June 4, 1935. J. S. FRYE 2,003,483

FUSE IGNITER

Filed Feb. 21, 1933 2 Sheets-Sheet 1

Fig. 1

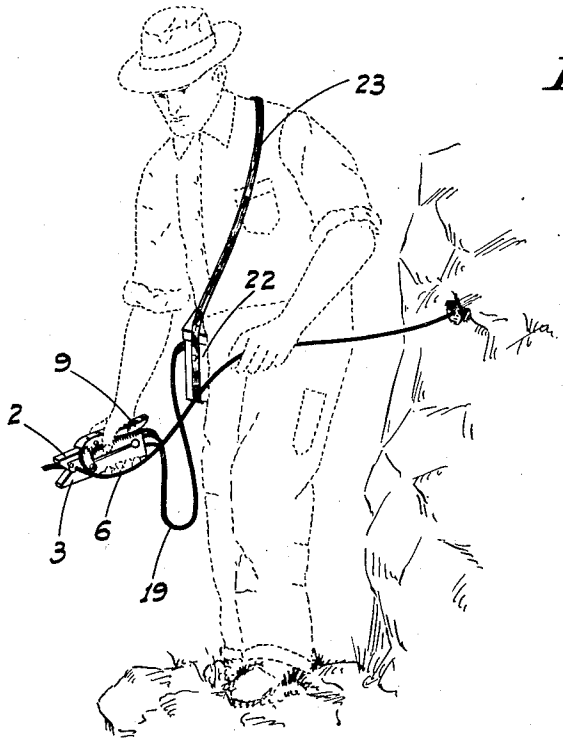


Fig. 5

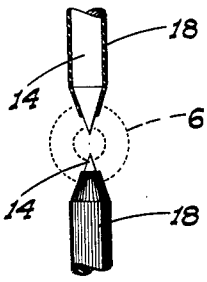


Fig. 6

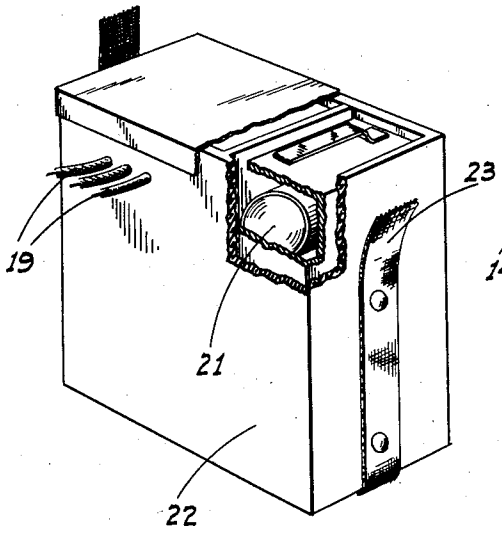
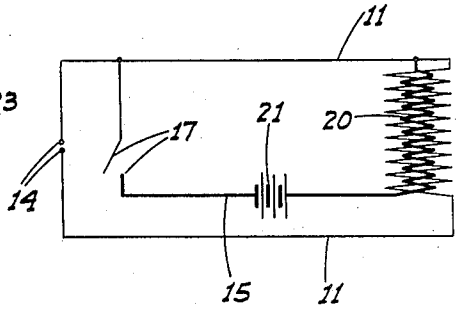


Fig. 7



INVENTOR

J. S. Frye

BY

ATTORNEY

June 4, 1935. J. S. FRYE 2,003,483

FUSE IGNITER

Filed Feb. 21, 1933 2 Sheets-Sheet 2

Fig. 2

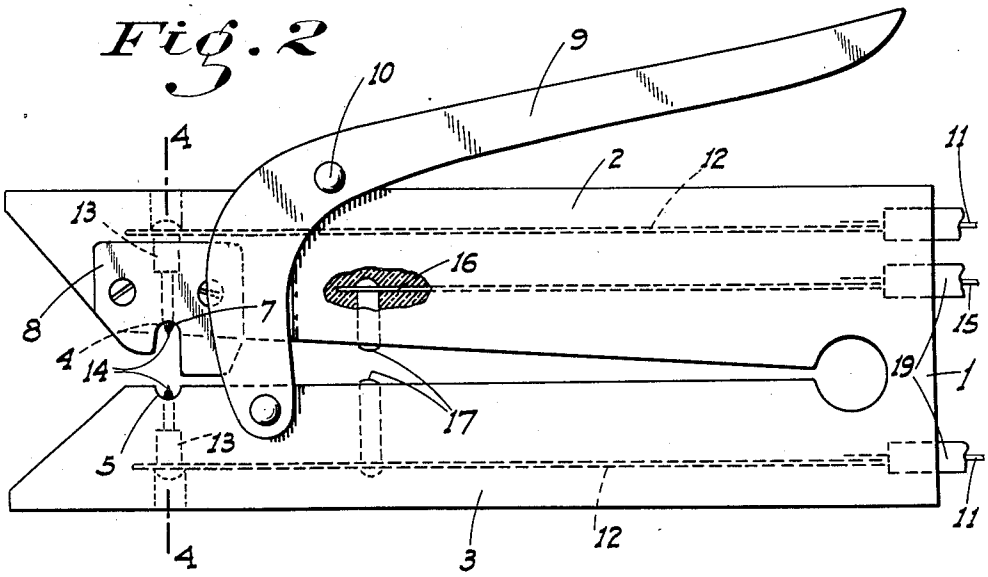
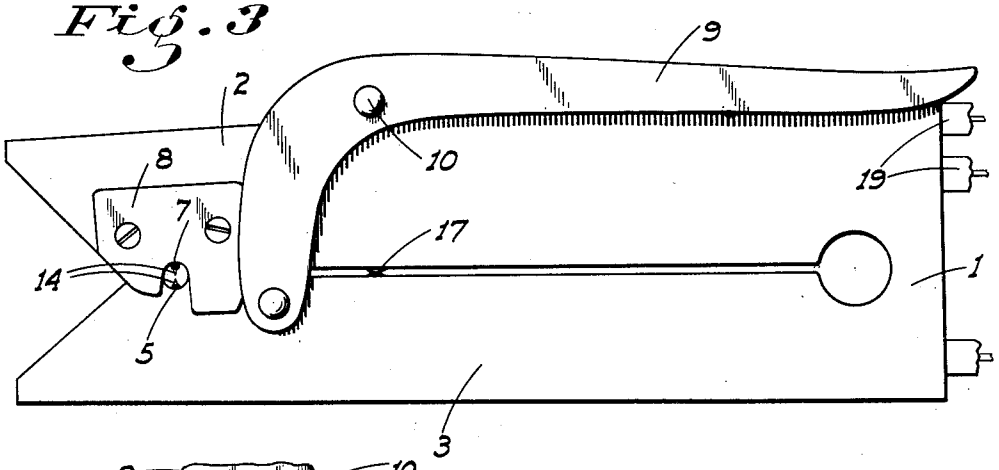


Fig. 3



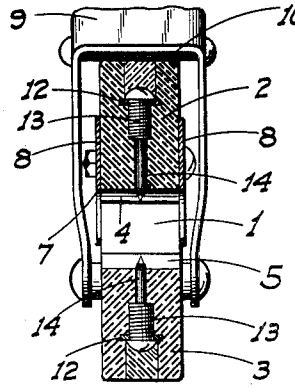


Fig. 4

INVENTOR

J. S. Frye

BY

ATTORNEY

Patented June 4, 1935

2,003,483

UNITED STATES PATENT OFFICE

2,003,483

FUSE IGNITER

Jason S. Frye, Sacramento, Calif., assignor of one-third to C. E. Baker, one-third to A. I. Richards, and one-third to H. M. Rich, all of Sacramento, Calif.

Application February 21, 1933, Serial No. 657,830

9 Claims. (Cl. 175—91)

This invention relates to the ignition of fuses such as are used in connection with blasting operations. Such fuses consist of a tubular fabric conduit enclosing a core of powder. At present it is necessary to split and open or separate the end of the fuse to be ignited to expose some of the powder which is then lit by the application of a live flame of some kind. If these operations are carried out under damp conditions such as are encountered in tunnels dripping water, or in inclement weather, the exposed end of the fuse is liable to be wet so that it cannot be lit. Also, when a number of fuses are being lit in continuous succession, particularly in underground or tunneling operations, the smoke from those already burning sometimes fogs the surrounding atmosphere so that the operator cannot see whether he has successfully lit a fuse or not. Under such unsatisfactory conditions the non-functioning of one fuse or the other is a frequent occurrence. Considerable time is also consumed in preparing the fuses for ignition and the operations generally are frequently fraught with danger.

The principal object of my invention is to eliminate the objectionable features of the present method of lighting fuses by providing an electric igniter so constructed that it is not necessary to spread or specially prepare the fuses in any way; which will cause the positive ignition of a fuse irrespective of dampness of the fuse or the surrounding atmosphere; and which causes the fuse at the instant of initial ignition to emit an audible signal, so that the operator will positively know that the fuse is burning even though he cannot see the same. Also, my improved device is of such a character that it only requires a second or less of time to effect ignition of the fuse from the moment the tool is initially engaged with the same.

A further object of the invention is to produce a simple and inexpensive device and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views:

Fig. 1 is a fanciful outline of a man as equipped with my improved fuse igniting apparatus showing the tool in operation.

Fig. 2 is a side elevation of the igniter in its normal inoperative position.

Fig. 3 is a similar view of the igniter in its operating position.

Fig. 4 is a transverse section on the line 4—4 of Fig. 2.

Fig. 5 is a fragmentary enlarged view of the ignition points showing the insulation covering thereof.

Fig. 6 is a perspective view of the portable battery and coil box of the apparatus partly broken out.

Fig. 7 is a diagram of the circuit of the apparatus.

Referring now more particularly to the characters of reference on the drawings, the tool in the form herein illustrated comprises a body 1 of insulation material preferably of a somewhat resilient nature such as vulcanized fibre or bakelite. This body is formed with a longitudinal slit extending from one end toward the other so as to form upper and lower jaws 2 and 3 respectively spaced from each other and integrally connected at the rear end.

Toward their forward ends the adjacent faces of the portions 2 and 3 are formed with transversely extending vertically alined grooves 4 and 5 respectively. Both grooves are substantially semi-circular in form with a diameter approximating that of the fuse 6 to be ignited. On the upper groove, the corresponding semi-circular form is given to the same at its ends by recesses or cuts 7 in plates 8 of metal or other suitable material secured against the sides of the upper portion 2. These plates back of the cuts depend below the lower edge of the same and of the upper portion 2 some distance so as to form stops for the fuse and thus cause the fuse, when the tool is placed over the same, to be positively located in alinement with the recesses.

Forwardly of the grooves the adjacent faces of the jaws flare away from each other abruptly so as to form wide mouths for the easy guidance of the fuse into place.

A hand lever 9 straddles and is pivoted on the lower jaw 3 and extends thence over and lengthwise of the upper jaw 2 toward its rear end, so as to provide a hand grip for the hand of the operator grasping the tool. A cross pin 10 on the lever engages the top surface of the jaw 2 so that when the lever is depressed the jaws will be moved together toward their forward end, as shown in Fig. 3.

The wires 11 of a high tension circuit project into the rear end of the tool and are connected to flat conductor strips 12 embedded in and extending lengthwise of the jaws to adjacent their

forward end. At such end vertical screws 13 are inserted in the jaws from their opposed faces and passed through the strips 12 in contact therewith. Sharp pointed contact pins 14 rigidly secured to or integral with the screws project beyond the strips and into the corresponding grooves 4 and 5 centrally of their length and axially thereof.

A wire 15 of a low tension circuit also taps the back of the body and is connected to an embedded contact strip 16 and to the strip 12 of the other jaw (which last named strip is also in the low tension circuit) and project through the adjacent faces of the jaws for engagement with each other. The switch points and contact pins are arranged so that when the jaws are brought together by manipulation of the lever 9 and said points contact each other, the pins 14 will still be spaced somewhat from each other so as to form a spark gap. At the same time said points are close enough to project through the jacket or outer covering of the fuse and into the powder zone thereof as indicated in Fig. 5.

The pins 14 are preferably coated with insulation enamel or similar insulating material, as shown at 18, which however leaves the points themselves exposed so as not to interfere with the jumping of a spark therebetween. The enamel however engages the jacket of the fuse and thus prevents the possibility of a current passing between the pins around the jacket in the event of the latter being wet rather than causing a spark to pass between the points, which is necessary for the ignition of the powder.

The wires 11 and 15 are enclosed in flexible coverings 19 of suitable length, being connected to any suitable portable source of high and low tension current respectively. For this purpose I preferably make use of a vibrator coil of common character indicated at 20, and a plurality of flashlight batteries 21. These are mounted in compact and cooperating relation in a box 22 to which the different wires lead, said wires being of course connected inside the box to the various terminals of the batteries and coil. The box is provided with a shoulder strap 23 so that it may be conveniently supported on the person of the operator without the need of a hand to hold the same, as indicated in Fig. 1.

The circuits themselves are similar to those used in automotive work, the switch points 17 taking the place of the distributor. The points 14, the strips 12 and the wires 11 are connected to the secondary winding of the coil 20 and form the high tension circuit. The wire 15 in which the batteries are interposed and one of the wires 11, together with the switch points 17 and the corresponding body strips, form the low tension circuit and are connected to the primary winding of the coil, so that the necessary high tension current is induced by the closing of the low tension circuit at the points 17.

In operation it is only necessary to grasp the tool in one hand while holding the jaws spread and engage the same with the fuse at any desired point so that the latter is disposed transversely of the tool and is abutting against the stop plates 8. The jaws are then closed by depression of the lever 9 until the points 17 engage each other. This operation causes the sharp points 14 to pierce the fuse jacket and simultaneously close the circuit through such points, causing a spark to jump between the points. The ends of the points being in contact with the powder the latter is positively ignited. Owing to the fact that the powder is confined at the point of ignition a sharp report will be emitted, similar to that heard by the firing of a percussion cap. This gives an audible and unmistakable signal to the operator that the tool has functioned and the fuse is ignited.

With this self contained and portable device it is also feasible to mount an audible timing signal device on the box 22 to indicate to the operator how much time has elapsed in the fuse igniting operations, when igniting a number of fuses at one time. This will give him an opportunity to gauge his operations accordingly so as to be out of harm's way when the blast occurs.

From the above description it will be evident that the essential features of the tool are the opposed jaws associated with each other so that they can be brought together, and the spark-gap points on the jaws to penetrate the fuse in cooperating relation with each other. Therefore, although I have here shown and described a certain form of the tool, and certain materials in its construction as being preferable, it is to be understood that I do not wish to limit myself to such form or materials, as the tool is obviously capable of being made of various materials and in various forms.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described my invention what I claim as new and useful and desire to secure by Letters Patent is:

1. A fuse igniting tool comprising separate axially alined spark points, means to move the points toward each other and through the jacket of a fuse so that the adjacent ends of the points are in contact with the powder, a circuit for the points and means closing the circuit only when said points are moved in contact with the powder and also limiting the approach of the points toward each other.

2. A fuse igniting tool comprising opposed normally separated jaws, spark points projecting from the adjacent faces of the jaws, means on the jaws to locate a fuse in proper relationship to the points, means to bring the jaws toward each other so that the points will penetrate the fuse jacket, means limiting such movement of the jaws so that the points will then be spaced from each other a predetermined distance, and means to pass a current through the points only when the movement of the jaws is so limited.

3. A fuse igniting tool comprising opposed normally separated jaws, spark points projecting from the adjacent faces of the jaws, means on the jaws to locate a fuse in proper relationship to the points, means to bring the jaws toward each other so that the points will penetrate the fuse jacket, means limiting such movement of the jaws so that the points will then be spaced from each other a predetermined distance, and means formed in part with said movement limiting means to then pass a current through the points.

4. A fuse igniting tool comprising opposed normally separated jaws, spark points projecting from the adjacent faces of the jaws, means

on the jaws to locate a fuse in proper relationship to the points, means to bring the jaws toward each other so that the points will penetrate the fuse jacket, means limiting such movement of the jaws so that the points will then be spaced from each other a predetermined distance, circuit elements projecting into the jaws and connected to the points, a source of current to which said elements are connected, and means to induce a high tension current in said elements including switch points mounted on the tool and adapted to engage each other only when the jaws have been brought together so that the points are in predetermined spaced relation to each other.

5. A fuse lighting tool including separate partially exposed sharp pointed current conducting pins forming a sparking device, means to project said pins into a fuse to contact with the powder therein, means to close a circuit through the pins, and a thin insulation covering on the pins except at the extreme points thereof.

6. An electric fuse igniter comprising jaws normally spaced to receive a fuse therebetween and movable toward each other, fuse penetrating spark points projecting toward each other from the adjacent faces of the jaws, one jaw having a transverse fuse receiving groove in its face and from the bottom of which the corresponding point projects, and means on one jaw to engage a fuse when the jaws are initially passed over the same, to cause said fuse to be positively alined with the groove.

7. An electric fuse igniter comprising jaws normally spaced to receive a fuse therebetween and movable toward each other, fuse penetrating spark points projecting toward each other from the adjacent faces of the jaws, one jaw having a transverse fuse receiving groove in its face and from the bottom of which the corresponding point projects, and a stop element on the side of one jaw immediately adjacent the plane of the back edge of the groove and projecting toward the other jaw in position to overlap the corresponding side thereof.

8. An electric fuse igniter comprising jaws normally spaced to receive a fuse therebetween and movable toward each other, fuse penetrating spark points projecting toward each other from the adjacent faces of the jaws, one jaw having a transverse fuse receiving groove in its face and from the bottom of which the corresponding point projects, a stop element fixed to one jaw, and projecting towards the other jaw, the space between the end of the stop and the inner face of the other jaw, when the jaws are open, being less than the diameter of the fuse on which the igniter is to be used.

9. A fuse igniting tool comprising separate axially alined spark points, means to move the points toward each other and through the jacket of a fuse to contact the powder therein, means to limit such movement to maintain the points in spaced relation within the fuse and means to establish an electric current through the points when so held spaced in the fuse, the limiting means constituting the switch points to close the circuit.

JASON S. FRYE.