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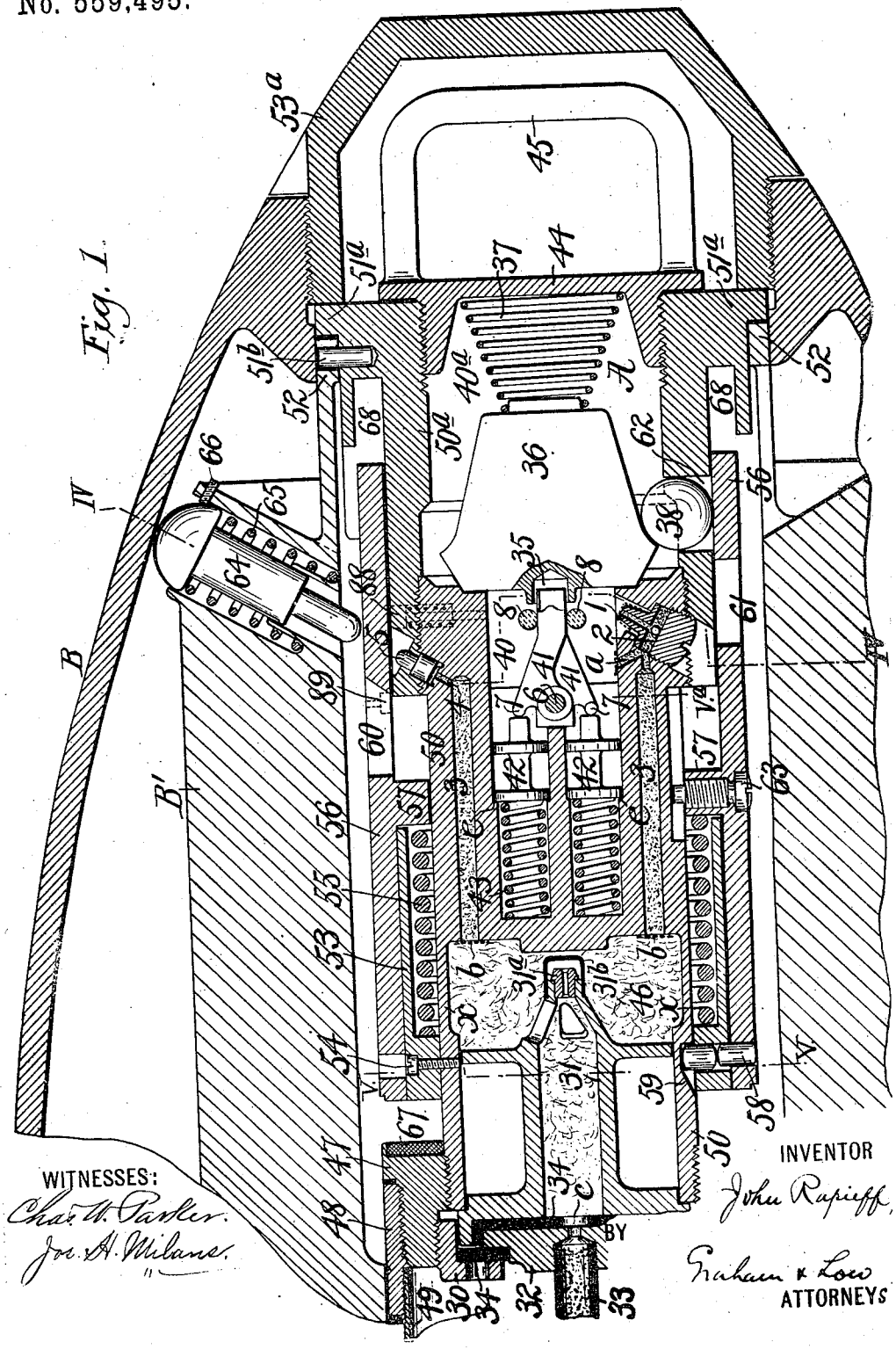
10 Sheets—Sheet 1.

J. RAPIEFF.

AUTOMATIC SHELL FUSE.

No. 559,495. Patented May 5, 1896.

Fig. 1.



WITNESSES:
Chas. W. Parker.
Jos. A. Milans.

(No Model.) 10 Sheets—Sheet 2.

J. RAPIEFF.

AUTOMATIC SHELL FUSE.

No. 559,495. Patented May 5, 1896.

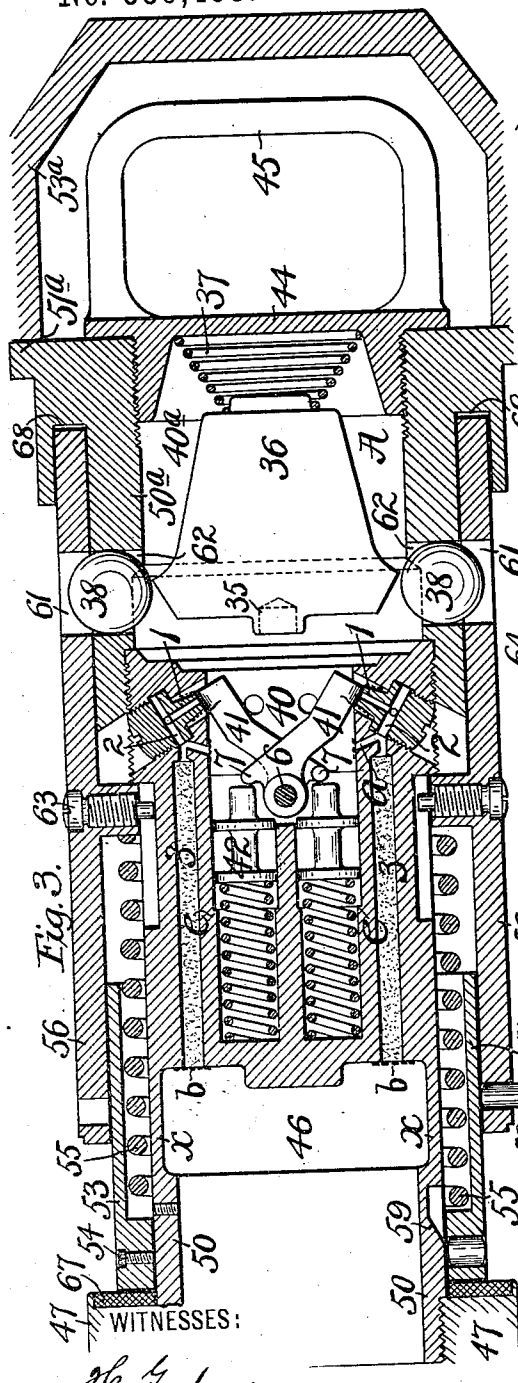


Fig. 3.

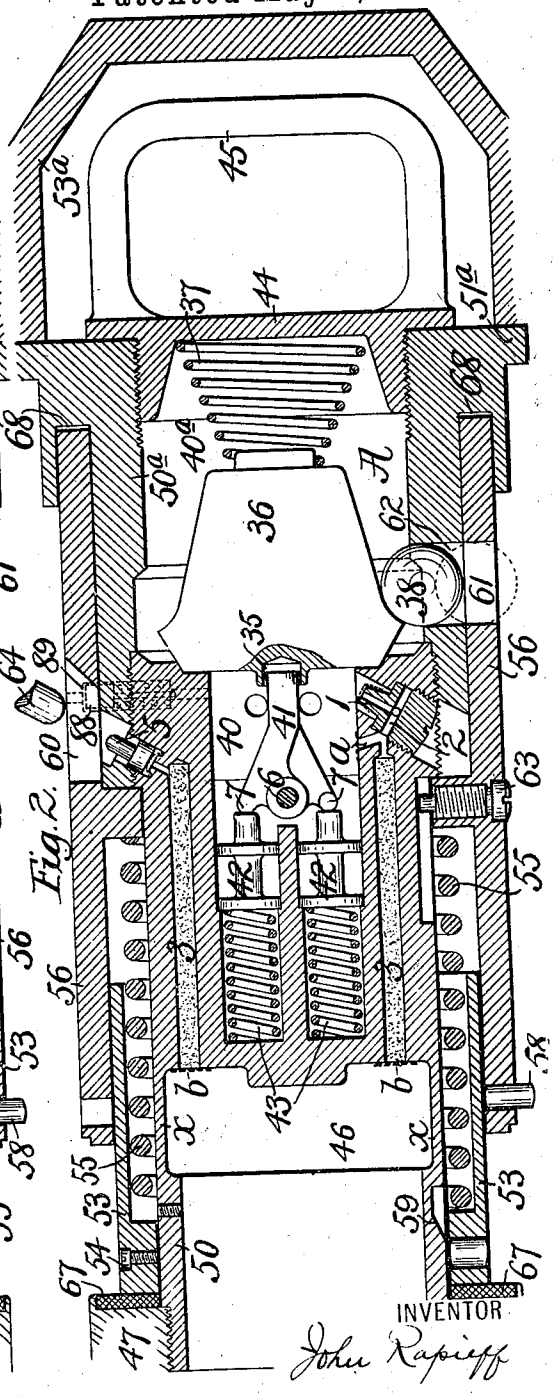


Fig. 2.

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(No Model.)

J. RAPIEFF.

AUTOMATIC SHELL FUSE.

No. 559,495. Patented May 5, 1896.

Fig. 5

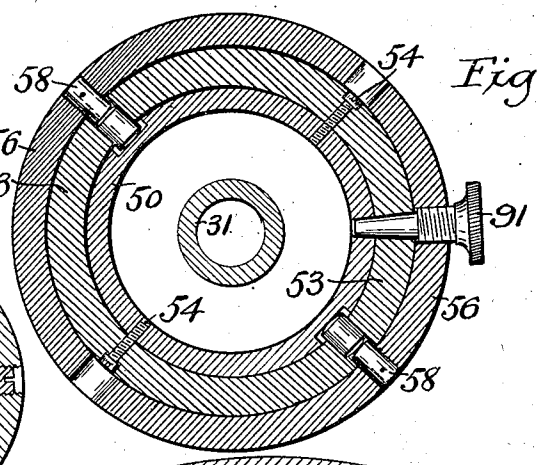


Fig. 5a

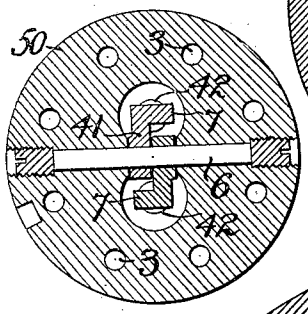
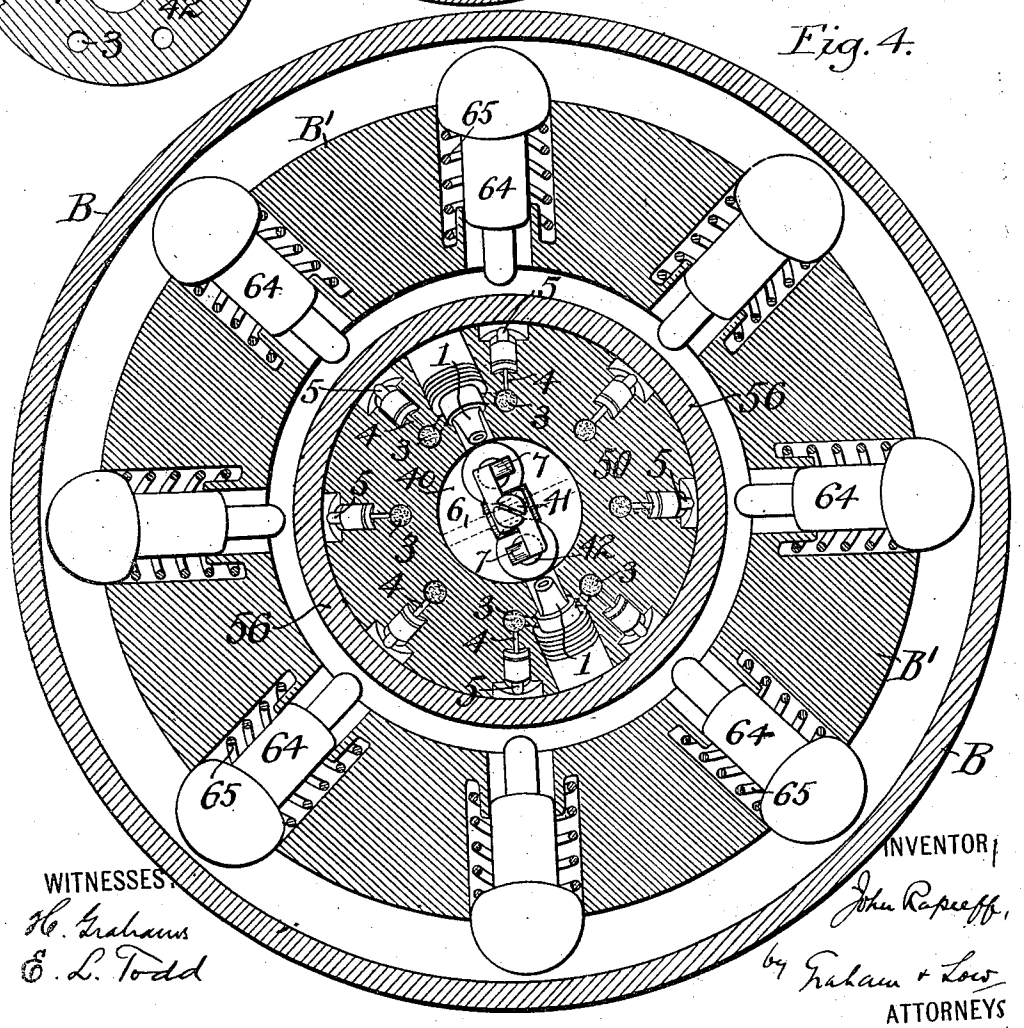


Fig. 4.



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(No Model.) 10 Sheets—Sheet 4.

J. RAPIEFF.

AUTOMATIC SHELL FUSE.

No. 559,495. Patented May 5, 1896.

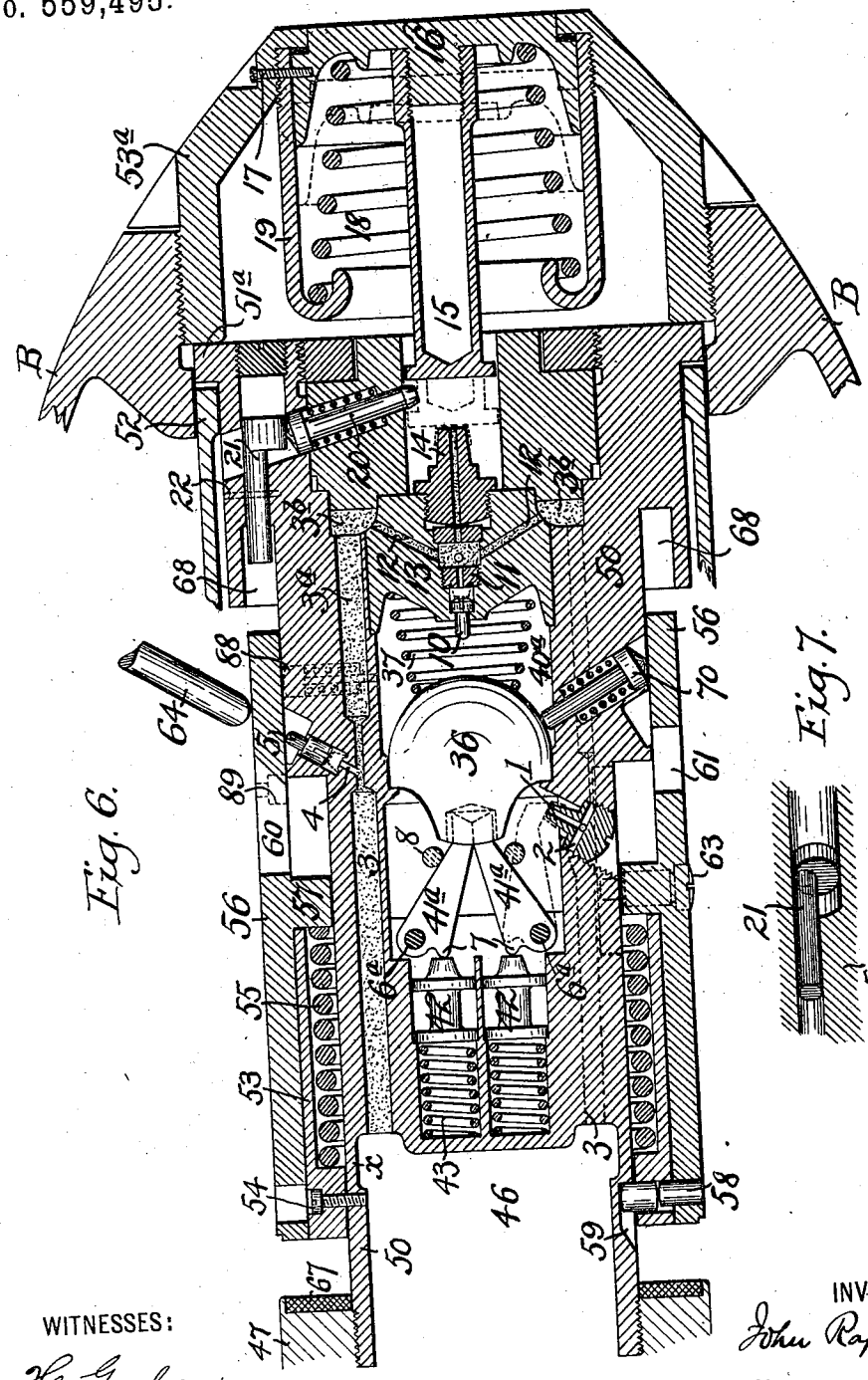

Fig. 6.

Fig. 7.

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(No Model.) 10 Sheets—Sheet 5.

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AUTOMATIC SHELL FUSE.

No. 559,495. Patented May 5, 1896.

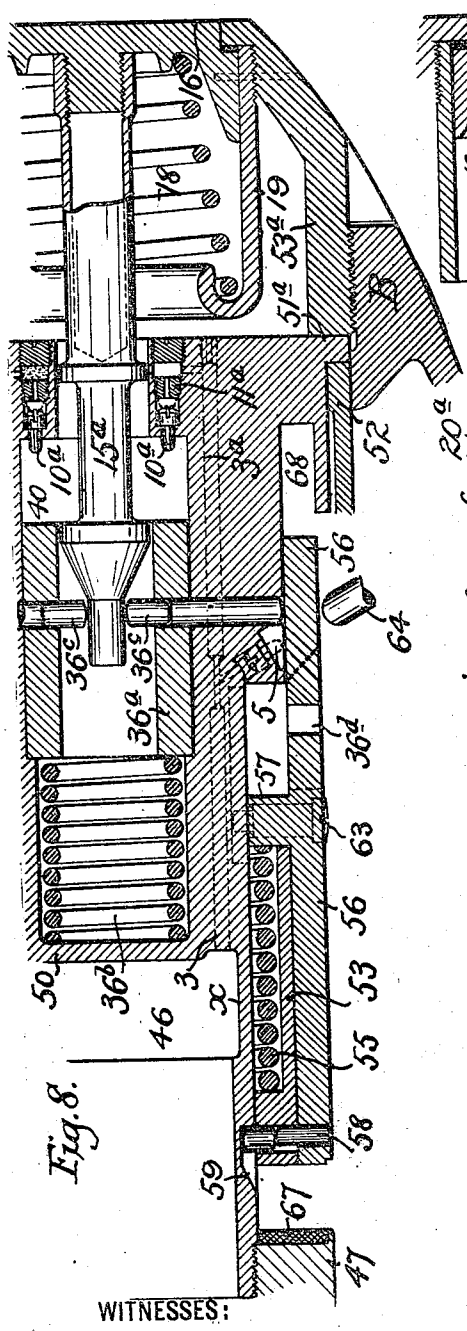

Fig. 8.

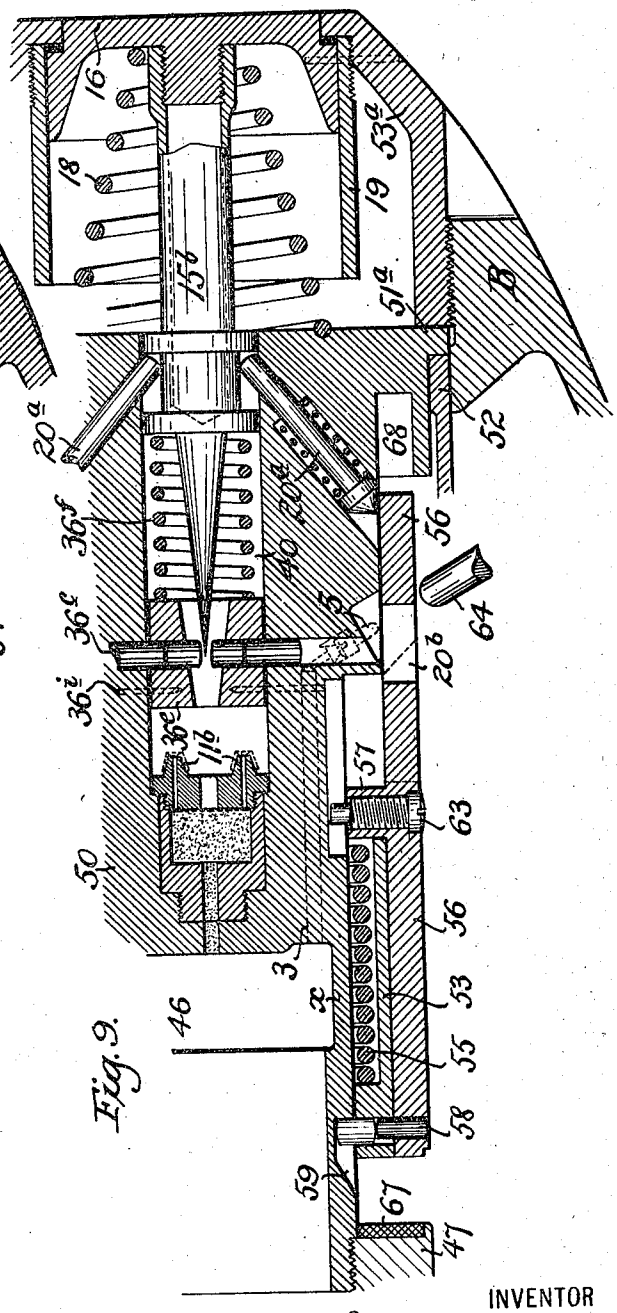

Fig. 9.

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(No Model.) 10 Sheets—Sheet 6.

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AUTOMATIC SHELL FUSE.

No. 559,495. Patented May 5, 1896.

Fig. 10

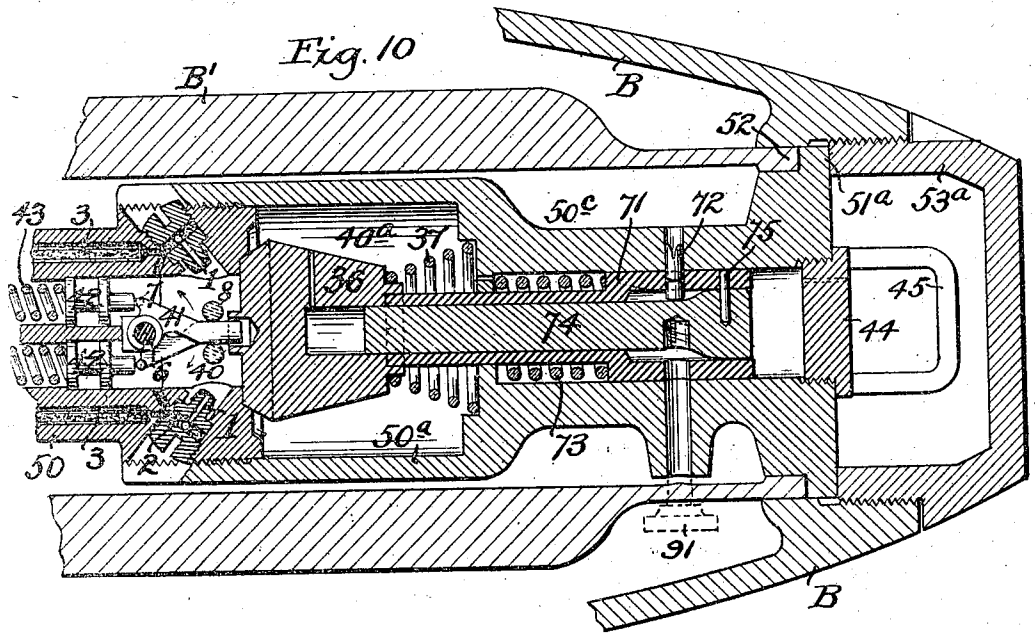
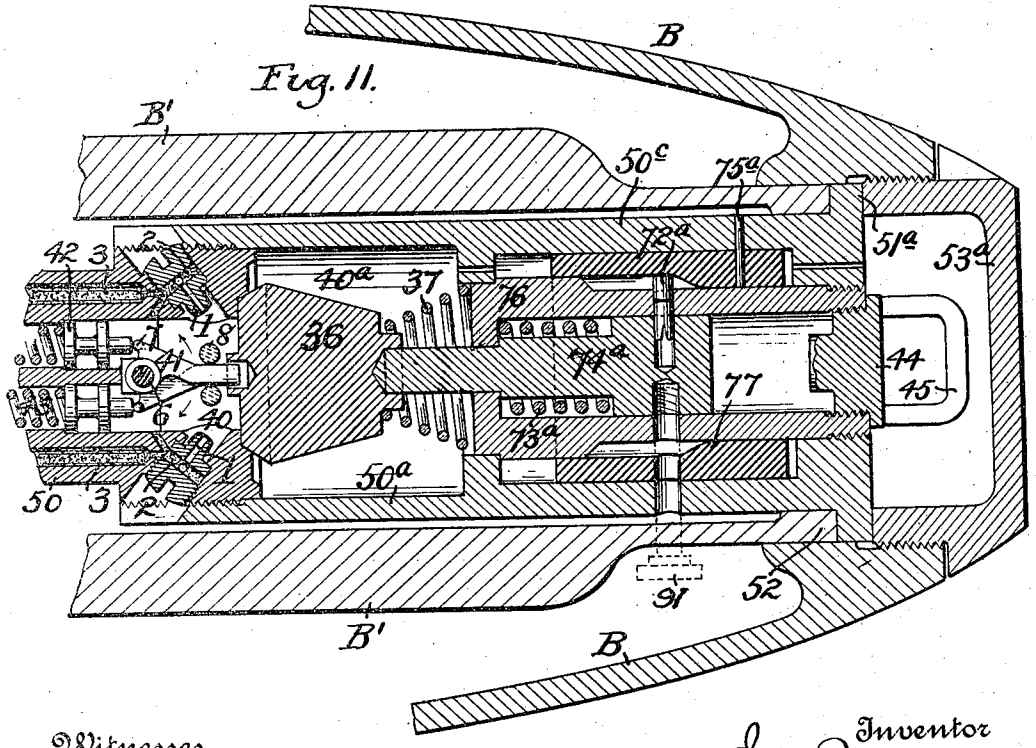


Fig. 11.



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(No Model.) 10 Sheets—Sheet 7.

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AUTOMATIC SHELL FUSE.

No. 559,495. Patented May 5, 1896.

Fig. 12.

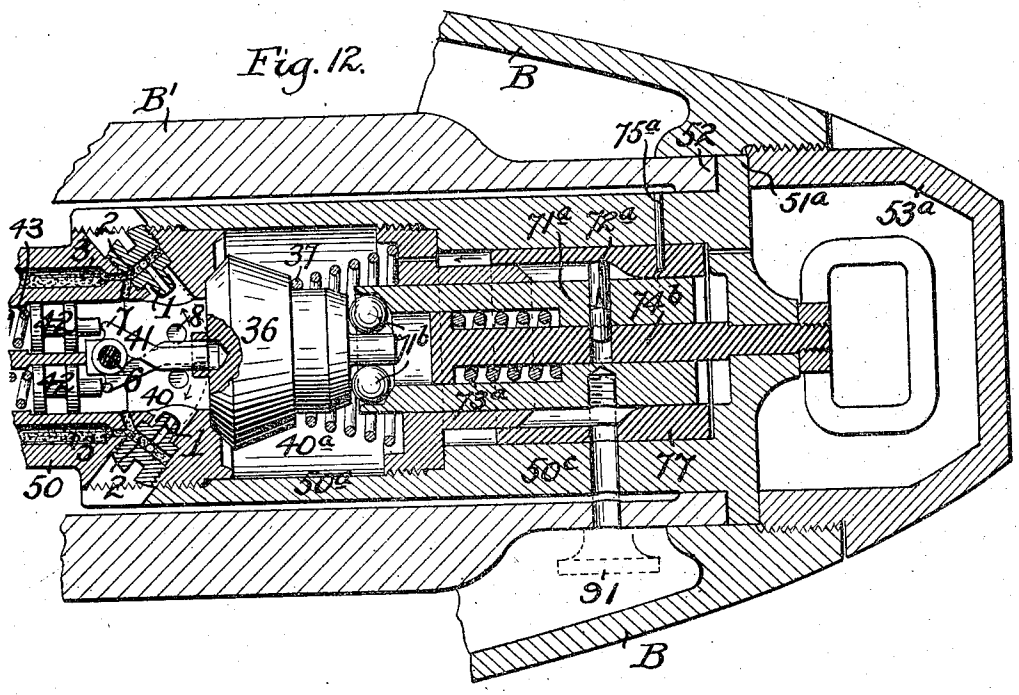
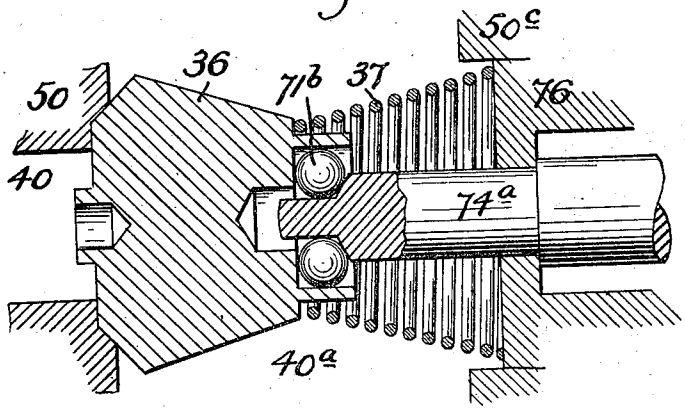


Fig. 13.



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10 Sheets—Sheet 8.

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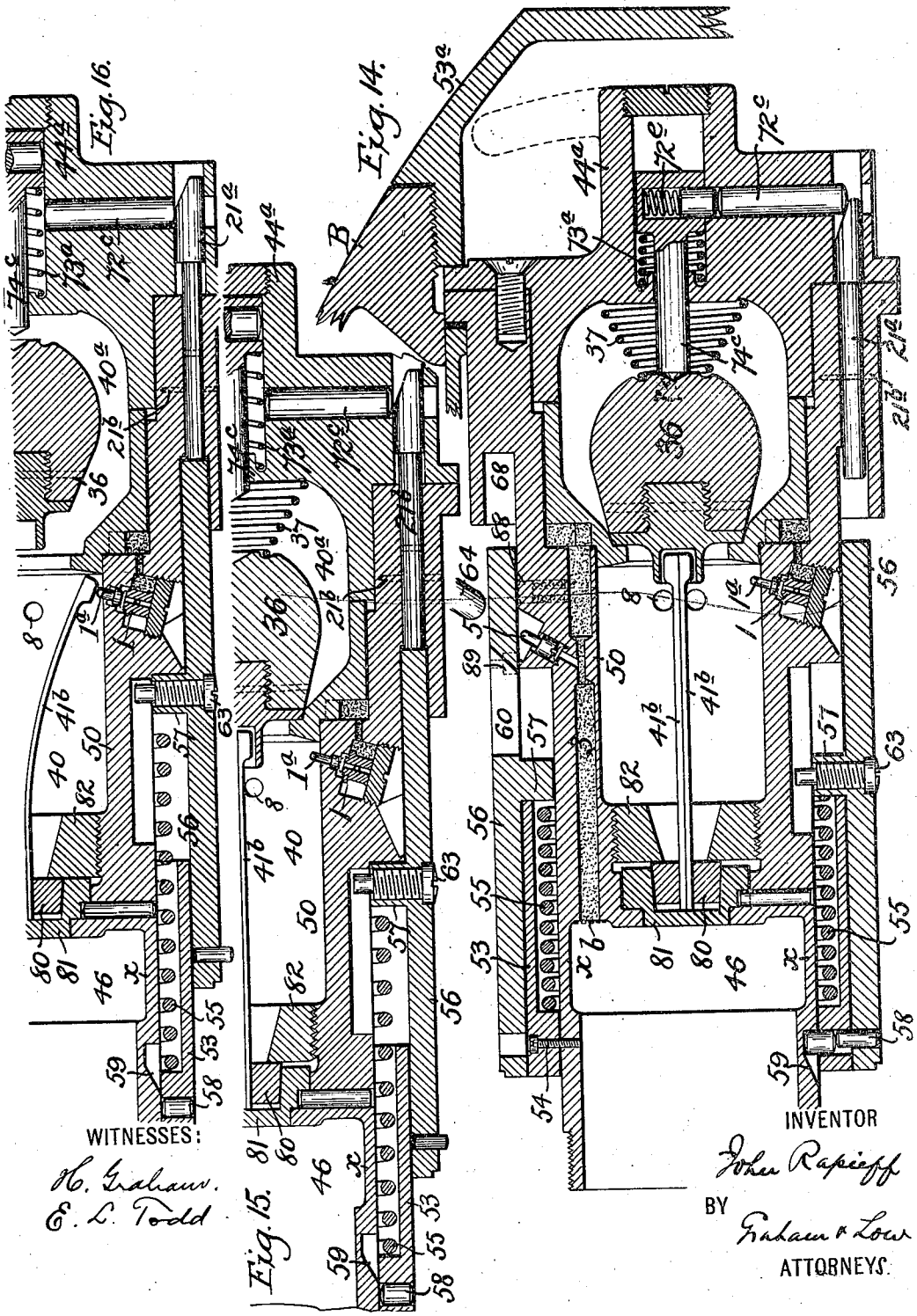
AUTOMATIC SHELL FUSE.

No. 559,495. Patented May 5, 1896.



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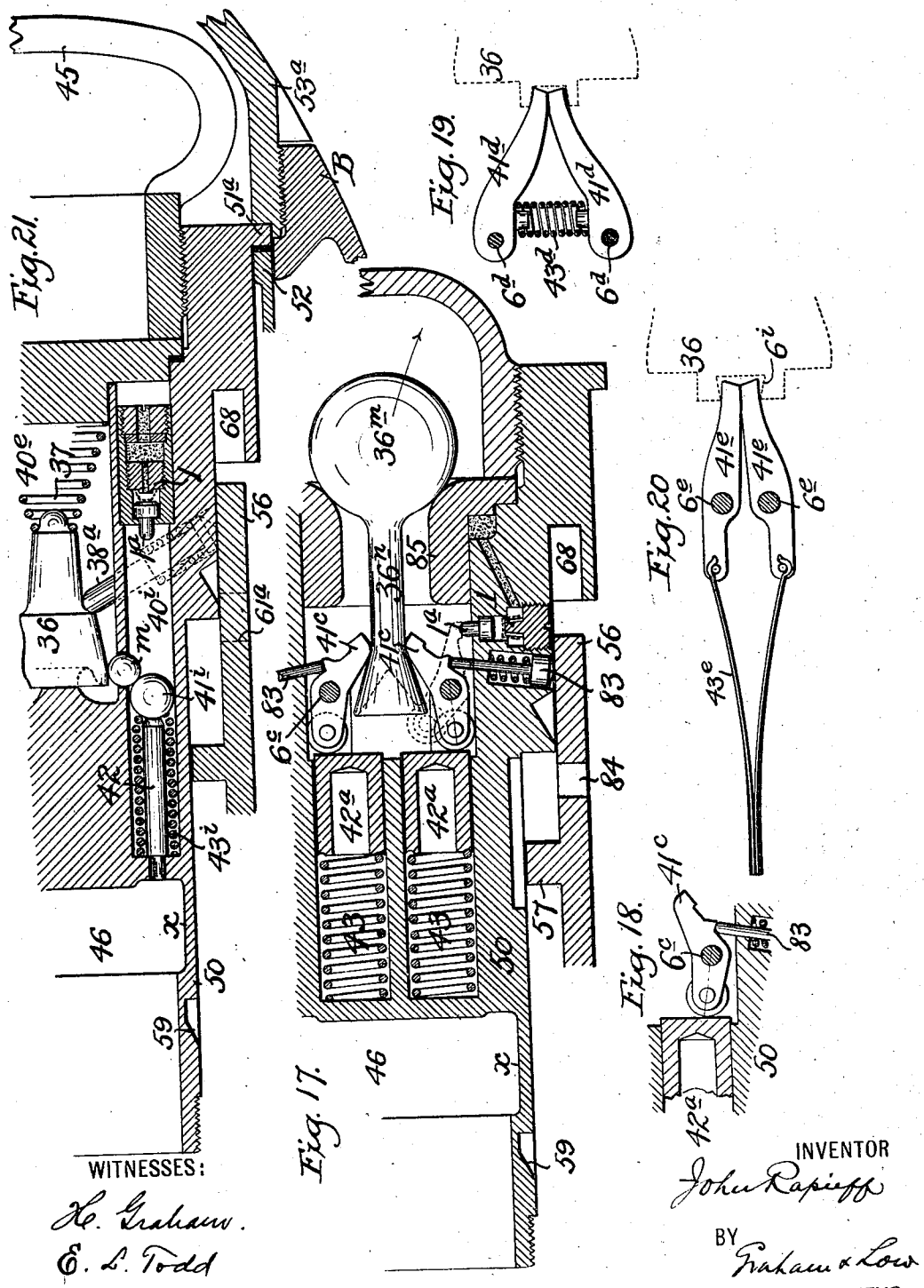
J. RAPIEFF.

AUTOMATIC SHELL FUSE.

No. 559,495. Patented May 5, 1896.



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(No Model.) 10 Sheets—Sheet 10.

J. RAPIEFF.

AUTOMATIC SHELL FUSE.

No. 559,495. Patented May 5, 1896.

Fig. 23.

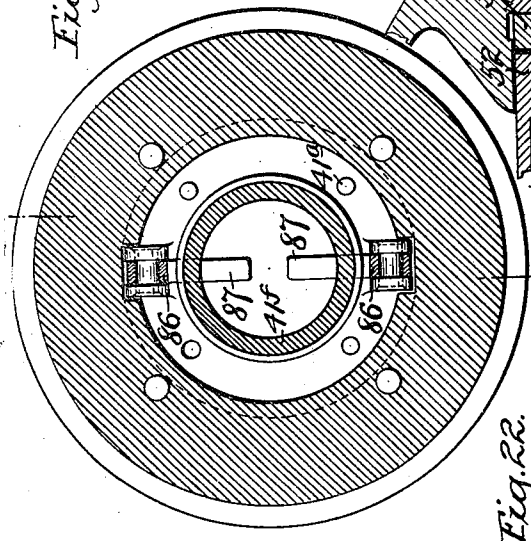


Fig. 24.

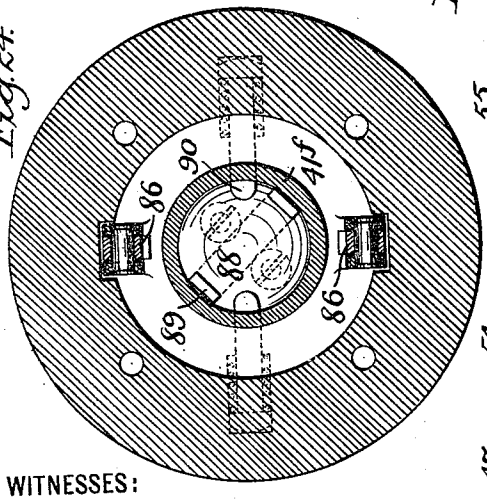
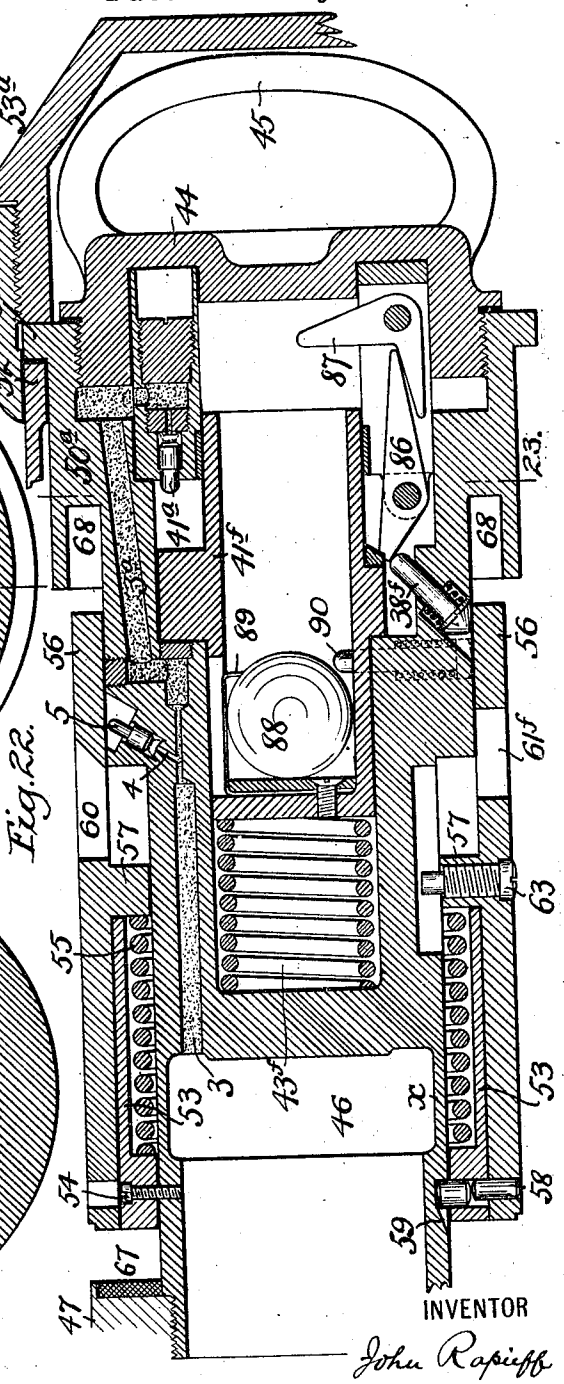


Fig. 22.



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UNITED STATES PATENT OFFICE.

JOHN RAPIEFF, OF NEW YORK, N. Y.

AUTOMATIC SHELL-FUSE.

SPECIFICATION forming part of Letters Patent No. 559,495, dated May 5, 1896.

Application filed September 15, 1894. Serial No. 523,155. (No model.)

To all whom it may concern:

Be it known that I, JOHN RAPIEFF, a citizen of Russia, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Automatic Fuses, of which the following is a specification.

The present invention particularly relates to a fuse for explosive shells—that is to say, to a fuse carried by the shell, that is adapted at the proper time to fire the bursting charge, also carried by the shell.

The improvements consist, essentially, in a normally-restrained and spring-projected hammer or hammers and one or more percussion-primers arranged in the path of movement of the hammer and to be struck thereby to fire the bursting charge. Normally the hammer is held away from the percussion-primers by a positive retaining means combined with a releasing or protecting sleeve which is adapted to free the retaining means to enable it to release its hold upon the hammer at the moment of impact of the shell with the target. The structure also includes one or more radial hammers with coacting percussion firing-pins and an interposed protecting-sleeve which normally protects the firing-pins from the hammers, but which is adapted at the moment the projectile is propelled from the gun to move to uncover said firing-pins, so that the radial hammers may be free to strike them should they become operative by the shell striking on the side of its head instead of head on. The improved structure also includes a removable fuse-case containing the detonating hammer or hammers, the several firing-pins, and other coacting parts, adapting the fuse mechanism for transportation independent of the projectiles and to be inserted in place in the projectile just before use.

The accompanying drawings illustrate a practical embodiment of the invention, in which—

Figure 1 is a longitudinal sectional elevation of the forward end of a projectile with the improved fuse and case shown in position within the head of the shell and in normal position. Figs. 2 and 3 are similar views of the main portion of the fuse with some of its contiguous parts and shown in changed positions. Fig. 4 is a cross-sectional elevation on the irregular line IV IV of Fig. 1, showing the ends of the hammers in elevation, the hammer-locking pins being absent. Fig. 5 is a cross-section on the line V V of Fig. 1, and Fig. 5^a is a like section on the line V^a of Fig. 1. Figs. 6 to 24, inclusive, are sectional views of modified structures hereinafter fully set forth.

The fuse A is shown as a head-fuse located within the head of a projectile B, and is arranged to be inserted bodily in place therein, ready for firing. The fuse in the main consists of a cylindrical body 50, screw-threaded, to which is an annular extension 50^a, having a head-flange 51^a, arranged, when the fuse is in place in the projectile, to seat against the end 52 of the inner head B′ of the projectile and to be held firmly in place by a screw-threaded cup-shaped cap 53^a, which closes the front end of the projectile. The position of the fuse is assured with respect to the inner head B′ by a guide-pin 51^b, that enters a slot in the end 52.

The interior of the body 50 provides a hammer-chamber 40 and the extension 50^a a retainer-chamber 40^a, communicating with the hammer-chamber, the chamber 40^a being closed by a screw-cap 44, which has a handle 45, by which the fuse, as a whole, may be handled before and while being placed within the projectile. The rear of the body has a chamber 46, with which communicate a number of longitudinal channels 3, intended to contain a quick or time train or charge of gunpowder. The front of some of the channels 3, two as here constructed, which preferably contain a time-train, communicate with flash-passages 2 of nipples 1, arranged to support a cap which is exposed to the hammer-chamber 40. The other channels 3 communicate in front with a plurality of flash-passages 4, between which and a firing-pin 5, projecting outwardly and exposed to the exterior of the extension 50^a, is also arranged a cap to be exploded when the pin is struck. The rear end of the body 50 is screw-threaded to a ring 47, which in turn through a ring 48 is connected to the front end of a case 49, containing a priming charge of dry gun-cotton or other suitable explosive. The ring 47 also carries a gland 30, between the flange of which and the rear end of the body 50 is confined the flange end

of a central case 31, containing, preferably, a charge of gunpowder or other explosive, which projects within the chamber 46. Between the rear end of the case 31 and the flanged ring 30 there is supported a plate 32, having a central hole at its front with the interior of the case 31 and at its rear with a small cylindrical case 33, containing fulminate of mercury. The plate 32 is directly confined between disks or washers of lead 34, or other substance insensitive to the vibrations of the metallic portion of the fuse and of the projectile for the purpose of deadening the vibrations, thus preventing the premature explosion of the fulminate of mercury.

Immediately in front of the ring 47 the body 50 supports a recessed sleeve 53, held to the body by a shearing screw or pin 54. In the recess of the sleeve 53 and surrounding the body 50 is arranged a coiled spring 55, the front of which presses against the shoulder 57 of a releasing or protecting shield or sleeve 56, which overlies the sleeve 53 and also at its front end the extension 50^a, the rear end of which extension forms a front stop limiting the forward movement of the sleeve 56 when it is projected forward by the spring 55. The releasing-sleeve 56 is normally connected to the body 50 through the sleeve 53 by a divided or two-part bolt 58, the inner portion of which bolt projects into a rearwardly-inclined recess 59 in the body 50. The forward portion of the releasing or protecting sleeve 56 has a plurality of holes 60, arranged, when the sleeve is projected forward, to aline with and expose the firing-pins 5, as in Fig. 2, and with a set of holes 61 for coincidence at the same time with holes 62 in the extension 50^a.

In the hammer-chamber 40 is arranged a pair of spring-pressed hammers 41, mounted together on a pivot 6 and having heels 7, borne upon by slidable blocks 42, seated in recesses in the body 50 against springs 43. The two ends of the hammers when rocked on their pivot are arranged to strike caps on the nipples 1, as in Fig. 3, but normally are arranged to lie adjacent one another and be confined against the rocking force of their springs 43 by entering a recess 35 in the rear of a weighted retainer, tripper, or trigger 36, as in Figs. 1 and 2, and to be also confined and guarded from being accidentally released by a pair of removable pins 8, (see dotted lines, Fig. 1,) which are removed just previous to the fuse being placed within the projectile. The sleeve 56 is prevented from turning on the body 50 by a guide-screw 63, the end of which enters a longitudinal slot in said body.

The weighted retainer, tripper, or trigger 36 is held seated within the chamber 40^a against the front end of the body 50, closing the chamber 40, by a spring 37, interposed between the cap 44 and the retainer. The retainer is normally locked in place by one or more balls 38, which are seated in the holes 62 of the extension and project a sufficient distance into the chamber 40^a to prevent the forward movement of the retainer, the balls being held in place and from accidental displacement by the solid portion of the sleeve 56, but adapted to drop outward from the holes in the extension 50^a when the holes 61 in the sleeve 56 coincide with said holes 62.

The inner sleeved head B′ of the projectile supports a plurality of radial hammers 64 equal in number to the firing-pins 5 and in position to strike said pins, when the protecting-sleeve 56, a solid portion of which is normally interposed between the hammers and the pins, as in Fig. 1, is moved to bring its holes 60 in line with the pins to expose them to the hammers. As shown in Fig. 1, each radial hammer 64 has its head held just behind and in contact with the exterior wall of the projectile-head, and is seated upon a spring 65, yieldingly holding the hammer outward against said wall and against the force of which spring the hammer is moved inwardly to strike the pin should the projectile hit the target on its side instead of head on. A stop-pin 66 is employed to hold the hammers in place during assemblage.

In operation, at the moment of the propulsion of the projectile along the gun-barrel, the shock of the setback of the sleeves 53 56 and the spring 55, contained between them, is sufficiently great to move them rearward and to shear the screw-pin 54, thereby disconnecting said sleeve from the body 50 and bringing both rearwardly against a buffer 67, provided on the ring 47. This rearward movement of the two sleeves causes the incline of the recess 59 to force the two-part locking-bolt 58 outwardly, so that the two sleeves are no longer held together, whereupon the spring 55, after the acceleration of the projectile ceases, moves the protecting-sleeve 56 forward into the position shown in Fig. 2, at the same time holding the recessed sleeve 53 in its rearmost position against the buffer 67. In the forward movement of the protecting-sleeve its forward end enters an annular pocket 68, formed in the extension 50^a, and, fitting said pocket, snugly cushions against a small body of air trapped therein, which may be regulated in any proper manner, and the sleeve may be locked in this position by a spring-pressed bolt 88, supported by the fuse-body in position to interlock with a recess 89 in the sleeve. In the forward position of the sleeve 56 the holes 60 have been brought in line with the firing-pins 5, so that the radial hammers are free to act to strike one or more of such pins, and the holes 61 have been brought in line with the holes 62, so that the balls 38 may leave their places, and thus no longer act to lock the retainer 36 against movement. Such is the condition of the fuse during the flight of the projectile. At the moment the projectile strikes the target the retainer 36, due to its inertia and the consequent retardation of the projectile, jars off its seat or moves forward against the pressure of the spring 37, and thus releases its

hold of the ends of the hammers 41, which thereupon are forcibly rocked outwardly in opposite directions under the force of their springs 43 to strike the caps on the nipples or anvils 1, as in Fig. 3, whereby the train in the channels 3 is fired.

The fire from the time-train in the channels 3 ignites the flocculent gun-cotton in the chamber 46, and this in turn ignites the gunpowder in the central case 31, which in turn explodes the fulminate in the case 33, and the latter detonates the dry gun-cotton in the case 49, which in turn detonates the main charge of explosive carried by the body of the projectile, as is usual. In practice the vent *a* from the flash-channel 2 and the ends of the time-train channels 3, entering into the chamber 46, will be plugged or covered with some suitable paper or cloth washer *b*, which will be waterproof and cemented down in place, and likewise there will be a similar washer *c* covering the perforation leading to the fulminate-case 33, so as to divide or separate the different charges of explosive from each other and confine them in place. So, too, the slidable blocks 42, bearing against the heels of the hammers 41, will be held by the springs 43 off from the shoulders *e*, so that in the setback, at the moment the projectile is propelled through the gun, the shoulders will stop the rearward motion of the blocks 42 and relieve the springs of the shock incident to the setback, and thus avoid their breaking. The walls of the fuse-body surrounding or adjacent the rear chamber 46 are made thinner, as at *x*, than at other portions, and the powder-case 31 supports a cap-anvil 31^a, protected by a fragile cap 31^b, immediately behind and not touching a solid portion of the fuse-body, so that should the projectile and fuse-body be crushed by the impact with the target the collapse of the body will first be had at the weak portions *x* and the cap on the anvil 31^a be exploded to fire the powder in the case 31 and detonate the fulminate in the case 33.

In the modification shown in Fig. 6 the weighted retainer 36 is confined to its seat by a spring-seated bolt 70, which is normally held in place by the overlying solid portion of the protecting-sleeve 56; but when the sleeve moves forward into the position shown in Fig. 2 the bolt is free to drop outwardly under pressure of the spring through the hole 61 and thus release the retainer 36. In addition to the freeing of the hammers 41^a the weighted retainer 36, after being released by the bolt 70, acts itself as a hammer to strike a forward firing-pin 10 to explode a cap on the anvil 11 to ignite, through the flash-channels 12, the time composition in the longitudinal channels 3. The anvil 11 and flash-channels 12 are provided in a central head-block 13, forming the end of the chamber 40^a, the spring 37 being interposed between said head and the retainer 36. The head 13 also supports another anvil 14, projecting forwardly and supporting a cap adapted to be struck at the proper time by a rearwardly-moving hammer-sleeve 15. This hammer-sleeve is connected at its front end to an inwardly-movable exterior head 16, forming the head of the projectile and normally held in place against movement by a shearing-pin 17. This head 16 is arranged to be moved, as indicated by dotted lines, when striking a water-target or other object, which may be struck head on by the projectile, the movement of the head being opposed by a suitable spring 18, interposed between said movable head and an annular cup-shaped seat formed at the inner end of an inwardly-projecting sleeve 19, carried by the cap of the projectile 53. Normally the hammer 15 of the movable head 16 is locked against movement by a bolt 20, spring-pressed outwardly, which bolt in turn is held in locking position by the eccentrically-shaped head on the longitudinally-moving pin 21, (see also Fig. 7,) which pin is held in place by a shear-pin 22, and its end is arranged to be struck by the end of the protecting-sleeve 56 when said sleeve moves forward to its foremost position (shown in Fig. 2) in the manner before described. The sleeve thus strikes the pin 21, shears its shearing-pin 22, and moves the eccentric head from contact with the bolt 20 and allows said bolt to spring outwardly, having released the hammer-sleeve 15, so that such sleeve may operate to explode the cap on the anvil 14 should the movable head 16 be moved inwardly when the projectile strikes the target. The operation of the hammers 41^a is similar to that of the hammers 41, before described. They differ somewhat in construction in that they are mounted on separate pivots 6^a.

In the modification shown in Fig. 8 a tubular form of hammer 36^a is arranged to move forward at the proper time under the pressure of the spring 36^b to strike one or the other or all of a number of firing-pins 10^a to ignite caps on the anvils 11^a to ignite the time composition in the channel or channels 3, as before. The hammer 36^a is locked in place by a pair of two-part bolts 36^c, which are confined against accidental displacement by the overlying solid portion of the protecting-sleeve 56, which bolts or the outward parts of them are arranged to be freed by the alinement of the hole or holes 36^d in the sleeve 56 when the sleeve has moved to its foremost position. The inwardly-movable head 16 in this case, instead of moving a hammer-sleeve, as in Fig. 6, is connected to and moves a taper-ended bolt 15^a, the taper of which is arranged, when the head 16 is moved inward, to bear against the inner ends of the two-part bolts 36^c and move them outwardly, and thus free the hammer 36^a and permit it to be projected forward by the spring 36^b to strike one or all of the firing-pins 10^a.

In the modification shown in Fig. 9 the taper-ended bolt 15^b is locked in place by one or more locking-bolts 20^a, which are released by the alinement of a hole 20^b in the protect-

ing-sleeve 56. The hammer 36^e in this case is arranged to move rearwardly against caps on anvils 11^b, said hammer being projected by a spring 36^f, mounted between the hammer and a flange on the taper-ended bolt 15^b. The hammer is held in place by shearing-pins 36^i and, as before, is locked in place by a pair of divided locking-bolts 36^c, which are arranged to be displaced to release the hammer by the inward movement of the taper end of the bolt, as before, the spring 36^f being strong enough to shear the pins 36^i to entirely free the hammer.

In the modification shown in Figs. 10 to 13, inclusive, different means are shown for locking and releasing the weighted retainer 36 and thereby releasing the hammer 41. The retainer is held in its seat against the end of the body 50 in Fig. 10 by the abutting end of a front sleeve 71, that is mounted to slide in a central opening in the forward extension 50^c of the body portion of the fuse, said sleeve being locked in place by a two-part locking-bolt 72 against the pressure of a confined spring 73. Within the sleeve is mounted a rod 74 with a flared head, the rod being connected to the sleeve by a shear-pin 75, which on the setback at the moment of propulsion of the projectile in the gun is sheared, so that the rod may move rearwardly, moving by the incline or flare of its head the two-part locking-bolt 72 from place and thereby releasing the sleeve 71 and permitting the spring 73 to move the sleeve forward and release its end from contact with the retainer 36, thereby freeing the retainer, so that at the moment of impact with the target such retainer will move forward against the force of the spring 37 to release the hammers 41, which are of the construction previously described.

In Fig. 11 the weighted retainer 36 is locked in place by the end of a bolt 74^a, that is mounted within a sleeve 76, carried by the head of the extension 50^c of the fuse. The bolt is locked in place against the pressure of a confined spring 73^a by a two-part bolt 72^a, which bolt is arranged to release the bolt 74^a at the setback by the movement of the sleeve 77, whose inclined or flared inner surface bears against the two-part locking-bolt and moves it inwardly, the inner part into a recess in the bolt 74^a. The sleeve 77 is held in place against premature movement by a shearing-pin 75^a.

In the construction shown in Fig. 12 the central bolt 74^b is mounted rigid with the head of the body 50 of the fuse, over which bolt is a sleeve 71^a with its inner end holding the retainer 36 securely in place through a plurality of interposed balls 71^b. Said sleeve is held rigid with the central bolt by the two-part bolt 72^a, the outer end of which bears against the inner surface of another sleeve 77, the inclined or flared surface of which on the setback moves the two-part bolt inwardly and releases the sleeve 71^a from the bolt 74^b, so that the confined spring 73^a is free to move the sleeve 71^a forward to remove its inner end from holding the balls 71^b and thus release the retainer 36, so that the latter is free to move forward at the moment of impact of the projectile with the target. The sleeve 77 is held in place, as before, by a shearing-pin 75^a. Instead of the central bolt 74^a of Fig. 11 holding the retainer 76 by direct contact, the balls 71^b, as in Fig. 13, may be interposed between the bolt and the retainer, the operation being the same as that described in connection with Fig. 11.

In the modification shown in Figs. 14, 15, and 16 the hammers 41^b are simple spring-blades supported at their inner ends by a block 80 in a removable head 81, held in a seat at the rear of the body 50, the block being held in place by a screw-threaded sleeve 82. The ends of the spring-bladed hammers are headed and confined by the retainer 36, as before, the retainer being held in place by a central bolt 74^c. This bolt is mounted in a central perforation in the front cap-piece 44^a, secured to the body portion of the fuse, and is secured in position by a two-part bolt 72^c, that is arranged to be moved to release the bolt 74^c by a longitudinal bolt 21^a, mounted in the body 50 in position to be struck and moved forward by the protecting-sleeve 56 as the latter moves to its foremost position in the manner before described. The longitudinal bolt 21^a is held against premature movement by a shearing-pin 21^b, and its forward end is inclined to engage and move the two-part bolt 72^c inwardly, such movement being had against a spring 72^e, mounted in the head of the central bolt 74^c. In the forward movement of the sleeve 56 its end meets the bolt 21^a and moves it forward, as shown in Fig. 15, releasing the two-part bolt 72^c and allowing the central bolt 74^c to move forward under the pressure of the confined spring 73^a, thus releasing the retainer 36. Upon the retardation of the projectile on striking the target the retainer 36 moves forward, as in Fig. 16, releasing the hammers 41^b and allowing them to strike the caps on the anvils 1 through the interposed firing-pins 1^a in a manner similar to that before described.

In the construction shown in Figs. 17 and 18 each of the hammers 41^c is pivoted on an independent pin 6^c with its heel having a small roll bearing upon a block 42^a, spring-pressed by a spring 43, as in the structure shown in Fig. 1. Each hammer is held from premature movement and is borne upon in front of its pivot by a rod 83, the head of which is spring-pressed outwardly, but is confined in place in the normal position of the parts by the overlying solid portion of the protecting-sleeve 56, and adapted to release the rods when said sleeve, due to the setback before described, is in its foremost position by the alinement of a hole 84 in the sleeve with each rod 83. Between the hammers extends a trigger in the form of a conical-headed rod 36^n, forming the tailpiece of a weighted sphere or other shaped piece 36^m, that is seated against

the front end of a centrally-perforated cap-piece 85, interposed between the hammer-chamber 40 and the front chamber 40^a, which is closed by the cap 44, and in which front chamber the weighted piece 36^m moves upon the retardation of the projectile. In normal position the hammers 41^c are locked against movement, also confining the trigger-weighted piece 36^m against movement by the action of the protecting-sleeve 56, through the rods 83 before referred to, the line of contact of the rolls on the rear ends of the hammers with the spring-pressed blocks 42^a being such that the tendency of the blocks upon the hammers is to force their front heads inwardly. Upon the setback the rods 83 are released and fall from place, and at the moment of retardation or impact of the projectile with the target the weighted piece 36^m moves forward by its momentum, so that its conical inclined or wedge-shaped tailpiece rocks the hammer-heads outwardly, changing the position of the point of contact of the hammer-rolls with the blocks 42^a, as in Fig. 18, each of which is thereupon free to operate to force each hammer under spring-pressure against a firing-pin 1^a to explode the cap upon the anvil 1, with results similar to those previously described.

In Figs. 19 and 20 other forms of hammers 41^d 41^e are shown adapted to the structures herein described. In Fig. 19 the pair of hammers are acted upon by a single helical spring 43^d, confined between them just in front of their pivots 6^d, the hammers being retained in position ready to strike by the weighted retainer 36. (Indicated by dotted lines.) In Fig. 20 the pair of hammers 41^e, mounted upon pivots 6^e, are acted upon by spring-blades 43^e, the hammers being held in position to strike the caps by the retainer 36, as before. It should be remarked that the freedom with which the retainer 36 shall release the ends of the hammers may be governed by the shape of the recess 6^i, in which the hammer-heads project in the retainer. Thus if the recess be undercut, as indicated, the freeing of the hammers will be less delicate, and if such recess be formed the reverse of undercut the holding action of the retainer will be exceedingly delicate, and thus any degree of sensitiveness to movement may be provided for.

In Fig. 21 the weighted retainer 36 is held in place by an inclined rod 38^a, which in turn is confined by the protecting-sleeve 56 and released when the sleeve is in its foremost position by the coincidence of a hole 61^a in the sleeve with said rod 38^a. The retainer in this structure holds in striking position a ball-shaped hammer 41^i through the interposition of another ball *m*, which is located in an opening in the wall of the body 50, separating the retainer-chamber 40^e from the hammer-chamber 40^i. When the retainer 36 moves forward at the moment of impact of the projectile with the target against the pressure of its spring 37, the ball *m* is released by the retainer and is forced into the chamber 40^e by the pressure of the spring 43^i, which is then free to suddenly project the hammer 41^i forward against the firing-pin 1^a to explode the cap, as before, with like effect.

In the modified structure shown in Figs. 22 to 24, inclusive, the tubular or sleeve shaped hammer 41^f is mounted in a central chamber of the fuse-body 50 with its rear wall seated against a confined spring 43^f and held in such position compressing said spring by a pivoted detent 86, that is arranged to be tripped at the proper time by the rocking of a trigger-lever 87, one end of which lever is in position to be struck by the forward blow of a trip or ball 88, seated in the tubular portion of the hammer 41^f. The detent 86 is locked in holding position by a bolt 38^f; that is confined by the solid portion of the protecting-sleeve 56, which bolt is freed by the coincidence of a hole 61^f in the sleeve when the sleeve is in its foremost position, as before described. The ball 88 is yieldingly confined in place by the bent-down ends of a spring-blade 89, carried by the hammer 41^f, and is also locked in place and released by the protecting-sleeve in a manner similar to that of the bolt 38^f. At the setback on the propulsion of the projectile through the gun the protecting-sleeve 56 releases the bolts 38^f and 90 and places the parts in condition for action. On the impact of the projectile with the target, the hammer 41^f still being held by the detent 86, the trip or ball 88, due to its momentum, forces the ends of the spring-blade 89 aside and suddenly strikes the lever or levers 87, which in turn rock the detent 86, freeing the hammer 41^f, which thereupon is forced forward by the spring 43^f to strike the firing pin or pins 41^a as before and with like effect.

It may be stated that while the fuse fully charged and set ready for insertion in place in the projectile is being handled and transported, it is preferred to lock the parts against accidental movement, as by a pair of pins 8 locking the hammers 41, and by a thumb-screw 91 locking the sleeve 56 securely to the fuse-body, as in Fig. 5, and locking the bolts and sleeve of the structure shown in Figs. 10 to 12, as indicated by dotted lines, which pins 8 and screw 91 will be removed just previous to placing the fuse in position in the projectile.

It will be understood that while I have illustrated the several novel features as combined in a single fuse part thereof may be used independent of others and in other kinds of fuses.

What is claimed is—

1. In an automatic fuse, the combination with the cap-anvil and the hammer, of a trip or trigger normally holding the hammer against movement, a lock for the trip, and a sleeve to release the lock, as set forth.

2. The combination with a pair of hammers, of a single trigger holding the hammers in striking position and free to move by momentum at the moment of impact with the target, and a releasable lock for the trigger released

by the setback at the moment of propulsion, as set forth.

3. The combination with a fuse having a plurality of exteriorly-projecting firing-pins, of a plurality of hammers adapted to strike said pins, and a longitudinally-movable shield or sleeve movable to expose said pins to the hammers, as set forth.

4. The combination with the fuse-body supporting a number of exteriorly-projecting firing-pins, of a number of radially-mounted hammers for said pins, and a protecting-sleeve surrounding the fuse-body and normally covering the firing-pins, and adapted to move at the setback to expose the pins, as set forth.

5. The combination with the fuse-body, supporting a number of exteriorly-projecting firing-pins, of a number of radially-mounted hammers for said pins, a protecting-sleeve surrounding the fuse-body and normally covering the pins, and a spring for moving the sleeve forward to uncover said pins, as set forth.

6. The combination with the fuse-body, supporting a cap-anvil and a hammer for exploding the cap, of a longitudinally-movable shield or sleeve and a part or body interposed between the sleeve and hammer normally holding the hammer against movement and releasing the hammer upon the movement of the sleeve, as set forth.

7. The combination with a pair of spring-pressed hammers and their respective cap-anvils, of a weighted trigger holding the hammers in position to strike and a spring for the trigger compressible on the movement of the trigger due to its momentum, as set forth.

8. The combination with the fuse-body, its cap-anvil and hammer, of a spring-pressed longitudinally-movable protecting-sleeve normally preventing the hammer from striking the cap, another sleeve coöperating with the protecting-sleeve, a two-part locking-bolt locking the sleeves together, and means for releasing the bolt to permit the protecting-sleeve to move forward, as set forth.

9. The combination with the fuse-body, its cap-anvil and hammer, of a spring-pressed longitudinally-movable sleeve, a locking-bolt normally locking the sleeve against movement, means for releasing said bolt, and another bolt for locking the sleeve in position after movement, as set forth.

10. The combination with the fuse-body, its cap-anvil and hammer, of a spring-pressed longitudinally-movable sleeve surrounding said body and normally preventing the hammer from striking the cap, a lock for normally holding the sleeve against movement, means for releasing the lock at the setback and an annular front recess on the fuse-body forming a front air-cushion seat for the sleeve, as set forth.

11. The combination with the fuse-body, its cap-anvil and hammer and having a rear chamber in communication with the flash-channel of the anvil, a cap-anvil projecting into said rear chamber toward a solid portion of the fuse-body and a collapsible wall to said chamber to permit the cap on said anvil to be exploded by impact with the solid portion of the body, as set forth.

12. The combination with the fuse-body having a collapsible wall, of a cap-anvil supported axially of the fuse-body and an opposed transverse striking portion of the fuse-body, as set forth.

13. The combination of the chambered fuse-body, its cap-anvil and hammer, of a front cap closing the end of the body and having a handle for bodily handling the fuse, as set forth.

14. The combination of the fuse-body, its cap-anvil and hammer, a rear fulminate-case carried by the body and portions of material insensitive to the vibrations of the metal portions of the fuse interposed between said case and the fuse-body, as set forth.

15. The combination of the fuse-body, its cap-anvil and hammer, a rear powder-case and fulminate-case, and a gland holding both in place to the fuse-body, as set forth.

In witness whereof I have hereunto signed my name in the presence of two witnesses.

JOHN RAPIEFF.

Witnesses:
GEO. H. GRAHAM,
H. N. LOW.