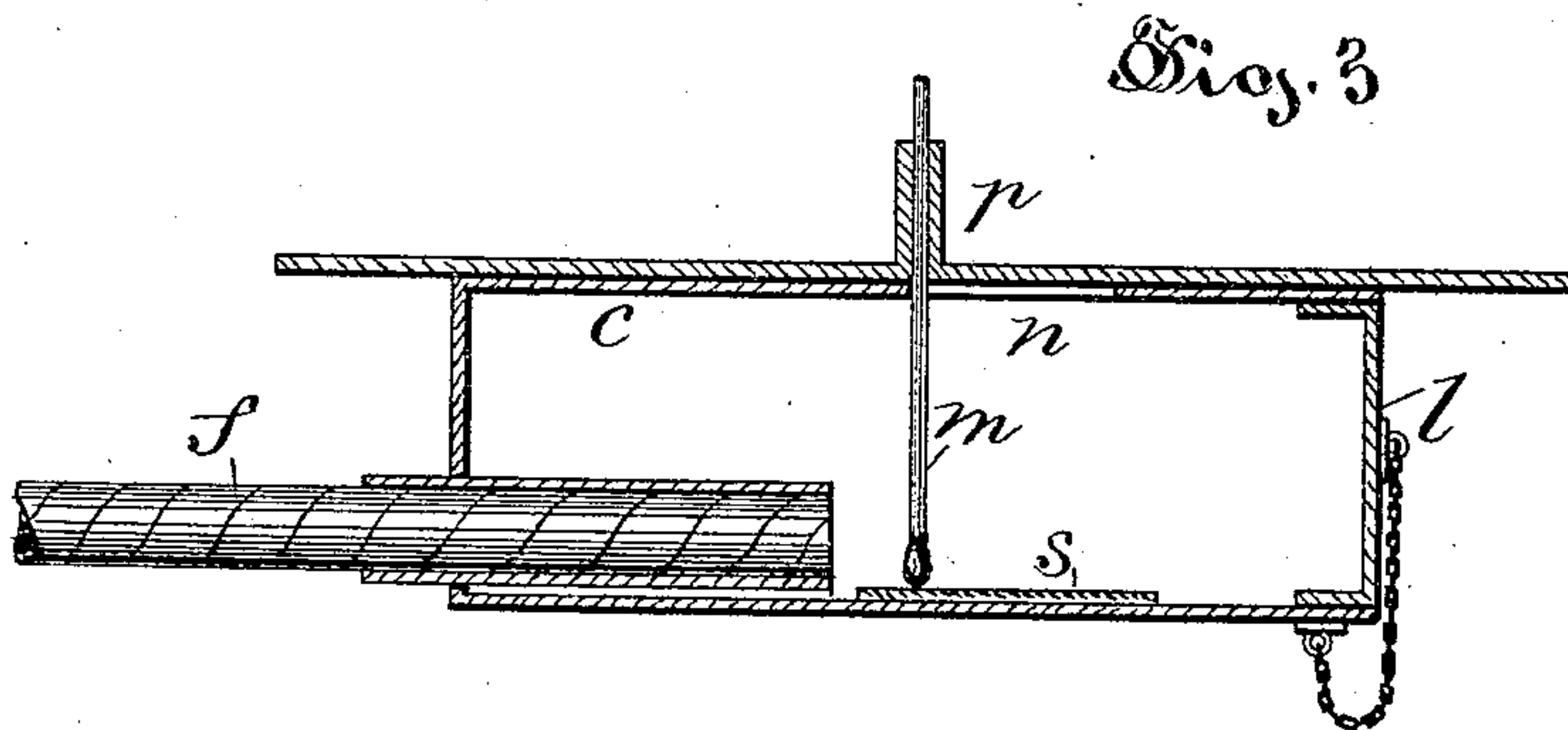
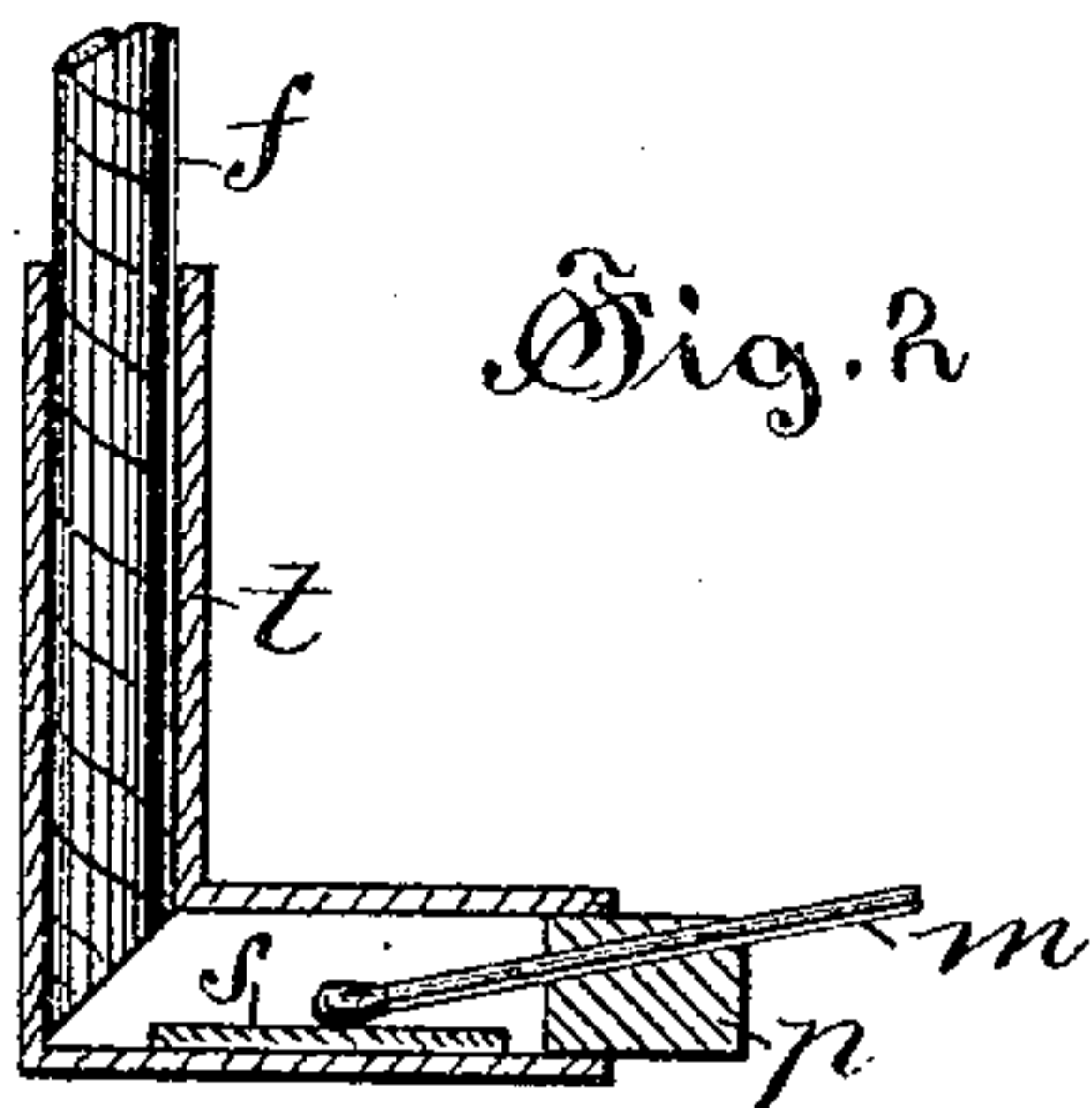
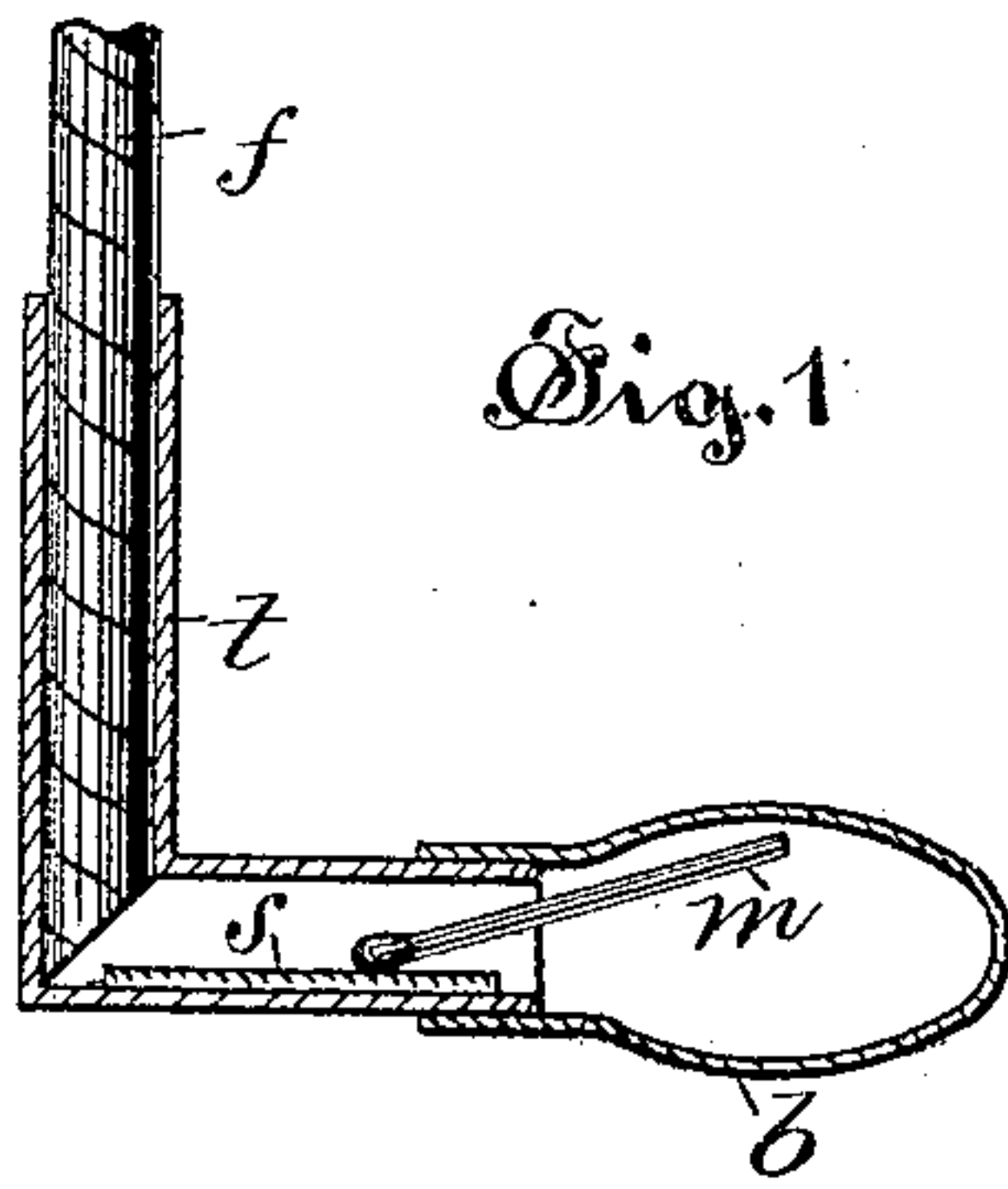


(No Model.)

W. BICKFORD-SMITH & G. J. SMITH.
MEANS FOR IGNITING FUSES WITHOUT EXPOSING FLAME OR SPARKS.

No. 429,597.

Patented June 10, 1890.



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UNITED STATES PATENT OFFICE.

WILLIAM BICKFORD SMITH, OF HELSTON, AND GEORGE J. SMITH, OF TRURO,
COUNTY OF CORNWALL, ENGLAND.

MEANS FOR IGNITING FUSES WITHOUT EXPOSING FLAMES OR SPARKS.

SPECIFICATION forming part of Letters Patent No. 429,597, dated June 10, 1890.

Application filed March 25, 1889. Serial No. 304,574. (No model.) Patented in England January 10, 1887, No. 393.

To all whom it may concern:

Be it known that we, WILLIAM BICKFORD SMITH, of Helston, county of Cornwall, England, and GEORGE J. SMITH, of Truro, county of Cornwall, England, subjects of the Queen of Great Britain, doing business at Tuckingmill, in the county of Cornwall, England, have invented certain new and useful Improvements in Means of Igniting Fuses Without Exposing Flame or Spark, (for which we have received Letters Patent in England, No. 393, dated January 10, 1887;) and we do hereby declare that the following is a full, clear, and exact description of the invention, which will enable any person skilled in the art to which it appertains to make and use the same.

This invention relates to means of igniting fuses without exposing flame or spark, the object being to avoid the risk attending the firing of blasts in an inflammable or explosive atmosphere. For this purpose we employ a match, preferably of the kind known as "safety-matches," which will ignite only by friction on a specially chemically-prepared surface, and we effect its ignition within a closed tube, in which is inserted the end of the fuse that is to be ignited, as we will describe, referring to the accompanying drawings.

Figure 1 is a sectional view illustrating the device. Fig. 2 is a sectional view illustrating the device with a modified arrangement for igniting the match. Fig. 3 is a like sectional view showing another modified form.

In Fig. 1, *t* is an elbow-pipe, into one limb of which is inserted the end of the fuse *f*. In the other limb is fixed a strip *s* of chemically-prepared friction-surface. The safety-match *m* is introduced loosely, and the mouth of the tube is covered by a flexible hood or bag *b*, which may be of leather or any fabric capable of being moistened. By pinching the hood *b*, so as to get hold of the match *m*, its tip can be pushed along the friction-surface *s*, causing flame, which will ignite the fuse *f*. Fig. 2 shows a similar arrangement with the stem of the match *m* passed through the hole in the plug *p*.

In the apparatus shown in Fig. 3, *c* is a cas-

ing with a tubular mouth, into which is inserted the end of the fuse *f*. Behind this is fixed in the casing a strip *s* of chemically-prepared friction-surface, and the casing is closed by a lid *l*. On the upper side of the casing is a slotted hole *n*, and over this is a sliding lid *p*, having projecting up from it a tubular stem, into which is inserted the stem of the safety-match *m*, its tip reaching the strip *s*. On sliding the lid *p* along, the tip of the match *m* is rubbed along the strip *s*, and the flame produced ignites the fuse *f*.

Although we have mentioned that the matches employed are by preference of the kind known as "safety-matches," which are not liable to accidental ignition, as ordinary matches, obviously with ignition apparatus such as we have described ordinary matches may be used, the friction-surface being in that case simply a rough surface of the usual kind. As a precaution against communication of sparks to the exterior of the apparatus the stem of the match, or the part of it exposed externally, may be of any incombustible material, or may be rendered incombustible in any known manner.

We claim as our invention—

In a means for igniting a fuse, the combination of a casing from which the outer air is excluded, a fuse one end of which is inserted a distance into the closed casing, an igniting-surface arranged and inclosed within the casing adjacent to the fuse, a match inserted in the casing with its end to contact with the igniting-surface, and means, substantially as described, for igniting said match, substantially as specified.

WILLIAM BICKFORD SMITH.
GEORGE J. SMITH.

Witnesses to signature of Wm. B. Smith:

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A. J. MCHUGH,

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