

J. H. ANDREWS.

Safety-Fuse.

No. 45,572.

Patented Dec. 27, 1864.

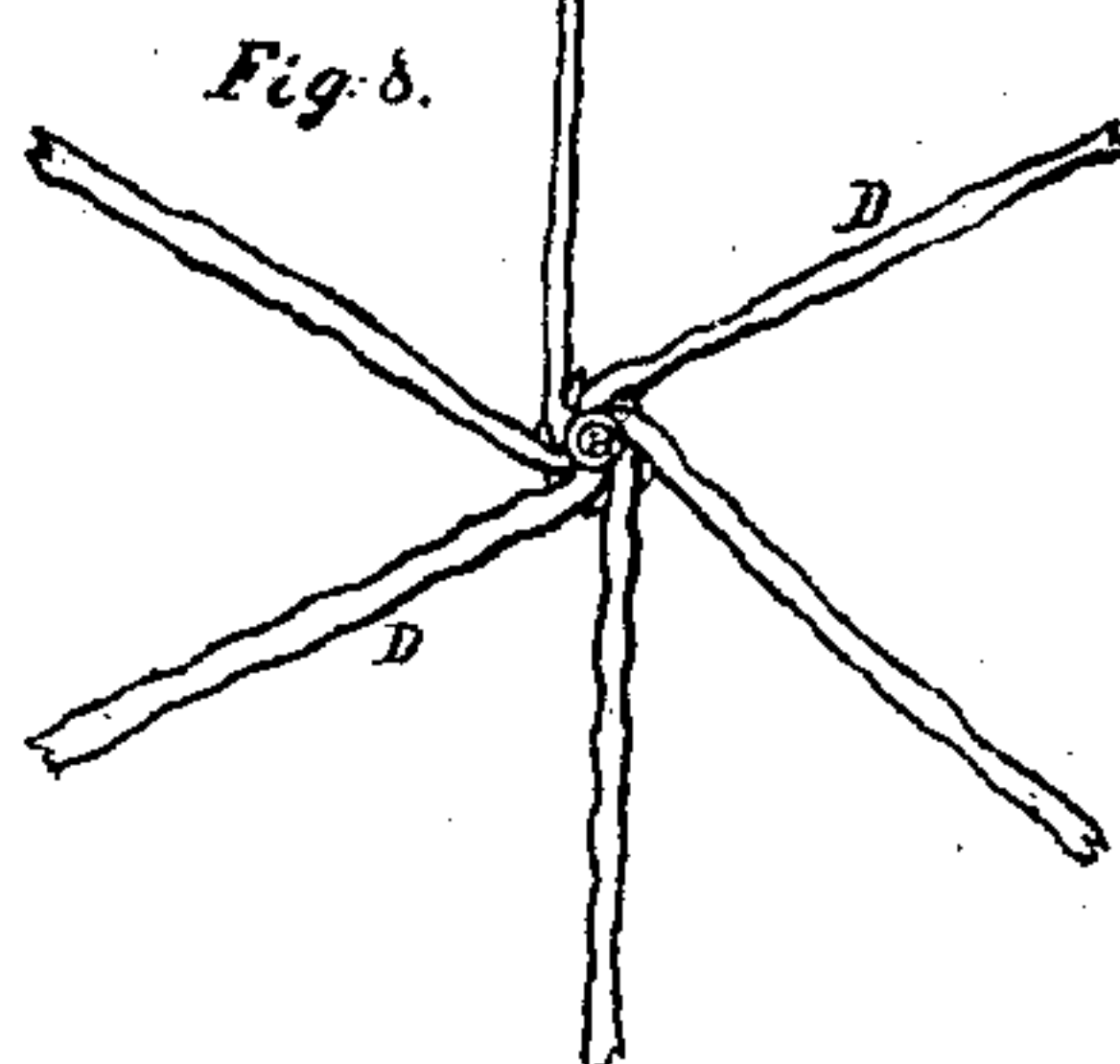
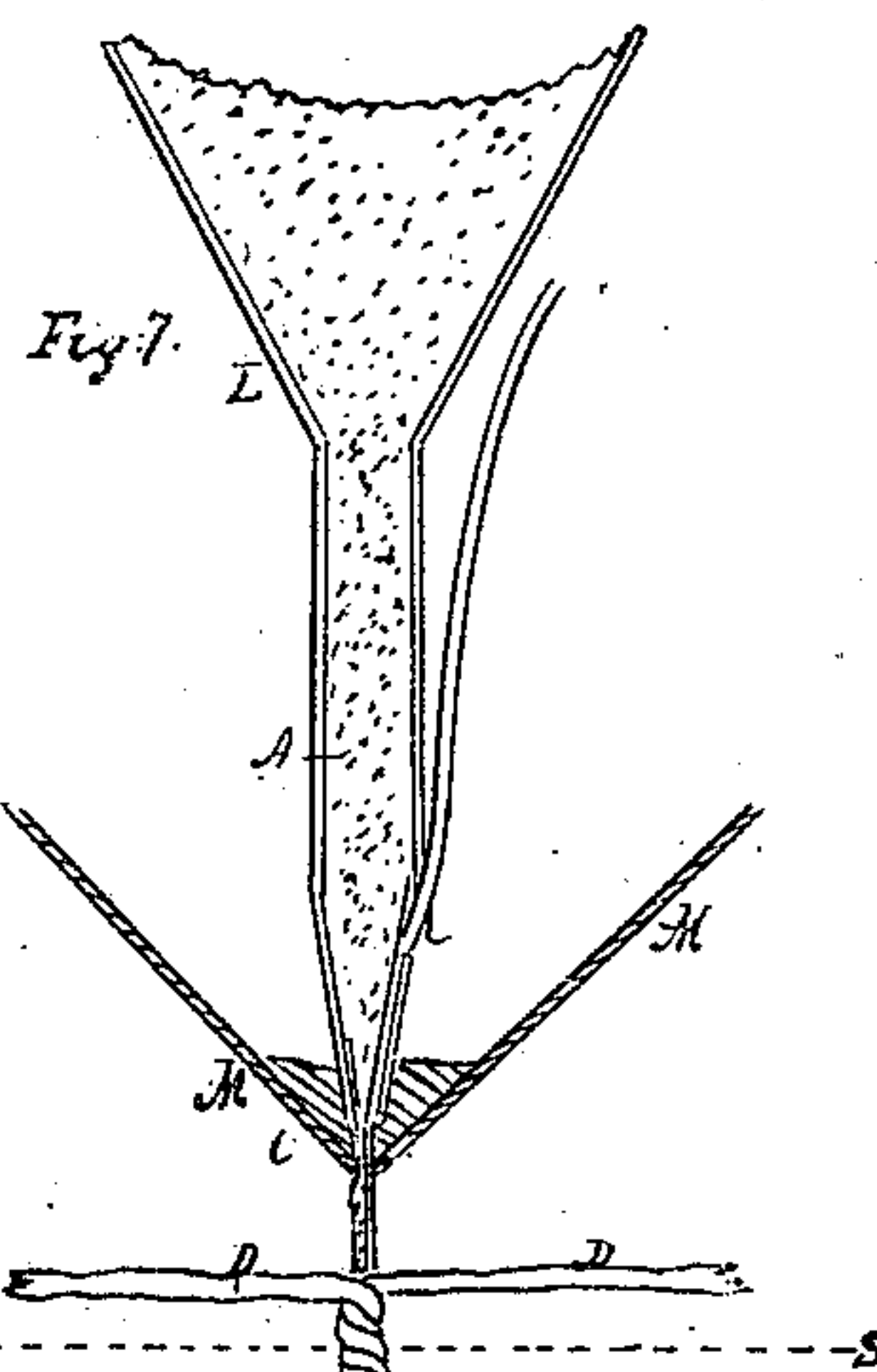
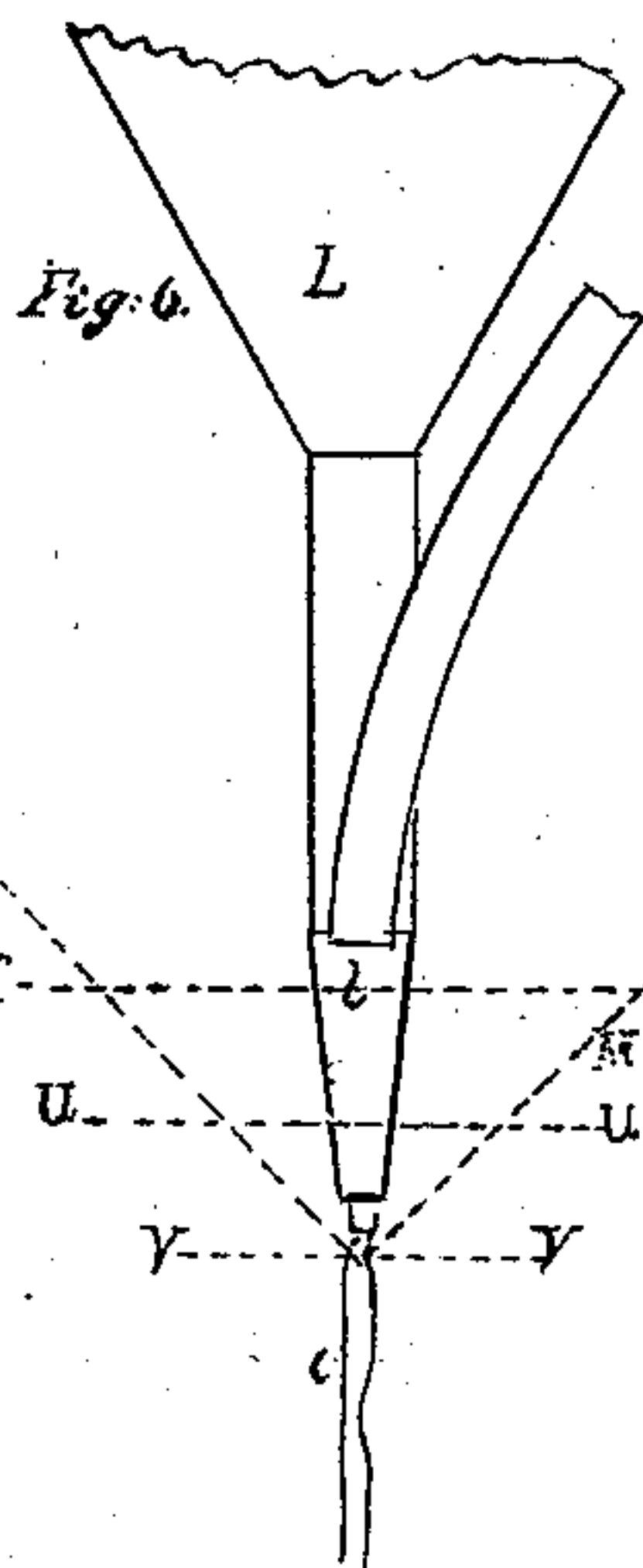
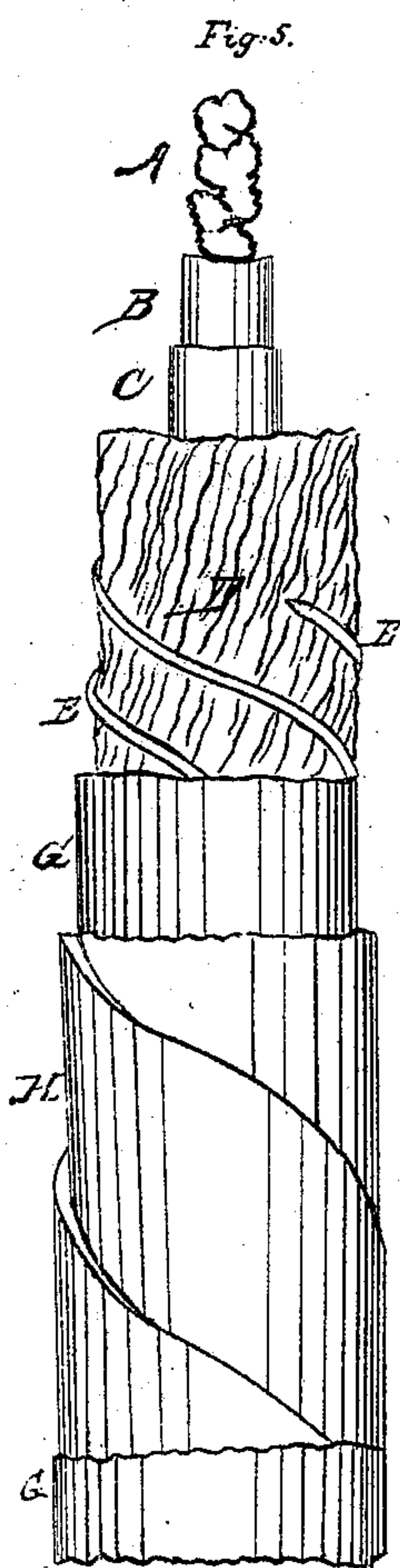
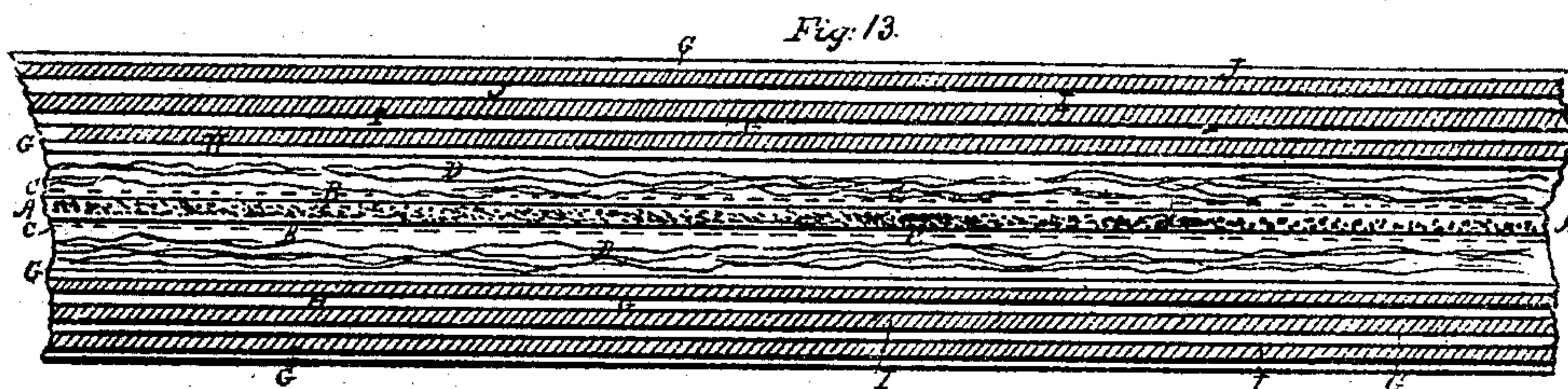
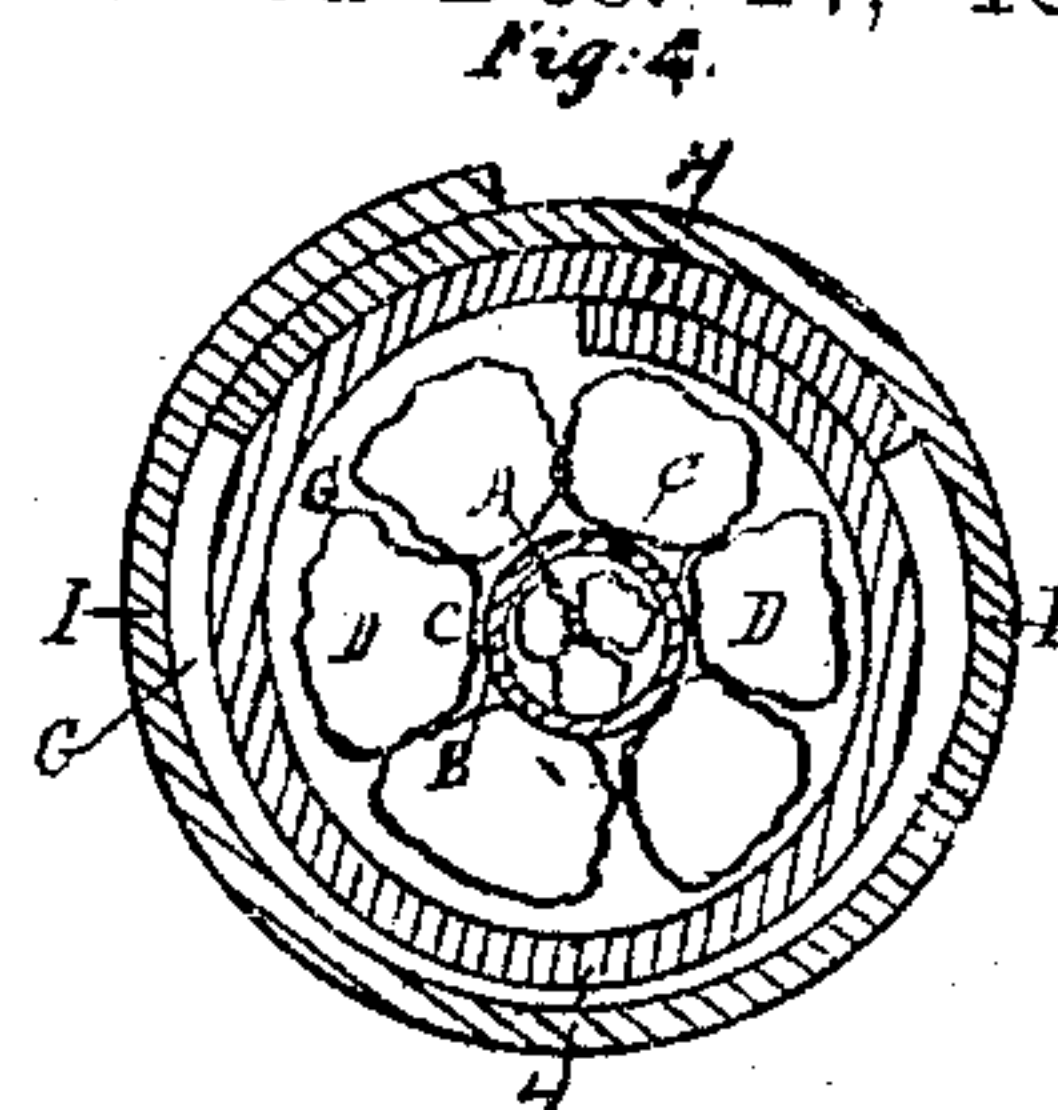
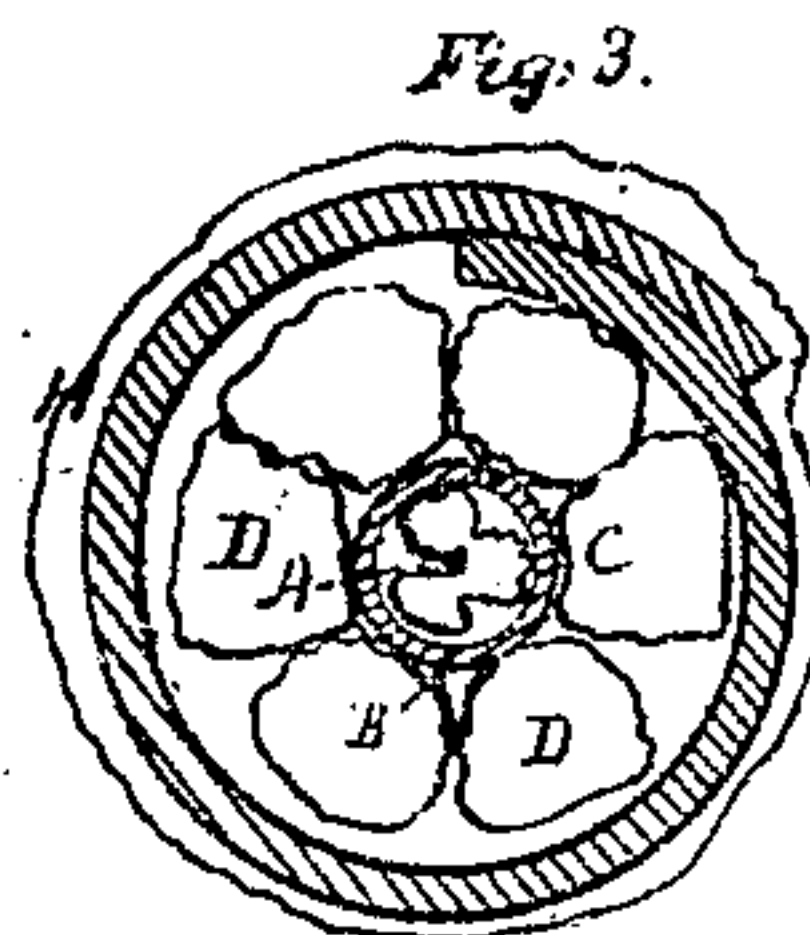
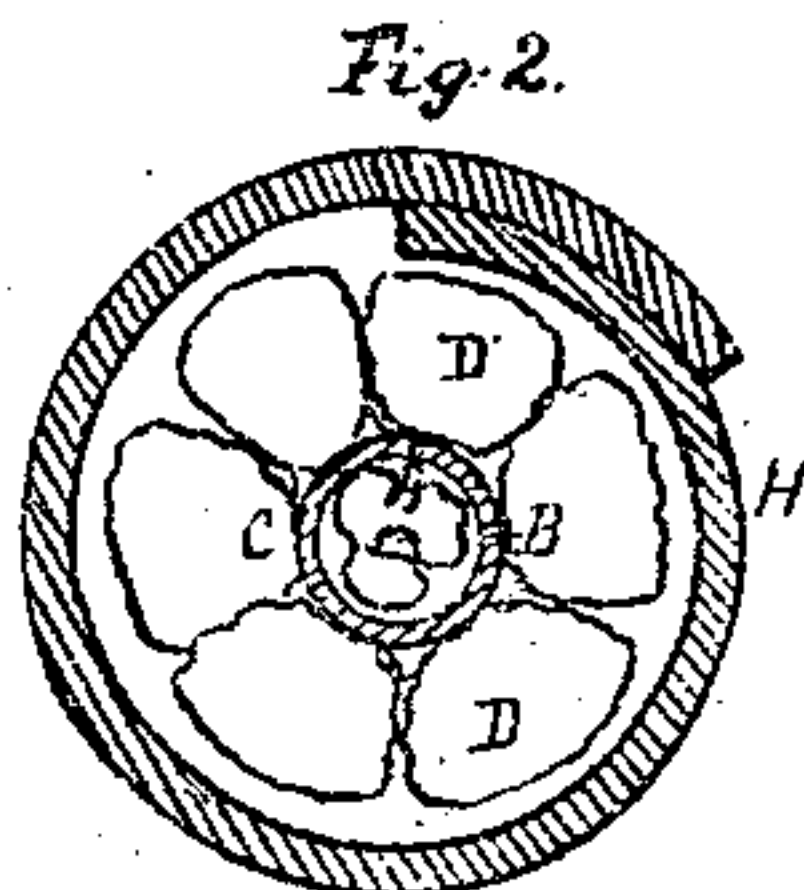
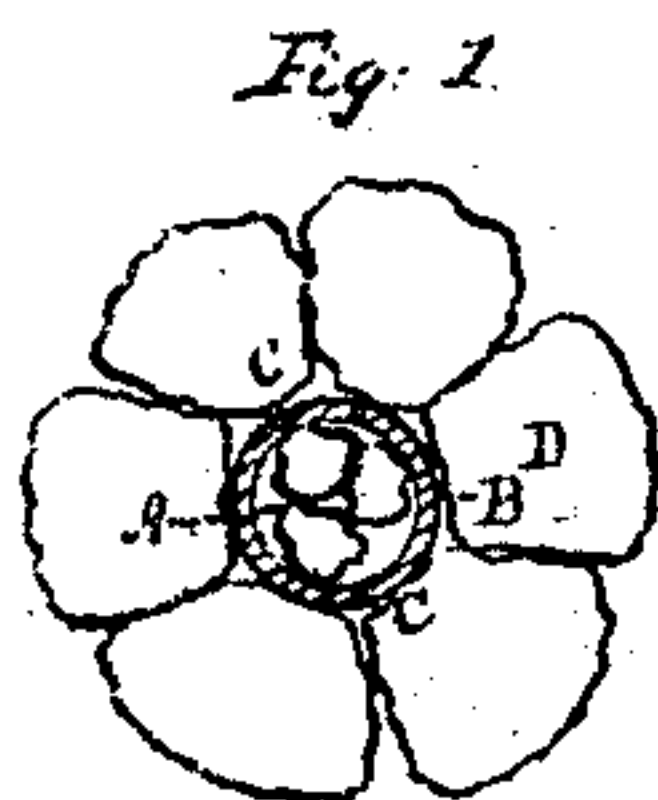


Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Witnesses

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UNITED STATES PATENT OFFICE.

JOHN H. ANDREWS, OF AVON, CONNECTICUT.

IMPROVED SAFETY-FUSE.

Specification forming part of Letters Patent No. 45,572, dated December 27, 1864.

To all whom it may concern:

Be it known that I, JOHN H. ANDREWS, of Avon, in the county of Hartford and State of Connecticut, have invented a new and Improved Mode of Manufacturing Safety - Fuses for Blasting, &c.; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The first part of my invention relates to the interior, and the second to the exterior, of the fuse.

I know of but one manufactory of blasting-fuse in America except my own, and the rarity of the art renders it proper to explain briefly the ordinary fuse of this character. In the common mode of manufacturing these fuses, several yarns of cotton, jute, linen, or other fibrous material are twisted together to form the main substance of the fuse, and a train of powder is inclosed in its center, the train being so slender and so inclosed as to burn slowly and uniformly. The powder is introduced between the several strands of fibrous material by the aid of a funnel-shaped tube having a small aperture at its lower extremity. The whole is then cross-wound with finer yarns of cotton or other fibrous material, and the surface afterward further protected. This mode of construction fulfills, with some success, the conditions required, which are not alone the preservation of a series of grains of powder in juxtaposition each with another along the center of the structure, and the preservation thereof in a dry condition, but also that the combustion, as it proceeds, shall so far destroy the enveloping material as to maintain a tolerably free escape for the gases, so that the powder shall burn with uniformity from one end to the other. A fine center thread is usually led down through the powder-funnel, and allowed to remain in the fuse with the powder. This tends greatly to reduce the risk that the powder may clog in the passage; but accidental accumulations of detached particles of fibrous material from the center thread, the existence of uneven places in the outer yarns, with various other causes, frequently occasion a partial or entire interruption of the powder as it is being twisted into the yarns. This is a very serious evil, as it not only renders the

fuse at that point inoperative and worthless, but causes it to become a source of great delay and expense to those attempting to use the article. Sometimes fuse so defective retains fire smouldering slowly within it until it again ignites the train and endangers the lives of the workmen. To obviate this difficulty I first inclose the powder in a slender tube of paper or other suitable material by passing a strip or several strips into the powder-tube near its lower extremity and folding or bending the same around the powder. By thus surrounding and smoothly inclosing the powder before it leaves the funnel, I secure a more continuous and uniform line of powder, and consequently secure more certainty in its burning and more regularity in its rate of consumption. It also affords very favorable conditions for introducing a water-proof coating near the center of the fuse.

The common water-proof fuses, known as "single-tape," "double-tape," and "triple-tape" fuses, are made by winding the outer surface spirally with strips of cloth or tape, or the warp-yarns thereof correspondingly aggregated together. The common fuse, with its envelope of jute or the like, above described, is coated with fuse-varnish and dried, and then run through a winding-machine, in which the tape or its equivalent is wound tightly around, slightly lapping or superposing each coil upon the edge of the last preceding. Winding once, and then coating again with varnish, makes single-tape fuse. Cross-winding this by winding with another tape spirally in the opposite direction and again coating makes double tape. Rewinding and again coating makes triple tape, which is the most elaborate of any in common use. The object of all these external protections is chiefly to secure the powder in a dry condition when employed in wet blasting. In my invention I substitute strips of thick and strong paper or paper parchment in place of the tapes or threads above described. I make these strips narrower and wind them in narrower spirals than the enveloping material has been usually heretofore applied, and with these precautions experiment proves my single, double, or triple wound fuse, when correspondingly coated with varnish, to be more impervious to water than any correspondingly coated before known, and better

in other important respects than any other of like cost.

Experiments have been tried in coating fuses with rubber or other material more impervious than fuse-varnish with a view to render them perfectly water-tight; but this has been found to be impracticable, because the confinement of the gases from the burning powder would accumulate pressure and cause the fuse to burst and burn unevenly. In my invention the employment of paper or paper parchment insures an efficient and flexible protection with liberty for the escape of gas through the spiral joint, which is presented at each half-inch, or thereabout, and by making water-proof my inner tube, which directly incases the powder, by coating it with rubber or other water-proof cement, a perfectly water-proof fuse may be secured without the objections due to similar outside coating, because in my invention, the rubber, being in close proximity to the powder, is destroyed at once and allows the gasses to escape freely.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation by the aid of the drawings and of the letters of reference marked thereon.

Figure 1 is a cross-section of my central tube after the jute is wound on. Fig. 2 is a corresponding section of my fuse after the fuse-varnish is applied and a strip of paper or paper parchment has been wound on; Fig. 3, the same with another coat of varnish; Fig. 4, the same after another strip of paper or paper parchment has been wound on, making what is called "double-tape fuse," all on a scale greatly magnified. Fig. 5 is a section on a correspondingly-magnified scale, showing at the upper end only the column of powder, and showing at successive lower stages first my inner tube, next my inclosing-rubber, next the fibers of jute, next the ordinary slight binding-threads which serve to maintain the jute fibers in position while the fuse is awaiting subsequent operations, next the fuse-varnish, next the spirally-wound external protection of paper, next the fuse-varnish again, &c. Fig. 6 is an elevation, and Fig. 7 a section, of the funnel and certain of its connections, by which I prepare the inner tube and cover it with water-proof composition. Fig. 8 is a horizontal section on the line S S, showing the condition of the partially-formed tube at that point. Figs. 9, 10, and 11 show the condition of the inner tube at two different stages, Fig. 9 being a section on the line T T, and Fig. 10 a section on the line U U; Fig. 11, the same on V V. Fig. 12 is a section showing the material of the inner tube overlapped. This mode of construction may be in some cases preferable. Fig. 13 is a longitudinal section through my triple-tape fuse on a scale less magnified than Figs. 1 to 5. The rubber or other water-proof coating on the inner tube is tinted red, to more plainly distinguish it.

Similar letters of reference indicate like parts in all the figures.

I manufacture my fuses at two or more distinct operations, all analogous to those heretofore practiced.

A is the powder.

B is an inner tube which completely surrounds the powder, and which I prefer to make of dense and tough paper.

C is a water-proof and highly-adhesive composition which I prefer to make by dissolving raw india-rubber in oil of turpentine or other volatile solvent.

D is a fibrous envelope, which I make, for economy, of jute, and which is wound spirally around the parts A B C.

E is a slight spiral tie or confining-thread, which I prefer to triplicate or employ in the form of three separate spirals, of cotton or other slender yarns.

G is the fuse-varnish, which I prefer to make of wood-tar and coal-tar, of about equal proportions.

H is a spiral envelope, of paper or paper parchment. This latter I apply by means of the well-known winding machines; and after coating again with the fuse-varnish G, I apply at pleasure one or more additional coatings or envelopes of similar material, I and J. I apply a coat of the fuse-varnish G after each, and usually coat the whole with finely-pulverized soapstone, whiting, or the like, (not represented;) to render the surface less liable to be sticky. I apply the fuse-varnish G by drawing the material through the melted composition and stretching it a considerable distance through the air on the way to the reel, so as to allow it to harden. The fibrous enveloping material D is applied by carrying it on bobbins around the descending contents in the manner described in the patent issued to my brother, Albert F. Andrews, dated July 28, 1857, and in another, No. 8,963, issued in 1852.

To manufacture and introduce my inner tube, B, and apply the rubber cement or other water-proof and adhesive cement thereon, I employ a funnel, L, and guide I, by the aid of which the strip of paper to form the said inner tube is curved gradually around into a tube, and the powder is inclosed therein in a continuous and smoothly-bounded line; and I employ a conveyer represented in a very primitive but effective form by the lower funnel, M, which contains a quantity of the soft cement and causes it to apply evenly and continuously over the whole exterior of the tube B as it emerges from the upper funnel, L. Immediately below the lower funnel, M, the jute D is wound around, and succeeding this the binding-threads E are wound on, so as to confine and protect the inner tube, as indicated.

Some of the advantages due to certain features of my invention may be separately enumerated as follows:

First. By inclosing the powder A in an inner tube, B, as above described, a uniform line of powder is secured, and by coating the tube B with rubber or equivalent cement, C, a perfectly water-proof fuse may be obtained, while the rubber coating, by being removed from the surface, precludes the liability of its being cut or otherwise injured in tamping, and by its close proximity to the powder is certain to be immediately destroyed as the fire traverses along the fuse.

Second. By substituting paper or paper parchment for cloth or other material in the surfacing H, &c., of tape fuses, a fuse is produced of better quality and at less expense than heretofore known.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The inner tube, B, as herein described, and also the coating of the same with rubber or other equivalent material, for the purpose herein set forth.

2. The substituting of paper or paper parchment in the place of cloth or other material now used in the manufacture of tape fuses, substantially as herein described.

JOHN H. ANDREWS.

Witnesses:

SAMUEL HADSELL,
AMOS W. WOODFORD.