

C. ARICK.
Shell-Fuse.

No. 44,061.

Patented Sept. 6, 1864.

Fig. 1.

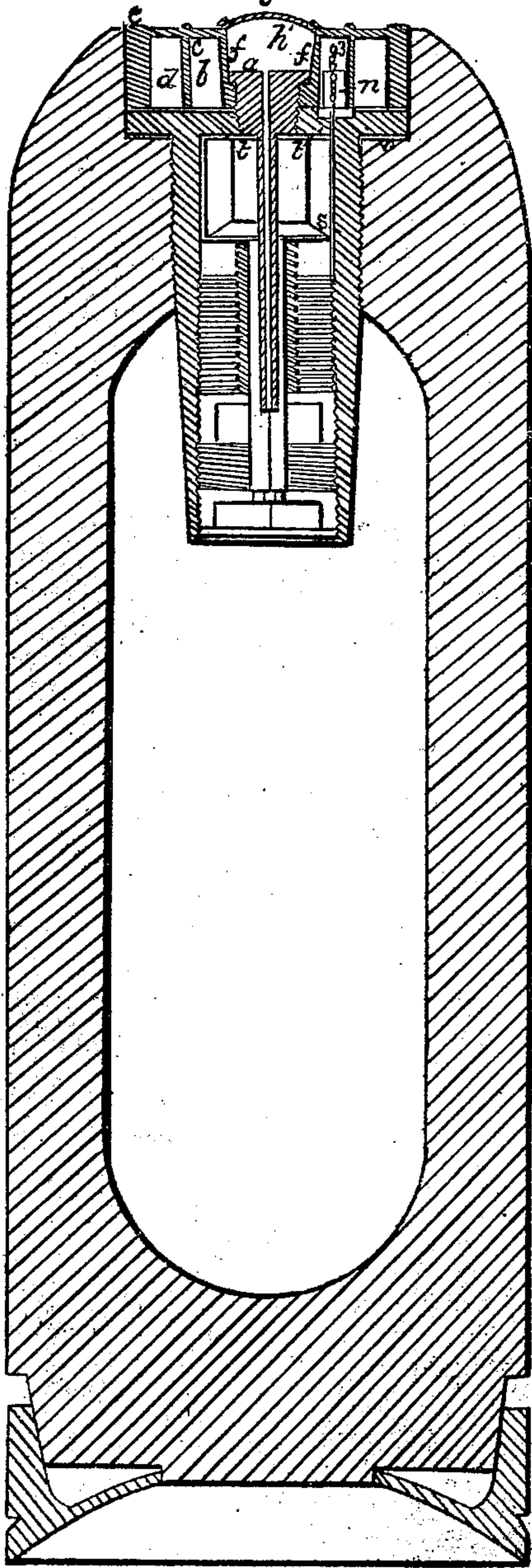


Fig. 2.

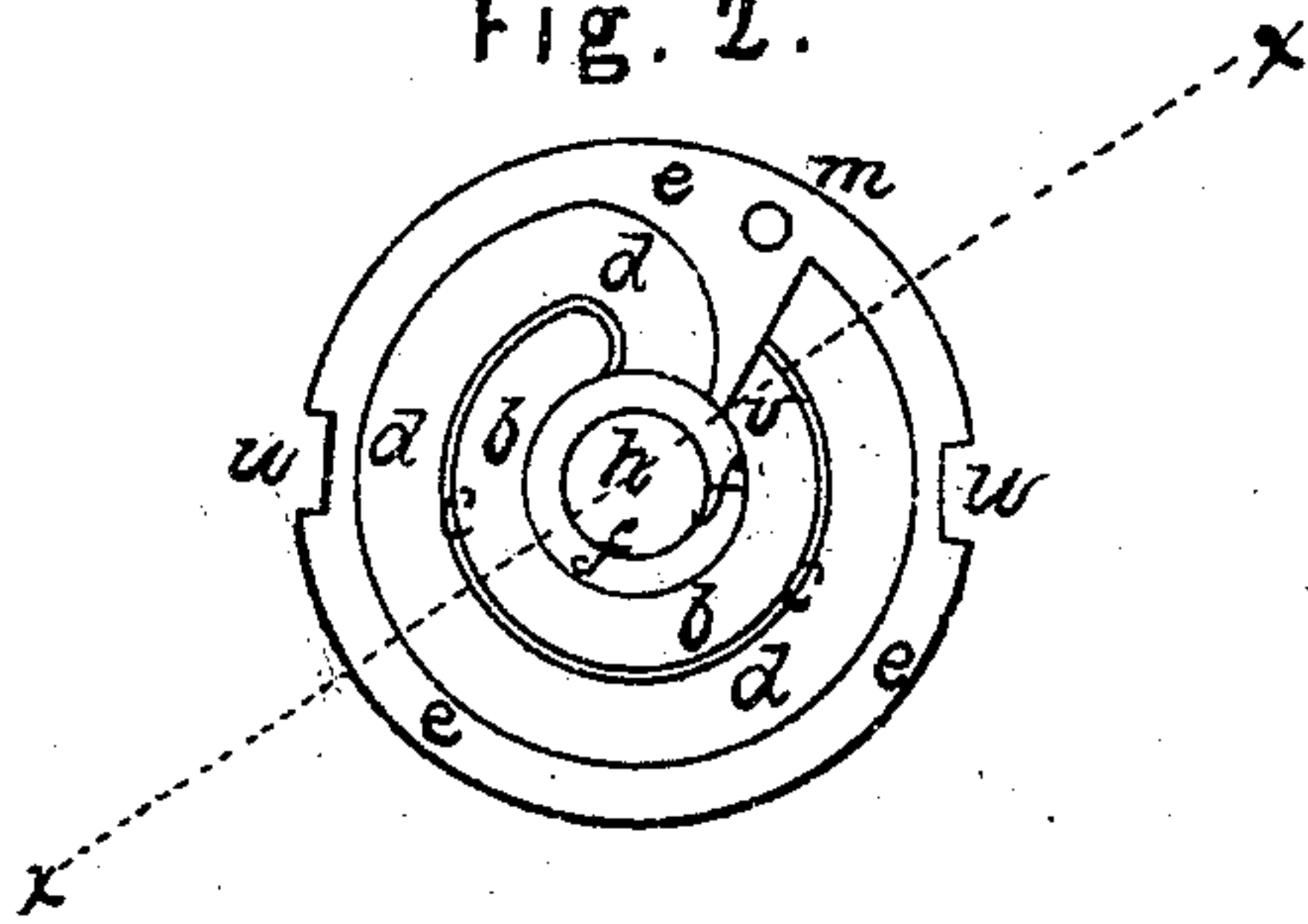
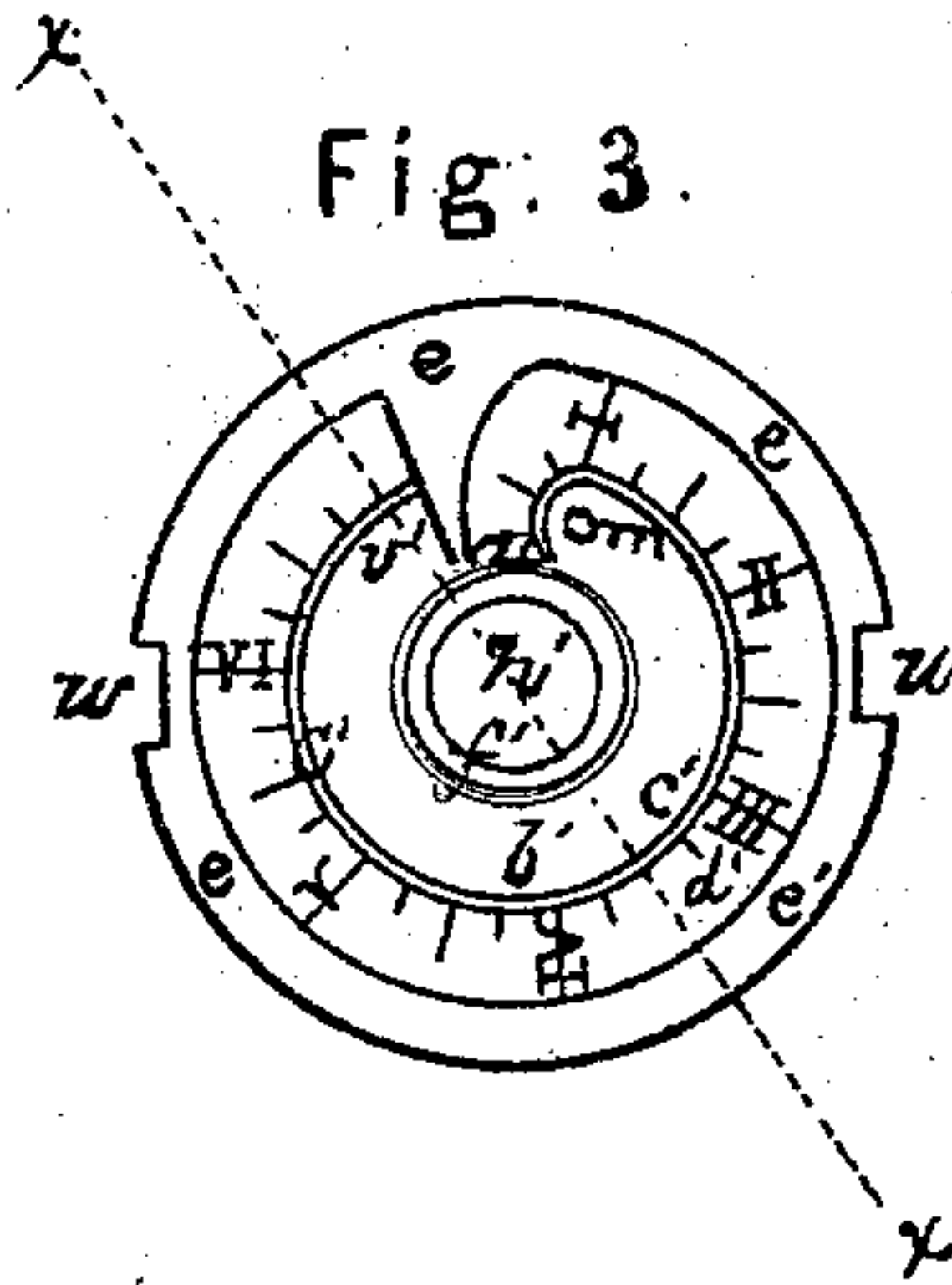


Fig. 3.



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Inventor:

Clifford Arick

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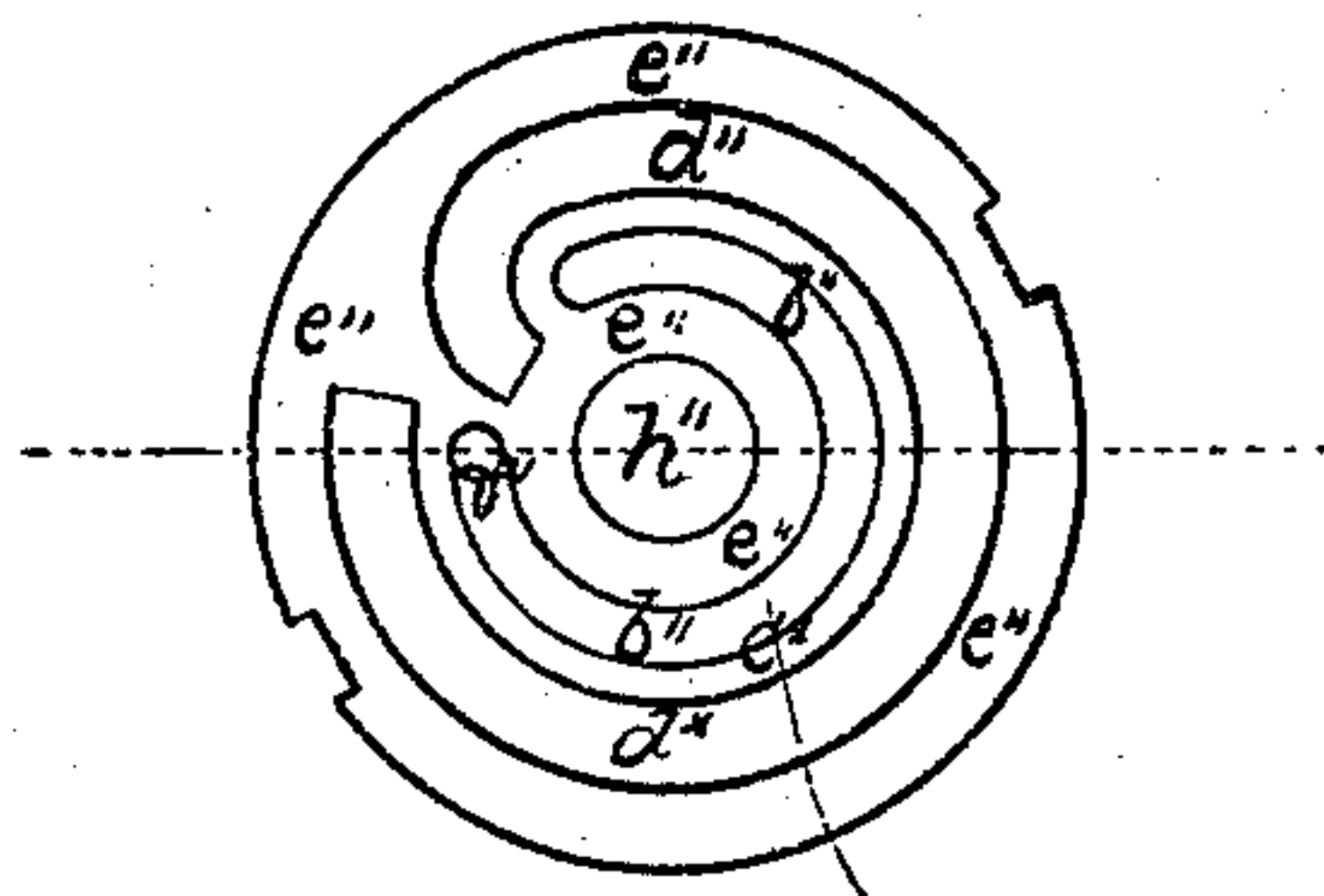
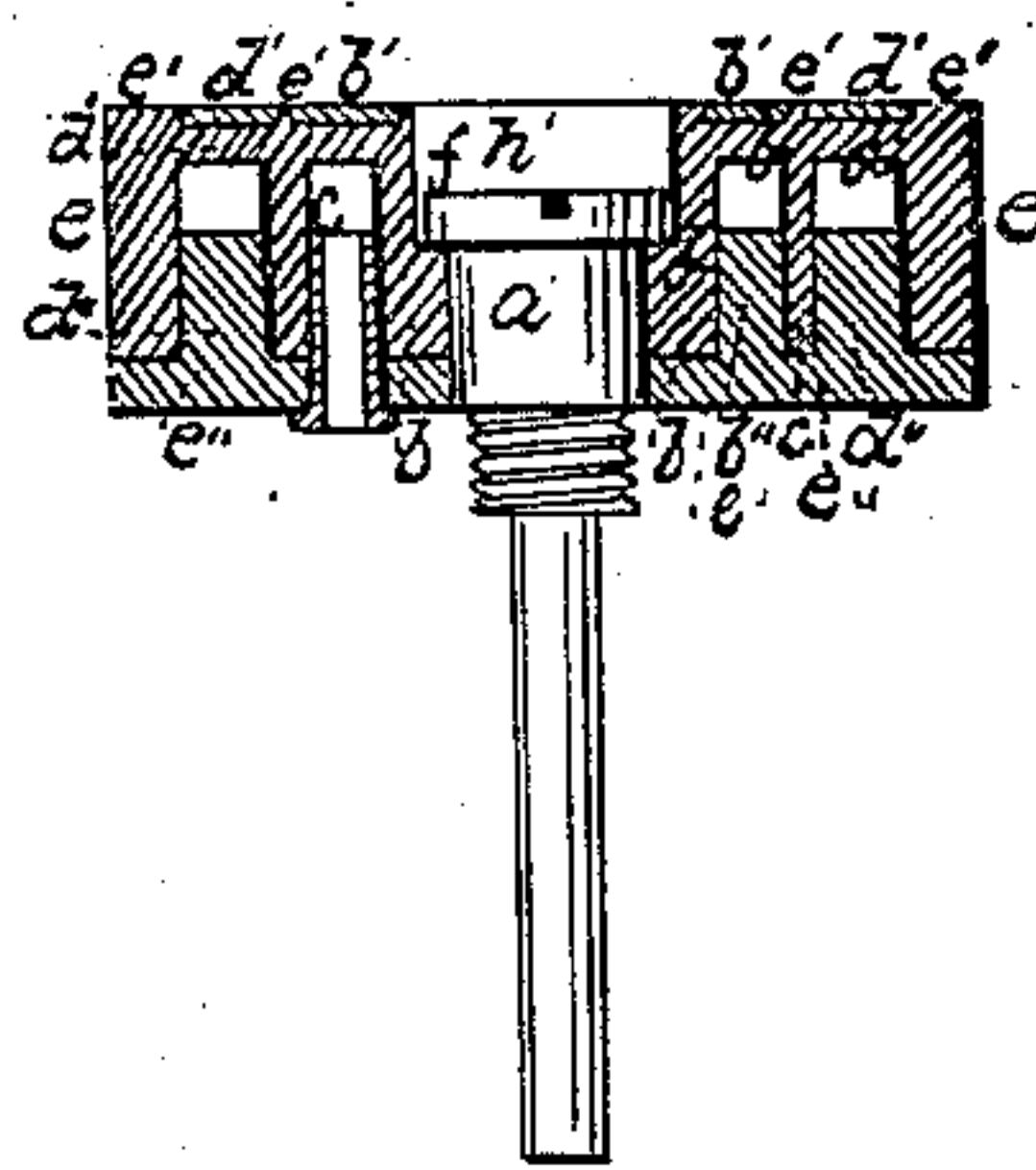


Fig. 2.



Witnesses:

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Inventor:

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UNITED STATES PATENT OFFICE.

CLIFFORD ARICK, OF ST. CLAIRSVILLE, OHIO.

IMPROVEMENT IN COMBINED TIME AND CONCUSSION FUSE.

Specification forming part of Letters Patent No. 44,061, dated September 6, 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 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 the letters of reference marked thereon.

My improvement relates to that class of inventions which have been variously denominated "combined concussion and time," or "percussion and time" fuse, together with a means of igniting the same by or independently of the windage-flame; and it consists, chiefly, in the means used for effecting these combinations in a more practical and compact form than heretofore adopted, and of securing greater certainty of action, economy of construction, and safety from accident than are secured in the use of other devices having the same object in view. As a means to this end I have selected, first, what is known as the "Tice" fuse, secured by Letters Patent of the United States bearing date June 23, 1863, to Isaac P. Tice, of New York; second, the well-known "Bormann" fuse; and, third, as a means of igniting the Bormann fuse independently of the windage-flame, I use substantially the devices employed in the Armstrong fuse, patented in England April 10, 1858, and consisting, among other things, "of a means of firing a detonating substance by the stroke or action of a weight, which, by means of its inertia, becomes liberated from a fastening when the projectile receives its impulse in the gun."

To enable others skilled in the art to make and use my invention, I will describe the mechanical changes necessary in the construction of said original fuse-cases to their combination as herein contemplated—

Figure 1 of the drawings being a longitudinal sectional view thereof, taken in a line, *xx*, of a top view, as shown in Fig. 3. Fig. 2 is a bottom view of the Bormann section of the combination, wherein *e* is the outer wall, *d* the fuse-chamber, *c* the partition-wall, and *b* the crescent-shaped fire-chamber, *f* being the inner wall thereof, and *h* a central aperture through the case, the aperture *h* being of such form as to admit the head of the hollow screw-pin *a*,

as shown in Fig. 1. The top of this Bormann fuse-case, as shown in Fig. 3, is completely closed, excepting only the aperture *m'* and the part *h'*, which is an enlarged portion of the aperture *h*.

h' forms a deep countersink for the flanged head of the pin *a*, and becomes itself the magazine of this fuse-case, the flange of the pin-head, when in its place, being its bottom and the disk *i* its top.

e', Fig. 3, is a raised continuation of the wall *e*. *d'* forms the bottom to the fuse-chamber *d*. *c'* is a raised continuation of the wall *c*, and *b'* forms the bottom to the crescent-shaped fire-chamber *b*. The bottom *d'* is indexed, as shown, and *f'* is a continuation of the inner wall, *f*.

This fuse-case is cast, as heretofore, from a metal mold, half-and-half tin and lead. The mold consists of two parts, one containing a form the counterpart of the top and of the aperture *h*, while the other contains the counterpart of the bottom. The chamber *d* is put in communication with the magazine *h'* at the cast by bringing at *a'* the form in one side of the mold for casting the chamber in close contact with the form in the other side for casting the magazine.

As a means of packing the Bormann fuse-case thus cast, I cast in another mold a disk, *e''*, with its projections *d''* and *b''* and its annular cavity *c''*, corresponding to the chambers *d* and *b* and the wall *c* in the fuse-case, and having its outer flange coincident to the wall *e*. Through this disk are the apertures *h''* and *v''*, the first coincident with the aperture *h*, and the second so as to admit the cap *n* to its place at *v*. When the fuse-chamber *d* is charged with the fuse composition, the disk *e''* is placed in its place and driven by a press or other suitable means, so as at once to pack the fuse composition, contract the fire-chamber *b*, and hermetically to seal it at all points except at the apertures *v''* and *m*, as fully shown. This contraction of the fire-chamber may be increased or diminished by increasing or diminishing the depth of the projection *b''* of the disk *e''*, the cap *n* being elongated or shortened, so as to present its inner end flush with the depth of this projection.

As will be seen from the drawings, very little change in either the construction or oper-

ation of the Tice fuse-case and fuse will be necessary in order to adapt it to the proposed combination, and reference is here made to said Letters Patent for such particular description as may be necessary to enable those skilled in the art to make and operate the original invention.

Referring to the differences in construction and operation, it will appear, first, that the weight used in the Tice fuse-case for "unlocking" it, as it is called, after being liberated from its fastenings, is intended to accomplish instantly the additional object of firing a detonating substance by means of its remaining inertia; second, to enable the weight to perform this double function at the time indicated; as shown in the present case, a wire rubber is secured to its rim, as shown at *s*, before it is placed in position; third, the head of the Tice fuse-case is given such diameter as will conform it to the Bormann fuse-case combinable with it, and a suitable aperture is made through it, to allow the rubber attached to the weight to pass through it, as shown in Fig. 1; about this aperture, on the outside of the head, is a countersunk bottom for a small tube or cap, as shown at *o*; fourth, the aperture for admitting the center-pin through the head of the case is somewhat enlarged, so as to give the connecting-pin additional substance and strength; fifth, the center-pin used in the Tice fuse-case, which is solid, is made hollow in the present instance, and becomes a connecting-link between the magazine of the two fuses. It is also given a flanged head, and is provided with an enlarged screw-thread, as shown at *t*, Fig. 1. This center-pin is made to perform in this combination three important functions--namely, the functions of the solid pin used in the Tice fuse-case, the function of holding the two fuse-cases firmly together on a common center, and the function of practically connecting their magazines. By this connecting-link the magazine in the Tice fuse-case becomes also an inner or final magazine of an outer and independent time-fuse. The cap *n* is a bottomless cup, designed to contain the friction composition or other detonating substance to be acted upon by the rubber, and it corresponds, in the present case, substantially with the short tube of the ordinary friction-primer used for discharging cannon. It is charged in the same manner. When the composition is placed in the cap, a flattened aperture is made through it, so as to admit the serrated end of the rubber. By turning the cap one-half way round after it is put over the rubber, the relation of the latter to the composition will be the same as in the friction-primer. The top of the cap may then be closed and the end of the wire bent over, or not, as may prove desirable. Before placing the composition-cap in position over the rubber, a suitable gum washer is passed ahead of it, so as to completely close the aperture surrounding it, and thereby to prevent any injection of the gases generated in the cap

into the Tice fuse-case. The cap *n* is so formed as to readily enter at *v* the horn of the crescent farthest from the zero end of the fuse. Its flanged bottom, when the fuse-cases are brought together, will be pressed by the surrounding walls into the countersink provided for that purpose, as shown at *o*, whereby the gum washer will be held in action and the cap itself secured without any force or strain whatever being exerted on either the wire rubber or the composition.

A different method of charging the composition-cap may be adopted, if found more convenient, securing substantially the same arrangement. The rubber, being an annealed wire of suitable dimensions, is secured to the weight, as before; but it is not flattened or serrated until after it is placed in position, the cap charged in the ordinary way of charging the short tube of a friction-primer, and it and the gum washer put in their place upon it. It is then flattened and serrated with a suitable tool and given such length as necessary. The length of rubber above the top of the composition-cap and admissible between it and the bottom of the fire-chamber is believed to be sufficient. A greater length may be given it by bending it over toward the zero end of the chamber.

The combination of these fuse-cases, when thus constructed, is effected as follows: First, the pin *a* being inserted in the head of the Tice case, the Tice fuse is mounted on it in the usual way, the wire rubber being first duly attached; second, the pin *a* being removed, the gum washer and the composition-cap, duly charged, are adjusted in place, as before indicated; third, the Bormann fuse-case, duly charged, is applied to the head of the Tice case, with the composition-cap and wire rubber resting in the fire-chamber at the indicated point *v*; fourth, a lock-pin (not shown in the drawings) is attached to the head of the Tice fuse-case, so that under the indicated conditions it will coincide with and enter the opening *m* in the Bormann case, Fig. 2; fifth, the pin *a* is then returned to its place through the aperture *h*, the flanged head of the pin clasping and holding the two cases firmly together, while, in conjunction with it and the composition-cap, the lock-pin inserted in the opening *m* effectually prevents any independent axial motion of either; sixth, a tin disk, *i*, being provided and the magazine *h'* and hollow pin *a* being charged with rifle-powder, the disk is inserted in the fuse-case and sealed, substantially as it is in the magazine of the Bormann fuse, as heretofore, and as shown in the drawings, Fig. 1. When thus combined, the fuse-cases and fuses occupy a fixed relation to each other, the situation of every part being well known and being also sufficiently indicated by the insignia of the outside, as shown in Fig. 3, the composition-cap and wire rubber being situated in the extremity of the crescent farthest from the zero end of the fuse, as indexed, and immediately below at *v'*. A wrench-seat, *w*, is provided, whereby the fuse is inserted in the shell, the fuse-hole therein being

countersunk so as to admit the outer wall of the Bormann fuse-case within the walls of the shell, as shown, while the passage to the chamber of the shell is provided with a thread corresponding to the thread of the Tice fuse-case. It is by this thread that the fuse is held in its place. A permanent vent to the fire-chamber is provided in its extremity nearest the zero of the fuse, whereat the gas generated by the ignition of the composition will, under certain circumstances, be allowed to escape without igniting the fuse. This vent is shown at *m'*, Fig. 3, and is to be sealed with wax or other removable material under slight pressure, and the head of the combined fuse is rendered air and water tight by a substantial coat of varnish. When thus completed, the combined fuse is ready for service, and will be found equally effective in spherical or elongated projectiles, without any reference whatever to the manner of their flight. Care must be taken in all cases to see that when the projectile is home in the gun the axes of the fuse shall coincide with the axes of the bore, (head toward the muzzle;) otherwise the weight will not be so situated as to perform its functions, and the whole arrangement will consequently fail.

The operation of my invention is as follows: If it is intended to ignite the bursting-charge of the projectile at the moment of impact, it is placed in the piece and fired without molesting any of its parts. If it is intended to ignite the bursting-charge at any moment of its flight, before placing it in the piece from which it is to be fired the Bormann fuse column is cut at the indicated point, extending the cut across the partition-wall *c*, as indicated on the outside by its raised continuation *c'*, so as to unite at that point the fuse column and the fire-chamber. At the discharge, by means of its inertia, the weight in the Tice fuse will in every case unlock it, and it will at the same instant fire the detonating substance provided for its action. If the fuse is not cut, the gas generated by firing the detonating substance will expel the wax from the vent *m'* and will escape at that point. The result will be the same if by any accident it should be fired prematurely. The fuse will not be ignited or injured in either case beyond the loss of this means of ignition. If the fuse is cut before the discharge, the escape of the gas will be at the cut, and the fuse column will be ignited thereby in every instance. It will also, when cut, be as completely exposed to the action of the windage-flame as heretofore, and with projectiles which will allow of ignition in that way the fire-chamber, with all its accompaniments, need not be used. It will be found, however, that with the best rifle-projectiles this means of ignition is very uncertain, the windage being so quickly closed.

The advantage of the Tice fuse over all others of which I have any knowledge, designed merely for exploding shells at the impact, consists, chiefly, in the completeness of its arrangement and action, regardless of the condition of a particular point of impact, and also in the

great security of the detonating substance used before and its extreme sensitiveness and exposure after the fuse is unlocked.

The advantages of the Bormann arrangement of time-fuse are too apparent to be placed in comparison with any other time-fuse whatever.

The advantage of the present arrangement is that it secures the combined quality of both these fuses without confusion of their respective parts, or, it is believed, in any manner modifying their separate actions, together with a simple and effective means of igniting the same by or independently of the windage-flame.

I do not claim herein combining in a single fuse-case a "time and concussion fuse" or a "time and percussion fuse," or either of these in combination with "an independent ignitor for a time-fuse;" nor do I claim producing a jet of flame by the flash of a detonating composition fired by a blow or by friction or other means; nor do I claim "igniting a time-fuse by the flash of a detonating substance ignited by the stroke or action of a weight, which, by means of its inertia or otherwise, becomes liberated from a fastening when the projectile receives its impulse in the gun." It is conceded that all these points are substantially presented in the fuse of Sir William Armstrong, before referred to, as well as numerous other English and American inventions. Nor do I claim having added anything to the Tice fuse beyond the imposition on some of its parts of an easy and convenient double use; nor do I claim having added any new feature to the Bormann fuse as a fuse; but

What I do claim in that connection as new, and desire to secure by Letters Patent, is—

1. Constructing a Bormann fuse-case with its magazine on its index side and with an independent concentric fire-chamber between its fuse-chamber and magazine, substantially as described.

2. Combining with the magazine of a Bormann fuse-case, and acting as a bottom to it, a hollow pin to serve as a means of fastening it in a shell or as a conductor of its flame through an intervening space or obstacle to the bursting-charge thereof, substantially as set forth.

3. Combining with a Bormann fuse-case thus constructed, with or without its independent fire-chamber, by means of a central hollow pin, a concussion or percussion fuse, either or both, and whether ignitable by or independent of the windage-flame, substantially as described.

4. So combining in a Bormann fuse-case a fuse and concentric fire-chamber that when the fuse is cut at the desired point the partition-wall between the two chambers may be conveniently included in the cut, and they be thereby united, substantially as described.

Witnesses:

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