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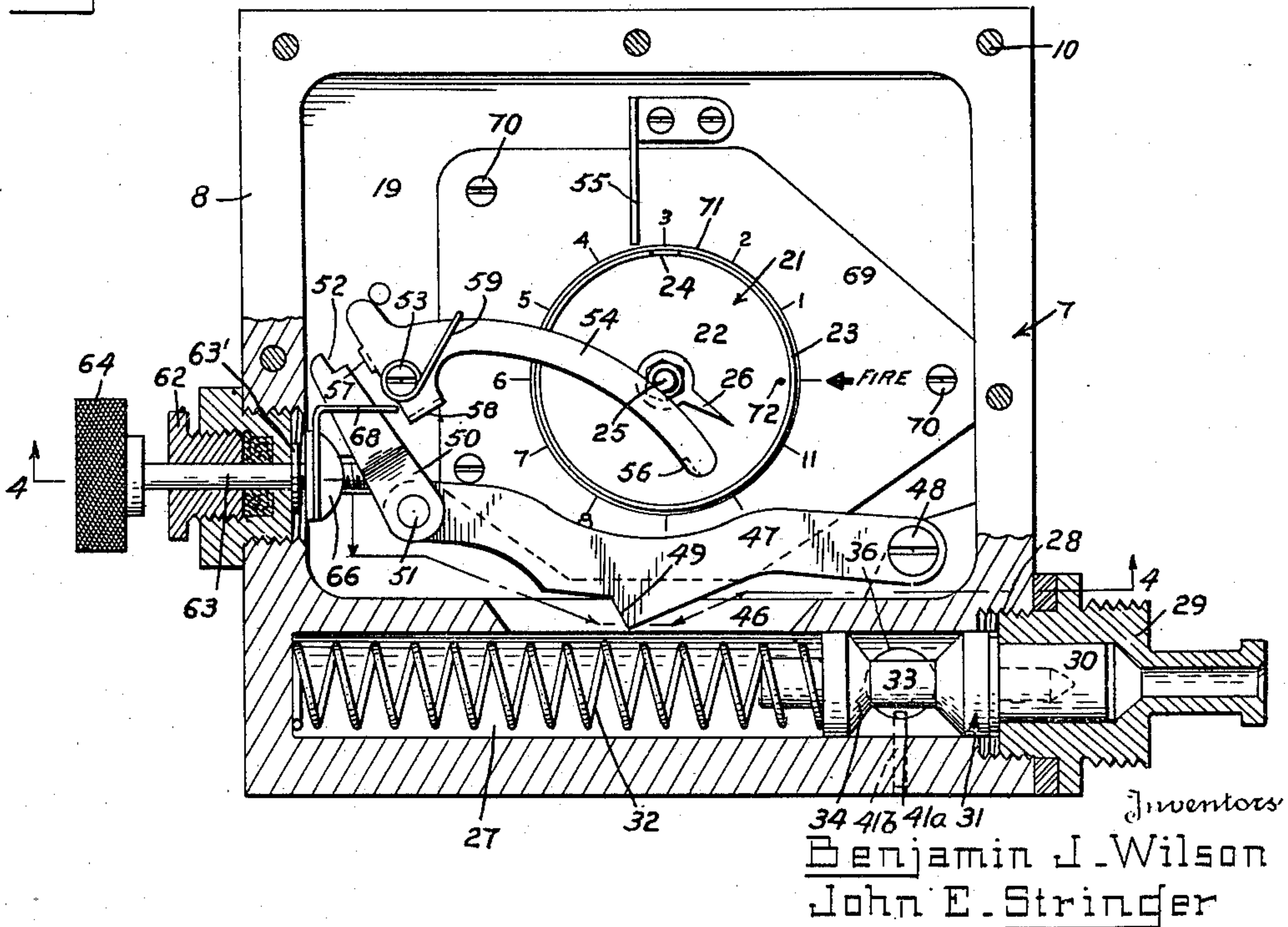
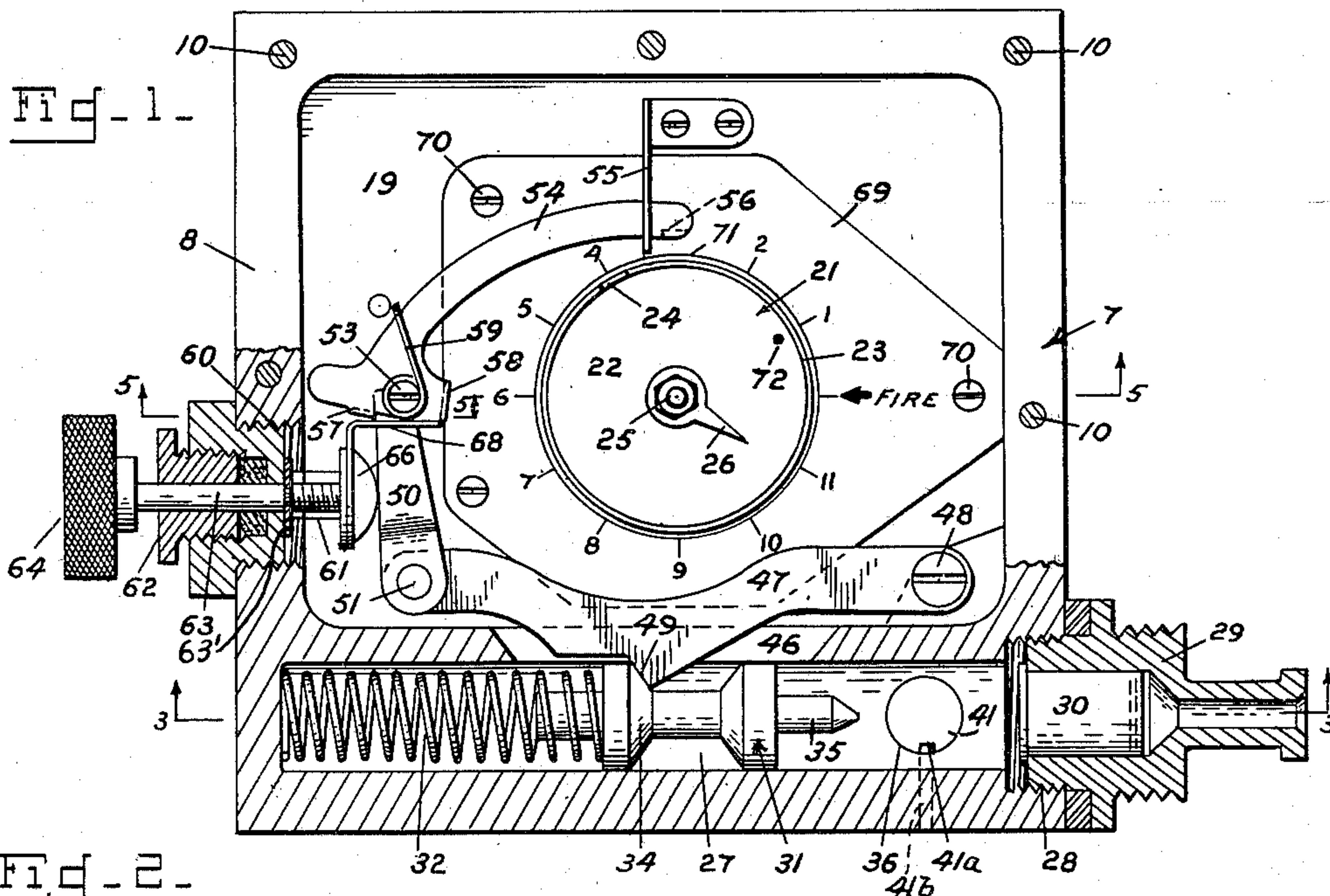
B. J. WILSON ET AL

2,485,949

DELAY ACTION FUSE

Filed July 18, 1945

2 Sheets-Sheet 1



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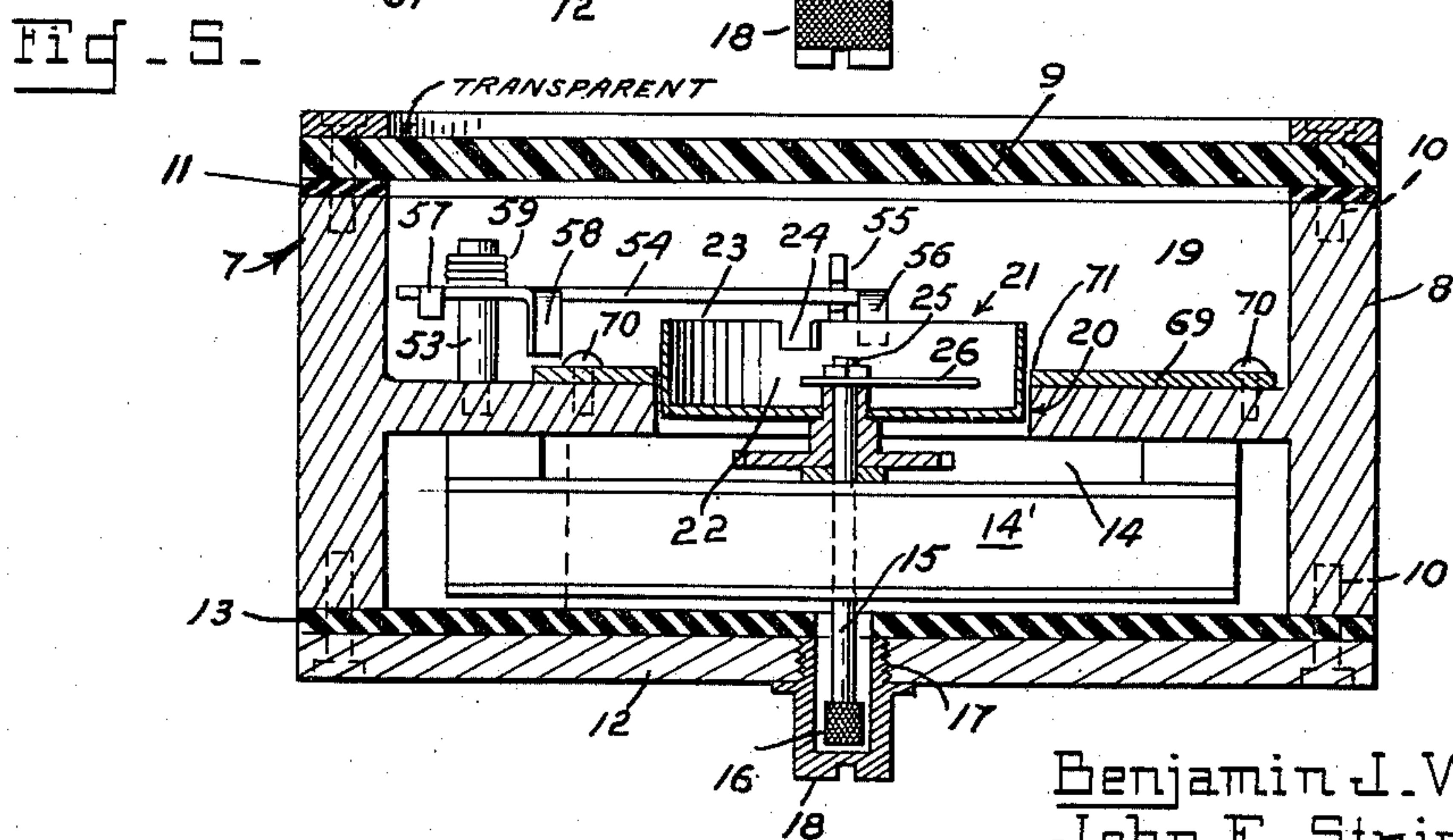
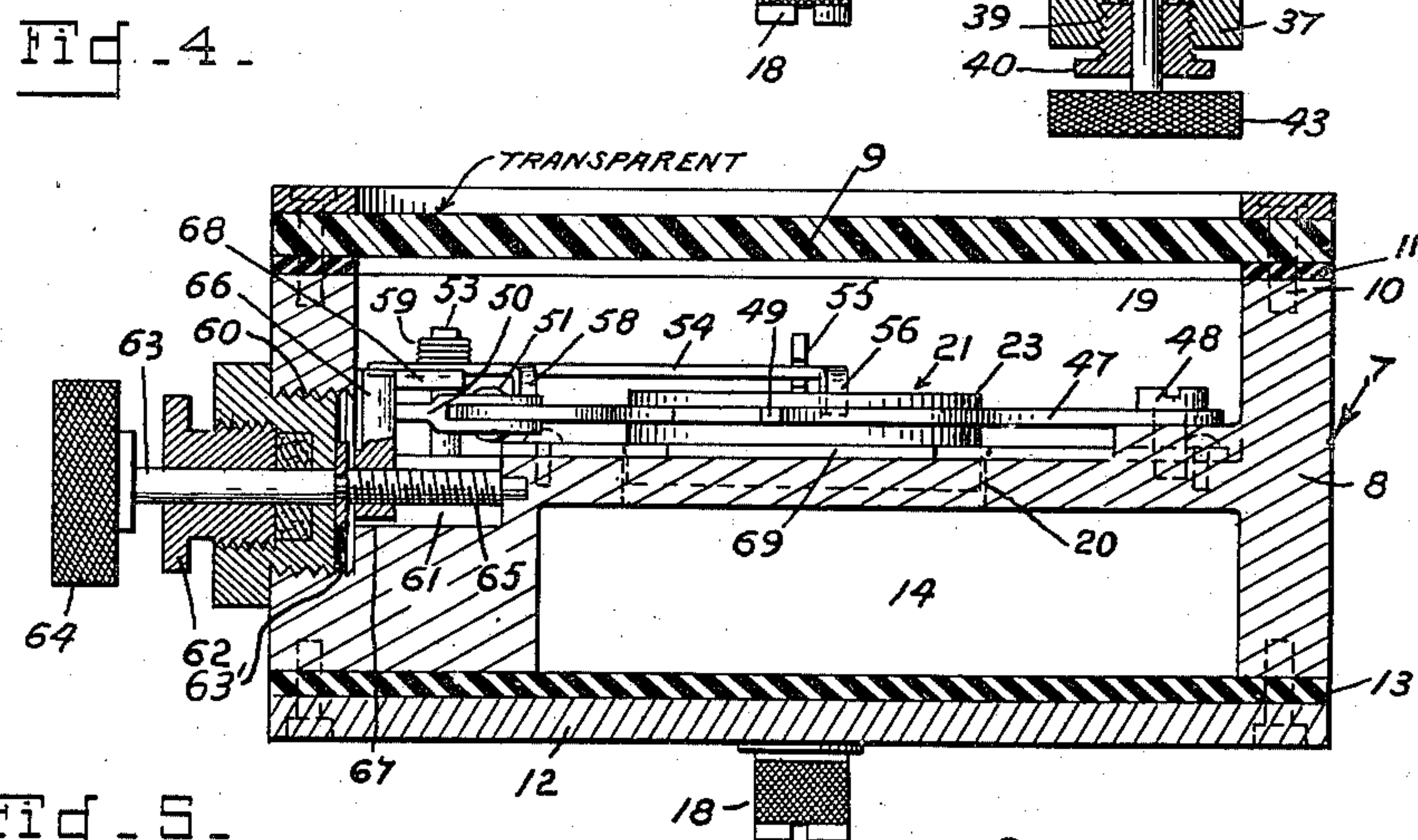
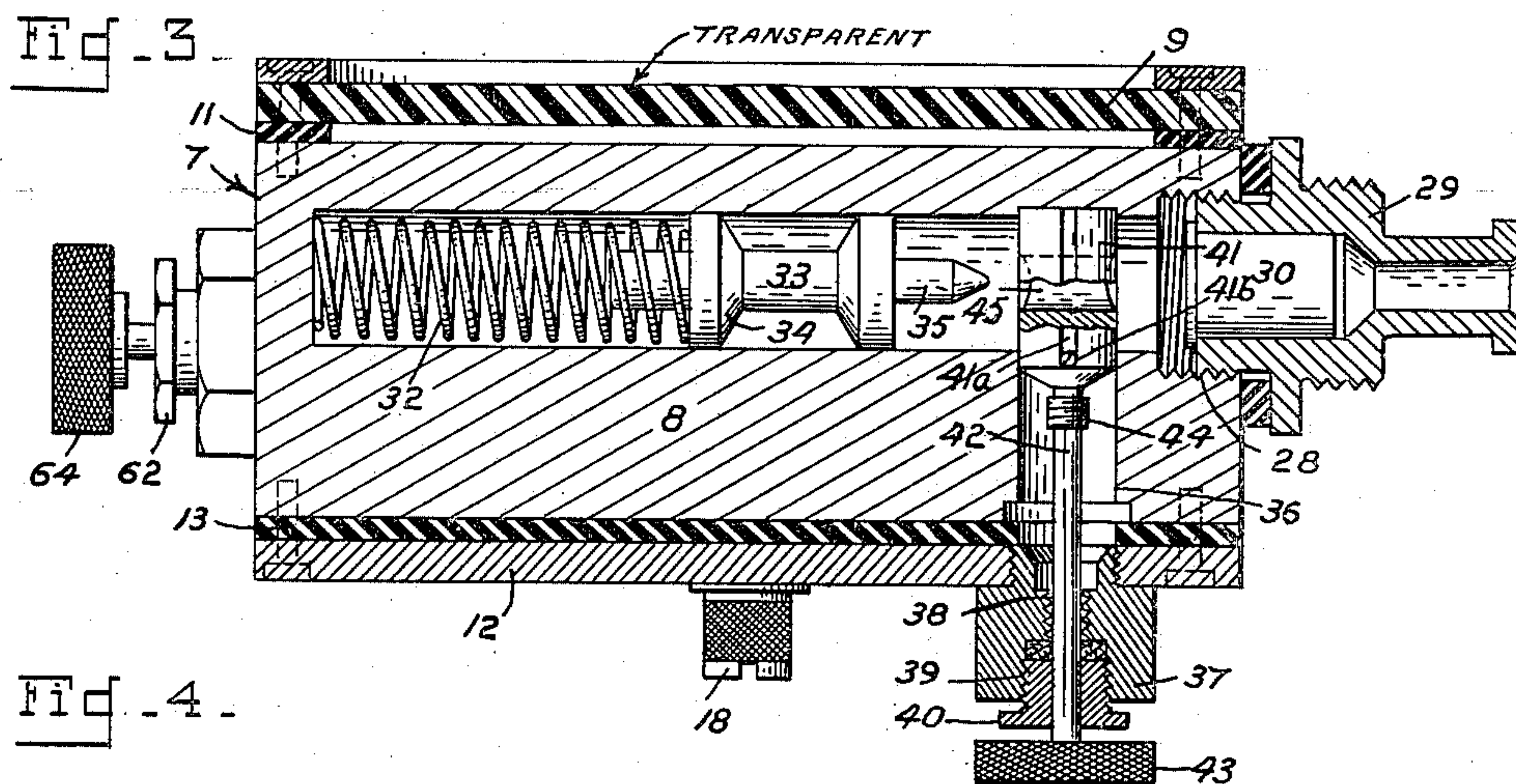
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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DELAY ACTION FUSE

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3 Claims. (Cl. 102—84)

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This invention relates to improved delay action type fuze to be used for detonating explosive charges and which is suitable for use in detonating submerged charges at a predetermined, future time.

More particularly, it is an aim of the invention to provide a novel construction of fuze, which is entirely of a mechanical construction and which includes a time measuring mechanism, such as a watch or clock movement, capable of being readily set and wound from the exterior of the fuze housing; which is provided with means to provide precision setting of the time mechanism, and which is further constructed so that the mechanism is protected from the effects of strong magnetic fields.

Delay action fuzes now used employ a chemical action for detonating the fuze at a predetermined future time, which chemical is extremely sensitive to variations of temperature, so that the exact time of detonation of the fuze cannot be exactly predetermined. It is therefore a primary object of the present invention to overcome this disadvantage by providing a mechanical fuze capable of being accurately set, and equipped with time measuring means which will function accurately to detonate the fuze at the desired future time, and which is not subject to variation due to changes of temperature.

Still another object of the invention is to provide a fuze, of the above described character, capable of being equipped with an inexpensive watch movement which is rugged and durable, which will minimize the possibility of failure to function, and which will enable the fuze to be accurately set to function at the desired time.

A further object of the invention is to provide a fuze having a safety means interposed in the path of the projected movement of the firing pin, which will prevent the functioning of the firing pin until said means is moved to a fuze arming, retracted position, and which will be held by the firing pin, to prevent retraction of said means, should the firing pin be prematurely released from a cocked position.

Another object of the invention is to provide a fuze having a window portion through which the setting of the time mechanism is clearly visible and also through which the position of a movable safety member can be seen.

Other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawings, which illustrate a preferred embodiment of the invention, and wherein:

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Figure 1 is a top plan view, partly in section, of a time delay fuze constructed in accordance with the invention;

Figure 2 is a view similar to Fig. 1 but showing the fuze parts in released positions;

Figure 3 is a cross sectional view taken substantially along the plane of the line 3—3 of Fig. 1;

Figure 4 is a cross sectional view taken substantially along the plane of the line 4—4 of Fig. 2; and

Figure 5 is a cross sectional view taken substantially along the plane of the line 5—5 of Fig. 1.

Referring more particularly to the drawings, wherein like reference characters designate like or corresponding parts throughout the several views, the fuze includes a fuze housing, designated generally 7, including a body portion 8, which is preferably formed of metal, and a transparent top wall or cover 9, which is preferably formed of a plastic. Cover 9 is detachably secured to the upper surface of the body 8 and along the edges thereof by means of a plurality of screw fastenings 10, and a sealing gasket 11 is interposed between the parts 8 and 9 to provide a watertight connection. The housing 8 also includes a detachable bottom portion 12 which is secured to the opposite side or face of the body 8 by means of additional fastenings 10. The bottom wall 12 includes an inner ply 13 of any suitable sealing material such as a plastic which forms a liquid-tight seal between the parts 8 and 12. The back cover 12 is formed of iron, which, due to its close proximity of the balance wheel of the time mechanism, not shown, reduces magnetic intensities sufficiently so that they do not affect the accuracy of the time mechanism.

The body 8 is provided with a bottom cavity 14 which is adapted to contain the time measuring mechanism 14', the mechanism therein being not shown, and which, as previously mentioned, preferably consists of a watch movement of simple inexpensive construction which will be rugged, durable and efficient in operation. The time measuring mechanism 14' includes a setting stem 15 which is provided with a knurled outer end 16 which extends outwardly through an opening 17 in the bottom wall 12, 13. The opening 17 is internally threaded to receive a cap 18 in which the knurled end 16 is normally contained. The time measuring mechanism is also provided with a winding stem, not shown, which similarly extends through the wall 12, 13 and which is also enclosed within a cap, corresponding to cap 18.

The upper part of the housing body 8 is provided with a cavity 19 containing a circular recessed portion 20 and in which is rotatably mounted a member 21. The member 21 includes a bottom portion 22 having an upstanding annular wall 23 which is provided with an upwardly opening notch 24. A shaft or arbor 25 extends upwardly through the time mechanism 14' and is concentric with the bottom 22. The shaft or arbor 25 is driven by the time measuring mechanism 14', in a conventional manner, to make one revolution each hour. A minute hand 26 is keyed to the upper end of the arbor 25 so as to rotate in the annular walled member 21. The annular walled member 21 is also connected to the time measuring mechanism 14' in a conventional manner as in the case of the ordinary hour hand of a watch or clock and driven at a speed of one complete revolution in a period of twelve hours.

Referring to Fig. 2, the body portion 8 along one side thereof is provided with a bore or barrel 27 having an open internally threaded end 28 which opens outwardly of one side of body 8 and which is adapted to be closed by means of a conventional percussion cap base or primer holder 29, which is recessed to contain a primer or percussion cap 30, the head of which is disposed at the inner end of the base 29 and within the barrel 27. A firing pin, designated generally 31, is slidably mounted in the barrel 27 and is spring urged towards the percussion cap 30 by an expansion spring 32, one end of which abuts against the rear end of the firing pin 31, and the opposite end of which bears against the closed end of the barrel 27. The firing pin 31 is provided with a recessed intermediate portion 33 the rear end of which is defined by an annular cam surface 34. The firing pin 31 is provided with a restricted, pointed projection 35 at its forward end which is adapted to strike and detonate the percussion cap 30 when the firing pin is moved from a cocked position, as seen in Fig. 1, toward a projected position, as seen in Fig. 2, by its spring 32. Referring to Fig. 3, the housing 7 is provided with upwardly extending bore 36 which extends through and slightly beyond the barrel 27, adjacent its open end 28. Bore 36 has an outwardly opening end which is formed by the bottom wall 12, and which is internally threaded to receive a stuffing box 37 which is provided with an inner, restricted threaded bore portion 38 and an outer threaded bore portion 39. A bushing member 40, forming a part of stuffing box 37, threadedly engages bore portion 39. A safety stop member 41 is slidably mounted in the bore 36 and is provided with a stem 42, which extends from the outer end thereof through the bores 38 and 39 and which slidably and turnably engages the bushing 40. The stem 42 is provided with a knurled knob 43 on its outer end by means of which the stop member 41 can be projected and retracted within the bore 36, relatively to the barrel 27. The stem 42 is provided with a fixed threaded collar 44 which is engaged with the threaded bore 38, when the stop 41 is in a retracted position, by rotating the knurled knob 43. It will be readily apparent that the stop 41, when in an operative position, as seen in Fig. 3, functions to retain the fuze 6 disarmed by being disposed in the path of movement of the firing pin 31 and between the firing pin and the primer 30, and thereby prevents detonation of the primer 30 until the stop 41 has been retracted. Stop 41 is provided with a keyway 41a which cooperates with a key pin 41b so as to align a transverse opening 45 to receive projection 35 if the

firing pin 31 is inadvertently released from its cocked position prematurely. It will be readily apparent that if the projection 35 engages the opening 45 it will prevent the stop 41 from being retracted to arm fuze 6, to thereby indicate that the fuze parts have been inadvertently released and that the fuze is not capable of being used until the firing pin has been recocked, as will be described.

The inner side of the barrel 27, as seen in Figs. 1 and 2, is provided with a slot 46 which opens into the upper chamber or cavity 19. A sear 47 is pivotally mounted at one end thereof by means of a pin 48, which extends into the body 8, within the chamber 19. The sear 47 is provided with a laterally offset intermediate portion which extends through the slot 46 and which includes an inclined shoulder or face 49 which bears flush against the cam surface 34, when the sear 47 is in an operative position, as seen in Fig. 1. An arm 50 is pivotally mounted by means of a pin 51, at one of its ends, to the free end of the sear 47. As best seen in Fig. 2, the arm 50 is provided with a notch 52 at its free end, which opens outwardly of said end and laterally from the inner edge of the arm 50, for a purpose which will hereinafter be described.

A post 53 is anchored in the body 8 and extends upwardly therefrom into the chamber 19. A detent lever 54 is rotatably connected at one end thereof to the post 53 and is provided with an arcuately shaped shank. The detent 54, adjacent its opposite, free end, normally engages in a bifurcated guide 55 which is anchored to the bottom of the chamber 19. The free end of the detent 54, beyond the guide 55, is provided with a struck-out, downwardly projecting tongue 56, as best seen in Figs. 4 and 5. The pivotally mounted end of the detent 54 is laterally enlarged and, as best seen in Fig. 5, is provided with a downwardly extending lug 57 on one side of post 53 and a downwardly extending trip arm 58 on the other side of the post 53. A torsional spring 59 is wound around and anchored to the post 53 and has one end thereof engaging against the outer edge of the detent 54 for urging the detent 54 to rotate in a clockwise direction about the post 53.

One side edge of the body 8 is provided with an internally threaded bore 60 which communicates with a channel 61 which is formed in the body 8 and which opens upwardly into the chamber 19. A stuffing box 62 is in threaded engagement with bore 60 and a stem 63 turnably engages the stuffing box 62 and is provided with a knurled knob 64 at its outer end. Stem 63 is provided with an integral threaded extension 65, on its inner end, which is disposed in the upwardly opening channel 61. A split washer 63' retains the stem 63 in position relative to the channel 61, as more clearly shown in Figure 4.

As best seen in Fig. 4, a stop 66 is provided with a restricted depending section 67 which is loosely disposed in the channel 61 and which is provided with a threaded bore which engages the threaded portion 65 for reciprocating the extension 67 within the channel 61 when stem 63 and the threaded extension 65 are rotated. Stop member 66 is disposed in the chamber 19 and is positioned for movement toward and away from the arm 50 from an operative position, as seen in Fig. 1, to an inoperative position, as seen in Fig. 2. As best seen in Figs. 1 and 2, stop 66 is provided with an arm 68 which is fixed thereto and which projects toward the center of the fuse 6 and which

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is disposed substantially parallel to the stem 63 and above the arm 50.

A plate 69 is secured by means of fastening 70 to the bed of the chamber 19 and is provided with an opening 71 which surrounds the annular wall 23. The upper surface of the plate 69, around the opening 71 thereof, is suitably inscribed with circumferentially spaced markings and numerals from "1" to "11" arranged therearound in numerical order in a counterclockwise direction so that the markings and numerals are spaced equal distances apart except for the space between numerals "1" and "11," the distance between which numerals is twice the distance between any of the other two numerals. Between the numerals "1" and "11," the plate 69 has inscribed thereon an inwardly directed arrowhead and the indicia "fire." The minute hand 26 is preferably coated with a radium substance and the disc or bottom portion 22 is provided with a dot 72 of the same material.

In order to set the fuse 6, preparatory to firing, firing pin 31 is retracted to its position of Fig. 1 and is engaged and held in a cocked position by the shoulder 49 of the sear 47. The notch 52 of arm 50 pivoted on the sear 47 engages post 53 for holding the sear 47 of the firing pin in an engaging position. When detent 54 is disposed, as seen in Fig. 1, with its free end in the guide 55, the lug 57 engages behind the bill, formed by the notch 52, and positively retains said notch in engagement with post 53. The stop member 41 being advanced into obstructing relationship to the barrel 27, as seen in Fig. 3, forms one part of the safety means to prevent full release of the firing pin 31, and a second part of this safety means is afforded by moving the stop member 66 forwardly and into engagement with the outer edge of the arm 50 to provide an additional means for preventing the notch 52 from being disengaged from the post 53. With the stop member 66 thus disposed, as seen in Fig. 1, the arm or extension 68 is bearing against the outer edge of the enlarged end of the detent 54 and against an edge of sear trip 58 to retain the detent 54 in a fully retracted position, as seen in Fig. 1. When the fuse parts, previously described, are thus disposed, the fuse is in a safe or disarmed position, and while thus disposed the knurled knob 16 may be rotated for setting the hour member 21 and the minute hand 26, which will cause the fuse 6 to function at any desired future time up to approximately 11¾ hours after the time that the fuse 6 is set. After thus setting the mechanism in the conventional manner, said mechanism is wound in a conventional manner. The knob 64 is then rotated to retract the stop member 66 and its arm 68 out of engagement with the arm 50 and the detent 54, respectively. This movement of knob 64 actuates means, not shown, which is in engagement with the time mechanism to release it to cause the hour member 21 and minute hand 26 to begin to revolve, both in a clockwise direction. When the stop member 66 is fully retracted from its position of Figure 1 to its position in Figure 2, it will have completely disengaged itself from the arm 50 and the detent 54. This will release the detent 54 to permit said detent to swing in a clockwise direction a slight distance until the tongue 56 at the free end thereof is bearing against the annular wall 23, against which it lies as the hour member 21 revolves. The wall 23 acts as a stop for holding the detent 54 in a retracted position until such time as the notch 24 moves into registry with tongue 56. Notch 24 is sized to permit the passage there-

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through of the tongue 56 for releasing the detent 54 to detonate the fuse 6, as will presently be described. After the time measuring mechanism is set and the stop 66 is retracted to its position of Fig. 2, if there has been no movement of the sear 47, and assuming that the charge, not shown, to be detonated by the fuse is attached to the nipple and threaded outer portion of the primer base 29, the knurled knob 43 is pulled downwardly or outwardly to retract the stop 41 out of obstructing relationship to the barrel 27; and to insure that the stop 41 will remain in its retracted position, knurled knob 43 is rotated to cause the collar 44 to threadedly engage the threaded portion 38. With the parts thus disposed, the fuse 6 is ready to be detonated when the hour member 21 has revolved in a clockwise direction sufficiently to bring the radium dot 72 into alignment with the arrowhead associated with the indicia "fire." When the radium dot 72 is thus disposed, the minute hand 26 will also be in alignment with said parts and the notch 24 will be approximately in the position as seen in Fig. 2, in which the parts 21 and 26 are shown a few moments after the release of the firing pin 31. Thus it will be readily apparent that the minute hand 26 provides means for accurately setting the hour member 21. The parts of the time mechanism are illustrated in Fig. 1, with the parts disposed when said parts still have approximately an operating time of 55 minutes before release of the firing pin 31. At the instant that the minute hand 26 and the dot 72 are aligned with the arrowhead, the notch 24 is disposed to permit the tongue 56 to pass therethrough, thus releasing the detent 54 to be moved by its spring 59 in a clockwise direction to the position of Fig. 2. The clockwise movement of the detent 54 will cause the lug 57 to move out of engagement with the outer edge of the arm 50. Immediately after the lug 57 is moved out of engagement with the outer edge of the arm 50, the sear release detent portion 58 strikes the inner edge of the arm 50, to positively kick the notch 52 out of engagement with the post 53 to thereby release the sear 47. The sear 47 is rocked in a clockwise direction, from its position of Fig. 1 to its position of Fig. 2, by the camming action of the coacting cam surfaces 34 and 49, due to the pressure exerted by the firing pin spring 32, to thus release the firing pin 31, which is then spring-biased forward by spring 32 to strike and detonate percussion cap 30 for setting off the explosive charge attached to the outer end of the primer base 29.

All of the moving parts which project from the housing 7 are rendered liquid-tight by means of packing, and the joints of the housing parts are provided with liquid-tight sealing gaskets so that the fuse can function while in a submerged position and, due to the transparent top wall or cover 9, the operator is enabled to set the fuse 6, while it is in a submerged position, by viewing the position of the fuse parts through the window thus afforded.

Various modifications and changes are contemplated and may obviously be resorted to without departing from the spirit and scope of the invention as hereinafter defined by the appended claims, as only a preferred embodiment of the invention has been disclosed.

We claim:

1. A delay action fuze comprising a housing adapted to receive a time measuring mechanism therein, a part adapted to be driven by the time measuring mechanism, a detent disengageably

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held by said part, a spring pressed firing pin, and a sear means engaging and holding the firing pin in a retracted, cocked position, said sear means detachably engaging the detent and being releasably held in engagement with the firing pin thereby, said detent having a lug bearing against the sear means for retaining it in an operative position in engagement with the firing pin, said lug being movable out of engagement with the sear means by the movement of the detent to a released position, and a tongue on the detent disposed to engage and trip the sear means toward a released position, when the detent is released.

2. A delay action fuze comprising a housing adapted to receive a time measuring mechanism therein, a rotatable annular wall adapted to be driven by the time mechanism, a pivotally mounted detent having a free end spring biased into engagement with the wall, a spring projected firing pin, a sear means pivotally mounted at one of its ends and having a portion engaging and holding the firing pin in a retracted, cocked position said sear means having a free end portion pivotally supporting an arm engaging the detent for holding the sear means in engagement with the firing pin, said annular wall having a notch for passage of the detent free end when the wall is in one position, said detent, when released by its free end thereof passing through the notch, being spring biased to a position to release said arm of the sear means, and said sear means and firing pin having co-acting cam surfaces for camming the sear means out of the path of the firing pin, and said detent having a lug for engaging the free end portion of said arm and which is movable out of engagement therewith when the detent is released by the annular wall, and a tongue on the detent for tripping said arm to insure release of said sear means.

3. A delay action fuze comprising a housing adapted to receive a time measuring mechanism therein, a rotatable annular wall adapted to be driven by the time mechanism, a pivotally mounted detent having a free end spring biased into engagement with the wall, a spring projected firing pin, a sear means pivotally mounted at one of its ends and having a portion engaging and hold-

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ing the firing pin in a retracted, cocked position, said sear means having a free end portion pivotally supporting an arm engaging the detent for holding the sear means in engagement with the firing pin, said annular wall having a notch for passage of the detent free end, when the wall is in one position, said detent, when released by its free end thereof passing through the notch, being spring biased to a position to release said arm of the sear means, and said sear means and firing pin having co-acting cam surfaces for camming the sear means out of the path of the firing pin, and a safety for engaging said arm and detent, when in an operative position, to lock said parts in cocked position for disarming the fuze, said safety being retractable to release said arm and detent, to arm said fuze, said safety comprising a stem rotatably mounted in a wall of said housing in operable relationship to said arm, one portion of said stem extending outwardly of said wall of said housing and terminating in a knob for manual rotation of said stem, the opposite portion of said stem extending inwardly of said wall of said housing into the cavity of said housing and threadedly, movably supporting a stop member having a stop arm affixed thereto, said stop member and said stop arm engaging or disengaging said arm and said detent.

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