

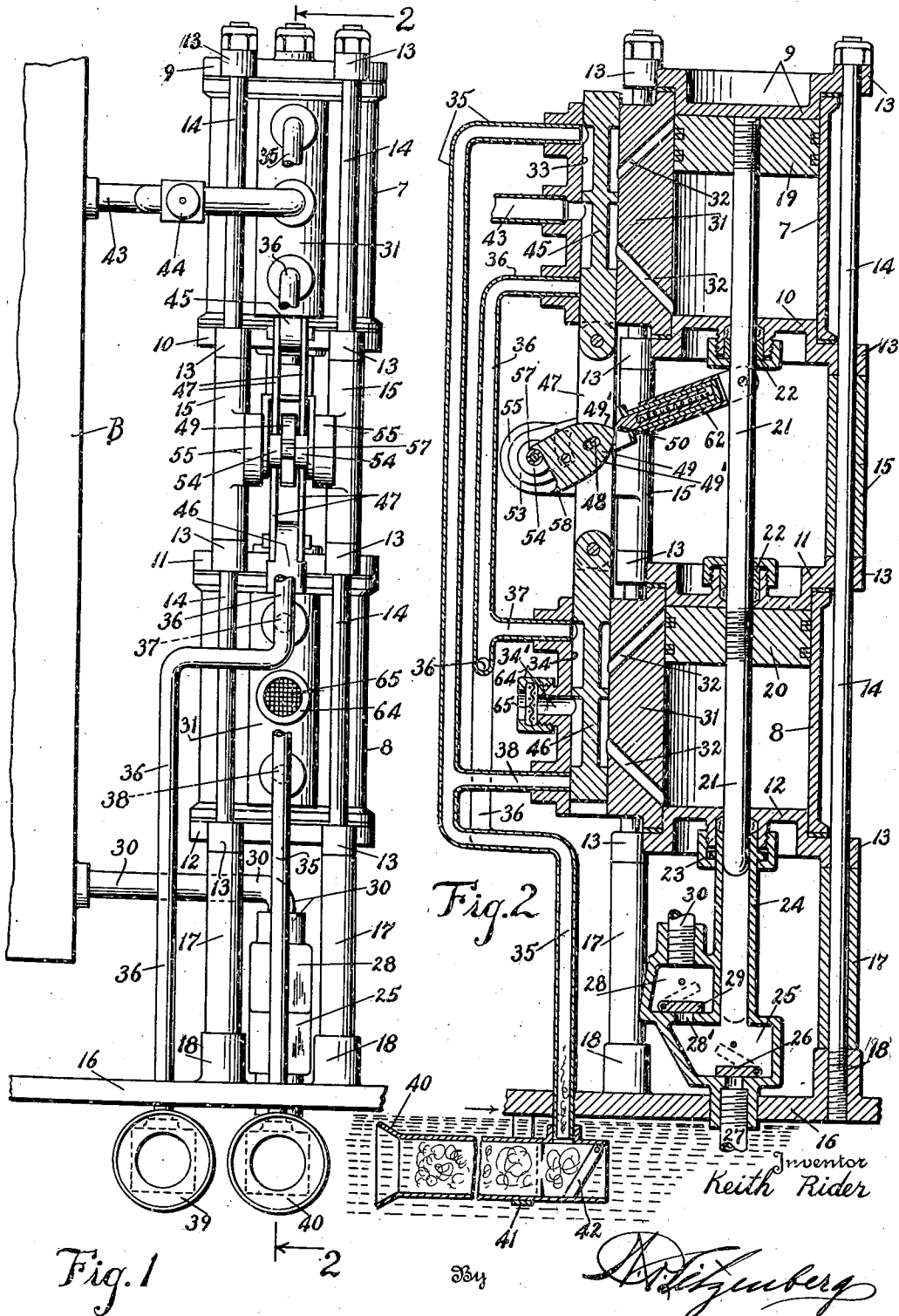
Nov. 1, 1949.

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JET DEVICE FOR BOAT PROPULSION EMPLOYING
AIR AND STEAM SLUGS

2,486,495

Filed Jan. 26, 1946

2 Sheets-Sheet 1



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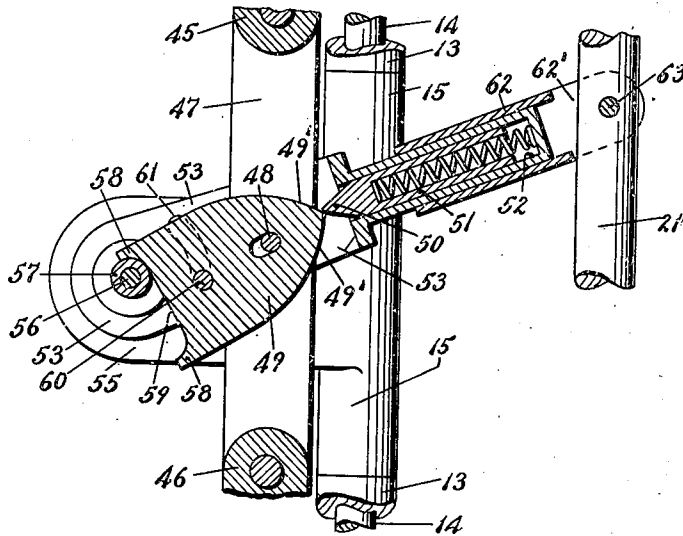


Fig. 3

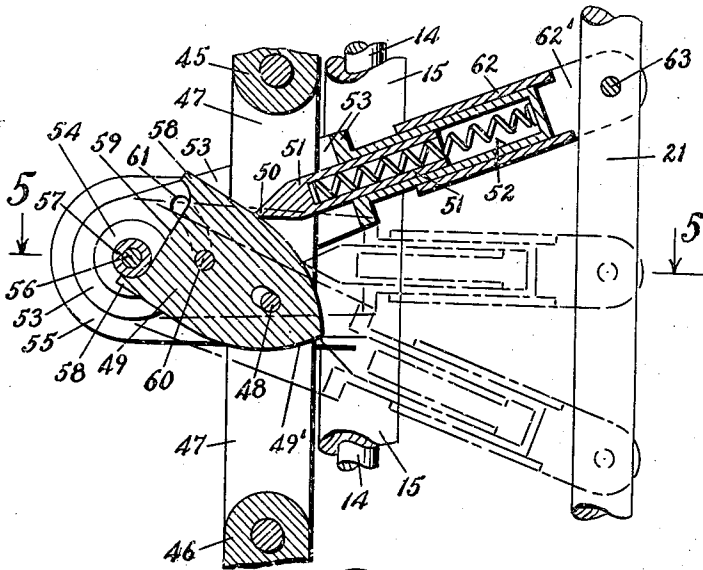


Fig. 4

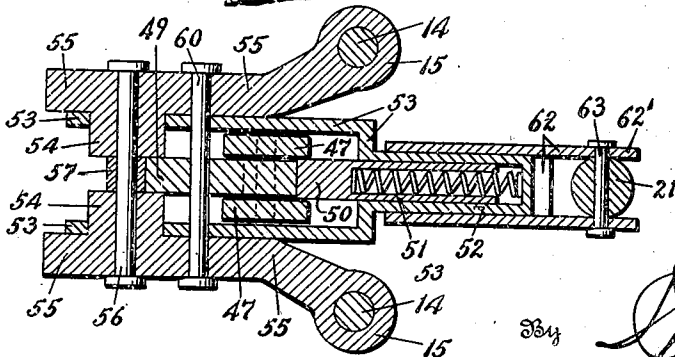


Fig. 5

Inventor
Keith Rider

By *Aditzberg*
Attorney

UNITED STATES PATENT OFFICE

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JET DEVICE FOR BOAT PROPULSION
EMPLOYING AIR AND STEAM SLUGS

Keith Rider, Covina, Calif.

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5 Claims. (Cl. 60—35.5)

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This invention relates to boat propulsion means, and more particularly to certain improvements wherein expanding steam, directed into a tubular nozzle on a boat and submerged in the water in which the boat moves, gives a propelling impulse for moving said boat.

When steam comes in contact with water it immediately condenses and no propulsive force results therefrom. However, if the steam is insulated from the water for a period of time long enough to allow for its full expansion, a propulsive impulse results.

In order to more fully explain my invention, I have illustrated on the accompanying two sheets of drawings, one embodiment of my invention, which I will now describe:

Figure 1 is a side elevation of a mechanism embodying my invention, with parts broken away to disclose other parts and with a steam boiler only partially shown;

Figure 2 is a longitudinal sectional view taken on the line 2—2 of Fig. 1; and

Figures 3, 4, and 5 are enlarged detail views of a trip valve operating mechanism, Fig. 5 being a sectional view taken on line 5—5 of Fig. 4.

Referring now in detail to the drawings, Figs. 1 and 2, I have shown two cylinders 7 and 8, in axial alinement, each having cylinder heads, as 9 and 10 for cylinder 7, and 11 and 12 for cylinder 8, said cylinder heads all having ear portions, as 13, 13, by means of which said cylinders are connected by long studs, as 14, 14.

Cylinders 7 and 8, and their adjacent cylinder heads 10 and 11 are spaced apart by means of sleeves, as 15, 15, on the studs 14, 14. The lower cylinder head 12 is shown supported above a base 16, by sleeves 17, 17, into which the studs 14, 14, are screwed, as at 18, 18.

Within said cylinders 7 and 8, are two pistons, as 19 and 20, secured to a common piston rod 21, operating through packings, as 22 in cylinder heads 10 and 11. The lower end of said piston rod 21 operates through a packing 23 in cylinder head 12, and into a small cylinder 24, having at its lower end a chamber 25, with inlet valve 26, to control the inflow of water through a pipe 27, extended into the water under the boat. A second chamber 28 is shown, with a flap valve 29 therein to cover an inlet opening 28' thereto from chamber 25, said chamber 28 is connected by means of a pipe 30 with the steam boiler B, as indicated in Fig. 1. Thus said piston rod 21, at its lower end, in said cylinder 24, operates as a pumping means for supplying water to the steam boiler during the operation of the mechanism.

Each of said cylinders 7 and 8, at the left side

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in Fig. 2, and in front in Fig. 1, has a body portion, as 31, 31, with ports, as 32, therethrough to said cylinders, said body portions also having on their outer sides cylindrical valve chambers, as 33, for the upper cylinder 7 and 34 for the lower cylinder 8, said upper valve chamber 33 having connected thereto two pipes, as 35 and 36, extended downwardly with branch pipe connections, as 37 and 38, with the lower valve chamber 34, as clearly shown in Fig. 2, said pipes 35 and 36 extended downwardly through the base 16, and each being connected with a discharge nozzle, as 39 and 40, suspended under the base 16 by a supporting band 41 for each, said nozzle having a flap valve 42 in each, at its forward end to admit water and at its other end being flared.

A pipe 43 connects the upper valve chamber 33 with the steam boiler B, said pipe having a control valve 44 therein for opening the steam to said valve chamber 33 and to said cylinder 7, as will be clear from Fig. 2.

Operating in said valve chambers 33 and 34, are two valve members 45 and 46, operatively connected by a link 47, consisting of two spaced flat members, as seen in Fig. 1. A pin 48 intermediate the ends of said link 47, constitutes the operating element for shifting the two valves 45 and 46 together up and down, for a purpose hereinafter again referred to.

The mechanism which operates this connecting link 47 to move the two valves 45 and 46, includes a cam member 49, having a slot connection with said pin 48, and rests between the flat members of said link 47, as clearly shown, the said cam member 49 having two rounded and converging surfaces 49', 49', on which operates the pointed end 50 of a spring pressed plunger 51, operating within a casing 52, forming a part of a pivoted member 53 of bifurcated form, as seen in Fig. 5, the sides of which are pivoted on two lug portions 54, 54, formed on the inner faces of two supporting members 55, 55, supported on the two studs 14, 14, of the main structure, as clearly shown in Figs. 1 and 2. Said supporting members 55, 55, are connected by a pin 56, on which, between said lug portions, is a bushing 57. The cam member 49, at its outer end is provided with two ears, as 58 and a connecting surface 59, operating back and forth against said bushing 57, as will be clearly understood from Figs. 3, 4 and 5. A through pin 60 extends through the supporting members 55, 55, and the opposite sides of the bifurcated member 53, as seen in Fig. 5. This pin is the pivotal support for the cam member 49. The opposite sides of said bifurcated member 53 is provided with a curved slot, as 61, to

permit the oscillating movement of said cam member 49, again referred to.

The casing or extension 52, within which is the spring pressed plunger 51, is mounted within a sleeve 62, having bifurcated end portions 62', pivotally connected with the piston rod 21, as shown, by a pivot pin 63. In Figs. 3, 4 and 5 said tripping or cam operating mechanisms are shown in different positions of the piston rod 21. The operation by said piston rod is for the purpose, through this cam operating mechanism, of also operating the connecting link 47 to operate the two control valves 45 and 46 for directing steam into the opposite ends of the cylinder 7.

The lower cylinder 8, and the valve chamber portion 34 thereof, is shown provided with an opening 34' with an open cap 64 for retaining a screen 65 over said opening and through which air is sucked into said valve chamber 34 by the movement of the piston 20.

The operation of the mechanism described may be briefly stated as follows:

The pistons 19 and 20 are in their up position and the pivoted valve rod operating mechanism, as seen in Fig. 3 is just ready for the plunger 50 to pass over the pointed end of the cam member 49, and to force it downwardly to the position shown in Fig. 4, which shifts the valve connecting link 47 downwardly, together with the valves 45 and 46. This will permit steam from the boiler B to enter the upper part of the valve chamber 33 and into cylinder 7, above the piston 19 and thus force said piston 19 and the piston rod 21 downwardly.

This movement moves the cam operating member 50 downwardly, as indicated in light broken lines in Fig. 4, ready to engage the cam member 49 and flip it up to the position shown in Fig. 3.

Piston 20 has also been moved downwardly, forcing the air therein out through lower port 32 and to and through pipe 38 and 35 and discharging a blast of air into the nozzle 40. The steam from the lower portion of cylinder 7 has been allowed to escape through lower port 32 and into the upper end of pipe 35 and down to the nozzle 39.

Thus, when piston 19 is being forced up, steam from the upper part thereof is permitted to escape through pipe 35 to nozzle 40, and when forced down, steam from the lower part thereof flows out through pipe 36 to nozzle 39. Alternating therewith, as piston 20 is forced up with piston 19, air in the upper part of cylinder 8 is being forced out through pipe 37 and 36 to nozzle 39, and when said piston 20 is moved downwardly, the air therein is forced out through pipe 38 and 35 to nozzle 40. This puts a charge of air into each nozzle in advance of the charge of steam, whereupon the steam can expand with the propulsion action inside the nozzles against the valve 42 and against the air and water in the open end of the nozzle, something like the recoil of a gun when shot, and giving an impulse to the boat.

The purpose of this, as set forth in the opening statements of this specification, is to insulate the steam from the water long enough so that its expansion when released will provide the impulse to the boat. In other words, a slug of air is provided in the nozzle ahead of the steam slug or discharge so that said steam is prevented from contact with the water until it expands with the desired impulse. These are alternated in the two nozzles, piston 20 furnishing the air alternately to the two nozzles, and the steam

piston 19 furnishing the steam alternately to the two nozzles following the air supply to each so as to accomplish the desired purpose.

The movement of the pistons and the piston rod 21, operates the valve operating mechanisms, as described, to alternately supply steam to the top and then to the bottom of cylinder 7 for driving the piston 19 up and down in a well known manner.

The lower end of the piston rod 21 operates as a piston in the small cylinder 24 to function as a pump, drawing water in through the pipe 27 and valve 26, and forcing it out through valve 29 to pipe 30 and to the boiler, as before referred to.

Referring to Fig. 2, and the nozzle 40, the cycle of operation may be stated as follows: as a discharge of air into said nozzle is made, the valve 42 is closed and this is immediately followed by the discharge of steam into said nozzle, the steam being insulated from the water for a minute interval of time by the air previously introduced therein (such interval being sufficient to allow for the complete expansion of the steam). The slug of water is forced out of the nozzle to the rear and a forward motion is imparted to the valve 42, and through the nozzle to the boat. This is accomplished solely by the expansion of the steam between the valve member 42 and the air which is confined between the steam and the water, thus making it possible for said steam to expand. Immediately following the full expansion of the steam in said nozzle, condensation of the steam therein will cause a partial vacuum to prevail and due to the forward motion of the boat and said nozzle, valve member 42 will open, admitting a charge of water to fill the nozzle and the cycle will be repeated.

The volume of the nozzles 39 and 40 is sufficient to permit full expansion of the steam so that the force of expansion will be spent immediately upon the ejection of the slug of water.

I do not limit my invention to the details of construction and arrangement here shown for explanatory purposes, as I realize that many changes can be made in these details, except as I may be limited by the hereto appended claims forming a part of this specification.

I claim:

1. In a machine of the character referred to for propelling boats and the like, two cylinders in axial alinement, two pistons in said cylinders, a piston rod common to both pistons, whereby one piston is moved by the other, a source of steam supply, valve controlled means for directing it alternately to the opposite ends of one of said cylinders for moving its piston in opposite directions, valve controlled means for admitting air to the other cylinder during one movement of its piston, a nozzle for receiving and discharging air and steam therefrom to give propulsion impulses to said boat, and means for operating said valve controlled means together for alternately discharging steam and air from said cylinders, and pipe connections from said cylinders to said nozzle, whereby the air charge forms a wall in said nozzle between the steam charge and the water to permit the steam charge to expand in said nozzle to give the desired impulse.

2. In a machine for propelling boats and the like, the combination with a steam boiler, a pair of cylinders supported in axial alinement at a space apart, a piston in each cylinder, a piston rod common to both pistons for moving them together, valve means for directing steam alternately to the opposite ends of one of said cylin-

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ders for moving its piston, valve means for controlling the air flow to and from said other cylinder, a pair of discharge nozzles connected with said boat in submerged position thereunder, pipe connections from said cylinders to said nozzles, operating connections for operating said valve means whereby to alternately discharge air and steam from said cylinders to said nozzles, the air charge forming an insulating wall between the steam charge in each nozzle, and the water, to permit the steam to expand in said nozzles to give the desired propulsion impulse.

3. In a mechanism for propelling boats, the combination of a pair of cylinders with inlet and outlet ports at their opposite ends, pistons operable in said cylinders, and operatively connected together for operation of one by the other, valve control means for each cylinder for admitting steam alternately to the opposite ends of one cylinder and for admitting air to and from the opposite ends of the other cylinder, a source of steam supply connected to one of said cylinders for operating the piston therein, means connecting the said valve control means together for simultaneous operation, a discharge nozzle submerged in the water and connected with said boat to be propelled, pipe connections from said cylinders to said nozzle, whereby air and steam discharged from said cylinders are discharged into said nozzle, in said order, whereby the air forms a wall between the steam charge and the water during the expansion of said steam to give the impulse propelling said boat.

4. In a mechanism of the character shown and described, the combination of a pair of cylinders in axial alinement with each other, pistons in said cylinders with a common piston rod connecting them for operation of one piston by the other, valve controlled ports to and from the opposite ends of one of said cylinders, for the flow of steam to and from said cylinder, valve controlled ports to and from the opposite ends of the other cylinder for the flow of air to and from said cylinder, means connecting the valves for both cylinders for simultaneous movement, operating connections from said piston rod for moving said valves in opposite directions, a source of steam

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supply connected with one of said cylinders, a pair of discharge nozzles submerged under water, pipe connections from the opposite ends of said cylinders, through said valve controlled ports, to said nozzles, whereby air and steam are alternately discharged into said nozzles, and so that the air charge forms a wall between the steam charge and the water in each nozzle, for the purpose described.

5. A mechanism for propelling boats including a pair of cylinders in axial alinement with each other, pistons operating in said cylinders, a common piston rod connecting said pistons and operating one piston from the other, valve-controlled means for admitting steam to and from one of said cylinders for moving said piston, a steam boiler with connections through said valve-controlled means to said cylinder, a pair of discharge nozzles supported under said boat in submerged condition, pipe connections from said cylinders, through said valve-controlled means, to said nozzles for discharging air and steam alternately from said cylinders to said nozzles, one of said cylinders being connected through said valve controlled means with the atmosphere for drawing in, and discharging air through said pipe connections, the air charge in each nozzle serving as a wall between the steam charge therein and the water, whereby the expansion of said steam gives a propulsion impulse to said nozzle and said boat, and a water pump operated by said piston rod for pumping water from under the boat to said steam boiler.

KEITH RIDER.

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

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