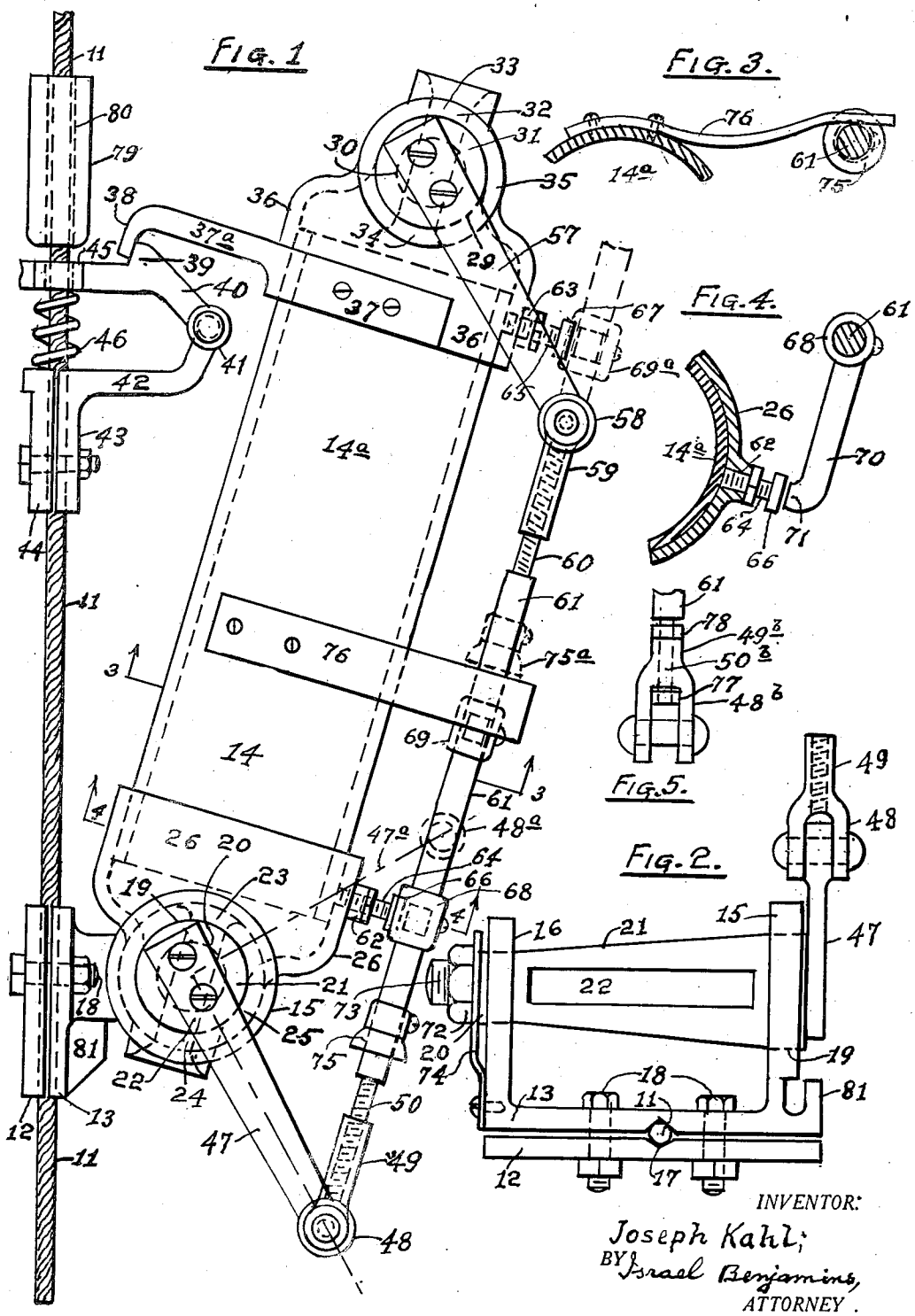
Jan. 1, 1946. J. KAHL 2,391,978

MARINE SAMPLING BOTTLE

Filed Jan. 5, 1945



INVENTOR:
Joseph Kahl;
BY Israel Benjamins,
ATTORNEY.

Patented Jan. 1, 1946 2,391,978

UNITED STATES PATENT OFFICE

2,391,978

MARINE SAMPLING BOTTLE

Joseph Kahl, New York, N. Y.

Application January 5, 1945, Serial No. 571,411

12 Claims. (Cl. 137—18)

My invention relates to improvements in marine sampling bottles which are employed to obtain samples of water from various depths of seas and lakes.

These bottles are usually pivotally connected at their lower ends to a suitable clamp on a cable which extends downwardly from aboard a ship; and their upper ends are detachably connected in an inclined position to another clamp on the same cable and are released by an impact mass dropped from aboard the ship; the bottles, when released, turn about the center line of the bearings at their lower ends as an axis through an angle which is less than 180 degrees by the amount of their original inclination until they become substantially vertical and inverted in position.

The type of bottles to which this invention relates is provided with rotary valves which are located in seats in the ends of the bottle whereby to open or close suitable ports in said seats, which ports are in registration with openings in the valves when the ports are uncovered by the valves.

The bottles are arranged to be open in their original inclined position and to be closed by the rotation of the bottles when the upper ends of the same are released.

My invention consists in the novel features which are hereinafter described.

One of the objects of my invention is to provide a means for adjusting the position of the rotary valves when the ports are open.

Another object of my invention is to provide a means for limiting the rotation of the valves from an open to a closed position of the ports and to adjust the positions of the valves when the ports are closed.

A further object is to limit the angle through which the valves may rotate together with the bottle about their common axis and to force the bottle to rotate about the valve at its inner end through an angle of ninety degrees, thereby closing the ports in the ends of the bottle.

A still other object is to simplify the construction of the suspending and releasing means of the marine sampling bottle and the transmission of motion from the valve at the inner end to that at the outer end of the bottle.

Other objects and advantages will hereinafter appear.

I attain these objects by the mechanisms which are illustrated in the accompanying drawing or by any mechanical equivalents or obvious modifications of the same.

In the drawing

Fig. 1 is a side view of my improved marine sampling bottle shown in its position before it is released and showing the lever 40, which is hereinafter described, as broken off at its left end.

Fig. 2 is a top plan view of the support for the inner end of the bottle, showing the rotary valve in position with parts which are attached thereto.

Fig. 3 is a fragmentary detail in cross-section on the line 3—3 of Fig. 1, showing a manually releasable stop for the valve mechanism, which is hereinafter more fully described.

Fig. 4 is a fragmentary detail in cross-section on the line 4—4 of Fig. 1 showing a means for adjusting the open port position of the valve at the inner end of the bottle; a side-view of a similar device is shown in Fig. 1 as used for adjusting the position of the same valve when it closes the port at the lower end of the bottle.

Fig. 5 is a fragmentary detail of a coupling and the end of a rod which may be employed as a variation of the coupling at one end of the connecting rod which is hereinafter described.

Similar numerals refer to similar parts throughout the several views.

11 designates a cable extending downwardly from aboard a ship, and 12—13 a pair of plates of a clamp which is supporting and is pivotally connected to the lower end of a marine bottle 14 by means of the bearings 15 and 16 on the plate 12.

The plates 12 and 13 of the clamp are notched as at 17 to receive a part of the cable 11 therebetween, and they are shown as secured to each other by means of bolts 18.

The bearings 15 and 16 have journalled therein the cylindrical ends 19 and 20 of a conical rotary valve 21, which has therein passing therethrough an opening 22 which registers with ports 23 and 24 in the seat 25 which is provided for the valve 21 in a casing 26 at the lower end of the bottle 14, which has thereon at the upper end thereof a similar casing 36 which encloses a seat 35 for a similar valve 31 which has therein an opening 32 registering with ports 33 and 34 in the seat 35.

The valve 31 also has at the ends thereof cylindrical journals 29 and 30 which extend from the seat 35 at the ends of the latter.

The casings 26 and 36 are connected by means of a tube 14a which is in communication with the casings 26 and 36 through the ports 23 and 34 in the seats 25 and 35.

When the valves 21 and 31 have their openings 22 and 32 in registration respectively with the ports 23 and 24 and 33 and 34, the bottle 14 is

in communication with the body of water surrounding the same.

The casing 36 has thereon secured thereto or integral therewith a beam 37—37a which terminates in a downwardly extending finger 38 which is engaged by an upwardly extending shoulder 39 on a lever 40 which is shown as pivotally connected at 41 to a bracket 42 which is integral with a plate 43 which is bolted to a plate 44 and clamping a part of the cable 11 therebetween.

The lever 40 has integral therewith a perforated plate 45 which is encompassing the cable 11 and is pressed upwardly by an initially stressed spring 46 which is shown as seated on the upper end of the plates 43—44.

The lever 40 is extending beyond the plate 45 and is shown as broken off in the drawing.

The pivot 41 may be placed to the left of the cable 11 in the drawing.

The bottle 14 is shown as inclined to the cable 11; the angle of inclination depends on the length of the beam 37—37a which is shown as having the inner end thereof 37 fastened by screws to the casing 36.

As the bottle 14 is lowered to a desirable depth of the sea or lake in the position as shown in the drawing, the water therein is being replaced through the open ports and valve openings which register with each other and are kept in registration by devices which are hereinafter described.

The ends 19 and 29 of the valves 21 and 31 have secured thereto arms 47 and 57 which are pivotally connected to couplings 48 and 58 which have thereon interiorly threaded hubs 49 and 50 respectively which are in movable engagement with right handed and left handed threads at the ends 50 and 60 of a connecting rod 61 which act as feed screws when desired, as is hereinafter described.

The casings 26 and 36 have thereon interiorly threaded bosses 62 and 63, which have adjustably engaged therewith threaded members 64 and 65 which have thereon heads 66 and 67 respectively.

Safety nuts are shown on said members 64 and 65 at said bosses 62 and 63.

The rod 61 has attached thereto sleeves 68 and 69 which have extending therefrom brackets 70 which have each at its end a foot 71.

The foot 71 carried by the sleeve 68 contacts the head 66 when the ports in the casing 26 are in registration with the opening 22 in the valve 21 and the other foot 71 carried by the sleeve 69 contacts with the head 67 when the ports in the seat of the casing 26 are closed by the valve 21 after the latter has been rotated with relation to the bottle 14 through an angle of 90 degrees by means of the arm 47; the same result is attained when the bottle 14 has been rotated about the valve 21.

In the closed position of the ports 23 and 24 by the valve 21 the position of the arm 47 with relation to the bottle 14 is indicated in dot and dash lines by the center line 47a in Fig. 1 of the drawing.

The position of the sleeve 69 when the ports 23 and 24 in the seat 25 are closed by the valve 21 is indicated in dotted lines at 69a.

When assembling the mechanism the member 64—66 is turned and adjusted to contact with the foot 71 when the opening 22 in the valve 21 registers with the ports 23 and 24 in the seat 25 of the casing 26; the member 65—67 is turned and adjusted to contact with the other foot 71 when the opening 22 in the valve 21 is at right angles to the ports 23 and 24 in the seat 25 of the casing 26.

Each of the above adjustments is accompanied by shifting the sleeves 68 and 69 on the rod 61 and by turning the arm 47 until the foot 71 on each of the brackets 70 contacts with the corresponding head 66 or 67 respectively.

These adjustments may be repeated when the valve 21 has been worn or the mechanism disarranged.

The valve 21 is shown as kept to its seat by means of a nut 72 on a threaded part 73 on the end 20 of the valve 21, assisted by a leaf spring 74 which is secured at one end thereof to the clamp plate 13 and is pressing at the other end thereof against the nut 72.

The valve 31 may be similarly kept to its seat by a nut and leaf spring which are not shown.

To keep the bottle 14 when closed from being inadvertently opened by accidentally turning the arm 47 or 57 in a clockwise direction a checking cam or collar 75 is provided on the rod 61 and a resilient strip 76 is secured to the tube 14a to pass over the cam 75 when the valve 21 is being turned in a counterclockwise direction in Fig. 1 and to prevent the cam from returning from its position shown in dotted lines at 75a which corresponds to the position of the arm 47 as indicated in dot and dash lines at 47a.

When it is desired to open the bottle 14 the end of the strip 76 may be manually raised from the rod 61 sufficiently to permit the cam 75 with the rod 61 to be moved in a direction to turn the arm 47 in a clockwise direction.

The rod 61 is shown in the drawing as parallel to the center line of bottle 14; but in the art which is imperfect these are not always parallel, but may be inclined to each other, the positions of the valves 21 and 31 are therefore, frequently not similar and the position of the valve 31 may have to be adjusted when the opening 22 in the valve 21 is in registration with the adjacent ports 23 and 24.

To accomplish this purpose I provide the right handed and left handed feed screws 50 and 60 at the ends of the rod 61 in movable engagement with correspondingly threaded hubs 49 and 59 on the couplings 48 and 58, whereby by turning the rod in one direction its effective length increases, and by turning the rod in the opposite direction it diminishes.

By this means the arm 57 with the valve 31 may be turned and adjusted to have the opening 32 of the valve 31 register with the ports 33 and 34 of the seat 35 in the casing 36 of the bottle 14.

Variation in the length of the rod 61 may also be attained by a feed screw at one end of the rod and a swivel at the other end as shown in Fig. 5 in which the end 50b of the rod 61 is journalled in the hub 49b of the coupling 48b and is kept from being displaced longitudinally by means of collars 77 and 78 on the end 50b of the rod 61.

Other means may be employed for varying and adjusting the effective length of the rod 61, if desired; but the feature of an extensible rod 61 is believed to be new and useful.

After the marine bottle has been lowered to the required depth of the water, which is to be sampled, an impact mass 79, which has therein an opening 80, for the cable 11 to pass therethrough, is dropped from aboard the ship onto the plate 45 which with said lever 40 is thereby caused to turn about the pivot 41 against the

resistance of the spring 46, thereby lowering the shoulder 39 sufficiently to release the finger 38 with the beam 37 on the bottle 14, which is then turned by gravity about the axis of the bearings 15 and 16 on the clamp 12—13 through an angle, which is equal to the difference between 180 degrees and the angle of inclination of the bottle 14 with the cable 11, into an inverted position.

The valve 21 turns with the bottle 14 about the same axis through an angle which is equal to the difference between 90 degrees and the angle of inclination of the bottle 14 with the cable 11; the arm 47 on the valve 21 is then intercepted by a lug 81 on the plate 13 which is disposed in the plane of rotation of the arm 47, as shown in Fig. 2.

The valve 21 is thereby brought to a standstill and the bottle 14 is caused to turn about the valve 21 as a journal during the balance of its course of rotation which is equal to an angle of 90 degrees.

The relative motion between the valve 21 and the bottle 14 brings the arm 47 to the position shown by its center line at 47*a* and the coupling 48 is thereby carried to its position shown in dotted lines at 48*a*.

The ports 23 and 24 in the seat 25 of the valve 21 are thereby closed and placed at right angles to the opening 22 in the valve 21.

The rod 61 causes the valve 31 to be rotated with the arm 57 with relation to the bottle 14, thereby closing the ports 33 and 34 through the relative motion of the arm 47 with said bottle 14.

The sleeve 69 with the bracket thereon, which is similar to the bracket 70—71, is then carried to the position shown in dotted lines at 69*a* and with the foot 71 carried by the sleeve 69 into contact with the adjusting member 65—67, thereby determining the closing position of the ports 23 and 24 with relation to the valve 21 and causing the body of the valve 21 to overlap the ports 23 and 24 to an equal distance on each side of each of said ports.

The stop 67 also prevents the reopening of the ports 23 and 24, as well as 33 and 34, by a continued rotation of the arm 47 with relation to the bottle 14, as when the bottle 14 oscillates on the cable 11.

The cam 75 is then carried to the position indicated in dotted lines at 75*a* past the plate spring 76, as above described.

In current practice the rod 61 is placed at an angle to the center line of the bottle 14, and the arm 57 is longer than the arm 47; this causes the valve 31 to turn through an angle which is less than 90 degrees by the rotation of the arm 47 through 90 degrees, but sufficiently large to cover the ports 33 and 34 as long as the angle of inclination of the rod 61 to the bottle 14 is limited to about 10 degrees.

This is due to the fact that in current practice the upper end of the bottle 14 is suspended from the upper end of the rod 61 which is placed on the side of the bottle 14 which is adjacent to the cable 11.

By suspending the upper end of the bottle 14 independently of the rod 61, the angle of inclination of the bottle 14 to the cable 11 is not limited, the rod 61 may be parallel to the center line of the bottle 14 and the arm 57 may be equal in length to that of the arm 47.

This would allow the valve 31 to be rotated through an angle of 90 degrees by the arm 57 when the arm 47 is rotated through the same angle with relation to the bottle 14. whereby the ports 33 and 34 may be overlapped by the valve 31 to an equal distance on opposite sides of the ports 33 and 34; this would help to prevent or to reduce leakage past the valve 31 when the bottle 14 is being hoisted on board the ship.

The pressure of the leaf spring 74 against the nut 72 is also designed to help to prevent leakage at each of the valves 21 and 31.

Variations are possible and parts of my invention may be used without other parts.

I do not therefore restrict myself to the details as shown in the drawing.

I claim as my invention and desire to secure by Letters Patent:

1. In a marine sampling arrangement a bottle adapted to be lowered into a body of water by flexible means, the bottle having ports at each end thereof, a rotary valve in each end of the bottle at said ports, the valve being adapted to uncover the ports to open the bottle and to cover the ports to close the bottle, a means for operatively connecting the valves to each other whereby to turn said valves, means for rotatably supporting one of the valves, means for swivelly mounting one end of the bottle thereon, means for detachably holding the other end of the bottle so as to incline said bottle relative to said flexible means and for releasing the bottle from said position, thereby causing it to rotate about said one end into a substantially vertical position, said valves being so arranged as to open the ports when the bottle is in its inclined position, means for causing the bottle during part of its rotation to turn about the valve at said one end to close the ports at said end, combined with a means on a part of said bottle and a part connected to the valve at said one end, cooperating therewith, for initially adjusting the position of the valve at said one end, whereby to insure the adequate opening of the ports at said end to provide an unobstructed passage for water therethrough during the lowering of the bottle through the water.

2. The elements of claim 1, combined with a means on said bottle and a part connected to the valve at said one end cooperating therewith for adjusting the position of the valve at said one end of the bottle for closing the ports at that end.

3. In a marine sampling arrangement, a bottle adapted to be lowered into a body of water by a flexible means, the bottle having ports at each end thereof, a rotary valve in each end of the bottle at said ports, said valves being adapted to uncover the ports to open the bottle and to cover the ports to close the bottle; a rod pivotally connected at its ends to arms respectively attached at the ends of said valves so as to turn said valves, means for rotatably supporting one of the valves, means for swivelly mounting one end of the bottle thereon, means for detachably holding the other end of the bottle so as to incline said bottle relative to said flexible means and for releasing the bottle from said position, thereby causing it to rotate about said one end into a substantially vertical position, said valves being so arranged as to open the ports when the bottle is in its inclined position, means for causing the bottle during part of its rotation to turn about the valve at said one end to close the ports at said end, combined with means on said bottle and means on a part of said rod cooperating therewith for initially adjusting the position of the valve at said one end to insure the adequate opening of the ports at said end to provide an unobstructed passage for water there-

through during the lowering of the bottle through the water.

4. The elements of claim 3, combined with a means on another part of the bottle and a means on another part of said rod cooperating therewith for limiting the angle of rotation of the rotatably supported valve with relation to said bottle and for adjusting the position of this valve for closing the ports at the swivelled end of the bottle in a way to have the body of the valve overlap the edges of the ports substantially evenly on both sides of the ports.

5. The elements of claim 3, the said adjusting means comprising a stop member on a part of the bottle and a contact member on said rod adapted to be brought into juxtaposition to the stop member, one of said members having thereon a threaded part movably extending at right angles to said rod, whereby to adjust the position of the rod at the point of contact of said members, thereby adjustably limiting the rotation of the rotatably supported valve with relation to the bottle in a way to adjust the position of this valve to insure an adequate opening of the ports, at the swivelled end of the bottle.

6. The elements of claim 3, combined with a means for adjusting the effective length of said rod, whereby to initially adjust the position of the valve at the other end of the bottle to insure the adequate opening of the ports at said other end to provide an unobstructed passage of the water therethrough when lowering the bottle through the water.

7. The elements of claim 3, combined with a feed screw at one end of the rod in movable engagement with a corresponding interior thread at it connection to the arm on one of the valves and a rotatable connection with the arm on the other valve at the other end of the rod, whereby to adjust the effective length of said rod by turning the same and thereby to initially adjust the position of the valve at the said other end of the bottle to insure the adequate opening of the ports at said end to provide an unobstructed passage of the water therethrough when lowering the bottle through the water.

8. The elements of claim 3, combined with a feed screw at each end of the rod in movable engagement with a corresponding interior thread at the connection thereof to the arm on each valve, whereby to adjust the effective length of said rod by turning the same and thereby to initially adjust the position of the valve at the said other end of the bottle to insure the adequate opening of the ports at said other end to provide an unobstructed passage of the water therethrough when lowering the bottle through the water.

9. In a marine sampling arrangement, a bottle adapted to be lowered into a body of water by flexible means, the bottle having ports at each end thereof, a rotary valve in each end of the bottle at said ports, the valves being adapted to uncover the ports to open the bottle and to cover the ports to close the bottle, a rod, positioned substantially parallel to the center line of the bottle and pivotally connected at its ends to arms respectively attached at the ends of said valves so as to turn said valves, means for rotatably supporting one of the valves, means for swivelly mounting one end of the bottle thereon, means for detachably holding the other end of the bottle so as to incline said bottle relative to said flexible means and for releasing the bottle from said position, thereby causing it to rotate about said one end into a substantially vertical position, said valves being so arranged as to open the ports when the bottle is in its inclined position, means for causing the bottle during part of its rotation to turn about the valve at said one end to close the ports at said end, said holding means comprising a beam at the upper end of the bottle integral therewith and terminating in a downwardly extending finger, a pivotally mounted lever carried by a part on said flexible means, a shoulder on said lever extending upwardly into engagement with said finger, an initially stressed spring carried by the said part on said flexible means for supporting said lever and to be depressed by the collision of said lever with an impact mass, thereby releasing the bottle from said inclined position.

10. In a marine sampling arrangement a bottle adapted to be lowered into a body of water by flexible means, the bottle having ports at each end thereof, a rotary valve in each end of the bottle at said ports, the valves being adapted to uncover the ports to open the bottle and to cover the ports to close the bottle, a mechanism for operatively connecting the said valves to each other whereby to turn the said valves, a means for rotatably supporting one of said valves, means for swivelly mounting one end of the bottle thereon, means for detachably holding the other end of the bottle so as to incline said bottle relative to said flexible means and for releasing the bottle from said position, thereby causing it to rotate about said one end into a substantially vertical position, said valves being so arranged as to open the ports when the bottle is in its inclined position, means for causing the bottle during part of its rotation to turn about the valve at said one end to close the ports at said end, combined with a means on a part of said bottle and a part of said mechanism cooperating therewith for initially adjusting the position of the valve at said one end, whereby to insure the adequate opening of the ports at said end to provide an unobstructed passage for water therethrough during the lowering of the bottle through the water.

11. The elements of claim 10, combined with a means on another part of said bottle and another part of said mechanism, cooperating therewith for limiting the angle of rotation of the valve at the said one end of said bottle with relation to said bottle and for adjusting the position of the valve at said one end for closing the ports at said end.

12. The elements of claim 10, combined with a means on a part of said mechanism for initially adjusting the position of the valve at the said other end of the bottle to insure the adequate opening of the ports at that end to provide an unobstructed passage of the water therethrough during the operation of lowering the bottle through the water.

JOSEPH KAHL.