May 13, 1924.

E. P. JONES ET AL

1,493,881

SAFETY IGNITER

Filed Nov. 6, 1923

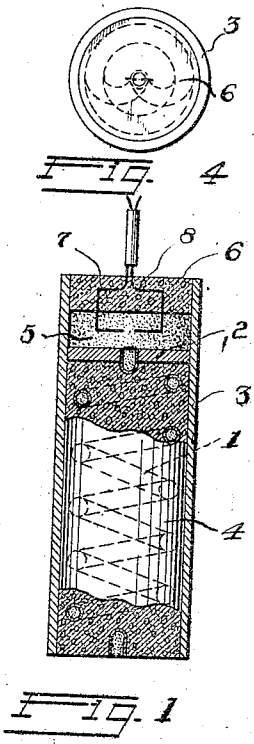


Fig. 4

Fig. 1

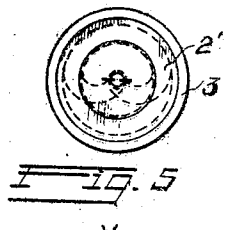


Fig. 5

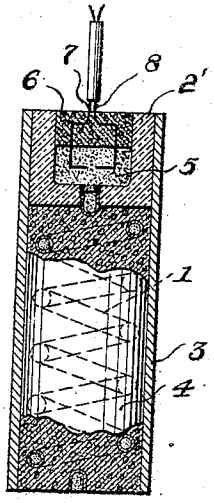


Fig. 2

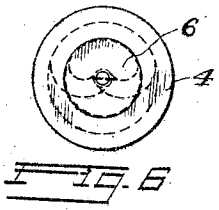


Fig. 6

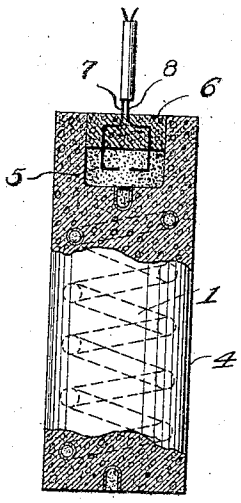


Fig. 3

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UNITED STATES PATENT OFFICE.

EDWARD P. JONES, DANIEL W. FALL, AND FRANCIS EDWARD JONES, OF BRECKENRIDGE, COLORADO.

SAFETY IGNITER.

Application filed November 6, 1923. Serial No. 673,086.

To all whom it may concern:

Be it known that EDWARD P. JONES, DANIEL W. FALL, and FRANCIS E. JONES, citizens of the United States, residing at Breckenridge, in the county of Summit and State of Colorado, have invented certain new and useful Improvements in Safety Igniters, of which the following is a specification.

The present invention relates to safety igniters for all sorts of high explosives, such for example as are used in blasting, mining and like operations.

An object of the invention is to provide a safety igniter structure embodying and retaining the most important features of the igniter disclosed in copending application Serial No. 660,635 filed Sept. 1, 1915, and which may be more readily and cheaply manufactured.

Another object of the invention is to provide a new, efficient and cheap method of manufacturing igniters of standard dimensions, but of variable timing.

Further objects of the invention will appear in the following detailed description of the preferred embodiments of the invention of which—

Figs. 1, 2 and 3 are sectional elevations of different forms with parts broken away to disclose the structure, and

Figs. 4, 5, and 6, are plan views of the forms shown in Figs. 1, 2, and 3 respectively.

Referring to Figs. 1 and 4, 1 represents a hollow tube which may be of any flexible noncombustible material, but is preferably of metal, such for example, as copper, lead, or like metals. In practice, tube 1 may be of any length and is filled with powder or like combustible materials while straight, and is then preferably wound into a long helix. This long helix may then be cut into proper lengths to give desired time trains for variously timed igniters. It will be obvious that with standard dimensions for the igniter, for a given length of fuse the maximum time will be given when the turns of the helix are in contact with each other, and the shortest time will be attained for the standard length, when the tube 1 is substantially straight. Between these limits, a wide range of timing is possible.

Having cut time train 1 to proper length, the ends are preferably dipped into wax, paraffin or like easily fusible materials to hold the filling in place and the upper end thereof is inserted in a washer 2 preferably of nonmetallic and noncombustible material. The washer is then fitted into a hollow tube 3. Tube 3 is of noncombustible and of preferably nonmetallic material, and may be shouldered if desired, to maintain washer 2 in the proper position until the igniter has been completed. The lower end of train 1 is then held in proper position to reach the lower end of tube 3, and a filling 4 of cement, paste, paraffin, wax, or like materials, which may be liquefied at a temperature sufficiently low to prevent ignition of the combustible material in tube 1, is poured around tube 1 into tube 3 and permitted to solidify. After 4 has hardened sufficiently to hold tube 1 in place, the lower end may be dipped in wax or like materials to seal the end of the igniter. A filling 5 of powder of like combustible material is then placed in the upper end of tube 3. A plug 6 of paste, cement, or like materials in which are imbedded conductors 7 and 8, is then inserted in and seals the upper end of tube 3, the ends of conductors 7 and 8 being bent to form a pair of spark points across which an electrical spark may be passed to ignite material 5. Wires 7 and 8 are properly insulated from each other, and adapted to be connected to a source of electrical energy in well known manner.

In the form shown in Fig. 2 the method of manufacture and parts are the same as for the form shown in Fig. 1, except that washer 2 is replaced by a member 2′, preferably of nonmetallic and noncombustible materials which is shaped to make a chamber for material 5. The upper end of tube 1 is inserted only partially through the opening in 2′ to avoid possibility of an accidental ground igniting the powder train by jumping a spark from either terminal 7 or 8 to the metallic tube 1, and to avoid accidental interference with the spark across 7 and 8.

In the form shown in Fig. 3, members 2, 2′ and 3 are eliminated, and material 4 is molded around tube 1 in a manner to provide a chamber for material 5 and with which the upper end of tube 1 communicates. Plug 6 is applied as before.

It will be seen that simple forms of safety igniters are provided which may be cheaply manufactured according to the method of

the present invention in which all possibility of hanging fire is eliminated, and in which a wide variation of timing for a standard length of igniter may be provided. It will of course be understood that the igniters are to be properly marked to indicate the timing thereof and may be applied to a cap as disclosed in the copending case.

Having described preferred embodiments of the invention, what is desired to be secured by Letters Patent and claimed as new is:

1. A safety igniter comprising a body of standard length and solid material, in which a tubular helix of rapidly combustible material is imbedded; a chamber with which the upper end of said helix communicates, combustible material in said chamber, and means for igniting said combustible material sealed in said chamber.

2. The igniter as set forth in claim 1 in which said body is confined in a protective outer tube.

3. The igniter as set forth in claim 1 together with a base member for said chamber, and an opening in said base member into which an end of said helix is inserted.

4. The combination as set forth in claim 1 together with a base member for said chamber and an opening in said base member into which the end of said helix partially extends.

5. The combination as set forth in claim 1. together with a base member for said chamber, and an extension of said base member forming side walls for said chamber.

Signed at Breckenridge, Colorado, this 31 day of October, 1923.

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