Sept. 6, 1955 G. E. BETTS, JR., ET AL 2,716,959

NET GATE FOR MARINE HARBORS

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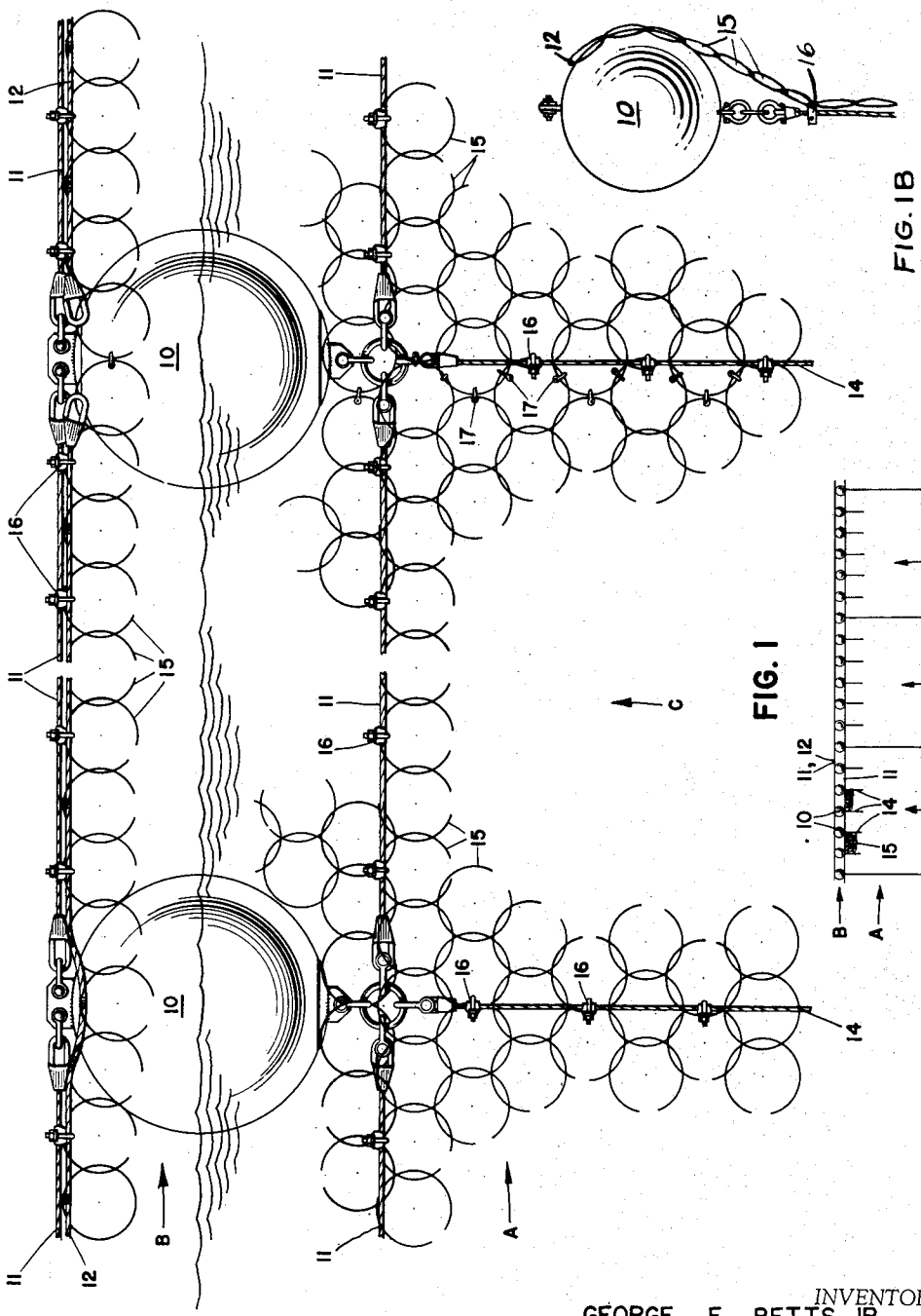


FIG. 1A

FIG. 1

FIG. 1B

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NET GATE FOR MARINE HARBORS

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FIG. 4

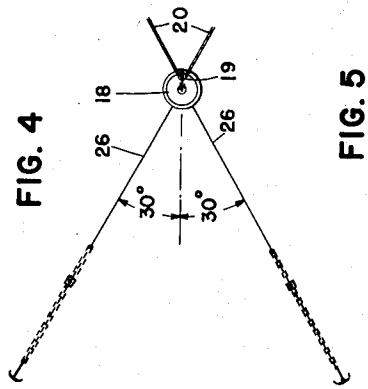


FIG. 5

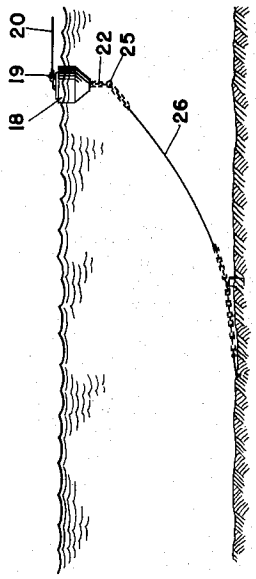


FIG. 3

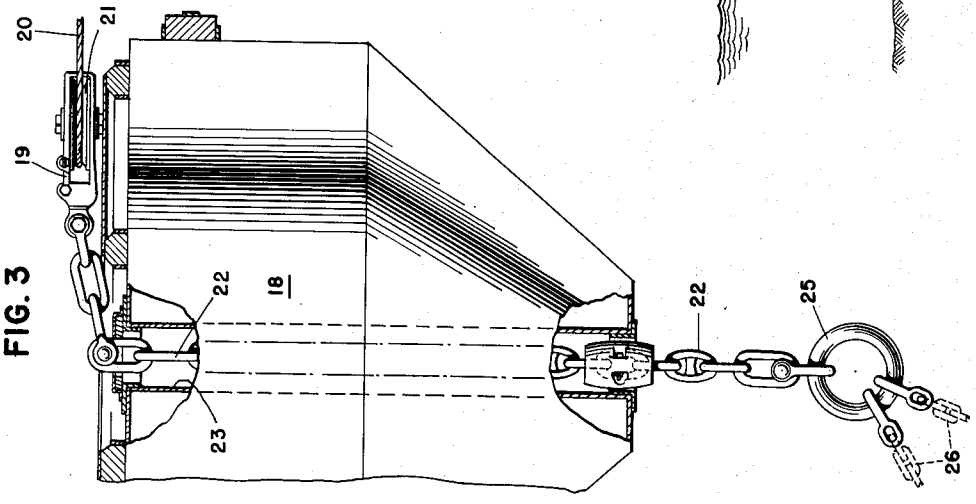
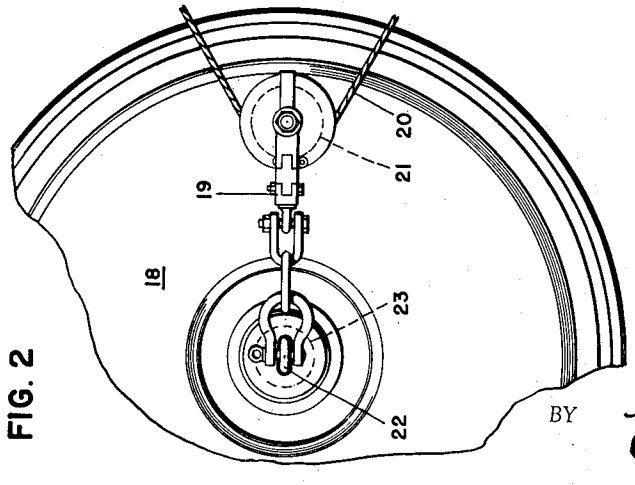


FIG. 2



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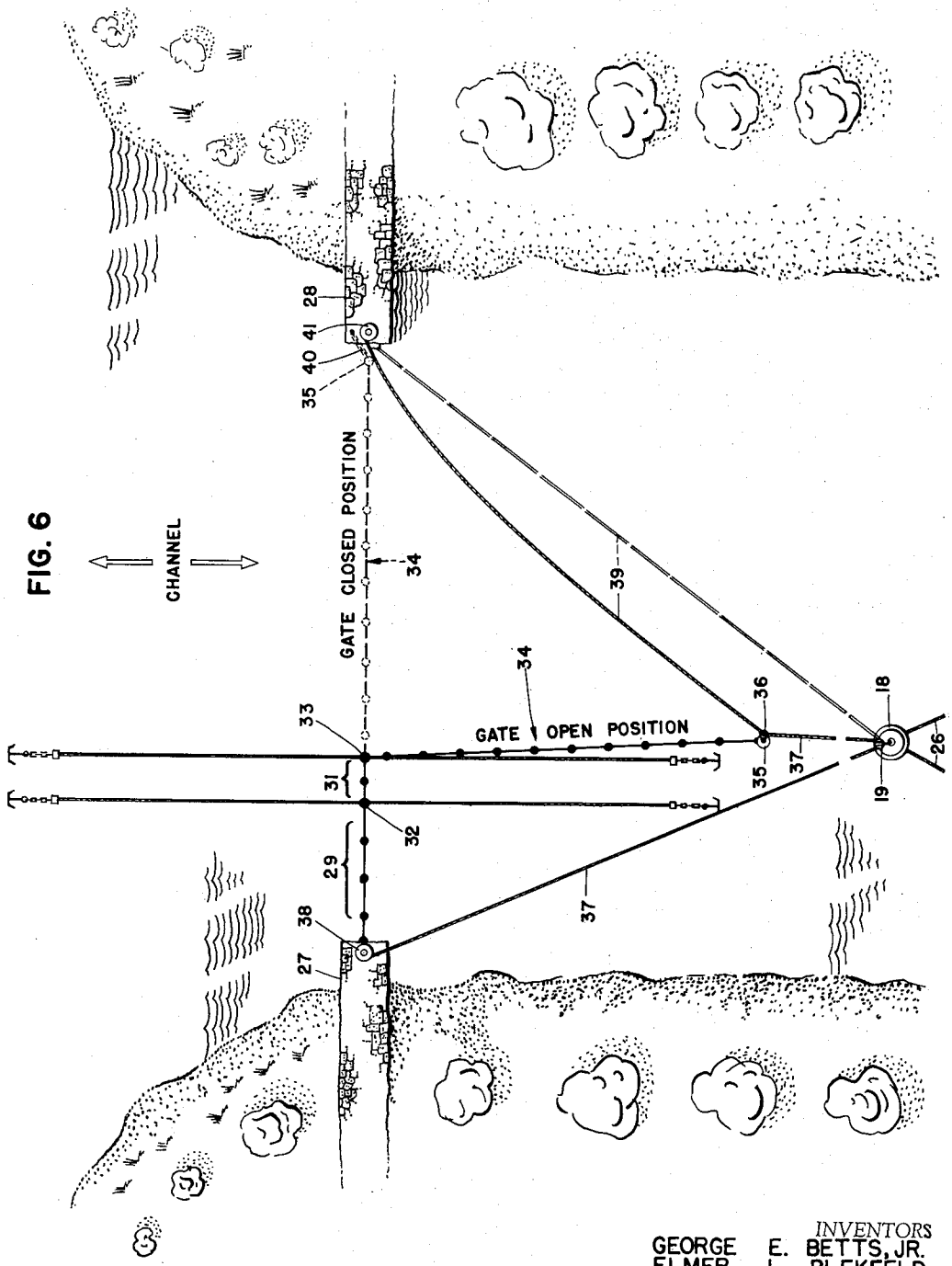
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FIG. 6



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NET GATE FOR MARINE HARBORS

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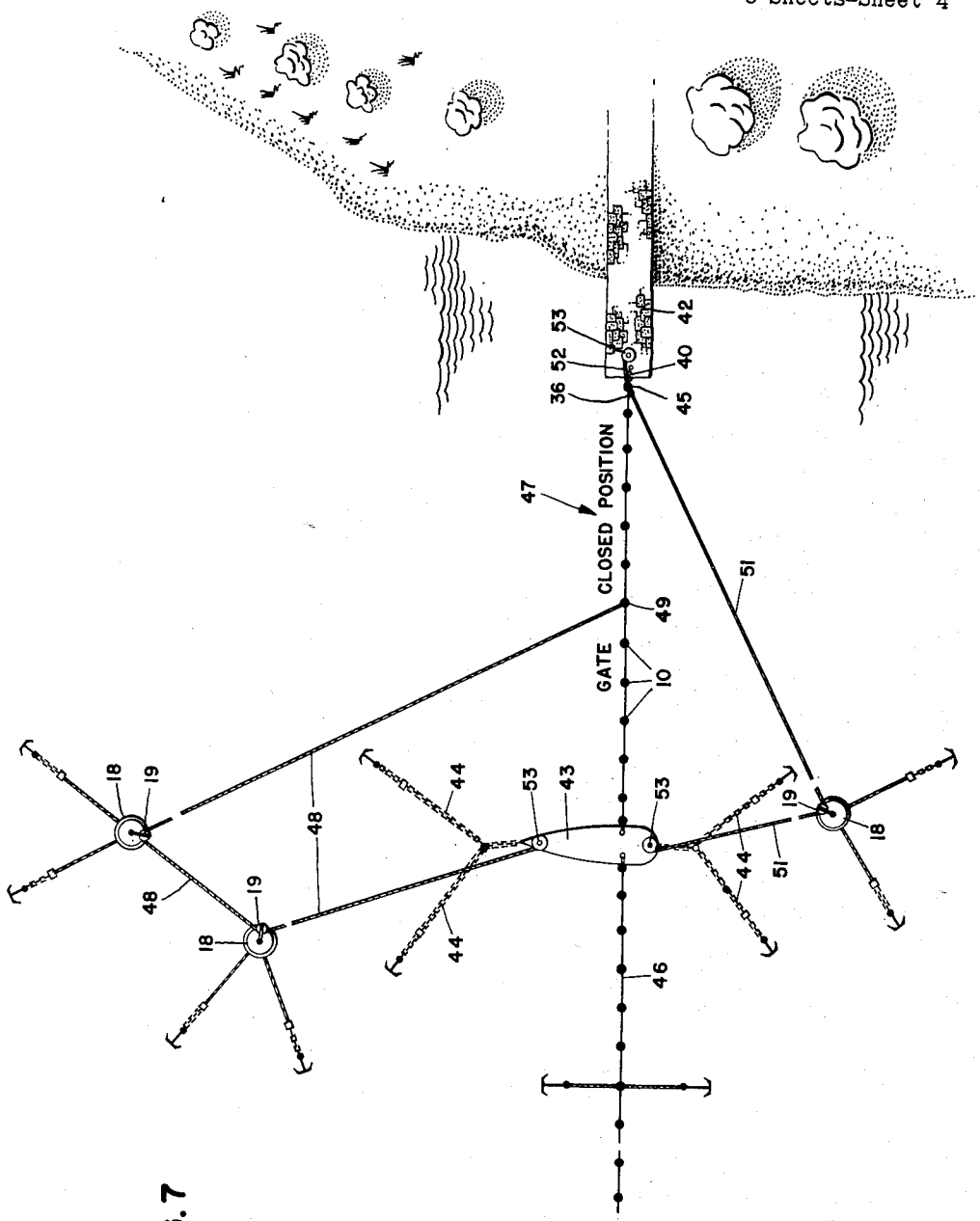


FIG. 7

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NET GATE FOR MARINE HARBORS

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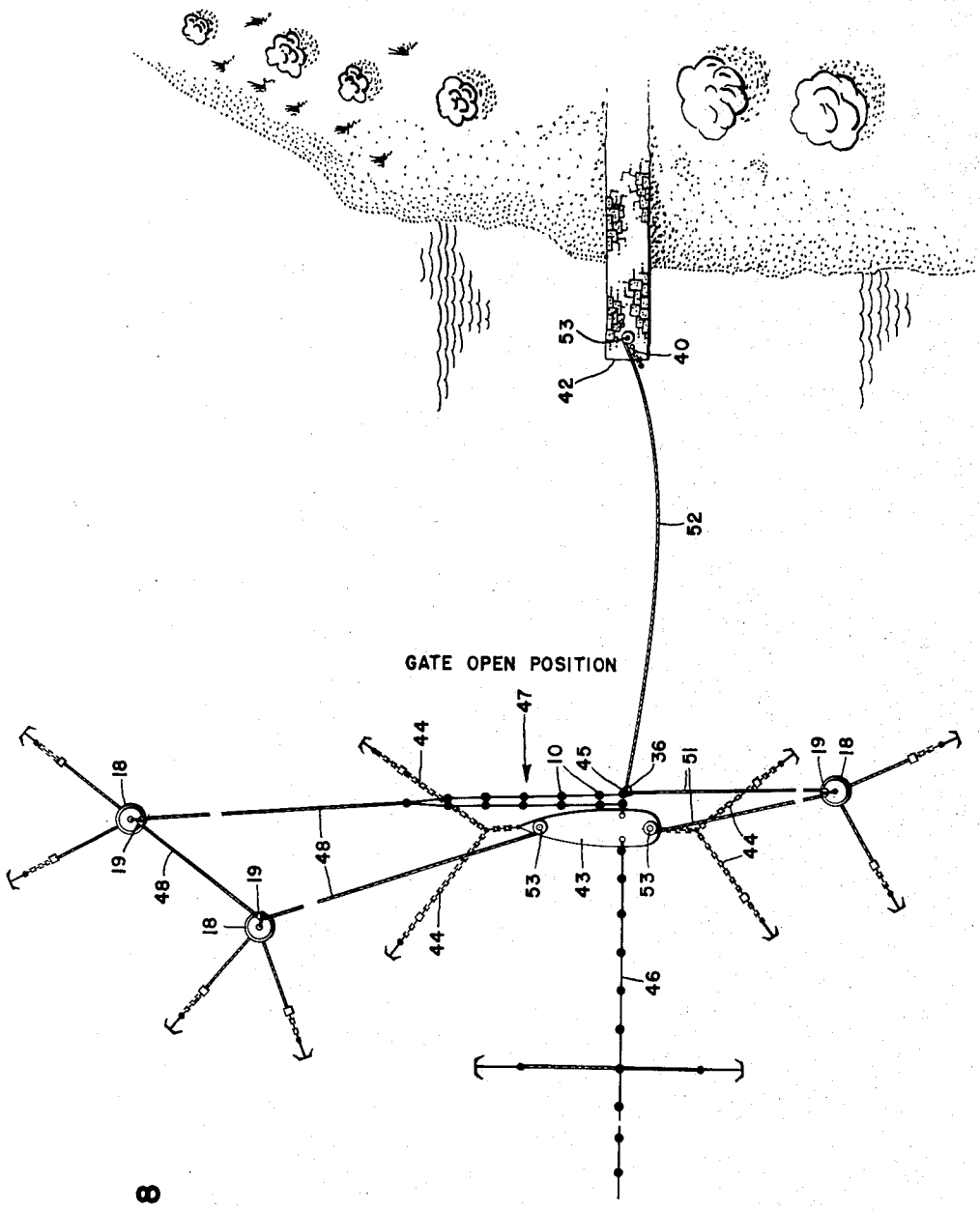


FIG. 8

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NET GATE FOR MARINE HARBORS

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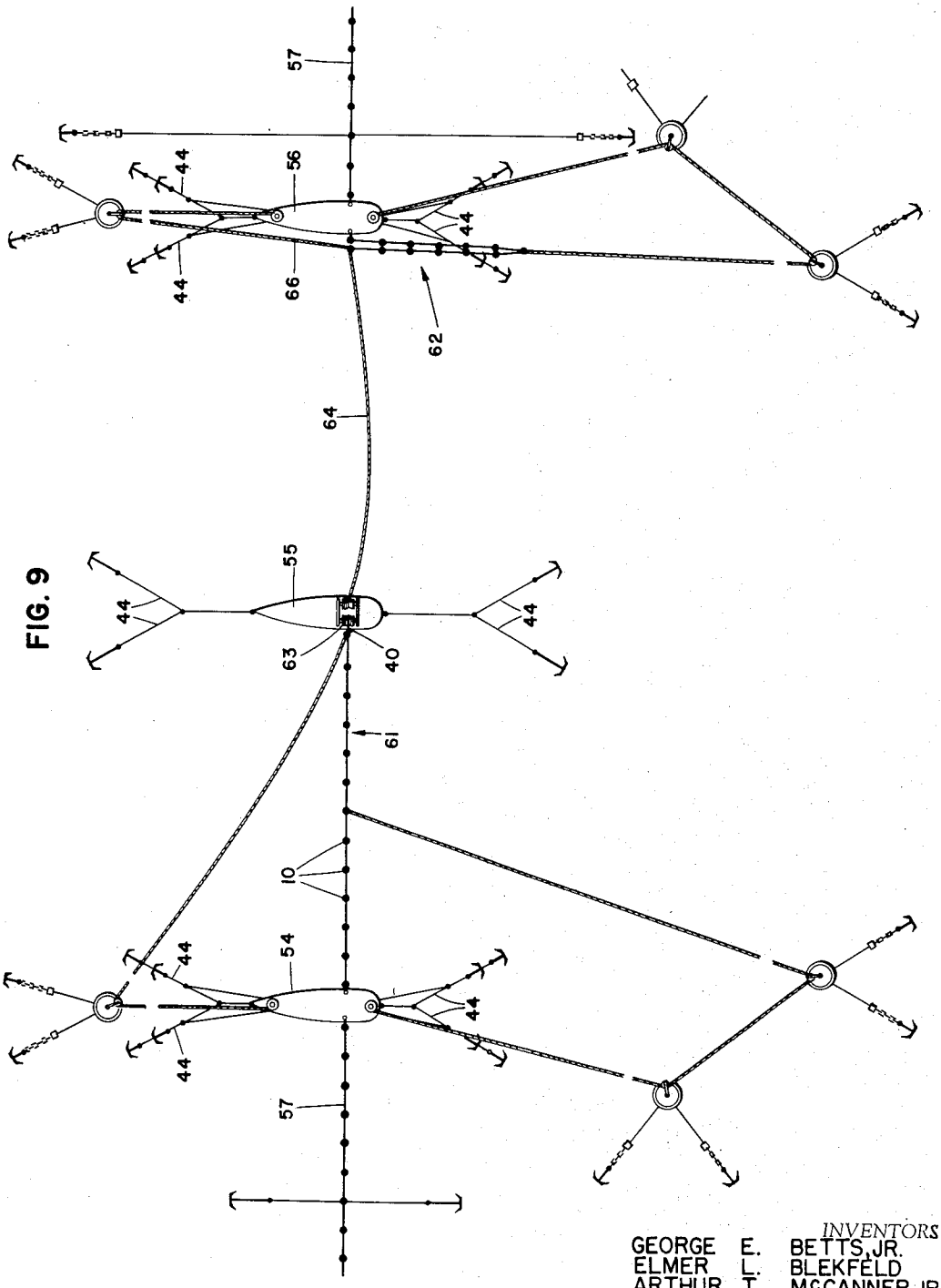


FIG. 9

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NET GATE FOR MARINE HARBORS

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Application May 17, 1954, Serial No. 430,465

4 Claims. (Cl. 114—241)

(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 nets, to net supports, and to net gates for marine use and more particularly to barrier nets employed in harbor defense and the like as protection against submarines, torpedoes, etc., in warfare.

Heretofore, it was common practice to suspend nets from the lowermost ends of buoys or floats so that the top of the net was a substantial distance below the surface of the water. It will be apparent that with such construction a torpedo traveling close to the surface may pass over the net to enter a harbor which is sought to be protected.

It has also been proposed to use in such net constructions gate portions including pneumatic floats which could be collapsed as desired to temporarily lower one or more net sections so that a vessel might pass thereover. This construction requires inflating and deflating the floats to cause them to rise and lift the net in place or to drop down and permit vessels to pass. A gate so constructed is liable to become fouled and inoperative and the harbor thereby left unprotected.

It is an object of the present invention to provide an underwater net construction wherein the upper edge of the net, in use, is buoyantly supported above the surface of the water and consequently protects against the passage of shallow or surface running torpedoes.

It is another object of the present invention to provide a gate construction adapted for use in harbor defense net installations wherein the gate portion of the net may readily be opened to permit entry or departure of watercraft and may quickly and positively be closed thereafter without the danger of parts becoming fouled and without the necessity for lowering any portion of the net.

Another object of the present invention is to provide a net construction and operating means therefor which is positive in operation and provides maximum underwater protection.

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 side elevational view of a three-panel net assemblage;

Fig. 1A is a side elevational view of a portion of a net embodying features of the present invention;

Fig. 1B is a side illustration of Fig. 1A partially in elevation taken along a vertical plane perpendicular to the plane of Fig. 1A and in the vicinity of one of the buoys;

Fig. 2 is a fragmentary top plan view of a peg top buoy supporting a snatch block;

Fig. 3 is a side elevational view of the buoy illustrated in Fig. 2 with portions broken away;

Fig. 4 is a schematic top plan view showing the method of anchoring the buoy of Figs. 2 and 3;

Fig. 5 is a side elevational view of the anchorage arrangement of Fig. 4;

Fig. 6 is a schematic top plan view of a two-winch net gate and operating means constituting one embodiment of the present invention;

Figs. 7 and 8 are schematic top plan views of a single-vessel and single-winch net gate and operating means constituting a modified form of the present invention showing the gate in the closed and opened positions respectively; and

Fig. 9 is a schematic top plan view of a three-vessel net gate and operating means constituting still another modified form of the present invention.

Referring to the drawings, Figs. 1 and 1A show the structure of the barrier net A and its flotation system B in general arrangement and in detail respectively. The net A is made up of a determined number of sections, each section composed of a selected number of panels C. Each panel C is supported by a number of spherical floats **10** which are interconnected at the top and bottom by short jackstays **11** which act as spacers, and clipped to the headrope **12** which runs the length of each panel. Depending from the spherical floats **10** are ropes **14** of a specified length, rove through and clipped to the net panel grommets **15** to distribute the buoyant forces of the floats **10** throughout the net panels.

To the framework above described are secured net panels C with wire rope clamps **16** to jackstays **11**. The net panels are married along the side edges by screw pin shackles **17**.

It will be apparent that with the above construction the protection extends above the surface of the water to the approximate top of the floats, thus protecting the harbor or other area against both shallow or surface running torpedoes.

In the net gate constructions hereinafter described there are employed peg top buoys **18**, shown in Figs. 2 through 5, equipped with snatch blocks **19** which can be opened whereby a line **20** may be passed around a sheave **21** for purposes hereinafter set forth. In this construction the snatch block **19** is linked to a chain **22** passing through a central opening **23** in the peg top buoy **18** and terminating below the buoy in an anchorage ring **25** to which suitable anchorages **26** as illustrated in Figs. 4 and 5 may be secured.

In the net gate operating construction illustrated in Fig. 6 there are shown two breakwaters **27** and **28** with a gap therebetween which is closed by fixed apron panels **29** and **31** moored as by anchored portions **32** and **33**, the latter forming a pivot point for the fixed end of a movable gate **34**. This gate comprises net panel sections of the character illustrated in Figs. 1 and 1A including at the free end a spherical float **35** provided with a ring **36** to which is secured the gate opening rope **37** and gate closing rope **39**. A release **40** secures the gate when in the closed position. As illustrated a peg top buoy **18** of the type shown in Figs. 2 through 5 is moored by anchorages **26**. The snatch block **19** is mounted on the peg top buoy **18** and the opening rope **37** passes through it to an opening winch **38** mounted on breakwater **27**.

For closing purposes a closing rope **39** operated by closing winch **41** is employed to swing the gate back into the place.

In Fig. 6 the gate **34** is illustrated in solid lines in the open position which was achieved by reeling in opening line **37** by operation of winch **38** and paying out closing line **39** until it rests upon the harbor bottom. Thereafter ships may pass through the opening between the breakwater **28** and the moored portion **35** of the net apron **31**.

It will be apparent that during closing operation the

closing rope 39 is reeled in by operation of winch 41 and the opening rope 37 is payed out to permit the gate to be swung from the full line open position of Fig. 6 to the dotted line closed position. When this point is reached the release 40 is closed and the harbor entrance is secured.

In the net gate operating system illustrated in Figs. 7 and 8, the net gate 47 is between a breakwater 42 and a gate vessel 43. The vessel 43 is anchored by moorings 44 fore and aft in the net line 46. The net gate 47 is of the character illustrated in Figs. 1 and 1A, including at the free end a spherical float 45, with a ring 36 to which is secured one gate opening rope 51 and gate closing rope 52. A release 40 secures the gate 47 to breakwater 42 when it is closed. The gate opening rope 51 goes through one snatch block 19 mounted on the peg top buoy 18 to the winch 53 on the gate vessel 43. The other gate opening rope 48 is attached to the cylindrical buoy 49 in the center of the gate 41 and goes through two snatch blocks 19 to the other winch 53 on the gate vessel. When opening the gate, the gate opening ropes 48 and 51 pull the net to jackknife position shown in Fig. 8 and winch 53 on breakwater 42 pays out closing rope 52 so that it will be slack and not foul vessels passing through the opening. In closing the gate, winch 53 on breakwater 42 reels in closing rope 52 while winches 53 on vessel 43 pay out on opening ropes 48 and 51 until the gate is in closed position as indicated in Fig. 7.

The gate operating system illustrated in Fig. 9 is used where there is sufficient traffic in and out of the protected area to warrant a double gate. As illustrated there are three gate vessels 54, 55, 56 which are anchored by moorings 44 fore and aft in the net line 57. The operation of the gates is identical to the operation described in Figs. 7 and 8. Vessels 54 and 56 are the opening vessels and vessel 55 is the closing vessel. In Fig. 9 the left-hand net gate 61 is shown as closed with gate secured with release 40 at gate vessel 55. The right-hand gate 62 is shown open in the jackknife position with the gate closing rope 64 slacked off to permit passage of ships. When this gate is closed it will be secured with the release at gate vessel 55.

From the foregoing description it will be seen that the invention comprises a system of flotation designed to hold the net above the surface of the water, with a system of net gate operation whereas the protection is complete when gate is closed, but provides a means of opening the gate about a pivot point by a system of ropes, snatch blocks and winches without disturbing the flotation of the gate section.

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 is:

1. A swing type aqueous barrier for closing a shipping channel to surface and undersurface traffic comprising a nonrigid net of a length to span said channel, said net including a hinge end and a free end, a plurality of spaced floats supporting the net including a free end float, means anchoring the hinge end along one side of the channel, an opening cable and a closing cable connected to the free end, means at the same side of the channel as said hinge end but laterally spaced therefrom a distance greater than the net length for drawing in and paying out said opening cable such that said net is maintained in substantially a straight line while being opened or closed, and means

at the side of the channel opposite said anchoring means for drawing in and paying out said closing cable.

2. A folding type aqueous barrier for closing a shipping channel to surface and undersurface traffic comprising a nonrigid net of a length to span said channel, said net including a hinge end, a free end and a substantially medial portion, a plurality of spaced floats supporting the net including a free end float, means anchoring the hinge end along one side of the channel, an opening cable and a closing cable connected to the free end, a folding cable connected to said medial portion, means at the same side of the channel as said hinge end and laterally spaced therefrom a distance greater than half the net length for operating said folding cable and positioned to fold said medial portion in straight line increments in jackknife fashion to one side of said channel, opening cable operating means at the same side of the channel as said hinge end but spaced laterally therefrom in a direction opposite said folding cable operating means, and closing cable operating means at the side of the channel opposite said anchoring means.

3. The method of operating a float-supported aqueous nonrigid net barrier to secure a harbor against infiltration by surface or undersurface traffic and movable between open and closed positions relative to a channel, said barrier having an anchored end at one side of the channel and a free end, comprising exerting a closing pull on the free end of the barrier toward the opposite side of the channel, exerting an opening pull on the free end of the barrier toward said one side of the channel but in a direction away from said anchored end, and increasing the relative magnitude of one of said pulls while maintaining at least a fraction of the other of said pulls consonant with the barrier movement desired such that said barrier is maintained in a substantially straight line while in swinging movement, thus tending to hold the free end of the nonrigid barrier distal from said anchored end during swinging movement of the barrier.

4. The method of operating a float-supported aqueous nonrigid net barrier to secure a harbor against infiltration by surface or undersurface traffic and movable between open and closed positions relative to a channel, said barrier having an anchored end at one side of the channel, a free end at the other side of said channel, and a substantially medial portion, comprising exerting a closing pull on the free end of the barrier toward said other side of the channel, exerting a pull on the free end of the barrier toward said one side of the channel in a direction laterally spaced apart from said anchored end, the relative magnitude of one of said pulls to the other being such that the barrier may be opened or closed in substantially straight-line increments, and exerting a pull on the medial portion sufficient to take up any slack in the barrier during opening or closing movement whereby the barrier is jackknifed during opening and unfolded during closing.

References Cited in the file of this patent

UNITED STATES PATENTS

1,551	Vrooman	Apr. 15, 1840
218,962	Hansler	Aug. 26, 1879
311,865	Allen	Feb. 10, 1885
330,016	Green	Nov. 18, 1885

FOREIGN PATENTS

23,489	Great Britain	Dec. 3, 1914
26,900	Australia	May 26, 1930