

Safety Fuse

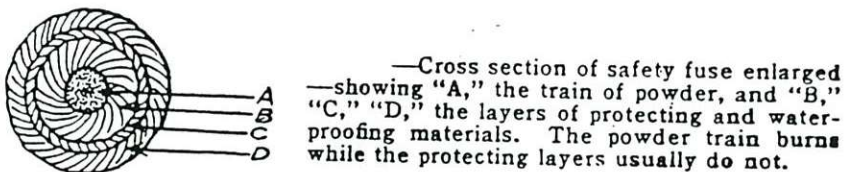
by Mark Bohannon

Safety fuse consists of a center thread surrounded by a train of potassium nitrate black powder manufactured specifically for fuse, and is enclosed in various wrappings of textiles and waterproofing materials (Fig. 1). Its purpose is to transmit fire to a blasting cap or other explosive charge. The center thread has no influence on the burning rate of the fuse but is used to aid in securing a uniform flow of powder into the fuse.

Safety fuse is made in two distinct burning rates of approximately 120 and 90 seconds per yard when burned in the open at sea level. All manufacturers of safety fuse state that they use every care and precaution to manufacture their fuse within an allowable variation of ten per cent either way from the standard burning rates. There is no absolute standard burning rate. Increased pressure as in the confinement of a bore hole may cause the burning rate to be considerably greater than in the open. The burning rate under these circumstances is highly variable due to the many different kinds of stemming material used and the different degrees of tightness of the tamping. A reduction in external pressure, on the other hand, slows the burning rate. Thus the altitude above sea level must be taken into consideration.

The powder train is protected from abrasion and penetration from water by the covering of tapes, yarns, and coatings of waterproofing materials such as asphalt and plastic. These protective coverings also prevent the transmission of fire between adjacent lengths of fuse and minimize the chance of prematurely setting off the explosive charge by stray sparks.

When the fuse is lit, the outside coverings of the fuse will smoke and sizzle due to the melting of the asphalt based waterproofing material, but all of the fire will be contained within the core of the fuse. Properly ignited, a jet of flame called the "ignition spit" shoots out of the end of the fuse the moment the powder core is lit.



—Cross section of safety fuse enlarged —showing "A," the train of powder, and "B," "C," "D," the layers of protecting and waterproofing materials. The powder train burns while the protecting layers usually do not.

Fig. 1



Double roll of safety fuse with paper wrapping removed.

Safety fuse was used extensively in early underground mining due to the fact that the delay electric blasting cap was still in the development stage, and safety fuse was simple to use. Unlike delay electric blasting caps, which required the purchase of not only the caps, but also a blasting machine and a galvanometer and rheostat, the use of safety fuse takes only the fuse, blasting caps, and crimpers. Any miner could set off a round of explosives with delays by using safety fuse of varying lengths. The shortest lengths of fuse will detonate their charges first.

The primary factor for the extensive use of safety fuse in underground mining was the low cost and the need for millisecond delays was unnecessary. Most miners preferred a second or more between each hole to insure adequate rock movement to avoid fracturing the surrounding roof and walls.