J. I. CRABTREE.

IGNITION APPARATUS.

APPLICATION FILED MAR. 17, 1917.

1,286,891.

Patented Dec. 3, 1918.

2 SHEETS—SHEET 1.

FIG. 1.

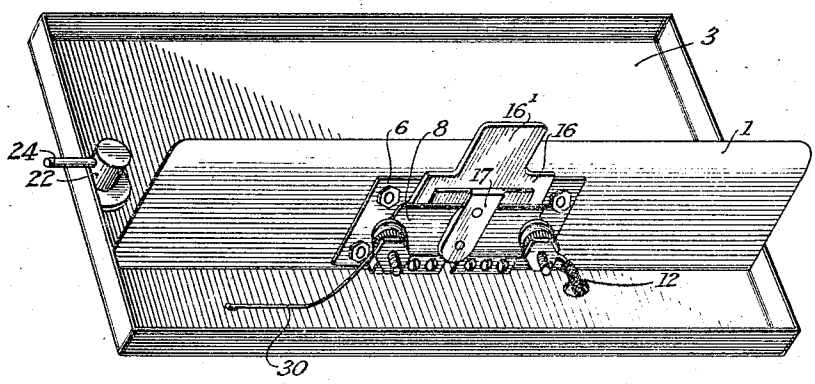


FIG. 2.

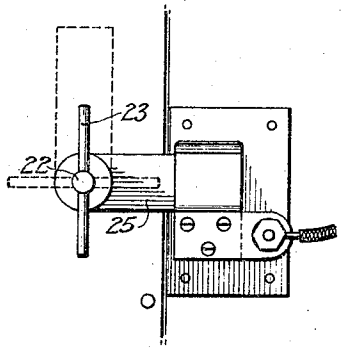


FIG. 3.

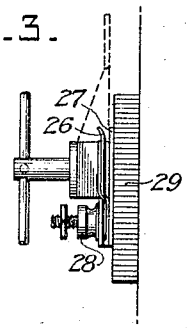


FIG. 4.

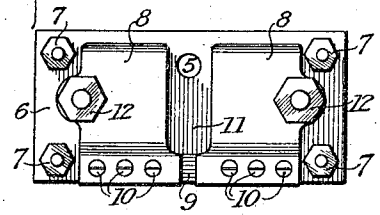


FIG. 5.

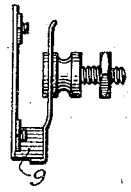
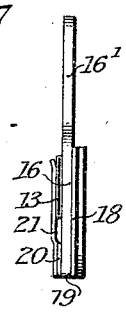


FIG. 6.



WITNESSES:

Donald K. Stewart.

Ray L. Stinchfield

INVENTOR

John I. Crabtree,

BY

Clayton L. Jenkins

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

J. I. CRABTREE.

IGNITION APPARATUS.

APPLICATION FILED MAR. 17, 1917.

1,286,891.

Patented Dec. 3, 1918.

2 SHEETS—SHEET 2.

FIG. 7.

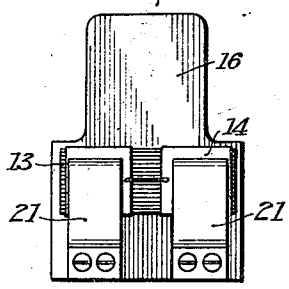


FIG. 8.

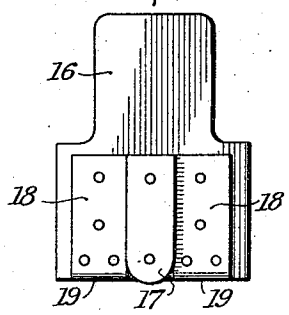


FIG. 9.

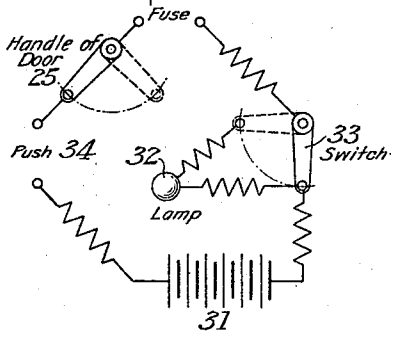


FIG. 10.

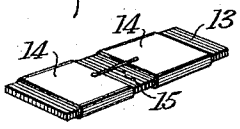
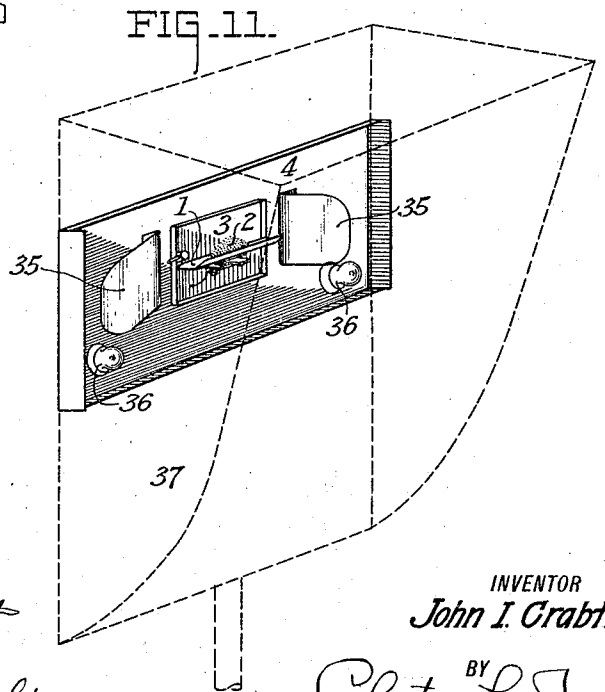


FIG. 11.



WITNESSES:

Ruth R. Stewart

Ray L. Stinchfield

INVENTOR

John I. Crabtree,

BY

Clayton L. Jenks

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN I. CRABTREE, OF ROCHESTER, NEW YORK, ASSIGNOR TO EASTMAN KODAK COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

IGNITION APPARATUS.

1,286,891. Specification of Letters Patent. Patented Dec. 3, 1918.

Application filed March 17, 1917. Serial No. 155,538.

To all whom it may concern:

Be it known that I, JOHN I. CRABTREE, a subject of the King of Great Britain, residing in Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Ignition Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference-numerals marked thereon.

This invention relates to electrical ignition apparatus, and more particularly to ignition apparatus of the type in which the ignition element is removable and renewable. It is my object to provide a simple and cheap igniter in which reliable electrical contact will always be obtained between the electrical ignition element, such as a fuse, and the coöperating electric circuit terminals; in which the ignition element and the combustible element, such as flash-powder, may be quickly, conveniently, and safely renewed; in which the ignition will occur with certainty and yet premature ignition will be prevented; and in which the parts are so arranged that a plurality of igniters may be connected together for simultaneous ignition of separate combustible elements. Other objects will hereinafter appear.

While I shall describe the preferred embodiment of my invention as applied to the ignition of photographic flash-powders, it will be understood that the invention is neither limited to this embodiment nor to the photographic art but may be embodied in other forms and used in other arts within the scope of the appended claims.

In the accompanying drawing,—

Figure 1 is a perspective view of the apparatus showing the underside of the flash pan.

Fig. 2 is a front elevation of the combined latch and switch.

Fig. 3 is a side view of the same.

Fig. 4 is a bottom plan view of certain circuit terminals.

Fig. 5 is a side view thereof.

Fig. 6 is a side view of the fuse holder with a fuse mounted therein.

Fig. 7 is a top plan view of the same.

Fig. 8 is a bottom plan view thereof.

Fig. 9 is a diagram of the ignition circuits.

Fig. 10 is a perspective view of a fuse.

Fig. 11 is a diagrammatic perspective view showing the igniter mounted in a flash-bag or cabinet.

The pan 1, which receives the flash powder 2, is mounted upon a substantially vertical metal door 3 hinged on the flanged metal panel 4. The pan has a small opening in the bottom thereof alining with hole 5 in insulating plate 6 bolted at 7 at the bottom of pan 1. Mounted on plate 6 are two parallel strong terminal springs 8 of brass or copper, spaced from plate 6 by insulating bar 9 to which they are fastened at 10 and also spaced from each other so as to leave opening 11. They carry binding posts 12.

The fuse, which is an organized structure in contradistinction to a mere wire, comprises a strip 13 of insulating material wrapped at each end with thin copper, brass, or similar bands 14, 14, between which a fuse wire 15 such as fine iron wire is stretched and soldered.

The fuse is not placed directly in the apparatus but is first mounted on a holder which is then slipped into the apparatus. This holder comprises a handle 16′ and a plate 16 of insulating material such as hard fiber on the bottom of which is medially fastened an insulating guide piece 17 adapted to fit opening 11. On both sides of the piece 17 are fastened two copper bands 18, 18, which are bent up around the edge of the plate at 19, with their ends 20 on the top of the plate. Two strong copper or brass springs 21, 21, under which the fuse may be slid, are fastened on or made integral with ends 20. The outer ends of springs 21, and 8 are beveled or bent to permit the parts to be readily inserted under them.

The latch of the door 3 includes a rotary shaft 22 carrying at its outer end a handle 23 and at its inner end a bar 24 adapted to catch over the panel 4 to help hold the door closed. Also mounted near the outer end of shaft 22 is a switch arm 25 adapted to close the electric circuit, when the door is shut, by contacting with the complementary switch members 26, 27 mounted together with binding post 28 on insulating plate 29 on panel 4. One side of the electric circuit is con-

nected to binding post 28; the other side is connected to one of the binding posts 12. The remaining post 12 is connected to the metal door 3 by wire 30 soldered thereon. Bar 24, which may be insulated, has an additional function. When door 3 is open, the operator might inadvertently turn arm 25 to its horizontal position. Under such circumstances the arm 25 could hit against the outer face of member 26 and cause a premature ignition, if no preventive means were present. Bar 24 constitutes such preventive means. With door 3 open, if arm 25 be turned to the horizontal position, bar 24 likewise becomes horizontal and will itself hit against member 26 and positively maintain arm 25 separate from member 26.

Fig. 9 illustrates a convenient way of connecting up the above parts with a source of power 31, a pilot glow lamp 32, a two-way switch 33 and a normally open push switch 34. When making a flash the current from source 31 passes through the following series of parts: Push switch 34, post 28, members 26, 27, arm 25, shaft 22, door 3, wire 30, a post 12, a strip 8, a band 18, an end 20, a spring 21, a band 14, fuse wire 15, the other band 14, the other spring 21, end 20, band 18, strip 8, post 12, and switch 33 to the source 31. To test the circuit before the flash is set off, the lamp 32 is connected in the circuit by turning switch 33 to the dotted position in Fig. 9. This lamp will glow if all the electrical connections are adequate but its resistance is so great that it lowers the test current to a small amount which does not blow the fuse. When switch 33 short-circuits the lamp 32, as shown in full lines in Fig. 9, a current through the fuse can be obtained great enough to blow it.

Deflectors 35, 35 may be fastened to panel 4 at each side of door 3. The panel 4 may also carry incandescent lamps 36 to illuminate the subject to be photographed while being posed. The apparatus hereinabove described may be used as an open-tray flash device or it may be incorporated in a bag or cabinet 37, (Fig. 11) of the light-diffusing and smoke-retaining type. Due to the certainty and promptness of ignition, several of these ignition devices may be connected together so as to fire their charges simultaneously.

The operation of my apparatus is as follows:

A fuse is slipped under springs 21 on the holder with fuse wire 15 on the outside as shown in Fig. 7. The rubbing and scraping action between springs 21 and bands 14 insures a good broad electrical connection between them. This is an important point because it avoids the insulating effect of the scale which always forms in time on the parts near the flash. It is also noted that this scale-removing friction takes place between metal parts that have sufficient area and are hard enough to accomplish the desired result. In devices, where the electric connection is made directly with a small, and often soft, fuse-wire by pressure or friction, the results are not reliable because of the small contact area of the wire and the inability of the soft wire to remove the insulating scale. By soldering the fuse wire to bands 14 and letting the latter make the rubbing contact, the connections are always reliable, thereby avoiding the loss of prestige which comes to a photographer whose flash refuses to go off.

The handle 23 of the door 3 is next turned to the position indicated in dotted lines in Fig. 2, and the door opened, thereby breaking the electrical connection between arm 25 and switch members 26, 27 so that no current can be sent through the apparatus as long as the door is open.

The assembled holder and fuse are next inserted under springs 8, guide 17 sliding into opening 11 and the fuse-wire 15 coming opposite hole 5. During this insertion the springs 8 strongly rub against bands 18, insuring reliable electrical connection between them. The flash powder is now placed in the pan above the fuse with which it comes into igniting proximity through hole 5.

The door is next closed and handle 23 turned so as to lock it and restore connections between arm 25 and members 26, 27. If desired, a test of the electrical connections can now be made, using lamp 32 as hereinabove described. The fuse is set off by closing the push switch 34 when the other switches are in correct position. The current highly heats the wire 15 to the point where it melts and perhaps gives a puff of incandescent vapor, igniting the flash powder above it within a very short time after the push switch is closed.

It is sometimes necessary to make a second flash as soon as possible after the first one. My device especially facilitates this. The operator opens the door, takes out the holder, replaces the spent fuse with a fresh one, and pours a new charge of powder into the tray, thereafter proceeding as with the first flash. It will be evident that he does not have to insert the second fuse out of sight under the tray with his bare hands, which operation is awkward and might injure his hands by contact with the parts heated by the preceding flash. Instead he has only to grasp the holder by means of handle 16′ and remove it to a position where a fuse may be conveniently inserted in full view and where the parts of the holder will quickly cool.

While the fuse is preferably of the form shown, any fuse which includes sufficient area in its terminals to allow a scale-removing frictional contact may be used. Other modifications within the scope of the ap-

pended claims will occur to persons skilled in this art.

I claim:

1. In an ignition device, an ignition element having electrical terminals of relatively wide area, a holder, means on the holder for detachably supporting said ignition element and frictionally engaging said terminals and a support for the combustible having means thereon for detachably retaining the holder and ignition element in igniting proximity to the combustible, said holder being provided with a handle extending away from the combustible when the holder is in position on said support.

2. In an ignition device, an ignition element having electrical terminals thereon, a holder having means for detachably and replaceably supporting said ignition element and for making electrical connection with said terminals, and a receptacle for the combustible having members for detachably retaining the holder and ignition element in operative proximity to said combustible, said members making electrical connection with said means, said holder having a handle shielded by the receptacle from said combustible.

3. In an ignition device, an ignition element having electrical terminals thereon, a holder having metal strips shaped to detachably and replaceably support the ignition element and electrically connected with said terminals, and a receptacle for the combustible having metal strips for detachably supporting the holder and for making electrical connection with the strips on said holder.

4. In an ignition device, an ignition element including electrical terminals, a holder having metal strips with resilient portions to detachably support the ignition element and frictionally connect with said terminals, and a receptacle for the powder having resilient metal strips thereon for detachably supporting the holder.

5. In an ignition device, an ignition element having electrical terminals, a holder therefor comprising a base carrying two metal strips to detachably support the ignition element and frictionally connect with said terminals and also carrying a guide, and a receptacle for the combustible having two spaced resilient metal strips for detachably supporting the holder and for frictionally contacting with the strips on the holder, said guide fitting between the strips on the receptacle.

6. In an ignition device, the combination with an ignition element having electrical terminals, and a holder comprising a base having an insulated handle and provided on its upper face with two spaced insulated metal springs for holding said ignition element and contacting with its terminals, said holder being provided on its under face with a guide and two metal terminals connected to said springs, of a receptacle for the combustible having an opening in the bottom thereof and two spaced insulated metal springs on each side of the opening for supporting the holder so that ignition element is adjacent the opening, said springs on the receptacle frictionally contacting with the terminals on the under face of the holder and receiving between them the guide on the holder.

7. In an ignition device, a fuse holder comprising a base provided on its upper face with two spaced metal gripping springs and on its under face with two metal terminals electrically connected to said springs, and a receptacle for the combustible provided with two metal springs for detachably supporting the fuse holder and frictionally making electric contact with said terminals.

8. In an ignition device, a fuse holder comprising a base provided with an insulated handle and having on its upper face two spaced metal gripping springs and on its under face a central guide and at each side of said guide two terminals electrically connected to said springs, and a receptacle for the combustible provided with two spaced metal springs under which the fuse holder is adapted to be slipped and detachably held, said springs on the receptacle making electrical contact with said terminals and receiving the guide between them.

9. In an ignition apparatus, a holder for detachably supporting a fuse, comprising a base having an insulated handle and on one face two metal gripping springs and on its other face two terminals electrically connected with said springs.

10. In an ignition apparatus, a holder for detachably supporting a fuse, comprising a flat base of insulating material having an insulated handle and provided on one face with two metal gripping springs and on its other face with an insulated block and two metal terminals electrically connected to said springs.

11. In an ignition apparatus, a panel and a door hinged thereon provided with a support for a combustible and a detachable electric ignition element adjacent the combustible, said door provided with a combined latch and switch, the switch being in circuit with the ignition element so as to open said circuit when the door is unlatched.

12. In an ignition apparatus, a panel and a door hinged thereon provided with a support for a combustible and a detachable electric ignition element adjacent the combustible, said door carrying a pivoted switch arm, there being a coöperating switch element on the panel with which the switch arm interlocks to complete the circuit and hold the door in closed position.

13. In a flash apparatus, a panel, a door in said panel provided with a combined latch and switch, said switch being open when the door is unlatched, said door carrying an ignition device, and means for preventing premature closure of said switch while said door is in open position.

14. In a flash apparatus, a panel, a door in said panel, a switch member on said panel, a movable coöperating switch member on the door, said switch members coöperating to latch the door, and a safety element movable with the switch member on the door to maintain said members separate when the door is unlatched.

In testimony whereof I have signed this specification, in the presence of two witnesses, this 8th day of March, 1917, at Rochester, N. Y.

JOHN I. CRABTREE.

Witnesses:
FRED H. GARDNER,
C. E. MARTIN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."