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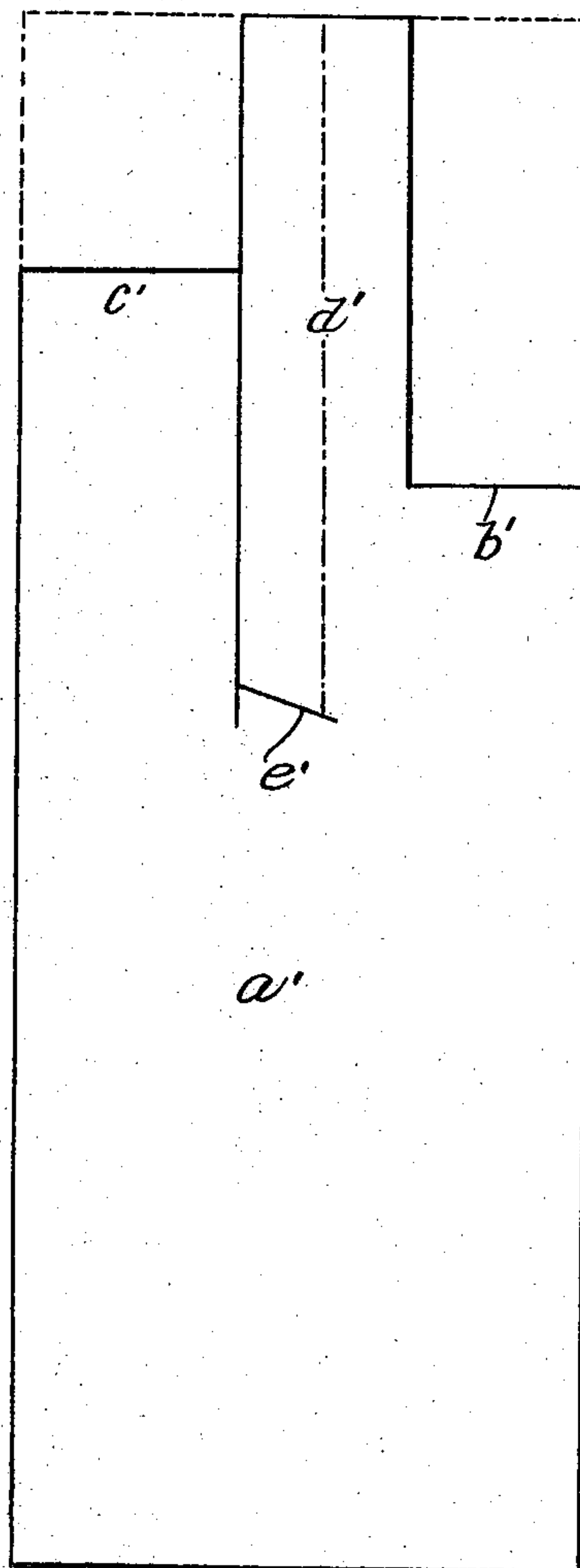
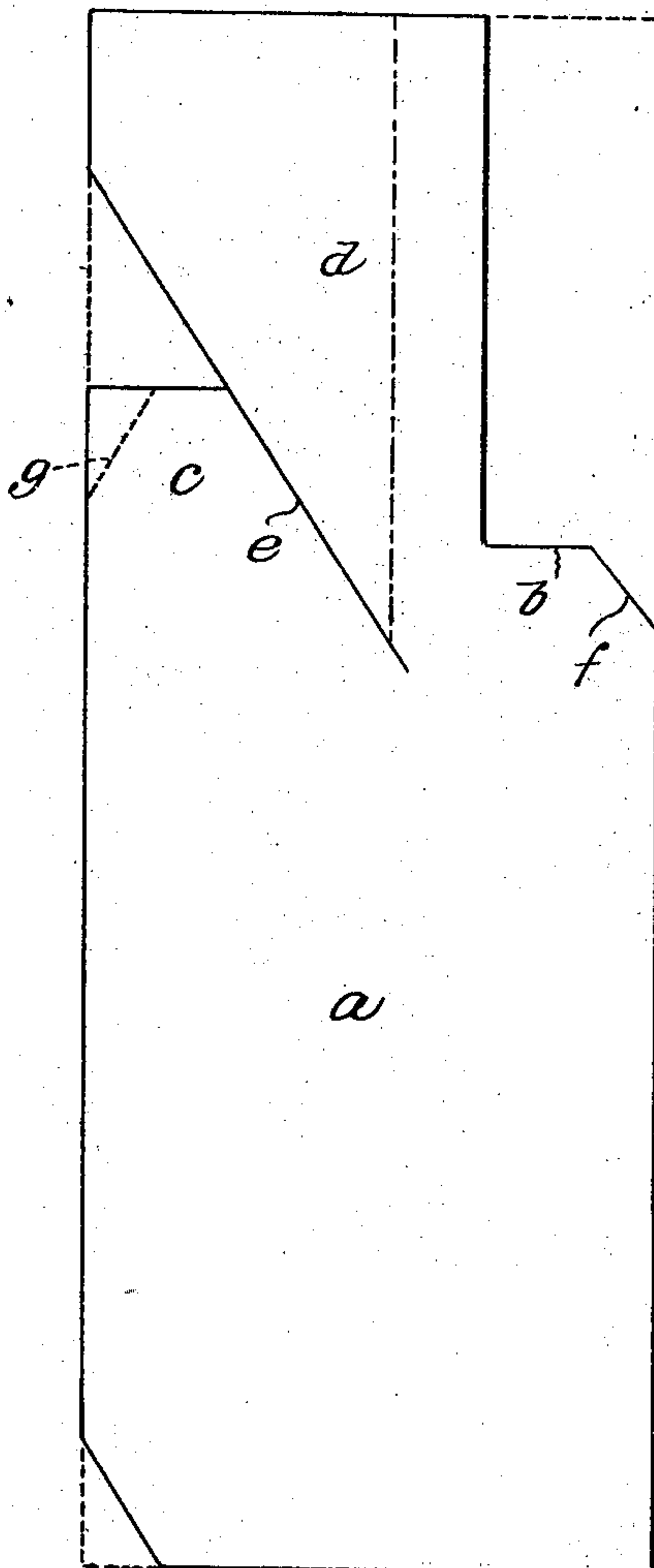
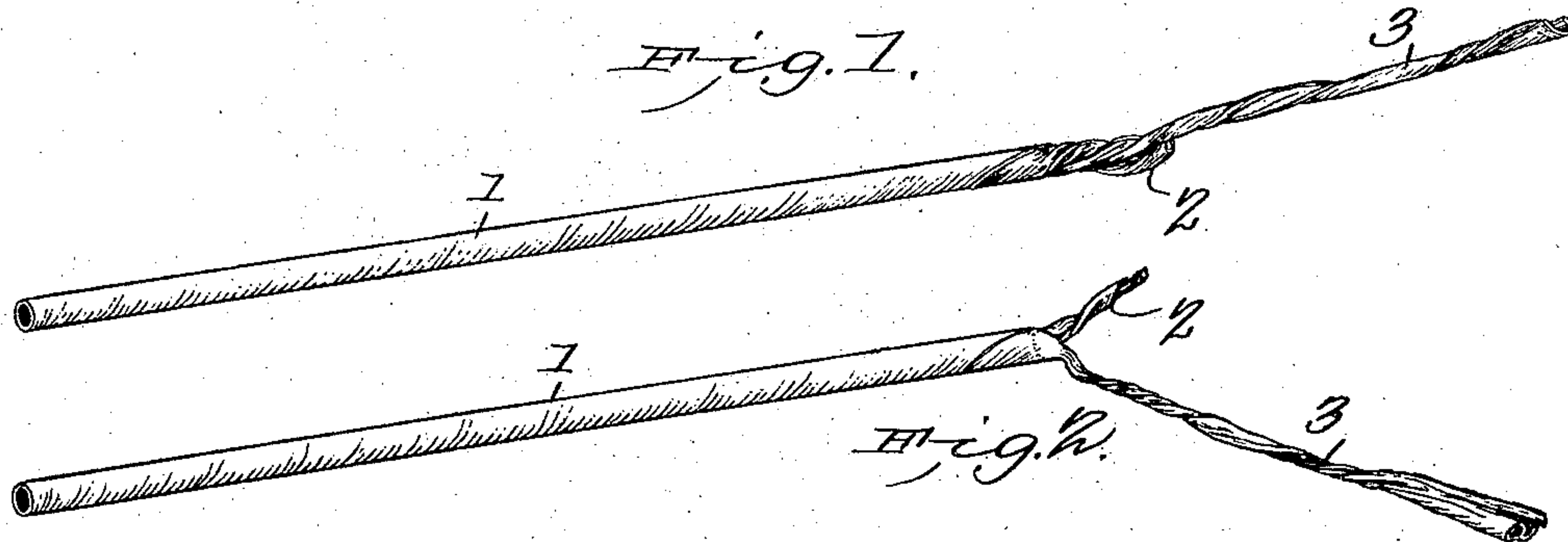
PATENTED JULY 26, 1904.

J. R. POWELL.
MINING SQUIB.

APPLICATION FILED JULY 23, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses

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by

John R. Powell, Inventor.

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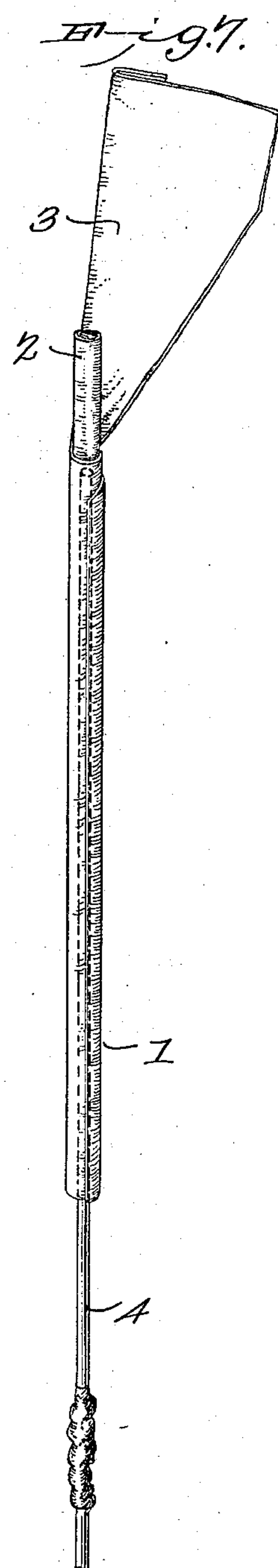
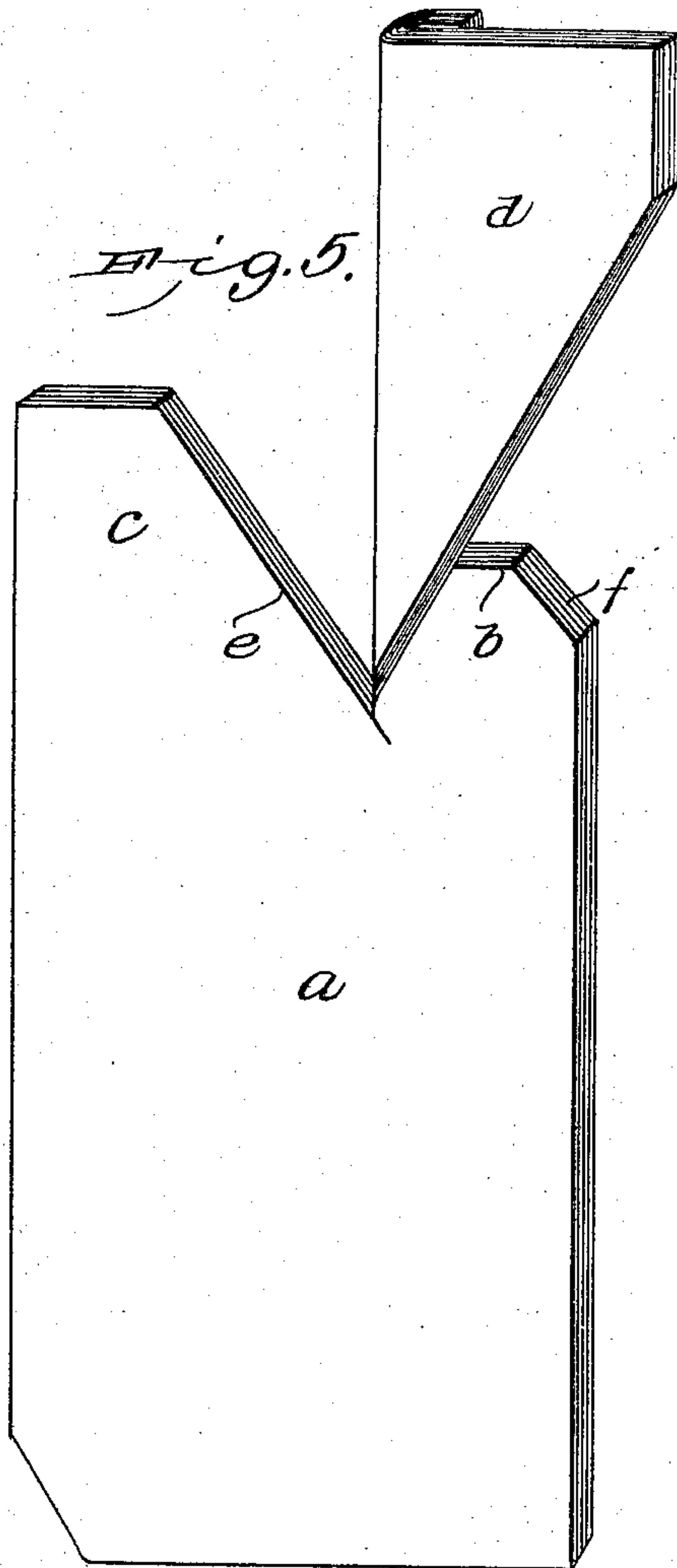
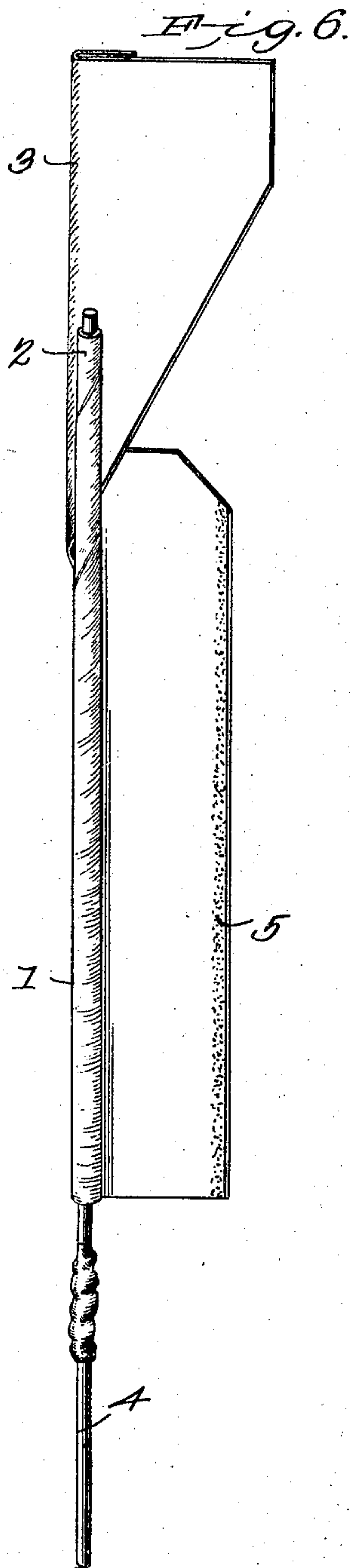
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UNITED STATES PATENT OFFICE.

JOHN R. POWELL, OF PLYMOUTH, PENNSYLVANIA.

MINING-SQUIB.

SPECIFICATION forming part of Letters Patent No. 766,062, dated July 26, 1904.

Application filed July 23, 1902. Serial No. 116,714. (No model.)

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 Mining-Squib, of which the following is a specification.

The invention relates to mining-squibs used in connection with blasting operations; and the object in view is to provide a device of this class which can be made with greater facility and at less cost than articles for the same purpose heretofore in use, and particularly to provide improved means for closing the squib-tube, for communicating the fire to the contents of the squib-tube, for normally protecting the end of the squib-tube to prevent the accidental escape of the explosive contents thereof, and for normally protecting the closure of the squib-tube, while permitting ready inspection thereof.

A further object of the invention is to provide a device of this class in which there is formed a twisted tube-closure separate and independent from the fuse or match and so arranged that it may be untwisted in order to permit examination of the contents of the squib without untwisting the fuse or match.

Further objects and advantages of the invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims, it being understood that various changes in the form, proportion, and minor details may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

In the drawings, Figure 1 is a view of a complete squib constructed in accordance with the invention. Fig. 2 is a view showing the fuse or match drawn to one side to fully expose the closure of the squib-tube. Fig. 3 is a view of the preferred form of blank, which may be of tissue, Manila, or any other suitable kind of paper or other material. Fig. 4 is a view of a slightly-modified form of blank. Fig. 5 is a detail view of a stack of blanks with the fuse-tongues folded longitudinally to illustrate the first step in the operation of constructing the squib. Fig. 6 is a view showing the body portion of the blank

partly rolled around the forming-pin. Fig. 7 is a view showing the blank completely rolled and the pin partly withdrawn, so that its extremity is at the end of the squib-tube proper, the fuse and closure tongues being extended preparatory to twisting.

Similar reference characters indicate corresponding parts in all the figures of the drawings.

The squib embodying the invention comprises a squib-tube 1, fitted at its upper end with a flexible twisted closure 2 and also provided with a flexible twisted fuse or match 3, the closure and fuse being separate and being independently twisted, but the lower portion of the fuse embracing and partly surrounding the lower portion of the closure adjacent to the extremity of the squib-tube, so as to choke or bind the closure, and thereby prevent the accidental untwisting thereof, and hence prevent the accidental discharge of the contents of the squib-tube.

Various forms of blanks may be used in the construction of the squib embodying the invention; but the preferred form is shown in Fig. 3, and it consists of a body portion *a*, the length thereof from the lower end to the shoulder *b* determining the length of the squib-tube. Projecting from and integral with the upper end of the body portion *a* at the opposite side edge from the shoulder *b* is a closure-tongue *c*, and projecting in the same direction from the body portion of the blank between the closure-tongue and the shoulder *b* is a fuse-tongue *d*, the closure and fuse tongues being separated by a cut *e*, which extends inward a considerable distance beyond the line of the shoulder *b* for purposes hereinafter explained. In this preferred form of blank the line of cut *e* by which the closure-tongue is separated from the fuse-tongue is oblique to the length of the blank, and said line is extended beyond the abrupt end of the closure-tongue *c* until it intersects a continuation of the line of the outer side edge of said tongue, whereas the opposite edge of the fuse-tongue is on a line parallel with the side edges of the body portion of the blank and meets the upper edge of the tongue at a right angle. As indicated by the bounding dotted lines in Fig. 3, the

blank is cut from a rectangular sheet from which there are no projections, and hence the waste in forming the blank is small. Moreover, while in practice it is preferred to cut the corner of the body portion at its upper end opposite to the closure-tongue, as indicated at *f*, it is possible to carry out the main object of the invention without this additional cut and by allowing the right edge of the blank, as shown in Fig. 3 by dotted lines, to intersect the shoulder *b* in a right angle.

In the modified form of blank illustrated in Fig. 4 the body portion *a'* corresponds substantially in shape with the body of the preferred form of blank, terminates at its upper end near one edge in an abrupt shoulder *b'*. A closure-tongue *c'* projects upward from the body portion at the opposite edge from the shoulder *b'*, and a fuse-tongue *d'* extends upward from the body portion between the closure-tongue and the shoulder *b'*; but in this form of the invention the side edges of the fuse-tongue are parallel, as are the side edges of the closure-tongue, to a point inward beyond the shoulder *b'*, and said closure and fuse tongues are further separated by an inclined or oblique cut *e'*.

It will be seen that in both of the illustrated forms of blank the body portions are of substantially rectangular contour, from the upper ends of which project the fuse and closure tongues of different lengths, the former extending beyond the latter, and it will be seen, moreover, that in both forms the adjacent edges of the tongues are prolonged inwardly (into the body portion of the blank) and separated by a cut, which permits the independent rolling of the tongues, for a purpose hereinafter explained.

Inasmuch as the operation of forming the squib is practically the same with either form of blank and with any form of blank having the same general features of construction the description of said operation in reference to one form will be sufficient to disclose the nature of the invention, particularly as the resulting articles are sufficiently similar in appearance and structure to be indistinguishable except to an expert. Therefore in further describing the invention particular reference will be had to the preferred form of the blank as illustrated in Fig. 3.

The first step in the operation of forming a squib (after the blanks have been cut) is to fold the fuse-tongue longitudinally, as indicated in Fig. 5. This is desirable, though not necessary, as a means of insuring the independent formation of the tube-closure and fuse by preventing the tongues from rolling together except at a point near their juncture with the body portion of the blank. The ordinary device for use in connection with the rolling of the tube is a pin 4, which in practice is placed on the blank near one side edge. The edge of the blank is pressed over the same,

and then the turning of the pin will roll the body portion until it forms a perfect tube. It is desirable to provide for proceeding with this operation without such delay as would be involved in folding the fuse-tongue, and therefore it has been an important object of this invention to provide such a construction of fuse-tongue as would permit the preliminary folding of a number of them prior to separating the blanks. Therefore in practice the lower portion of the fuse-tongue is cut obliquely, (see both illustrated forms, Figs. 3 and 4,) and when a plurality of the blanks arranged in a stack, as shown in Fig. 5, have been folded to thereby interlock the tongues the operator may grasp the uppermost blank near the lower end of the body portion and by a quick movement separate its tongue from those of the stack without danger of tearing, even when tissue or other light paper is used. The obliquely-disposed edge *e* of the uppermost blank draws over the lower portion of the folded fuse-tongue, and the latter readily disconnects itself from the stack of folded tongues without disturbing those which are not grasped. Thus one folding operation of the tongues will suffice for a large number of blanks, and, moreover, the folding or interfolding of the tongues holds the blanks from becoming scattered or disarranged by the movements of the operator. Having folded the tongues of a stack of the blanks, the next operation is to remove the uppermost blank from the stack in the manner above described, place the pin 4 parallel with the left-hand edge of the body portion of the blank, start the edge of the blank over the pin, as indicated in Fig. 6, apply paste or other adhesive material to the surface of the body portion adjacent to the right-hand edge, as indicated at 5 in Fig. 6, and then quickly roll the pin to gather up the remaining portion of the blank. Obviously as soon as the pasted or adhesive edge of the blank comes in contact with the rolled body portion it can be pressed to place by a quick movement of the thumb and forefinger of the left hand of the operator, when the article has the appearance indicated in Fig. 7, with the closure and fuse tongues projecting upward from the tube and close together, but not interrolled. While the rolling operation insures the folding of the lower or base portion of the closure-roll within the lower portion of the fuse-tongue, the upper or outer extremity of the closure-tongue has passed over the folded part of the fuse-tongue, and hence is presented, as in Fig. 7, at the end of the rolling operation in position to receive a twist without being wholly enveloped by the fuse-tongue.

The final step in the operation of forming the squib is accomplished almost simultaneously with the smoothing of the pasted edge of the body portion. As the fingers of the operator pass upward in the act of smoothing

this joint they come in contact with the projecting portions of the closure and fuse tongues, when by a quick backward and forward movement of the thumb and forefinger each tongue is twisted separately, and each projects from the tube independently of the other except at their inner interlocked portions, and it should be noted that it is immaterial in which direction the tongues are twisted. It is usual in this art to twist a tongue continuously in one direction until the desired compactness is insured; but with the arrangement above described it is possible to give the tongues the required twist by simply rolling them between the thumb and forefinger, the movement of the latter being forward and backward and both of the tongues being grasped at the same time. This completes the operation of rolling the squib, after which the filling may be accomplished in accordance with the usual practice.

It has been found in the course of experiments that good results are obtained by cutting away the corner of the body portion of the blank at the shoulder *b* and terminating the paste-line at the lower end of this cut-away portion, because it leaves the upper end of the tube soft and unaffected by the paste, so that the fire of the fuse is more readily communicated to the contents of the tube, the desired rigidity of construction being secured by the spiral winding of this oblique edge *f* around the previously-rolled portion of the body of the blank. It will be seen, however, that at the completion of the rolling operation the upper end of the closure-tongue projects above the upper end of the tube, while the lower portion of the closure-tongue is embraced or infolded by the lower portion of the fuse-tongue, so that when the tongues are twisted to receive the form indicated in Figs. 1 and 2 the lower portion of the fuse-tongue is tightly drawn around that portion of the closure-tongue which is located directly at the end of the squib-tube, thus in effect choking or binding the closure to add to its efficiency in preventing the accidental escape of the contents of the tube. This arrangement of parts, however, has a further function of vital importance in this connection. When the extremity of the fuse is lighted and the burning has progressed to a point adjacent to the end of the squib-tube, the fire embraces the adjacent portion of the closure, and therefore ignites the closure, and thus with certainty the fire is communicated to the contents of the squib-tube. There is no possibility of the fire being conveyed to one side of the end of the tube, and thus dying by reason of lack of fuel suitable for supporting combustion. The closure-tongue is the innermost roll of the tube, and therefore fire communicated to this closure-tongue must be conveyed into the tube, particularly if the portion of the tube adjacent to its extremity has not been hardened

by paste or adhesive material, and fire must be communicated to the closure because of the lower or inner portion thereof being embraced by the fuse or match.

The separate construction of the closure and fuse provides for the inspection of the former without untwisting the latter, as in the usual practice, such untwisting being necessary under ordinary circumstances to ascertain whether any of the explosive contents of the tube have escaped into the fuse, and, moreover, this separate construction of the closure and fuse provide for dipping both into either a solution of saltpeter or liquid sulfur to increase the inflammability thereof and insure the continuous burning thereof when ignited. Moreover, the upper outer corner of the closure-tongue may be cut away, as indicated by the dotted line *g*, to facilitate starting the blank on the pin in the act of rolling, or the lower left-hand edge of the blank may be cut away, as indicated by the dotted line *h*, for a similar purpose, or both expedients may be adopted.

A further advantage of the described construction of parts, particularly with reference to the extension of the cut *e* between the closure and the fuse or match tongues downward for a considerable distance beyond the transverse line of the upper end of the body portion of the blank and also inclining this cut inward or from the closure-tongue is that while it narrows the fuse or match tongue transversely or on a line parallel with the end edges of the body portion, so as to facilitate the rolling of the closure-tongue without gathering up and infolding it with the fuse or match-tongue, it leaves a sufficient width of material at the base of the fuse or match tongue on its line of juncture with the body portion to prevent accidental tearing or detaching of the fuse or match tongue in the act of separating a blank from a stack and in finally rolling or twisting the tongues to form the resulting closure and fuse or match.

Having described the invention, what is claimed is—

1. A mining-squib having a fuse or match and a separate exposed tube-closure that may be untwisted to permit examination of the contents of the tube without untwisting the fuse or match.

2. A mining-squib having a fuse or match and an exposed twisted tube-closure that may be untwisted to permit examination of the contents of the tube without untwisting the fuse or match.

3. A mining-squib having a twisted fuse and a tube-closure embraced and choked or contracted at one point by the adjacent portion of the fuse, and having a free extremity that may be untwisted to permit examination of the contents of the tube without untwisting the fuse or match.

4. A mining-squib having separate twisted

fuse or match and closure tongues interlocked at the extremity of the squib-tube, the closure-tongue independent of the fuse or match to permit the untwisting thereof and examination of the contents of the tube without untwisting said fuse or match.

5. A mining-squib having free twisted fuse or match and closure tongues of which the latter may be untwisted to expose the contents of the tube without untwisting the fuse or match, the portion of the closure-tongue adjacent to the extremity of the squib-tube being embraced by the fuse or match tongue.

6. A mining-squib having a free twisted tube-closure, and a separate twisted fuse or match embracing the closure at a point adjacent to the extremity of the tube, thereby to permit of untwisting of the tube-closure to examine the contents of the tube without untwisting the match.

7. A mining-squib having a match and a rolled tube with a portion of its blank extended beyond the extremity of the tube and twisted to form a tube-closure that may be untwisted to examine the contents of the tube without untwisting the match.

8. A mining-squib having a match and a rolled tube of which one or more inner wraps are extended beyond the end of the tube and are twisted to form a tube-closure that may be untwisted to examine the contents of the tube without untwisting the match.

9. A mining-squib having a rolled tube constructed of a blank having separate tongues extended from one end and twisted to form respectively a tube-closure and a fuse or match that may be untwisted independent of each other.

10. A mining-squib having a rolled tube

provided with terminal twisted extensions which are interrolled at the end of the tube and are terminally separate to form respectively a fuse or match and a tube-closure that may be untwisted independent of each other.

11. A mining-squib having a rolled tube of which the outer and inner wraps are extended beyond the end of the tube, and are twisted to form respectively a fuse or match and a separate tube-closure that may be untwisted independent of each other.

12. A blank for a mining-squib having a body portion provided at one end with separate extensions respectively of lesser and greater length forming respectively closure and fuse or match tongues that may be untwisted independent of each other.

13. A blank for a mining-squib having a body portion provided at one end with extensions respectively forming a closure-tongue and a fuse or match tongue, the line of separation between which is extended inward beyond the adjacent end of the body portion of the blank.

14. A blank for a mining-squib having a body portion provided at one end with separate extensions forming respectively a closure-tongue and a fuse or match tongue separated by a cut disposed obliquely to the length of the body portion and extended inward beyond the adjacent end of the body portion of the blank.

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:

J. ROSS COLHOUN,
C. E. DOYLE.