No. 749,534. PATENTED JAN. 12, 1904.

H. DAHLKE.

FUSE FOR PROJECTILES.

APPLICATION FILED MAY 9, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.

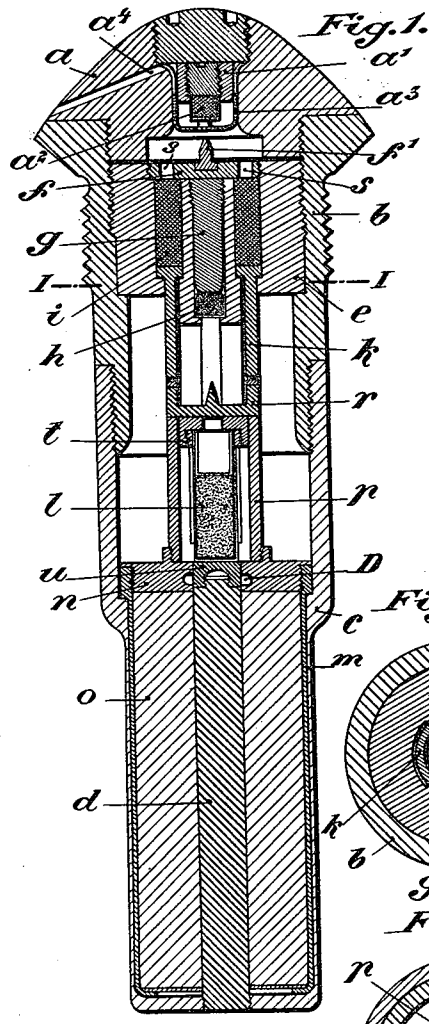


Fig. 2.

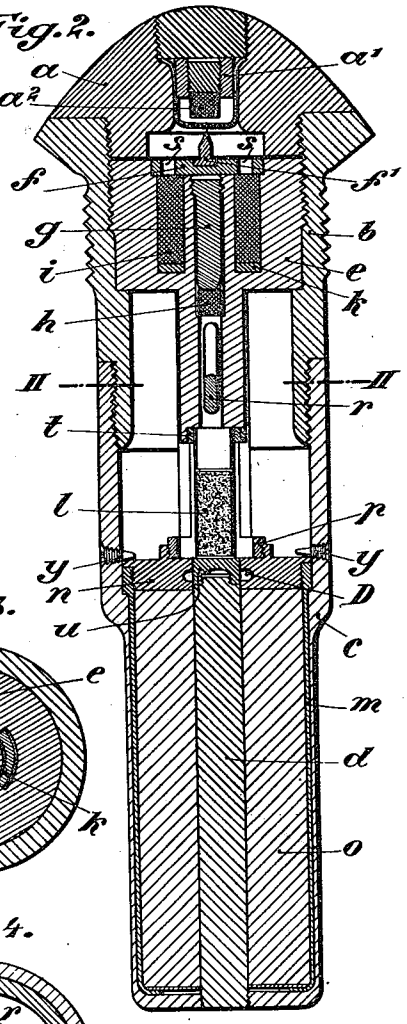


Fig. 3.

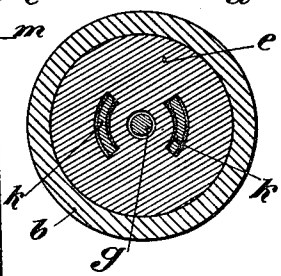
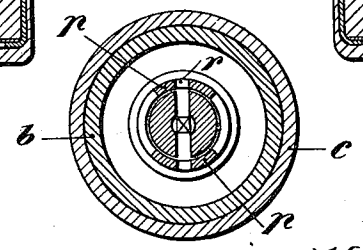


Fig. 4.



Witnesses:

W. B. Keep

N. L. Bogan

Inventor

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By James L. Norris

Atty.

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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 5.

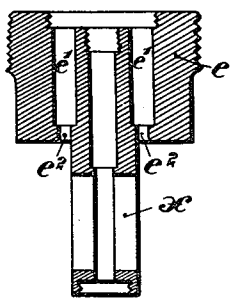


Fig. 6.

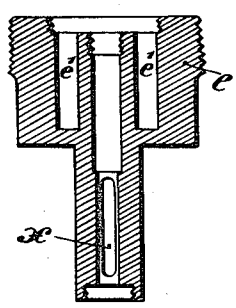


Fig. 7.

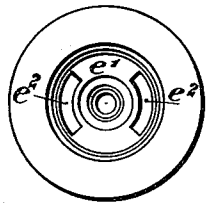


Fig. 8.

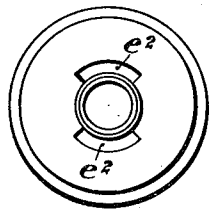
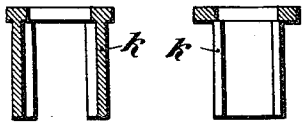


Fig. 13. Fig. 14.

Fig. 9. Fig. 10.



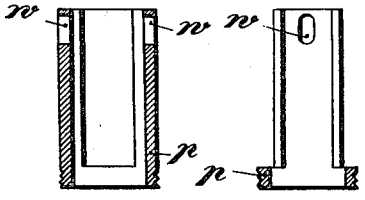
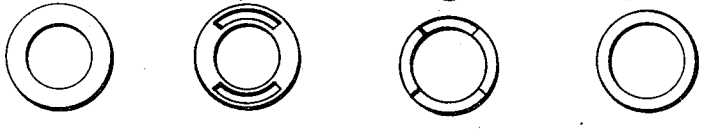


Fig. 11. Fig. 12. Fig. 15. Fig. 16.



Witnesses:

W. D. Keeler

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No. 749,534. PATENTED JAN. 12, 1904.

H. DAHLKE.

FUSE FOR PROJECTILES.

APPLICATION FILED MAY 9, 1903.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 17.

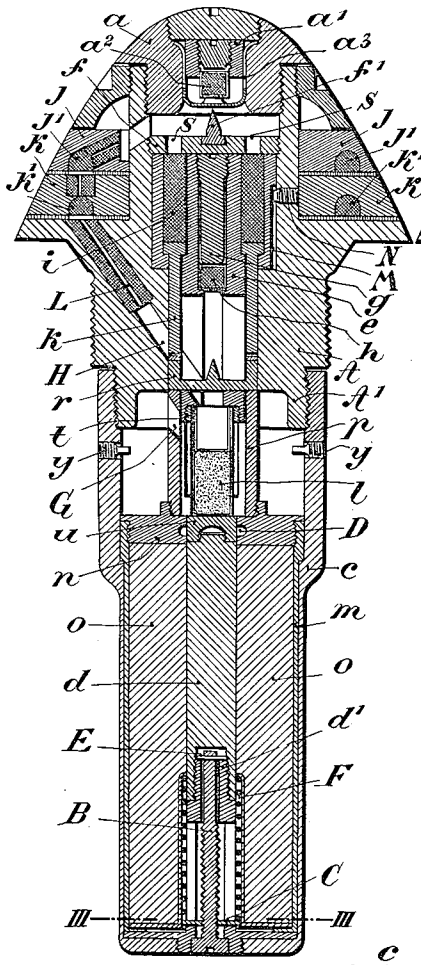


Fig. 18.

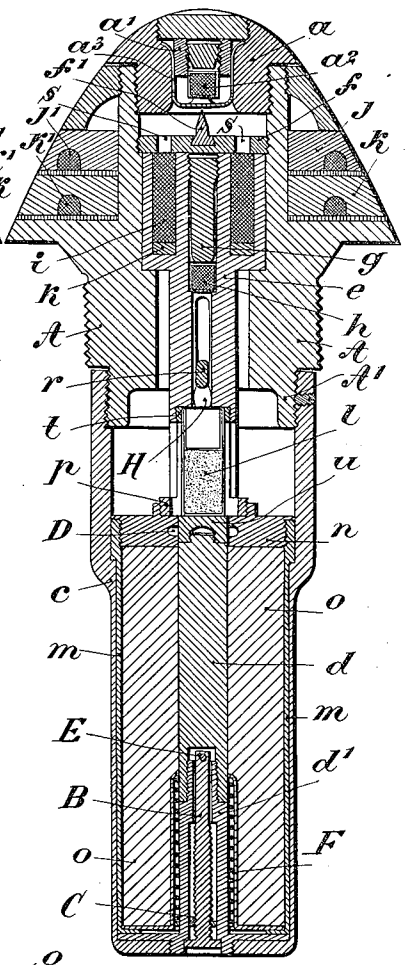
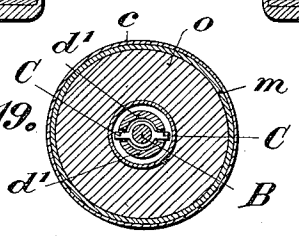


Fig. 19.



Witnesses:
W. B. Kelly
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Inventor
Hermann Dahlke
By James L. Norris
Atty.

No. 749,534. Patented January 12, 1904.

UNITED STATES PATENT OFFICE.

HERMANN DAHLKE, OF SÖMMERDA, GERMANY.

FUSE FOR PROJECTILES.

SPECIFICATION forming part of Letters Patent No. 749,534, dated January 12, 1904.

Application filed May 9, 1903. Serial No. 156,449. (No model.)

To all whom it may concern:

Be it known that I, HERMANN DAHLKE, inspector, a subject of the King of Prussia, Emperor of Germany, residing at Sömmerda, in the Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in or Relating to Fuses for Projectiles and the Like, of which the following is a specification.

The fuse according to my invention differs from percussion and combination fuses hitherto used for shells provided with explosive bursting charges by the fact that the very sensitive explosive primer is fixed, while the body transmitting the action of the primer to the bursting charge of the shell is movable and before the shot is fired is situated under the primer, being separated from it and coming to lie over the primer only after the shot has been fired, owing to its own movement. In this way the very sensitive primer does not make any movement at the moment of the shot being fired, but remains stationary, the danger of premature self-ignition of the primer thus being reduced. As an additional precaution against accidental self-ignition of the primer the latter is closed against the bursting charge ignited by a safety device of such shape that in the case of accidental or premature explosion of the primer it becomes deformed and closes the primer against the bursting-charge igniter in a gas-tight manner.

In the constructions illustrated in the accompanying drawings in case of percussion-fuses the bursting-charge igniter inclosed in a thin metal casing incloses the primer only at the moment of the shell striking any obstacle, owing to the advance of the casing containing the bursting-charge igniter, while in combination-fuses the bursting-charge igniter is brought into the operative position indicated after expiration of a certain time after firing by the action of some elastic medium or some other device, so that the bursting charge can be exploded during the flight of the projectile, as in the case of shrapnel. The device for advancing the bursting-charge igniter before the projectile strikes an obstacle could, of course, be arranged in the same manner in percussion-fuses. In both kinds of fuses the bursting-charge igniter is held in the bursting-charge cartridge in the well-known manner by means of a composition ring placed on the top of a locking-ring until said composition ring has burned down and the projectile traveled a certain distance.

Figures 1 to 16 of the accompanying drawings illustrate a percussion-fuse with safety device according to this invention. Fig. 1 is a longitudinal section through the fuse; Fig. 2, a longitudinal section on a plane taken at a right angle to the former; Fig. 3, a cross-section on line *i i* of Fig. 1; Fig. 4, a similar section on line II II of Fig. 2. Figs. 5 to 16 are detail views. Figs. 17 to 19 show a combination-fuse of the generally well-known construction provided with the device according to this invention. Fig. 17 is a longitudinal section of the fuse; Fig. 18, a longitudinal section at a right angle to the former; Fig. 19, a cross-section on the line III III of Fig. 17.

The mouth *b* of the fuse receives in its screw-threaded portion a screw-plug *a*, carrying the ignition-pin *a'*, detonator-cap a^2, and protective spring a^3, as well as the primer-holder *e*, with needle-plate *f*, plug *g*, detonator-cap *h*, composition ring *i*, locking part *k*, and primer *l*.

The primer-holder *e*, Figs. 5 to 7, is provided with an annular groove *e'*, communicating at the bottom with perforations e^2, forming parts of a circle at two opposite points, Figs. 5, 7, and 8. The locking part *k*, Figs. 9 to 12, is placed in the groove in such a manner that its arms project through the openings e^2 of the primer-holder *e* and its head fits exactly the bottom surface, so that the gases generated by the burning of the composition ring *i* cannot pass downward. It is, however, possible for them to escape into the passage a^4 in the plug *a*.

In the lower central part of the primer-holder *e* is a bearing or recess for the detonating-cap *h*, which is held in position by means of the plug *g*.

The composition ring *i* and the screw-plug *g* are secured against loosening by means of the needle-carrying screw-plate *f*, screwed over them, which plate is provided with four

holes s for the passage of the flames from the detonating-cap a^2 to the composition ring i. The primer-holder e is provided at the bottom with an extension x, Figs. 5 and 6, longitudinally perforated for the passage of the flames from the detonating-cap h and with a slot for the advance of the needle r, the primer l being screwed at t or otherwise fixed in the lower part of said extension.

The bursting-charge-igniter casing c is bored out at the top to a larger diameter than the lower part, the bursting-charge casing m resting with its flange on the offset thus constituted. This casing is screw-threaded inside at the upper end and has screwed into it a disk n, provided with a central perforation for a rod d. Into the disk in question is screwed the locking-sleeve p, Figs. 13 to 16.

The locking-sleeve p incloses the primer-cap l and the lower portion of the extension of the holder e. The needle r passes transversely through oppositely-arranged slots w in the locking-sleeve p, Figs. 13 and 14, and through the slot x of the primer-holder, Figs. 5 and 6.

The safety-rod d is provided at the top with a partially hollow or solid head u, made of some soft material and suitably connected with it. In case of a premature detonation of the primer the gases force the said head into an annular groove D in the bore of the closing-disk n, thus closing it in a gas-tight manner against the bursting-charge igniter o. This closing may be, of course, effected in some other manner—for instance, by turning the head u of the safety-rod d to a pin shape or by making the safety-rod of the same soft material throughout and providing it with a groove inside the closing-disk n. Further, a soft ring or a body of some other shape, of soft material, may be placed in a correspondingly-shaped recess in the closing-disk n, which ring would then be pressed into a groove of the safety-rod.

The safety-rod d may be made of the same diameter as the primer or of a larger diameter. In the latter case the upper surface of the head may be recessed, so as to surround the bottom of the primer.

The working of the fuse is as follows: The spring-held mass a', owing to its momentum, strikes, when the shot is fired, together with the ignition-cap a^2, against the ignition-needle f', thus igniting the ignition-cap. The flames pass through the perforations s in the plate f to the composition ring i, which burns away while the shell leaves the gun and completes a part of its trajectory. The locking-ring k becomes released, and therefore also the parts situated under it and connected with each other—viz., the locking-sleeve p, with the needle r and the bursting-charge igniter o. The parts mentioned are held fast during the remainder of the travel of the projectile only by two breaking-pins y. When the shell strikes an obstacle, the bursting-charge casing, with the locking-sleeve p and the needle r, strikes against and breaks the pins and the locking-ring k is also moved forward. Owing to the advance of the parts mentioned at the end of this movement the primer is completely surrounded by the bursting-charge igniter. At this moment the point of the needle r strikes the detonating-cap h and explodes it. The flames pass into the primer, explode it, and the latter causes the explosion of the bursting charge, completely surrounding it.

In the fuse illustrated in Figs. 17, 18, and 19 the center of the fuse A is formed into a bearing for the primer-holder e and the needle-plate f, the lower part of the fuse terminating in a screw-threaded part A′ of less diameter, on which is screwed the bursting-charge-igniter casing c. The safety-rod in this case, made in two parts d and d', the lower, d', being made preferably of steel and bored to receive a screw-spindle B with a nut C movable on it and provided with two projections, slots for the said projections being formed in the part d. The screw-spindle is provided at the bottom with a head which is cross-cut to allow for a screw-driver to be used, and it engages by means of a cylindrical projection with the screw-threaded pin of the safety-rod d' and is connected over the end surface of the latter with the part d' by means of a cross-pin E.

The bursting-charge igniter o is provided in a central casing in its lower part with a helical spring F, the lower end of which rests on the projections of the nut C, projecting through the longitudinal slots in the safety-rod. When the spindle B is screwed up, its nut, guided by means of its projections in the slots in the rod d, is forced to move upward and compresses the spring F.

The breaking-pins y are arranged in such a manner that the locking-disk n when moved forward together with the bursting-charge-igniter casing comes in contact with them only when the point of the needle r comes right up against the detonating-cap h, but does not penetrate it to effect ignition. In this position the primer l is completely surrounded by the bursting-charge igniter o, the oblique perforation G of the locking-sleeve p, the lateral position of which is fixed by the screw N in the fuse-body A, and the groove M in the primer-holder is brought into communication with the passage H of the fuse-body A, and the fuse is ready for use as a time-fuse.

Assuming that the helical spring F has been set by turning the spindle B, (which should be done only just before putting the fuse into the shell, so as to preserve the spring,) the fuse works as follows: After the composition ring i, as described for the percussion-fuse, has been ignited and burned the parts connected together—viz., the locking-sleeve p with the needle r, locking-disk n, and bursting-charge-

igniter casing *m*—are moved forward by the helical spring F until the locking-disk *n* comes in contact with the breaking-pins *y*, in which position, as already stated, the oblique perforation G of the locking-sleeve *p* communicates with the passage H in the fuse-body A and with the top of the primer *l*. Together with the ignition of the ring *i* the ignition of the composition ring *j''* of the upper part *j* takes place. The ring *j''* transmits the fire after a certain time in the ordinary way to the composition ring K' of the lower part K and thence to the powder-core L in the fuse-body A. The flames finally pass, after having been increased by the powder L, through the passage H to the primer *l*, which explodes and ignites the charge *o*, which explodes the bursting charge of the projectile.

If the fuse is to be used as a percussion-fuse, the lower part K is turned to the ✳ mark, whereby, as is well known, the fire is prevented from passing to the powder-core L and the fuse cannot act as a time-fuse. When the projectile strikes an obstacle, the pins *y* break, and the remainder of the action is the same as already described in the case of the percussion-fuse.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. A fuse comprising a stationary primer, and a bursting-charge igniter normally separated therefrom, said bursting-charge igniter being adapted to move into proximity with and be exploded by said primer.

2. A fuse comprising a stationary primer, a bursting-charge igniter normally separated therefrom, said bursting-charge igniter being adapted to move into proximity with and be exploded by said primer, and means controlled by a premature ignition of said primer for preventing communication between said primer and said bursting-charge igniter.

3. A fuse comprising a stationary primer, means for igniting said primer, and a bursting-charge igniter normally separated from said primer, said bursting-charge igniter being adapted to move into proximity with and be exploded by said primer.

4. A fuse comprising a stationary primer, means for igniting said primer, a bursting-charge igniter normally separated from said primer, said bursting-charge igniter being adapted to move into proximity with and be exploded by said primer, and means controlled by a premature ignition of said primer for preventing communication between said primer and said bursting-charge igniter.

5. A fuse comprising a stationary primer, a movable bursting-charge igniter, and means for retaining said bursting-charge igniter temporarily in position, said bursting-charge igniter when displaced being adapted to move into proximity with and be exploded by said primer.

6. A fuse comprising a stationary primer, a movable bursting-charge igniter, means for retaining said bursting-charge igniter temporarily in position, said bursting-charge igniter when displaced being adapted to move into proximity with and be exploded by said primer, and means controlled by a premature ignition of said primer for preventing communication between said primer and said bursting-charge igniter.

7. A fuse comprising a stationary primer, means for igniting said primer, a movable bursting-charge igniter, and means for retaining said bursting-charge igniter temporarily in position, said bursting-charge igniter when displaced being adapted to move into proximity with and be exploded by said primer.

8. A fuse comprising a stationary primer, means for igniting said primer, a movable bursting-charge igniter, means for retaining said bursting-charge igniter temporarily in position, said bursting-charge igniter when displaced being adapted to move into proximity with and be exploded by said primer, and means controlled by a premature ignition of said primer for preventing communication between said primer and said bursting-charge igniter.

9. A fuse comprising a casing, a stationary primer in said casing, and a bursting-charge igniter in said casing, said bursting-charge igniter being adapted to slide in said casing and lie in proximity to said primer.

10. A fuse comprising a casing, a stationary primer in said casing, means for igniting said primer, and a bursting-charge igniter in said casing, said bursting-charge igniter being adapted to slide in said casing and lie in proximity to said primer.

11. A fuse comprising a casing, a stationary primer in said casing, a bursting-charge igniter in said casing, said bursting-charge igniter being adapted to slide in said casing and lie in proximity to said primer, and means controlled by a premature ignition of said primer for preventing sliding of said bursting-charge igniter in said casing.

12. A fuse comprising a casing, a stationary primer in said casing, means for igniting said primer, a bursting-charge igniter in said casing adapted to slide therein and lie in proximity to said primer, and means controlled by a premature ignition of said primer for preventing sliding of said bursting-charge igniter in said casing.

13. A fuse comprising a casing, a stationary primer in said casing, and a bursting-charge igniter in said casing normally located away from said primer and adapted to slide forward and surround said primer.

14. A fuse comprising a main casing, a stationary primer in said casing, and a sliding

casing in said main casing adapted to contain a bursting-charge igniter, said sliding casing being arranged to slide forward and surround said primer.

15. A fuse comprising a casing, a stationary primer in said casing, a bursting-charge igniter in said casing normally located away from said primer and adapted to slide forward and surround said primer, and means controlled by a premature ignition of said primer for preventing movement of said bursting-charge igniter and for isolating it from said primer.

16. A fuse comprising a main casing, a stationary primer in said casing, a sliding casing in said main casing adapted to contain a bursting-charge igniter, said sliding casing being arranged to slide forward and surround said primer, and means controlled by a premature ignition of said primer for preventing movement of said sliding casing.

17. A fuse comprising a casing, a stationary rod in said casing, a primer on the upper portion of said rod, and a bursting-charge igniter surrounding the lower portion of said rod, adapted to slide forward in said casing and surround said primer.

18. A fuse comprising a casing, a stationary rod in said casing, a primer on the upper portion of said rod, a bursting-charge igniter surrounding the lower portion of said rod, adapted to slide forward and surround said primer, and means controlled by a premature ignition of said primer for preventing movement of said bursting-charge igniter.

19. A fuse comprising a main casing, a stationary rod in said casing, a primer on the upper portion of said rod, and a sliding casing surrounding the lower portion of said rod, adapted to contain a bursting-charge igniter, said sliding casing being arranged to slide forward and surround said primer.

20. A fuse comprising a casing, a stationary primer in said casing, a bursting-charge igniter normally separated from said primer, said bursting-charge igniter being adapted to move into proximity with and be exploded by said primer, and a combustible ring for controlling the movement of said bursting charge with respect to said primer.

21. A fuse comprising a casing, a stationary rod in said casing, a primer on the upper portion of said rod, a bursting-charge igniter surrounding the lower portion of said rod and adapted to slide forward and surround said primer, and a combustible ring for controlling the movement of said bursting-charge igniter with respect to said primer.

22. A fuse comprising a main casing, a stationary rod in said main casing, a primer on the upper portion of said rod, a sliding casing surrounding the lower portion of said rod, adapted to contain a bursting-charge igniter, and a combustible ring in said main casing for controlling the movement of said sliding casing.

23. A fuse comprising a main casing, a stationary rod in said main casing, a primer on the upper portion of said rod, a sliding casing surrounding the lower portion of said rod, adapted to slide forward and surround said primer, a sleeve portion attached to said sliding casing, a combustible ring adjacent to the end of said sleeve portion, and means for igniting said combustible ring.

24. A fuse comprising a main casing, a rod in said main casing, a primer on the upper portion of said rod, a sliding casing in said main casing surrounding the lower portion of said rod, said sliding casing being arranged to slide forward and surround said primer, and a soft mass arranged adjacent to said primer and said sliding casing, said soft mass being adapted to be deformed by a premature ignition of said primer and to prevent the movement of said sliding casing.

25. A fuse comprising a main casing, a stationary rod in said main casing, a primer on the upper portion of said rod, a sliding casing surrounding the lower portion of said rod, adapted to contain a bursting-charge igniter, a sleeve portion attached to said sliding casing and surrounding said primer, a firing-needle carried by said sleeve portion, a detonator-cap for igniting said primer arranged in the path of said firing-needle, a combustible ring adjacent to the end of said sleeve portion, a detonator-cap for igniting said combustible ring, and means for exploding said last-mentioned detonator-cap.

26. A fuse comprising a main casing, a rod in said casing, a primer on the upper end of said rod, a sliding casing, adapted to contain a bursting-charge igniter, surrounding the lower portion of said rod, and means for moving said sliding casing forward until it surrounds said primer.

27. A fuse comprising a main casing, a rod in said main casing, a primer on the upper portion of said rod, a sliding casing surrounding the lower portion of said rod, and a spiral spring for advancing said sliding casing until it surrounds said primer.

28. A fuse comprising a main casing, a rod in said main casing, a primer on the upper portion of said rod, a sliding casing surrounding the lower portion of said rod, a spiral spring for advancing said sliding casing until it surrounds said primer, and means for adjusting the tension of said spiral spring.

29. A fuse comprising a main casing, a rod in said main casing, a primer on the upper portion of said rod, a sliding casing, adapted to contain a bursting-charge igniter, surrounding the lower portion of said rod, a sleeve portion on said sliding casing, a combustible ring adjacent to the end of said sleeve portion, means for igniting said combustible ring, means for advancing said sliding casing as said combustible ring is consumed, a passage in said main casing containing a time-charge, means for

igniting said time-charge, and means for communicating the flame of said time-charge to said primer when said sliding casing has advanced a sufficient distance in said main casing to surround said primer.

30. A fuse comprising a main casing having rings therein adapted to communicate with a time-charge, means for igniting the time-charge, a rod in said main casing, a primer on the upper portion of said rod, a sliding casing surrounding said rod, adapted to contain a bursting-charge igniter, a sleeve portion on said sliding casing, said sleeve portion having an aperture adapted to register with said time-charge when said sliding casing has been advanced, said aperture being adapted to communicate the flame of the time-charge to said primer, a combustible ring adjacent to the end of said sleeve portion, and adjustable means for advancing said sliding casing in said main casing.

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

HERMANN DAHLKE.

Witnesses:
MAX MEYER,
ERNST EBERHARDT.