(No Model.)

L. S. WOODBURY.

PRIMER FOR FUSES.

No. 457,391. Patented Aug. 11, 1891.

Fig. 1.

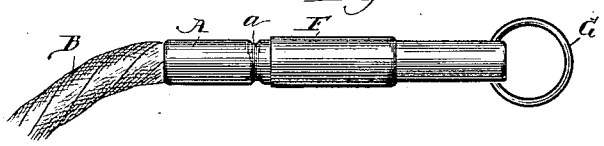


Fig. 2.

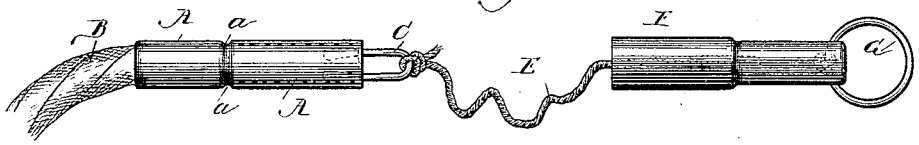


Fig. 3.

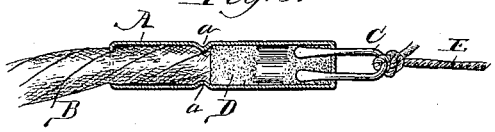
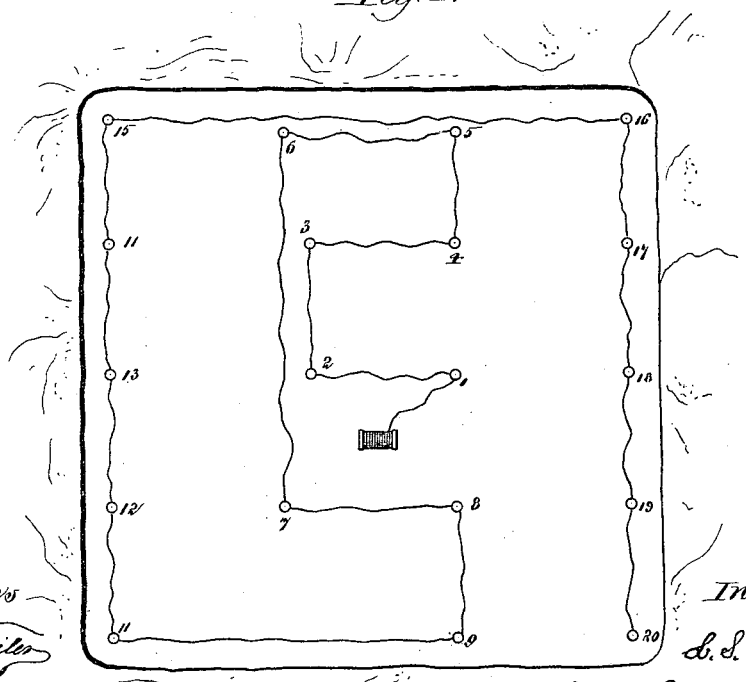


Fig. 4.



Witnesses
W. Rossiter
H. A. Young.

Inventor
L. S. Woodbury
By Raymond & Veeder
Attys.

UNITED STATES PATENT OFFICE.

LEANDER S. WOODBURY, OF DETROIT, ASSIGNOR TO F. E. WOODBURY, OF IRON MOUNTAIN, MICHIGAN.

PRIMER FOR FUSES.

SPECIFICATION forming part of Letters Patent No. 457,391, dated August 11, 1891.

Application filed October 25, 1890. Serial No. 369,273. (No model.)

To all whom it may concern:

Be it known that I, LEANDER S. WOODBURY, of Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Primers for Fuses, of which the following is a specification.

My invention has for its object the provision of a primer for igniting fuses or explosives which shall be certain in its action, and which shall require a minimum of skill to use it, and which shall diminish the danger to the operator as much as possible.

It is further the object of my invention to provide a primer which shall be unaffected by dampness and not liable to premature explosion.

My invention provides a means of igniting the fuse which is entirely under the control of the operator, so that he can fire as many blasts simultaneously as he may wish, or can fire them in any desired order of succession, and can fire a charge under water as easily and surely as elsewhere.

In the accompanying drawings, Figure 1 is a side elevation of a fuse end and the attached primer. Fig. 2 shows the primer ready to be exploded, the protecting-cap having been detached. Fig. 3 is a section of the primer, showing the internal construction. Fig. 4 shows the method of connecting a number of blasting-charges for simultaneous or successive firing.

A, Fig. 3, is a cylindrical cap or tube, preferably made of copper, like the ordinary exploder-cap. The primer-cap A is fitted to slip over the end of the fuse B, and is held in place by compressing its end after having been placed upon the fuse. The outer end of the primer-cap A is closed, except for an aperture or apertures made for the reception of a staple C. The ends of said staple C, which project within the primer-cap, are flattened or roughened and are buried within a paste of fulminate or other compound easily ignited by friction. Within the cap is also placed a wicking D or other suitable fibrous material, which is saturated with any fiercely-burning but not explosive material or powder, the whole being held within the cap by a stricture *a*. There is a small air-space left between the ignitible paste or fulminate and the wicking D, which affords partial room for the gas formed by the explosion of the fulminate, so that the latter will not blow the cap off from the fuse. This air-space relieves the first pressure only, the slot in the end of the cap through which the staple passes affording a vent for the remainder of the gases. The staple and the end of the primer-cap A without are coated with shellac or other water-proof substance, which serves the double purpose of excluding moisture and of retaining the staple C in place, and the whole cap is also coated with paraffine to more thoroughly exclude moisture. To the staple C is attached a cord or wire E, Fig. 1, the other end of which passes up into a protecting-cap F, at the outer closed end of which it is secured. The cap F is fitted so as to slip part way over the primer-cap A, the cord or wire E being coiled within the outer end of the cap F. A ring G is secured to the cap F, so as to furnish a point of attachment for the cord used in igniting the primer. The cap F is secured in place upon the primer-cap A by any suitable cement, and the whole is preferably coated with paraffine or shellac, so as to render it water-proof.

To be certain of making the coating of paraffine perfectly water-proof, it is desirable that the primer should be dipped in a bath of melted paraffine and be left therein for several seconds, so that the primer may be thoroughly coated throughout. Instead of being secured by cement, the cap F may be retained in place by any mechanical means—such as a small pin or by indentations in primer-cap A and cap F, or by soldering a small portion of cap F to primer-cap A in such a way as to resist a longitudinal strain but yield readily to torsion.

Before the primer is to be fired the cap F is loosened from the cap A by twisting one slightly upon the other, which breaks the cement or other fastening.

The operation of the primer described is obvious. The fuse having been properly cut so as to present a fresh end, the primer is slipped thereon and secured by compression or pinching. A cord having been attached to the ring G, and the cap F having been loos-

ened, the operator retires to a safe distance, and then by pulling the cord detaches wholly or partially the staple C, the compound in which it is embedded being thereby ignited. Fire thus produced is communicated through the fibrous material D to the fuse B.

By virtue of the fact that the primer need not be fired until the operator has retired to a safe distance a much shorter fuse can be used than where the ordinary means of lighting are employed, the method of firing herein being in this respect as advantageous as that in which electricity is employed for igniting the fuse. The method herein described has the advantage over electrical firing, in that the holes can be fired either simultaneously or successively, it being practicable to allow any desired interval between the firing of the successive charges.

The manner of arranging for firing a number of holes at a blast is shown in Fig. 4. Each hole is charged and provided with a fuse, a primer, and a single cord I is secured to all the primers successively, the first charge to be fired being connected to the cord I at the point nearest the operator and the other charges being secured in the order of their firing, or, as usually will be most convenient, the end of the cord is secured to the primer of the charge last to be fired and then to the primers of other charges in inverse order down to the charge to be first fired. The operator then retires to a safe distance, and by pulling the cord can fire each hole in succession or can fire all the holes practically simultaneously, as he may desire.

By my method of firing the advantages arising from the use of electricity and of other ordinary methods of firing are combined without their corresponding disadvantages—that is, the safety, economy, and controllability arising from the use of electricity are combined with the simplicity and the availability by comparatively unskilled workmen of the ordinary methods. It is obvious that where the tamping will not interfere with the operation of the primer and it is not necessary to have any time elapse between the igniting of the primer and the explosion of the charge the primer can be secured directly in the explosive charge and the fuse may be dispensed with.

While I have described the staple C as being detached in the operation of firing the primer, it is not necessary that it should be wholly withdrawn from the cap, as a slight motion is sufficient to ignite the fulminate, and in using the word "detachable" in the claims I do not wish to be understood as meaning that the staple should be wholly withdrawn from the cap, but simply that it should be movable to a sufficient extent to ignite the fulminate. The flattened form for the ends of the staple is preferable, for the reason that the edges thereof have a concentrated action upon the fulminate within which they are embedded, and, furthermore, the elasticity of the cord to which the staple is fastened causes it to become detached very suddenly once the shellac or other fastening which secures the staple is broken, and the ignition of the compound is thus made certain.

What I regard as new, and desire to secure by Letters Patent, is—

1. In a primer for igniting explosive charges, the combination of a cap containing a compound ignitible by friction, a detachable ignitor in contact with said compound, a protective cap adapted to the first-named cap, and a cord or wire uniting the detachable ignitor and the protective cap, and means for detaching the protective cap, substantially as described.

2. The combination, in a primer for igniting explosives, of a cap containing a compound ignitible by friction, a detachable ignitor in contact with said compound, and a fibrous material in said cap in proximity with said ignitible material and charged with a non-explosive powder, substantially as described.

3. The combination, in a primer, of a cylindrical cap closed at one end, except as to a perforation or perforations, in which is inserted a detachable ignitor, the other end of said cap being adapted for the insertion therein of the fuse end, a compound ignitible by friction within the closed end of said cap and in contact with said ignitor, a non-explosive powder in proximity to said frictionally-ignitible material, and a cord or other attachment to said detachable ignitor, whereby it may be withdrawn by the operator at a distance, substantially as described.

4. The combination, in a primer, of a cylindrical cap adapted to be placed upon the fuse end and provided at its outer end with a fulminate or other material ignitible by friction, a detachable ignitor embedded in said material, a protective cap fitted to the primer-cap and connected to the ignitor by a cord, said protective cap being secured to the primer-cap by a frangible cement, substantially as described.

5. The combination, in a primer, of a cylindrical cap closed at one end, except as to a perforation or perforations, in which is inserted a detachable ignitor, the other end of said cap being adapted for insertion therein of the fuse end, a compound ignitible by friction within the closed end of said cap and in contact with said ignitor, a non-explosive powder in proximity to said frictionally-ignitible material, but separated therefrom by an air-space, and a cord or other attachment to said detachable ignitor, whereby it may be withdrawn by the operator at a distance, substantially as described.

LEANDER S. WOODBURY.

Witnesses:
H. O. CHOWEN,
NELLIE PERKINS.