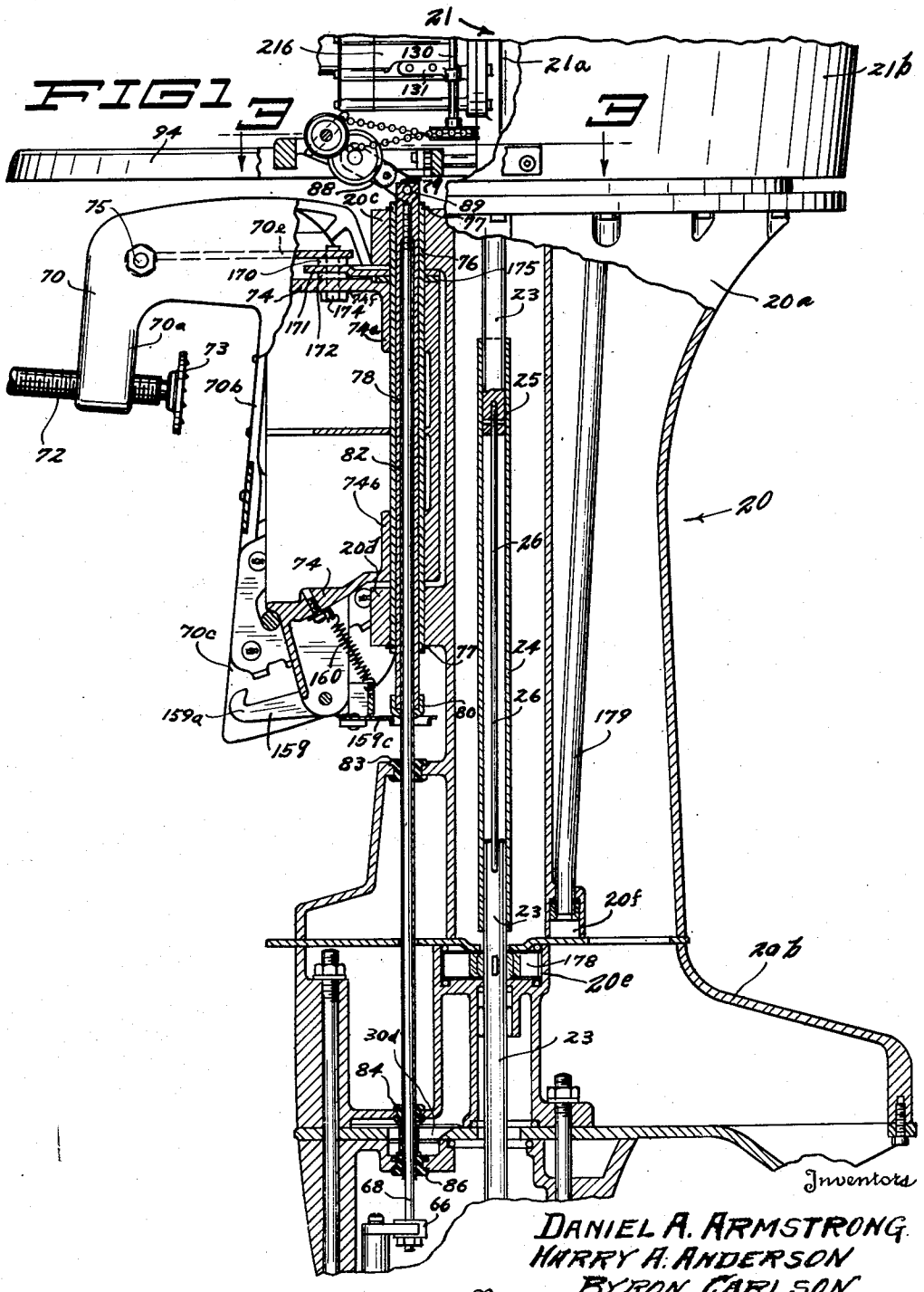
Dec. 7, 1954 D. A. ARMSTRONG ET AL 2,696,188

ENGINE AND REVERSING CONTROL FOR OUTBOARD MOTORS

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FIG. 3



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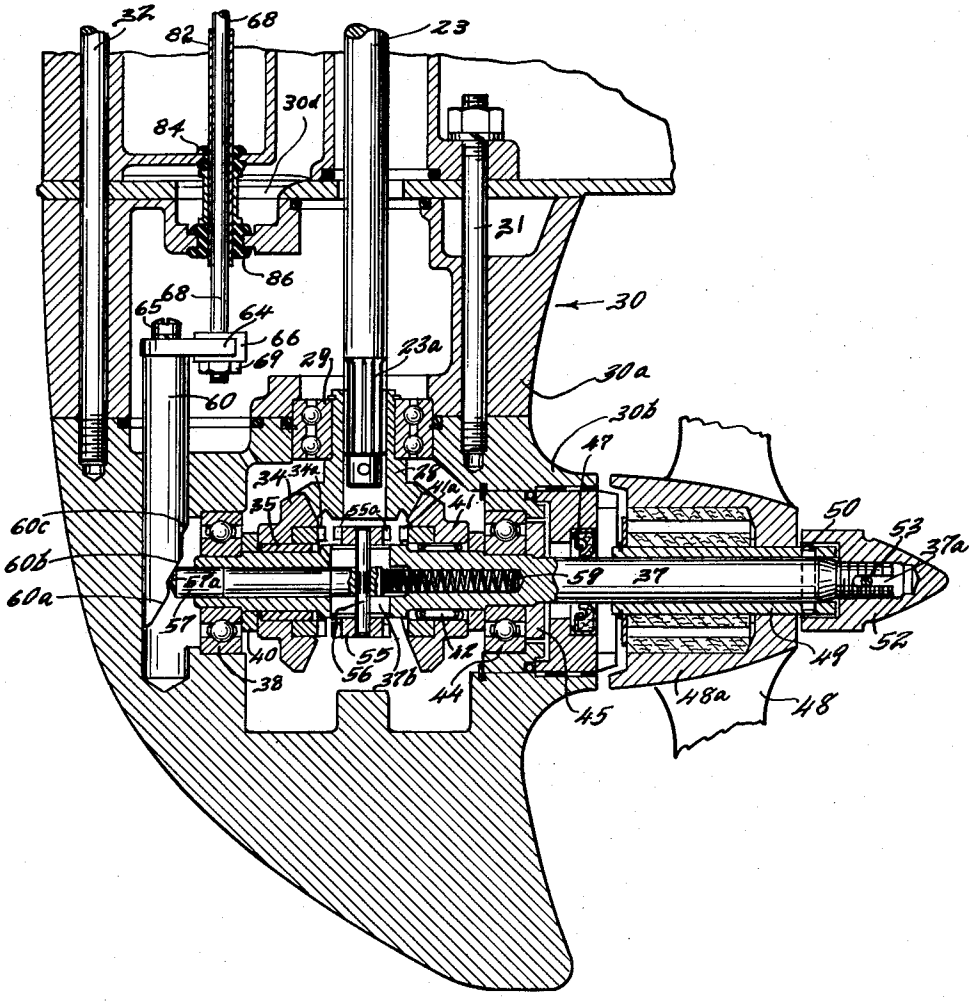
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ENGINE AND REVERSING CONTROL FOR OUTBOARD MOTORS

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FIG 2



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ENGINE AND REVERSING CONTROL FOR OUTBOARD MOTORS

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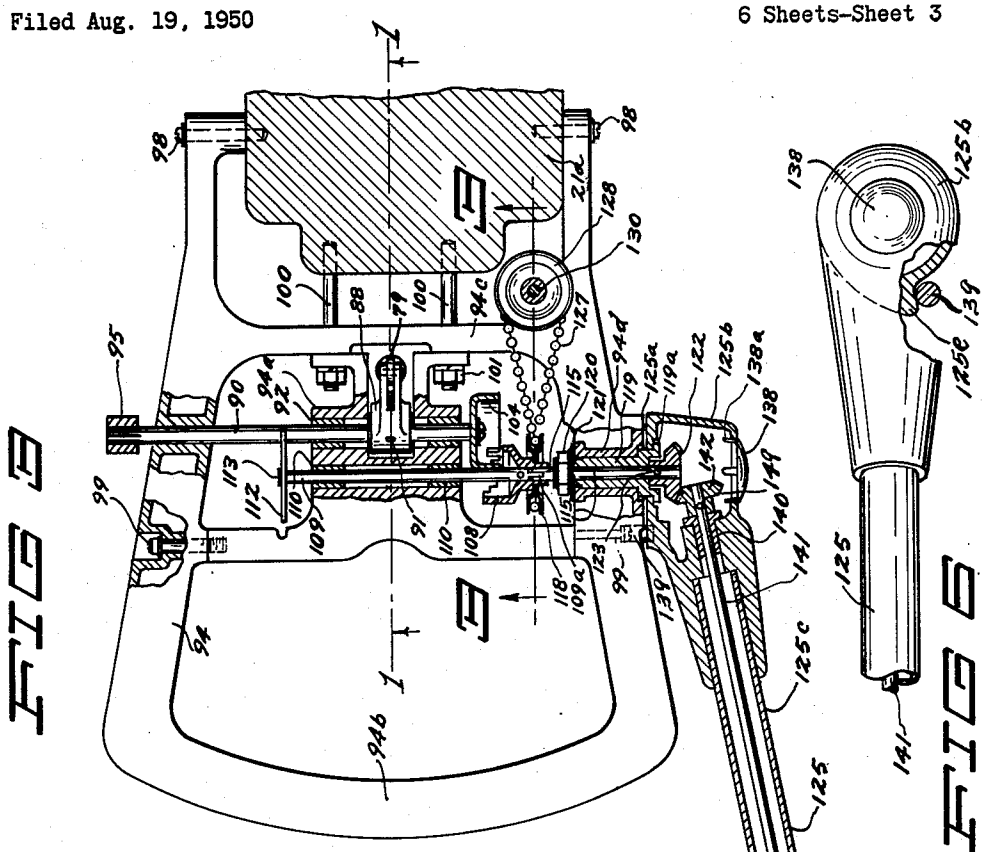


FIG 3

FIG 6

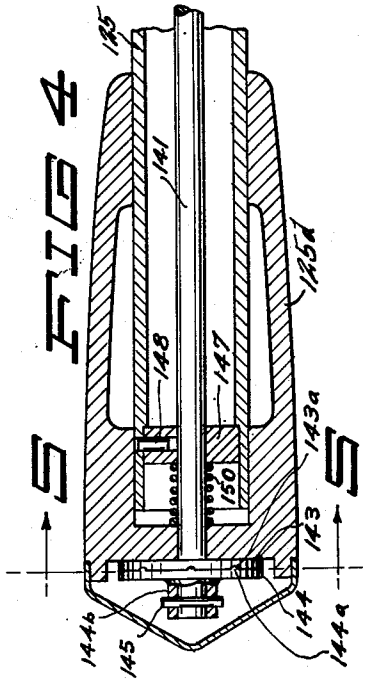


FIG 4

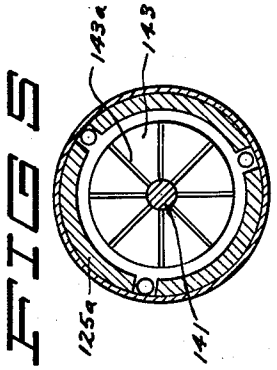


FIG 5

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ENGINE AND REVERSING CONTROL FOR OUTBOARD MOTORS

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FIG 7

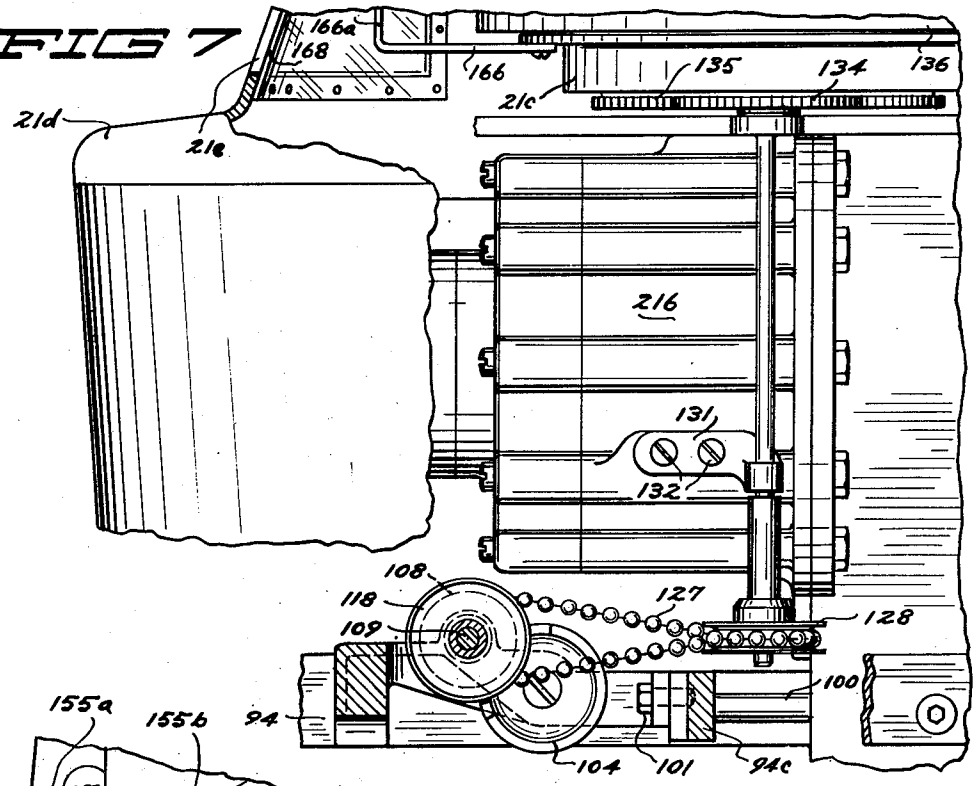
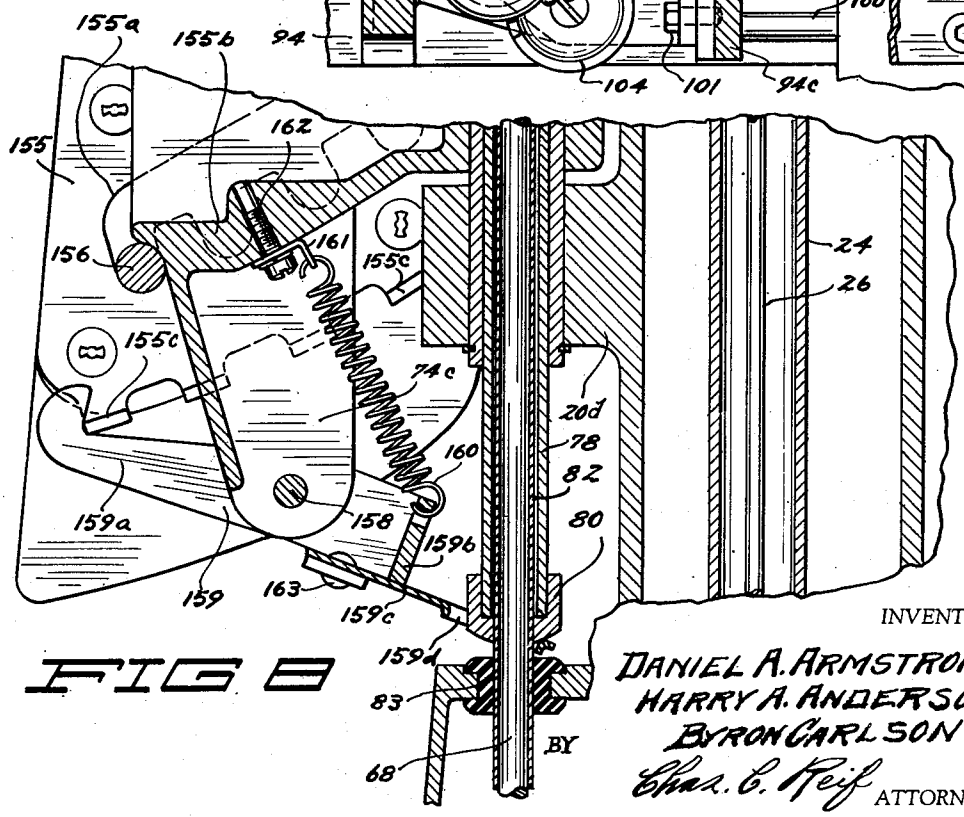


FIG 8



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Dec. 7, 1954 D. A. ARMSTRONG ET AL 2,696,188

ENGINE AND REVERSING CONTROL FOR OUTBOARD MOTORS

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FIG 9

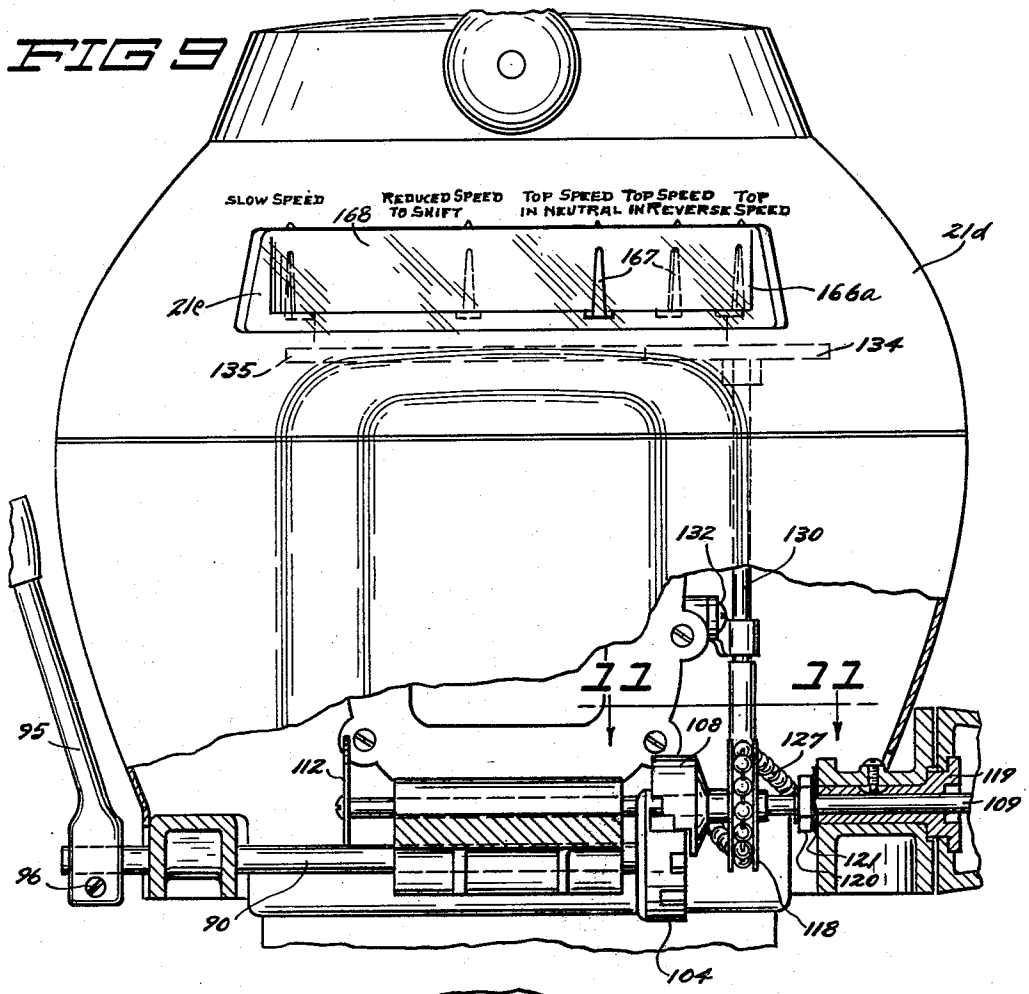
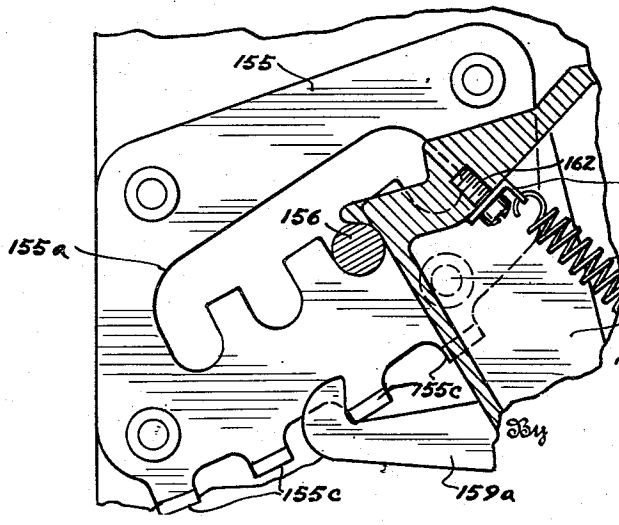


FIG 10



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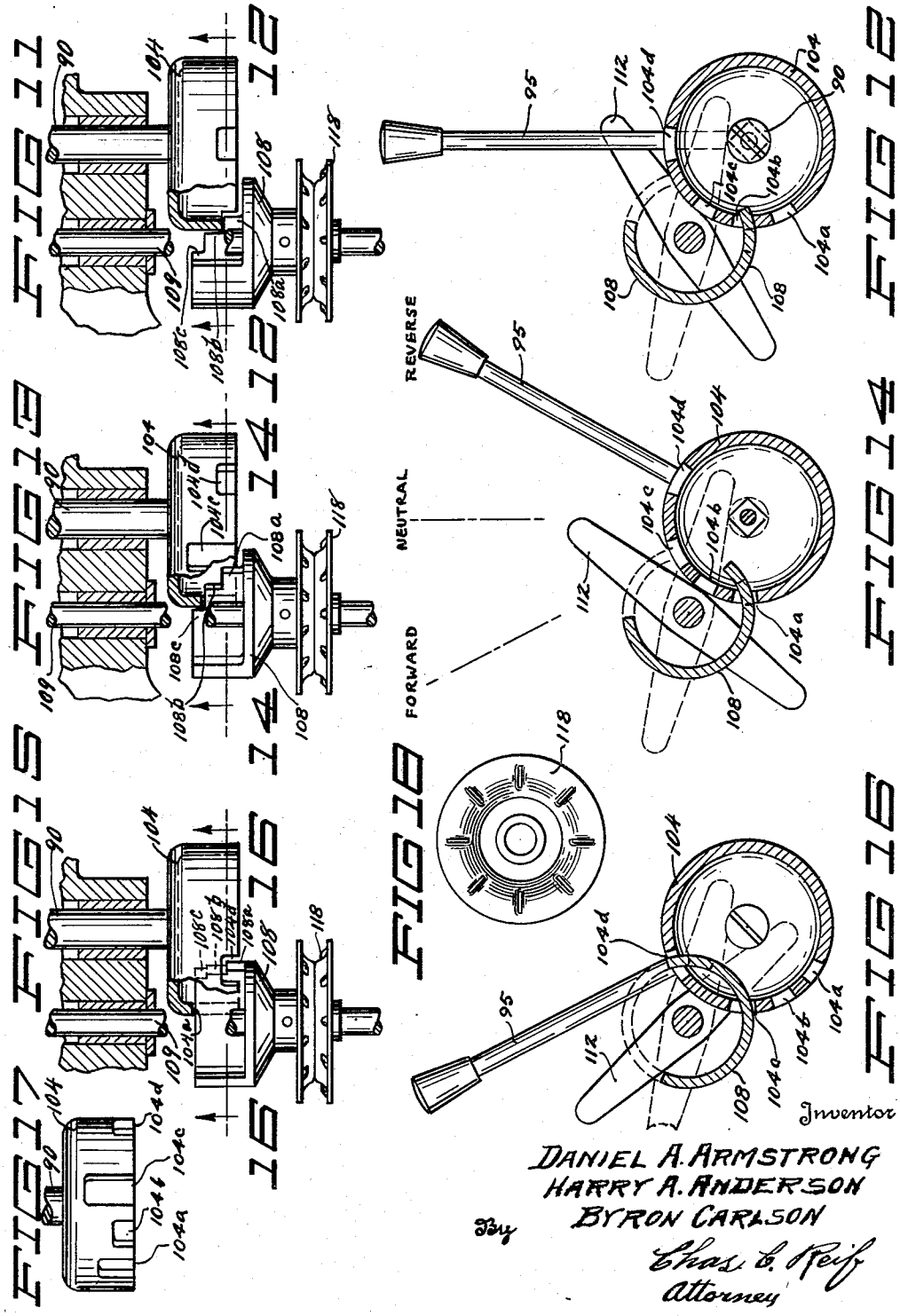
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ENGINE AND REVERSING CONTROL FOR OUTBOARD MOTORS

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United States Patent Office

2,696,188

Patented Dec. 7, 1954

2,696,188

ENGINE AND REVERSING CONTROL FOR OUTBOARD MOTORS

Daniel A. Armstrong, Byron Carlson, and Harry A. Anderson, Minneapolis, Minn., assignors to Scott-Atwater Manufacturing Co. Inc., Minneapolis, Minn., a corporation of Minnesota

Application August 19, 1950, Serial No. 180,446

15 Claims. (Cl. 115—18)

This invention relates to the structure of an outboard motor and particularly to novel means for adjusting the spark on said motor, and a novel means for operating a reversing mechanism for the propeller shaft of said motor.

It is an object of this invention to provide an outboard motor structure comprising a handle lever for swinging said motor for steering, together with means carried by said lever for adjusting the spark and fuel supply.

It is another object of the invention to provide an outboard motor structure comprising a lever for swinging the motor for steering said lever having a grip handle which is rotatable for adjusting the spark and fuel supply.

It is also an object of the invention to provide an outboard motor structure comprising a bracket adapted to be attached to a boat, a casing carrying the power head and driving shaft of said motor, a pivot connecting said casing and bracket about the axis of which said casing is swingable, a propeller shaft, a propeller secured to said shaft, a reversing mechanism for said propeller shaft, and means for operating said reversing mechanism including a member coaxial with said pivot.

It is another object of the invention to provide such an outboard motor structure as set forth in the preceding paragraph and in which said reversing mechanism includes a movable clutch member, a member movable substantially parallel to the driving shaft for moving said clutch member, a rod for moving said last mentioned member connected to said first mentioned member, and a shift lever connected to said first mentioned member, said rod preferably being coaxial with and disposed in said first mentioned member.

It is still another object of the invention to provide an outboard motor structure comprising a bracket adapted to be attached to a boat, a member pivoted to said bracket about a substantially horizontal axis, a casing carrying the power head and driving shaft of said motor, a pivot disposed in said member and connecting said member and casing, the axis of said pivot extending substantially at right angles to said first mentioned axis, a propeller shaft, a propeller secured to said shaft, a reversing mechanism for said propeller shaft, means for operating said reversing mechanism including a member coaxial with said pivot and movable longitudinally thereof, and a latch operated by movement of said member for engaging said bracket and preventing movement of said casing away from said bracket.

It is still further an object of the invention to provide an outboard motor structure comprising a power head and driving shaft, a propeller shaft, a propeller secured to said propeller shaft, a reversing mechanism for said propeller shaft, means for adjusting the spark and fuel supply of said motor including a rotatable member, means for operating said reversing mechanism including a second rotatable member adjacent said first mentioned rotatable member, said rotating members being adjacent each other and having inter-engaging portions for limiting the operation of said reversing mechanism at certain times in accordance with the position of said means for adjusting the spark and fuel supply.

It is more specifically an object of this invention to provide an outboard motor structure comprising a power head and driving shaft, a propeller shaft, a propeller secured to said propeller shaft, a reversing mechanism for said propeller shaft movable to forward, reverse, and neutral positions, a hand lever for swinging said motor for steering, a handle on said lever rotatable to adjust the spark and fuel supply of said motor, a lever for operating said reversing mechanism, and adjacent rotatable shell-like members movable to positions respectively by said shift lever and hand lever and having inter-engaging portions adapted to limit the movement of said shift lever when the means for adjusting the spark and fuel supply is in various positions.

Another object of the invention is to provide a rotatable member, preferably a part of or carried by the magneto, which carries thereon a speed indicating means, a housing enclosing said member, an indicator on said housing indicating different speeds with which said means cooperates and a window in said housing through which said means is visible.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings in which like reference characters refer to similar parts throughout the several views and in which:

Fig. 1 is a view for the most part in vertical section taken substantially on line 1—1 of Fig. 3, as indicated by the arrows, some parts being shown in side elevation;

Fig. 2 is a view in vertical section in substantially the same plane as Fig. 1 showing the lower portion of the motor;

Fig. 3 is a horizontal section taken substantially on line 3—3 of Fig. 1, as indicated by the arrows;

Fig. 4 is a central horizontal section of the end of the steering lever;

Fig. 5 is a vertical section taken on line 5—5 of Fig. 4, as indicated by the arrows, Figs. 4 and 5 being shown on an enlarged scale;

Fig. 6 is a view for the most part in side elevation as seen from the right of Fig. 3, some parts being broken away and others shown in vertical section;

Fig. 7 is a view partly in side elevation and partly in vertical section of a portion at the upper part of said motor;

Fig. 8 is a view partly in side elevation and partly in vertical section taken substantially in the same plane as Fig. 1, Figs. 7 and 8 being shown on an enlarged scale;

Fig. 9 is a view partly in front elevation and partly in vertical section of the upper part of the motor;

Fig. 10 is a partial view similar to Fig. 8 showing the parts in different positions;

Fig. 11 is a view partly in plan and partly in horizontal section showing a shift-limiting structure;

Fig. 12 is a vertical section taken on line 12—12 of Fig. 11;

Fig. 13 is a view similar to Fig. 11 showing the parts in different positions;

Fig. 14 is a vertical section taken on line 14—14 of Fig. 13;

Fig. 15 is a view similar to Fig. 11 showing the parts in still other positions;

Fig. 16 is a vertical section taken on line 16—16 of Fig. 15;

Fig. 17 is a top plan view of one of the shift-limiting members and a portion of its carrying shaft; and

Fig. 18 is a view in side elevation of a sheave or pulley used.

Referring to the drawings, parts of an outboard motor are shown comprising a casing **20** which carries the power head **21** which includes the cylinder block **21***a*, the crankshaft casing **21***b*, the carburetor (not shown), the magneto **21***c* and the usual cover or housing **21***d*. Casing **20** has sections **20***a* and **20***b* connected by exterior bolts (not shown). A driving shaft **23** is shown which will be connected to the crankshaft of the motor, said driving shaft being shown as having spaced portions embraced by a tubular sleeve **24** secured by a pin **25** to the upper portion of shaft **23** and embracing the lower portion of said shaft. A flat resilient strip **26** extends into central longitudinal slots of the spaced portions of shaft **23** and is secured by the pin **25** to the upper portion of shaft **23**. The lower portion of driving shaft **23** has a splined portion **23***a* adjacent its lower end which fits into a correspondingly splined hub of a beveled gear **28** which is thus secured to shaft **23**, said hub being rotatable in a ball

bearing 29 carried in a propeller shaft casing 30 having upper and lower sections 30*a* and 30*b* secured by bolts 31 and 32 to casing 20. Gear 28 meshes with another beveled gear 34 having a hub bored to receive a bushing 35 through which extends a propeller shaft 37. Shaft 37 is rotatable in a ball bearing 38 carried in casing 30 and extends through a thrust collar 40 disposed between the hub of gear 34 and bearing 38. Another beveled gear 41 meshes with gear 28 and has a hub journaled in a needle bearing 42 through which shaft 37 extends and on which said shaft also bears. Shaft 37 is also journaled in a ball bearing 44 carried in casing 30, said shaft extending through another thrust collar 45 disposed between the end of gear 41 and bearing 44. Shaft 37 extends through a sealing washer 47 and has secured thereto a hub 48*a* of a propeller 48. A bushing 49 is disposed in the hub 48*a* and secured to shaft 37 by a pin 50. An end member 52 is threaded on the end of shaft 37 and is also secured by a pin 53 extending through a slot 37*a* in shaft 37. A clutch member 55 is slidable on an enlarged portion of shaft 37 and is secured to said shaft by a pin 56 extending therethrough and through a slot 37*b* formed in shaft 37. Pin 56 also extends through a shaft 57 fitting in and longitudinally movable in a bore in shaft 37, the same being engaged at one end by a compression coiled spring 59 engaging the end of said bore in shaft 37 at its other end. Clutch member 55 has clutch teeth 55*a* at opposite sides engageable respectively with clutch teeth 34*a* and 41*a* on the adacent ends of gears 34 and 41 as disclosed in application S. N. 116,131, filed September 16, 1949, by Daniel A. Armstrong et al. One end of shaft 57 has a beveled end 57*a* adapted to be engaged by spaced beveled portions 60*a*, 60*b* and 60*c* of a shaft 60 which is vertically movable in a bore in casing 30. Casing 30 is shown as being in two parts separated on a horizontal plane. Shaft 60 extends through an arm 64 to which it is secured by a headed screw 65. Arm 64 is embraced by a bifurcated member 66 threaded on rod 68 through which and through arm 64 extends a rod 68 having a lock nut 69 secured thereto below member 66.

A bracket 70 is shown having spaced surfaces 70*a* and 70*b* forming part of a substantially U-shaped recess in which the transom of a boat is adapted to be received on which the outboard motor will be supported. The motor will be clamped to the boat by a pair of threaded screws 72 having clamping heads 73 mounted on their ends. Bracket 70 has a member 74 pivotally connected thereto by a pivot bolt 75 extending transversely and substantially horizontally therein. Member 74 has vertically spaced bearing portions 74*a* and 74*b* which are bored to receive a tubular pivot member 76 which also extends through lugs 20*c* and 20*d* projecting from casing 20 which are disposed respectively above lug 74*a* and below lug 74*b*. Casing 20 is thus pivotally connected to member 74 and bracket 70 and can swing about the axis of pivot 76. Pivot 76 extends some distance above and below lugs 20*c* and 20*d* respectively and is provided with annular grooves in which are received holding plates or washers 77 which hold pivot 76 in place. Another tubular member 78 is disposed in and fits in the bore of pivot 76 and is thus concentric with member 76. Member 78 has a cup-shaped member 80 secured to its lower end adapted to cooperate with a latching member to be later described. Member 78 is provided with an axial bore in which is disposed a tube 82 extending to adjacent the top of said axial bore and extending downwardly through member 80, through a sealing bushing 83 in a portion of casing 20, another sealing bushing 84 in a portion of casing 30, and a third bushing 86 also disposed in a portion of casing 30. Bushings 83, 84 and 86 may be made of some resilient material, such as rubber. Rod 68 is disposed in the tube 82 and is secured at its upper end to member 78 in any suitable manner as by the threaded connection shown. Member 78 is pivotally connected above pivot 76 in a bifurcated end of an arm 88 by a pivot member 89 shown as a headed pin (see Fig. 3). As shown in Fig. 3, the upper end of member 78 is flattened and a short link 79 connects said end and arm 88. From the described structure it will be seen that rod 68, which is moved for operating the reversing mechanism or the propeller shaft, is coaxial with the pivot 76 and also with the shift operating member 78. Arm 88 is secured to a shaft 90 in any suitable manner, as by a set screw 91. Shaft 90 is journaled in bushings 92 carried in a bore in a portion 94*a* of a bracket 94. Shaft 90 has secured at one end thereof a shift lever 95 which is thus disposed at one side of bracket 94. As shown in Fig. 9, lever 95 has a split hub which engages the splined end of shaft 90 and is tightly held on said shaft by a set screw 96 (see Fig. 9). Shaft 90 also extends through and is journaled in one side of bracket 94. As shown in Fig. 3, bracket 94 has converging side portions the ends of which engage the sides of the cylinder block 21*a* and are secured thereto by the headed bolts 98 shown as having split washers beneath the heads thereof. Bracket 94 also has a curved end portion 94*b*. Portion 94*a* is disposed between the side portions of bracket 94 and secured thereto by headed bolts 99 having their heads countersunk in the sides of bracket 94 and having split washers beneath said heads. Portion 94*a* is also secured to the crank case 21*b* by spaced studs 100 which extends through side flanges of portion 94*a* and through a transversely extending portion 94*c* of bracket 94. Studs 100 are provided with nuts 101 which have disposed therebeneath split washers. A cup-shaped member 104 is secured to the other end of shaft 90 by a headed screw overlying a washer. Member 104 is adapted to co-operate with a member 108 having a partial cup-shaped portion or flange and having a hub secured to a shaft 109 journaled in bushings 110 disposed in a bore in portion 94*a*. Member 108 is secured to shaft 109 in any suitable manner, as by a pin or set screw 111. Member 104 has a plurality of slots 104*a*, 104*b*, 104*c* and 104*d* extending inwardly from the edge of its cylindrical portion, said slots being of different depth. Member 108 is provided with stepped portions 108*a*, 108*b* and 108*c*, as shown in Fig. 14. As shown in Figs. 11 to 16, the cylindrical surface of members 104 and 108 intersect. A stop member 112 is secured to one end of shaft 109 by a headed screw 113, the head of which overlies a split washer engaging member 112. The other end of shaft 109 is provided with a flattened tongue portion 109*a* which is received in a central slot in the end of a shaft 115 which extends into the hub of member 108. The hub of member 108 has secured thereto a grooved sheave or pulley 118. Shaft 115 extends through a sleeve 119 disposed in a bore in a hub portion 94*d* of bracket 94 and having an enlarged end countersunk into said hub. The inner end of sleeve 119 is threaded and has threaded thereon a nut 120 engaging a corrugated spring washer 121 which engages the inner end of hub 94*d*. Shaft 115 has secured to its outer end a beveled gear 122 secured thereto in any suitable manner, as by a pin 123. Sleeve 119 has at its outer end a projecting annular flange 119*a* which engages the outer side of an inwardly extending flange 125*a* of a head or end member 125*b* of a steering lever 125. An endless member 127 runs over pulley 118 and over another pulley 128 disposed in a plane at right angles to pulley 118 and secured to a shaft 130 journaled in a bracket 131 secured to the crank case 21*b* by the headed bolts 132. The upper end of shaft 130 has secured thereto a gear 134 which meshes with a gear 135 secured to the rotatable adjustable member of magneto 136 of the motor. Pulleys 118 and 128 have sheet metal sides with circumferentially spaced indentations which form pockets for the beads on member or belt 127. While the endless member or belt 127 could take various forms, in practice it has been made of a small bead chain. The end member 125*b* is bored to receive the end of a tubular portion 125*c* of the steering lever 125 to which said member will be secured. Portion 125*b* has an opening in line with gear 122 which is closed by a cap 138 provided with a plurality of circumferentially spaced prongs 138*a* which hold it in said opening. Member 125*b* is bored to receive a flanged bushing 140 in which is journaled a shaft 141 having secured to one end thereof a beveled gear 142 secured thereto in any suitable manner, as by the pin 149. Beveled gear 142 meshes with gear 122 and the end of its hub seats against the flange of bushing 140. The tubular portion 125*c* at its other end extends into a hand grip member 125*d* having a bore at its outer end through which shaft 141 extends. Shaft 141 has extending thereabout a pair of disks 143 and 144. Disk 143 is provided with a plurality of circumferentially spaced recesses 143*a* illustrated as of semi-cylindrical form, and disk 144 is provided with a plurality of circumferentially spaced projections 144*a* adapted to seat in the recesses 143*a*. Disk 144 has an outwardly

projecting central hub 144*b* which is secured to shaft 141 by a pin 145. Tubular portion 125*c* is counterbored at its outer end to receive a block or collar 147 having a radial bore in which is disposed a pin 148 also extending into a bore in tubular portion 125*c*. A compression coiled spring 150 surrounds shaft 141, the same bearing at one end on collar 147 and at its other end on the end of member 125*d*. Portion 125*b* is provided with a lug 125*e* adapted to engage a pin 139 secured in the side of bracket 94. Pin 139 thus forms a stop limiting the swinging movement of lever 125.

From the described structure it will be seen that oscillation of shift lever 95 will move member 78 vertically in tubular member 76. This will move rod 68 vertically so that member 60 will be moved vertically. The portions 60*a* and 60*b* and 60*c* will act to cam shaft 57 horizontally and move clutch member 55 to engage one or the other of the gears 34 and 41. The bracket 70 has spaced side portions 70*c* of plate-like form to each of which is secured a plate 155 having an elongated slot 155*a* therein from which extend downwardly spaced slots 155*b* which as illustrated are four in number. A headed pin 156 extends between plates 155 and through the same having heads at its ends. Pin 156 can be moved into the long shot 155*a* and dropped into any of the slots 155*b*. Said pin 156 forms an abutment for the rear side of member 74, as shown in Figs. 1 and 8. The position of pin 156 will determine the position of casing 20 relatively to bracket 70. The plates 155 have projecting inwardly therefrom spaced narrow portions or tongues 155*c*. Member 74 has a depending portion 74*c* to which is pivoted by a pivot 158 a latch member 159 having latch portions 159*a* at each side thereof having hooks or bills at their ends adapted to be swung into engagement with one of the tongues 155*c*. Member 159 is thus of U shape and has a lower or bight portion 159*b* apertured to have secured therein one end of a tensile coiled spring 160, the other end of which is secured in a small bracket 161 secured to member 74 by a headed screw 162. Member 159 has a resilient portion 159*c* secured thereto in any suitable manner, as by the rivets 163, which portion 159*c* has an opening 159*d* therethrough through which opening the tube 82 and the rod 68 therein pass. The member 159*c* has a short depending flange about opening 159*d* and the portion about opening 159*d* is constructed and arranged to be engaged by member 80 when member 76 is moved downwardly in the shifting operation.

In Fig. 9 a front view of the motor is shown. A member 167 is secured to the plate-like portion 166*a* of the rotatable part of the magneto 21*c*, the position of which indicates different speeds of the motor. Member 167 is visible through an opening 21*e* which may be covered with a transparent sheet 168. As shown in Fig. 9, certain legends will be placed on the motor casing or transparent sheet. These are respectively "Slow speed" at the left of opening 21*e*, "Reduced speed to shift" near the center of said opening, "Top speed in neutral," "Top speed in reverse," and "Top speed," which latter is at the right of opening 21*e*. Member 167 cooperates with said legends.

A plate 70*e* secured to a sleeve surrounding bolt 75 and extending between the sides of bracket 70 has an inner end which engages two washers 170 overlying a plate 171 beneath which are two other washers 172 supported on a plate 74*f* extending from one of the apertured lugs 74*a*. A headed bolt 174 extends through member 74*f* and is threaded in plate 70*e* so that said parts are secured together. Plate 171 has an opening through which passes pivot 76 and a yielding or resilient washer 175 is disposed below plate 171 and engages the top of lugs 74*a*. Friction is thus placed on lug 20*a* acting to prevent free swinging of casing 20. Said structure forms no part of the present invention.

As shown in Fig. 1, a rotatable water pump 178 is secured to shaft 23 which pumps the cooling water. The water enters chamber 20*e* through openings not shown, the same entering the pump chamber and being forced therefrom into chamber 20*f* from which it passes into the tube 179 and is conveyed to the cooling passages in the power head. Said pump and cooperating parts form no part of the present invention.

In operation the engine of the motor will be operated as usual and drive shaft 23 will be driven. This will drive gear 28 and gears 34 and 41 will be rotated in opposite directions. When clutch member 55 is in its central position, as shown in Fig. 2, propeller shaft 37 will not be driven and the motor will thus be in neutral. At this time shift lever 95 is usually in vertical position, as shown in Fig. 12. If the motor is to be propelled forwardly, shift lever 95 will be moved to the position shown in Fig. 16. This will swing arm 88 and raise member 78 so that member 60 will be raised. The portion 60*a* will move upwardly, pass the end of shaft 57 and spring 59 will move clutch member 55 to engage gear 34. The propeller shaft 37 and propeller 48 will now be rotated so that the boat is moved forwardly. Should it be desired to move the boat rearwardly, or in other words to put the motor in reverse shift, lever 95 will be swung to the position shown in Fig. 14. This will push down on member 78 and member 60 will be moved downwardly so that portion 60*b* thereof will cam shaft 57 inwardly so that the end thereof will come against the vertical portion of member 60 above the inclined surface 60*b*. Clutch member 55 will then be moved into engagement with gear 41 and propeller shaft 37 and propeller 48 will be rotated in a direction to move the boat rearwardly. When the motor is thus in reverse or the boat is being moved rearwardly, there is a tendency for the propeller to push or swing casing 20 away from bracket 70. To offset this, latch 159*a* is moved into engagement with one of the tongues 155*c*, as shown in Fig. 8. When member 78 is moved downwardly to put the motor in reverse, member 80 engages portion 159*c* and this swings member 159 about its pivot 158 and latch member 159*a* engages one of the tongues 155*c* thus latching casing 20 to bracket 70 and preventing upward swinging of said casing. There is one of the tongues 155*c* for each of the slots 155*b*. No matter which of the slots 155*b* pin 156 occupies, one of the tongues 155*c* will be in position to be engaged by the latch members 159*a*. When the shift lever is moved and member 78 is raised to move the reversing mechanism into neutral, spring 160 will swing member 159 to unlatching position, as shown in Fig. 1.

In previous outboard motors it has been a common practice to have a spark adjusting lever secured to the magneto and swingable horizontally just above the power head. In the present structure the magneto 21*c* is moved and the spark is advanced or retarded by rotation of the grip handle 125*d*. The operator usually has hold of the steering lever 125 and grip handle 125*d* and can thus very easily and conveniently adjust the spark by a mere turning movement of his hand and of grip 125*d*. When grip handle 125*d* is rotated, shaft 141 is rotated, thus rotating gear 142 and gear 122. Shafts 115 and 109 are thus rotated and pulley 118 is rotated. Rotation of pulley 118 rotates pulley 128 through the belt or bead chain 127 which in turn rotates shaft 130, gears 134 and 135, and thus the magneto. The spark is thus advanced or retarded by merely rotating the grip handle 125*d*. The member 112 secured to the end of shaft 109 is rotated with said shaft and moves to positions with its ends respectively engaging shaft 90. In one of these positions, namely the one shown in Fig. 12, said member 112 is engaging shaft 90 and limiting movement of the magneto rotor in its movement to retard the spark. This prevents gear 134 from running off of gear 135. In Fig. 16 member 112 is shown as engaging the opposite side of shaft 90 from that engaged in the showing in Fig. 12 and this limits the movement of the magneto to advance the spark.

When the driving gears are in reverse position it is desirable to limit the speed of the motor for reasons of safety. As stated, reverse lever 95 is shown in reverse position in Fig. 14. This moves with member 104 to the position shown in Fig. 13. When member 108 moves with shaft 109 to advance the spark and thus increase the speed, the step portion 108*c* will engage the outside of the cylindrical portion of member 104 and the advance of the spark and thus the increase in speed will be limited. It is also undesirable to shift the gears when the motor is running at high speed. The members 104 and 108 constitute means for preventing shifting at high speed. Assuming that the motor driving gears are in forward position, member 108 then occupies the position shown in Figs. 15 and 16. The cylindrical portion of member 108 can now pass freely through slots 104*a* and 104*d* in member 104, as shown in Fig. 16, so

that there is no limit on advancing the spark or increasing the speed except that furnished by the stop member **112**. However, if it is attempted to move the shift lever **95**, the side of slot **104***a* would engage the cylindrical portion of member **108** and prevent shifting. It will be necessary to turn grip handle **125***d* and rotate member **108** until its cylindrical portion **108***a* is out of slot **104***b* before the shift lever and member **104** can be rotated. This is approximately the position of member **108** shown in Fig. 14. In Fig. 12 member **108** is also shown in reduced speed position. The motor must thus be reduced in speed before shifting can take place. When the motor is in neutral position, it is also desirable to limit the speed so that the motor will not race objectionably while in neutral. When the driving gears are in neutral, parts **104** and **108** occupy the position shown in Fig. 12. Step portion **108** is now in slot **104***b*, as shown in Fig. 11. Member **108** can thus be moved to increase the speed some distance before its step **108***b* will engage the outer side of member **104** and this engagement will limt the movement of member **108** and thus limit the advance of the spark and the increase in speed while in neutral. Members **104** and **108** must not only prevent shifting while the motor is in high speed but they also limit the speed of the motor when in neutral and in reverse.

Lever **125** is secured to bracket **94** as described, and when said lever is swung, the casing **20** is swung and the motor and boat are thus steered. The lever **125** can be swung upwardly about the axis of shaft **115** through quite an angle. When said lever swings downwardly its movement will be limited by the stop pin **139**. Should the operator swing lever **125** upward when stop member **112** is in engagement with shaft **109**, there would be great force exerted on shaft **109** and stopping member **112** which might cause damage. It will be seen that there is great leverage on said members. To prevent any such damage the clutch comprising disks **143** and **144** is provided. There would be a tendency to rotate gear **142** as it moved about gear **122** and this would rotate shaft **141**. The resistance offered would cause disk **144** to move away from disk **143** against the resistance of spring **150**. The projections **144***a* would move out of the recesses **143***a* and shaft **141** would merely rotate freely. This would prevent any damage. When the stress is relieved from shaft **141**, spring **150** will again engage portions **143***a* and **144***a*. It may be stated that movement of the rotatable part of the magneto also adjusts the supply of fuel in synchronism with such movement as is common, one form of means for such adjustment being shown in the application of Walter J. Raleigh, S. N. 163,062, filed May 19, 1950 for "Carburetor Valve Regulator," now Patent No. 2,635,595.

The operator can see the member **167** and can by the legends associated therewith see at what speed the motor is operating. The front portion of member **94** forms a very convenient handle for carrying the motor.

From the above description it will be seen that we have provided a comparatively simple and yet novel and highly efficient structure of outboard motor. The steering and speed regulation by spark adjustment are operated from one member. The operator can thus regulate his speed very easily and conveniently with the same hand that is doing the steering. The members which are moved vertically for shifting are coaxial with the pivot about which the casing and motor swing and are thus kept free from strain and very nicely protected. When the motor is put in reverse the casing is with the same operation locked against swinging upwardly. A simple and ingenious mechanism limits the speed in neutral and reverse and prevents shifting when the motor is running at high speed. The device has been amply demonstrated in actual practice and the same is being commercially made.

It will of course be understood that various changes may be made in the form, details, arrangement and proportions of the parts, without departing from the scope of applicants' invention, which generally stated, consists in a device capable of carrying out the objects above set forth, in the parts and combinations of parts disclosed and defined in the appended claims.

What is claimed is:

1. An outboard motor structure having in combination, a bracket adapted to be attached to a boat, a member pivoted to said bracket about a substantially horizontal axis, a casing carrying the power head and driving shaft of said motor, a pivot carried in said member having its axis substantially at right angles to said axis for connecting said casing and member so that said casing is swingable about the axis of said pivot, a propeller shaft, a propeller secured to said shaft, a reversing mechanism for said propeller shaft, means for operating said reversing mechanism including a second member coaxial with said pivot and longitudinally movable relatively thereto, a latch pivotally mounted on said first mentioned member, a stop member carried in said bracket movable to different positions adapted to be engaged by said first mentioned member for holding the latter and said casing in different positions, said bracket having a plurality of spaced portions engageable by said latch, said portions corresponding respectively to the different positions of said stop member.

2. An outboard motor structure having in combination, a bracket adapted to be attached to a boat, a casing carrying the power head and driving shaft of said motor, a tubular pivot connecting said casing and bracket, said pivot extending beyond said casing and bracket at its ends, means at said ends for holding said pivot in position, a propeller shaft, a propeller secured to said shaft, a reversing mechanism for said propeller shaft, a sleeve coaxial with and disposed in and fitting said pivot, a tubular member within said sleeve and extending to below said casing, a rod coaxial with and secured to said sleeve, said rod being secured to its upper end to said sleeve and means for operating said reversing mechanism including said sleeve and rod.

3. An outboard motor structure having in combination, a magneto, means for adjusting said magneto to advance or retard the spark on said motor for increasing or decreasing the speed of said motor, a member of cylindrical form movable in direct ratio to the movement of said magneto, a propeller shaft, a reversing mechanism for said propeller shaft movable to different positions, a shift lever for operating said reversing mechanism, a second member of general cylindrical form adjacent said first mentioned member and rotated in direct ratio to the movement of said shift lever, said members having co-operating engaging parts for limiting movement of said lever.

4. An outboard motor structure having in combination, a magneto, means for adjusting said magneto to advance or retard the spark on said motor for increasing or decreasing the speed of said motor, a member of cylindrical form movable in direct ratio to the movement of said magneto, a propeller shaft, a reversing mechanism for said propeller shaft movable to different positions, a shift lever for operating said reversing mechanism, a second member adjacent said first mentioned member movable in direct ratio to the movement of said lever, said second member having cylindrical portions the cylindrical surfaces of which intersect and are provided with slots and step portions respectively to limit the movement of said members under different conditions.

5. An outboard motor structure having in combination, a magneto, means for adjusting said magneto to advance or retard the spark on said motor for increasing or decreasing the speed of said motor, a member of cylindrical form movable in direct ratio to the movement of said magneto, a propeller shaft, a reversing mechanism for said propeller shaft movable to different positions, a shift lever for operating said reversing mechanism, a second member adjacent said first mentioned member movable in direct ratio to the movement of said lever, said members having substantially cylindrical portions the cylindrical surfaces of which intersect, said portions having openings and engaging portions respectively for limiting relative movement of said members.

6. An outboard motor structure having in combination, a magneto, means for adjusting said magneto to advance or retard the spark on said motor for increasing or decreasing the speed of said motor, a member of cylindrical form movable in direct ratio to the movement of said magneto, a propeller shaft, a reversing mechanism for said propeller shaft movable to different positions, a shift lever for operating said reversing mechanism, a second member adjacent said first mentioned member movable in direct ratio to the movement of said lever, said members being of cylindrical cup-

like form and having substantially parallel axes and open ends facing each other, one member having spaced slots extending longitudinally inward from its free edge and the other member having its cylindrical portion provided with circumferentially spaced longitudinally extending step portions, the cylindrical portion of said latter member being adapted to move through said slots and said step portions being adapted to engage the cylindrical portion of said first mentioned member.

7. An outboard motor structure having in combination, a bracket adapted to be secured to a boat, a casing carrying a power head, drive shaft, propeller shaft and propeller pivoted to said bracket about a substantially vertical axis whereby said casing is swingable about said axis, a magneto having a movable member for advancing or retarding the spark for increasing or decreasing the speed of said motor, a hand lever secured to said casing for swinging the same for steering, a second member rotatably carried on said lever, means connecting said second member and movable member including a rotatable shaft, a stop for limiting rotative movement of said rotatable shaft, said means also including a friction connection whereby said second member can rotate without moving said rotatable shaft when said stop is operative.

8. An outboard motor structure having in combination, a magneto carrying a rotatable part, a housing for said motor enclosing said magneto, said part having a speed indicating means thereon, an indication on said housing for different speeds with which said means cooperates, and a window in said housing through which said rotatable part and means are visible.

9. An outboard motor structure having in combination, a bracket adapted to be attached to a boat, said bracket having substantially vertically spaced bearings, a casing having substantially vertically spaced bearings disposed above and below said first mentioned bearings respectively, a tubular pivot extending through all of said bearings for connecting said bracket and casing so that said casing is swingable about the axis of said pivot, said pivot extending above and below said last mentioned bearings respectively, means engaging said pivot above and below said bearings respectively for holding said pivot in place, a cylindrical member fitting in said pivot and extending above and below the same, a tubular member disposed in said cylindrical member, a propeller shaft casing secured to the lower end of said casing, said tubular member extending into said propeller shaft casing, a rod slidable in said tubular member and secured at its upper end to said cylindrical member, a reversing mechanism in said propeller shaft casing, and means for operating said reversing mechanism including said rod and cylindrical member.

10. The structure set forth in claim 9, said first mentioned casing and propeller shaft casing having waterproof bushings therein through which said tubular member extends and in which it fits.

11. The structure set forth in claim 9, a latch for connecting said bracket and casing when said reversing mechanism is placed in reversed position, and a member carried by said cylindrical member for engaging said latch and moving the same to latching position.

12. An outboard motor structure having in combination, a bracket adapted to be secured to a boat, a casing carrying a power head, a drive shaft, a propeller shaft casing secured to said casing, a propeller shaft in said last mentioned casing, a propeller secured to said propeller shaft, a gear shift mechanism between said drive shaft and propeller shaft movable to forward, reverse and neutral positions, a lever movable to operate said shift mechanism, a second shaft secured to said lever, a third shaft, a steering lever having a fourth shaft extending longitudinally thereof, a grip handle for said steering lever secured to said fourth shaft, gears connecting said third and fourth shafts, a timer device, means for operating said timer device from said third shaft, and a stop member secured to said third shaft for limiting the rotation thereof.

13. The structure set forth in claim 12, and cooperating cup-shaped members having intersecting cylindrical step portions for limiting the movement of said first mentioned lever and operation of said gear shift at certain times.

14. An outboard motor structure having in combination, a casing carrying a power head, a drive shaft, a propeller shaft, a propeller secured to said propeller shaft, a reversing mechanism between said drive shaft and propeller shaft movable to forward, reverse and neutral positions, a movable lever for operating said reversing mechanism, a second shaft to which said lever is secured oscillatable by said lever, a third shaft extending substantially parallel to said second shaft, a steering lever, a hand grip at one end of said steering lever and rotatable thereon, means for rotating said third shaft by rotation of said hand grip, a timer device, means for turning said timer device from said third shaft, and cooperating members on said second and third shafts for limiting the speeds of said motor when operating said reversing mechanism.

15. The structure set forth in claim 14, a stop member on said third shaft engageable with said second shaft for limiting the rotation of said third shaft and thus the movement of said timer device.

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