Sept. 11, 1928. 1,683,692

A. OGDEN

DEPTH CHARGE, BOMB, PROJECTILE, AND OTHER EXPLOSIVE BODIES

Filed April 5, 1926 3 Sheets-Sheet 1

Fig. 1.

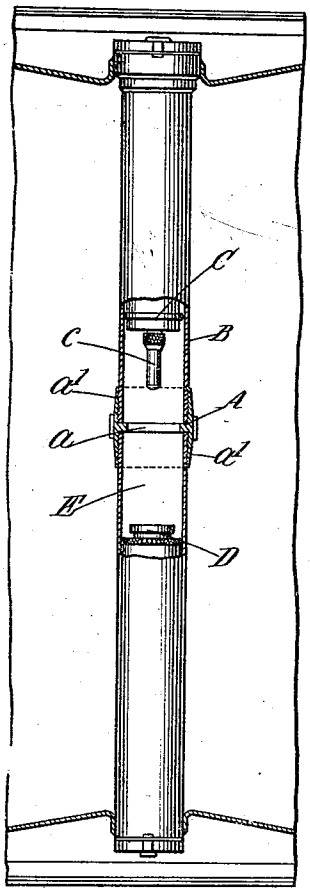

Fig. 2.

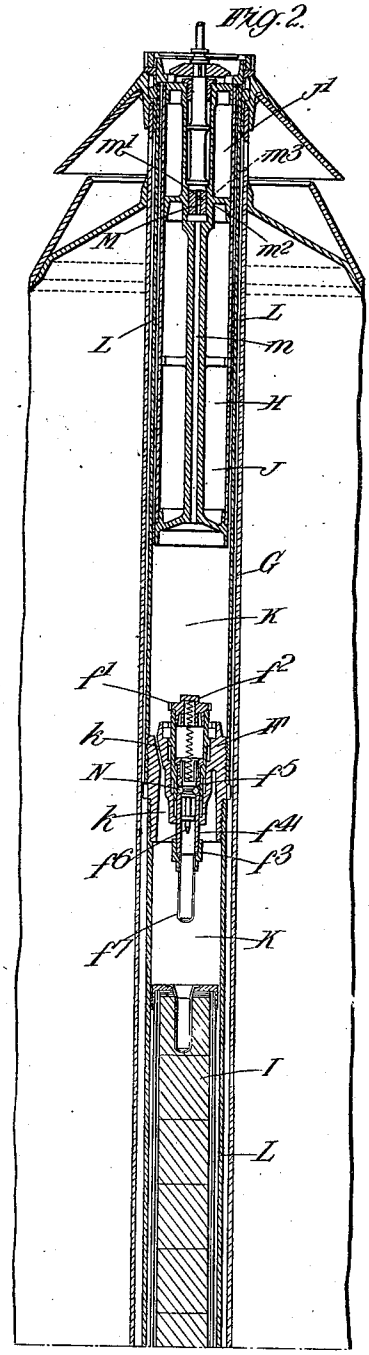

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Fig. 3.

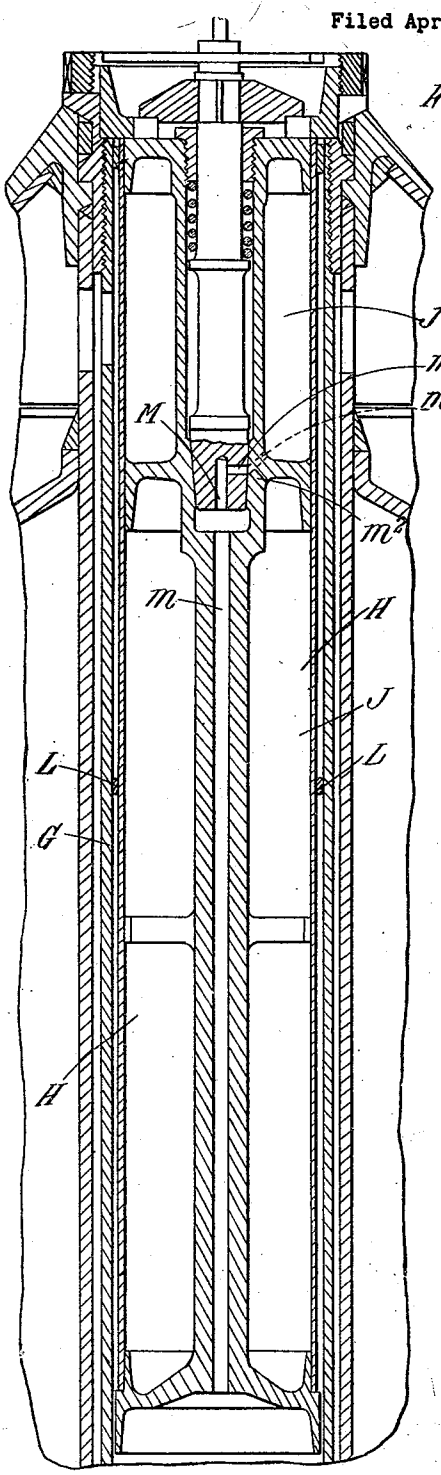
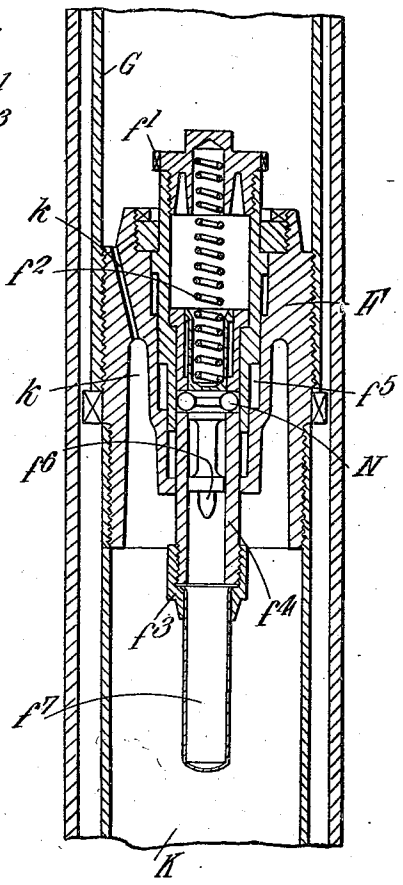


Fig. 4.



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DEPTH CHARGE, BOMB, PROJECTILE, AND OTHER EXPLOSIVE BODIES

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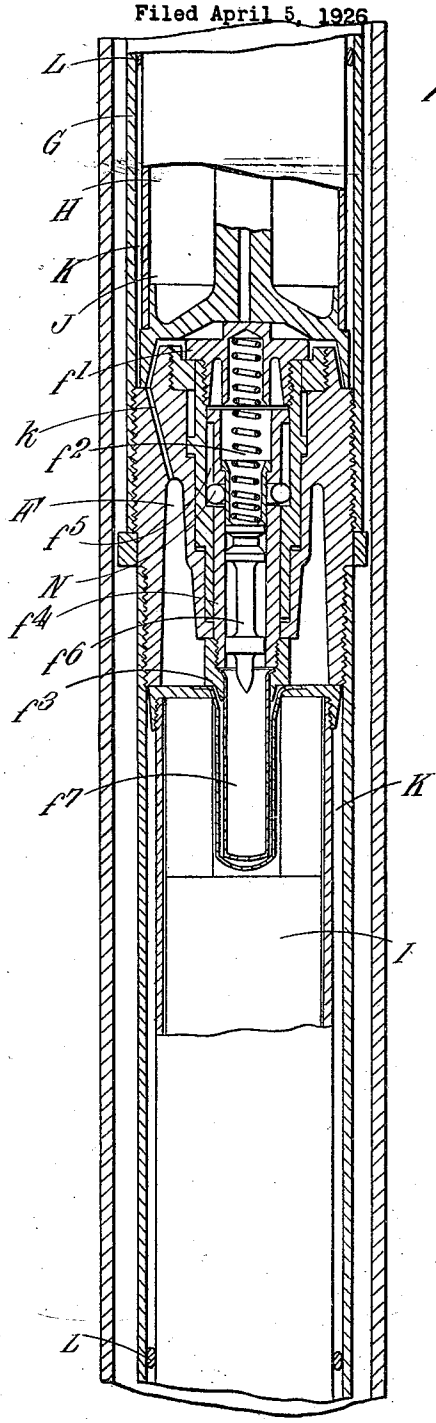
Fig. 5.



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UNITED STATES PATENT OFFICE.

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DEPTH CHARGE, BOMB, PROJECTILE, AND OTHER EXPLOSIVE BODIES.

Application filed April 5, 1926, Serial No. 99,695, and in Great Britain April 9, 1925.

This invention relates to depth charges, bombs, projectiles and like explosive bodies (hereinafter termed "depth charges") in which the firing gear comprises two units adapted to move towards one another under the influence of hydrostatic pressure. In such firing mechanism the pistol (i. e. the part which carries the detonator) usually constitutes one unit, and the primer usually constitutes the other unit. Both said units, are slidably mounted within a tube extending axially of the depth charge, and the said units are adapted, under the influence of hydrostatic pressure, to move inwards towards the centre of the depth charge so as to explode the same.

It has been found that when depth charges fitted with such relatively moving firing units are suddenly accelerated, or their movement suddenly retarded, one or other of the two units is liable to be impelled by inertia or momentum along the tube within which it is located towards the other unit, this result tending to occur when the depth charge is suddenly accelerated when being projected by a thrower or gun or on the sudden stoppage or retardation of the movement of the depth charge when the latter strikes the water or a solid substance or in cases where the depth charge is accidentally dropped while being handled.

According to the present invention safety means are provided which permit of the necessary relative movement under the influence of the hydrostatic pressure of both units towards one another to explode the depth charge, but effectually prevent any such movement of the units under the influence of inertia or momentum as would accidentally or prematurely explode the depth charge.

In order that the said invention may be clearly understood and readily carried into effect, the same will now be described more fully with reference to the accompanying drawing, in which:—

Figure 1 is a sectional view of part of a depth charge constructed according to one embodiment of the present invention,

Figure 2 is a sectional view showing a modified form of the present invention.

Figure 3 is a view on a larger scale of the upper part of Figure 2.

Figure 4 is a view on a larger scale of the middle part of Figure 2.

Figure 5 is a view similar to Figure 4 showing the parts of Figures 3 and 4 in firing position.

In the embodiment shown at Figure 1 the safety means comprise a stop device constituted by a ring like member A located at or about the centre of the axially disposed tube B within which the pistol unit C and the primer unit D are slidably mounted, said ring like member A having a central opening a through which the detonator c, carried by the pistol unit C, projects when the relatively movable parts C and D move towards one another under the influence of hydrostatic pressure and assume the firing position.

In order that the tube B may accommodate the stop ring A it is formed in two parts which are adapted to be coupled together at the centre of the depth charge by being located within a sleeve a^1 having screw threaded ends and an internal flange which projects within the tube B and forms the stop ring proper.

The pistol unit C is of the type described in my copending U. S. patent application, Serial No. 59,808, filed October 1, 1925 and includes a depth regulator for varying the depth at which automatic firing takes place. As explained in the said specification the depth regulator is provided with a number of air spaces one or more of which can be placed in communication with the main air space E located between the pistol and primer units C and D so as to increase or diminish the volume of air initially trapped between said relatively movable pistol and primer units, automatic firing being adapted to take place when the hydrostatic pressure has moved both the pistol and primer units, against the pressure of the trapped air, into correct relative firing position. Both the pistol and primer units are fitted with a rubber ring (not shown) but similar to that designated by the letter L in Figure 2.

In the modified arrangement shown at Figure 2 the depth charge pistol F is rigidly attached to the guide tube G and thus acts in a similar manner to the stop ring A shown at Figure 1, while the depth regulator H is itself movable within the tube 6, under the influence of the hydrostatic pressure, relatively to the primer unit I.

In this embodiment of the invention the depth regulator is provided with two auxiliary air chambers J and J^1 in addition to

the main air chamber K, the main air chamber K being located on each side of the pistol F and a passage *k* being provided to place the two parts of the chamber K in communication with one another.

The depth regulator H and the primer unit I are each provided with a rubber ring L located respectively between the depth regulator H and primer unit I and the tube G within which they are slidably mounted. The rubber rings L, L, maintain an airtight joint, while at the same time give very little resistance to movement. By means of these rubber rings a volume of air is strapped between the primer unit I and the depth regulator H which has to be compressed before these two members can move into a position at which they jointly operate the depth charge pistol F. The external water pressure and the internal air pressure will at any given depth be substantially the same, the hydrostatic pressure being slightly greater so as to overcome the slight friction due to the presence of the rubber rings L, L. There is, therefore, no tendency for air to leak out and due to the slight difference of pressure the rubber rings L, L effectually prevent water from leaking inwards. The initial air volume and the final compression volume provided for the purpose of regulating the depth at which firing is to take place is adjusted in advance by cutting off the volumes J and J^1 by means of a rotary valve M from communication, through the passages m, m^1, m^2 and m^3 with the main air chamber K.

In the arrangement shown at Figure 2 the depth charge is adapted to fire at 30, 120 or 180 feet. In order to fire at 30 feet the additional volumes J and J^1 are opened to the central working volume K; to fire at 120 feet the volume J is cut off; to fire at 180 feet the volumes J and J^1 are cut off. When, however, the depth charge has reached the depth at which automatic firing is to take place and is subjected to a hydrostatic pressure corresponding to any one of the said set depths the depth regulator H is pushed inwards until it strikes the pistol F and moves inwards the part f^1 so as partially to compress the spring f^2.

At the same time the primer unit I has also been moved inwards by the hydrostatic pressure along the guide tube G until it contacts with the shoulder f^3 and pushes in the detonator support f^4 also compressing the spring f^2. When both these movements are completed the balls N of a ball releasing device of common construction are free to move radially outwards into the space f^5 thus releasing the striker f^6 which moves forward and fires the detonator f^7. It will be clear that in this embodiment of the invention, in common with the embodiment described with reference to Figure 1, the pistol cannot operate until both the depth regulator and the primer units are simultaneously pushed in to the centre of the guide tube. Should the primer unit or the depth regulator move in separately, for example owing to inertia, the depth charge cannot accidentally be exploded as the pistol can only be operated by the hydrostatic pressure acting simultaneously on both units. The firing of the depth charge is therefore independent of the speed at which the depth charge sinks in the water which speed necessarily varies according to the height from which the depth charge has been dropped. For example, the speed will be greater if the depth charge is dropped from an aeroplane than will be the case if it is dropped from the deck of a surface vessel.

What I claim and desire to secure by Letters Patent of the United States is:—

1. A submarine explosive body wherein the firing gear comprises in combination two movable units which are normally out of contact with one another, means whereby, as said body sinks, both said units are moved towards each other into firing relationship at a predetermined depth of immersion, means for causing said units to explode the mine automatically as they reach said firing relationship, and safety means, located at a point between said relatively movable units, for preventing them from accidentally assuming firing relationship under the influence of inertia or momentum.

2. A submarine explosive body wherein the firing gear comprises in combination a tube, two units slidably mounted in said tube and adapted, as said body sinks, to move towards one another under the influence of hydrostatic pressure and actuate the firing gear at the set depth, and safety means substantially at the center of said tube which prevent said units, until the set depth is reached, from accidentally exploding the body under the influence of inertia or momentum.

3. A submarine explosive body wherein the firing gear comprises a guide tube, a depth regulating unit and a primer unit slidably mounted in said tube and adapted to move towards one another under the influence of hydrostatic pressure and explode the body at the set depth, and a safety device constituted by a stop ring located about the center of said guide tube.

AMOS OGDEN.