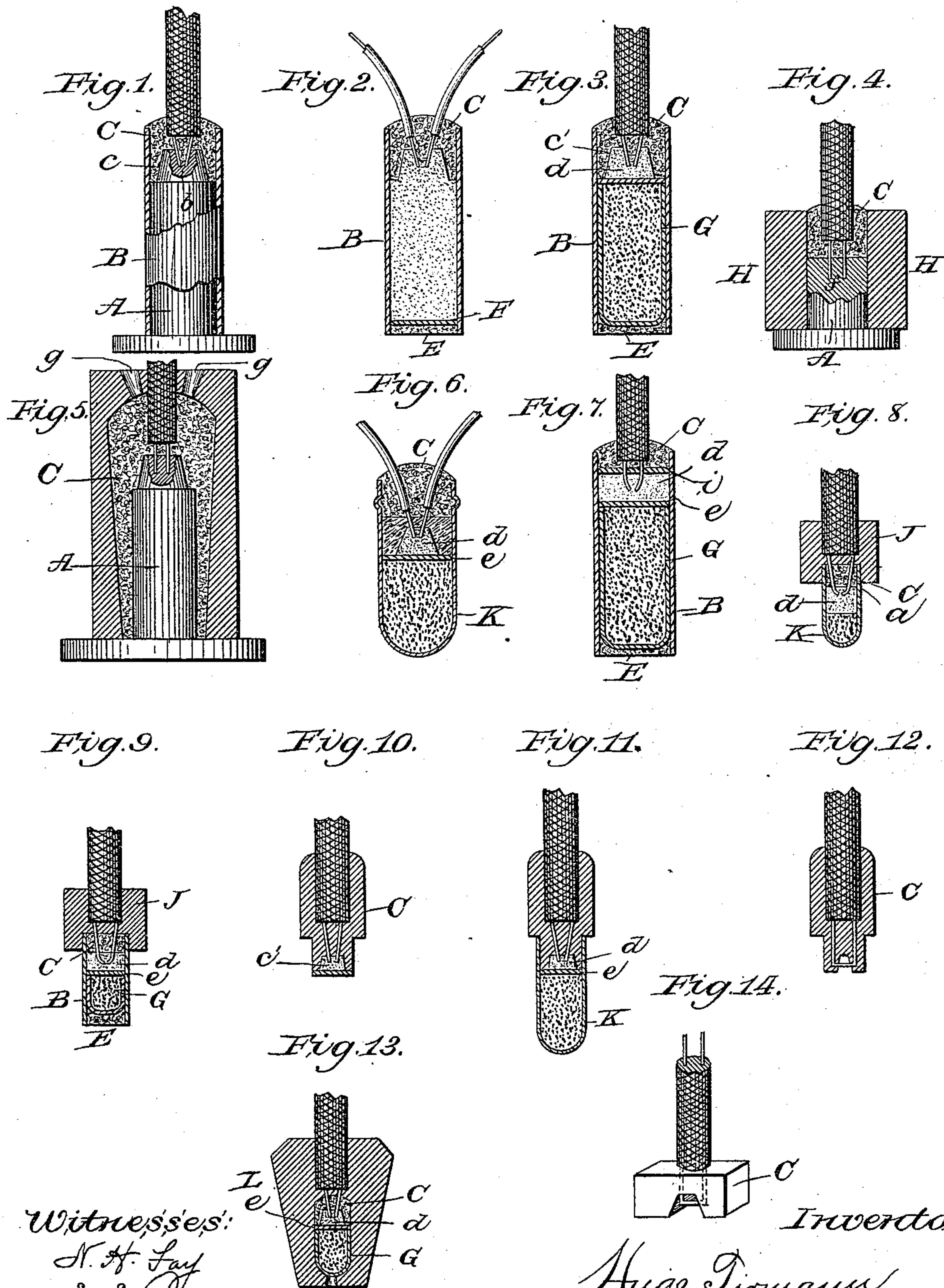


(No Model.)

H. TIRMANN.
ELECTRICAL FUSE.

No. 426,971.

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Witnesses:
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UNITED STATES PATENT OFFICE.

HUGO TIRMANN, OF CLEVELAND, OHIO, ASSIGNOR TO THE UNITED STATES
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ELECTRICAL FUSE.

SPECIFICATION forming part of Letters Patent No. 426,971, dated April 29, 1890.

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To all whom it may concern:

Be it known that I, HUGO TIRMANN, a citizen of Austria, having declared my intention of becoming a citizen of the United States of America, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Methods of Making Electrical Fuses, of which the following is a specification, the principle of the invention being herein explained, and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

The object of this invention is to provide a form of electrical fuse which shall materially cheapen previous cost of production, and at the same time the better attain the various advantages desirable in such class of articles, and which shall thereby enable me to place on the market a better article of manufacture made with great saving of initial expense over the fuse previously used.

According to my invention the electrodes are maintained in fixed relative position by an insulating contrivance, the electrode-points are without electrical connection and are relatively located so as to permit of a static discharge between them, the fuse-head is formed of an insulating mass which maintains the electrodes in their said operative position, and the shell may be charged at either one of its two ends. The substance of the shell itself may be of any suitable material and may be independent of the fuse-head or formed integral therewith. The charge may be permanently separated from the fuse-head or from either end closure of the fuse by any desired detachable partition-layer. Paste, cement, sulphur compound, or other suitable composition may constitute the material of the fuse-head, or of either end closure of the shell.

Referring to the drawings, Figure 1 is a longitudinal vertical sectional view of one mode of forming the fuse-head. Fig. 2 is a similar view of the completed fuse. Fig. 3 is a similar view of another form of completed fuse. Fig. 4 is a similar view of a fuse-head illustrating another method. Fig. 5 is a similar view of a fuse-head illustrating a method of making the fuse-head integral with the body

of the shell. Fig. 6 is a similar view of another form of completed fuse. Figs. 7, 8, and 9 are similar views, respectively, of different forms of completed fuse. Figs. 10 and 12 are similar views of two forms of heads intended, respectively, for spark and platinum fuses. Fig. 11 shows the spark-fuse head of Fig. 10 as applied to a cap. Fig. 13 is a longitudinal sectional view representing a different form of invention. Fig. 14 is a view of a different form of platinum-fuse head.

The method of manufacture illustrated in Fig. 1 consists in first loosely fitting over a forming-pin A a shell B, preferably of paper, but may be of any other suitable material; secondly, introducing the wires down into the shell and forcing the electrodes *a* into the V-shaped opening *b*, formed in the conical top *c* of the forming-pin, said electrode-points being thereby deflected toward each other so as to be in proper relative position to permit of a static discharge between them; thirdly, pouring into the upper end of the shell and about the electrodes a plugging mass of any suitable insulating liquid composition, which latter when set constitutes a solid head for the fuse, said composition insulating-head serving to close the electrode end of the shell, and also to permanently hold the electrodes in relative position suitable for static electrical discharge between their points; fourthly, withdrawing the shell as thus formed from off the forming-pin; fifthly, providing the shell with its charge D, of any suitable explosive substance, such charging being done through the end of the shell opposite to its electrode-supporting head, and, sixthly, closing the said charging end of the shell by a closure E, of paste, cement, or other suitable material. If desired, a partition-layer of paper or any other suitable substance F may be interposed between the charge and said end closure E, all the said procedure producing a fuse of the character as shown in Fig. 2, made at a single operation, having the foregoing steps.

The fuse shown in Fig. 3 is made similarly with that of Fig. 2 in so far as the shell and head of the fuse are concerned. The remaining portions of the fuse are, however, made as follows: Suitable priming *d* is introduced into

the end of the shell opposite to that of the electrode-supporting head, sufficiently filling the conical recess c' of the head C to insure the firing of the explosive contained in the copper cap G, as the electric spark may fire such priming. A partition-layer e , preferably of paper or other suitable material, may be interposed between the copper cap, so as to prevent relative displacement of such substances, the end closure E in this instance being the same as described for the fuse of Fig. 2.

Fig. 4 represents a mode of making a fuse-head, which latter is adapted for use either as a platinum fuse or as a spark-fuse, in either instance the electrodes being supported in and maintained at a proper relative distance by the insulating composition head C, said head in this instance being made by a method independently of the shell, and adapted, when made, to be fitted into a shell of any desired description. The forming-pin A is in this instance provided with a plane-faced top having two parallel vertical holes f , in which latter the two electrodes are respectively inserted, while the forming-pin is surrounded by any suitable mold H, which projects above the top of the forming-pin, a bipartite hand-mold being preferably used for such purposes. The fuse-head C is then formed by pouring in a liquid insulating substance, the same as heretofore described. When such insulating substance is set, the two parts of the mold may be separated and the fuse-head be withdrawn from the forming-pin and be ready for use in connection either with a platinum fuse or with a spark-fuse.

Fig. 5 represents a method of forming the body of the fuse-shell integral with the insulating fuse-head and of the same substance, the forming-pin A having fitted upon it any suitable bipartite mold I, of shape and size relatively to the pin, so that a space may be formed between the two in correspondence with the desired form of shell to be molded, the mold being provided with suitable filling-openings g , through which sulphur compound or other suitable liquid substance may be introduced to the interior of the mold, said mold being further provided with a central top opening h , through which the wires may be introduced, so that the shell may be molded with the electrodes included in its head or with their points projecting a suitable distance into the open body of the shell.

Fig. 6 represents a fuse having a copper shell K, having but one opening, in which latter the insulating-head C is fitted, the opposite portion of the shell being provided with an explosive substance, while priming is interposed between the head C and the detachable partition-layer e , if the latter be used.

In Fig. 7 the fuse-head C of the sulphur composition or other suitable substance is employed. An independent disk i is in this instance used, the same serving to insure the central location of the electrodes in the forma-

tion of the fuse-head, and also preventing the composition mass from unduly incrusting the electrodes, while the priming d is located between said disk i and partition-layer e , which latter separates the priming from the coarser explosive substance contained within copper cap G, said cap being held in place within the shell-body by closure E.

Fig. 8 represents a form of fuse having a shell K open at one end, and which is preferably charged with a suitable quantity of coarse explosive substance, while a priming d is located between such coarse explosive substance and the electrode-points a , such electrodes being fitted in insulating-head C, while a sleeve J, of suitable composition, as heretofore described for said fuse-head, is cast or molded over the adjacent connecting portions of the wires and the shell and secures the same together in durable relation.

Fig. 9 represents a fuse preferably having a paper shell B, in which the charge may be either entirely of priming or other detonating substance, or may be, as shown in the drawings, a copper cap G. In either instance the adjacent end of the shell B is closed by a suitable composition closure E. A composition sleeve J secures together the shell with the wires, the electrodes of which latter are fitted in insulating-head C.

Figs. 10 and 12 represent two forms of fuse-heads, intended, respectively, for spark and platinum fuses, each adapted to be made and sold as an independent article of manufacture, if so desired. In such instance the head may be applied to a cap filled with any suitable explosive substance, either at the factory or by the miner himself. The fuse-head C of Fig. 10 is cast about the wires, is then provided in its recess c' with priming, and a disk, preferably of paper, is then placed over such priming-recess and preferably secured by a paste. At any desired time such fuse-head may be slipped into the fuse-cap and secured thereto by a suitable paste.

Fig. 11 shows the spark-fuse head of Fig. 10 as applied to a cap. It will be understood that the platinum-fuse head of Fig. 12 may in like manner be secured to the cap.

In Fig. 13 the body L of the fuse is formed of a suitable mass or composition molded about the other parts of the fuse. In making this fuse the parts other than as body L are first made, all as heretofore indicated, and said parts are then maintained in suitable position with a bipartite mold, while the liquid mass, of any suitable substance, which is to form the exterior body of the fuse is poured into the mold and about the parts of the fuse held therein, the wires being depended within the mold from any suitable suspension, while the cap G is supported by an upright pin, on which its bottom rests. This form of manufacture provides a practically air-tight fuse and one well adapted for miners' use in view of its peculiar structure.

Fig. 14 represents an oblong fuse-head C,

made as heretofore indicated, but in this instance adapted for a platinum fuse in contradistinction to a spark-fuse, the platinum wire being by this form of fuse-head protected from injury. When the priming-recess of this fuse-head is filled with priming, the recess may be inclosed by a paper or other suitable device applied thereto and pasted in position, thereby retaining the priming in position, and also aiding in preventing injury to the platinum wire.

While I have in certain instances herein represented the priming as being separated by a detachable partition-layer from the explosive contained within the cap or the shell, yet the said partition may be omitted, if so desired.

The foregoing description and accompanying drawings set forth in detail certain specific methods and mechanism in embodiment of my invention. Change may therefore be made therein, provided the principles of procedure and construction respectively recited in the following claims are employed.

I therefore particularly point out and distinctly claim as my invention—

1. A method of casting an electrical fuse-head at a single operation, consisting of the following steps: first, introducing two elec-

trodes into a mold arranged to compel their points to come toward each other; second, pouring into the mold around said electrode-points liquid insulating material, which when set holds said points in fixed position, said mold being of such character as to shape a recess about the points for an explosive, substantially as set forth.

2. A method of casting an entire electrical fuse-head at a single operation, consisting of the following steps: first, introducing two electrodes into a mold adapted to compel their points to approach each other; second, introducing into the mold and about the electrode-points liquid insulating material, which when set holds the points in fixed relative position, said mold adapted to shape a recess about the electrode-points for an explosive and to leave said electrode-points in free projection directly from such recessed insulating-head, substantially as set forth.

In testimony that I claim the foregoing to be my invention I have hereunto set my hand this 22d day of June, A. D. 1888.

HUGO TIRMANN.

Witnesses:

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E. J. CLIMO.