

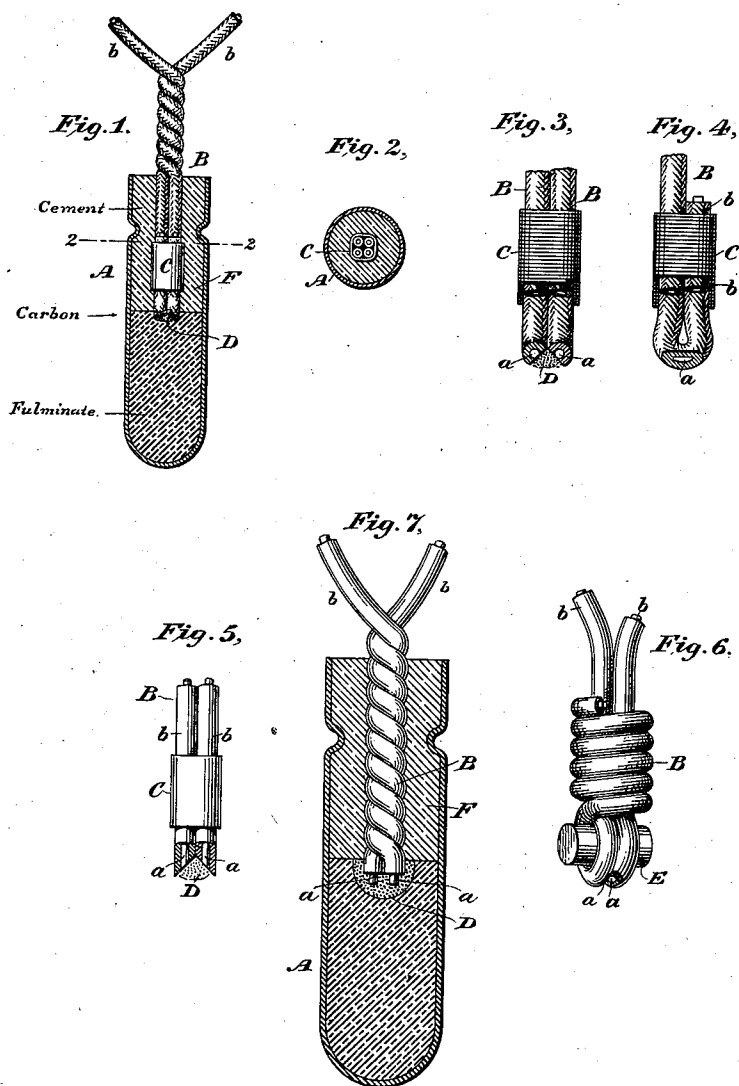
(No Model.)

K. J. SUNDSTRÖM.

ELECTRIC FUSE.

No. 374,640.

Patented Dec. 13, 1887.



WITNESSES:

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ELECTRIC FUSE.

SPECIFICATION forming part of Letters Patent No. 374,640, dated December 13, 1887.

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To all whom it may concern:

Be it known that I, KARL JOHN SUNDSTRÖM, residing at Dover, in the county of Morris and State of New Jersey, have invented certain new and useful Improvements in Electric Fuses, of which the following is a specification.

Electric fuses or exploders for exploding blasting charges and the like have heretofore been constructed with a fine platinum wire as the incandescent conductor, by the heating of which upon the passage of the electric current the explosive charge is ignited. The platinum wire has been connected to the leading-in or conducting wires by soldering—a process which is very difficult to perform, and which renders such fuses expensive of construction. There is also liability that in the putting together of the parts constituting the fuse the delicate platinum wire will be broken or become disconnected, thereby rendering the fuse inoperative. Defects of this character are undiscoverable, except by the failure of the charge to explode—an occurrence which results frequently in great loss and inconvenience.

My invention aims to produce an electric exploder which shall be free from the disadvantages incident to the employment of platinum wire as the incandescent conductor. To this end I employ the usual insulated leading-in wires and at some convenient point I remove the insulation and insert the wires into the shell of the exploder, with the portions thus bared of insulation in contact with powdered carbon or other comminuted conducting material of sufficiently high resistance to become incandescent upon the passage of an electric current of the character ordinarily employed for igniting blasting charges. The conducting-wires may be looped or not, their bared portions in either case being preferably at the extremity. The insulation is preferably removed by cutting an angular notch between the extremities of the wires or loops of wire, so that upon dipping or pressing the wires into a mass of powdered carbon enough of the latter will be pressed into the notch to remain there and constitute the incandescing conductor.

a longitudinal mid-section of an electric fuse or exploder constructed according to my invention in its preferred form. Fig. 2 is a transverse section thereof cut on the line 2 2 therein. Fig. 3 is a fragmentary view, on an enlarged scale, of the electric primer or conductors removed from the shell. Fig. 4 is a similar view looking in a direction at right angles to Fig. 3. In both these views the wires are partly broken away or in section to show the construction. Fig. 5 is a similar view illustrating a modified construction of primer. Fig. 6 is an oblique elevation of a further modification. Fig. 7 is a longitudinal mid-section of the fuse, showing another modification.

Referring to Fig. 1, let A designate the usual metallic shell of the fuse or exploder, which contains the usual charge of fulminate, and in which is placed the electric primer B. This primer consists of two leading-in wires, *b b*, which are connected together by being twisted or otherwise, and are, as usual, inclosed in insulation. According to the preferred construction, which is shown in Figs. 1 to 4, their ends are doubled back upon themselves, and the doubled end portions of the two wires are bound firmly together by a sheath, C, consisting of a wrapping of thread, wire, or any other suitable material. The doubled or looped ends of the two wires project somewhat beyond this sheath and lie parallel to each other and in close contact, the conducting-wires being separated from one another only by their insulating-covering. After the wires are connected in this manner, the insulation is removed from the extremity of their looped portions by means of a three sided file, or by a suitable grinding-wheel, or in any other convenient manner, by which, preferably, an angular or V-shaped notch is cut through the insulation and partially into the metallic wires, as clearly shown in Fig. 3. In this manner a surface of the metallic wires is exposed at *a a*, which should be, by preference, of somewhat greater area than that of the cross-section of the wires. It is obvious that if wires thus prepared be dipped into a mass of powdered carbon and an electric current of sufficient energy be sent through the wires, entering at one wire, passing through the mass of

Figure 1 of the accompanying drawings is

carbon and passing out by the other wire, the particles of carbon will be heated to incandescence in the path of the electric current. I avail myself of this fact in the construction of my electric fuse.

Before placing the primer in the shell I thrust its end, where the notch has been formed through the insulation, into a mass of finely-powdered retort carbon, pressing it into the mass, and thereby forcing the carbon into the notch and into close contact with the bared portions *a a* of the wire. Upon removing the primer a small mass of carbon remains firmly compacted into the notch, as shown at *D* in Fig. 3, and this constitutes the incandescing conductor of the primer. The primer is then inserted into the shell *A*, in which has previously been placed the customary charge of fulminate. The primer is placed with its carbon *D* against the top of the fulminate, and then, by preference, a small quantity of fulminate is filled in around the terminals of the primer, or some gunpowder or gun-cotton may be inserted. Finally, the usual filling, *F*, of sulphur or other suitable cement or plastic material, is run into the upper portion of the shell around the primer, in order to hold the latter in place and to hermetically close the exploder and exclude moisture therefrom.

The precise construction of shell *A* and its contents, which I have herein shown and described, is not essential to my invention; but any construction or arrangement of the parts or elements of the exploder other than those to which my invention specially pertains may be employed. For example, the shell *A* may be of various shapes and may be closed or sealed in various ways—such, for example, as in any of the constructions of electric exploders heretofore made. Any explosive material may be used, and the powdered carbon or other comminuted conducting substance may be arranged in any suitable way relatively to the explosive, as may be preferred in any particular instance.

The primer *B* may be held in place within the shell by any of the means heretofore employed for fastening leading-in wires, and may itself be constructed in various ways, of which some examples, in addition to the preferred method already described, are shown in Figs. 5, 6, and 7 of the drawings.

Fig. 5 shows the two conducting-wires joined together by a sheath, *C*, substantially as already described, but without having their end portions doubled back upon themselves. The extreme ends of the wires lie side by side, separated only by their insulation, and between them an angular notch is formed by means of a file or otherwise, as already described, thereby preparing the ends of the wires for making contact with the powdered carbon.

Fig. 6 shows a construction wherein the sheath *C* is omitted, the end portions of the wires *B B* being looped around a small bar, *E*, of wood or other suitable material, and twisted together above the same, or otherwise

firmly joined or bound together. An angular notch is filed in the looped portions of the wires beneath the bar *E*, as shown, to remove the insulation and expose a bright or untarnished surface of the conducting-wires. When placed in the shell *A*, the ends of the bar *E* may be made to fit against the sides thereof, and thereby hold the conductors in the proper position within the shell while the filling of sulphur or other sealing substance is being run in.

Fig. 7 shows the two conducting-wires *b b* united by simply twisting them together, the insulation being removed from their extreme ends in such manner as to leave the latter protruding, so that when thrust into the powdered carbon they will make a good electrical contact therewith. This figure shows a modified means of putting together the fuse, in that the powdered carbon *D* is not attached to the primer before the latter is inserted in the shell, but is first placed in the shell, lying in a hollow formed to receive it in the top of the mass of fulminate, so that when the primer is inserted its terminals are thrust or embedded into the loose powder, after which the filling of sulphur, resin, or other substance, *F*, is run in.

Instead of employing powdered carbon for the incandescing conductor, the terminals of the electric conductors may be thrust into a mass of loose gunpowder, which will itself serve as a high-resistance conductor, although not so suitable for the purpose as the carbon, since it contains a less proportion of conducting substance. The carbon, instead of being in the form of a powder, may be in the condition of a plastic paste, which may harden around the conductors after the latter are thrust into it. Thus my invention is not limited absolutely to the employment of the incandescing conductor in a comminuted condition. It is, however, essential to my invention that the incandescing conductor shall be in such condition that when the bared terminals of the conducting-wires are thrust into it it shall make an electric connection with said terminals, thereby avoiding all soldering or other joining or connecting of the incandescing with the leading-in conductors before their insertion into the shell. The particular construction by which this desideratum is realized may be varied considerably within the limits of my invention.

The sheath *C*, although consisting, preferably, of a wrapping of soft thread or fine wire, may be made of a sleeve or band of leather, rubber, cotton, or other textile material, or of copper, lead, or other metal, into which the wires may be thrust, or which may be wrapped or closed around the wires, as may be preferred.

My improved electric fuse presents the advantages of cheapness of manufacture, simplicity of construction, reliability—there being nothing that can break or get out of order and thereby destroy or impair the electrical connections—of being safer to make and han-

5 dle than those heretofore used, and of requiring less electro-motive force for firing them.

I claim as my invention the following-defined improvements in electric fuses, substantially as hereinabove specified, namely:

10 1. In an electric fuse, the combination of insulated conducting-wires having relatively adjacent portions bared of insulation with an incandescing conductor consisting of a mass of carbon lying between the bared portions of the wires.

15 2. In an electric fuse, the combination of insulated conducting-wires having their terminal portions doubled upon themselves and having adjacent portions upon the loops thus formed bared of insulation with an incandescing conductor consisting of a mass of material of high electric resistance lying between the bared portions of the wires.

20 3. In an electric fuse, the combination of insulated conducting-wires having relatively adjacent portions bared of insulation with a sheath by which said wires are bound together, and with an incandescing conductor consisting of a mass of comminuted material of high electric resistance lying between the bared portions of the wires.

4. An electric fuse consisting of a shell, A, a charge of explosive material therein, insulated conducting-wires *b b*, having adjacent portions bared of insulation, a sheath, C, binding said wires together, an incandescing conductor consisting of a mass of comminuted material of high electric resistance lying between the bared portions of said wires, and a filling of plastic material placed around said conductors and sealing said shell.

5. A primer for electric fuses, consisting of two insulated conducting-wires bound together and having an angular notch cut through their insulations, whereby adjacent portions of the wires are bared of insulation, and a mass of carbon wedged into said notch and forming a high-resistance electric bridge between the bared terminals of the wires.

45 In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

KARL JOHN SUNDSTRÖM.

Witnesses:

JAMES MACBETH,
ARTHUR C. FRASER.