

Dec. 18, 1945.

W. W. MACFARREN

2,391,059

PONTOON ASSEMBLY AND METHOD OF USING THE SAME

Filed Nov. 20, 1940

2 Sheets-Sheet 1

FIG. 1

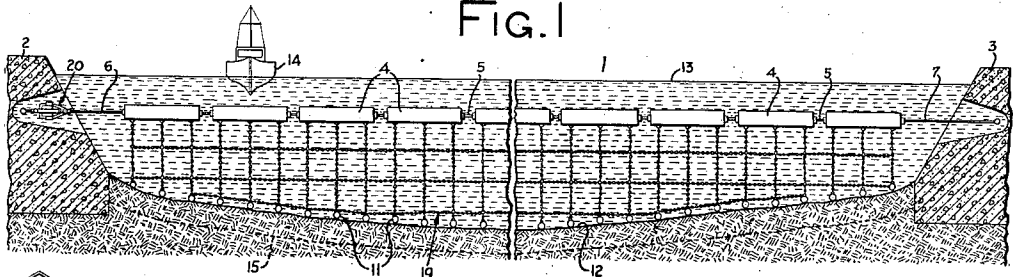


FIG. 2

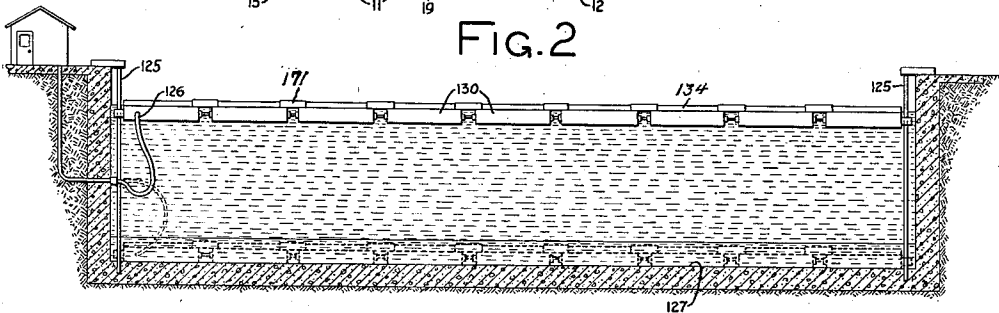


FIG. 3

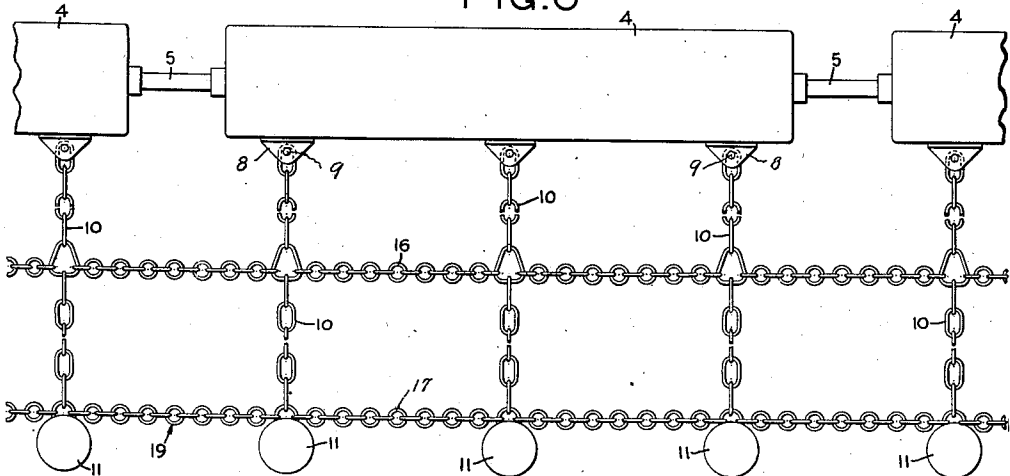


FIG. 4a

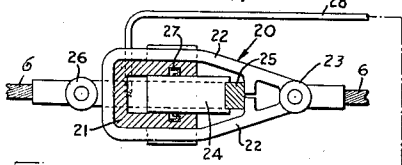


FIG. 5

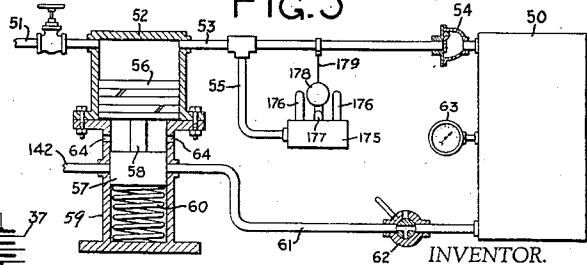
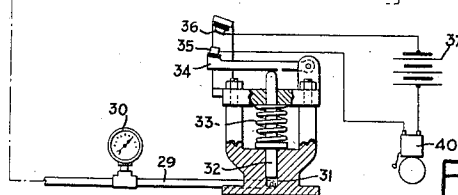


FIG. 4b



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2 Sheets-Sheet 2

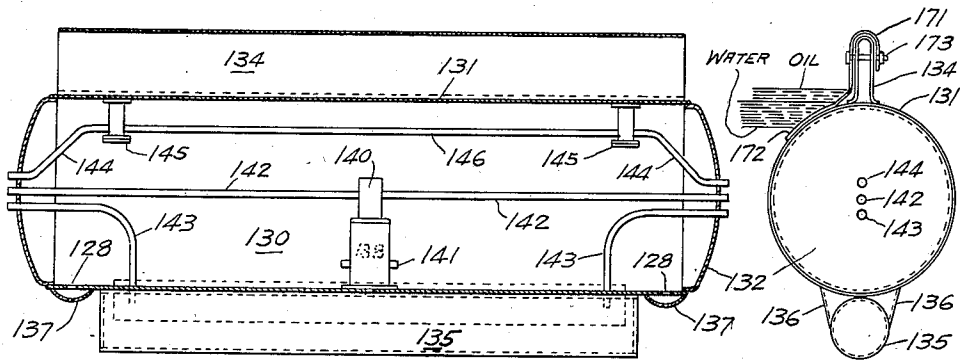


FIG. 9.

FIG. 10.

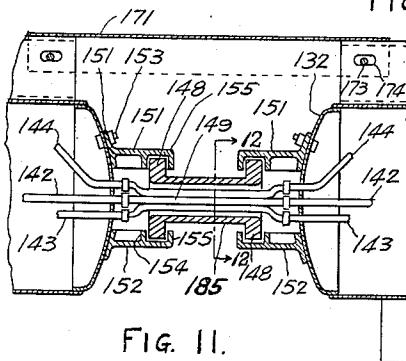


FIG. 11.

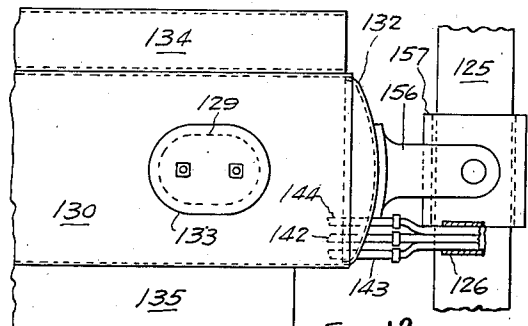


FIG. 13.

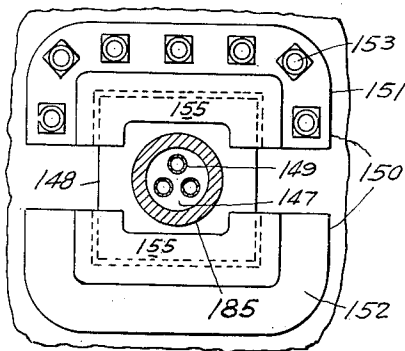


FIG. 12.

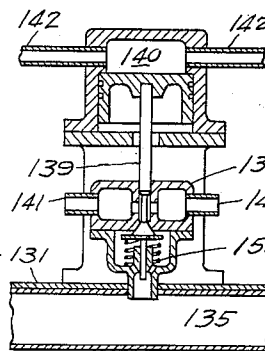


FIG. 7.

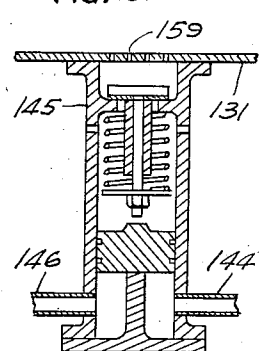


FIG. 8.

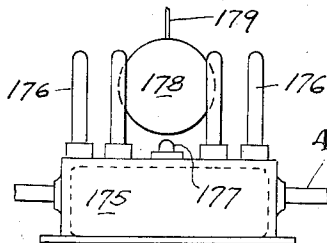


FIG. 14.

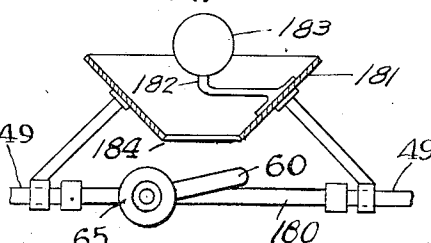


FIG. 6.

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2,391,059

PONTON ASSEMBLY AND METHOD OF
USING THE SAME

Walter W. Macfarren, Los Angeles, Calif.

Application November 20, 1940, Serial No. 366,507

20 Claims. (Cl. 114—0.5)

My invention comprises a plurality of pontoons arranged in a connected line or group for simultaneous operation, and usually set across a water way or ship channel, for the purpose of acting as a gate to prevent, or permit, movement of water borne material or objects, either above or below the surface of the water, along said water way.

The present application consists in part of material divided out of my application Serial No. 198,093, now Patent No. 2,224,844, for Protective devices for pipe lines, and in part of new material herein disclosed

The objects of my invention are:

1. To provide a line of pontoons which may be permanently stretched across a channel or water way with its ends appropriately anchored, and made to rise or fall by expulsion of water from, or admission of water to, all the pontoons at the same time.

2. To provide an individual reservoir of compressed air for each pontoon, in combination with means for charging and discharging all of said reservoirs at the same time.

3. To provide manually operated controls for causing the pontoon assembly to rise or fall, operatable from either an adjacent or a distant point, and to provide automatic means for causing the pontoons to either rise or fall, as desired, upon the occurrence of a substantial seismic shock.

4. To provide a method of gradually charging the pontoon reservoirs by an air line from the shore.

5. To provide a method of quickly discharging the water from the pontoons to raise them, by the use of the stored air in the pontoon reservoirs.

6. To provide a method of quickly admitting water to all the pontoons, to sink them.

7. To provide pressure operated controls for operating the pontoons from the shore, according to one or more of the above methods.

8. To provide means whereby the rise and fall of the pontoons may be entirely under water, so that the pontoons are at all times concealed.

9. To provide various attachments for the pontoons to serve a variety of useful purposes.

10. And in general to provide a rugged, practical, and useful assembly of flexibly connected pontoons for such uses as may be found for them.

As one suggested use, such a line of pontoons may be employed to support a skimming dam to extend above the surface of the water, and to prevent the passage of floating oil, floating tim-

ber or cargo of any kind, or floating debris. As another use, such a line of pontoons may be employed to support a chain or cables to close a river or harbor entrance against movement of surface shipping. A third use might be to support a fish net across a fish run, the lower edge of the net being weighted to anchor it to the bottom.

A similar use would be to close a river or harbor entrance by cables or chains suspended from the pontoons in the form of a net, to prevent the entrance or egress of submarine boats. In this case the pontoons should preferably be kept continuously under water by limiting their rise from a position at or near the bottom, to a level a few feet below the surface.

This may be done either by attaching anchors to the submarine net so as to prevent the rise of the pontoons above a predetermined level, or by limiting the volume of the displacement air supplied to the pontoons to just enough to float them to said level with a certain weight of net attached. This may be easily done by limiting the air pressure.

By day the pontoon assembly and the attached net could lie on the bottom, and at night the pontoons could rise to the level chosen, say just below the draft of small boats, and both day and night the pontoons would be invisible, except possibly from the air.

As an auxiliary device to be used in connection with a submarine net, I show apparatus in Fig. 4 which may indicate the presence of a submarine boat in contact with the net.

Since the use of skimming dams and the use of submarine nets are both broadly old, the present application is confined to the use of a flexible pontoon assembly, the construction of the same, and the method or methods of operating the same.

In the drawings,

Fig. 1 is an elevation of a pontoon assembly according to my invention, moored to the banks of a waterway by cables, and supporting a submarine net having its lower edge positioned by anchors resting on the bottom.

Fig. 2 is an elevation of a pontoon assembly according to my invention, slidably attached to vertical posts, and provided with an attached skimming dam.

Fig. 3 is an enlarged elevation of one form of a submarine net, showing the method of attaching it to the pontoons, etc.

Fig. 4a is a part of a diagram of apparatus for

indicating the pressure of a submarine boat against the net 19 of Fig. 1.

Fig. 4b is the other part of the diagram shown in Fig. 4a, and these two figures are to be read together.

Fig. 5 is a diagram of compressed air apparatus for the automatic operation of the pontoons upon the occurrence of a seismic shock or other ground movement.

Fig. 6 is a diagram of a control device to be operated by a seismic disturbance.

Fig. 7 is a sectional elevation of a blow out valve.

Fig. 8 is a similar view of a pontoon vent valve.

Fig. 9 is a vertical longitudinal pontoon section.

Fig. 10 is an end elevation of the same.

Fig. 11 is a vertical section of a flexible connector between two adjacent pontoons.

Fig. 12 is a cross section of the same taken on the line 12—12 of Fig. 11.

Fig. 13 is an elevation of one of the end pontoons, and one of the vertical anchor posts therefor.

Fig. 14 is an elevation of a second type of seismic control device.

Referring to Figs. 1 and 3, a ship channel 1 may be provided with a pair of masonry anchorages or piers 2 and 3, and a line of connected pontoons 4, having flexible connectors 5, may be anchored to piers 2 and 3 by chains or cables 6 and 7. The detailed construction of the pontoons, and their connections will be described later.

To this line of pontoons there may be attached a steel submarine net, one form of which may be constructed as shown in Fig. 3, in which pairs of angles 8 may be fastened to the shell of each pontoon 4, and chains 10 may be connected to the angles 8, by pins 9.

At the lower end of each chain 10, there may be attached an anchor 11, in the form of a ball, or of any other suitable form, and the lengths of the chains 10 may be so chosen that where the bottom 12 is uneven, as shown in Fig. 1, the pontoons when in their upper position as shown, may form a level assembly at such a distance below the water line 13, as to permit the passage of small boats 14.

Horizontal chains 16 and 17 may be connected to the vertical chains 10, thus forming a net with rectangular or square meshes. Assuming for the moment that the pontoon assembly may be made to rise and fall, as desired, in the position shown in Fig. 1 the chain net is suspended across the channel in such a way as to completely block the passage of a submarine boat, and the pontoons are kept below the water surface by the anchors 11, an amount sufficient to permit the passage of small boats 14.

When water is admitted to the pontoons to reduce their buoyancy, the pontoon assembly, together with the chain net supported thereby, may sink to the bottom and rest thereon, thus freeing the channel for the passage of large ships. If desired, a trench may be dredged to receive this apparatus, as indicated by the dotted line 15 of Fig. 1.

When the arrangement shown in Fig. 1 is used to guard against the passage of submarine boats, it is desirable to have some form of indicator to disclose the presence of such a boat. For this purpose I provide the apparatus shown more or less diagrammatically in Figs. 4a and 4b. When

a submarine boat contacts the net 19, it will put a strain on the pontoon anchor cables 6 and 7, and this strain may be indicated by a pressure gauge through the following means: A hydraulic

5 "connector," or tension jack 20 may be located in one (or both) of the anchor cables 6 and 7, and may comprise a cylinder 21, having integral or attached tension members 22, with eyes 23, which may be connected to the cable 6, and a plunger 24, having a strap 25, with eyes 26, which may be connected to an end of cable 6.

A U packing leather 27 may hold the pressure developed by the strain on the cable 6, and this may be transferred through a flexible pipe 15 28, to a gauge 30, located at a convenient control point. The needle of the gauge 30 may be provided with a ratchet or some form of detent to record the pressure generated in cylinder 21, until said detent is manually released.

20 This gives a visual indication of strain in the cable 6, and a measure of its magnitude, but an audible indication is also desirable, and this may be obtained by continuing the pipe 28, by a pipe 29, to a small indicating cylinder 31, having a 25 plunger 32, acting against a spring 33.

When abnormal pressure reaches the plunger 32 it raises the same, and actuates a pivoted lever 34 to bring an attached electrical contact 35 against a fixed contact 36, and thus supply current from a battery 37 or other source, to an electric bell 40. The lever 34 may also be provided with a detent, so that the bell 40 will ring until the same is manually released.

Thus the presence of the submarine boat will 35 be well indicated, and appropriate measures may be taken to dispose of, or capture it.

I will now describe the detailed construction of a preferred form of my improved pontoon assembly, and its method of operation when used 40 as a skimming dam. In harbors and other water ways where ships are loaded with oil or gasoline, or in waters congested with shipping, and having contiguous docks or warehouses, and where oil is stored nearby in large tanks, or transported 45 nearby in large pipe lines, leakage of oil from tanks or pipe lines to the harbor waters is a serious fire hazard, and when such leaks occur it is of advantage to be able to confine the floating oil to a limited area, or areas.

In many cases, depending on the topography 50 of the harbor, this may be done by floating skimming dams, and if these dams are carried by a pontoon assembly such as herein disclosed, they may lie on the bottom, out of the way of shipping until needed, and then each of them, of all of them may be brought very promptly into 55 working position at the water surface, with a portion of the structure projecting above said surface to restrict or prevent, the flow or movement of floating or wild oil, upon said water surface.

The pontoon supported skimming dam of Fig. 2 may be constructed as shown in Figs. 9-13, and be normally submerged in a ditch 127, formed below the channel bottom, so as to clear the hulls 60 of passing ships of the deepest draught.

This dam may be connected at each end to a vertical guide bar 125, which may be a heavy steel pipe, having its lower end driven into, or anchored by a foundation to the channel bottom, and having its upper end supported from a dock or similar structure, as indicated in Fig. 2.

The pontoons are floated, or submerged, by the action of compressed air supplied from the shore through a flexible connection 126. The 75 vertical movement of the pontoons from their

lower position to their upper or floating position, will of course depend on the depth of the channel and may be from 30 to 50 ft. or more, and the length of the dams may vary from 100 feet to 1000 feet, or more.

Each pontoon 130 may consist of a hollow metal cylinder 131, made of ordinary steel plate, rustless steel, or bronze, and having dished ends 132, preferably connected by welding, and forming an air tight structure except for a pair of discharge openings 128, both at the bottom of the pontoon, and one near each end thereof.

The pontoon 130 should preferably be of sufficient diameter to admit a man through a man-hole 129, having a tight cover 133, and the length of the pontoons may vary from 20 to 50 feet, as desired. These pontoons should be designed to have lateral stability of a reasonable amount when afloat.

Each pontoon 130 may have on its upper side, a dam 134, formed of a bent plate similar in section to an inverted U, and welded to the outer shell 131. These dams 134 may be flexibly connected one to another, to form a continuous barrier for a quantity of floating oil or other material.

As shown in Figs. 10 and 11, the dam connecting member may be a bent plate or sheet 171, whose upper portion is given a U bend to fit loosely over the tops of two adjacent dams 134, and whose lower portion 172 may conform to the shape of the pontoon 130, and rest thereon. Slotted holes 174 may be formed in the dams 134, and bolts 173 may loosely secure the connecting members 171 in place, with allowance for the relative movement of the pontoons.

As a substitute for the rigid member 171, the same may be replaced by a heavy woven mat of similar form, and made of asbestos or glass fiber, or other fire resisting material.

Below the shell 131 of each pontoon 130, there may be located a piece of steel pipe 135, (or other material) having closed ends, and secured to the shell 131 by a pair of plates 136, and preferably welded to said members.

The member 135 is a reservoir for storing compressed air in readiness for immediate action, and its capacity must be such that it will store sufficient air under pressure to completely discharge the water in the shell 131, when the pontoon is to be floated.

The reservoir 135, together with the plates 136, form a keel to give the pontoons 130 lateral stability when afloat, and also form a smooth underbody which is not likely to stick in the mud of the harbor bottom, and interfere with floatation. Strainers 137 may be provided to cover the discharge openings 128.

Within the shell 131, and connected to the reservoir 135, there is a valve chest 138, which may contain a poppet air valve, as shown in Fig. 7. This valve may be tightly seated by a spring 158, and opened by a push rod 139, operated by a small air cylinder 140 above the valve chest 138, and when this valve is so opened, compressed air from reservoir 135 may flow out of the short pipes 141, to discharge the water from the shell 131, through the openings 128. The rapidity of such discharge may be fixed by the size of the air passages in the pipes 141.

To supply the several cylinders 140 (one for each pontoon 130) with compressed air to operate the push rods 139, there is a continuous pipe line extending from pontoon to pontoon, and to a control station on the shore. As part of this

line, pipes 142 are connected to the cylinder 140, one at each side thereof, and above the piston therein, and each of these pipes extends through one of the heads 132, into which it may be welded.

Similarly, the several reservoirs 135 are connected to each other in series relation through pipes 143, so that the reservoirs may be charged with compressed air from one (or both) ends of the pontoon line. To exhaust the air from the interior of the pontoon shell 131, so that the pontoons may become submerged, I provide a pair of small piston operated vent valves 145, secured to the upper inner surface of the shell 131, and connected to each other and to similar valves in adjacent pontoons by a continuous air line, of which the pipes 144 and 146 form a part. Each pipe 144 may extend through a head 132, and be welded thereto.

It will now be seen that there are three separate air lines for operating the pontoons 130, with separate controls to be described later, as follows:

1. A line to charge the reservoirs 135, including the pipes 143.

2. A line to discharge the reservoirs 135, through the action of the valves 138, and including the pipes 142, for floating the pontoons.

3. A line to vent the air from the pontoons through the valves 145, and the small vents 159, so they may sink, and including the pipes 144 and 146.

It is obvious that such a line of connected pontoons as herein proposed must be flexible, and to this end I provide hollow metal connectors 185, which have a central opening 147, and square flanged ends 148 (or other shape) to prevent relative rotation of the pontoons. Through the opening 147 three flexible rubber or metallic air conduits 149 may be passed, which connect the respective adjacent pipes 142, 143, and 144, by suitable unions, to form continuous lines.

To each of the heads 132 there may be secured, preferably by welding, a retaining member 150 for the square ends 148, of the connectors 185. The members 150 may be formed in various ways, but I prefer to construct them in two parts, as shown in Figs. 11 and 12, and comprising a lower section 152, which may be rigidly and permanently attached to one of the heads 132, as by welding, and an upper section 151, which may be detachably secured to the same by bolts 153.

It will be noted that each square end, or flange 148, is loosely confined between inner flanges 154, and outer flanges 155, both of these forming part of the members 150. This construction enables the pontoon connectors 185 to take either tension, compression, or twisting stresses, and to allow the adjacent pontoons to operate freely at a slight angle to each other, while at the same time preserving the general alignment of the chain of pontoons with sufficient accuracy for the intended purpose.

Referring to Fig. 13, a special bracket 156 may be provided for each of the two end pontoons of the line, in which is mounted a pivoted sleeve 157, to engage one of the vertical guides 125. To the pipes 142, 143, and 144, emerging from the end pontoon near the guide 125, there may be connected flexible air conduits, each controlled by a valve at a control point on shore, and these three conduits may be enclosed in a heavy flexible protective cover 126, leading to supply pipes on shore.

The manual control of my pontoon assembly is accomplished as follows: The pontoons may be

normally lying on the bottom with the reservoirs 135 fully charged with compressed air. It will be noted that the air pressure required will depend on the depth to which the pontoons are sunk, and must be sufficient to start forcing the water out of the shells 131 at that depth.

When it is desired to raise the pontoons, compressed air from a storage reservoir at the control point may be admitted to pipe line 142, which, upon entering the various cylinders 140 will depress their respective pistons operating the push rods 139, and open the air valves to permit of air from each of the reservoirs 135 to blow out the contained water from its respective pontoon, thus raising all of the pontoons at the same time, and at substantially the same speed.

At any time later, air may be supplied through the pipes 143, to recharge the reservoirs 135. The pontoons will float, as shown in Fig. 2, or will stay at their highest position, as shown in Fig. 1, as long as the water is kept out of the pontoons by the air pressure in them.

When it is desired to sink the pontoon assembly, air pressure is admitted to the connected pipes 144, and 146, which acts equally on the various vent valves 145, thus allowing the compressed air in the interior of the pontoons to escape through the respective vents 159 in the upper portion of the shell 131 of each pontoon, and allowing water to enter the respective pontoon shells 131 through the holes 128 in their bottom portions.

It will be noted that both the valves operated by the push rods 139, for blowing out the water from the pontoons, and the valves 145 for venting the air from the pontoons, are operated by the admission of air pressure to parts connected to said valves, and by the transmission of the said pressure from a stationary control point on shore.

Such action can be rendered automatic upon the occurrence of an earthquake, or a ground tremor due to an explosion, or bomb, in the following way.

Referring to Fig. 14, the same shows a hollow metallic air pressure container 175, which may be connected to a line normally containing compressed air.

For instance, either of the pipe lines 142, or 144 may be connected to the container 175 by a pipe such as 49 of Fig. 14, and the air may either pass through the container 175 on its way to do its work, or the container 175 may be at an end of the pipe. The essential condition is that if the container or any of its connected pressure holding parts is ruptured, the pressure within it, and within the connect-pipe lines will promptly escape to the atmosphere.

Attached to the upper side of the container 175 there are a number of glass tubes 176, preferably arranged in a circular row, and having closed upper ends and with their lower ends communicating with the interior of the container 175. At the center of this outer row of tubes there may be a single glass tube 177 of similar form, but shorter than the others.

All of these glass tubes are subject to the fluid pressure in the container 175. Suspended by an elastic cord or spring 179, and located about in the center of the outer row of tubes 176, there is a metallic ball or similar heavy object having sufficient weight to easily break any of the glass tubes, and release the contained air pressure.

In the event of an earthquake, or a sharp ground shock due to an explosion, the container 175 being supported more or less rigidly by the

ground, moves with it, while the weight 178, being suspended like a pendulum may remain still or have a different movement. If the ground movement is horizontal these relative movements will break one of the tubes 176, and if the relative movement is vertical the ball 178 may contact the tube 177, break it, and release the pressure.

In Fig. 5 I show how the reduction of pressure in a container such as 175 may act to apply pressure to a pipe such as 142, and thus cause the pontoons to rise.

The reservoir 50, which may be located at or near a convenient control point on shore, may be supplied with compressed air by a pipe 51 leading to any convenient source of pressure, and connecting the same to a cylinder 52, from which a second pipe 53 leads to reservoir 50. There may be a check valve 54 in the pipe 53 arranged to prevent the escape of air pressure from the reservoir 50.

A container 175 may be connected by a branch pipe 55 to the pipe 53, between the cylinder 52, and the check valve 54, and a ball 178 may be suspended in striking position above it.

The cylinder 52 may contain a piston 56, and below the piston 56 there may be placed a cylindrical valve 57, operating in a valve chest 59 concentric with the bore of cylinder 52. Both the members 56 and 57 may be secured to a stem 58, and the downward motion of these parts may be resisted by a spring 60.

A pipe 61 may lead from the reservoir 50 to the valve chest 59, and the pipe 142 for admitting air to the pontoon blow out valves, may also be connected to the valve chest 59 as shown in Fig. 5, so that in the position shown no air can pass the valve 57.

In the pipe 61 there may be a 3-way cock 62, for passing air pressure from the reservoir 50 to the valve chest 59, or for venting the pipes 61 and 142 to atmosphere when the valve 57 is in its raised or open position. A pressure gauge 63 may be provided for the reservoir 50, and vents 64 may be formed in member 59. Members 52 and 59 may be bolted together.

The operation of this apparatus is as follows: The reservoir 50 is charged through the pipes 51 and 53, and normally contains compressed air under some predetermined pressure. This pressure forces the piston 56, and the valve 57 downward to the position shown, thus closing the valve against the spring 60.

When the valve 57 is closed, the 3-way valve 62 may be opened as shown to supply pressure to the valve 57 in readiness for use. The valve 62 is operated manually. If now the ball 178 contacts one of the breaker tubes 176 and breaks it, the pressure on piston 56 is quickly released, and the valve 57 rises and opens under the upward push of the spring 60.

Compressed air from the reservoir 50 may now flow past the valve 57 to the pipe 142 to perform its intended function, and the reservoir 50 must supply a volume of air sufficient to do this. This action is an emergency action and may also exhaust reservoir 50. In order to again charge the reservoir 50, the 3-way cock is turned to close the outlet from the reservoir 50 via pipe 61, and to vent the air from pipe 142 to the atmosphere. When this is accomplished, the pressure in reservoir 50 may be built up again, and when full pressure is reached the 3-way valve may be returned to the position shown, and as the valve 57 has already been closed by the re-established pres-

sure in cylinder 52, the apparatus is again ready to supply compressed air automatically to pipe 142, as before.

The arrangement shown in Fig. 5 is necessary when using the type of breaker tube 176 and container 175, but the control device illustrated in Fig. 6 may be used directly to admit air pressure to a conduit.

This is indicated in Fig. 6 where a valve or cock 65, having a lever handle 66, may be opened (or closed) by a falling weight 183. The weight 183 may be balanced on the cupped end of a bracket 182, over a hopper 181 having a lower aperture 184 large enough so that the ball 183 may fall through it when it is shaken off the bracket 182, and shatter a glass tube 180, set in the pipe 49, thus releasing the pressure in the pipe.

However, if the glass tube 180 be removed, and a valve or cock 65, be connected to the pipe 49 in any usual way so as to control the flow of fluid in said pipe, and with its lever handle 66 directly below the hopper opening 184, and in such a position that the ball 183 will strike the handle 66, and throw it over, the valve 65 may be either opened or closed by the descent of the ball, depending on which way the handle 66 projects from the valve 65, as will be readily seen.

It will thus be seen that I have provided two separate types of control devices, as shown respectively in Figs. 6, and 14, the device of Fig. 6 being adapted to either turn on, or turn off, the pressure in an air line directly, and the device of Fig. 14 being adapted to release the pressure in an air line directly and to apply pressure to such a line indirectly and with the help of other connected elements.

The above description covers present preferred apparatus, and methods at present preferred for its operation, and is believed to be clear enough so that those skilled in the related arts may construct and use the same.

I claim:

1. The method of preventing the dispersion of floating oil or combustible debris upon the surface of a ship channel or water way, comprising the vertical movement of a skimming dam extending across said water way, from a submerged position to a floating position in which its upper portion will extend above the water surface, and confine such oil or debris to a limited area.

2. The method of operating a flexibly connected line of submarine pontoons comprising the following steps: (a) Simultaneously charging individual reservoirs in each of the pontoons with compressed air; (b) Simultaneously releasing air from each of said reservoirs into the interior of its respective pontoon to drive out the contained water, or a portion of it, to increase the buoyancy of adjacent pontoons by a substantially equal amount; (c) Simultaneously releasing the air within the pontoons in such a manner as to produce a substantially equal decrease in the buoyancy of adjacent pontoons.

3. The method of operating a skimming dam extending across a ship channel or water way, and permanently anchored in a desired location, comprising the following steps: (a) Submerging the dam to a depth sufficient to clear the keels of passing ships, and maintaining the dam in said position indefinitely; (b) Raising the dam to a floating position at the surface of the water way at such times as it may be desired to confine the movement of floating oil or other combustible floating matter to one side of the dam;

(c) Returning the dam to its normal submerged position in readiness for further action.

4. The method of operating a skimming dam extending across a ship channel or water way and permanently located in a desired position, comprising the three consecutive steps set forth in claim 3, plus the further step of raising the dam immediately upon the occurrence of a distinct seismic shock.

5. The method of operating a flexibly connected line of metallic submarine pontoons placed across a waterway, from a lower to a higher level for the purpose described, comprising the raising or lowering of all the pontoons simultaneously in a substantially vertical path, and with all the pontoons normally at equal levels.

6. The method of preventing the dispersion of floating oil or combustible debris upon the surface of a ship channel or water way, by opposing a barrier to the surface movement of such material in such a manner that said barrier may be extended across said water way to form a skimming dam upon completing a bodily movement of less than the depth of water in said water way.

7. The method of operating a skimming dam at a desired point across a navigable ship channel or water way, comprising the bodily movement of said dam from an inoperative under water position below the draught of ships, in the shortest possible path to an operative position at the surface of the water, whereby emergency operation of said dam may be accomplished in the shortest practicable time.

8. The method of operating a skimming dam at a desired point across a navigable ship channel or water way, comprising the bodily movement of said dam in a direction substantially at a right angle to its length, from an inoperative to an operative position, and vice versa.

9. The method of moving a skimming dam from an inoperative under water position to a higher position, by the sudden application of large lifting forces equally distributed from end to end of said dam, whereby the said dam is brought to the surface of the water in readiness for immediate use, and in the least practicable time.

10. A normally submerged chain of flexibly connected pontoons, which when floating may form a skimming dam to prevent the spread of floating material upon the waters of a harbor or ship channel, and comprising a series of pontoons, each of which is provided with an individual reservoir for compressed air, means for positioning the said series of pontoons and guiding their vertical movement between floatation and submergence, means for charging the said air reservoirs, means for simultaneously passing air from each of said reservoirs to its connected pontoon, to blow out the contained water and float the pontoon, and means for venting the said air from all the pontoons at the same time, to allow them to submerge.

11. A line of flexibly connected submarine pontoons stretched across a water way and having its ends so secured at opposite sides of said water way that said chain of pontoons may be made to float or submerge at will by the simultaneous expulsion of water from the interiors of all of said pontoons, or the simultaneous admission of water thereto, means for expelling water from said pontoons by compressed air, means for admitting water to said pontoons, and separate means for controlling said admission and ex-

pulsion of water from a common control point on shore.

12. A submarine pontoon having an integral reservoir for compressed air located outside the pontoon shell, and having its center of gravity below the center of buoyancy of the pontoon shell, for lateral stability, means for charging said reservoir leisurely while the pontoon is submerged, and means including a pressure operated valve for admitting compressed air from said reservoir to the interior of the pontoon to quickly blow out some of the water therein and increase the buoyancy of the pontoon, and means for operating said valve.

13. The elements of claim 10, in combination with a separate pressure operated valve for each blow out means and each vent means on the pontoons, in combination with an operating valve for controlling all said blow out valves, and a second operating valve for controlling all said vent means, said operating valves being located at a control station on shore.

14. A plurality of flexibly connected submarine pontoons, individual means in each pontoon for blowing out the contained water to float said pontoons, individual means for admitting water to the interior of each of said pontoons to sink them, sockets on the adjacent ends of adjacent pontoons to engage and retain the end of a connector, and a connector between adjacent pontoons having each of its ends shaped to permit only limited torsional movement in its socket and engaging one of said sockets in such a manner that a line of connected pontoons may have limited flexibility longitudinally, vertically, horizontally, and torsionally, with respect to each other.

15. A line of flexibly connected submarine pontoons adapted to be stretched across a ship channel and anchored at its ends to opposite sides thereof, a metallic net supported by said pontoons and adapted to close said channel to the passage of submarine boats, and an indicating device adapted to give both visible and audible indications of the presence of a submarine boat in contact with said net, said device comprising means responsive to changes of tension in said line of pontoons for producing fluid pressure, a pressure responsive device for visually indicating said tension changes, and a second pressure responsive device for audibly indicating a considerable increase in said tension.

16. A line of flexibly connected rigid metallic pontoons adapted to be stretched across a ship channel and anchored there, a metallic fire resisting barrier wholly supported by said pontoons to prevent the movement of floating oil upon the water surface, means for sinking said pontoons to clear the channel for the passage of ships, and means for floating said pontoons at a higher level to make said barrier effective for the intended purpose.

17. A line of flexibly connected submarine pontoons, appropriate valves in each pontoon to control its buoyancy, means for simultaneously operating all the valves which cause the pontoons to rise, and similar means for simultaneously operating all the valves which cause the pontoons to submerge, and means for limiting the under-

water rise of said pontoons to form a substantially level line at a predetermined distance below the surface of the water.

18. The combination of a line of flexibly connected pontoons arranged across a waterway, and adapted to lie normally on the bottom or to float at a lower level, and to rise by their buoyancy when the contained water is displaced and support useful marine apparatus, such as a skimming dam or a submarine net, suitable means for displacing said water, suitable control means for the normal operation of said displacing means, and automatic emergency means for actuating said control means to displace said water and allow said pontoons and their connected apparatus to rise to an effective operating position upon the occurrence of a distinct seismic shock.

19. A line of flexibly connected submarine pontoons stretched across a water way, and having its ends so secured at opposite sides thereof that said line of pontoons may be caused to float or submerge by the simultaneous expulsion of water from the interior of all of said pontoons, or the simultaneous admission of water thereto, each of said pontoons comprising a hollow rigid metallic structure, and each pontoon having an integral reservoir for compressed air, a valve for admitting said air into the body of the pontoon to effect the discharge of water therefrom, a valve controlling the exhaust of said air to permit the entrance of water, an opening through which water may enter, means for supplying compressed air to said reservoirs, means for operating said valves to permit the entrance or egress of water to or from the pontoons, and a continuous upwardly extending skimming dam secured to and supported by said line of pontoons, and located above them so as to project above water when said pontoons are afloat.

20. A line of flexibly connected submarine pontoons adapted to be stretched across a ship channel or water way, and to support a barrier for preventing the passage of water borne objects, each of said pontoons comprising a hollow cylinder with closed ends, a socket on each end of each of said pontoons except the two end pontoons, hollow connectors each having each of its ends engaging one of said sockets so as to connect two adjacent pontoons in a manner permitting a limited amount of relative movement between them, an individual compressed air reservoir for each pontoon, a pipe passing through each end of each pontoon except the last one, and connecting to one of said reservoirs, a flexible conduit passing endwise through each of said connectors to connect said pipes, whereby compressed air may be forced into all of said pontoon reservoirs from one end of the line of pontoons, and stored therein ready for use, a pressure operated blow out valve in each of said pontoons, a continuous air line for operating said valves extending from one end of said pontoon line to the other end, and having flexible connecting conduits within said hollow connectors, a pressure operated vent valve in each pontoon, and a similar continuous air line extending through the aligned pontoons for operating said vent valves.

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