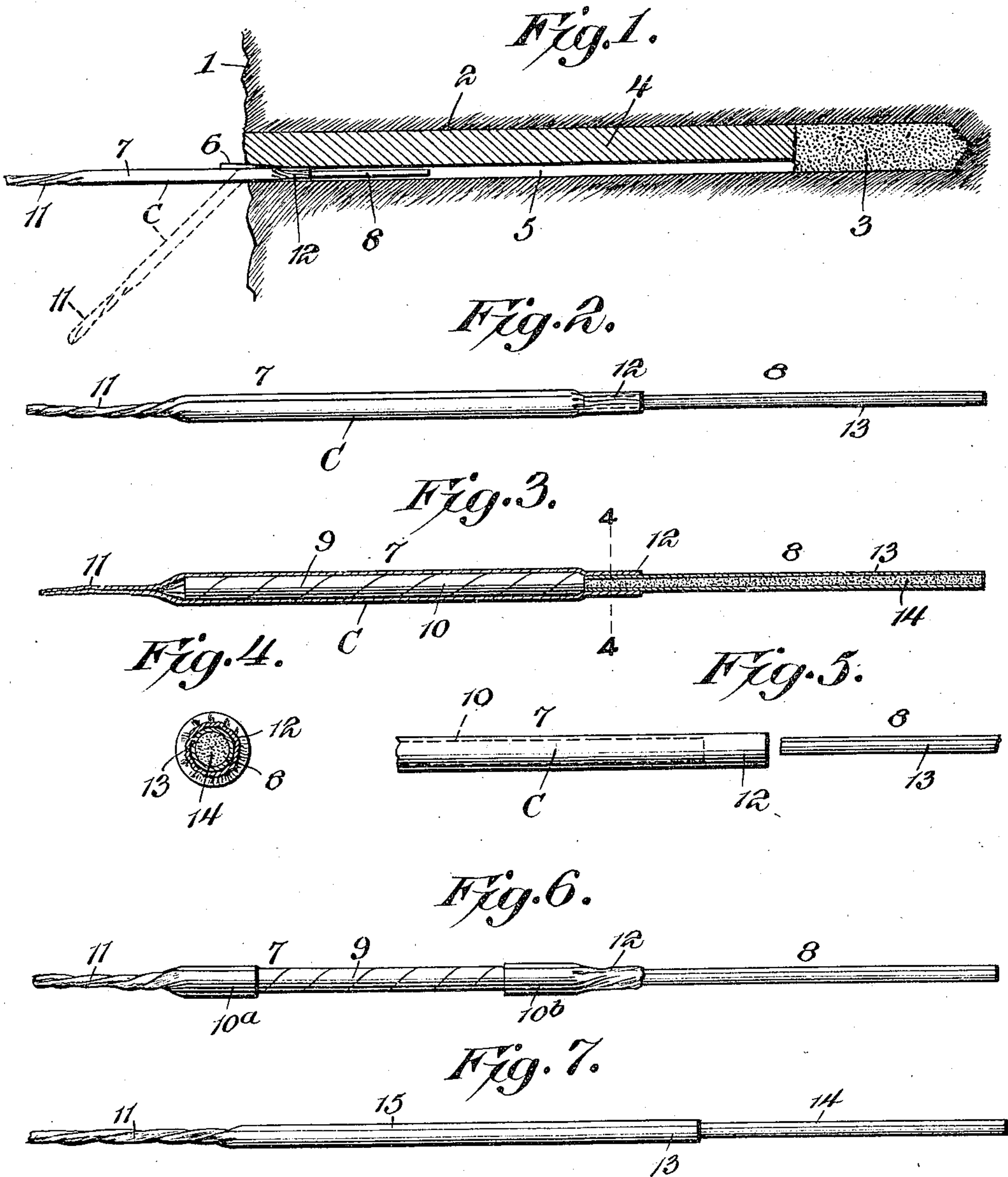


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PATENTED MAY 30, 1905.

J. R. POWELL.  
SECTIONAL SQUIB.  
APPLICATION FILED AUG. 11, 1904.



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# UNITED STATES PATENT OFFICE.

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## SECTIONAL SQUIB.

SPECIFICATION forming part of Letters Patent No. 791,211, dated May 30, 1905.

Application filed August 11, 1904. Serial No. 220,420.

*To all whom it may concern:*

Be it known that I, JOHN R. POWELL, a citizen of the United States, residing at Plymouth, in the county of Luzerne and State of Pennsylvania, have invented a new and useful Sectional Squib, of which the following is a specification.

My present invention relates to a novel squib designed to facilitate the firing of blasts with greater certainty than has heretofore been possible.

In mine-blasting a hole several feet in depth is drilled, and after the charge is inserted refuse is tamped around a "needle," which latter when withdrawn leaves a "needle-hole" leading to the charge, or in some instances an iron or other non-combustible tube, known as a "blasting-barrel," is inserted in the drilled opening. In either event a tubular conduit leading back to the charge is formed. Ordinarily the charge has been fired by means of a "squib"—an inflammable tube a few inches long filled with an explosive and designed when ignited to fly back from the outer end of the conduit to the charge for the purpose of firing the latter. Obviously since the squib is designed to fly back to the charge it must be loosely received in the firing tube or conduit. This, however, is not always practicable, because it is customary to fire a number of blasts at or about the same time, and as the charges are comparatively heavy, particularly in blasting "off the solid," the concussion produced by one blast is sufficient to dislodge the squib from an adjacent hole. Furthermore, a loose squib is apt to be blown out of a hole by the gases escaping therefrom and will drop out of place in overhead blasting. Under these various conditions the retention of the squib by some positive means is necessitated, and such means ordinarily consists in inserting a small wedge in the outer end of the hole to fasten the squib. Thus in using squibs under the conditions named diametrically-opposed requisites are encountered, since it is necessary for the squib to fly back to the charge and equally necessary for the squib to be held positively against accidental move-

ment. The result is that the wedge must be inserted with just sufficient force to prevent the accidental dislodgment of the squib without preventing the same from flying back to ignite the charge. It frequently happens, however, even when the wedge is carefully inserted, that the pressure thereof on the squib will either cause the latter to go out before it is completely consumed or to be consumed without flying back to the charge. In either event a misfire results. Obviously, therefore, the ordinary squib, while comparatively inexpensive, is not entirely efficient in overhead blasting or where the holes are gaseous or in the neighborhood of other blasts to be previously fired. This inefficiency of the squib has come to be recognized, and in many parts of the country fuses leading all the way from the outer end of the hole to the charge are employed notwithstanding the considerable additional expense involved.

The object of my present invention is to produce what may be termed a "sectional" squib, combining the advantageous characteristics and eliminating the objectionable features of both the squib and fuse as ordinarily constructed.

To the attainment of this object the invention consists in combining a front fuse-section, which may be securely wedged in the hole, and a rear squib-section, which when ignited from the fuse-section will fly back to fire the charge.

The invention also resides in certain features of construction and arrangement to be hereinafter described, illustrated in the accompanying drawings, and succinctly defined in the appended claims.

In said drawings, Figure 1 is a sectional view illustrating the application of my invention. Fig. 2 is a side elevation of the sectional squib shown in Fig. 1. Fig. 3 is a sectional elevation thereof. Fig. 4 is a transverse section on the line 4 4 of Fig. 3. Fig. 5 is an elevation of the adjacent ends of the sections in juxtaposition. Fig. 6 is an elevation of a modified construction, and Fig. 7 is a similar view of still another form.



Like characters designate corresponding parts in the several views.

1 indicates a wall of coal or other material to be blasted; 2, the opening drilled therein; 3, the explosive charge at the inner end of the opening, and 4 the material tamped in the opening to form the needle-hole 5. In the outer end of the hole 5 is securely held—as, for instance, by a wedge 6—the front or fuse section 7 of my sectional squib, which also includes a rear or squib section 8 so connected to the section 7 that it (the rear section) will be free to fly back to the charge when ignited from the front section.

I have adopted the above terms—to wit, “fuse-section” and “squib-section”—to designate the primary parts of my device for the reason that the front section performs merely the office of a fuse, since it conveys fire to the rear section, while the latter performs the office of a squib, inasmuch as it flies back bodily after being ignited to fire the charge. The front section comprises in its preferred embodiment a piece of fuse 9 of usual construction embodying a spirally-wound waterproof cover 10, within which is a suitable highly-inflammable substance wrapped in fiber. Inclosing this fuse 9 is a casing C, of flexible slow-burning material—as, for instance, paper chemically treated to make it burn dead—that is to say, without flame. This casing C is extended beyond the front end of the fuse and twisted to form a match 11 and is similarly extended beyond the rear end of the fuse 9 to form a compressible or collapsible sleeve 12. The sleeve 12 is designed for the reception of the front end of the squib-section 8, which is preferably a piece of squib composed, as usual, of a combustible tube 13, containing an explosive substance—as, for instance, powder 14. After the end of the squib-section 8 is inserted in the sleeve 12 the latter is twisted or otherwise compressed thereon to unite the sections sufficiently to facilitate their handling, but in a manner to permit the squib-section to fly back to fire the charge notwithstanding the secure retention of the front section 7 by the wedge or other instrumentality employed to prevent the accidental dislodgment of the device by concussion, gas-currents, or gravity. In fact, if desired, the sleeve 12 might be fastened to the squib-section, because while this would positively prevent the separation of the sections prematurely the thin inflammable character of the sleeve would insure its being burned away, and thus permit the squib-section to shoot back for the performance of its function. Preferably, however, the rear or squib section is loosely inserted in the sleeve and is retained merely by the compression thereon of the latter.

In Fig. 6 I have illustrated a modified construction consisting in forming the match 11

and sleeve 12 at the outer ends of two separate terminal casings 10<sup>a</sup> and 10<sup>b</sup>.

In Fig. 7 I have shown another modification, which consists in utilizing an ordinary squib 15 for the front or fuse section, in which case the rear section 14 is merely extended into the end of the tube 13.

It will now be seen that while my device is essentially a squib and is proportionately inexpensive, since it does not extend the entire length of the needle-hole, as a fuse necessarily does, it nevertheless possesses all of the advantages of a fuse, since it is rigidly retained against accidental dislodgment without in any way interfering with the firing of the blast and since its retained front end may be bent down to the position shown in dotted lines in Fig. 1, as is customary with fuses, to prevent gases issuing from the needle-hole from extinguishing the match.

It is thought that from the foregoing the construction, mode of manipulation, and many advantages of my sectional squib will be clearly comprehended; but while the illustrated embodiments of my invention are believed at this time to be preferable I reserve the right to effect such changes, modifications, and variations of the illustrated structures as may come fairly within the scope of the protection prayed.

What I claim is—

1. A squib, comprising two separate and distinct sections, one having the form of a fuse provided with a combustible sleeve secured to and extended from one end thereof and the other section having the form of a squib extended into the sleeve of the fuse-section and adapted upon ignition to fly back independently of the fuse-section to ignite the charge, and a match carried by and extended from the front end of the fuse-section and having no connection with the squib-section.

2. A sectional squib, comprising a fuse-section adapted to be rigidly secured at the front end of the blasting-conduit and having a match secured to one end and a flexible sleeve of combustible material secured to and extended beyond the opposite end thereof, and a squib-section extended into the sleeve and detachably retained by the compression of the sleeve thereon.

3. A sectional squib, comprising a fuse-section having a casing of comparatively thin, flexible and combustible material wrapped thereon and having its ends extended to form a match at one end of the fuse-section and a collapsible sleeve at the other end thereof, and a squib-section having one end extended into the sleeve and normally retained by the collapsing of the sleeve thereon, but capable, upon ignition, of flying back independently of the fuse-section to ignite the charge.

4. A squib, comprising two separate and distinct sections, one of said sections being a



piece of ordinary fuse and the other a piece  
of ordinary squib, the fuse-section having  
flexible, slow-burning material applied to its  
exterior to form a match at one end and a sleeve  
5 at the other end, said sleeve surrounding one  
end of the squib-section and collapsed thereon  
to temporarily retain the same.

In testimony that I claim the foregoing as  
my own I have hereto affixed my signature in  
the presence of two witnesses.

JOHN R. POWELL.

Witnesses:

JOHN L. JONES,

THOMAS L. EDWARDS.