May 8, 1951 C. POULIOT 2,551,967

ICE BREAKER

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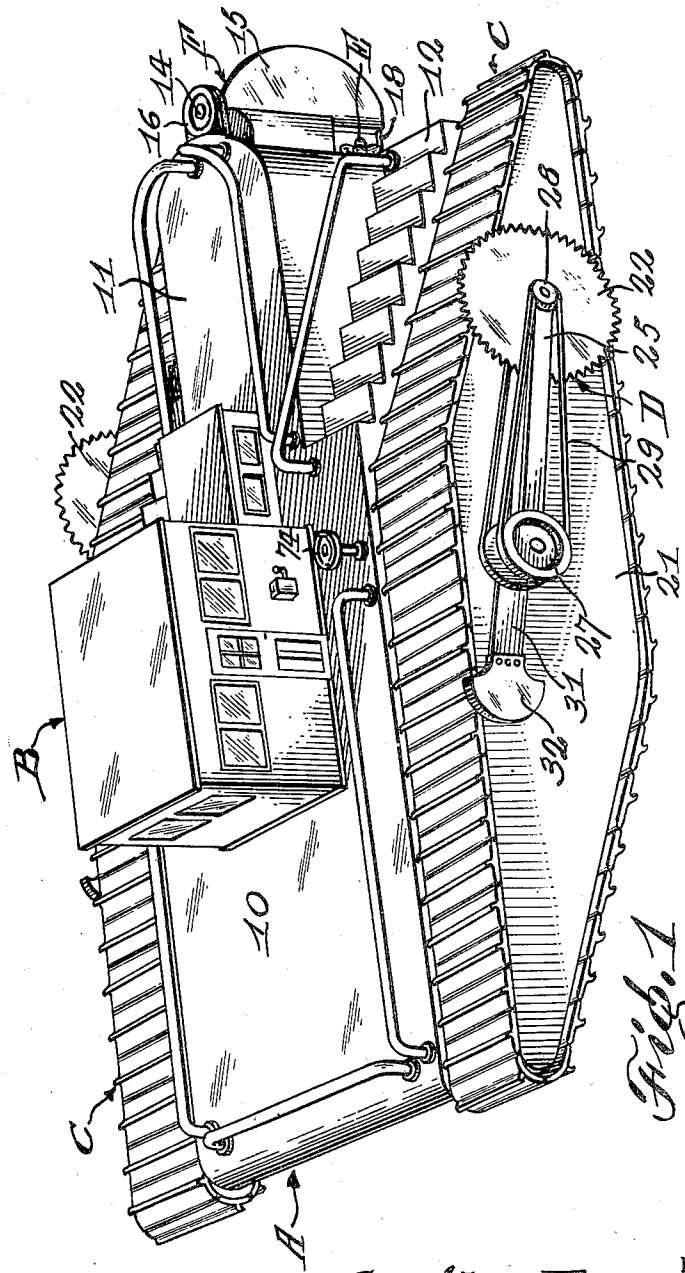

Fig. 1

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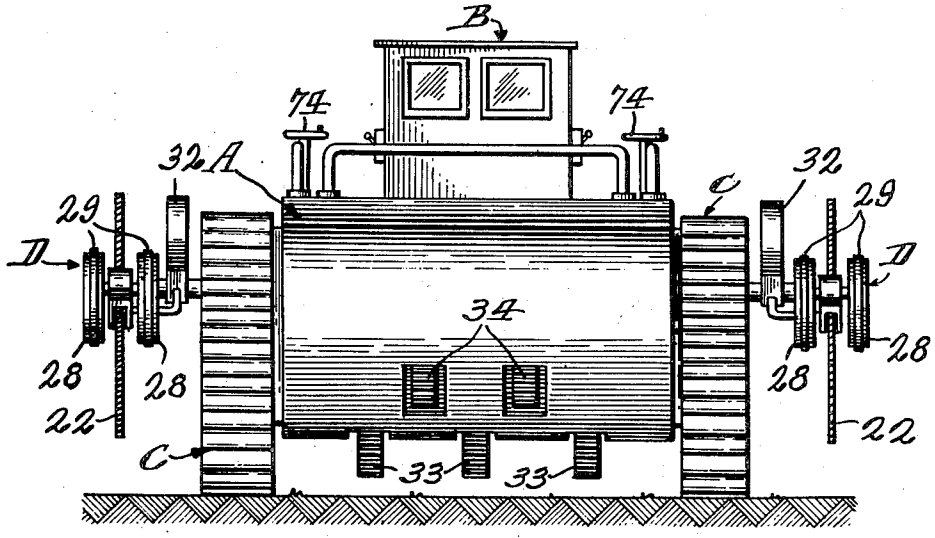


Fig. 2

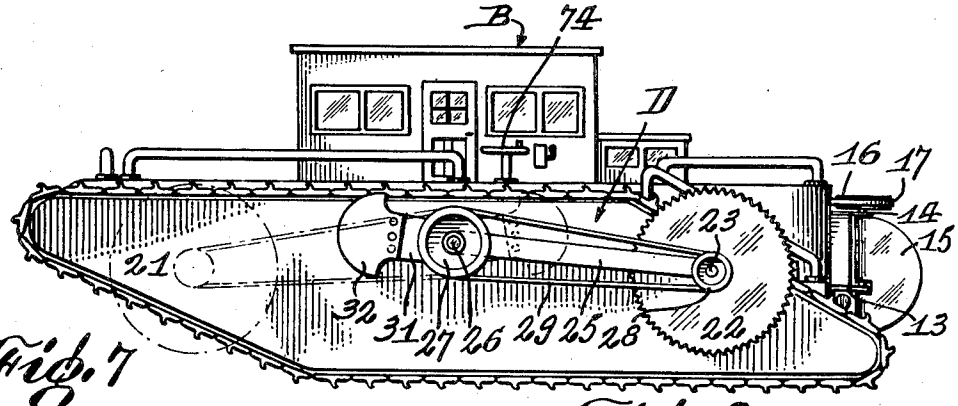
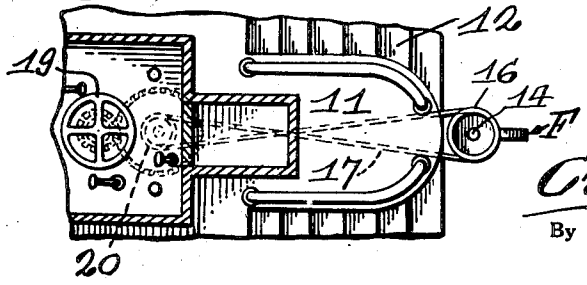


Fig. 3

Fig. 7



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ICE BREAKER

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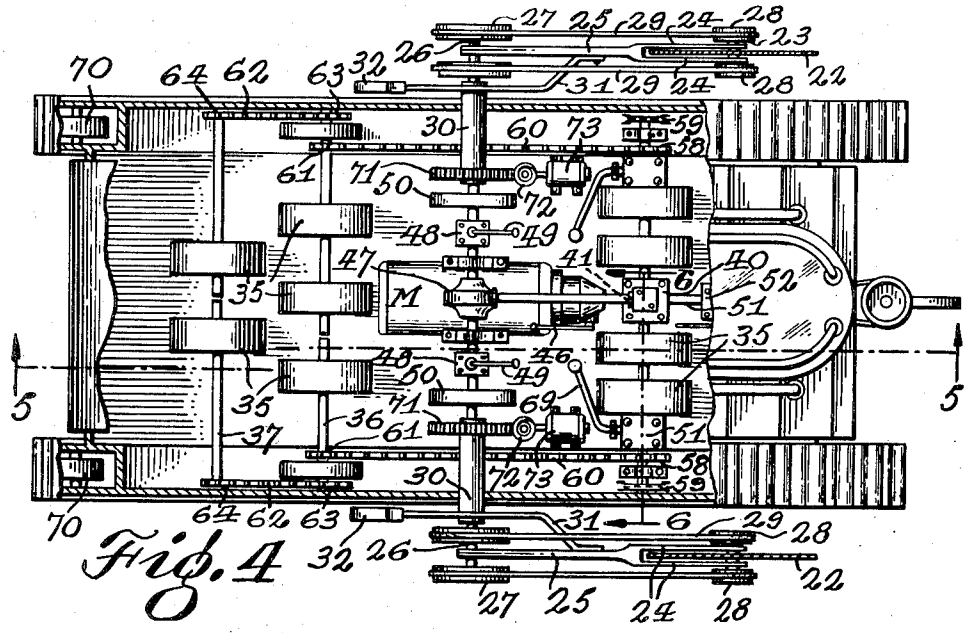

Fig. 4

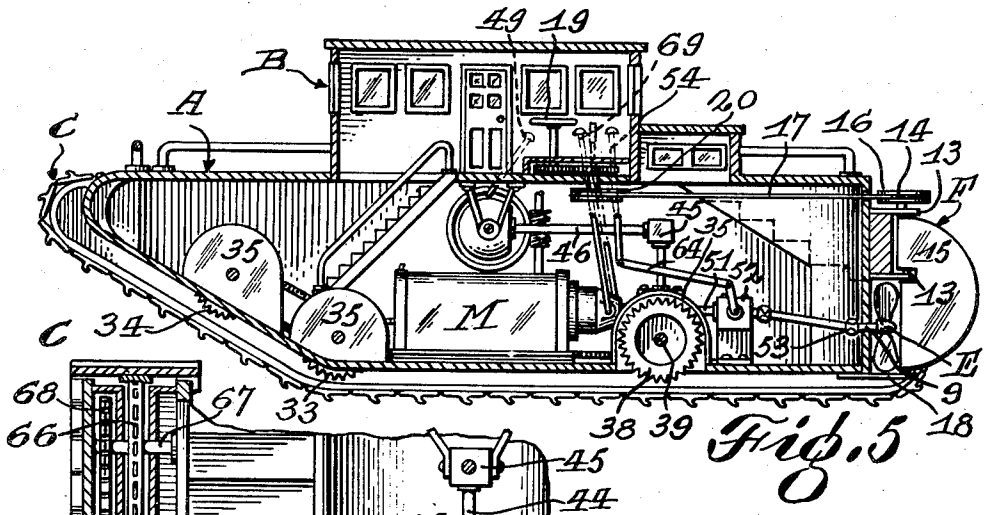

Fig. 5

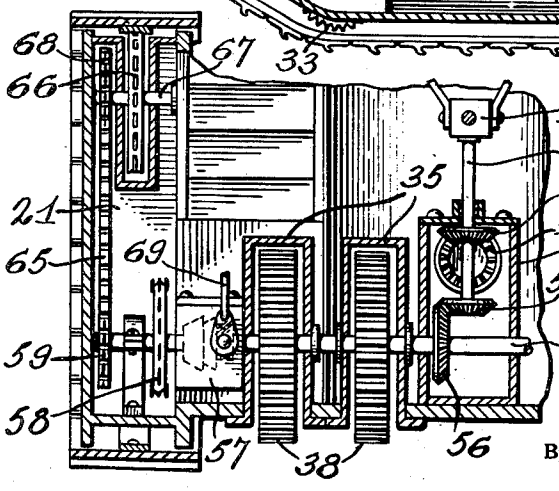

Fig. 6

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Patented May 8, 1951

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UNITED STATES PATENT OFFICE

2,551,967

ICE BREAKER

Cyrille Pouliot, Charlesbourg, Quebec, Canada

Application October 6, 1948, Serial No. 53,053
In Canada October 9, 1947

2 Claims. (Cl. 114—42)

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The present invention relates to an ice breaker.

More specifically, this invention relates to an amphibious vehicle to be used for breaking ice and opening ice bound ship channels.

Ice breakers presently in use are, for the most part, conventional ships but having specially-constructed, reinforced bows. As such a ship noses forward into an ice field, the bow thereof rides up on top of the ice, and, by virtue of the weight of the ship, smashes through to break up the field. The effectiveness of such a breaker therefore depends upon the shape of the bow and the weight which the latter may exert. In the event that the ice is very thick, the conventional ice breaker is helpless and cannot go forward.

The present invention contemplates utilizing an amphibious vehicle as an ice breaker. Such a vehicle would not only be capable of smashing ice by the conventional method outlined above, but would also be able to bring other methods to bear when a more formidable barrier is encountered. Being amphibious, such a vehicle would, upon encountering ice of unusual thickness, climb up on top of the field and bring power-operated cutting or crushing means to bear upon the mass of ice.

The main object of the invention, then, is to provide an amphibious vehicle capable of being used as an ice breaker.

Another object resides in the provision of an amphibious ice breaker which has maneuverable, power-operated means for cutting the ice.

Still another essential object of this invention resides in the provision of an amphibious ice breaker of the character described which is easily maneuverable on sea, on land, and on top of an ice field.

A further object is to provide power-operated cutting means for an ice breaker which are easily controllable to cut the ice in the vicinity of the breaker.

Other objects and advantages will become apparent, or be further pointed out, in the description to follow.

As an example, and for purposes of illustration only, a preferred embodiment of the invention is shown in the annexed drawings, wherein:

Figure 1 shows a perspective view of an amphibious ice breaker constructed according to the invention;

Figure 2 shows a front elevation view of the ice breaker;

Figure 3 shows a side elevation view illustrating the movement of the cutting means from inoperative to operative position;

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Figure 4 shows a sectional plan view through the ice breaker illustrating the control means therefor;

Figure 5 shows a sectional side elevation of the ice breaker along the line 5—5 of Figure 4;

Figure 6 shows a detail section along the line 6—6 of Figure 4, and

Figure 7 shows a detail of the rudder control means.

Referring now to the drawings, wherein the same reference characters denote corresponding parts throughout, the ice breaker of the invention is seen to consist generally of the hull or body A, the bridge or control house B, the caterpillar tracks C, the cutting assembly D, the screw E and the rudder assembly F.

Generally speaking, it is preferred that the hull A and propelling tracks C of the vehicle be shaped and disposed after the fashion of the earlier type of tanks; that is, the path of the tracks and the shape of the hull will resemble somewhat a forwardly-canted parallelogram (see Figure 1). Thus the front end of the vehicle will have a shovel-nose shape which is particularly adaptable for climbing up on obstacles. Upon the main deck 10 of the hull is disposed the control house B, and aft of this structure, a central platform 11 of the deck preferably extends to the rear of the vehicle and is flanked by the companion ways 12 which slope downwardly toward the screw E parallel with tracks C.

The propelling screw E is mounted centrally at the stern of the vehicle beneath the after platform 11. A shaft 9 to which the screw is keyed projects out of the hull and is driven by the vehicle engine as hereinafter described.

The rudder assembly F is disposed at the rear of the vehicle, above and behind the screw. Thus, for example, the ears 13 might project from a section of the hull above the screw, and an upright shaft 14, to which the rudder fin 15 is secured, might be pivotally housed in these ears. At the top of the assembly, a pulley 16, keyed to shaft 14 and controlled by a belt 17 leading to the control house B, would direct the angular displacement of the shaft and fin. Underneath the screw E, a lug 18 preferably projects from the hull to provide a thrust bearing for shaft 14 and to protect the screw from ice passing underneath the vehicle. In the control house, a hand wheel 19, acting through suitable gearing and a pulley 20, directs the movement of belt 17.

Each of the tracks C surrounds and moves around a housing 21 in which the track-driving mechanism is enclosed. These housings 21 are

connected to the hull A and are made structurally water-tight therewith.

Projecting from the outer side of each of the housings 21 are disposed suitable cutting means empowered by the vehicle. The preferred cutting means to be used with the invention is shown in Figures 1, 2, 3 and 4, and consists mainly of the circular saw 22. This saw is keyed on a shaft 23 which is rotatably held between the bifurcated ends 24 of a bar 25, which bar is in turn pivotally mounted on a shaft 26 projecting from housing 21. The shaft 26 provides the power for rotating the saw 22, preferably having two drive pulleys 27 thereon which connect, by means of belts 29, to two corresponding pulleys 28 fixed at each end of shaft 23. Thus rotation of the shaft 26 causes rotation of saw 22. In order that the saw may be vertically displaced at will, an axially-bored shaft 30 is provided projecting from housing 21 concentric to and bearing on shaft 26. The shaft 30 does not project out as far as shaft 26, but has fixed thereto the arm 31 which is secured to bar 25 at one end and has a counterbalancing weight 32 on the other end. Thus, if shaft 30 be angularly displaced, the whole saw assembly borne by the arm 31 and bar 25 will be similarly displaced (see Figure 3).

As an additional aid in climbing an obstacle, it is proposed that the shovel-nose or bow of the ice breaker be provided with toothed wheels, part of whose circumferences project downwardly from the sloping surface. Figures 2 and 5 show a preferred arrangement of such gripping serrated discs, with the three serrated discs 33 and the two serrated discs 34 arranged in two transverse rows projecting, respectively, from the bottom of the bow and halfway up the sloping surface thereof.

Water-tight interior housings 35 enclose the discs and prevent flooding of the hull. The row of discs 33 are keyed to a common shaft 36, and discs 34 to a shaft 37. These shafts traverse the hull in the interior thereof and are driven from the engines of the ice breaker as described below.

In order to aid in propelling the broken blocks of ice to the rear of the ice breaker, a further transverse row of serrated discs 38 may be disposed similarly to the above-mentioned rows and will project underneath the hull towards the stern thereof. These discs would also be enclosed in housings such as 35 and mounted on a common shaft 39.

With the exception of the means for swinging the cutting assembly, the ice breaker and its associated equipment is preferably driven by the engine M, which may be of the internal combustion type.

As shown in Figures 4 and 5, the engine drives into gear box 40 wherein, by means of suitable gearing, power may be taken off to drive the saw-actuating mechanism, the track-actuating mechanism and the screw.

Figure 6 shows a preferred construction of the gear box 40. Thus the engine drives into the gear box through shaft 41 and rotates bevel gear 42 which in turn drives the bevel gear 43 and an upright shaft 44 to which the latter is keyed. Shaft 44 drives into another gear box 45 from which power for rotating the saws is taken by shaft 46. Such saw-actuating mechanism may consist of the shaft 46 driving into transmission 47 which in turn drives the shafts 26 at each side of the hull through clutches 48. Control levers 49 for these clutches extend up into the control house B whereby power may be applied to the saws at will. In addition, a flywheel such as 50 may be provided on each shaft 26 as desired.

In gear box 40, a further bevel gear (not shown) may be disposed opposite 42 so as to derive its power from gear 43 and shaft 44. A shaft 51 (Figure 5) may lead aft from this gear and, through the medium of clutch 52 and suitable joints 53, be coupled to shaft 9 to which the screw is keyed. A jointed control lever 54 for clutch 52 will extend into the control house B, and, by means of this lever, power may be applied to the screw at will.

In Figure 6 again, the lower end of shaft 44 drives into the mechanism for actuating the tracks and the downwardly-projecting serrated discs. Thus, through bevel gears 55 and 56, power is applied to shaft 39 on which are secured the discs 38 and, through clutches 57 on each side of the hull, the sprocket wheels 58 and 59 in housings 21.

From the sprocket wheels 58 disposed one on each side of the hull, the chains 60 extend forward and transmit power to the sprocket wheels 61 on shaft 36, thus driving this shaft and the discs 33. Shaft 37, in turn, is similarly coupled to shaft 36 by means of chain 62 and sprocket wheels 63 and 64. Thus when either of the clutches 57 so permit, power may be transmitted to all the climbing wheels underneath the bow of the icebreaker.

The tracks C of the vehicle are driven through the medium of each of the sprocket wheels 59 in housings 21. Thus from each of the sprocket wheels, a chain 65 extends upwardly in the housing and engages a sprocket wheel 66 which is, in turn, keyed to a shaft 67 disposed transverse the housing near the top thereof. Secured to shaft 67, and surrounded by water-tight plates to prevent flooding of housing 21 is a gear wheel 68. As this wheel rotates, it is adapted to engage and displace one of the tracks C. Thus, by appropriate manipulation of the levers 69 extending up into the control house from clutches 57, the tracks C of the vehicle may be controlled independently to move in either direction at will.

Where the tracks move around the extremity of the housings 21, suitable idler pulleys such as 70 may be disposed so as to engage the former and maintain them in alignment.

Figures 4 and 5 show the means by which the displacement of the saws in a vertical plane is accomplished. Thus a gear wheel 71 is keyed to each of the shafts 30 at the end inside the hull thereof. An upright worm gear 72 engages gear 71 and is in turn controlled either by the electric motor 73 or hand wheel 74. Thus adjustment of the position of the saw may be made either from the control house or from the deck.

Obviously from the foregoing, the ice breaker of the present invention clearly fulfills the objectives hereinbefore set forth. Thus the ice breaker is amphibious and is easily and conveniently maneuverable in water and on top of an ice field. The ice cutting means projecting from the side of the vehicle are easily movable into any desired cutting position and will enable the breaker to clear a channel of any suitable width through ice fields with which conventionally designed ships are unable to cope. In addition, the vehicle has been equipped with suitable means for assisting it to climb up on top of obstacles which will also aid in shoving crushed blocks of ice to behind the stern. Moreover, it is seen that the vehicle itself and the power-operated equipment associated therewith may all be driven from

a single engine and controlled from a single convenient position, if desired.

It will be understood that, from the very nature of the invention, I do not limit myself to the particular embodiment herein shown and described. Certainly many sweeping variations may be made in the construction illustrated without altering fundamentally the operation or main components thereof.

For example, the circular saw of the cutting means might be replaced by a circular knife blade, by some sort of high temperature cutting means, or other alternatives. Or the rudder assembly might be altered radically without essentially changing the nature thereof. And, in particular, the entire mechanism by which power is distributed to the various power-operated units would be different in each different size and type of vehicle constructed.

It follows, therefore, that various changes may be made in the size, shape and arrangement of parts, and even in some of the components used, without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. An amphibious vehicle for use as an ice breaker comprising a hull, a water screw and a rudder supported from the lower portion of said hull to propel and steer said vehicle respectively when afloat, ground engaging tracks mounted on said hull to propel said vehicle when on land, ice cutting means mounted on said hull and an engine mounted within said hull for driving said screw and said tracks, said ice cutting means comprising an arm pivotally suspended at the side thereof, a circular blade rotatively mounted at the free end of said arm, means for rotating said blade and means for positively swinging said arm.

2. An amphibious vehicle as claimed in claim 1, a plurality of serrated discs rotatively mounted in said hull, part of whose circumferences project from under said hull, said discs drivingly connected to said engine for the purpose of aiding said vehicle to climb on top of an ice field.

CYRILLE POULIOT.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
26,960	Wiard	Jan. 24, 1860
588,393	Brown	Aug. 17, 1897
656,265	Richmond	Aug. 21, 1900
800,281	Esch	Sept. 26, 1905
1,716,230	Ingram	June 4, 1929
2,466,236	Hecker	Apr. 5, 1949