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AUTOMATIC TOWING BOAT

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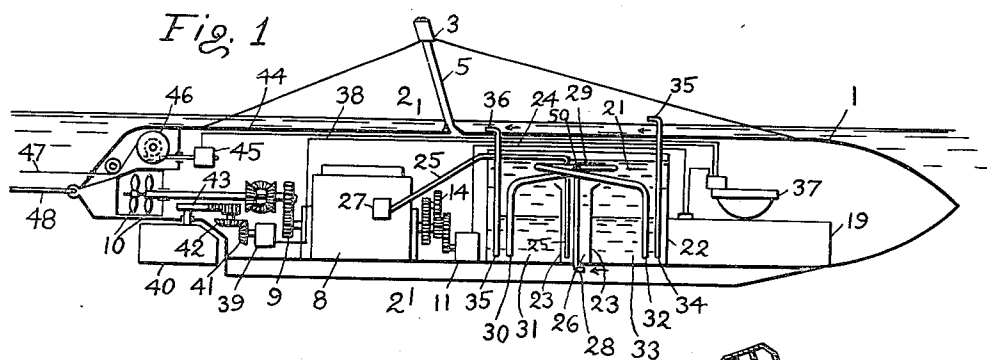


Fig. 2

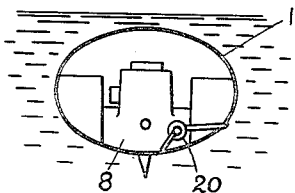
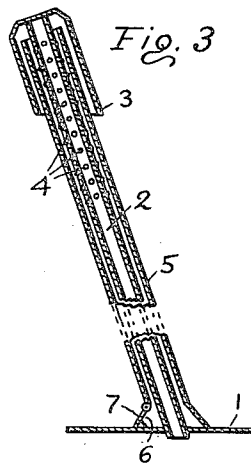
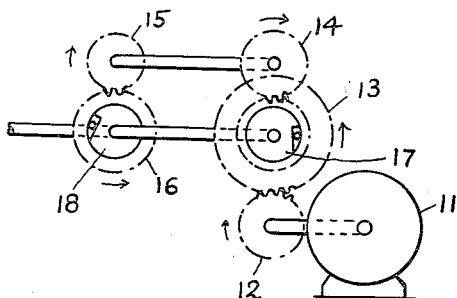


Fig. 4



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AUTOMATIC TOWING BOAT

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7 Claims. (Cl. 114—16)

My invention relates to automatic towing boats and has particular reference to boats having an automatic piloting mechanism.

My invention has for its object to provide a boat, partly or fully submerged, which can be automatically propelled by an engine, preferably of an internal combustion type, air for the engine being admitted into the boat through the air intake pipe extending above the level of water. I also provide protective enclosures for the pipe in order to prevent water from entering the boat with the air.

Another object of my invention is to provide means to maintain the weight of the boat constant by admitting water into the boat for compensating loss of weight caused by the consumption of liquid fuel by the engine. For this purpose, I provide a pipe or pipes extending from the outside into a tank in the boat for admitting water into the tank. The pipe may be placed in the fuel tank because water does not mix with ordinary engine fuels such as gasoline, or petrol, naphtha, crude oil, etc. In order to regulate the amount of water admitted into the tank, I provide a pipe extending from the bottom of the tank to a point below the level of water, the pipe being provided with a nozzle directed backward so that water is sucked out of the pipe by the motion of the boat. The suction pipe is made of a smaller diameter than the intake pipe, so that water gradually accumulates in the tank in excess of the amount required to compensate for fuel consumption.

For this purpose, a second suction pipe is provided extending above the level of water for the normal depths of submergence of the boat. With the gradual accumulation of excessive water in the tank, the boat will sink deeper below the level of water until the suction nozzle of the second pipe also becomes submerged. The second pipe will begin to function drawing water out of the tank, the two pipes exhausting more water than is admitted through the intake pipe. As a result, the boat will be lighter and it will rise again until the second pipe clears the surface. In this manner, the boat will be maintained at a certain depth of submergence as determined by the location of the second pipe. The latter may be made sufficiently long to keep the boat submerged to a desired depth.

Another object of my invention is to provide means to maintain the boat on an even keel while it is moving under the surface of water. For this purpose, I provide two tanks or two sections in one tank, located fore and aft respec-

tively. The intake pipe branches out to these two pipes forming an approximately horizontal loop. The rear pipe extends from the front portion of the loop and the front pipe extends from the rear portion of the loop so that if the boat becomes tilted forward, more water would flow by gravity into the rear tank causing the rear tank to become heavy until the balance is restored. Similarly, if the rear portion of the boat becomes heavier and the boat tilts backward, then the front pipe will receive more water until again the balance is restored.

My invention represents, therefore, an automatic towing boat, comprising an internal combustion engine, fuel tank for the engine, means to propel the boat by the engine and means to steer the boat by a compass mechanism.

My invention is more fully described in the accompanying drawing and specification in which:

Fig. 1 is a sectional elevational view of my towing boat.

Fig. 2 is a sectional view on the line 2—2 of Fig. 1.

Fig. 3 is a detail view of an air intake pipe.

Fig. 4 is a diagrammatic view of a starting mechanism for the engine.

The towing boat as shown in Fig. 1, consists of a water-tight hull 1 adapted to be fully submerged under water but provided with an air intake pipe 2 extending above the level of water. The pipe is closed on top with a cap 3 in order to prevent splashes of water from getting into the pipe, the air being admitted through inclined downward openings 4. A protective pipe 5 encloses the air pipe with a certain clearance, extending under the cap, so as to further protect the pipe from water. Any water which may get into the space between the pipes is drained through an opening 6 closed by a valve 7 from inside.

An internal combustion engine 8 is mounted in the boat and is connected by gears 9 with propellers 10 rotating in the opposite directions. A starting electric motor 11 is connected with the engine through gears 12, 13, 14, 15 and 16, shown diagrammatically in Fig. 4 and provided with overrunning or free wheeling clutches 17 and 18. The clutches are arranged so that the motor drives the engine through all these gears at the full reduction, the clutch 17 being then released, until the engine begins to operate under its own power; when the clutch 18 becomes released and the clutch 17 engaged so that the motor 11 will be driven through gears 13 and 12 at the lower

reduction. The motor then operates as a generator, charging an electric storage battery 19. A pump 20 operated by the special electric motor or from the shaft of the starter removes any water which may enter the hull through the air pipe.

Fuel 21 for the engine, such as gasoline, naphtha or crude oil is kept in a closed tank 22 with transverse partitions 23 in the middle extending to the upper portion of the tank and terminating at a distance from the cover 24. A fuel pipe 25 extends from the bottom of the compartment 26 formed by the partitions to the carburator, fuel pump or similar fuel feeding device 27 at the engine. A water intake pipe 28 extends from the outside of the hull into the compartment 26 and to the top of the tank. The lower end of the pipe has a nozzle directed forward so that water enters the pipe when the boat is moving. The upper end of the pipe is connected with a distributing loop 29, the front end of the loop being connected with a rear distributing pipe 30 extending to the bottom of the rear portion 31 of the tank, the rear end of the loop being connected with a front distributing pipe 32 extending to the bottom of the front portion 33 of the tank. Front and rear exhaust pipes 34 and 35 respectively extend from the bottom of the tank portions 31 and 32 to the outside and terminate with nozzles 35 and 36 directed rearward. The nozzle 36 ends below the level of water while the nozzle 35 extends at the level above. The tank usually is not completely filled, there being an air space left above the level of the liquid as shown in Fig. 1, and is, of course, provided with a hole for filling it with fuel, which may be closed by an ordinary cap (not shown) with a small vent hole in order to prevent formation of vacuum when fuel is drawn into the engine.

The object of the water intake and outlet pipes is to maintain the boat on an even keel and at a certain depth of submergence below the water level by automatically adding the correct amount of water into the tank to compensate for the loss of weight caused by the consumption of the fuel. As it was mentioned, the intake pipe 28 continuously draws water and distributes it to the front and rear tank compartments. The rear exhaust pipe 35 draws the water from the tanks but at a somewhat slower rate than it is taken in so that the boat will gradually sink until the end of the front pipe 34 becomes also submerged. The combined suction of the two pipes 34 and 35 will drain water more rapidly than it is delivered by the intake pipe with the result that the boat will again rise until the upper end of the pipe 34 clears the surface of the water. The boat, therefore, will be maintained submerged so that the surface of water will be at the level of the nozzle of the pipe 34.

It should be noted that water is delivered equally in the front and rear compartment 31 and 33 only as long as the boat remains in horizontal position or on an even keel. As soon as it is tilted endwise, however, the distribution of water will be changed. Due to the arrangement of the pipes 30 and 32, whereby the rear pipe extends from the front end of the loop, and the front pipe extends from the rear end of the loop, water will flow into the compartment which is at a higher elevation. Thus, if the rear portion of the boat becomes heavier, causing the stern to sink deeper, the front end of the loop 29 will rise, so that it will be easier for water to flow into the front compartment, thereby rendering

the latter heavier and causing the boat to be straightened to an even keel. This action will be further accelerated by the increased suction through the rear pipe 35 whose nozzle will be under water. The pipes 35 and 36 can be made of any suitable length for maintaining the boat at a desired depth of submergence.

The boat is controlled by an automatic piloting mechanism 37 described more fully in the foregoing application. It is connected by wires 38 with a motor 39 which operates the rudder 40 through gears 41 and 42 and a gear sector 43. The piloting mechanism 37 is also connected by wires 44 with a motor 45 operating a drum 46 with a steel cable 47 operating mine releasing mechanism, the mines being towed by a connecting bar 48.

I claim as my invention:

1. A towing boat comprising a hull adapted to be submerged in water, a tank in the hull, a water intake pipe for the tank having a nozzle extending forward outside the hull and adapted to draw water into the tank when the boat is in motion, and water exhaust pipes extending from the bottom of the tank and having nozzles directed rearward adapted to exhaust water from the tank when the boat is in motion, the nozzle of one exhaust pipe terminating below the level of water at the normal submergence of the boat, the nozzle of the other exhaust pipe terminating above the level of the first mentioned exhaust pipe, the first pipe being adapted to exhaust a smaller quantity of water than is taken in by the intake pipe, the two exhaust pipes, when both submerged, being adapted to exhaust more water than is taken in by the intake pipe, the three pipes being thereby adapted to maintain the boat at a predetermined depth of submergence in motion.

2. A towing boat comprising a hull adapted to be submerged in water, an engine in the hull for propelling the boat, a tank in the hull adapted to hold a fuel for the engine which does not mix with water, pipes extending from the bottom of the tank to the outside of the hull and terminating with an intake nozzle adapted to draw water into the tank when the boat is in motion thereby compensating for the loss of weight due to the consumption of the fuel by the engine, and water exhaust pipes extending from the bottom of the tank and having nozzles directed rearward adapted to exhaust water from the tank when the boat is in motion, the nozzle of one exhaust pipe terminating below the level of water at the normal submergence of the boat, the nozzle of the other exhaust pipe terminating above the level of the first mentioned exhaust pipe, the first exhaust pipe being adapted to exhaust a smaller quantity of water than is taken in by the intake pipe, both pipes when submerged being adapted to exhaust more water than is taken in, the three pipes being thereby adapted to maintain the boat at a predetermined depth of submergence in motion regardless of the amount of the fuel used.

3. An automatic towing boat comprising a hull, an engine in the hull for propelling the boat, a tank in the hull for an engine fuel, partitions in the tank extending to a height below the top of the tank and forming a central compartment and two side compartments for the fuel, means to pump water into the side compartments under the fuel, thereby forcing the fuel over the partitions into the central compartment, a fuel pipe for the engine extending from the bottom

of the central compartment, and water exhaust pipes extending from the bottom of the tank in the side compartments and having nozzles directed rearward adapted to exhaust water from the tank when the boat is in motion, the nozzle of one suction pipe terminating below the level of water at the normal depth of submergence of the boat, the nozzle of the other exhaust pipe terminating at a point above the level of the first mentioned exhaust pipe, the first exhaust pipe being adapted to exhaust a smaller quantity of water than is delivered by the pumping means, both exhaust pipes, when submerged, being adapted to exhaust a larger quantity of water than is delivered by the pumping means, the pipes with the pumping means being thereby adapted to maintain the boat at a predetermined depth of submergence in motion.

4. An automatic towing boat comprising a hull, an engine in the hull for propelling the boat, a tank in the hull for an engine fuel, partitions in the tank extending to a height below the top of the tank and forming a compartment for the fuel, means to pump water into the tank outside the compartment under the fuel, thereby forcing the fuel over the partitions into the compartment, said means comprising a suction pipe having a nozzle directed forward and adapted to draw water into the tank when the boat is in motion, a fuel pipe for the engine extending from the bottom of the compartment, and water exhaust pipes extending from the bottom of the tank outside the compartment and having nozzles directed rearward adapted to exhaust water from the tank when the boat is in motion, the nozzle of one exhaust pipe terminating below the level of water, at the normal depth of submergence of the boat, the nozzle of the other exhaust pipe terminating at a point above the level of the first mentioned exhaust pipe, the first exhaust pipe being adapted to exhaust a smaller quantity of water than is delivered by the pumping means, both exhaust pipes, when submerged, being adapted to exhaust a larger quantity of water than is delivered by the pumping means, the pipes with the pumping means being thereby adapted to maintain the boat in motion at a predetermined depth of submergence.

5. A towing boat comprising a hull adapted to be submerged in water, a front and rear tanks in the hull, means to draw water from the outside, pipes extending from the water drawing means to the tanks and forming substantially horizontal loops, the loops for the front tank extending to the rear and the loop for the rear tank extending to the front, the pipes being thereby adapted to maintain the boat on an even keel by admitting more water into the tank which has risen higher due to the axial inclination of the boat, an exhaust pipe for the rear tank having a nozzle extending rearward adapted to exhaust the water from the tank when the boat is in motion, the amount of the exhausted water being smaller than the amount delivered by the water drawing means, and a second exhaust pipe extending from the front tank having a nozzle directed rearward for exhausting the water from the tank, the first nozzle terminating below water level at

the normal submergence of the boat, the second nozzle terminating above level of the first mentioned exhaust pipe, both exhaust pipes when submerged being adapted to exhaust a larger quantity of water than is delivered by the drawing means, the pipes being thereby adapted to maintain the boat on an even keel while in motion.

6. A towing boat comprising a hull adapted to be submerged in water, a front and rear tanks in the hull, means to draw water from the outside, said means comprising a suction pipe having a nozzle directed forward and adapted to draw water into the tanks when the boat is in motion, pipes extending from the water drawing means to the tanks and forming substantially horizontal loops, the loops for the front tank extending to the rear and the loop for the rear tank extending to the front, the pipes being thereby adapted to maintain the boat on an even keel by admitting more water into the tank which has risen higher due to the axial inclination of the boat, an exhaust pipe for the rear tank having a nozzle extending rearward adapted to exhaust the water from the tank when the boat is in motion, the amount of the exhausted water being smaller than the amount delivered by the water drawing means, and a second exhaust pipe extending from the front tank having a nozzle directed rearward for exhausting the water from the tank, the first nozzle terminating below water level at the normal submergence of the boat, the second nozzle terminating above the level of the first mentioned exhaust pipe, both exhaust pipes when submerged being adapted to exhaust a larger quantity of water than is delivered by the drawing means, the pipes being thereby adapted to maintain the boat on an even keel while in motion.

7. An automatic towing boat comprising a hull, an engine in the hull for propelling the boat, a tank in the hull for an engine fuel, partitions in the tank extending to a height below the top of the tank and forming a compartment for the fuel, means to pump water into the tank outside the compartment under the fuel, thereby forcing the fuel over the partitions into the compartment, a fuel pipe for the engine extending from the bottom of the compartment, water exhaust pipes extending from the bottom of the tank outside the compartment and having nozzles directed rearward adapted to exhaust water from the tank when the boat is in motion, the nozzle of one suction pipe terminating below the level of water at the normal depth of submergence of the boat, the nozzle of the other suction pipe terminating at a point above the level of the first mentioned exhaust pipe, the first exhaust pipe being adapted to exhaust a smaller quantity of water than is delivered by the pumping means, both exhaust pipes, when submerged, being adapted to exhaust a larger quantity of water than is delivered by the pumping means, the pipes with the pumping means being thereby adapted to maintain the boat, while in motion at a predetermined depth of submergence, and means to prevent splashes of water from reaching the compartment.

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