

July 9, 1946.

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2,403,845

SUBMARINE MINE

Filed Sept. 23, 1941

Fig. 1.

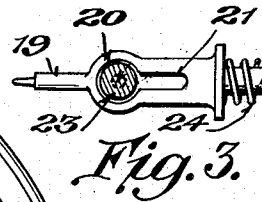


Fig. 3.

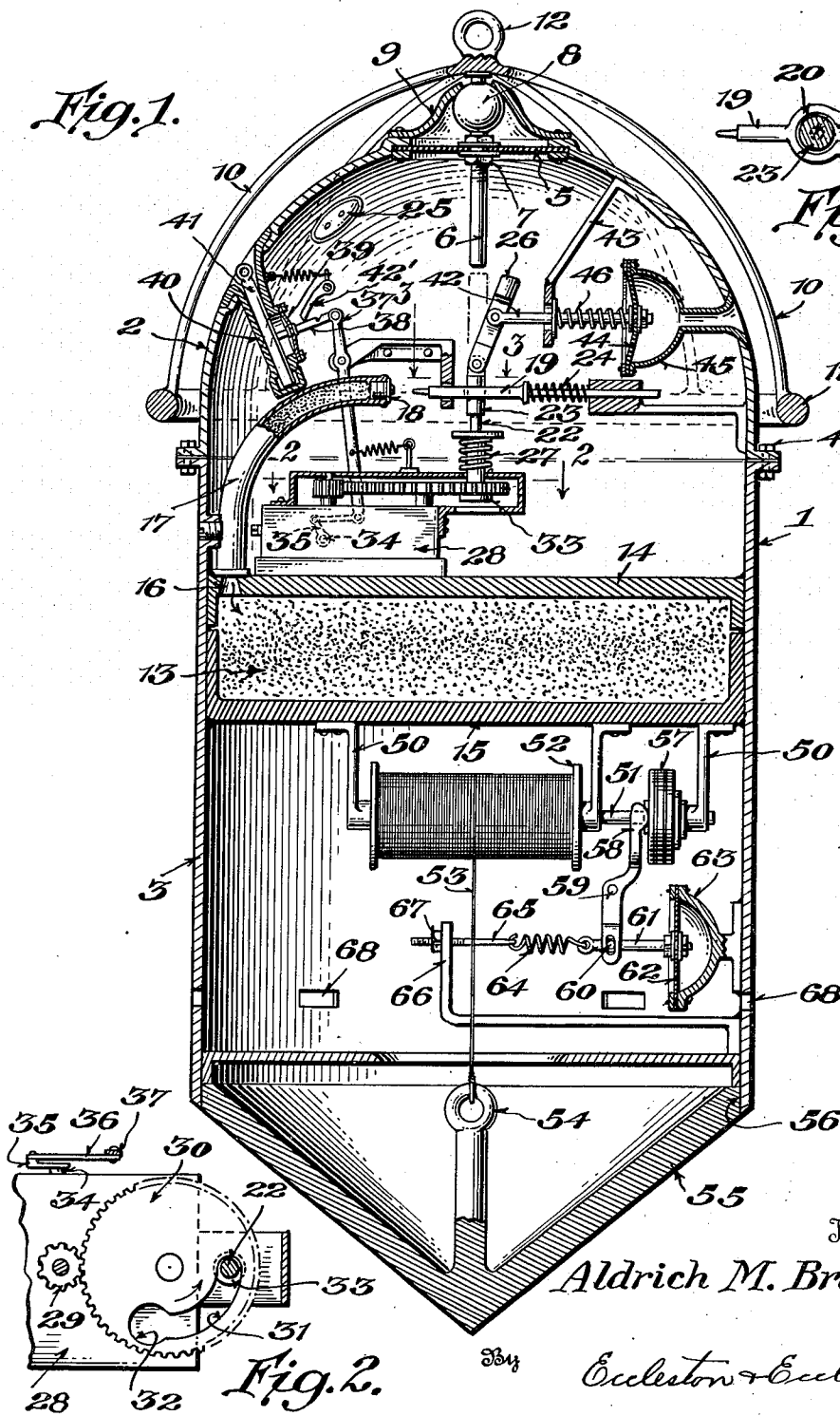


Fig. 2.

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UNITED STATES PATENT OFFICE

2,403,845

SUBMARINE MINE

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Application September 23, 1941, Serial No. 412,023

5 Claims. (Cl. 102—17)

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This invention relates to submarine mines adapted to be sown from aeroplanes or ships, and has for its primary object to generally improve apparatus of that type.

More particularly it is an object of the invention to provide a submarine mine which will readily explode on contact with a ship or other object at the proper depth in the water, and yet which is provided with such safeguards as to prevent accidental explosion while being transported and laid.

Another object of the invention consists in providing a submarine mine which will automatically explode if for any reason it should break away from its anchorage and rise to the surface of the water, thereby eliminating hazards to shipping in peace time.

A further object of the invention resides in the provision of a combined mine and anchor which is of relatively light weight due to the fact that a light anchor wire or cable may be employed, because even if the wire should eventually break, no great damage would be done inasmuch as the mine would automatically explode as it approached the surface of the water.

Other objects and advantages of the invention will be apparent from the following description when taken in connection with the accompanying drawing, in which,

Figure 1 is a vertical longitudinal section through the mine.

Figure 2 is a fragmentary sectional view taken on line 2—2 of Figure 1, and

Figure 3 is a similar view taken on line 3—3 of Figure 1.

Referring to the drawing in more detail, the numeral 1 refers to the casing of the mine which is preferably formed of steel and consists of upper and lower sections 2 and 3 bolted together as indicated by numeral 4.

The extreme top of the casing is provided with an opening in which is secured a diaphragm 5 serving as a movable mounting for a pin 6 which extends through the center of the diaphragm and is suitably secured thereto as indicated by numeral 7. The portion of pin 6 above the diaphragm is provided with a ball 8 cooperating with a socket member 9 secured to the exterior of the casing member 2. Fixed to the upper end of the pin 6 are a plurality of radially-arranged downwardly curved arms 10 rigidly united at their lower ends to a contact rim 11 encircling the casing and which is somewhat greater in diameter than the casing and is therefore spaced from the casing throughout its periphery. It

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will be apparent therefore that motion transmitted to the rim 11 from any horizontal direction whatever will be in turn transmitted to the arms 10 and pin 6 by reason of the flexible mounting of the latter. The contact rim 11 and arms 10 are preferably made of resilient material and of as small dimensions as possible so as to avoid deformation or distortion when brought into contact with the surface of the water at high speed. The ball and socket connection 8—9 between the pin 6 and casing 2 is supplemental to the diaphragm connection 5 and has for its purpose to carry the load in handling and in dropping the mine, and to this end the pin 6 is provided with a ring or eye 12 directly above the ball and socket connection.

The explosive charge of the mine is indicated by numeral 13 and is disposed between the horizontal partitions 14 and 15 which are preferably welded to the inner wall of the lower section 3 of the casing. The upper partition 14 is formed with an aperture 16 providing communication with an arcuately shaped tube 17 filled with a slow burning powder and carrying a percussion cap 18 at its upper end. The cap 18 is adapted to be engaged by a striking pin or plunger 19 under certain conditions, and the means for controlling the operation of the plunger will now be described.

A plan view of the plunger 19 is shown in Figure 3 and it will be noted that the plunger is provided with a flattened portion in which is located a circular opening 20 and communicating slot 21. Extending through the opening 20 is a vertically disposed pin 22 provided with an enlargement 23 which is normally positioned within the opening 20. In this position the pin locks the plunger against movement by its spring 24 and hence prevents firing of the percussion cap 18. If the pin 22 is allowed to move upwardly however so that its narrow portion is brought into alignment with the slot 21 then the operation of the spring 24 will drive the plunger into the percussion cap and explode the mine when the fire has traveled through the slow burning powder to the main explosive charge. A hand hole plate 25 is provided to facilitate insertion or removal of the percussion cap 18.

In order to normally prevent explosion of the mine until the rim 11 is engaged by a ship or the like an arm 26 is pivoted to the upper end of the pin 22 and has its upper end in engagement with the pin 6 after the mine is laid. Pin 22 is biased upwardly by a coil spring 27 and when released by a clock mechanism to be de-

scribed, will move arm 26 into engagement with the pin 6, thus "setting" the firing mechanism for later operation. Movement of the pin 6 laterally will of course free the upper end of arm 26 and the spring 27 will force the pin 22 upwardly to release the firing pin 19 as heretofore described.

To prevent accidental explosion of the mine after the percussion cap has been inserted and while the mine is being laid a clockwork mechanism 28 is employed. This mechanism is provided with a pinion 29 meshing with a gear wheel 30, the latter being provided with an arcuate slot 31 terminating in an enlargement 32 somewhat greater in diameter than the head 33 formed on the lower end of pin 22. It will be apparent therefore that the pin 22 will be released for upward movement only after the clock has operated to bring the opening 32 into register with the enlargement 33 on pin 22. The time required to bring this registration about may be varied by varying the gear ratio between the gears 29 and 30 but a period of fifteen minutes will ordinarily suffice.

The clock mechanism is normally locked against operation by a rod 34 provided with an arm 35 exterior of the clock casing. A link 36 connects the arm 35 with the lower end of a lever 37, and the upper end of the lever is provided with a pivoted arm 38 secured to a diaphragm 39. This diaphragm is mounted in a wall of a pocket 40 open to the exterior of casing 1 and therefore exposed to hydrostatic pressure. The free end of arm 38 is adapted to extend beyond the diaphragm 39 into the pocket 40 and a removable pin 41 normally located in the pocket serves to lock the arm 38 against movement and hence hold the clock mechanism against operation. The pins 41 are withdrawn when the mines are about to be sown and the timing mechanism is thus automatically released. In order that water pressure operating on the diaphragm 39 may not retract the arm 38 to thus stop the operation of the clock mechanism spring-pressed pawl 42 is provided for cooperation with a notch in the arm 38. When the arm 38 is first moved to the left upon the removal of pin 41 the pawl 42 is forced into the notch and thus locks the arm against inward movement by the diaphragm 39 through the medium of water pressure, thereby avoiding any chance of the clock mechanism being relocked prior to release of the pin 22. Upon disengagement of the head 33 from the slot 31—32 the spring 27 forces the arm 26 carried by pin 22 upwardly against the pin 6. Lateral movement of the pin 6 to disengage arm 26, as by operation of contact rim 11, or lateral movement of arm 26 due to reduction in hydrostatic pressure as will now be described, will permit the pin 22 to be forced further upward by spring 27 to thereby release the striking plunger 19 and cause the mine to explode.

It is highly desirable to avoid the presence of unexploded mines on the surface of water, and to accomplish that purpose the present construction is provided with means whereby the mine will be exploded if it rises in the water to a point where the water pressure is below that for which the apparatus is adjusted. The specific construction comprises a rod 42 pivoted to the arm 26 and slidably mounted in a bracket 43. The opposite end of the rod 42 is connected to a diaphragm 44 forming the bottom of a pocket 45 which communicates with the exterior of casing 1. A coil spring 46 encircles the rod 42 with its

ends engaging the diaphragm 44 and a portion of the bracket 43. Spring 46 therefore serves to draw the arm 26 to the inclined full-line position shown in Figure 1. However when the mine is submerged in the water at the depth to which adjusted the water pressure will flex the diaphragm to the left (Figure 1) and move arm 26 to the vertical dotted line position where it can come into contact with the pin 6 when released by the clockwork mechanism. If, for any reason the mine should rise above the depth to which adjusted the water pressure on the diaphragm will be reduced and will allow the spring 46 to come into operation and move arm 26 to the full line position, thereby releasing pin 22 and causing the mine to explode.

Having fully described the mechanism and manner of exploding the mine and the various safeguards associated therewith, the mechanism for automatically anchoring the mine at the desired depth below the surface will now be described.

Mounted in the lower portion of the casing 1 as by means of brackets 50 is a shaft 51 on which is mounted a drum 52. The required amount of wire or cable 53 is wound upon the drum and the free end of the wire is connected to an eye 54 formed on the anchor 55. This anchor is co-extensive with the width of the casing 1 and is preferably of conical shape to facilitate penetrating the surface of the water and reducing the amount of shock imparted to the mine as when dropped from a substantial height above the water; as well as to direct water sprays away from the contact mechanism. The bottom of the mine casing 1 is recessed at its lower end as indicated by numeral 56 for housing the base of the anchor, and the inner face of the anchor is preferably dished-out to improve its holding properties. By having the anchor co-extensive with the diameter of the casing it will be apparent that the anchor absorbs the impact of the water, and by housing the base of the anchor within the casing it will be apparent that the tendency for the anchor to separate from the casing upon striking the water is reduced to a minimum, thereby greatly reducing the liability of breaking the cable or anchor chain.

Also mounted on the shaft 51 is a multiple disc brake 57 with which a pivoted lever 58 is adapted to cooperate. The lever is pivoted intermediate its ends as at 59 and has its upper end in engagement with the multiple disc brake. The lower end of lever 58 is slotted and engages over a pin 60 on a rod 61 fixed to the center of a diaphragm 62. The edges of the diaphragm are hermetically sealed to the periphery of a cup 63 which has been vacuumized so as to avoid substantial fluctuations in pressure due to temperature changes which would occur if air were present. The opposite end of rod 61 is connected to a tension spring 64 which has its opposite end connected to a pin 65 secured to a bracket 66. The bracket 66 as well as cup 63, and other parts not specifically mentioned, are preferably welded to the casing.

The tension on the spring 64 may be varied by adjusting a nut 67 which connects pin 65 to the bracket 66. The spring acts upon the lever to apply the brake to the drum and this action is offset by water pressure entering the lower section of the casing through openings 68 when the combined mine and anchor descend in the water. When the pressure on diaphragm 62 is sufficiently great to extend the spring 64 the lever 58 will be

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operated to remove pressure from the disc brake and the anchor will separate from casing 1 and descend to the bottom of the body of water in which the mine is placed. The mine, due to its specific gravity will tend to rise to the surface and as soon as this happens the water pressure on diaphragm 52 will decrease. When the water pressure decreases to the extent for which the apparatus is set the spring 64 will again apply pressure to the disc brake and the mine will be firmly anchored at the desired depth below the surface of the water.

The operation of the several features of the invention have been described in connection with the description of the structural details, and further description is believed to be unnecessary, other than to say that the firing mechanism is designed for ready and reliable operation under desired conditions, and yet adequate safeguards are provided to prevent inadvertent explosions; and that by reason of the fact that the mine will explode if allowed to float to the surface a relatively light weight cable may be employed, thereby providing a combined weight of mine and anchor which is so small that a number of the devices may be carried by aeroplanes of moderate power and be readily and quickly sown in the desired areas.

In accordance with the patent statutes I have described what I now believe to be the preferred form of the invention, but inasmuch as various minor changes may be made in the details of construction without departing from the spirit of the invention it is intended that all such changes be included within the scope of the appended claims.

What I claim is:

1. A submarine mine including an explosive charge, a percussion cap associated therewith, a retractible percussion member adjacent the cap, a reciprocable pin normally retaining said retractible member in retracted position, an arm pivoted to the upper end of the pin, a flexibly mounted pin normally in contact with said arm for holding the latter against longitudinal movement, contact means for moving the flexibly mounted pin laterally, and hydrostatically-operated means for moving the arm about its pivot.

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2. A submarine mine including an explosive charge, a percussion cap associated therewith, a retractible percussion member adjacent the cap, a reciprocable pin normally retaining said retractible member in retracted position, an arm pivoted to the upper end of the pin, a flexibly mounted pin normally in contact with said arm for holding the latter against longitudinal movement, contact means for moving the flexibly mounted pin laterally, hydrostatically-operated means for moving the arm about its pivot and a time-controlled mechanism for normally retaining the reciprocable pin in operative position.

3. A submarine mine including an explosive charge, a percussion cap associated therewith, a percussion member adjacent the cap, means for firing the member against the cap, a reciprocable member for holding the percussion member in retracted position, a spring for moving the reciprocable member in inoperative position, an arm pivoted to the upper end of the reciprocable member, a flexibly mounted pin adapted to cooperate with said arm to normally prevent movement of the reciprocable member, means including a clockwork mechanism for normally retaining the reciprocable member in retracted position, and hydrostatically-operated means for retaining the member in operative position under certain conditions.

4. A submarine mine including an explosive charge, means for firing said charge, a latch for rendering the firing means inoperative, a plurality of controls for the latch including a clockwork mechanism, and means accessible from the exterior of the mine for normally rendering the clockwork mechanism inoperative.

5. A submarine mine including an explosive charge, means for firing said charge, a latch for rendering the firing means inoperative, a plurality of controls for the latch including a clockwork mechanism, means accessible from the exterior of the mine for normally rendering the clockwork mechanism inoperative, and hydrostatically-operated means for rendering the firing means inoperative except when the mine is submerged to a predetermined depth.

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