

Sheet 1-2 Sheets.

C. Arick.

Shell Fuse.

N<sup>o</sup> 44588.

Patented Oct. 11, 1864

Fig. 1.

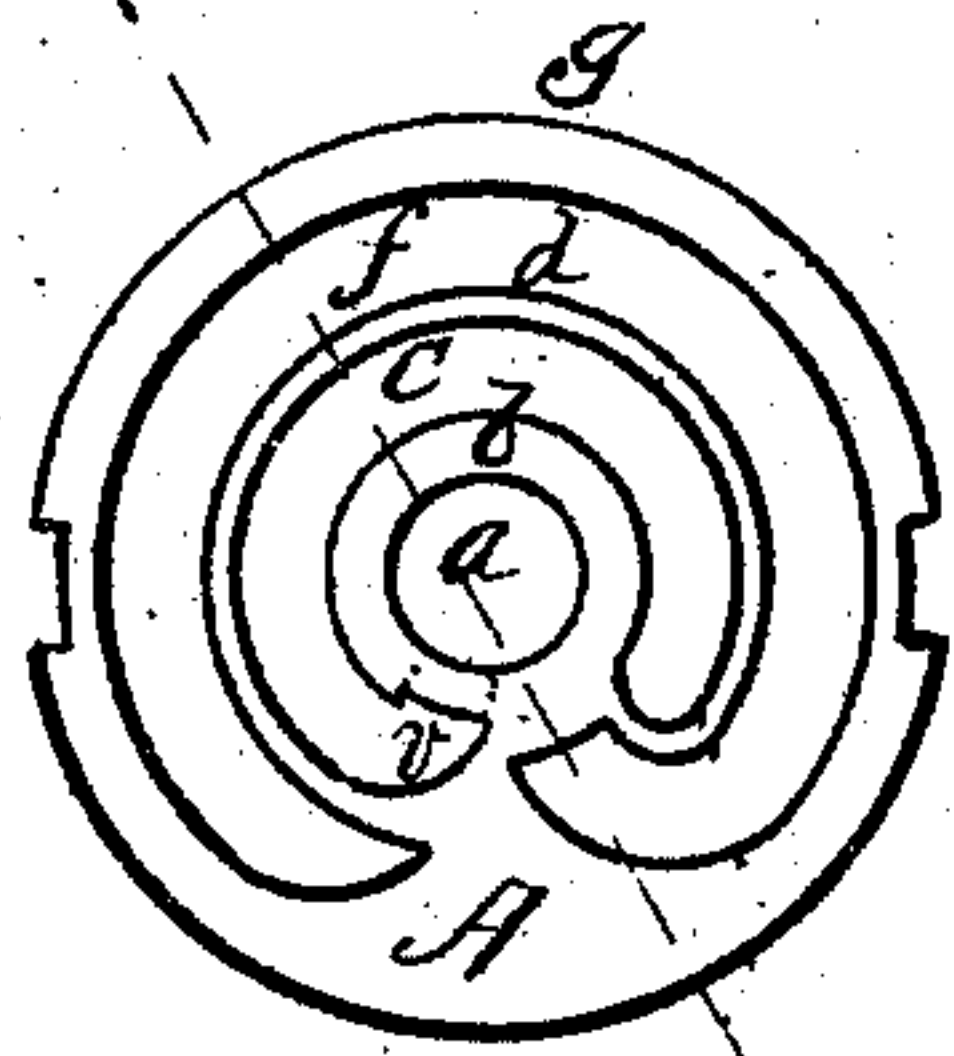


Fig. 3.

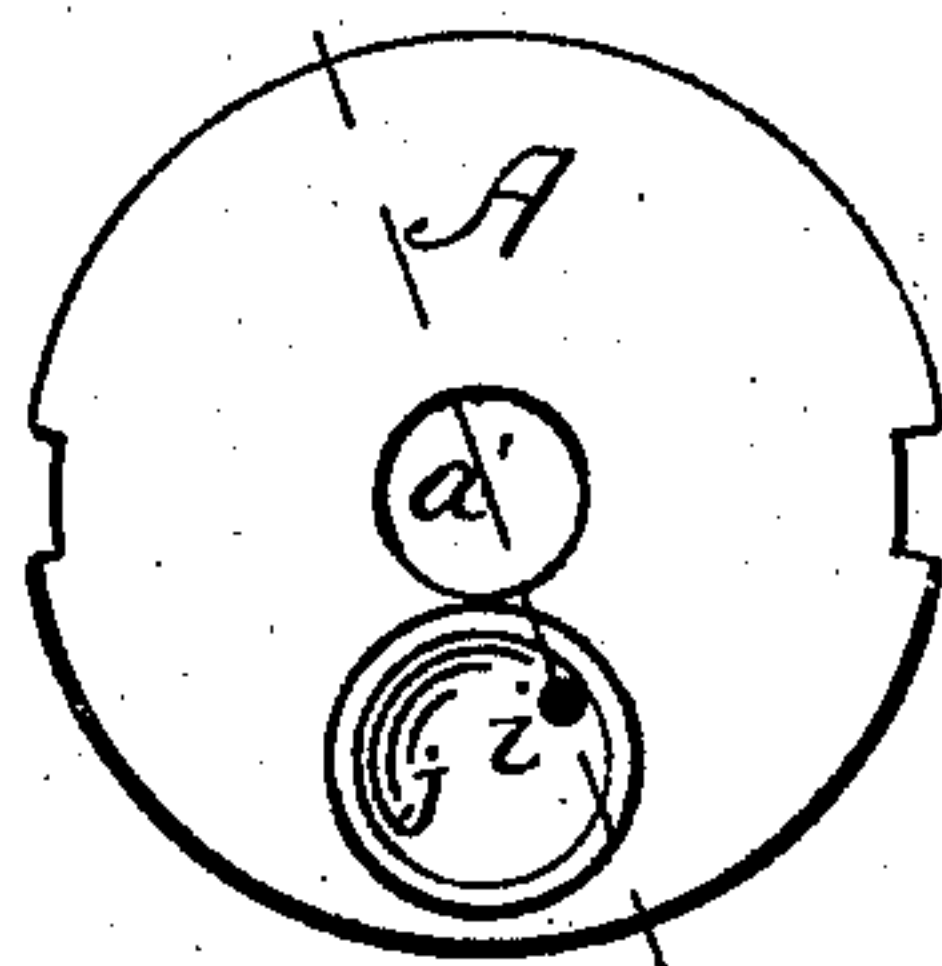


Fig. 2.

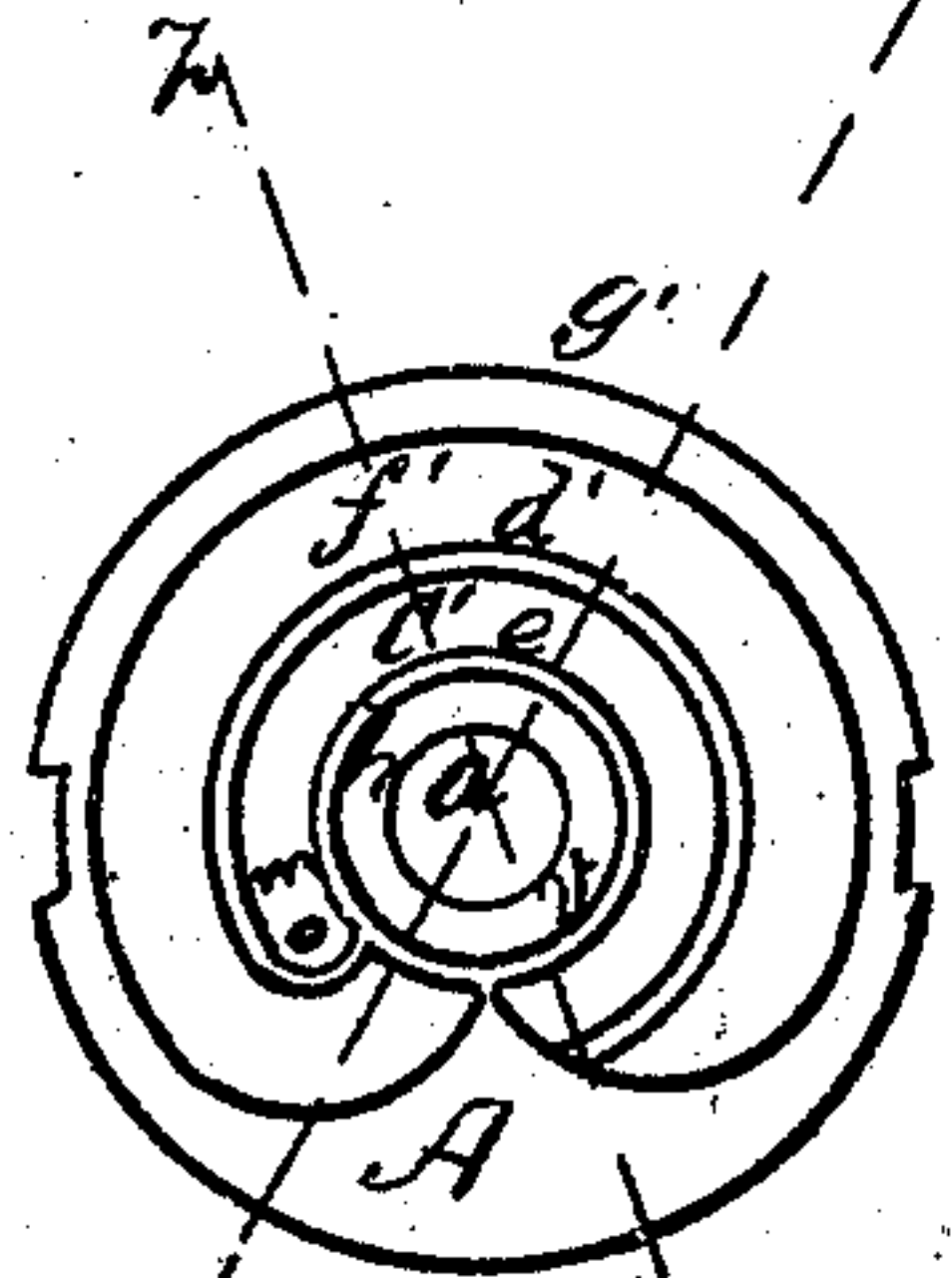


Fig. 4.

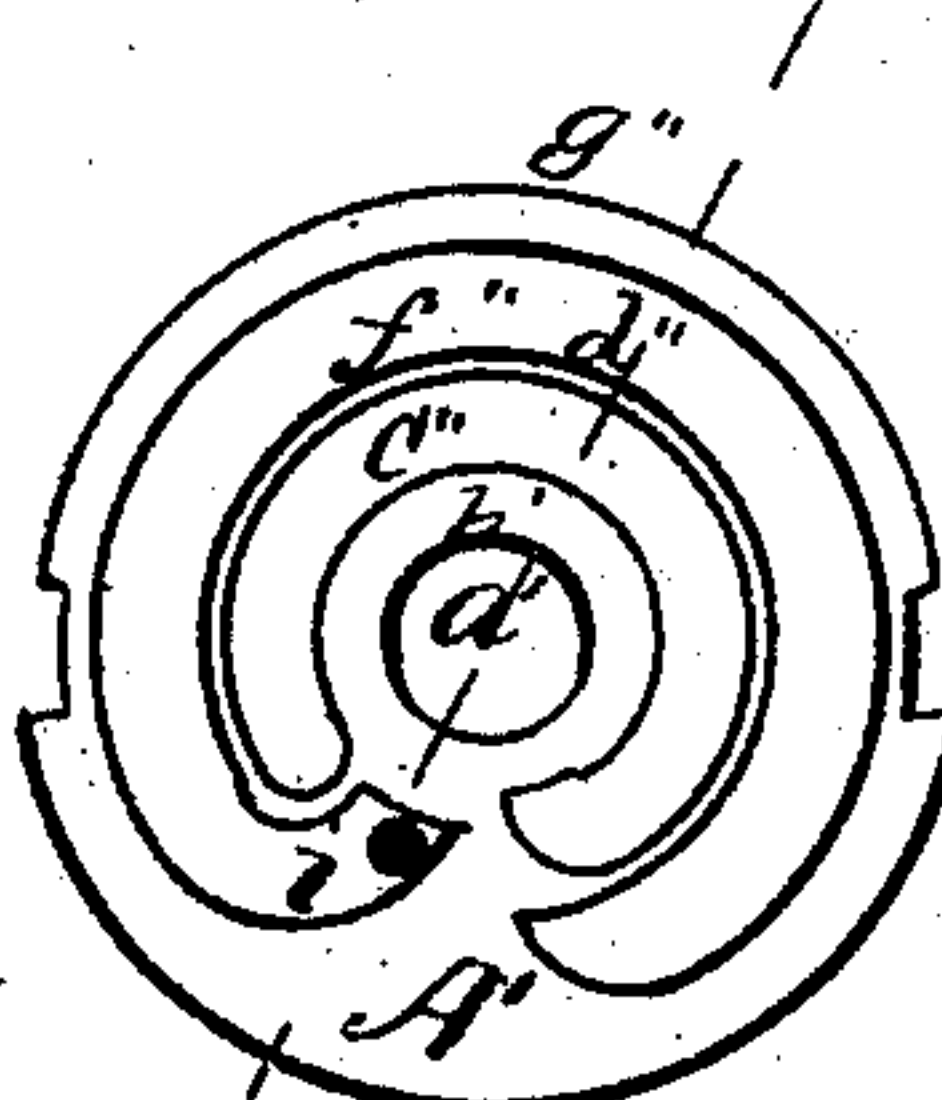


Fig. 5.

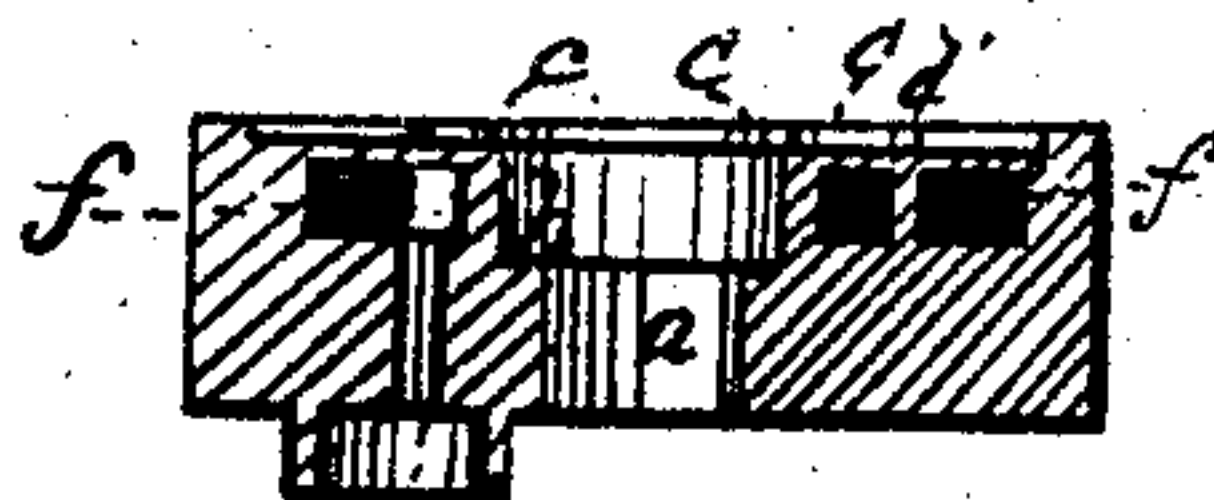


Fig. 6.

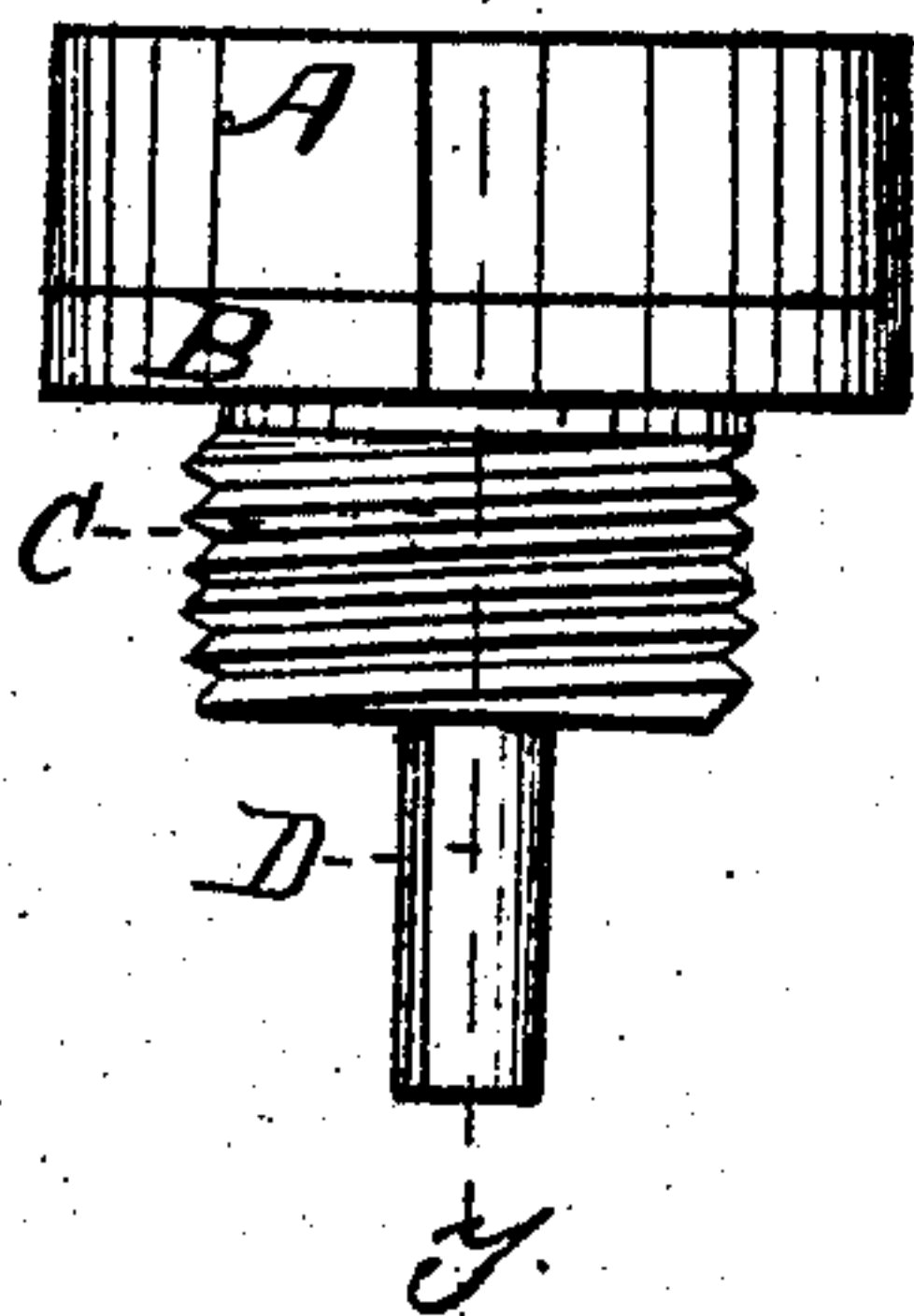
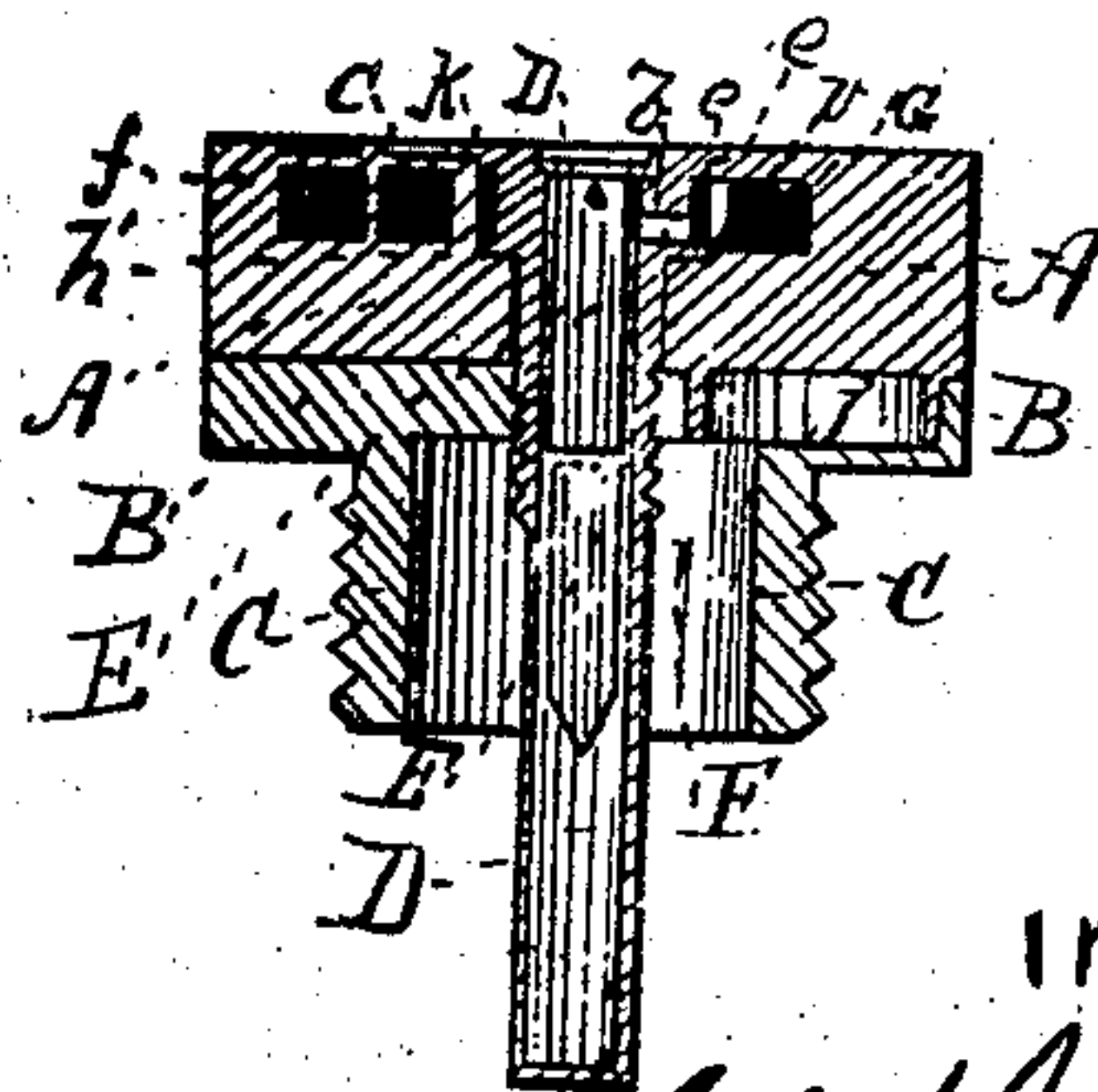


Fig. 7.



Witnesses

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C. Haylett

Inventor

Clifford Arick

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# Shell Fuse.

N<sup>o</sup> 44588.

*Patented Oct. 11. 1864.*

Fig. 9.

Fig. 11.

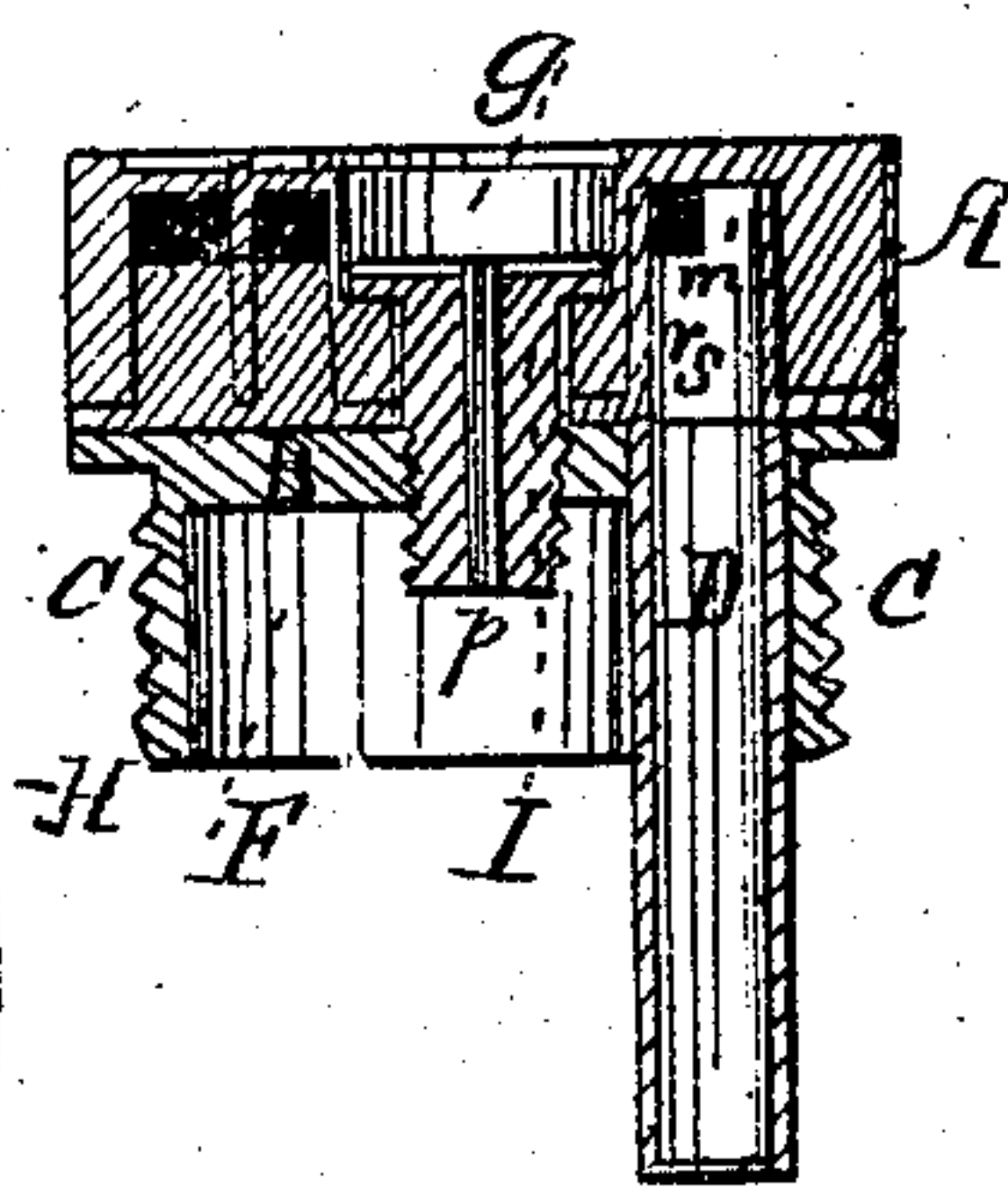
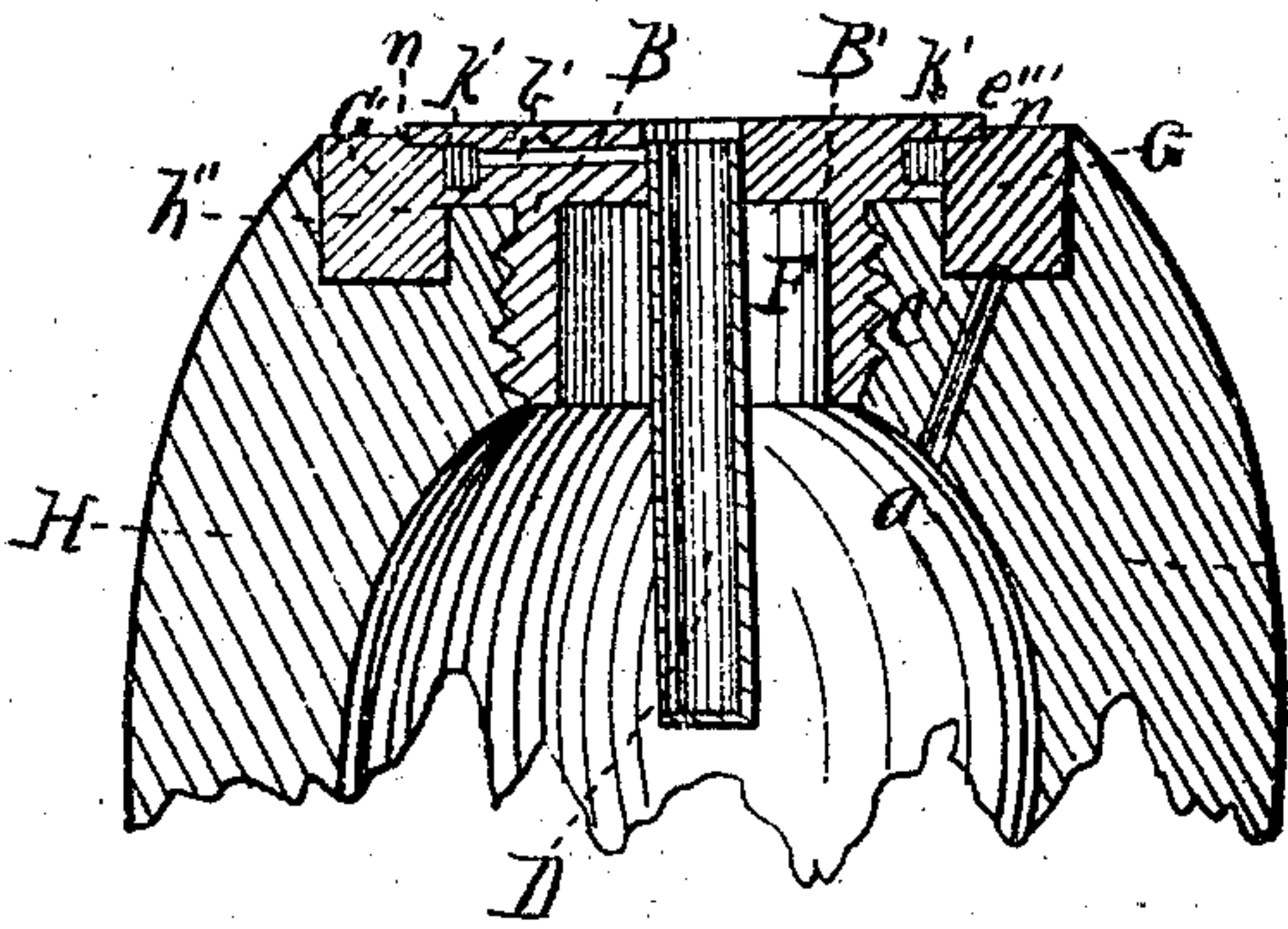


Fig. 8. *y*

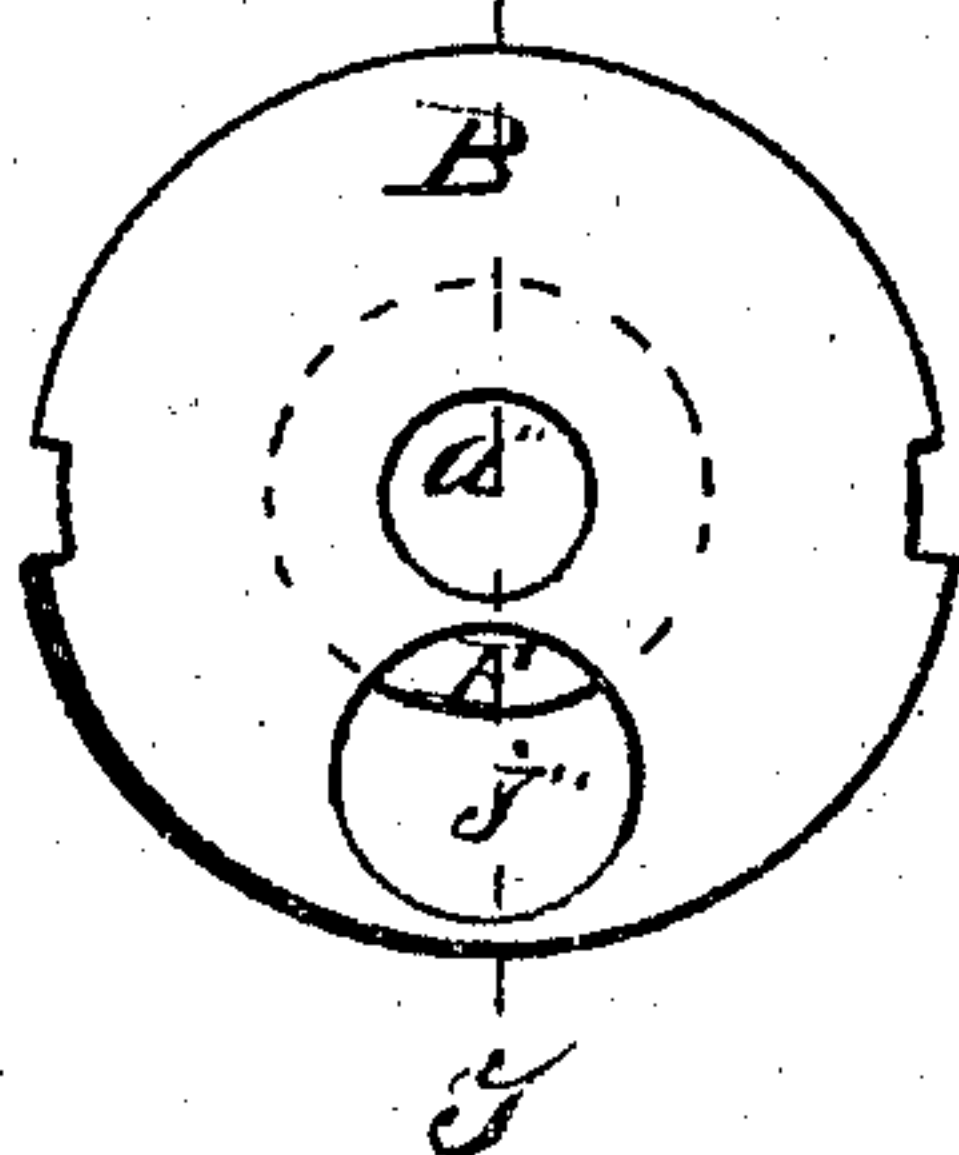


Fig. 10.  $n$

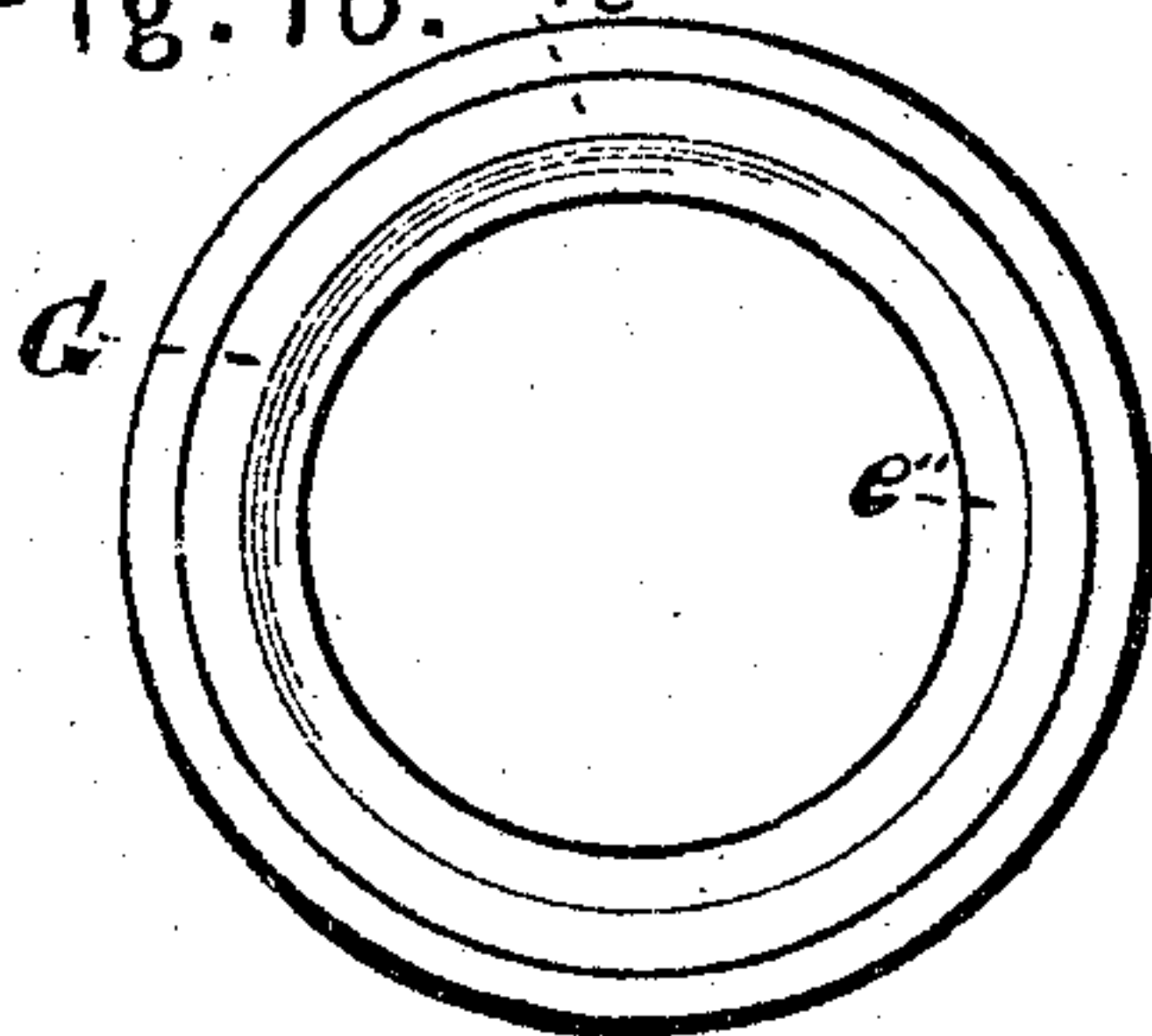


Fig. 12.

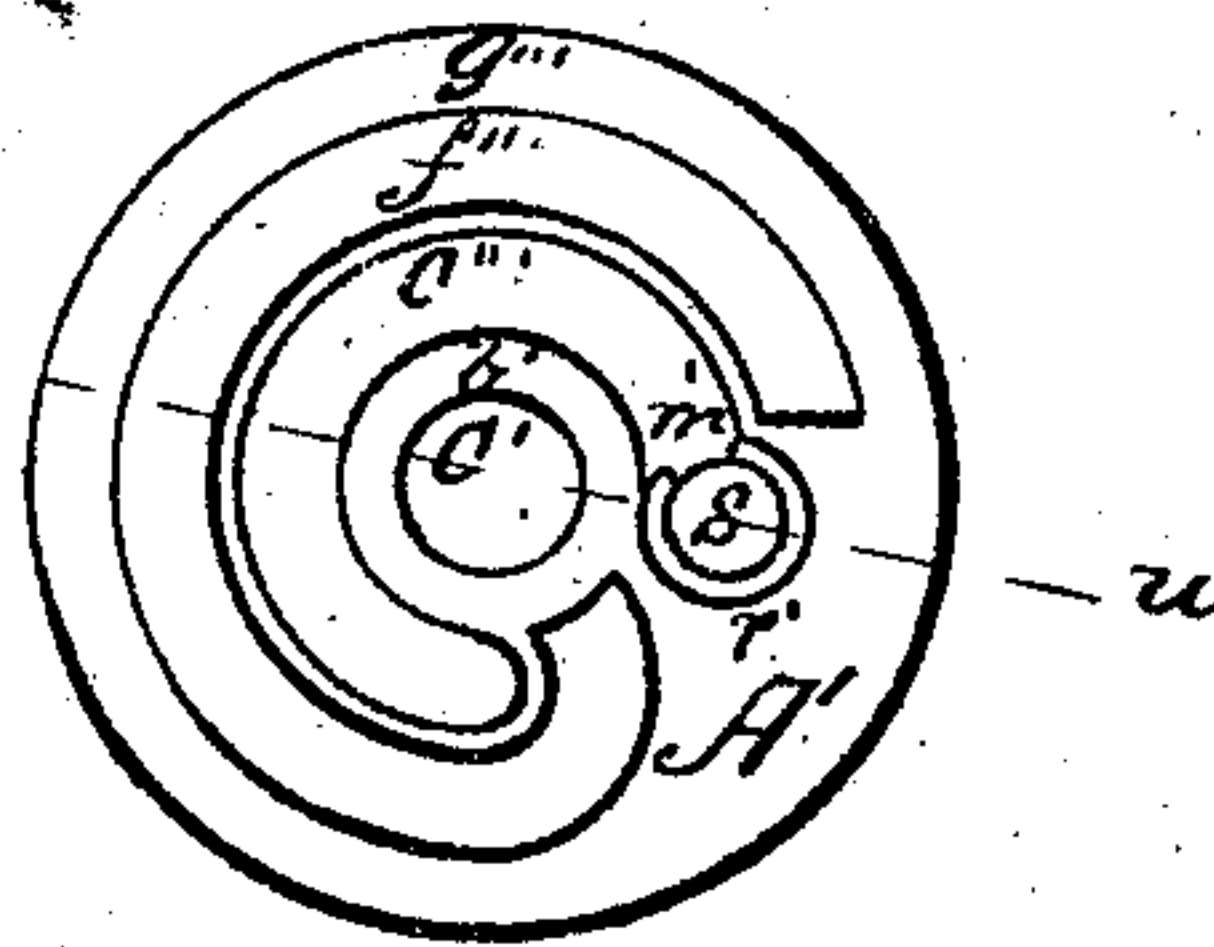
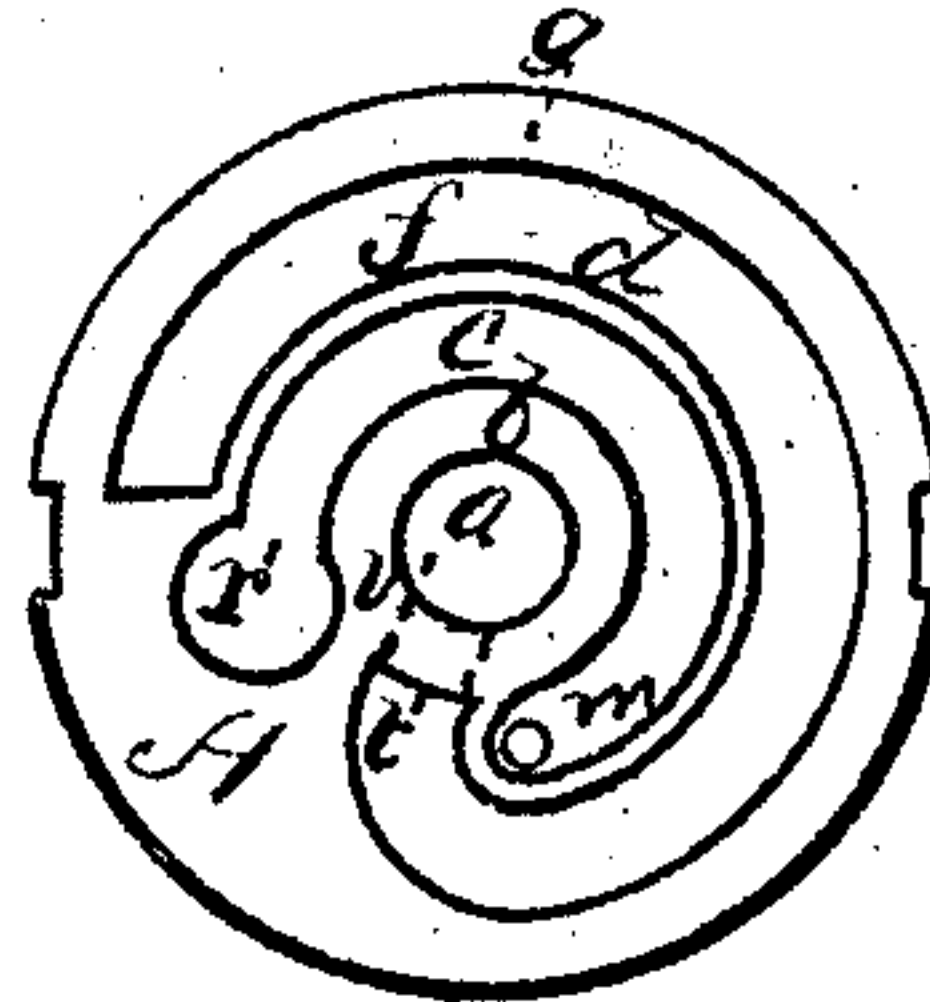


Fig. 14.



Fig. 13.



Witnesses

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# UNITED STATES PATENT OFFICE.

CLIFFORD ARICK, OF ST. CLAIRSVILLE, OHIO.

## IMPROVEMENT IN FUSES FOR EXPLOSIVE SHELLS.

Specification forming part of Letters Patent No. 44,588, dated October 11, 1864.

*To all whom it may concern:*

Be it known that I, CLIFFORD ARICK, of St. Clairsville, in the county of Belmont, in the State of Ohio, have invented a new and Improved Mode of Igniting the Bursting-Charge in Ordnance-Shells; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention relates to that class of improvements in the indicated art having for their object the ignition of the bursting-charge in ordnance-shells at any moment of their flight, or at the moment of impact, as the gunner may on the instant determine, together with a means of primary ignition by or independently of the windage-flame.

The invention in the present case relates more particularly to certain improvements in the construction and operation of the "Crescent Fuse" secured to me by Letters Patent of the United States bearing date September 6, 1864.

It consists, first, in exhibiting the means whereby my said invention may be operated as a detached time-fuse alone.

It further consists in adapting the "central hollow screw-pin" secured to me in said patent to the additional function of becoming the carrier of a friction-primer.

It further consists in so modifying the external formation of the head of this central screw-pin as to enable me to form an independent concentric fire-chamber, analogous to the one referred to in my said patent, by the combination thereof with the inner wall of a soft-metal fuse-case or annular fuse, substantially as hereinafter more particularly described.

It further consists in the construction of a packing-disk for a soft-metal fuse-case having an annular or crescent-shaped cover or covers corresponding to the annular grooves therein projecting from and attached to such disk on one side of it, as shown in my former invention, and a magazine for the fuse on the other side, arranged so as to communicate with the fuse by a vent connecting its bottom therewith through the disk and the zero end of the annular cover confining it, substantially as hereinafter more particularly set forth.

It further consists in the combination of this magazine with the head of a concussion or per-

cussion fuse-case, so that the same shall, when exploded, ignite the fulminate or other explosive substance confined therein and thereby, or by its own explosive force, make its way to the bursting-charge in the projectile and instantly ignite the same.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

Figure 1 of the drawings is a plan view of the inside and bottom of a soft-metal fuse-case, A, wherein *f* is the annular groove for the reception of the fuse. This groove is closed at both ends, and differs only in this respect from the annular groove shown in my former invention. *c* is the crescent-shaped fire-chamber of my former invention, provided with a vent, *v*, communicating it with the central aperture, *a*, as shown. *d* is the intervening continuous wall between these chambers *f* and *c*. *b* is its central wall, and *g* is the outer wall of the case.

Fig. 2 is a plan view of the top of the case A, and is substantially the same as the top view of the crescent-fuse case, exhibiting below the countersink *h* the vent *v* to the fire-chamber *c*, instead of a similar vent to the fuse-chamber *f*, as therein set forth. With these indicated modifications this fuse-case is cast from the same mold as the one presented in my said former invention.

Fig. 3 is a plan view of the under side of my soft-metal packing-disk A', wherein *j* is a magazine raised upon its surface at the east, and *i* is a vent communicating its bottom with the other side of the disk.

Fig. 4 is a plan view of the other side of the disk A', showing the vent *i* as it communicates with the bottom of the magazine *j*, and the outer edge of the annular covers *f''* at its zero end, as shown, so modified as to adapt these annular covers *f''* and *c''* to the annular grooves *f* and *c*, as herein set forth. This disk A' is in every other respect the same on this side of it, as shown in my former invention.

This fuse-case and packing-disk are cast from metal molds with all their parts precisely as represented, and are charged and packed in the manner following: There is provided, first, an annular box with a carved bottom, the type of the case A, as shown in Fig. 2. The walls of the annular box are of the same diameter as the fuse-case and of the same depth, including the edge of the disk A', so



that when the two are driven together their united thickness is the same as the depth of the box. One hemisphere of the surrounding wall to this box is securely fastened to its carved bottom, while the other, being hinged thereto, opens and closes readily, so as to facilitate the introduction of the fuse-case A therein, and is provided with a clip or other suitable device to hold the hemisphere securely together under a heavy pressure. This box contains a central form well secured to its carved bottom, the same in every respect as the form in the mold whereon was cast the central wall, *b*, with its aperture *a*, flanges and countersinks *e* and *h*, &c. The annular groove *f*, being charged with the fuse composition, is introduced into this box upon this central form, and the hinged hemisphere of the box is closed upon it and fastened in the manner indicated. An annular plate of hard metal of the diameter of the disk *A'* is then provided, having a central projection on one side of it, coinciding with the diameter and depth of the central aperture, *a'*. Around a proper center, and toward its periphery on the same side of this central projection, is carved into this annular plate an annular groove, into which the wall of the magazine *j* will nicely fit. On the inside of this groove a pin, coinciding with the vent *i* in form and depth, is secured, constituting this annular plate the counterpart of the form whereon the magazine side of the disk *A'* was cut. The disk *A'* is now placed in its position on this annular plate, and its covers are then adjusted, so as to coincide with the grooves *f* and *c* of the charged fuse-case A, already in the packing-box, as represented. The box being then placed on the platform of a strong screw-press, by a steady and uniform pressure the covers of the disk are forced into the chambers of the fuse-case until its flange *g'* is in close contact with the rim *g*, or until the annular packing-plate rests on the top of the packing-box, when it will be found that the fuse composition has been properly packed and seated, and the pin-chamber *c* hermetically closed at all points, except at the vent *v*, the chamber being intact and about one-eighth of an inch square, as shown in Fig. 5, a vertical section of a fuse-case formed and charged in this manner, taken in the lines *x x* of Figs. 1, 2, 3, and 4. The fuse thus packed is readily removed from the packing-plate and packing-box, and its vent and magazine being charged and properly sealed, is ready to be introduced into the combination hereinafter set forth. After a sufficient trial, (a particular composition and a known pressure having been used,) the annular groove *f* may be indexed at the cast in the usual manner, subdividing the time which the fuse is found to be in burning into seconds and parts of seconds and indicating it as in other cases on the index-plate outside.

As in my former patent, I propose to combine with this form of time-fuse the Tice concussion-fuse, with an independent igniter, so

that the fuse may be ignited by or independently of the windage-flame at the same cut, as will hereinafter be more particularly described.

As I have shown in my said former application the Tice arrangement complete, and as it is more fully described in the Letters Patent dated June 23, 1863, issued to said Tice, than I need set forth herein, I will describe only such necessary parts as have been modified so as to adapt them to the present combination, exhibiting more readily at the same time the manner of detaching the concussion or percussion fuse, and leaving intact a time-fuse, fuse-plug, and independent means of ignition.

Fig. 6 is an elevation of the present combination complete, such modifications thereof as I wish herein to suggest being represented in Figs. 9, 10, 11, 12, and 13. Fig. 7 is a vertical section of Fig. 6, and Fig. 8 is a plan view of the part B, with the part A, Fig. 7, removed. The parts B, C, and D are the parts of the Tice fuse-case herein represented, B being the head of the case, (somewhat enlarged in diameter,) C, the screw-thread for securing the shell, (the same as heretofore,) and D the central pin, (also somewhat enlarged in diameter,) used as a carrier for the other devices therein, and for expelling the fulminate from the sliding tube as the fuse is being unlocked. These parts are distinctly shown in vertical section, Fig. 7, wherein the center pin, D, constructed substantially as in my said former invention, is so modified as to adapt the aperture therein to a "Laidly igniter"—a friction-primer well known among ordnance men, the reputed invention of Maj. Laidly, of the United States army, an elevation of which is shown secured in its place, Fig. 7, wherein E is the priming-tube, having a flanged head, and E' is the weight for actuating the wire rubber therein.

A well-known device, which has been designated the "rebel fuse-igniter," is equally applicable. A representation of this device is seen in Fig. 14, wherein the wire rubber is secured to the flanged head, as shown. The weight of the friction-tube with its charge is so adjusted as to cause the latter to be ignited by the effect of their combined inertia at the discharge. This form of primer has some advantage over the Laidly, the length of tube wherein it is to act being less.

The further modifications of the pin D are only such as are necessary to communicate the flame of the igniter through the medium of the fire-chamber *c* to the fuse. To this end the upper section of the pin D at *e'* is given the same diameter as the countersink *c*. The second section of it is given the diameter and depth of the countersink *h*, the third of the aperture *a*, and this section is given sufficient length to pass through the aperture *a* in the case A, *a'* in the disk *A'*, and the part B of the Tice fuse-case, and is provided with a screw-thread for the latter, as shown. The remaining and lower section of the pin D is



given sufficient substance as to admit of the aperture for the igniter to be used, and is closed at the lower end. An annular groove, *k*, is cut into the second section of the pin D, leaving the flange *e'* above and the flange *h'* below, and a cross-vent, *l*, is made, uniting the central aperture of the pin D and the annular groove *k*.

When the primer is inserted in its place, its vent is made to coincide with the vent *l*, so that when it is discharged its flame is thrown first into the groove *k*, until, finding the vent *v*, it passes into and pervades the chamber *c*, and from thence escapes at the cut, igniting the fuse, or, in case the fuse is not cut, opens and makes its exit at the closed vent *m*, Fig. 2, as represented in my former invention. By this arrangement a concentric annular fire-chamber, *k*, is formed within the radius of the fuse by the combination of the flanged head of this screw-pin and the inner wall of the soft-metal fuse-case A, forming, in conjunction with my present fire-chamber *c*, a second one, wherein a flame may be generated and kept alive for a short space of time without interfering with its free circulation and exit through the other.

In Fig. 8 is shown the countersink *j'*, for the reception of the magazine *j*. The aperture F in the Tice fuse-case is continued into the part B, so that when the countersunk chamber *j'* for the magazine is of sufficient depth it will be through on the inside and not through without, as shown in Figs. 7 and 8, so that, while it furnishes a confined and secure receptacle for the magazine *j*, about one-third of its bottom will have a free passage-way into the Tice fuse-case, and, upon its explosion, will reach the fulminate and magazine situate therein, and thereby communicate with and ignite the charge in the projectile. When the annular chamber *f* is duly charged and sealed, and the vent *i* and magazine *j* are charged, the magazine may be closed with a disk of thick pasteboard. It is then placed in its position on the part B, and securely held by the screw-pin D, the magazine itself preventing any independent axial motion thereafter. The fuse is then introduced into the shell and securely fixed therein by the thread on the part *c*, a sufficient countersink being made in the shell to admit the time-combination within its wall flush with the outside.

Figs. 11, 12, and 13 present a modification of my invention, with the carrier for the primer in the position (about) of the magazine *j*, and the magazine is at the center, as shown in my former invention, while Fig. 9 represents the flanged head of my central carrier for a primer, in combination with the form of annular time-fuse, known as "Wright's annular fuse," of which Fig. 10 is a plan view, Fig. 9 showing the manner of inserting the same in the shell, and of combining the annular groove *k* so as to produce an annular chamber, substantially as before described.

It is evident that in the use of the form of

soft-metal fuse-case and fuse-plug, as shown in Fig. 9, the inner section of the metal of the shell surrounding the fuse-hole may or may not be left in its place, as the flanged head of the plug or fuse-case combined therewith will be sufficient to secure the soft-metal case in position without any other appliance. It is equally evident that the pin D may be given such dimensions as to constitute it (the fuse-plug or fuse-case) combinable with the soft-metal fuse-case represented in Fig. 7, the soft-metal case being increased in diameter accordingly, its magazine having a suitable sub-countersink and vent to receive it and communicate its flame to the bursting-charge. It is also evident that a cross-vent may be constructed communicating the zero end of the annular fuse to a magazine in the head of the tubular plug or other fuse-case, and communication to the bursting-charge be thereby secured. It will be seen, also, that in any of these combinations the soft-metal fuse-case, with its fuse and fire-chambers, will be held in its place in the projectile by the combined action of the screw-thread on the plug or other fuse case, and its flanged head in like manner as it is now held in its place, as shown in Figs. 7 and 9.

I do not confine myself to the means herein shown of generating a flame for the ignition of a time fuse at the moment it is discharged from a gun, nor do I confine myself to the volume of flame so produced, as it is evident that other means may be used—such as a blow, perforation by a point, or the like—and that the flame thus produced may be fed by the introduction of any combustible material within these confined fire-chambers, and its volume and intensity be increased to any desired extent. Nor do I confine myself to the use of the Tice concussion-fuse in this combination, as almost every concussion and percussion fuse-case known may be readily used. Nor do I confine myself to the method of introducing the primer from the outside of the center-pin, as it is evident that it may be put up with the fuse before it is sent into the service, either by constructing the center pin in two parts, or as shown in Figs. 11, 12, and 13. Nor can any well-founded objection be made to such an arrangement, as the weight attached to the primer can be so regulated as to guarantee its efficiency under the force of the discharge, and yet be unavailable, to actuate the wire rubber under any accidental blow. Besides, its premature discharge under extraordinary force would not ignite the fuse or do other possible damage further than to destroy itself.

The operation of my invention is that at the discharge a flame is generated by means of a weight acting on a wire rubber or other analogous means, which is diffused by means of the chambers and vents described to the point where the fuse is cut, and escaping there ignites the fuse, or, if the fuse be not cut, makes its exit at a permanent vent without endangering in any manner the fuse, so that when in combination the explosion of the projectile



may be secured, either at the impact or at any moment of its flight, as the gunner may on the instant before placing it in the gun elect; and it may be operated as either a combined concussion and time, or as an independent time-fuse alone, ignitable by the windage-flame, as well as in any other form of the Bormann fuse, or by independent means, as shown, or by both.

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

1. The formation of an annular fire-chamber within the radius of a Bormann or curved fuse by combining a grooved head to its screw-pin, or by combining the grooved head of a screw-plug with the inner wall of its soft-metal case, substantially as described.

2. A packing-disk for an annular fuse, having on one side of it the necessary wedge or

wedges for packing it, and on the other a magazine, as described.

3. The combination of an annular fire-chamber situated within the radius of a Bormann fuse with an independent primer, so that the flame generated by the primer is instantly injected into such fire-chamber, from whence, escaping at the cut, it will ignite the fuse, substantially as described.

4. So combining with a soft-metal fuse-case, a fuse-plug, or a concussion or percussion fuse-case as to securely hold the former in the projectile by the combined action of the screw-thread and flanged head of the latter.

CLIFFORD ARICK.

Witnesses:

JOS. PECK,  
C. HAZLETT.