

No. 708,833.

Patented Sept. 9, 1902.

W. RUEGG.

SAFETY DEVICE FOR SHELL FUSES.

(Application filed Sept. 26, 1901.)

(No Model.)

Fig. 1,

Fig. 2,

Fig. 3,

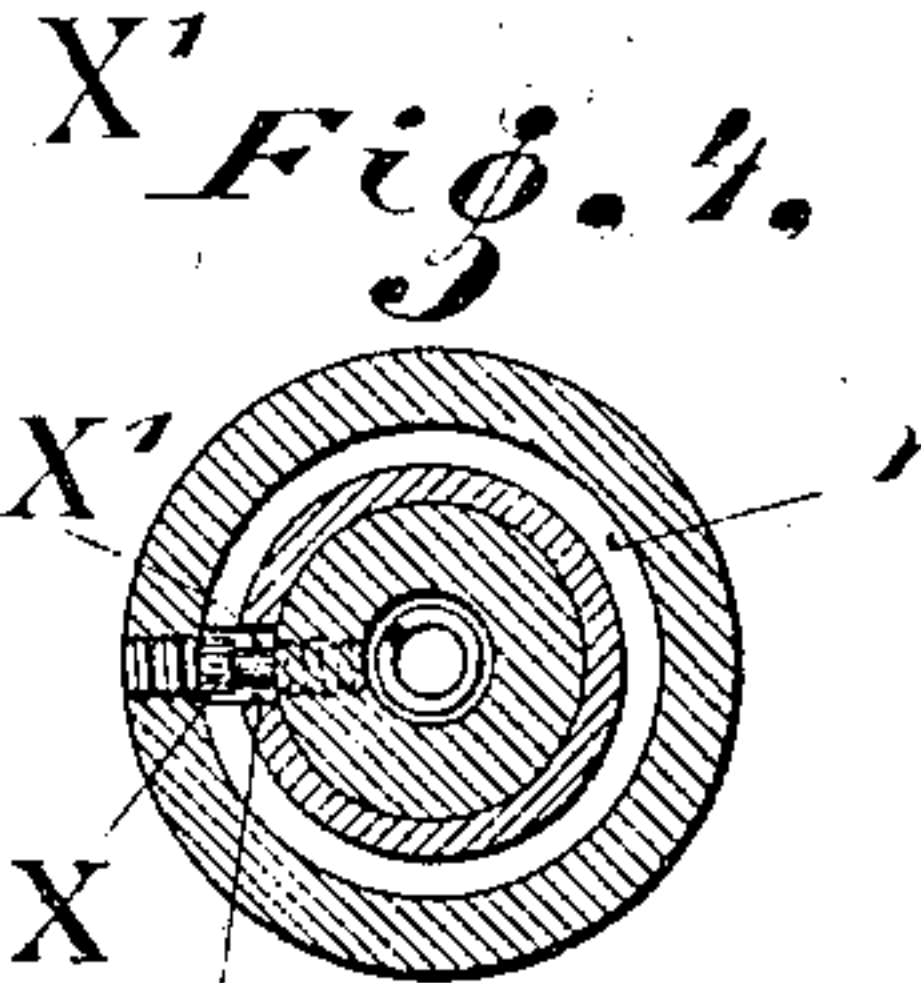
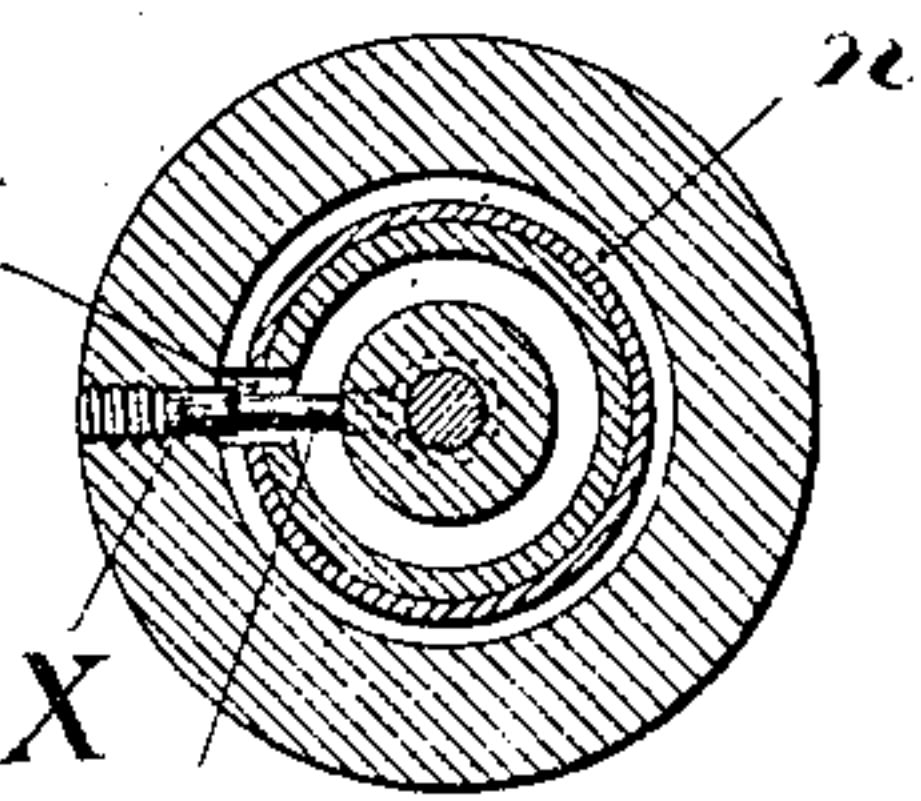
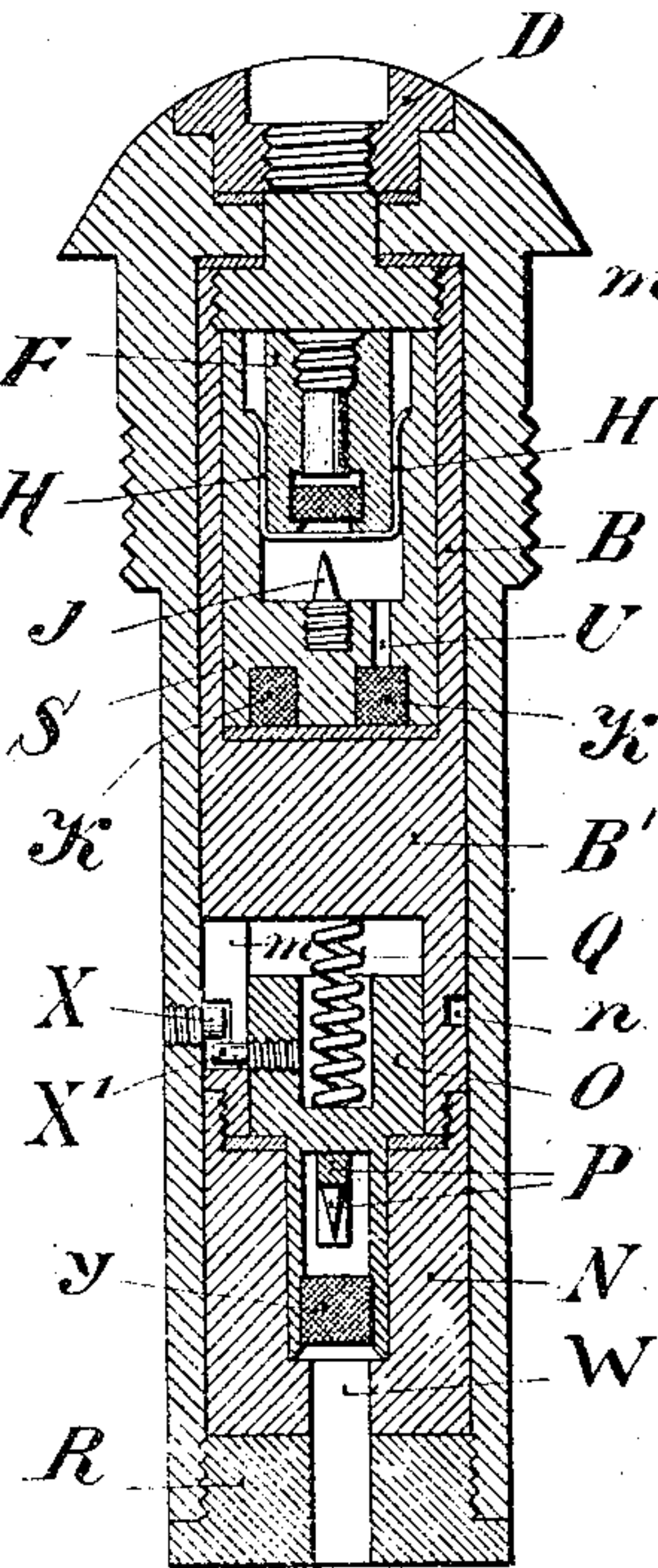
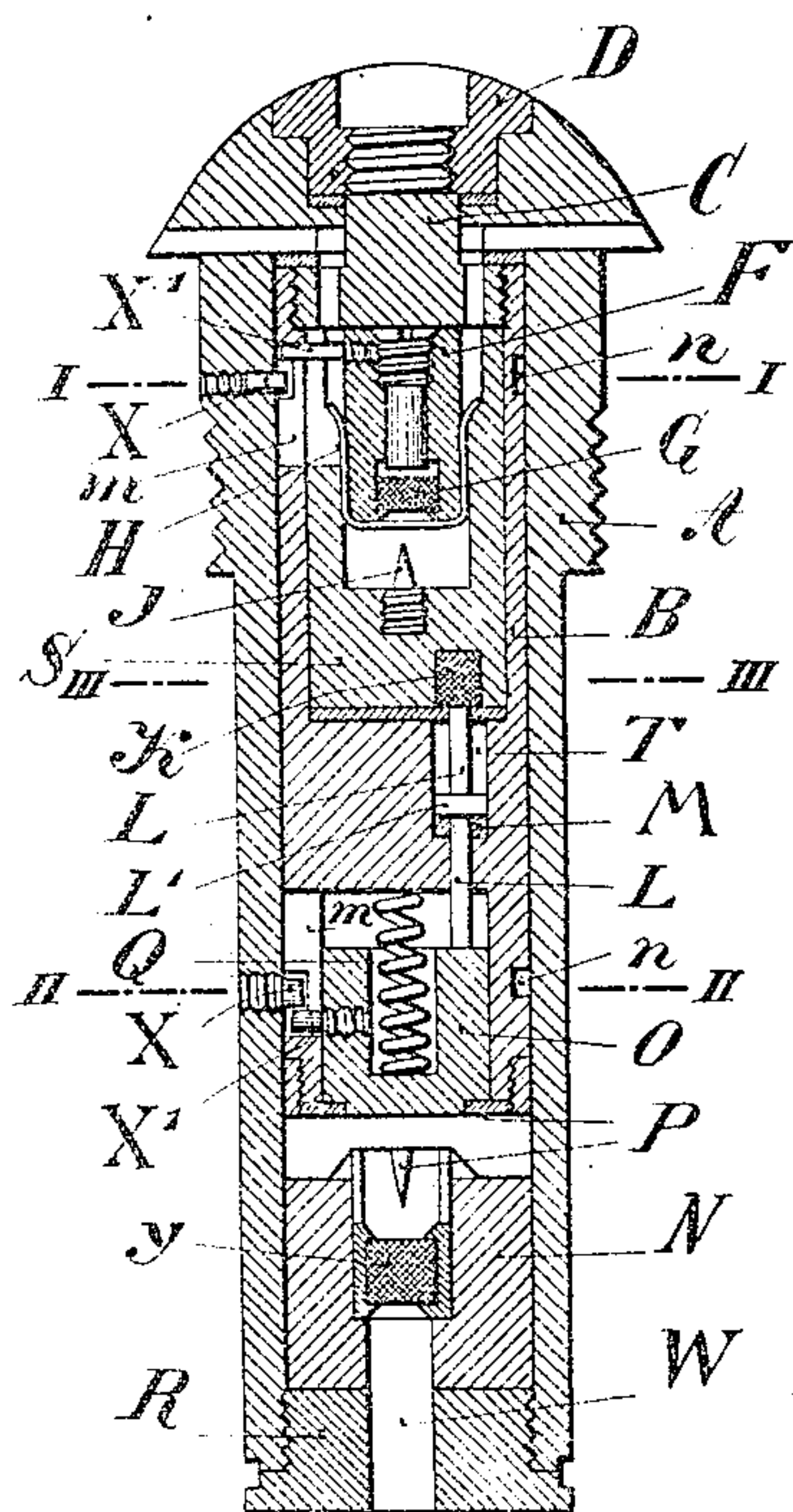
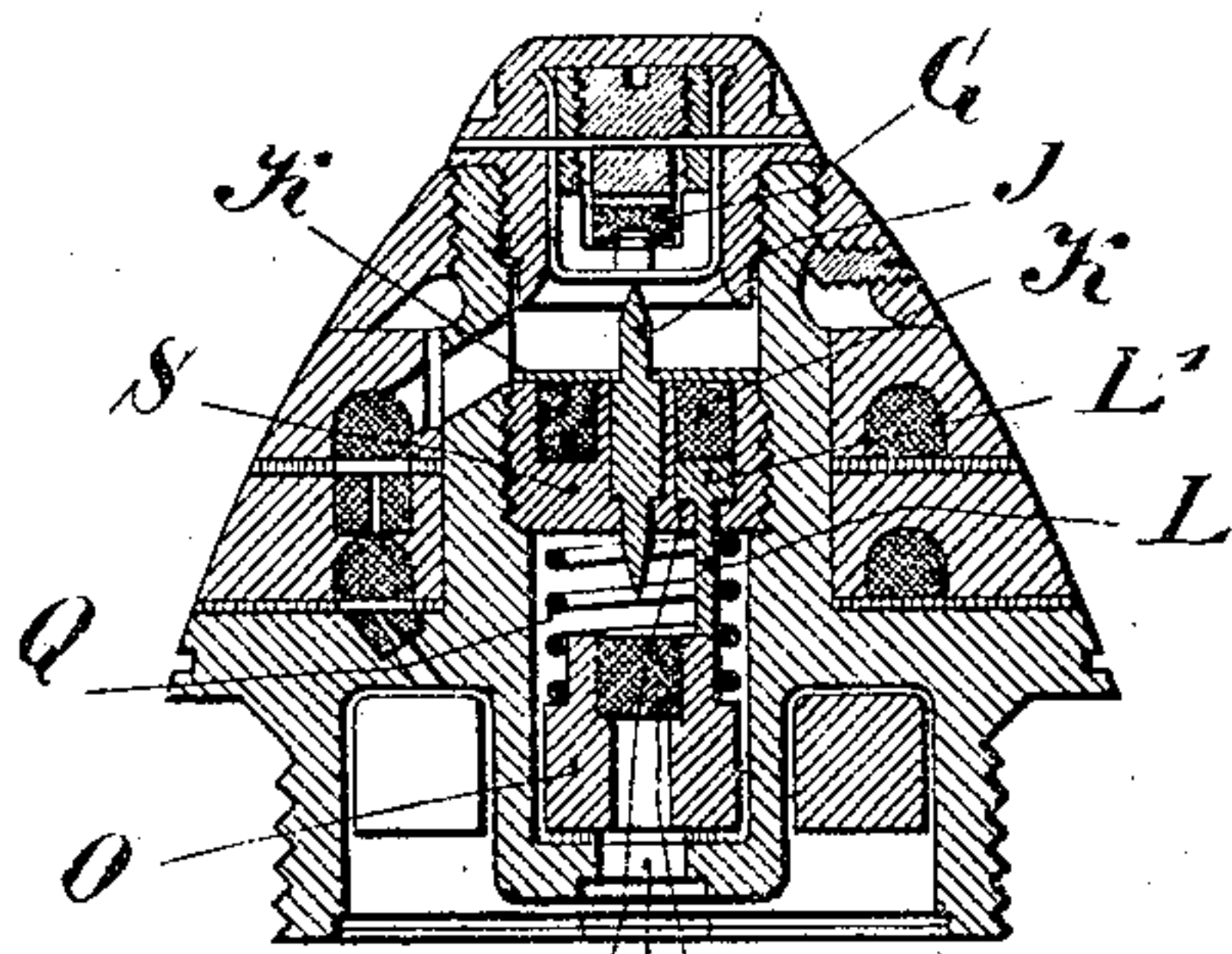
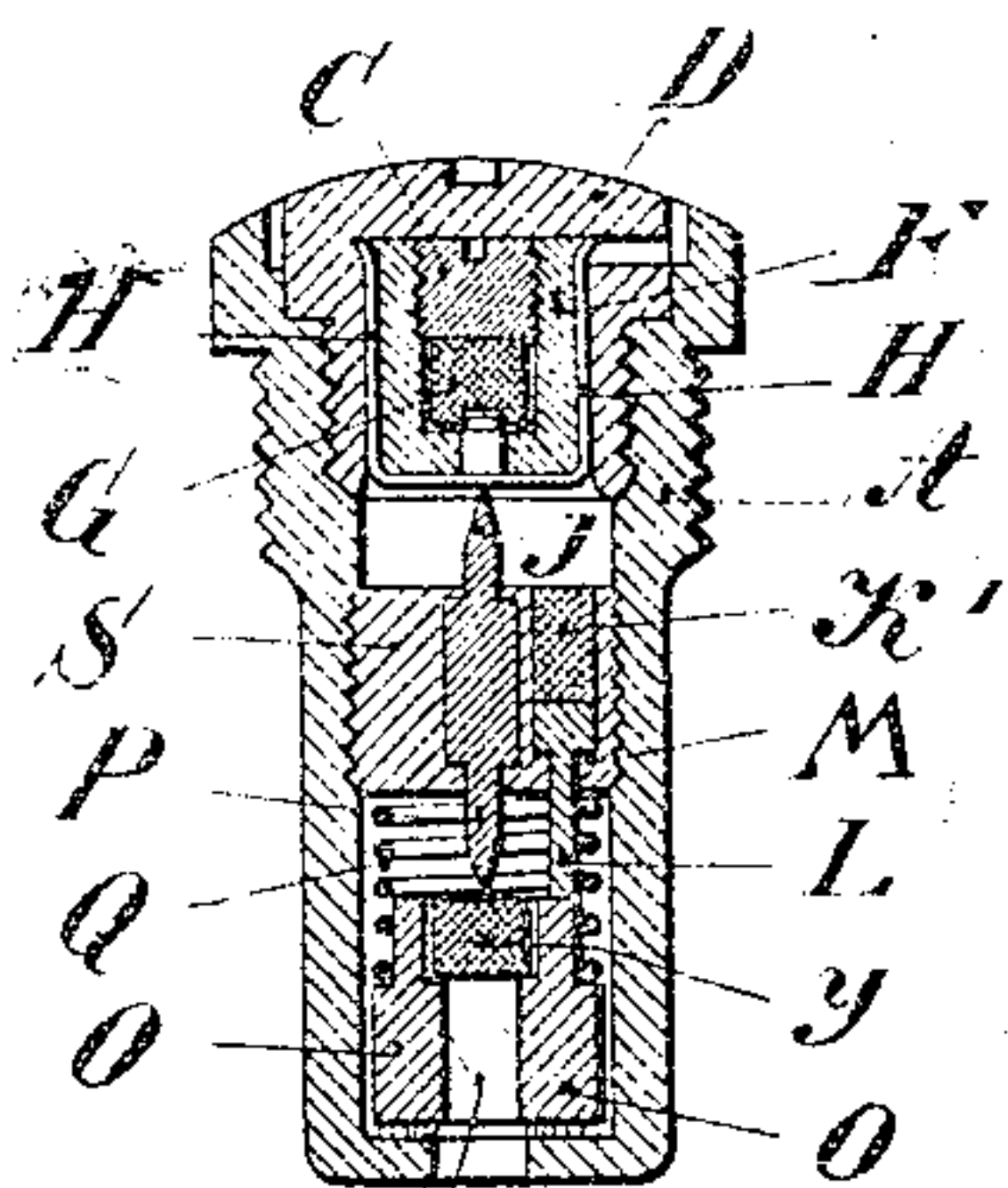


Fig. 6,

Fig. 7,



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# UNITED STATES PATENT OFFICE.

WERNER RUEGG, OF SÖMMERDA, GERMANY.

## SAFETY DEVICE FOR SHELL-FUSES.

SPECIFICATION forming part of Letters Patent No. 708,833, dated September 9, 1902.

Application filed September 26, 1901. Serial No. 76,699. (No model.)

*To all whom it may concern:*

Be it known that I, WERNER RUEGG, a citizen of Switzerland, residing at Sömmerda, in the Kingdom of Prussia and German Empire, have invented certain new and useful Improvements in or Relating to Safety Devices for Tube-Detonators for Shell and Shrapnel Fuses, of which the following is a specification.

10 This invention relates to certain new and useful improvements in safety devices adapted for use in connection with tube-detonators provided with time, percussion, or shell fuses, and has for its object to provide a device of  
15 this class with a resistance consisting of powder or other readily-combustible material which normally prevents the free movement of the percussion-bolt, but which when burned out allows the percussion-bolt to be moved,  
20 so that the latter is adapted to ignite the percussion-capsule. Any character of material which is readily combustible can be employed; but preferably a powder ring or grain of powder is used as the resistance.

25 In order to avoid a free motion of the priming-bolt or of the percussion-bolt, or of both, during transport of the projectile furnished with the fuse, locking-pins are arranged in the bolt-sleeve and in the fuse-casing, and  
30 the bolt-sleeve is adapted to turn and only after turning is brought into such a position as to allow of a free motion of the priming-pellet bolt and of the percussion-bolt, the latter after the ring or grain of powder is  
35 burned.

In describing the invention in detail reference is had to the accompanying drawings, forming a part of this specification, wherein like letters of reference indicate corresponding parts throughout the several views, and in which—

40 Figure 1 shows the fuse in longitudinal section. Fig. 2 is a longitudinal section of the same at right angles to Fig. 1. Fig. 3 shows a cross-section on the line I I of Fig. 1. Fig. 4 is a cross-section on the line II II of Fig. 1. Fig. 5 shows a cross-section of the gunpowder ring on the line III III. Fig. 6 shows a section of a shell with a grain of powder, and  
50 Fig. 7 shows the arrangement of a grain of powder for a time-fuse.

Referring to Figs. 1 to 5 of the drawings,

A denotes a fuse-casing in which is mounted a rotatable bolt-sleeve B and carries the cylinder-lengthening screw C and set-screw D. 55 Within the lower end of the fuse-casing A is arranged a socket N, which is held in position by means of a bottom plug or ring R. The rotatable bolt-sleeve B is divided by the partition B', forming thereby the chambers 60 B<sup>2</sup> B<sup>3</sup>. The partition B' is formed with an opening T, which extends in a longitudinal manner, but is of two different diameters, the larger in the front or upper portion of the partition and the smaller in the bottom 65 or lower portion of the partition. Mounted in the opening T, as well as extending there-through, is a locking-pin L, which carries a collar or disk L', adapted to seat itself against the washer M, mounted upon the shoulder 70 formed at the lower or rear end of that portion of the opening T of larger diameter or where that portion T of the larger diameter terminates into the portion of the opening T of smaller diameter. The bolt-sleeve B carries 75 in its chamber B<sup>2</sup> a socket S, in which is arranged a powder ring or grain of powder K, to which the passage U leads, as shown in Fig. 2. In the chamber B<sup>3</sup> of the bolt-sleeve B is arranged a percussion-bolt O, 80 which carries an ignition-pellet Y. Extending transversely through the percussion-bolt O is a bridge provided with a firing-pin P. The bridge is arranged within the sleeve or socket N and bears against a washer on the 85 lower end of the sleeve B and is thus maintained against longitudinal displacement.

The reference-letter G denotes a percussion-cap, which is carried by the priming-bolt F and extends down into the socket S in the 90 chamber B<sup>2</sup> of the percussion-bolt.

Assuming the priming-bolt is not secured, the operation of the fuse is as follows: The priming-bolt F, held by the locking-spring H in the usual manner, strikes on firing, in consequence of its momentum of inertia and the 95 deformation of the locking-spring H, against the firing-pin J, whereby the percussion-cap G, situated in the bolt, is ignited. The fire is transmitted through the passage U, Figs. 100 1, 2, to the inflammable ring K or directly to the grain of powder K', Fig. 6. The ring or grain of powder continues to burn during the course of the projectile through the barrel



and through several hundred meters of the ascending portion of its trajectory. During this period the locking-pin L is kept with its disk or enlarged head L' pressed against its seat or washer M in the bolt-sleeve by the ring or grain of powder, whereby the free motion of the percussion-bolt O is prevented and no fire can escape from the ring or grain of powder to the percussion-bolt. However, as soon as the fire has consumed the ring or grain of powder above the pin L the latter becomes free to move toward the front of the projectile. The percussion-bolt O is consequently also released and during the flight of the projectile is pressed against its lower bearing only by the spiral spring Q and is kept out of contact with the striker P. The spiral spring has therefore only the object of preventing the percussion-bolt during the further flight of the projectile from gradually moving forward. On impact the percussion-bolt O is thrown by its momentum in a forward direction, carrying with it the percussion-cap Y, inserted in its lower end and driving the latter against the striker P. The fire then enters the explosive charge in the projectile through the opening W. The powder ring K burns throughout its length from one end to the other, and according to the length used the timing can be varied. The same result is obtained by suitably selecting the length of the powder grain. The disk L' and washer M are employed to prevent any possibility of fire from the burning powder obtaining access to the detonator or primer Y. The arrangement can, according to Figs. 6 and 7, be such that the disk of the locking-pin L also forms the head of the latter. In time-fuses, where a priming-pellet G is used, the latter on firing immediately effects the ignition of the ring K or grain K' of the powder. The locking device for use in transport is shown in Figs. 1, 2, 3, and 4. The bolt-sleeve B is rotatably arranged in the fuse-casing A, together with the bolt F, guided by the sleeve, and, if desired, also with the percussion-bolt O. This locking device consists of a locking-pin X', screwed transversely into the bolt F or percussion-bolt O. The pin X' when the fuse is out of use is so placed above a second locking-pin X, screwed into the fuse-casing A, that in this position the bolt F or the percussion-bolt O cannot move, or, in other words, the bolt F is prevented from moving downwardly, while the percussion-bolt O cannot move in an upward direction. When the bolt-sleeve is turned, the pins X X' are no longer in alinement with each other and the bolt F can freely move in a downward direction, and the percussion-bolt O can move upwardly when the pin L allows such movement. As the motion of the bolt F is effected in a downward direction, the pin X is screwed into the fuse-casing below the pin X', whereas the pin X, which prevents the pin X' of the percussion-bolt from moving when the fuse is out of use, is situated in the casing above

the pin X' because of the moving of the percussion-bolt in an upward direction. In order to allow of a turning motion of the bolt-sleeve B, a groove *n* is arranged in the sleeve B at the point where the pins X engage with the latter, and the free motion of the pin X' for the bolt F or for the percussion-bolt O is obtained by the bolt-sleeve B being provided with recesses *m* beneath the pin X' for the priming-bolt F and above the pin X' for the percussion-bolt O.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a safety device for fuses, the combination with a bolt-sleeve carrying a mass of combustible material and a percussion-bolt, said sleeve provided with a partition interposed between the said material and bolt, of a longitudinally-extending locking-pin mounted within said partition and adapted to engage said bolt and material to prevent the movement of said bolt until the said material is burned away.

2. In a safety device for fuses, the combination with a bolt-sleeve having a mass of combustible material and a percussion-bolt mounted therein, and a partition interposed between the said combustible material and bolt and provided with a longitudinally-extending opening of two different diameters, of a locking-pin extending through the said opening, and a collar carried by the said pin and operating in that portion of the opening of larger diameter, said pin adapted to engage said bolt and material to prevent the movement of said bolt until the said material is burned away.

3. In a safety device for fuses, the combination with a bolt-sleeve carrying a mass of combustible material and a percussion-bolt, and a partition interposed between said material and bolt and provided with a longitudinally-extending opening of two different diameters, of a locking-pin extending through the said opening, a washer mounted in that portion of the opening of larger diameter, and a collar carried by said pin and adapted to engage the said washer, said pin adapted to engage said bolt and material to prevent the movement of said bolt until the said mass of combustible material is burned away.

4. In a safety device for fuses, the combination of a bolt-sleeve provided with a partition having a longitudinally-extending opening, a mass of combustible material carried by the sleeve above the said partition, a percussion-bolt carried by the sleeve below the said partition, and a locking-pin mounted in the said opening and engaging with said bolt and said material to prevent the longitudinal displacement of said bolt until the mass of combustible material is burned away.

5. In a safety device for fuses, the combination of a rotatable sleeve, a priming-bolt mounted therein, means for locking and releasing the bolt according to the adjustment



of said rotatable sleeve, a percussion-bolt carried by the sleeve, a mass of combustible material carried by said sleeve, a locking-pin interposed between the said combustible material and said percussion-bolt, whereby the movement of the latter is prevented until the former is burned away, and means for igniting said mass.

6. A safety device for fuses, comprising in its construction a casing, a rotatable bolt-sleeve mounted therein, a priming-bolt carried by the sleeve, a percussion-bolt mounted in the sleeve, means for locking or releasing the priming-bolt according to the adjustment of said rotatable sleeve, and a means for locking said percussion-bolt for safety and release it for action.

7. A safety device for fuses, comprising in its construction a bolt-sleeve having a longitudinally-extending opening, a longitudinally-extending locking-pin operating through said opening, a percussion-bolt mounted in one end of said sleeve and arranged at the rear of and engaged by said pin for locking said bolt in safety position, and means carried by the other end of the bolt-sleeve and arranged at the front of the locking-pin for releasing said pin from engagement with said bolt to permit of the operation of the latter.

8. In a safety device for fuses, the combination with a percussion-bolt and a mass of combustible material, a longitudinally-extending locking-pin interposed between said material and bolt and adapted to lock the latter in a safety position until the material is burned away, and means arranged at the front of said material for igniting the same.

9. In a safety device for fuses, the combination of a percussion-bolt and a mass of combustible material at the front thereof, of a longitudinally-extending locking-pin interposed between said material and bolt and adapted to lock the latter in a safety position until the material is burned away, means arranged at the front of said material for igniting the same, a priming-bolt for igniting said means, and means for locking the said priming-bolt.

10. In a safety device for fuses, the combination with a rotatable bolt-sleeve, provided with a partition having a longitudinally-extending opening, of a percussion-bolt carried by the said sleeve below said partition, a spring carried by the sleeve and engaging the bolt, a ring of combustible material carried by the said sleeve above said partition, means for igniting said ring, and a locking device mounted in the opening of said partition and adapted to prevent the movement of said bolt until the said ring is burned away.

11. In a safety device for fuses, the combination with a sleeve provided with a partition having an opening extending therethrough and a percussion-bolt mounted in the said sleeve, of means arranged in the said opening and engaging the bolt for preventing longitudinal displacement thereof, a mass of com-

combustible material carried by the sleeve and engaged by said means and adapted when burned away to permit of the longitudinal displacement of said means and bolt, and means carried by said sleeve for igniting the mass of combustible material.

12. In a safety device for fuses, a casing, a bolt-sleeve carried thereby and provided with a partition having an opening therethrough, a percussion-bolt mounted in the said sleeve at the rear of said partition, a combustible mass carried by the said sleeve at the front of the partition, means carried by the sleeve for igniting the said mass, a locking device mounted in the sleeve and adapted to engage said mass and bolt to prevent longitudinal displacement of said bolt until the said mass is burned away, a spring engaging the bolt, a bridge mounted in the casing and provided with a firing-pin, and an ignition-pellet carried by the percussion-bolt and adapted to be engaged by the firing-pin when said bolt is released by the burning away of the said mass.

13. In a safety device for fuses, the combination with a percussion-bolt and a ring of combustible material mounted at the front thereof, of a locking-pin interposed between said ring and bolt and adapted to lock the latter in safety position to prevent the longitudinal displacement thereof until said ring is burned away, and means at the front of the said ring of combustible material for igniting the same.

14. In a safety device for fuses, the combination with a bolt-sleeve provided with a partition forming a front and a rear chamber, said partition having an opening extending there- through, of a socket-piece mounted in the front chamber, a mass of combustible material carried by the socket-piece, a priming-bolt extending in the socket-piece for igniting the mass of combustible material, a percussion-bolt mounted in the rear chamber of the said sleeve, a locking-pin arranged in the opening of the partition and interposed between the mass of combustible material and said bolt, said locking-pin adapted to engage the percussion-bolt to prevent the longitudinal displacement thereof until said mass is burned away, an ignition-pellet carried by the percussion-bolt, and means for igniting the said pellet.

15. In a safety device for fuses, the combination of a bolt-sleeve, a percussion-bolt carried thereby, a priming-bolt carried thereby, a mass of combustible material arranged within the said sleeve above the said percussion-bolt and adapted to be ignited by the said priming-bolt, means for locking said priming-bolt in a safety position, a locking-pin interposed between said percussion-bolt and said mass of combustible material, said locking-pin adapted to engage the said percussion-bolt to prevent longitudinal displacement thereof until said mass of combustible material is burned away, an ignition-pellet carried by



the percussion-bolt, a firing-pin adapted to engage the pellet for igniting it, and a spring interposed between the said bolt and sleeve, said spring adapted to prevent the striking and ignition of the pellet by the firing-pin until the projectile on impact causes the percussion-bolt to overcome the spring and to drive the pellet upon the firing-pin.

16. In a safety device for fuses, the combination with a bolt-sleeve, a percussion-bolt carried thereby and a locking device for said bolt to prevent the longitudinal displacement hereof, of a mass of combustible material arranged within the said sleeve and at the front of the said locking device and adapted when burned away to release the locking-pin to permit of the movement of the bolt, and means at the front of said mass of combustible material for igniting it.

17. In a safety device for fuses, a casing, a spring-pressed percussion-bolt carried thereby, a mass of combustible material arranged within the casing at the front of the percussion-bolt, means carried by the casing for igniting said mass and communicating therewith by a fuse-channel, means interposed between the mass of combustible material and the said bolt and engaging the latter to prevent the longitudinal displacement thereof until the said mass is burned away, an ignition-pellet carried by the said bolt, and means carried by the casing for igniting said pellet.

18. In a safety device for fuses, a longitudinally-extending percussion-bolt, a longitudinally-extending locking-pin arranged at the front of said bolt and adapted to engage it and prevent the longitudinal displacement thereof, and a mass of combustible material arranged at the front of the head of said pin and adapted when burned away to release the pin to permit of the displacement of the said bolt.

19. In a safety device for fuses, a percussion-bolt, a locking-pin arranged at the front of said bolt and adapted to engage it to prevent the longitudinal displacement thereof, a mass of combustible material arranged at the

front of said pin and adapted when burned away to permit of the longitudinal movement of said pin and allow of longitudinal displacement of said bolt, means at the front of said mass of combustible material for suitably igniting it, and means for locking the said igniting means to safety position.

20. In combination, a casing, a rotatable bolt-sleeve mounted therein and provided with a partition having a longitudinally-extending opening, said partition dividing said bolt-sleeve into a front and a rear chamber, a socket-piece mounted in the said front chamber, a mass of combustible material carried by the socket-piece and arranged above the opening in the partition of the said sleeve, a priming-bolt carried by the socket-piece and provided with an ignition-pellet for igniting the said mass of combustible material, means carried by the casing to lock said priming-bolt to safety position, a percussion-bolt mounted in the said rear chamber of the sleeve, a locking-pin arranged in the opening of the partition between the said mass of combustible material and said bolt and adapted to prevent the longitudinal displacement of the latter until the mass of combustible material is burned away, an ignition-pellet carried by said bolt, and means carried by the casing for igniting said pellet.

21. In a safety device for fuses, the combination with a longitudinally-extending percussion-bolt, a mass of combustible material and a longitudinally-extending means interposed between the said mass and bolt to prevent the displacement of the bolt until the mass of combustible material is burned away, of an ignition-pellet, means for igniting said pellet, and an adjustable means for locking said ignition means to safety position.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WERNER RUEGG.

Witnesses:

PAUL TSCHIMMANN,  
WILHELM BINDEWALD.