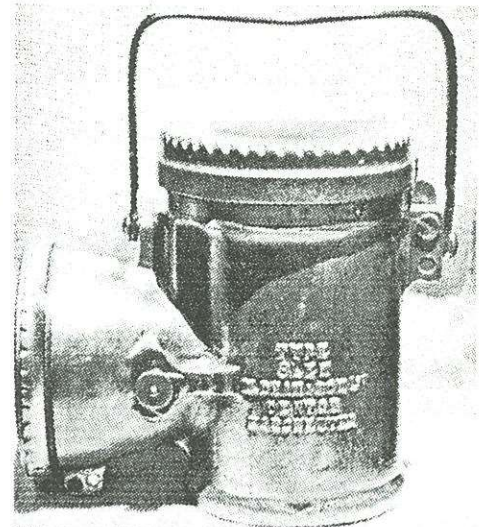
Left: unmarked brass English lamp.
Right: Unmarked copper & brass safety lamp from England.

Left: steel
handlamp
marked: TYPE
16621D

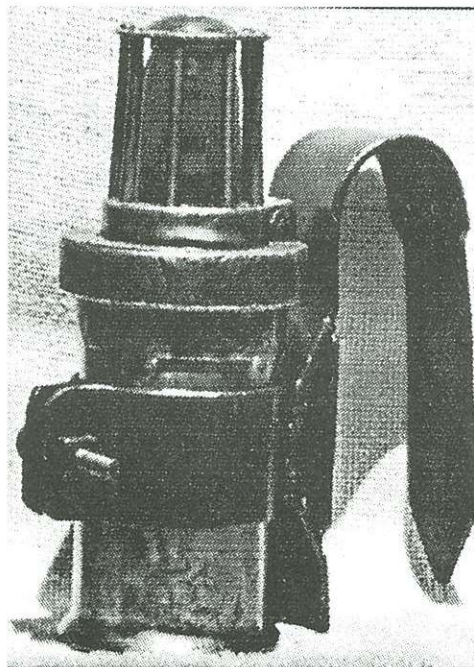


Right: Brass
Pioneer Electric
Mine Lamp Co.
hand lamp.

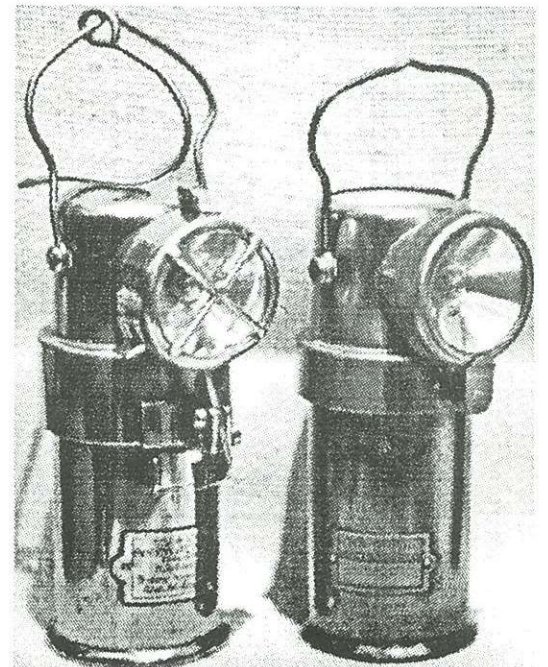
Large sheet
aluminum
hand lamp
manufac-
tured by
Oldham &
Son, Ltd.
Manches-
ter, En-
gland.



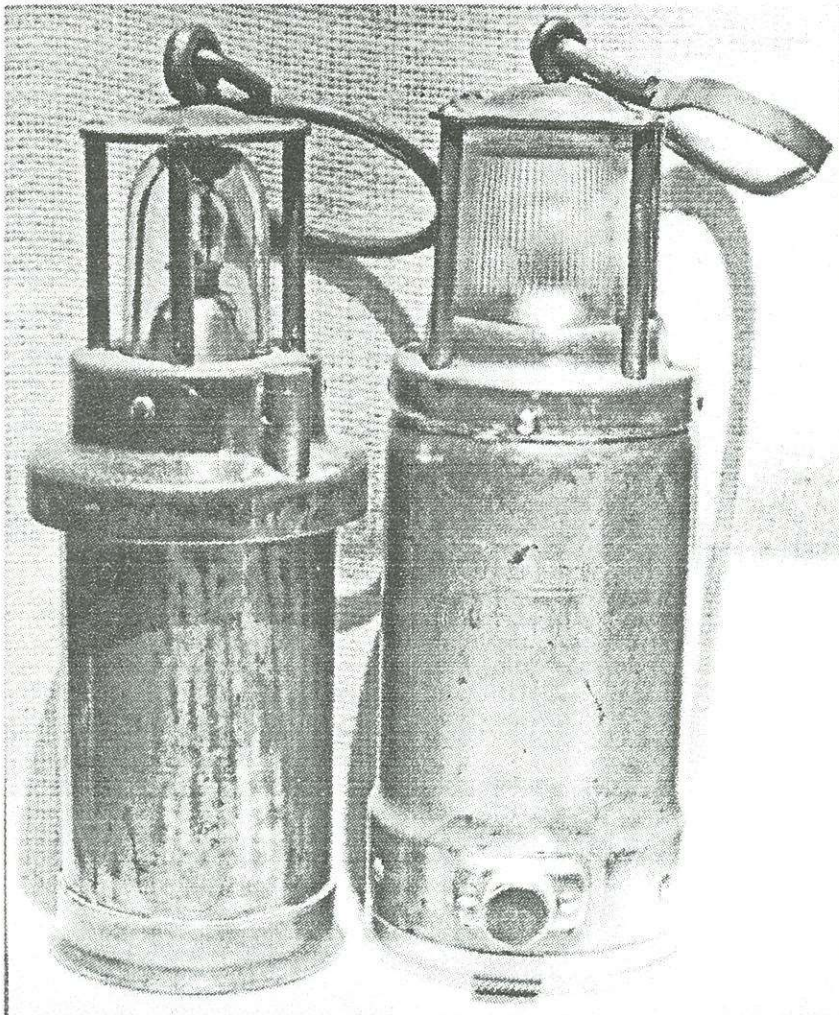
Aluminum Mine Locomotive Battery-powered headlight manufactured by the Pioneer Electric Mine Lamp Co.



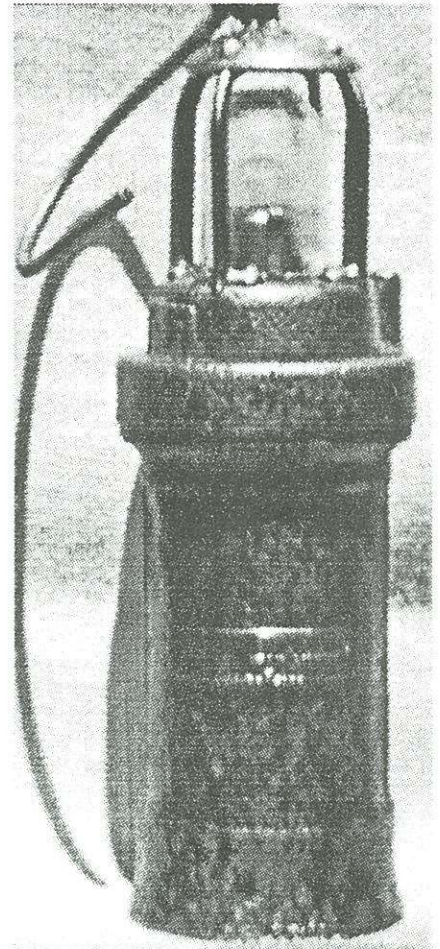
CEAG RMCT trip lamp with red glass dome lens.



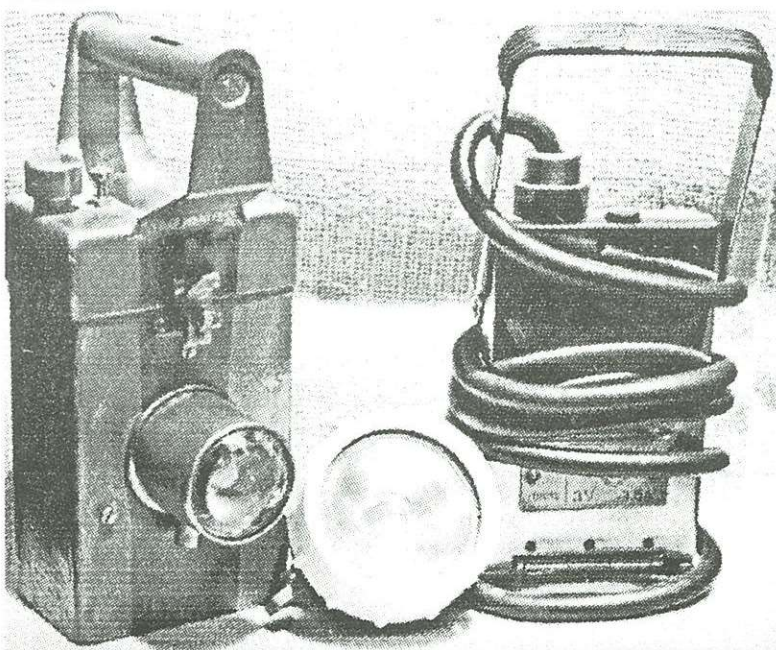
Two different brass & copper CEAG electric hand lamps.



Left: CEAG Electric safety lamp - steel. Model RMC.
 Right: Oldham Type 8115M Electric Safety Lamp - steel.



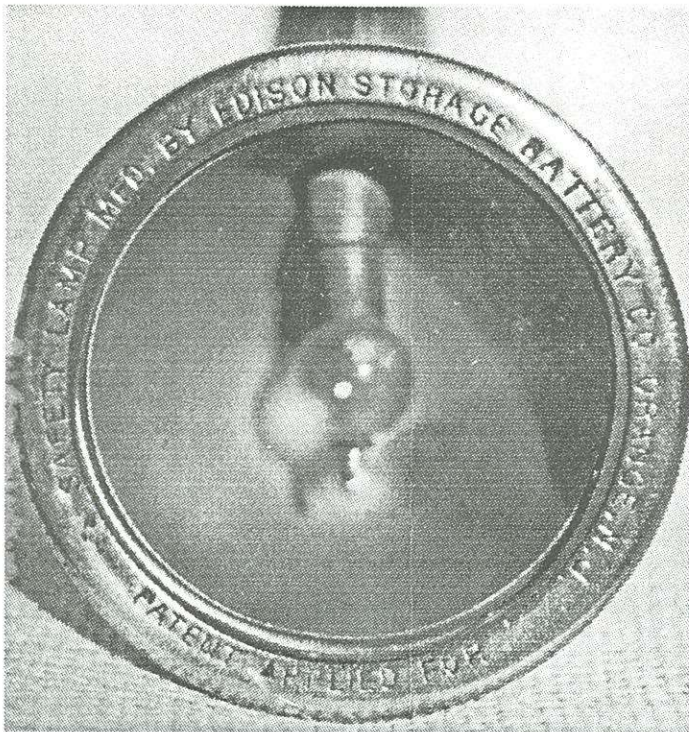
French, marked Comite du VIEUX-MARCHE BRUAY.



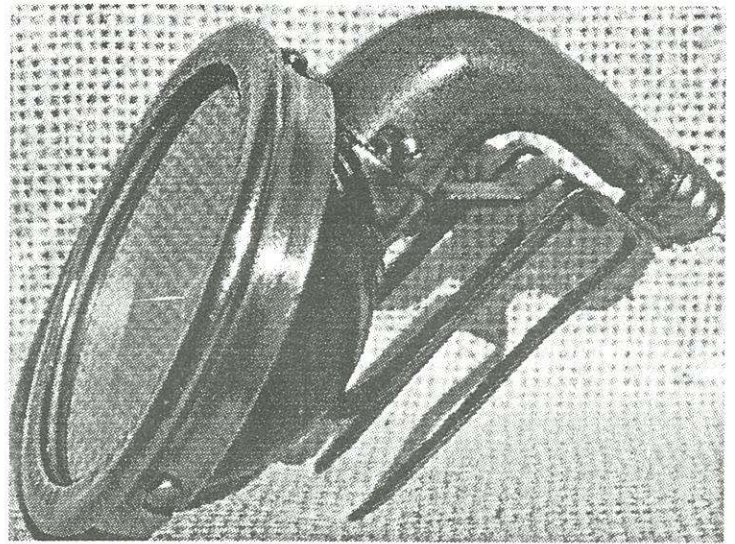
Left: Unmarked aluminum lamp.
 Right: Friemann & Wolf with handle and belt loop.



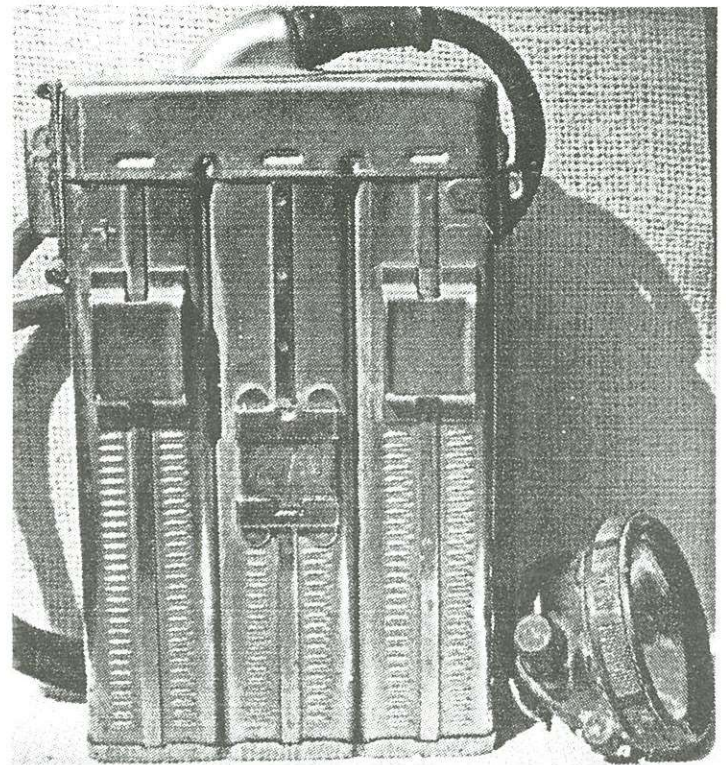
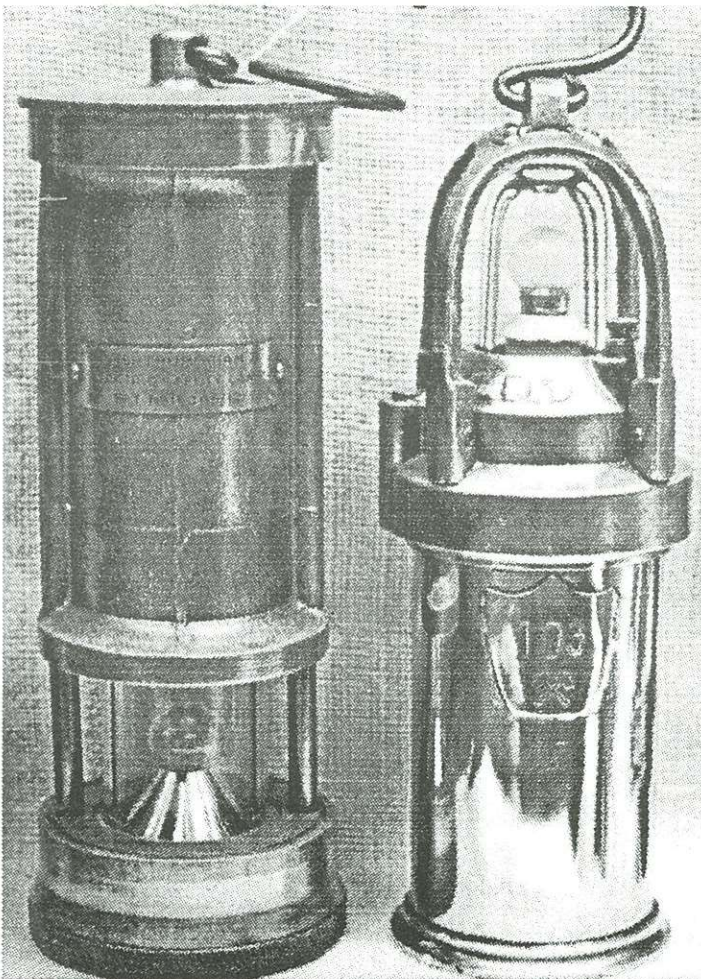
Left: Copper Joel-Fors Patent lamp made by John Mills & Sons.
 Right: CEAG inspection lamp, Type BE, all brass.



Front view of headpiece for Edison Model E.
Notice Patent Applied For stamping.



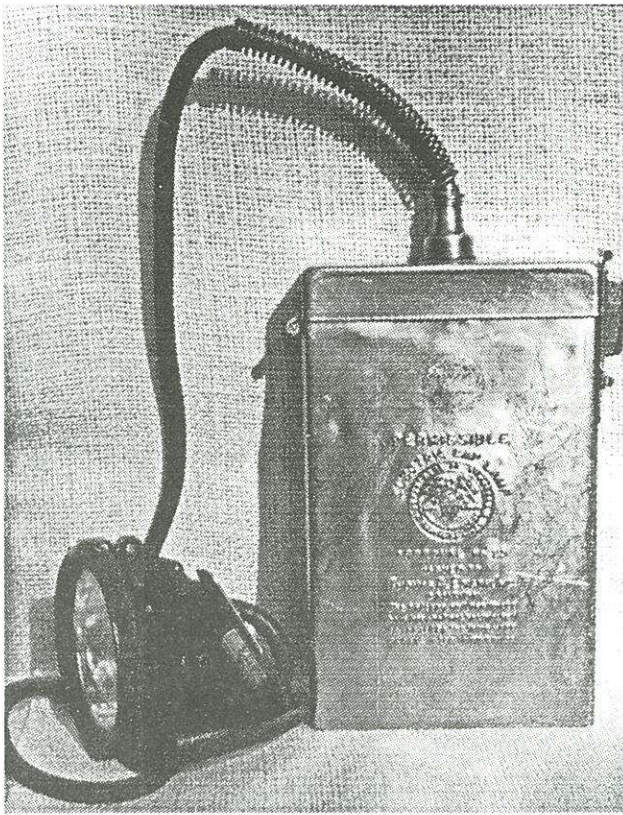
Side view of headpiece for Edison lamp Model E. Brass and steel construction.



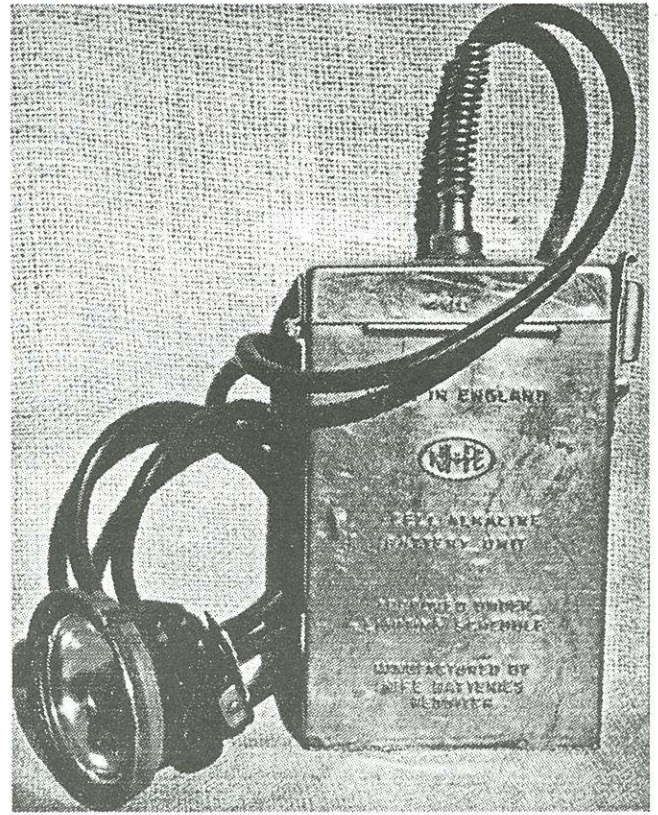
Edison Model P electric cap lamp.

Right: Northumbrian electric safety lamp - England - aluminum construction.

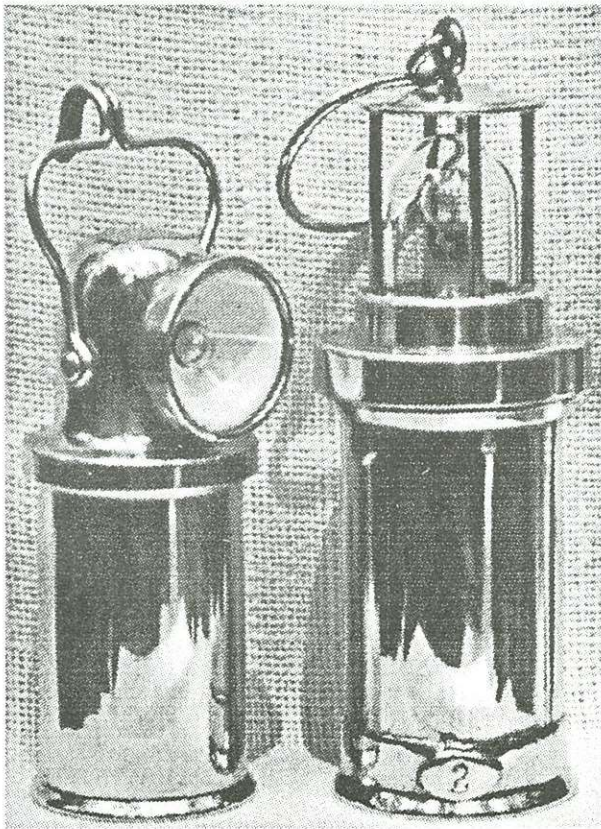
Left: Copper and brass electric safety lamp marked: Brevets Lemaire.



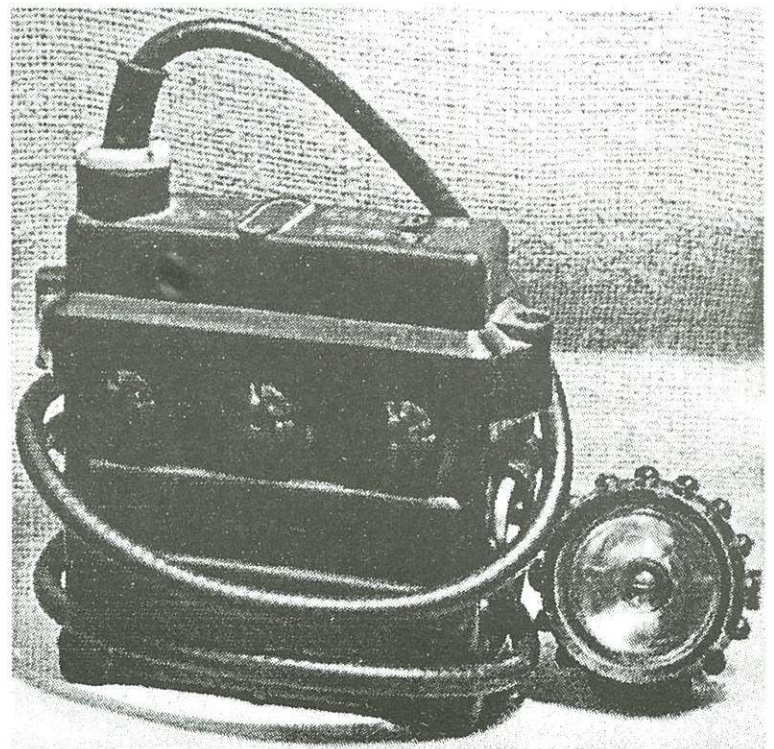
Edison Model K electric cap lamp.



English version of Edison Model K made by NIFE Batteries of Redditch.



Left: CEAG Model GMS, brass hand lamp with white porcelain reflector.
 Right: Unmarked brass electric safety lamp.



Russian electric cap lamp.