T. E. MURRAY.

ELECTRIC SAFETY FUSE.

APPLICATION FILED JULY 18, 1907.

920,613. Patented May 4, 1909.

Fig. 1.

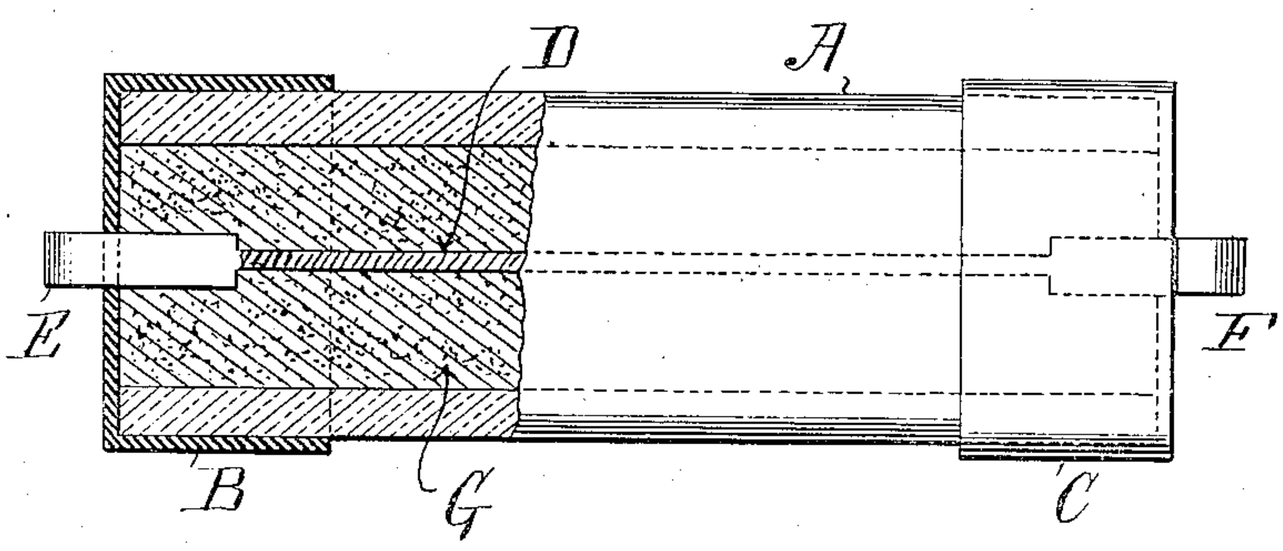
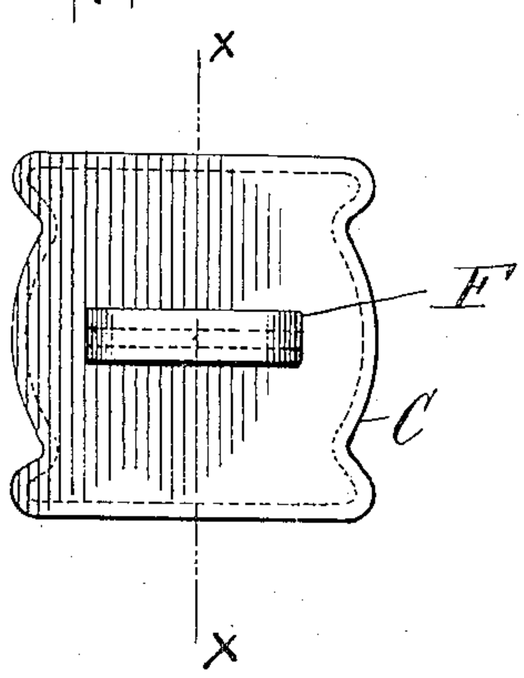


Fig. 2.



WITNESSES:

Gustave Detterich.

Edwin W. Dieterich.

INVENTOR

Thomas E. Murray

BY Paul Benjamin

his

ATTORNEY

UNITED STATES PATENT OFFICE.

THOMAS E. MURRAY, OF NEW YORK, N. Y.

ELECTRIC SAFETY-FUSE.

No. 920,613. Specification of Letters Patent. Patented May 4, 1909.

Application filed July 18, 1907. Serial No. 384,436.

To all whom it may concern:

Be it known that I, THOMAS E. MURRAY, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Electric Safety-Fuses, of which the following is a specification.

The invention relates to electric safety fuses.

The advantages of making the containing tubes of electric safety fuses of porcelain, glass or other fictile or vitreous material are that said material is insulating, non-inflammable, inexpensive, proof against moisture and easily and cheaply molded. On the other hand, it is fragile, and especially so under the sudden shock of the explosion of the fuse inclosed within it. Attempts have been made to meet this difficulty by providing escape ducts for the suddenly generated gases of explosion, or by the use of filling materials which would chemically combine with such gases and establish new paths of low resistance, or by providing auxiliary conductors or by-passes outside the fuse, or by making the porcelain or glass envelop in sections which it was supposed might yield at the joints, or by doing away with the desired material altogether and substituting paper or fibrous compounds; thus in the last case, for the sake of toughness, sacrificing the other desirable qualities above noted and at the same time incurring the dangers due to inflammability of the material. I have discovered that the problem of preventing rupture of fictile or vitreous tubes in such conditions can be solved by dampening the explosive vibration before it gets to the tube wall, and that this can be done if the fuse wire or strip within the tube is everywhere embedded in some inert and refractory material capable of acting as such a damper, and thus of protecting the tube from the direct shock. The breakage of the material of the tube is due not to continued strain like gas pressure in the bore of a gun, but to the immensely rapid jar which, especially if concentrated at some small portion of the tube, forces the molecules asunder beyond the range of their mutual cohesive attraction. I have found that when this shock is lengthened out, retarded, so to speak, the molecules apparently get time to adjust themselves to it and withstand what now becomes less a shock than a strain. All that is necessary, therefore, is to see to it that there is enough dampening material interposed between fuse wire and tube to effect this retardation. If none is present the porcelain or glass will break; if sufficient is present the porcelain or glass will not break; and that is the test.

I am aware that fuse wires have been disposed in glass tubes filled over portions of their length with so-called non-conducting material, there being elsewhere nothing but air space between fuse wire and tube. There is no possible suggestion of my principle in such a structure for the reason that to leave a part of the tube without dampening protection is even worse than to expose the whole of it; for the shock will localize at the unprotected portion, and besides the mere fact that any of the tube is thus left unprotected is to negative conclusively the perception of said principle. So also the presence of any one of the expedients above noted for avoiding the effects of the explosion, also negatives the inference of recognition of that principle, because none of them in any sense embodies it. On the contrary they each involve substitution of an essentially different principle. I create no escape duct for gases, I form no by path for the liberated energy, I neither combine the metal of the fuse chemically with the ingredients of the tube filling, nor rely upon any dissemination of that metal through a comminuted mass to produce a new path of low resistance. All of these expedients are too slow. The shock overcomes the molecular cohesion of the glass beyond its power to react before these things can get into action. Hence the need of retarding the propagation of the shock vibration by a medium interposed between the explosive focus and the comparatively fragile wall to be protected.

In the accompanying drawings—Figure 1 is a side elevation of my improved fuse showing a part in longitudinal section on the line *x x* of Fig. 2. Fig. 2 is an end view.

Similar letters of reference indicate like parts.

A is a tube integrally formed of porcelain. At the ends of said tube are caps B, C, preferably made by spinning up sheets of brass or other metal.

D is the fuse wire or strip, which may be of zinc, secured at its ends to the brass connecting pieces E, F, which pieces fit in openings in the caps B, C.

The whole interior of the tube A is filled with non-combustible material G, such as plaster, or asbestos in sufficient quantity to dampen the explosion of the blowing fuse and to retard its period of action upon the glass or porcelain of the tube. The density of the mass is immaterial so long as the desired result is produced. With some substances such as mixtures of magnesia and asbestos the interposed material may be substantially coherent and solid. With others, such as plaster it may be in a powder and loose. In some cases, the interposed material may, as already stated, completely fill the tube; in others it may be of less thickness and thus, if sufficiently coherent, may form a sleeve surrounding the fuse. But in all cases, there must not be free air space between the fuse proper and the tube wall, anywhere. The wall must be directly shielded everywhere by the interposed material.

In order to insure the complete embedding of the active fuse, the connecting pieces E, F, are provided, and the fuse proper is, therefore, preferably not to be connected directly with the metal caps. These caps are preferably struck up from sheet metal to avoid joints, and the circuit terminals are connected to them in any suitable way.

The term "fictile material" in the claim is intended to include not merely material made by the potter, such as porcelain, but also glass and like vitreous material liable to be ruptured by sudden shock.

I claim:—

In a safety fuse, a fusible strip, a tube integrally formed of fictile material inclosing said strip and a body of inert and refractory material everywhere interposed between said strip and said tube, and constructed to dampen or retard the vibrations due to sudden shock of explosion and thereby to prevent rupture of said tube.

In testimony whereof I have affixed my signature in presence of two witnesses.

THOMAS E. MURRAY.

Witnesses:
GERTRUDE T. PORTER,
MAUDE A. ROGERS.