

F. ALGER  
Shell-Fuse.

No. 36,329.

Patented Sept. 2, 1862.

Fig 1

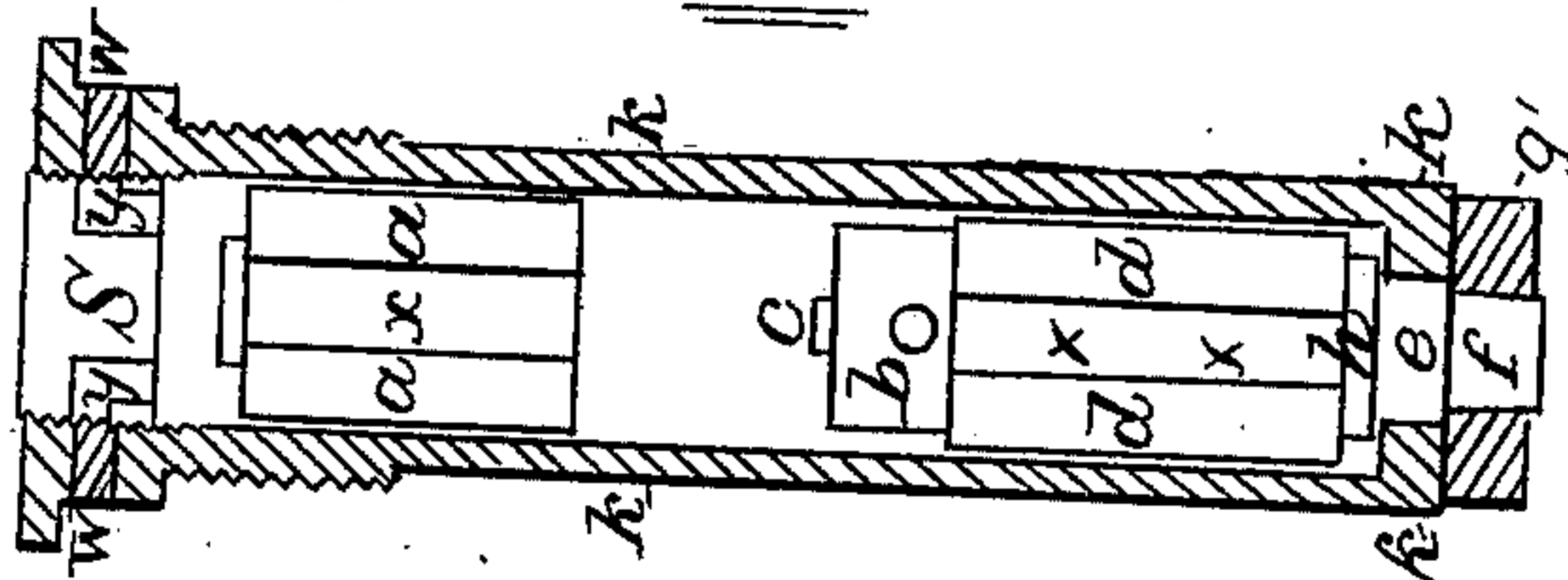


Fig 2

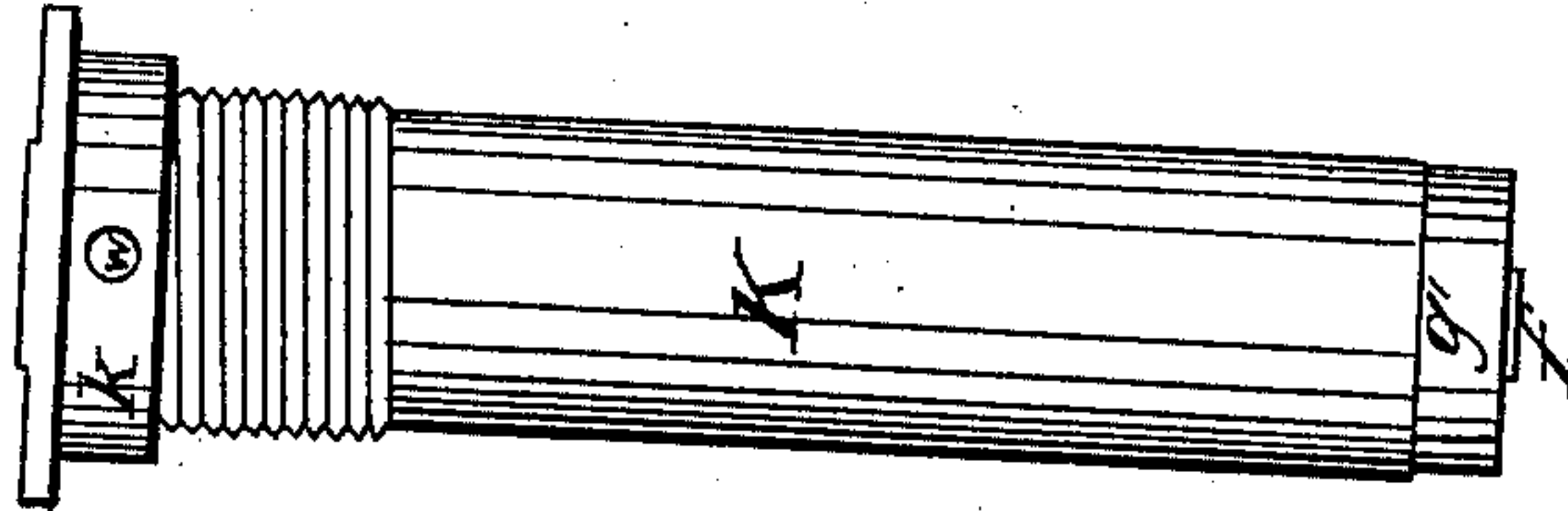


Fig 3

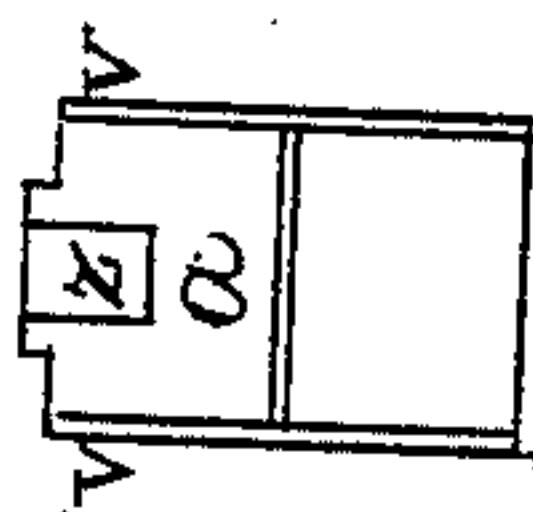
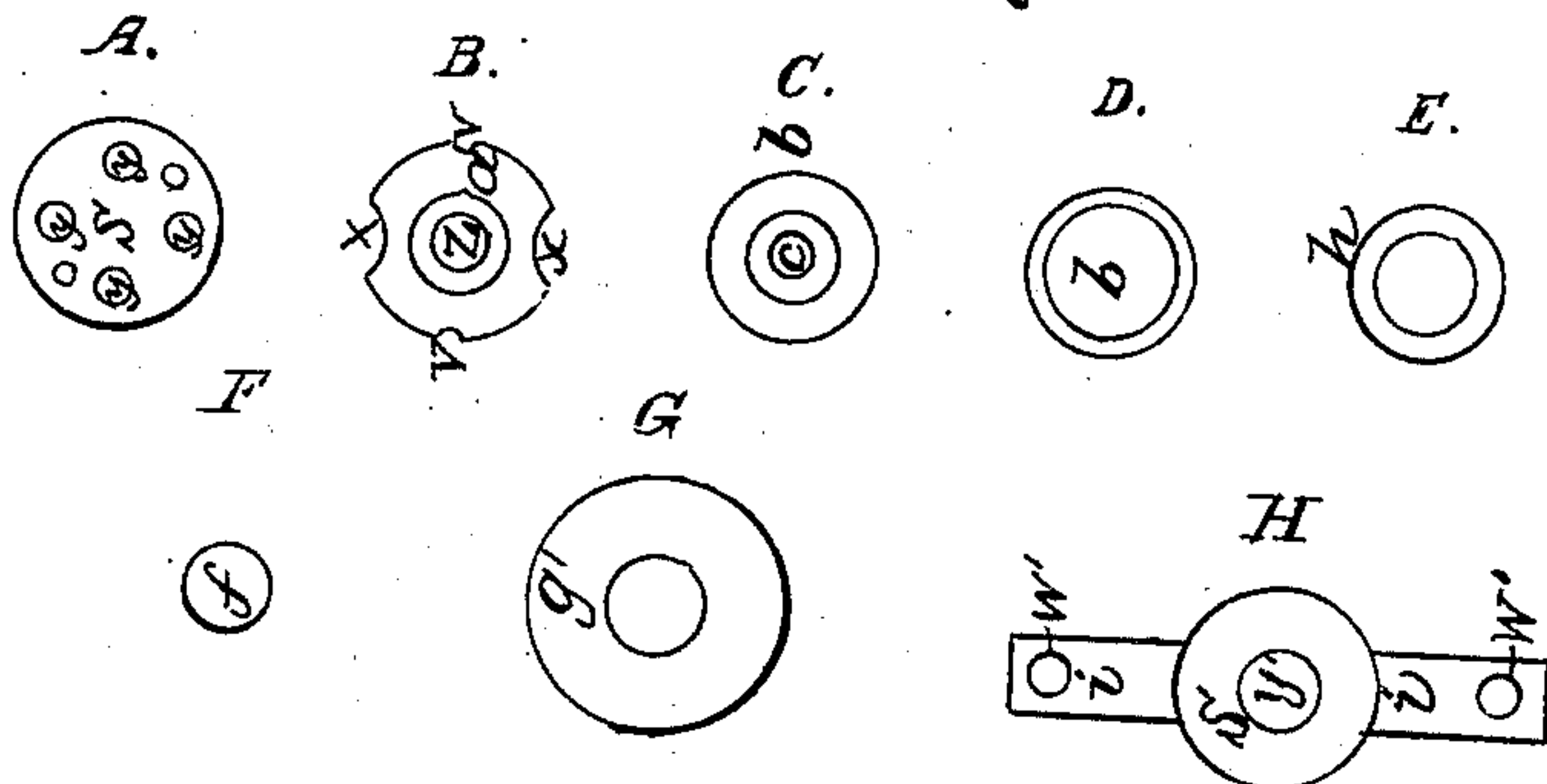
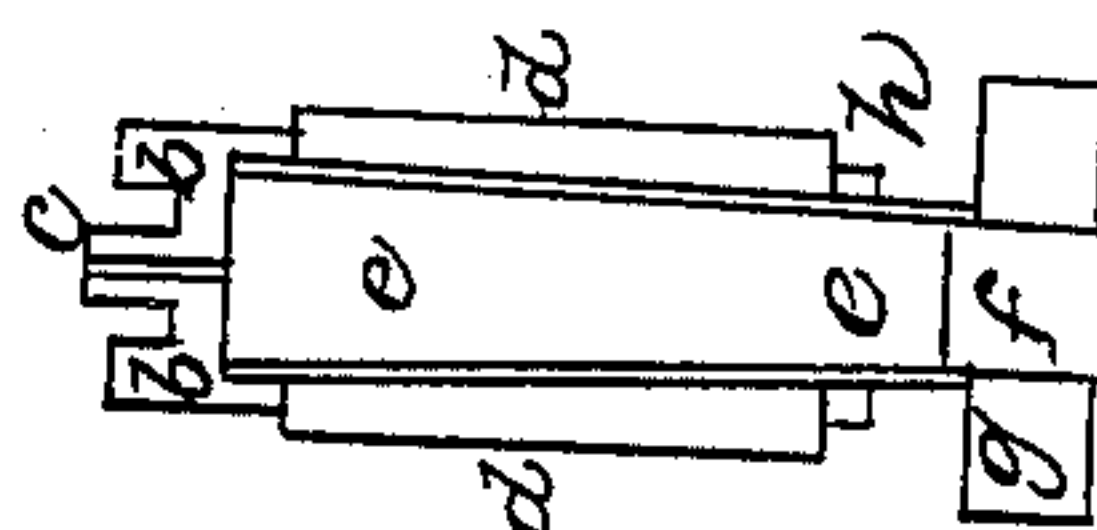


Fig 4



J. E. Maynard  
J. E. Power

Witness

F. Alger

# UNITED STATES PATENT OFFICE.

FRANCIS ALGER, OF BOSTON, MASSACHUSETTS.

## IMPROVEMENT IN FUSES FOR EXPLOSIVE SHELLS.

Specification forming part of Letters Patent No. 36,329, dated September 2, 1862.

*To all whom it may concern:*

Be it known that I, FRANCIS ALGER, of Boston, in the county of Suffolk and Commonwealth of Massachusetts, have invented a new and useful Improvement in Fuses for Shells; and I do hereby declare that the following is a full, true, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal section of the fuse-case *k* and its stopper *s*, showing a side view of the plunger or hammer *a* and time-percussion-fuse and its connections; Fig. 2, a side view of the fuse complete; Fig. 3, a longitudinal section of the plunger or hammer; Fig. 4, a longitudinal section of the time-fuse and its connections; Fig. A, a view of the interior surface of the stopper; Fig. B, a view of the recessed end of the plunger; Figs. C and D, views of the ends of the head *b* of the time-percussion-fuse. Figs. E, F, G, and H represent details, to be hereinafter referred to.

My present invention consists principally in so arranging a time-fuse in a fuse-case that it will be displaced when the shell strikes and allow free ingress into the fuse-case for the powder from the shell, or free egress for the flames from the time-fuse. To accomplish this I surround the time-fuse *e* by some suitable material heavy enough to cause it to fly forward when the shell strikes, thus leaving the lower part of the fuse-case empty. The striking of the shell also throws the powder with which it is charged into the lower end of the fuse-case around the burning time-fuse, and thus explodes the shell; or (perhaps) the flying forward of the time-fuse leaves a free passage through the lower end of the fuse-case, which the time-fuse had before filled up; for the flames from the time-fuse, and so explodes the shell; or these two causes may combine to produce the explosion.

I make my fuse-case with a cylindrical bore through all but a small portion of its length. The bore of this small portion I make conical, just large enough to contain the lower end of the time-fuse, which fits into and closes this end of the fuse-case. I surround this fuse with a covering of any suitable metal, (I prefer lead or one of its alloys,) so as to increase its weight and insure its displacement when the shell strikes. This metallic covering has an elastic

packing-ring, *h*, Figs. 1, 4, and E, (I use rubber,) between it and the shoulder in the interior of the fuse-case, which packing-ring serves to prevent the gases from the burning fuse from finding their way into the interior of the shell.

The time-fuse *e* shown is "Alger's Double Safety Fuse." The lead core *f*, Figs. 1, 2, 4, and F, projects beyond the lower end of the fuse-case, and on it I secure a washer, *g*, Figs. 1, 2, 4, and G, of lead or other suitable metal, both for the purpose of increasing the weight of the core *f*, which insures its being dropped into the interior of the shell when it starts, and also to prevent any accidental movement of the fuse, which might cause the cap *c* on its head *e*, Figs. 1, 4, C, and D, to strike the hammer *a* and be exploded. The purpose of the grooves *x x v v* in the metallic covering *d* and plunger *a*, as also of the apertures *y y* and *w w* in the stopper *s* and rim of the fuse-case, is to provide for the escape of the gases generated by the burning-fuse composition and for connecting the plunger with the stopper, and is not more fully described, because they make no part of my present invention.

The plunger *a* is a short cylinder, of metal, small enough to move freely in the fuse-case. One end is plain and the other is provided with the well-known safety-recess *z*, to receive the cap *c* of the time-fuse.

The operation of this fuse is as follows: The hammer or plunger, having its plane surface presented to the cap *c* of the fuse, as shown in the drawings, is caused by the sudden start of the shell to explode that cap, and thus ignite the fuse-composition. The start of the shell also causes the core *f* and its washer *g* to fall into the interior of the shell, and thus leave the time-fuse free to explode the powder if it burns out before the shell strikes. If the shell strikes before it is exploded by the time-fuse, then the inertia of the fuse and its metallic covering causes it to fly forward and leave the rear end of the fuse-case open, affording free passage to the powder or flame, as described.

Fig. H shows an arrangement of the stopper *s*, which dispenses with holes *w w* in the rim of the fuse-case, and at the same time affords a convenient handle for lifting the shell out of the packing-box and for unscrewing the stopper. This handle, as shown in the figure, consists of a tube, *i i*, secured to the exterior sur-



face of the stopper *s*. The stopper has a bore in its center *y*, leading into this tube, and the tube is provided with apertures *w' w'*, either as shown in the drawings, or its ends may be left open. In either case the passage of the shell through the atmosphere creates a partial vacuum around the mouths of these holes, and thus exhausts the interior of the fuse-case. This cross-piece *i i* may be solid instead of a tube, and still serve the purposes of a handle, in which case the exhaust will be otherwise provided for.

Another important feature of my invention is the manner of igniting the time-fuse. This has heretofore been accomplished, so far as I am aware, when the flame from the cartridge was not relied upon, only by the use of a hammer with a needle on the face nearest the fulminate, the needle puncturing the fulminate, and thus igniting the time-fuse, as in the Armstrong fuse. This method is liable to several objections, the principal of which are, first, the amount of fulminate required, increasing the cost of the fuse, and rendering it necessary to have very considerable quantities of this dangerous compound at the fuse-manufactory; second, the cost of securing the needle on the face of the hammer. To obviate these objections, I dispense with the needle and use a thin layer of fulminate, which is ignited by the blow of a hammer instead of the puncture of a nee-

dle. It is evident that the head *b* and percussion-cap may be dispensed with and a thin layer or wafer of fulminate be placed directly upon the upper part of the time-fuse, and this form of my invention, though not the one I prefer, would probably answer as nearly as well as the more complete form shown; or the wafer may even be placed in a recess in the face of the hammer, made for that purpose. None of these methods are shown, because it is believed that the one represented is preferable.

I do not claim the combination of a time and concussion fuse in one fuse-stock, as that, I am aware, is old; but

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. The construction and arrangement of a sliding time-fuse within a fuse-case, so that the shell will be exploded by striking, substantially in the manner described.
2. The elastic packing-ring *h*, applied and operating substantially as described.
3. The washer *g*, applied and operating substantially as described.
4. The arrangement of a hammer, fulminate, and time-fuse substantially in the manner and for the purposes specified.

F. ALGER.

Witnesses:

J. E. MAYNADIER.

F. E. POWERS.