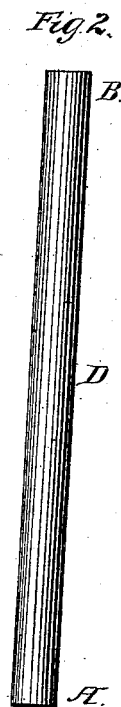
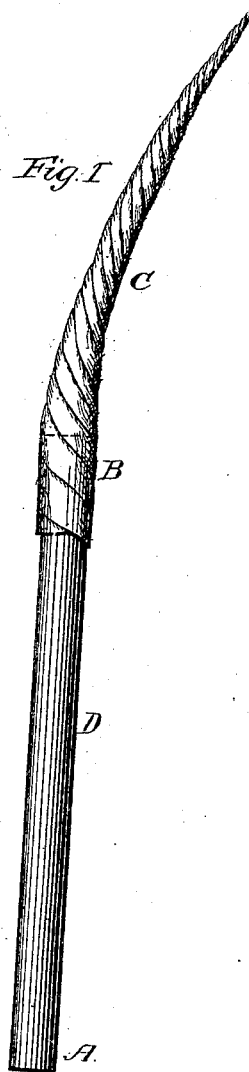


T. S. THOMAS & J. R. POWELL.  
Blasting-Squib.

No. 220,735.

Patented Oct. 21, 1879.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

THOMAS S. THOMAS AND JOHN R. POWELL, OF PLYMOUTH, PENNSYLVANIA.

## IMPROVEMENT IN BLASTING-SQUIBS.

Specification forming part of Letters Patent No. **220,735**, dated October 21, 1879; application filed July 27, 1878.

*To all whom it may concern:*

Be it known that we, **THOMAS S. THOMAS** and **JOHN R. POWELL**, of Plymouth, county of Luzerne, and State of Pennsylvania, have invented certain new and useful Improvements in Mining-Squibs for Blasting Coal and Rock; and we do hereby declare that the following is a full, clear, and exact description of the invention, that will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing, and to the letters and figures of reference marked thereon, which form a part of this specification.

The same letters and figures of reference are used to indicate the corresponding parts.

After describing our invention, its nature and extent will be shown in the claims.

Our invention relates to an improved match and squib used for firing the blast of powder in coal, rock, or other solid substance.

It consists of a water-proof tube made of straw or other material. This tube is four or five inches long, and its lower end is closed with soap or other suitable material of a similar character. It is then filled with powder. Its upper end is closed with sulphur, or any material which will burn only when brought into contact with a bright flame. Any substance that would burn, or even hold "dead-fire" when brought in contact with a live coal, would be unsuitable as a stopper for the upper end of the squib. A slow-match is attached to the upper end of the squib. This match consists of a small roll of twisted paper saturated with any suitable composition which will cause the match to burn with a slow bright flame until the sulphur in the end of the squib is reached. Any composition that would carry dead-fire or would burn with a coal would be an improper composition with which to saturate the match.

The composition should not be brittle, like sulphur, as that substance is liable to break off, and thus allow the paper, when the sulphur is removed, to carry dead-fire. A brittle composition will allow the match to become untwisted, so that the powder will run down in

the match, and thus discharge the blast prematurely. A composition of bees-wax, brown sugar, and starch will answer these conditions of a good slow-match.

The match may be made so as to fit squibs of any given size, and attached to the squib when needed; or the match may be loosely attached to the squib and then dipped in the inflammable composition, so that the attachment will become firm.

In the drawings, C is the match; D, the tube; B, the sulphur or the composition at the upper end, and A the soap at the lower end.

Squibs of straw or other water-proof material have been used before; and also slow-matches in connection with squibs have before been used; but the upper ends of squibs have not before been closed, so as to prevent the powder therein from running down into the match when the match becomes partially untwisted. This causes the premature explosion of the blast, and is the cause of many accidents in mining.

The object of our invention is to provide a squib which will avoid the danger from dead-fire, and also the danger from premature explosions, as herein described.

Having now fully described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a mining-squib, a water-proof tube closed at its upper end with sulphur or any similar material, in combination with the slow-match, substantially as shown and described, and for the purposes herein set forth.

2. A slow-match saturated with a composition of bees-wax, starch, and sugar, or any equivalent composition, substantially as shown and described, and for the purposes herein set forth.

Witness our hands this 23d day of July, A. D. 1878.

**THOMAS S. THOMAS.**  
**JOHN R. POWELL.**

In presence of—  
**H. C. MAGEE,**  
**J. W. ENO.**