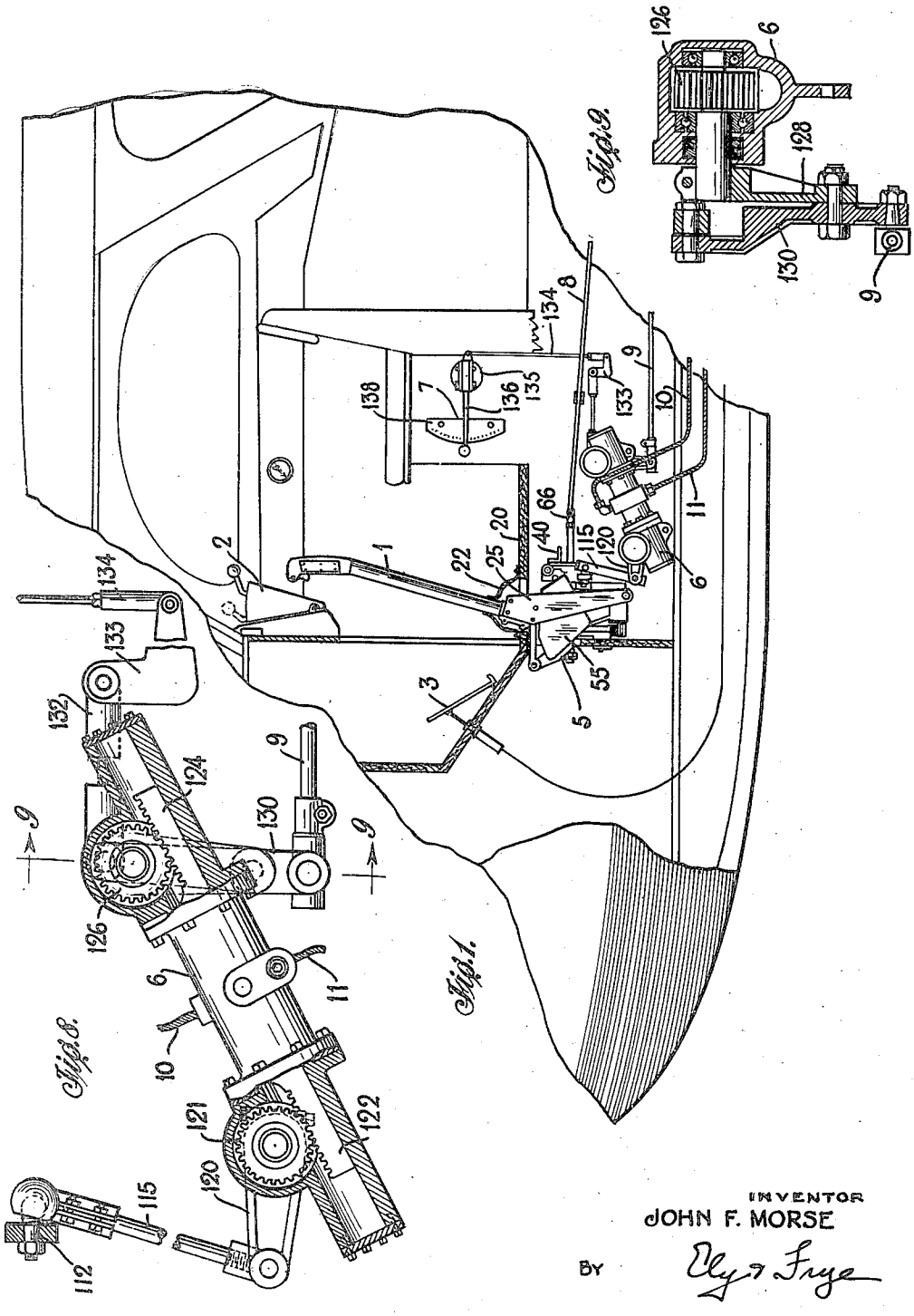
Jan. 24, 1950 J. F. MORSE 2,495,536

CONTROL MECHANISM FOR MARINE STEERING GEAR

Filed April 12, 1945 5 Sheets-Sheet 1



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CONTROL MECHANISM FOR MARINE STEERING GEAR

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Fig. 2.

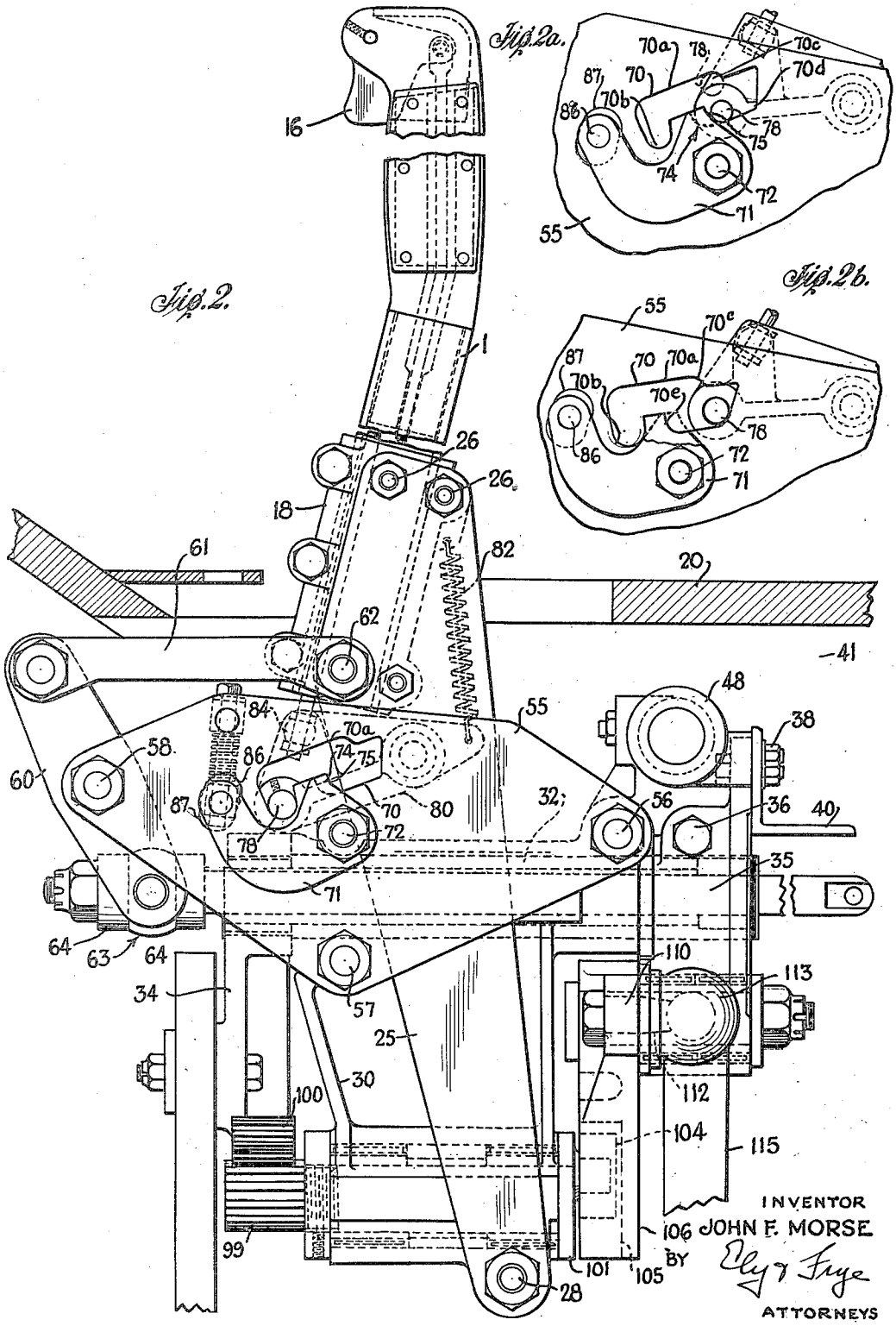


Fig. 2a.

Fig. 2b.

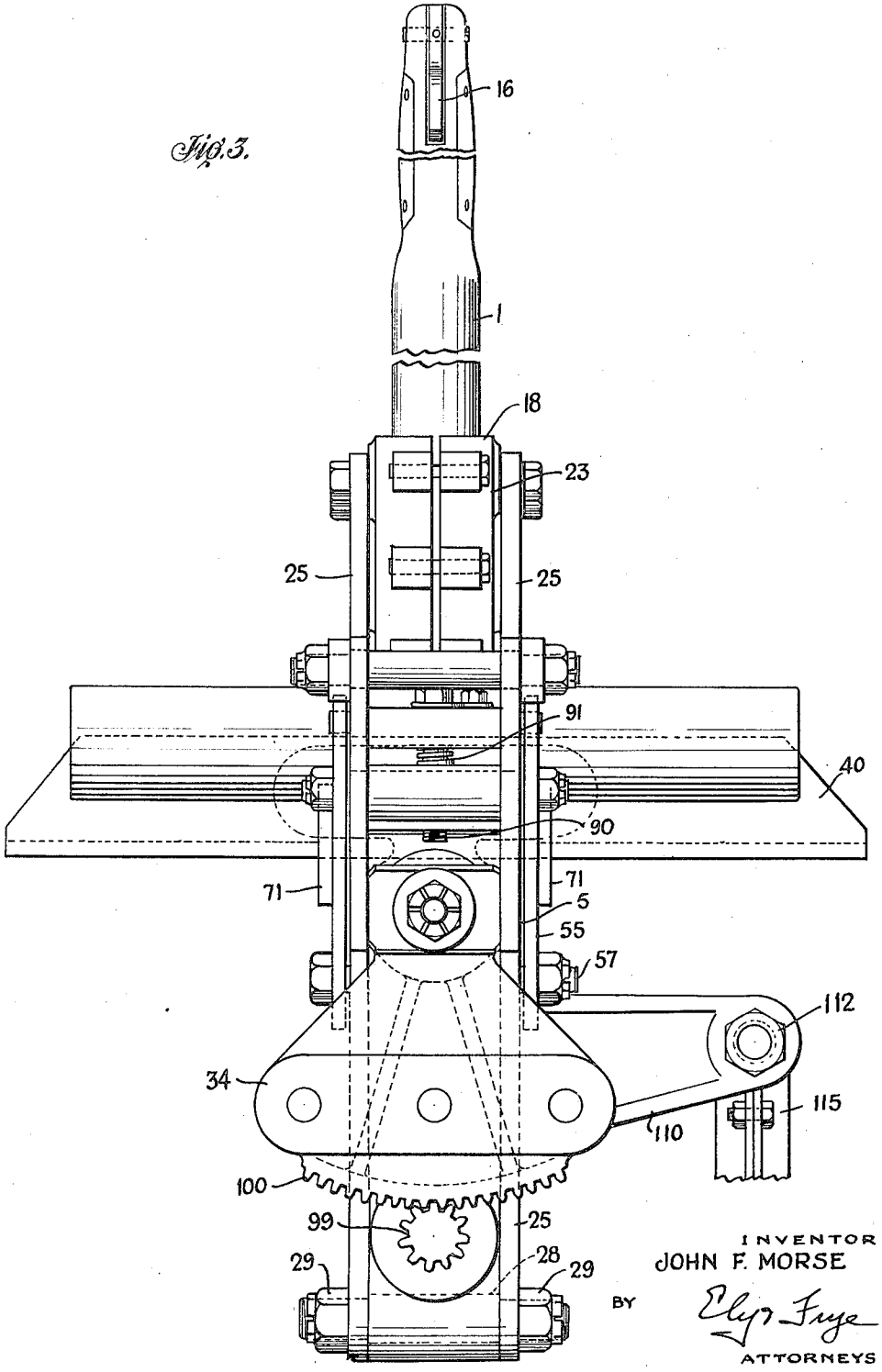
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CONTROL MECHANISM FOR MARINE STEERING GEAR

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Fig. 3.



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CONTROL MECHANISM FOR MARINE STEERING GEAR

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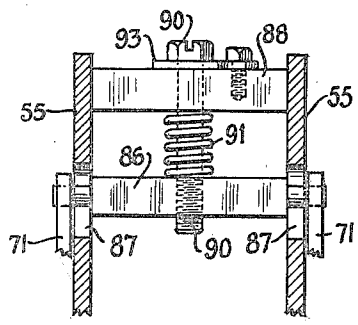
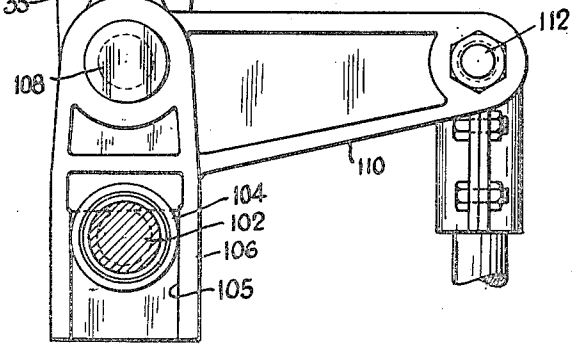


Fig. 7.

Fig. 4.

Fig. 6



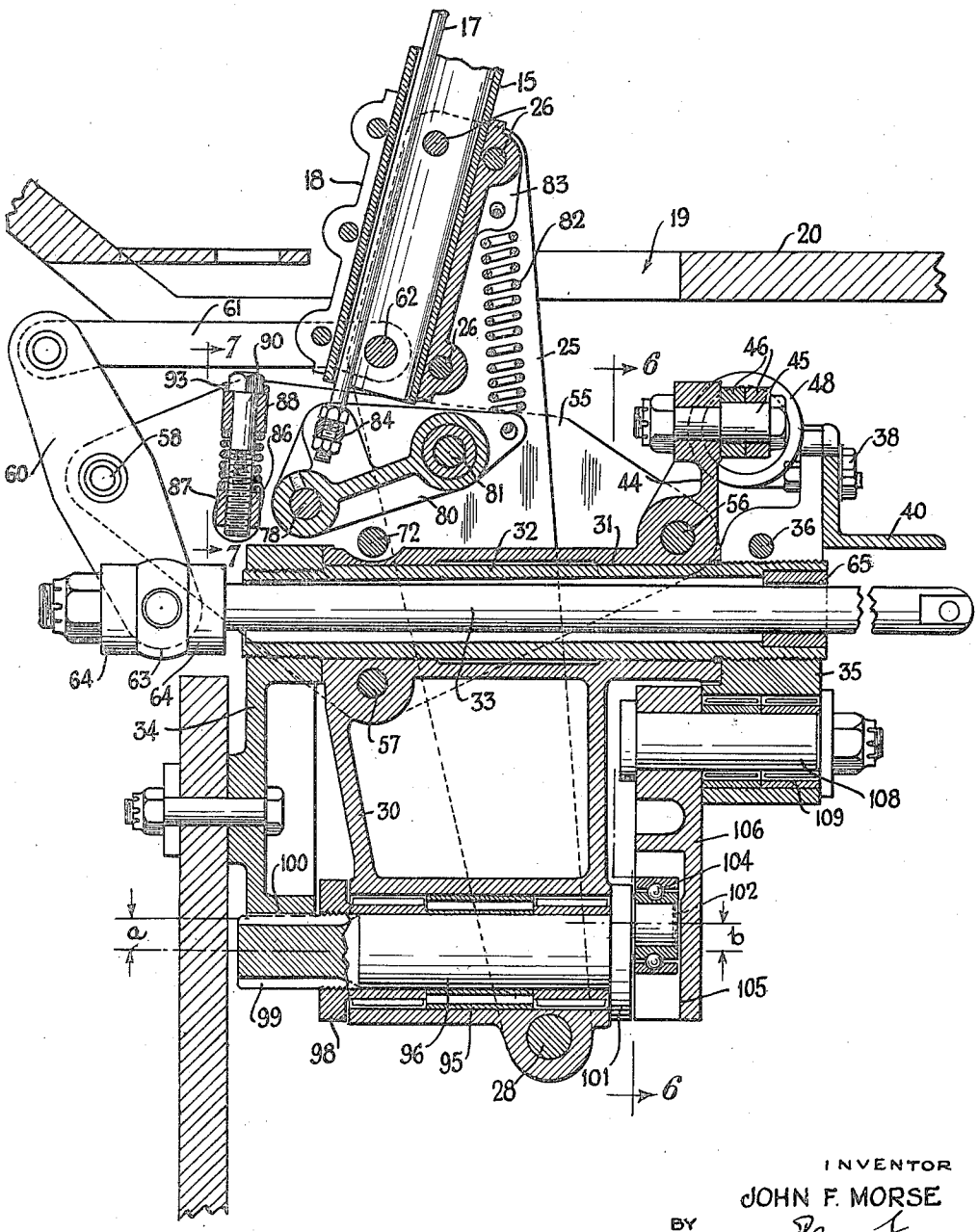
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CONTROL MECHANISM FOR MARINE STEERING GEAR

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Fig. 5.



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UNITED STATES PATENT OFFICE

2,495,536

CONTROL MECHANISM FOR MARINE STEERING GEAR

John F. Morse, Hudson, Ohio

Application April 12, 1945, Serial No. 587,887

24 Claims. (Cl. 114—144)

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The present invention relates to a control system for use on power craft, and particularly to the perfection and improvement of mechanisms by which the pilot may control both the rudder and the transmission by the operation of a single control device. This device may take the form of a steering wheel which is also mounted for bodily rocking movement, but it is preferred to employ a control stick such as shown herein. The control device is so mounted that the operator may shift the transmission, placing the engine in neutral, forward or reverse by the movement of the stick in one plane while the boat is steered by movement of control stick in a plane at right angles thereto. The mechanism shown and described herein is an improvement upon the basic invention covered in my former Patent No. 2,321,098, dated June 8, 1943.

In the application of the single-control-stick principle to marine control systems, as contemplated in my prior patent, it has been found advisable to incorporate in the connections between the stick and the rudder a variable ratio device by which the rocking movement of the control stick while the rudder is in a central or straightaway position is modified so that the amplitude of movement of the rudder is reduced in relation to the movement of the control stick. This gives a more delicate and sensitive control of the rudder during cruising. Conversely, when the boat is being maneuvered in close quarters, as in docking, or to avoid an obstruction where more rapid shifting of the rudder is desirable, the amplitude of rudder movement over stick movement is increased. This variable ratio mechanism is particularly desirable because of the necessarily limited arc through which the stick can be rocked in practical installations. This basic principle in rudder-stick control and a mechanism to accomplish the same as covered in my earlier Patent No. 2,392,056, issued January 1, 1946. The present application is directed to a further improvement for obtaining the same beneficial results, it being one of the purposes of the invention to carry out the basic principle in a better and more compact mechanical system and to provide more accurate variable ratio connections between the control stick and the rudder.

Disclosed in Patent No. 2,390,056 is the basically new feature of combining with the variable ratio connections, a trimming mechanism for setting the rudder at a position which will correct for side winds, which would tend to throw the craft off its course, without upsetting the action of the variable ratio device. If a trimming mechanism were not employed in conjunction with the variable ratio device, the setting of the rudder directly by the control stick to correct for side winds would throw the variable ratio device out of the position in which it will function correctly. This makes it desirable, if the variable ratio mechanism is to be employed, to have in the system some means for adjusting the rudder which is independent of the control stick and independent of the variable ratio device. In the present case this basic conception has been improved and modified.

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It is a further object of the invention to utilize a fluid pressure mechanism of any preferred type or design for moving the rudder. The fluid pressure is created by an auxiliary pump which is run by the motor, and a suitable type of fluid control unit is incorporated in the system so that the rudder is not moved directly by the control stick, but by the pressure of the fluid, usually a machine oil. This conception of adapting a fluid pressure device for doing the work of turning the rudder very materially lessens the manual work of steering the craft and is especially desirable in manipulating heavy or high speed vessels. Any form of power-operated unit may be employed for this purpose, but it is preferred to incorporate in the system a power-actuating unit such as shown in my prior copending application Serial No. 557,481, filed Oct. 6, 1944, to which reference may be made. This mechanism is installed in a pressure fluid circulating system and is so arranged that by rocking a control lever at one end of the pressure unit, the fluid pressure is admtited behind a piston, whereupon the pressure fluid actuates the piston which, in turn, is connected to the rudder. It is, therefore, one of the objects of the invention to provide for a stick control for the rudder through the variable ratio device, the actual operation of the rudder being performed by the pressure fluid.

A further object of the invention is to correlate the fluid pressure actuating mechanism and the rudder trimming mechanism.

It is a further object of the invention to combine these several mechanisms with the stick control without interfering with the operation of the stick for controlling the transmission. Other objects and purposes of the invention are to improve upon mechanism for power boat control so as to simplify the operation thereof and to facilitate the handling of power craft of all types. The entire control system is designed so that the operator will instinctively move the control stick

in the proper manner and this adds materially to the safety and ease of operation.

Other objects and advantages are secured by the mechanism shown and described herein as the best known and preferred form in which the invention has been perfected, but it will be understood that changes and modifications may be made therein without departing from the principles of the invention or sacrificing any of its benefits. It will further be understood that the invention is not limited to exact following of the details of the mechanism as shown herein and that the claims are not restricted to that specific form of the device.

In the drawings in which a practical form of the invention is fully disclosed:

Fig. 1 is a view of the cabin of a power craft equipped with the complete improved control mechanism.

Fig. 2 is an enlarged side elevation of the control stick which, in this view, is in forward position.

Fig. 2^a is a detail view showing the relation of certain parts when the control stick is in neutral position, the dotted lines showing the location of the latch in raised position, as in going from forward to neutral position.

Fig. 2^b is a similar view showing the position of the parts in reverse. In this view a portion of the adjusting cam is broken away to show the configuration of the slot in the main rocker frame or cradle.

Fig. 3 is a front elevation of the control stick.

Fig. 4 is a plan view of the control stick.

Fig. 5 is a vertical section taken through the center of the control stick.

Fig. 6 is a section on the line 6—6 of Fig. 5 looking toward the rear.

Fig. 7 is a section on the line 7—7 of Fig. 5.

Fig. 8 is a side elevation of the fluid actuating device looking at this portion of the mechanism in the opposite direction from that in Fig. 1 and showing the connections between that device and the control stick, the rudder and the rudder trimming device.

Fig. 9 is a cross-section on the line 9—9 of Fig. 8.

Referring to Fig. 1 which shows a typical cabin on a power boat equipped with the improved marine control mechanism, the control stick is indicated as a whole by the numeral 1, a hand throttle at 2 and a foot throttle at 3. As has been indicated in the introductory portion of the specification, the control stick is mounted so that it has a pivotal movement in the plane of Fig. 1 by which the transmission is controlled and a second rocking movement parallel to the beam of the boat by which the steering of the boat is effected. The rocking frame or cradle for the control stick which incorporates the various elements by which the results are obtained is indicated in general by the numeral 5. The fluid pressure control unit or cylinder is indicated at 6 and the rudder trimming device at 7, this latter device being conveniently mounted on the side of the seat in the reach of the pilot. The shaft to the transmission is indicated at 8 and the shaft to the rudder at 9. The inlet and outlet pipes to the fluid cylinder are indicated at 10 and 11, respectively, it being understood that the pipe 10 is connected to a pump, not shown, by which the oil or other pressure fluid is constantly supplied to the pressure cylinder or control device.

The main portion of the stick is composed of a tube 15, the upper end of which is provided with a grip at which is located the pivoted trigger 16 which is connected to a rod 17 extending through the stick and connected at its lower end to a latch or detent, to be described.

The lower end of the tube 15 is held in a split collar or sleeve 18 at about the point where the stick passes through a hole 19 in the deck 20 covered by the flexible hood 22. The sleeve 18 is formed with two spaced enlargements 23 which provide flat surfaces on which the upper ends of two elongated arms 25 are secured by bolts 26. The arms 25 extend from their points of connection to the control stick to the underside of the cradle where they are pivoted on the reduced ends of a transverse shaft or bolt 28 which constitutes the center of the transmission-controlling movement of the stick 1. Nuts 29 hold the arms in place.

The central portion of the shaft 28 is mounted in the lower end of the main rocking frame or cradle. This element is indicated as a whole at 30. At about its central portion the rocking frame 30 is provided with a fore-and-aft bearing 31 on which it rocks about the main bearing shaft 32. The bearing shaft 32 is tubular to house the transmission shift-connecting rod 33, to be described. The forward end of the shaft is screw-threaded and received in the forward supporting bracket 34 which is secured to the frame of the boat. This bracket also conveniently functions as an element of the variable ratio device, to be described. The rear end of the shaft 32 is threaded for reception in the aft supporting bracket 35. It will be noted that this latter bracket is split above the shaft, the split portions of the bracket being drawn together by a transverse bolt 36 so as to hold the shaft 32 in fixed position in the device. Upper extensions of the bracket 35 are secured by bolts 38 to the vertical flange of a transverse, angular beam or plate 40 by which the device is supported from some convenient part of the boat.

It is desirable both to cushion the rocking movement of the cradle and also to provide means by which it will be returned to upright position with the rudder on center when the pilot releases the control stick. For this purpose the frame 30 is provided above the shaft 32 with an upwardly extending lug or bracket 44 in which is located the bolt 45. The bolt 45 extends to the rear of the bracket where it receives the two articulated links 46. These links extend in opposite directions and are received in dashpots 48 which are secured by bolts 49 to the front face of the vertical flange of the beam 40. Springs 50 located at the ends of the links 46 in the corresponding dashpots are shown as the cushioning and righting means for the cradle in its rocking movement. Fluid means may be employed in lieu of the springs.

If the variable ratio device is not desired, the cradle may be connected directly to any suitable mechanism which operates the rudder and this may be cables or equivalent means. Or, if desired, the cradle may be connected directly to a fluid-pressure device such as shown herein. For the reasons stated, however, it is preferred to incorporate the variable ratio mechanism as a part of the cradle and this will be described at a later point in the specification. The connections from the stick to the transmission shaft 8 will now be described.

On opposite sides of the cradle and spanning the arms 25 are located two main supporting

plates 55 which are somewhat rhomboidal in form. These plates are secured to the frame 30 by a transverse bolt 56 which passes through the base of the bracket 44 and by a second bolt 57 which is located forwardly of the cradle and below the shaft 32. At the forward extremity of the plates 55 is a transverse bolt 58 which functions as the pivot for two parallel rocking arms 60. The upper ends of the rocking arms are connected by parallel links 61 to the stick 1 by means of a pin 62 passing through the base of the tube 15. The lower ends of the arms 60 are connected to a rotating collar 63 which is held between thrust bearings 64 on the forward end of the transmission-shift rod 33 where it projects beyond the hollow shaft 32. The rod 33 extends at the rear through a loose bearing sleeve 65 set in the rear end of the shaft 32 and is connected at a pivotal joint 66 to the forward end of the shaft 8 which extends to the transmission (not shown). It will be observed that the transmission may be operated irrespective of the angle to which the cradle may be shifted in steering the boat.

The mechanism here disclosed also includes an improvement in the means for controlling the transmission which provides a simple and effective arrangement for compensating for wear or differences in adjustment of the transmission. Marine transmissions are apt to vary with respect to the location of the neutral point and this makes it difficult to locate the neutral point and to keep the transmission control at that point. The shifting of the neutral point may be due to maladjustment, but more frequently is due to the wear of the parts. It is a purpose of this invention to provide means by which the transmission-controlling device may be adjusted so as to provide for variations in the neutral point. This is particularly desirable in a stick control device where the range of angular movement is necessarily much restricted. It is also especially desirable where, as in the present device, the stick often may be shifted from the vertical when it may be desired to operate the transmission. It is, therefore, an added refinement of the mechanism that the transmission-shifting device may be adjusted so as to assist the pilot in finding and holding the neutral point wherever it may be located. While this specific improvement is covered in my copending application, now Patent No. 2,398,243, in order to give a complete description of the operative mechanism, it will now be described with particular reference to Figs. 2, 2^a and 2^b.

Cut in the plates 55 are the irregular angular slots or grooves, designated in their entirety as 70. Each slot is formed with a main angular reach or portion 70^a which terminates at its forward end in a recess 70^b which corresponds to the forward location of the stick, as shown in Fig. 2. At the rear the slot is formed with a shoulder 70^c which leads to an offset bay 70^d which corresponds to the reverse position of the stick. The neutral position lying between 70^b and 70^c is adjustable, but the maximum forward position is represented by the shoulder 70^e in the lower wall of the slot opposite the point 70^c. Except in an extreme case, the actual operating neutral point is adjustably controlled by a pair of pivoted cam plates 71 which, as shown, are approximately C-shaped so as to clear the recesses 70^b. Each cam plate is pivoted on a side plate 55 on the pin 72 which is adjacent the point 70^e. The plate 71 has a shoulder 74 which

overlies the point 70^e, the rear face 75 of the lug forming the actual neutral point. It will be seen, therefore, that by shifting the cam plates about the point 72 the location of the neutral point may be adjusted to compensate for variations or inaccuracies in the transmission.

A transverse pin 78, usually of a hardened steel, extends across the plates 55, the ends of the pin riding in the slots 70. The central portion of the pin is fixed in the forward end of a rocking latch member 80 which is pivoted on the pin 81 mounted in the arms 25. A coil spring 82, extending from the rear end of the latch 80 to a lug 83 on the sleeve 18, yieldingly holds the pin 78 against the lower side of the slots 70. At its forward end the latch is connected by the knuckle joint 84 to the lower end of the trigger rod 17.

Assuming that the control stick is in forward position, the operator raises the pin 78 through the trigger 16 and rod 17 and may then move the control stick to place the transmission in neutral or reverse. If neutral position is desired, the operator can feel the pin, which is riding on the upper surfaces of the slots, strike the surfaces 70^c and he may then release the trigger and the pin will come to rest behind the shoulders 74 where the transmission will hold in neutral if the cam plates are properly adjusted. If reverse is desired, he may force the pin over the surface 70^c in going from forward or may draw the pin into the bay 70^d from neutral.

The adjustment of the neutral point represented by the shoulders 74 is accomplished by the angular adjustment of the pivoted cam plates 71. The free ends of these plates are pivotally connected to the rounded ends of a bar 86 which passes through slots 87 formed in the plates 55. Above the bar 86 extends a second transverse bar 88 mounted in the plates 55. An adjusting screw 90 is mounted in the bar 88 and in threaded engagement with the bar 86, an expansion spring 91 being interposed between the two bars. By rotating the screw 90 the cam plates 71 may be rocked about their pivot points to shift the location of the shoulders 74 and bring the neutral point for the control stick into exact conformity with the actual neutral point in the transmission. During the operation of the boat, if it is found that the stick is not holding the transmission in neutral, the operator may correct this condition by turning the screw 90 until the correct neutral position is found. A locking device 93 may be supplied for the screw 90.

Referring now to the variable ratio by which the rocking movement of the cradle 5 as it rotates about the tubular shaft 32 is transmitted to the rudder:

The lower end of the frame 30 is provided with a fore-and-aft bearing 95 which is preferably a roller bearing. In this bearing is mounted the shaft 96, the forward end of which is threaded to receive the thrust collar 98. The forward extremity of the shaft 96 where it extends beyond the rocking frame is provided with gear teeth 99 which are in mesh with a gear-toothed segment, here shown as a stationary gear sector 100 cut in the lower edge of the bracket 34 on an arc concentric with the axis of the frame 30. Therefore, as the frame is rocked, the shaft 96 will rotate in its bearing in the same direction. The member 100 may be a rack which is kept in mesh with the gear 99 during the rocking movement of the cradle, or other mechanical equivalents may be employed to impart a planetary motion to the shaft.

The opposite or rear end of the shaft 96 is provided with a head 101 on which is located an eccentric or crank pin 102 carrying the roller 104. The roller 104 is preferably mounted on anti-friction bearings and rides in the vertical slot or guideway 105 formed in the face of one arm of the angular rocker arm 106. The arm 106 is secured to and suspended from a pin or shaft 108 which is rotatably mounted in anti-friction bearing 109 formed in the lower portion of the bracket 35. From the arm 106 extends at right angles thereto a second arm 110, the outer end of which is connected by a ball and socket joint 112 to one end of a link 115 which, in the preferred embodiment of the invention, extends to the fluid operated mechanism for actuating the rudder.

It will be noted that the connection to the rudder may be made directly at this point and the variable ratio mechanism does not necessarily act through the fluid pressure device. In the preferred embodiment of the invention, however, the pressure fluid operating device is employed for the reasons stated.

In the operation of the variable ratio device, the roller 104 is at the top of its travel when the cradle is upright and the rudder on center. It will be noted that as the cradle rocks about its axis, the shaft 96 will also be rotated in a planetary motion due to the engagement of the pinion 99 with the fixed arcuate gear segment 100. Due to the factors which are present, any motion of the cradle 5 about its axis on either side of the vertical will result in a reduced movement of the arm 106 about its axis. As the cradle approaches either extremity of its angular movement, however, the movement of the arm 106 will be increased, and when the shaft 96 has rotated approximately 90° the arm 106 will actually move more rapidly than the cradle. This is due to the fact that the shaft 96 rotates in the same direction as the cradle and the net result is the difference in values of the lateral movement of the cradle and the arm until the shaft 96 passes approximately 90°, whereupon the net result is the sum of the lateral movements.

Referring to Fig. 5, it will be noted that the radius of the pitch line of the gear 99, indicated at *a*, is somewhat greater than the radius of the crank pin 102, indicated at *b*. In actual practice, *b* is about 80% of *a*. The purpose of this differential is to impart greater sensitivity to the rudder control device when the rudder is at or near its center position.

This variable ratio principle is fully set forth in my prior Patent No. 2,392,056. The result is that in cruising when the rudder is normally at or near its center position, a movement of the cradle to either side of the vertical will give a lessened angular movement of the rudder, or, stated in another way, a very slight movement of the rudder from its neutral position results from a magnified angular displacement of the cradle or control stick. It is, therefore, possible to secure accurate and sensitive control of the rudder within the immediate range of its straight-ahead position. Conversely, as the rudder approaches either extreme of its angular movement, a progressively greater angular movement of the rudder is secured with a given angular movement of the cradle. In maneuvering the boat in close quarters or in suddenly veering the course of the boat to avoid obstruction, it is particularly desirable to throw the rudder rapidly to one extreme or the other and this is made possible although

the rocking movement of the control stick is relatively limited.

Referring now to the power actuated mechanism which operates the rudder:

This has been designated as a whole by the numeral 6. It is not thought necessary to enter into a detailed description of such a device. The incorporation of such a device in steering a power craft of this type is believed to be new and it is also believed to be new to combine such a device with a unitary steering and transmission control. It is also believed to be new to incorporate such a device with a variable ratio steering mechanism and with a rudder trimming device.

The link 115 is connected to a lever arm 120 which is connected to a gear 121 in mesh with a rack 122 that opens the inlet port so that the fluid under pressure from the line 10 will actuate a piston or other movable element (not shown). The movement of the piston operates a rack 124 which is in mesh with a gear 126 on the power output side of the device. The gear 126 is connected to an arm 128.

If the rudder trimming mechanism is not to be employed, the arm 128 may be connected directly to the rudder operating shaft 9 or other connections to the rudder. Because of the presence of the variable ratio in the steering mechanism and of the advisability of maintaining in at its highest efficiency, it is preferred to employ a rudder trimming device. Such a device may be incorporated at any point in the rudder connections, but it is preferred to use a device such as previously indicated at 7, between the arm 128 and the rudder connections.

In the form of the invention illustrated here, the outer end of the arm 128 is pivotally connected to a rocker arm 130 at a point near one end thereof. The short end of the rocker arm is attached by a swivel joint to the rudder-operating means, represented by the shaft 9. The long end of the arm 130 is connected by the swivel joint 132 and bell-crank lever 133 to a connecting rod 134, the upper end of which is pivoted to a rotatable plate 135 mounted in the cabin. The plate 135 is connected to a hand-operated lever 136 which is movable over the quadrant detent plate 138 as shown in Fig. 1.

If the craft is subjected to a side wind which will tend to make it drift off its course, the rudder is set at the proper angle of deflection to offset the side drift by manipulation of the lever 136. This acts directly through the rocker arm 130 without affecting the position of the lever 128 and thus not disturbing or affecting the position of the stick 1 or upsetting the variable ratio connections. If the helmsman were compelled to operate the stick 1 to set the rudder to meet these conditions, the variable ratio device would be thrown off center and the function thereof would be impaired, the degree of impairment depending upon the extent to which the rudder is adjusted to prevent the boat from being deflected from its true course. The trimming mechanism preserves the variable ratio device at its maximum efficiency under all conditions.

It will be appreciated that the description and drawings have shown the preferred form of the invention in great detail, but that adherence to these details is not necessary in order to avail of the principles and benefits of the invention. There has been described herein a highly novel and efficient marine control system by which a power boat can be handled with ease in a seaman-like manner. It greatly facilitates the han-

dling of such a craft under all conditions of weather or location. The control mechanism has been perfected in mechanical arrangements and organization and, as such, the claims are believed to be entitled to a liberal construction.

What is claimed is:

1. A rudder control mechanism comprising a rocking frame, a control stick on the frame, a rotatable shaft carried by the frame, a means to impart a planetary motion to the shaft during rocking movement of the frame, a pivoted arm adjacent the frame, said arm being connected to the shaft and actuated by the rotation of the shaft during the rocking movement of the frame, and a rudder actuating means connected to the arm.

2. A rudder control mechanism comprising a rocking frame, a rotatable shaft carried by the frame and movable in an arcuate path by the rocking movement of the frame, a gear segment adjacent the frame, a gear on the shaft meshing with the gear segment, an eccentric carried by the shaft, a movable arm located beside the frame and actuated by the eccentric, a rudder actuating device, and driving connections between the arm and the rudder actuating device.

3. A rudder control mechanism comprising a rocking frame and a rudder actuating means, driving connections between the frame and the rudder actuating means, and a variable ratio device in said driving connections to impart a lesser degree of movement to the rudder with respect to a given degree of movement of the frame when the rudder is near its central position, said variable ratio device including a shaft carried by the frame and having a planetary movement thereon, an eccentric on said shaft, and an arm located beside the frame and movable by the rotation of the eccentric as the shaft is carried in its path about the axis of the frame, said arm being connected to the rudder actuating means.

4. A rudder control mechanism comprising a rocking frame and a rudder actuating means, driving connections between the frame and the rudder actuating means, and a variable ratio device in said driving connections to impart a greater degree of movement to the rudder with respect to a given degree of movement of the frame as the rudder approaches either extreme position, said variable ratio device including a shaft carried by the frame and having a planetary movement thereon, an eccentric on said shaft, and an arm located beside the frame and movable by the rotation of the eccentric as the shaft is carried in its path about the axis of the frame, said arm being connected to the rudder actuating means.

5. A rudder control mechanism comprising a rocking frame and a rudder actuating means, driving connections between the frame and the rudder actuating means, and a device in said driving means to increase the amplitude of rudder movement with respect to the amplitude of frame movement progressively as the frame is rocked toward either extreme of its movement, said device including a shaft carried on the frame at a distance from the axis of the frame, said shaft being provided with a gear and an eccentric, a gear segment in engagement with the gear, a movable arm located adjacent the frame and having an operative connection with the eccentric, and connections from the movable arm to the rudder actuating means.

6. A rudder control mechanism comprising a rocking frame and a rudder actuating means, driving connections between the frame and the rudder actuating means, and a device in said driving means to decrease the amplitude of rudder movement with respect to the amplitude of frame movement progressively as the frame approaches its central position, said device including a shaft carried on the frame at a distance from the axis of the frame, said shaft being provided with a gear and an eccentric, a gear segment in engagement with the gear, a movable arm located beside the frame and engaged by the eccentric, and connections from the movable arm to the rudder actuating means.

7. A rudder control mechanism comprising a rocking frame and a rudder actuating means, driving connections between the frame and the rudder actuating means, and a device in said driving means to increase the amplitude of rudder movement with respect to the amplitude of frame movement progressively as the frame is rocked toward either extreme of its movement, said device including a shaft carried on the frame at a distance from the axis of the frame, said shaft being provided with a gear and an eccentric, a stationary gear segment in engagement with the gear, a pivoted arm mounted adjacent the frame and having an operative connection with the eccentric, connections from the pivoted arm to the rudder actuating means, and means operable independently of the frame to shift the rudder actuating means.

8. A rudder control mechanism comprising a rocking frame and a rudder actuating means, driving connections between the frame and the rudder actuating means, and a device in said driving means to decrease the amplitude of rudder movement with respect to the amplitude of frame movement progressively as the frame approaches its central position, said device including a shaft carried on the frame at a distance from the axis of the frame, said shaft being provided with a gear and an eccentric, a stationary gear segment in engagement with the gear, a pivoted arm mounted adjacent the frame and having an operative connection with the eccentric, connections from the pivoted arm to the rudder actuating means, and means operable independently of the frame to shift the rudder actuating means.

9. A rudder control mechanism comprising a rocking frame and a rudder actuating means, driving connections between the frame and the rudder actuating means, a variable ratio device in said driving connections to impart a lesser degree of movement to the rudder with respect to a given degree of movement of the frame when the rudder is near its central position, said variable ratio device including a shaft carried by the frame and having a planetary movement thereon, an eccentric on said shaft, and an arm beside the frame and movable by the rotation of the eccentric as the shaft is carried in its path about the axis of the frame, said arm being connected to the rudder actuating means, and means operable to shift the rudder actuating means without disturbing the variable ratio device.

10. A rudder control mechanism comprising a rocking frame and a rudder actuating means, driving connections between the frame and the rudder actuating means, a variable ratio device in said driving connections to impart a greater degree of movement to the rudder with respect to a given degree of movement of the frame as the rudder approaches either extreme position, said

variable ratio device including a shaft carried by the frame and having a planetary movement thereon, an eccentric on said shaft, and an arm beside the frame and movable by the rotation of the eccentric as the shaft is carried in its path about the axis of the frame, said arm being connected to the rudder actuating means, and means operable to shift the rudder actuating means without disturbing the variable ratio device.

11. A marine control system comprising a rocking frame, a control stick pivoted on the frame, a transmission shift rod located at the axis of the frame, connections from the stick to the shift rod whereby the rod is shifted by the pivotal movement of the stick, a geared member adjacent to the frame, a shaft carried by the frame and movable in an arc about the axis thereof, a gear connected to the shaft and in mesh with the geared member, an eccentric connected to the shaft, an arm adjacent the frame and movable by the eccentric, and a rudder operating means connected to the arm.

12. A marine control system comprising a rocking frame, a control stick pivoted on the frame, a transmission shift rod located at the axis of the frame, connections from the stick to the shift rod whereby the rod is shifted by the pivotal movement of the stick, a geared member adjacent to the frame, a shaft carried by the frame and movable in an arc about the axis thereof, a gear on one end of the shaft and a crank on the other end of the shaft, said gear being in mesh with the geared member, a pivoted arm adjacent the frame and engaged by the crank, and a rudder operating means connected to the arm.

13. A marine control system comprising a rocking frame, a control stick pivoted on the frame, a transmission shift rod located at the axis of the frame, connections from the stick to the shift rod whereby the rod is shifted by the pivotal movement of the stick, a geared member adjacent to the frame, a shaft carried by the frame and movable in an arc about the axis thereof, a gear connected to the shaft and in mesh with the geared member, an eccentric connected to the shaft, an arm adjacent the frame and movable by the eccentric, a rudder operating means connected to the arm, and a rudder trimming mechanism in the rudder operating means.

14. A marine control system comprising a rocking frame, a control stick pivoted on the frame, a transmission shift rod located at the axis of the frame, connections from the stick to the shift rod whereby the rod is shifted by the pivotal movement of the stick, a geared member adjacent to the frame, a shaft carried by the frame and movable in an arc about the axis thereof, a gear on one end of the shaft and a crank on the other end of the shaft, said gear being in mesh with the geared member, a pivoted arm adjacent the frame and engaged by the crank, a rudder operating means connected to the arm, and a rudder trimming mechanism in the rudder operating means.

15. In a marine control system a control stick, a rocking support for the control stick, a variable ratio device actuated by movement of the control stick to vary the effective movement thereof, a fluid pressure actuating unit controlled by the variable ratio device, a rudder shifting means, connections between the rudder shifting means and the pressure unit, and means to trim the rudder independently of the pressure unit and at any position of the variable ratio device.

16. A marine control mechanism comprising a

rocking frame, a stick pivoted on the frame, a transmission control rod extending through the axis of the frame and connected to the stick, a shaft carried by the frame and movable about the axis thereof, a geared member adjacent the frame, a gear on the shaft in mesh with the geared member, a crank on the shaft, and a pivoted arm beside the frame, said arm being connected to the crank and movable by the rotation of the shaft as the frame is rocked about its axis.

17. A marine control mechanism comprising a rocking frame, a stick pivoted on the frame, a transmission control rod extending through the axis of the frame and connected to the stick, a shaft carried by the frame and movable about the axis thereof, a geared member adjacent to the frame, a gear on the shaft in mesh with the geared member, a crank on the shaft, a pivoted arm, said arm being connected to the crank and movable by the rotation of the shaft as the frame is rocked about its axis, the radius of the crank being less than the radius of the pitch line of said gear, and connections from the arm to the rudder.

18. A rudder control mechanism comprising a rocking frame, a shaft carried by the frame and movable about the axis thereof, a geared member adjacent to the frame, a gear on the shaft in mesh with the geared member, a crank on the shaft, a pivoted arm, said arm being connected to the crank and movable by the rotation of the shaft as the frame is rocked about its axis, and connections from the arm to the rudder.

19. A rudder control mechanism comprising a rocking frame, a shaft carried by the frame and movable about the axis thereof, a geared member adjacent to the frame, a gear on the shaft in mesh with the geared member, a crank on the shaft, a pivoted arm, said arm being connected to the crank and movable by the rotation of the shaft as the frame is rocked about its axis, the radius of the crank being less than the radius of the pitch line of said gear, and connections from the arm to the rudder.

20. In a marine control system a control lever, a rocking support on which said lever is mounted, a variable ratio device on the support and actuated by the rocking movement of the support, a fluid pressure actuating unit adjacent the support, a flexible connection between the variable ratio device and the said unit, a rudder shifting means and connections between the rudder shifting means and the said unit.

21. A rudder control mechanism comprising a rocking frame, a manually operated lever carried by the frame, a shaft mounted on the frame and movable in an arcuate path about the axis of the frame, driving means on the shaft to rotate the shaft upon its own axis while moving about the frame axis, an eccentric connected to the shaft, the radius of the eccentric being less than the radius of the driving means, and connections from the eccentric to the rudder.

22. A rudder control mechanism comprising a rocking frame, a manually operated lever carried by the frame, a shaft mounted on the frame and movable in an arcuate path about the axis of the frame, driving means on the shaft to rotate the shaft upon its own axis while moving about the frame axis, an eccentric connected to the shaft, and connections from the eccentric to the rudder.

23. In a control system for power-operated craft of the type having a stick pivotally mounted and a transmission control shaft having a connection with the stick and actuated by the pivotal

movement thereof, the combination of a frame rockably mounted and carrying said pivotally mounted stick, a power unit connected to the frame and actuated by the rocking movement thereof, a rudder actuating means connected to and operated by the power means, and a device interposed between the power unit and the rudder actuating means to adjust the latter relatively to the former.

24. In a control system for power-operated craft of the type having a stick pivotally mounted and a transmission control shaft having a flexible connection with the stick and actuated by the pivotal movement thereof, the combination of a frame rockably mounted and carrying said pivotally mounted stick, a power unit flexibly connected to the frame and actuated by the rocking movement thereof, a rudder actuating means connected to and operated by the power unit, and a rudder trimming device operable to adjust the rudder independently of the rocking of the frame.

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