Oct. 31, 1950 R. M. FLANAGAN 2,528,354

JET PROPULSION OUTBOARD MOTOR

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Fig. 1.

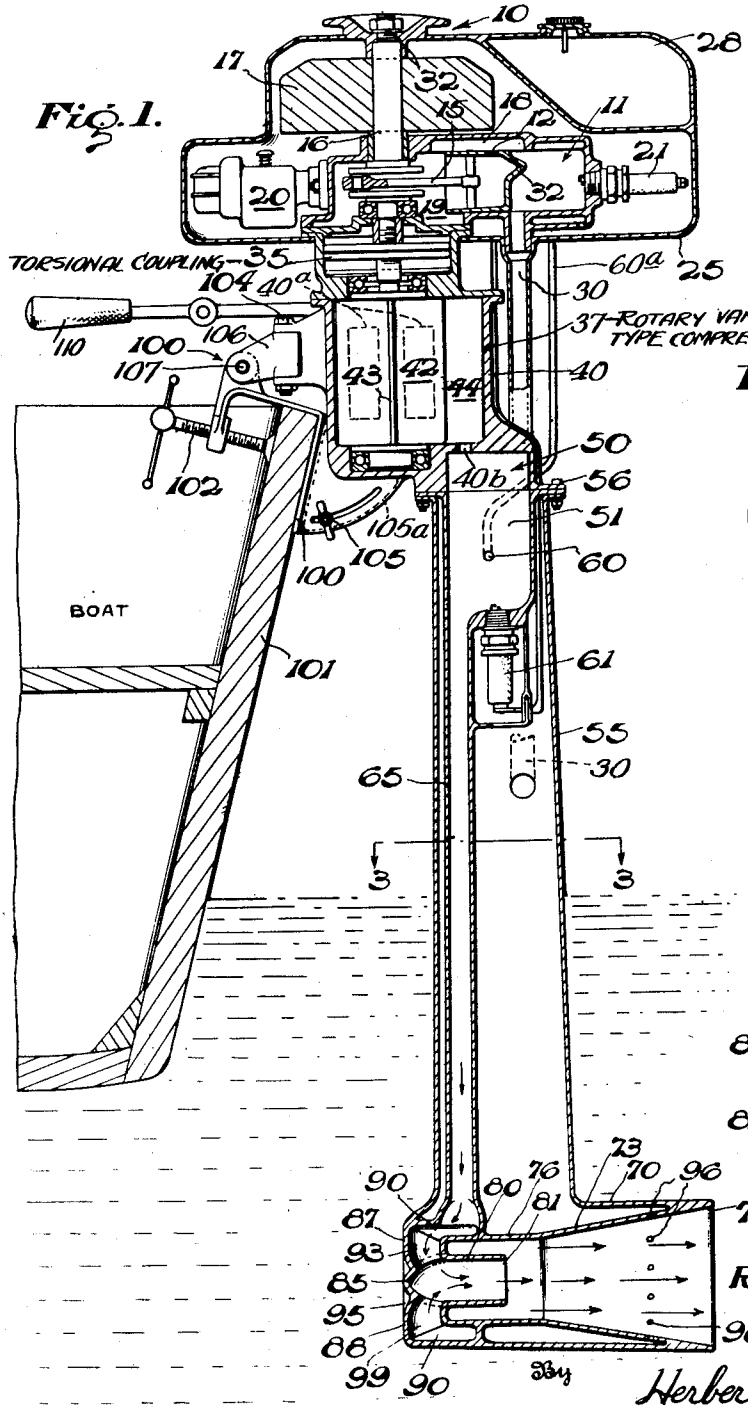


Fig. 3.

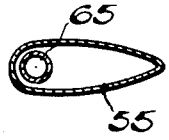
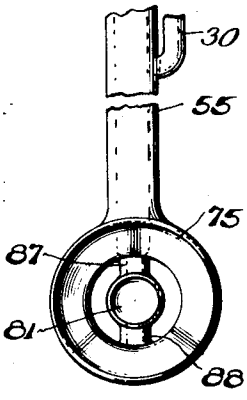


Fig. 2.



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JET PROPULSION OUTBOARD MOTOR

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1 Claim. (Cl. 60—35.6)

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The present invention relates to a novel means for propelling a boat and more particularly to a novel outboard jet propulsion mechanism.

An object of the invention is to provide a novel propelling mechanism for a boat, including an air compressor directly driven by an internal combustion engine and supplying air to a combustion chamber in which chamber there is located a nozzle for admitting a combustible fluid and means for igniting or exploding the resultant mixture in the chamber so as to provide an exhaust jet for propelling the boat.

Another object of the invention is to provide a novel expansion type nozzle in which the velocity energy of the exhaust gas is converted to pressure energy for propelling the boat.

Another object of the invention is to provide a novel propulsion unit for a boat arranged so as to entrain a portion of the water in which the boat floats by forcing exhaust gas into the throat of a suitable venturi tube carried by the boat and through which the water may flow.

Another object of the invention is to provide a novel manually operable means for controlling the direction of movement of the boat by changing the angle at which the venturi tube extends relative to the boat.

These and other objects and features of the invention are pointed out in the following description in terms of the embodiment thereof which is shown in the accompanying drawing. It is to be understood, however, that the drawing is for the purpose of illustration only, and is not designed as a definition of the limits of the invention, reference being had to the appended claim for this purpose.

Referring to the drawing:

Figure 1 is a vertical sectional view of a device embodying the invention;

Figure 2 is an end view of the venturi tube of Figure 1;

Figure 3 is a sectional view of Figure 1 taken along the lines 3—3 of Figure 1 and looking in the direction of the arrows.

As shown in Figure 1, there is provided an internal combustion engine 10 which may be of conventional type including a cylinder 11 having a piston 12 slidably mounted therein. The piston 12 is connected through a piston rod 15 to a crank shaft 16 on which is mounted a fly wheel 17. An inlet passage 18 for the combustible fluid leads into the cylinder 11 from the crank case 19. The combustible fluid is fed into the crank case from a carburetor 20 in a conventional manner. A spark plug 21 of conventional type and suitably electrically connected serves to ignite the combustible fluid thus fed into the cylinder 11.

A casing 25 enclosing the engine 10 has formed therein a tank 28 for holding a supply of the combustible fluid.

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Leading from the cylinder 11 is a passage 30 forming an exhaust passage for the gases from the cylinder 11 and opening into an outlet conduit as will be explained.

The passages 18 and 30 are controlled by the piston 12 which is shown in a position opening the passage 30 to the exhaust gases within the cylinder 11. A deflector 32 on the piston 12 deflects the incoming fuel gases from passage 18 to the opposite end of cylinder 11.

At the outer end of the crank shaft 16 there is mounted a starting plate 32, of conventional type. At the opposite end of the crank shaft 16 there is provided a torsional coupling 35 through which the crank shaft 16 is drivingly coupled to a rotary vane type compressor indicated generally by the numeral 37 and which may be of a type such as shown in Gregg U. S. Patent No. 2,148,070, granted February 21, 1939. The compressor 37 has provided a casing 40 having air inlet ports indicated in dotted lines by the numeral 40a. The casing 40 is suitably fastened at the upper end to the lower open end of the casing 25. The compressor 37 also includes a rotor 42 having slots in which are slidably mounted the vanes 43 and 44 in a manner well known in the art.

An air outlet opening 40b is provided in the casing 40 and leads from the compressor 37 to an outlet conduit 50. The outlet conduit 50 leads from the compressor 37 into a chamber 51 formed in the upper end of a tubular member or casing 55. The upper end of the tubular member 55 is fastened by bolts 56 to the lower end of the casing 40 and opening into the tubular member 55 is the exhaust passage 30 as shown in Figures 1 and 2.

A combustible fluid is conducted by suitable means including a conduit 60a, and fuel pump and pressure regulating valve, not shown, from the supply tank 28 into the chamber 51 through a suitable nozzle 60. A spark plug 61 of conventional type and suitably electrically connected serves to ignite the combustible fluid and air mixture in the chamber 51. The combustion in chamber 51 takes place continuously.

A tubular member 65 of reduced size leads from the lower end of the chamber 51 to a novel expansion type nozzle 70 formed at the lower end of the member 55.

The nozzle 70 extends substantially at right angles to the tubular member 55 and has formed therein a venturi tube 73 having a flared open end 75 and a throat portion 76.

Concentrically mounted within the throat portion 76 is a tube or propulsion unit 80 having an open end 81 extending in the direction of the flared open end 75 of the venturi 73. The opposite end of the tube 80 is closed at 85. The tube 80 is supported within the throat 76 of the venturi 73 by web members 87 and 88 projecting

from the upper and lower portions of the venturi 73 as shown in Figures 1 and 2.

About a portion of the throat 76 is an annular chamber 90 into which there opens the lower end of the tubular member 65. There is further formed in the web members 87 and 88 passages 93 and 99, respectively, which lead from the annular chamber 90 into the tubular propulsion unit 80.

As will be seen from Figures 1 and 2, one end of the venturi 73 has a flared open end 75, while the opposite end 95 of the venturi 73 has openings at the opposite sides of the web members 87 and 88, as best shown in Figure 2.

Thus water may enter the venturi through the open end 95 and pass out through the open flared end 75. Ports 96, formed in the venturi 73, serve as outlet openings for the exhaust gas in the tubular member 55 from the engine 10.

A bracket 100 which may be of conventional type is provided for fastening jet propulsion mechanism to the stern of a boat, indicated by the numeral 101. The bracket 100 has a conventional fastening screw 102 for fastening the bracket to the boat and a swivel mounting 104 whereby the jet propulsion mechanism is pivotally fastened to the bracket 100 for rotation of the mechanism on a vertical axis.

The swivel bolt 104 pivotally connects the mechanism to an arm 106 on a vertical axis, while the arm 106 is in turn pivotally connected to the bracket 100 on a horizontal axis by a swivel bolt 107.

A second adjustment nut 105 is provided for securing an adjustable plate indicated in dotted lines by the numeral 105a relative to the bracket 100. The plate 105a is formed separate from the bracket 100 and jet propulsion mechanism. Through adjustment of the mechanism around the horizontal axis of the swivel bolt 107 the angle at which the nozzle 70 is positioned may be varied. The bracket 100 is connected to the jet propulsion mechanism through the swivel bolts 104 and 106 only and plate 105a merely acts as an adjustable support for the mechanism to determine the angle at which the nozzle 70 is positioned about the horizontal axis 107. The bracket 100 and adjustable plate 105a are not fixedly connected to the jet propulsion mechanism.

A handle 110 is fastened to the jet propulsion mechanism so that the same may be conveniently pivoted on the swivel mounting 104 for changing the direction of movement of the boat under force of the propelling exhaust jet.

The adjustable plate 105 as shown by dotted lines in Fig. 1 serves as an adjustable stop to limit adjustment of the jet propulsion mechanism about the swivel bolt 107 in a clockwise direction. The casing of the jet propulsion mechanism is not fixedly secured to the bracket 100 or plate 105a, but rather so bears upon the plate 105a that the mechanism may be conveniently pivoted on the swivel mounting 104, as previously described.

In the operation of the novel mechanism described, it will be seen that the internal combustion engine 10 drives the rotary vane type compressor 37 through the torsional coupling 35 and air under pressure of the compressor 37 flows into the combustion chamber 51. A combustible fluid enters the chamber 51 through the nozzle 60 and is ignited through operation of the spark plug 61.

The heat of combustion of the mixture increases the volume of the air in proportion to the amount of combustible fluid introduced.

The increase volume of air due to the rise in temperature resulting from combustion passes through the conduit 65 and passages 90, 93, 99 and out the nozzle of the propulsion unit 80 and venturi throat 76. The propulsion unit 80 is so designed that the velocity of the escaping gas approaches the expected maximum speed through the venturi throat 76. The gas escaping through the nozzle 70 under pressure effects a forward thrust due to the ejector action of the venturi tube 70 causing the boat to move through the water.

Moreover, by turning the mechanism in relation to the boat by operation of the lever 110, the direction of the thrust may be changed and thereby the direction of movement of the boat.

Although only one embodiment of the invention has been illustrated and described, various changes in the form and relative arrangements of the parts, which will now appear to those skilled in the art, may be made without departing from the scope of the invention. Reference is, therefore, to be had to the appended claim for a definition of the limits of the invention.

What is claimed is:

A mechanism for propelling a boat, comprising, in combination, an internal combustion engine having an exhaust passage, a rotary air compressor driven by said engine, means for fastening said engine and compressor to the stern of a boat, a tubular member extending vertically downward from said engine and compressor, a combustion chamber provided within said tubular member and supplied with air under compression by said compressor, combustible fuel supply means for said chamber, ignition means for said combustible fluid, a venturi tube mounted at the lower end of said tubular member, said venturi tube having a throat portion and one end open through which water may be drawn, and an opposite open flared end through which the water may be expelled, a propulsion unit, a first conduit connecting said combustion chamber to said unit, said tubular member connecting said exhaust passage to said venturi tube and surrounding said first conduit, and said propulsion unit mounted in said throat portion for discharging a stream of combustion products from said combustion chamber in such a manner as to force entrained water from the flared end of said venturi tube so as to exert a force for propelling the boat.

ROBERT MICHAEL FLANAGAN.

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