Jan. 1, 1957 G. L. FOGAL 2,775,939

DRILL MINE

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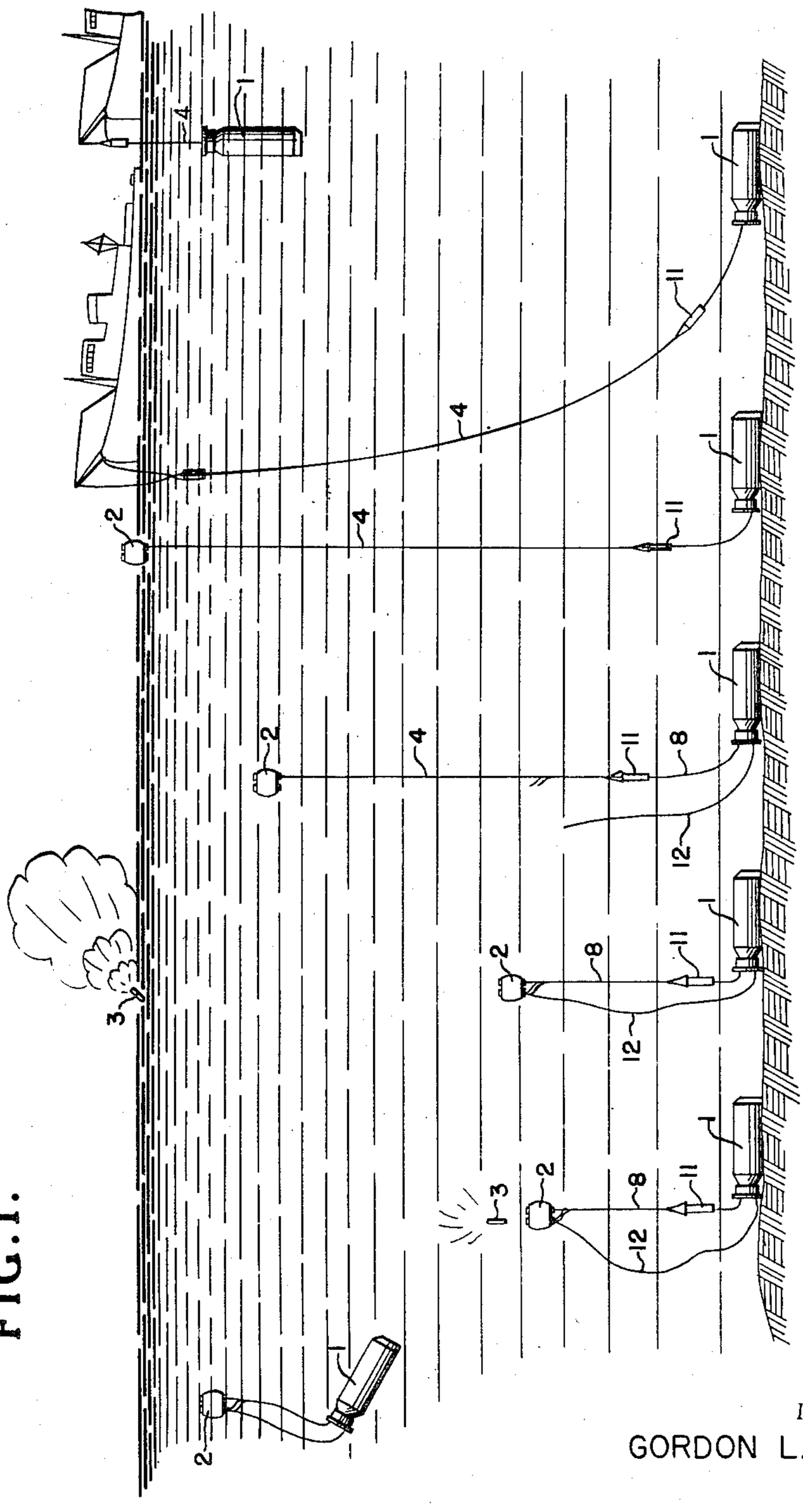

FIG. 1.

INVENTOR
GORDON L. FOGAL

BY

R. M. Hicks ATTORNEYS

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FIG.2.

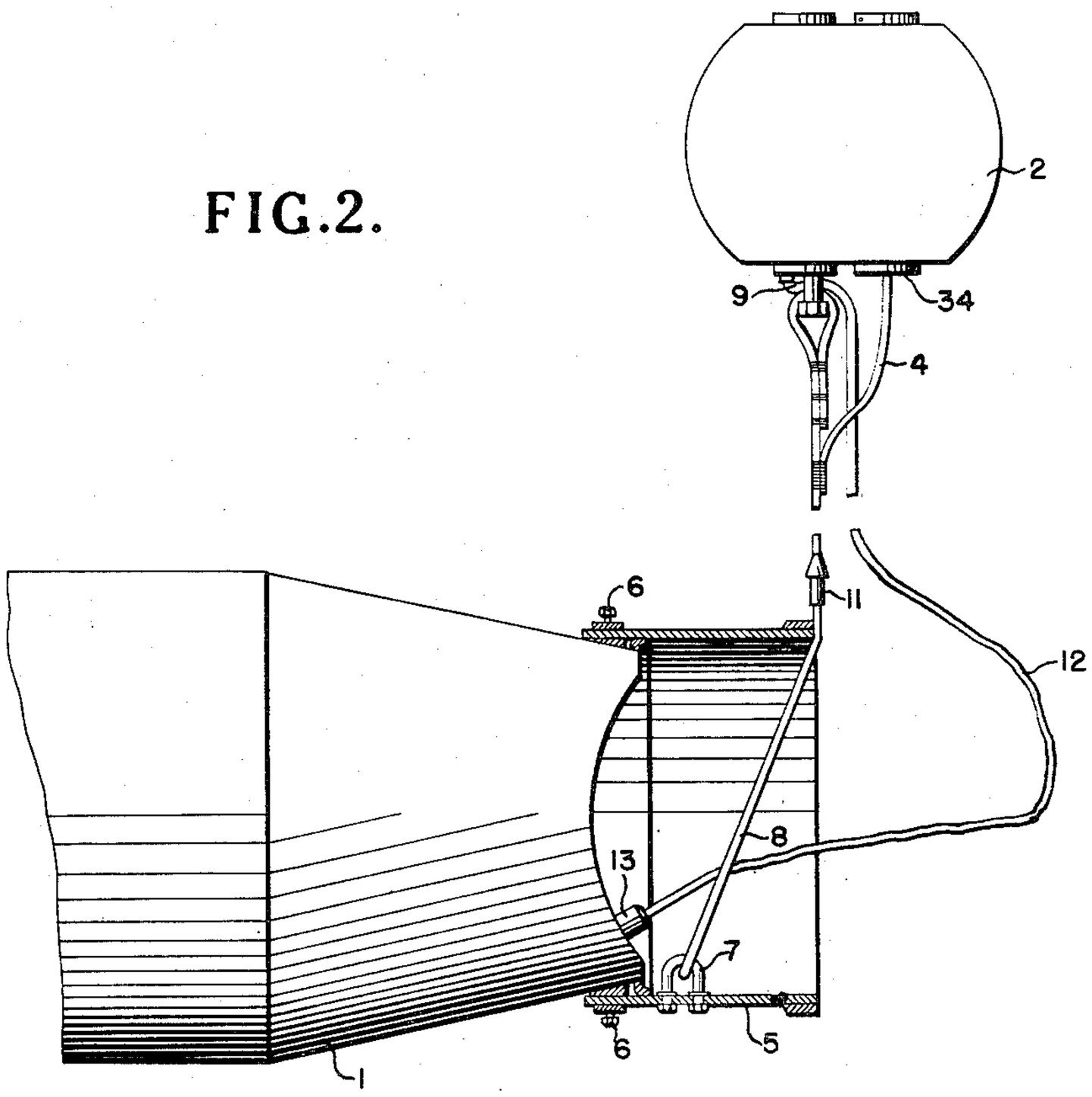
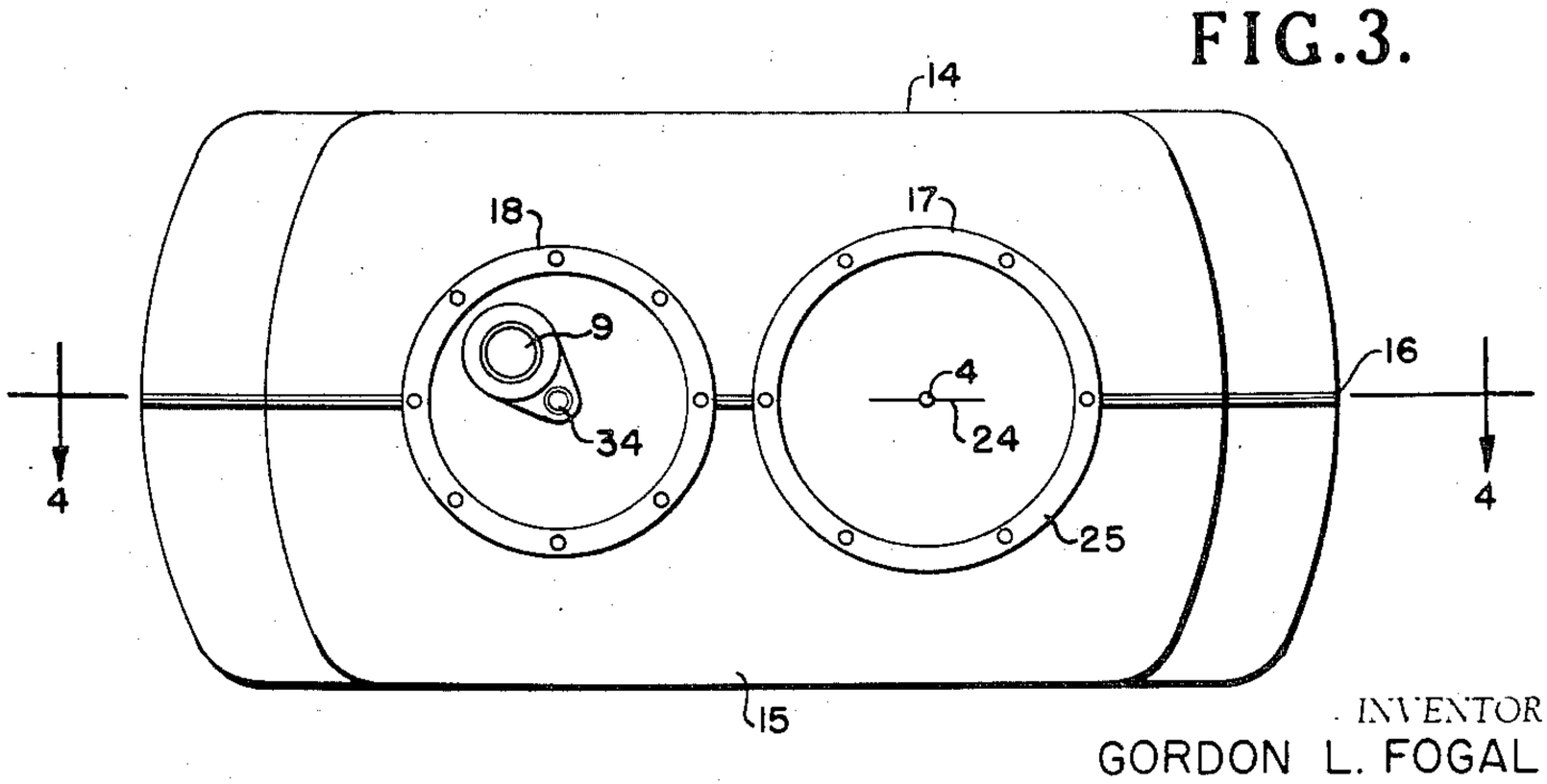


FIG.3.



INVENTOR

GORDON L. FOGAL

BY G. L. O'Brien
R. M. Hicks

ATTORNEYS

Jan. 1, 1957 G. L. FOGAL 2,775,939

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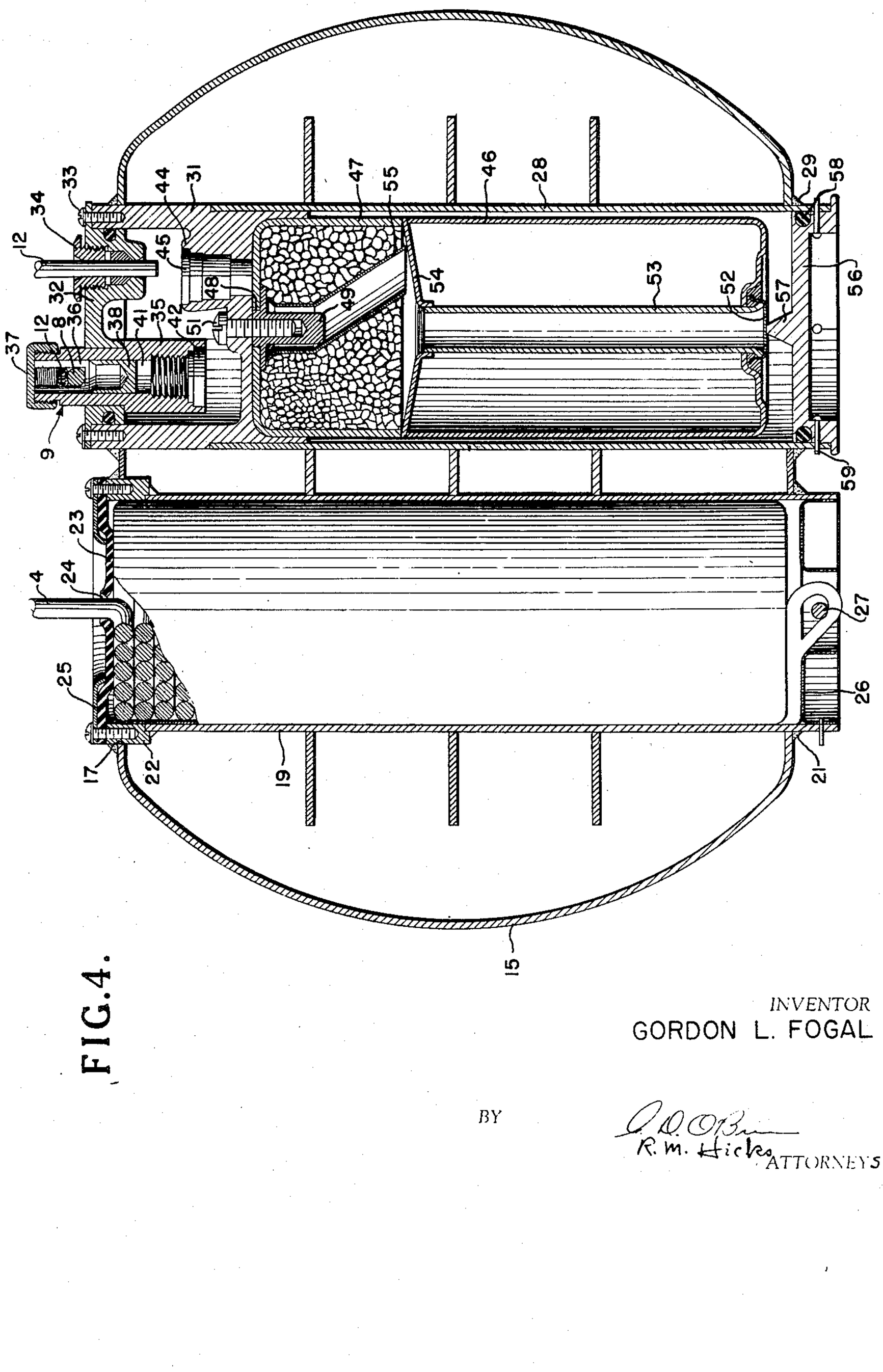

FIG. 4.

INVENTOR
GORDON L. FOGAL

BY R. M. Hicks ATTORNEYS

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DRILL MINE

Gordon L. Fogal, Silver Spring, Md., assignor to the United States of America as represented by the Secretary of the Navy

Application August 18, 1952, Serial No. 305,097

6 Claims. (Cl. 102—13)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to a float to be used in conjunction with a mine for drill purposes which includes a device for indicating actuation of the mine and which also provides means for facilitating recovery of the mine.

It is apparent that suitable means is required to indicate the actuation of mines used for drill or test purposes. Furthermore, it is necessary to provide recovery apparatus to assist in recovering the mine after actuation. Heretofore, such devices usually included a float suitably secured as by a rope to the mine. The float incorporated an explosive signaling device and a cable cutter having a detonator therein so that when a passing ship actuated the mine, the firing circuit of the mine caused the cable cutter to sever the cable connecting the float to the mine thereby releasing the float for surfacing. When the float reached the surface the signaling element was actuated thereby providing a flare and audible signal to indicate to the passing vessel that the mine had been actuated. Such devices while effective in indicating the actuation of the mine provided no suitable means for recovering the mine nor did they include a timing means to actuate the recovery apparatus a predetermined period of time after laying of the drill mine. Such a time delay is essential in order that the surfacing float will not be lost due to sweeping operations.

The present invention overcomes the disadvantages inherent in the prior art devices by providing a float which is used in conjunction with the drill mine and which includes a signaling device and recovery apparatus which are operated by electrical signals received from the mine. The float is located in the tail of the mine and is released when the mine is laid. The float normally assumes a position approximately 8 or 9 feet above the submerged mine. When a passing ship actuates the firing circuit of the mine the signal is transmitted to the float and a container is released from the float for surfacing. A chemical mixture within the container combines with the water to cause a smoke flare. After a predetermined period of time controlled by a clock mechanism within the mine the cable cutter within the float is actuated and the float surfaces uncoiling a recovery line attached to the mine. In this manner the position of the submerged mine is readily determined and the mine may be easily recovered by using any well known mine recovery apparatus such as, for example, that disclosed in the patent to W. O. Morey, 1,811,241, issued June 23, 1931.

An object of the present invention is to provide a float to be used with a mine for drill purposes, the float including both signaling means and recovery apparatus.

Another object of this invention is to provide a float to be used with a drill mine in which the signaling element comprises a smoke flare released in response to actuation of the mine firing circuit and in which the recovery apparatus is controlled by a clock mechanism within the mine.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is a diagrammatic view of the sequence of steps involved in the operation of the present invention;

Fig. 2 is an elevational view partly in section of the mine and float;

Fig. 3 is a plan view of the float; and

Fig. 4 is a sectional view along the line 4—4 of Fig. 3.

Referring now to the drawings wherein like numerals indicate like parts throughout the several views and more specifically to Fig. 1, there is shown a mine 1 which may be of any suitable variety employed for drill purposes. When the mine 1 is laid, the float 2 is released from the tail section and assumes a position approximately 9 feet above the submerged mine. When a passing vessel actuates the firing circuit of the mine, the firing circuit, instead of firing a detonator, causes a signal 3 to be released from the float which surfaces and produces a smoke flare to indicate that the vessel has in effect, fired the mine. Within the mine 1 there is provided a clock mechanism (not shown). The firing circuit and clock mechanism may be of any suitable variety such as, for example, that disclosed in the patent to Van Atta et al. 2,399,523 issued April 30, 1946. After a predetermined time delay the clock mechanism closes a switch which actuates a cable cutter within the float 2 to sever the cable securing the float to the mine. The float surfaces and uncoils a recovery cable 4 so that a recovering vessel may recover the submerged mine by employing the apparatus and method hereinbefore referred to.

Referring now to Fig. 2 it can be seen that the tail section of the mine 1 is provided with a circumferential shield 5 which is attached to the mine by means of bolts 6. Prior to use the float 2 is located within this shield and an ejection spring (not shown) acts between the float and the end of the mine and serves to eject the float when the mine is laid. A U-bolt 7 serves to secure a steel recovery cable 8 to the mine. This steel cable is looped on a cable cutting device 9 mounted on the float. The recovery cable 4 is spliced to this steel cable. A steel spear 11 is mounted on cable 8 to provide a recovery element for use with the recovery method and apparatus hereinbefore referred to. An electrical cable 12 passes through a packing gland 13 in the mine body and extends through the cable cutter 9 into the float 2. It can be seen that the float will be maintained in the position shown by the steel cable 8 until the cable cutter 9 is operated to break the electrical cable 12 and cable 8 to release the float for surfacing.

The float 2 is composed of sections 14 and 15 (Fig. 3) which are suitably secured together as at 16. Each section is provided with a pair of semi-circular cut-out portions in each end wall so that when the sections are secured together circular apertures 17 and 18 are provided. Within aperture 17 is disposed a tubular member 19 (Fig. 4) which is welded to the float at one end thereof as at 21 and is provided with a ring shaped member 22 adjacent the other end thereof which is also welded to the float. A rubber diaphragm 23 having an elongated slit 24 therein covers one end of the tubular member 19 and is secured thereto by retaining ring 25. The other end of the tubular member is enclosed by a plate 26 having a central bore therein for mounting a crossbar 27. This crossbar serves as an anchoring means for the recovery cable 4 which is suitably coiled within the tubular member 19 and passes through the slit 24 diaphragm 23. The end of this recovery cable is bound or spliced to the cable 8 (Fig. 2).

Disposed within aperture 18 is the signal unit consist-

ing of a tube 28 suitably welded to the body of the float as at 29. The tube is provided with a head section 31 which is welded to the float and which has a cover plate 32 secured thereon by screws 33. This cover plate is provided with ports for retaining the cable cutter 9 and a packing gland 34. The cable cutter 9 consists of a cylindrical body section 35 which is provided with slots 36 in the wall thereof for the reception of the electrical cable 12 and the steel cable 8. The end of the body section is closed by means of a cap 37. Within the bore in the body section of the cable cutter is slidably disposed a cutting element 38 which moves in response to the initiation of an explosive located within portion 41 of the bore. This bore is closed by means of a cap 42. The explosive is initiated by an electrical signal received from the mine through cable 12 and element 38 is forced forwardly within the bore in member 35 and the sharpened edges of the cutting element serve to sever both cable 12 and cable 8.

Within the head 31 is provided a boss 44 which is adapted to receive an initiator 45 for the signaling device. This initiator contains an explosive which is fired in response to an electrical signal received from the mine through cable 12. The signal comprises a shell 46 to which is secured a cap portion 47 having a central aperture 48 therein. This aperture is provided with an internally threaded insert 49 within which is disposed screw 51 which serves to maintain the signal in position adjacent the head 31. The lower end portion of shell 46 is provided with a central aperture which is covered by a frangible plate 52. A tube 53 extends the length of shell 46 into engagement with a circular plate 54. Within the cap 47 is disposed a mixture of calcium phosphide and magnesium aluminum phosphide which reacts with water to produce a smoke flare. The cap 47 is further provided with a tube 55 which extends diagonally toward plate 54. Tube 28 is provided with a cover plate 56 which has a central projection 57 thereon which is in alignment with the frangible plate 52. This cover plate is provided with an O-ring seal 58 which insures a water tight fit between the tube 28 and the cover plate. The cover plate is maintained in position by means of shear pins 59. When the initiator 45 within boss 44 is actuated in response to actuation of the firing circuit of the mine, the expanding gases exert pressure upon the cap 47 of the signal container causing the flanges on the insert 49 to be sheared. The container is then forced outwardly causing projection 57 to puncture the frangible plate 52 whereupon pins 59 are sheared so that the container is freed for surfacing. Buoyancy is supplied by the air chamber surrounding tube 53 and water enters the cap 47 through the openings in the end walls of the container. The reaction of the water with the chemical mixture produces smoke so that a visible indication of the firing of the mine is given.

The operation of the presently disclosed device is as follows. The clock mechanism within the mine is set for the desired time delay and the mine is laid. Hydrostatic pressure starts the clock mechanism and at the expiration of the predetermined period of time a switch is closed and a signal is transmitted to the cable cutter through the electrical transmission line. The explosive mixture within the cable cutting device is fired causing the cutting element to sever the cable securing the float to the mine and the electrical transmission line. The float surfaces uncoiling the recovery line which is spliced to the steel cable. The rubber diaphragm having a slit therein serves as a friction drag on the recovery line. If during the period of time the float is secured to the mine a passing vessel actuates the firing circuit of the mine, the signal within the float will be released for surfacing thereby providing a visual indication of the firing of the mine. It can be seen therefore that there has been provided by this invention a float for use with a drill mine which includes both means to indicate

actuation of the mine and means for assisting in recovery of the mine.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a drill mine adapted to be recovered after being laid, in combination, a float, a cable for securing said float to the mine, a container disposed within said float, means for ejecting said container for surfacing from said float in response to an electrical signal received from the mine, a chemical mixture disposed within said container adapted to react with water to produce smoke when said container surfaces, and means for severing said cable in time delayed relation to the laying of the drill mine whereby said float surfaces to assist in recovery of said drill mine.

2. In a drill mine adapted to be recovered after being laid, in combination, a float, a cable for securing said float to the mine, a recovery line coiled within said float and spliced to said cable, a container disposed within said float, means for ejecting said container for surfacing from said float in response to actuation of the firing circuit of the mine, means for producing smoke disposed within said container to indicate actuation of the mine when said container surfaces, and means for severing said cable in time delayed relation to the laying of the drill mine whereby said float surfaces uncoiling said recovery line to assist in recovery of the drill mine.

3. In a device of the class disclosed, a drill mine, a float, a cable securing the float to the mine, a container disposed within the float, a mixture of calcium phosphide and magnesium aluminum phosphide disposed within said container, a frangible plate forming a portion of the end wall of said container, means for ejecting said container from said float in response to actuation of the firing circuit of the mine, and means for puncturing said frangible plate as the container is ejected whereby water is admitted to said container and smoke is produced by the reaction of the water with said mixture to indicate the actuation of the firing circuit of the drill mine when said container surfaces.

4. In a device of the class disclosed for use with a drill mine, a float adapted to be secured to said mine, a container disposed within said float, a mixture of calcium phosphide and magnesium aluminum phosphide disposed within said container, a frangible plate forming a portion of the end wall of said container, explosive means for ejecting said container from said float in response to a signal received from said mine, and means mounted on said float for puncturing said frangible plate as the container is ejected whereby water is admitted to said container producing smoke by the reaction of the water with said mixture.

5. A device for use with a submerged drill mine comprising, a float, a cable for securing said float to said mine, a recovery line coiled within said float and secured to said cable, an electrical transmission line adapted to extend between said float and said mine, a slotted tubular member adapted to receive said cable and said transmission line, cutting means slidably disposed within said member, and initiating means for causing said cutting means to sever said transmission line and said cable in response to a signal received from the mine whereby the float surfaces and said recovery line is uncoiled to assist in recovery of the drill mine.

6. Recovery apparatus for use with a submerged drill mine comprising, a float, a cable for securing said float to said mine, a recovery line coiled within said float and secured to said cable, a slotted elastic diaphragm mounted on said float and enclosing the coiled line, said diaphragm serving as a friction drag when the line is un-

coiled, a slotted tubular member mounted on said float and adapted to receive said cable, cutting means slidably disposed within said member, and initiating means for causing said cutting means to sever said cable in response to a signal received from the mine whereby the float surfaces and said recovery line is uncoiled to assist in recovery of the drill mine.

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