INSTRUCTIONS BOOK

for

MODEL KD

Also Models KS, KSL, KDL

JOHNSON *Sea-horse*
OUTBOARD MOTORS

Johnson Motors
WAUKEGAN, ILLINOIS

1M—10-50—NSP—8911

301-474

INDEX

NOTE — Spark plugs are not installed in new motors when shipped from factory but packed separately.

WARRANTY

We warrant each new outboard motor of our manufacture to be free from defects in material and workmanship under normal use and service, our obligation under this warranty being limited to making good at the factory any part or parts thereof which shall, within three (3) months after delivery of such motor to original purchaser, be returned to us with transportation charges prepaid, and which our examination shall disclose to our satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties and representations expressed or implied and of all other liabilities in connection with the sale or use of any motors.

This warranty shall not apply to any motor which shall have been repaired or altered outside the factory in any way so as to affect its stability, nor which has been subject to misuse, negligence or accident.

We make no warranty in respect to trade accessories not of our manufacture; inasmuch as they are usually warranted separately by their respective manufacturers.

Because of the usual strains and accidents to which such products may be subjected, we make no warranty of either material or workmanship in racing outboard motors or any of our products when used for racing.

Claims must be entered on motors or motor parts returned to the factory for inspection, repair or replacement. Request form No. SE-16 from local Johnson Dealer or Service Station. This form should be filled in, signed by the motor owner and dealer or service station representatives and mailed to the factory with returned material, TRANSPORTATION CHARGES PREPAID.

Foreword

This instruction booklet is not a service manual, but a booklet prepared for the purpose of conveying to the Johnson Motor Owners, such information as will enable him to thoroughly understand the operation of his motor and the necessary procedure for its proper maintenance.

The motor consists of two major assemblies, namely—the power head and the lower unit. The power head (water cooled), contains the cylinder block, crankcase, crankshaft, piston and connecting rod assemblies, magneto, carburetor and gas tank—the power head is the engine (2 stroke cycle type, see page 9) or driving force. The lower unit contains the gearcase, consisting of the gears to drive the propeller, propeller shaft, driveshaft, exhaust outlet, brackets for attaching motor to the boat and the steering handle.

STEERING is accomplished by moving the steering handle to left or right as desired—see Fig. 1. It will be noted the entire motor turns with movement of the steering handle, thus steering is actually the result of propeller thrust. This arrangement makes possible 360 degree steering—consequently, to reverse direction of boat travel, simply turn motor around 180 degrees from normal operating position.

LUBRICATION of the **power head** is provided by mixing oil and gasoline in proportions as instructed on page 9. This mixture is poured into the gas tank and requires no further attention until the tank is empty.

LUBRICATION of the **gearcase** is accomplished by inserting gear lubricant as instructed on page 13.

STARTING (cranking) is achieved by wrapping a cord around pulley on the flywheel provided for this purpose and by pulling briskly on grip of cord. Fig. 5. Model KD equipped with ready pull. See starting instructions on page 14.

CONTROL (speed) is by movement of the magneto lever. See Figs. 1 and 7. Maximum speed is attained when lever is moved to extreme right (facing motor). Motor speed is reduced by moving lever to left (facing motor) as required to obtain desired results.

Dependability and long life are built into every Johnson Outboard Motor shipped from our factory—this is OUR RESPONSIBILITY. You will no doubt want to take full advantage of these valuable features and to enjoy hour after hour—year after year, that Dependability which can be realized only if the motor is properly cared for.—That is YOUR responsibility.

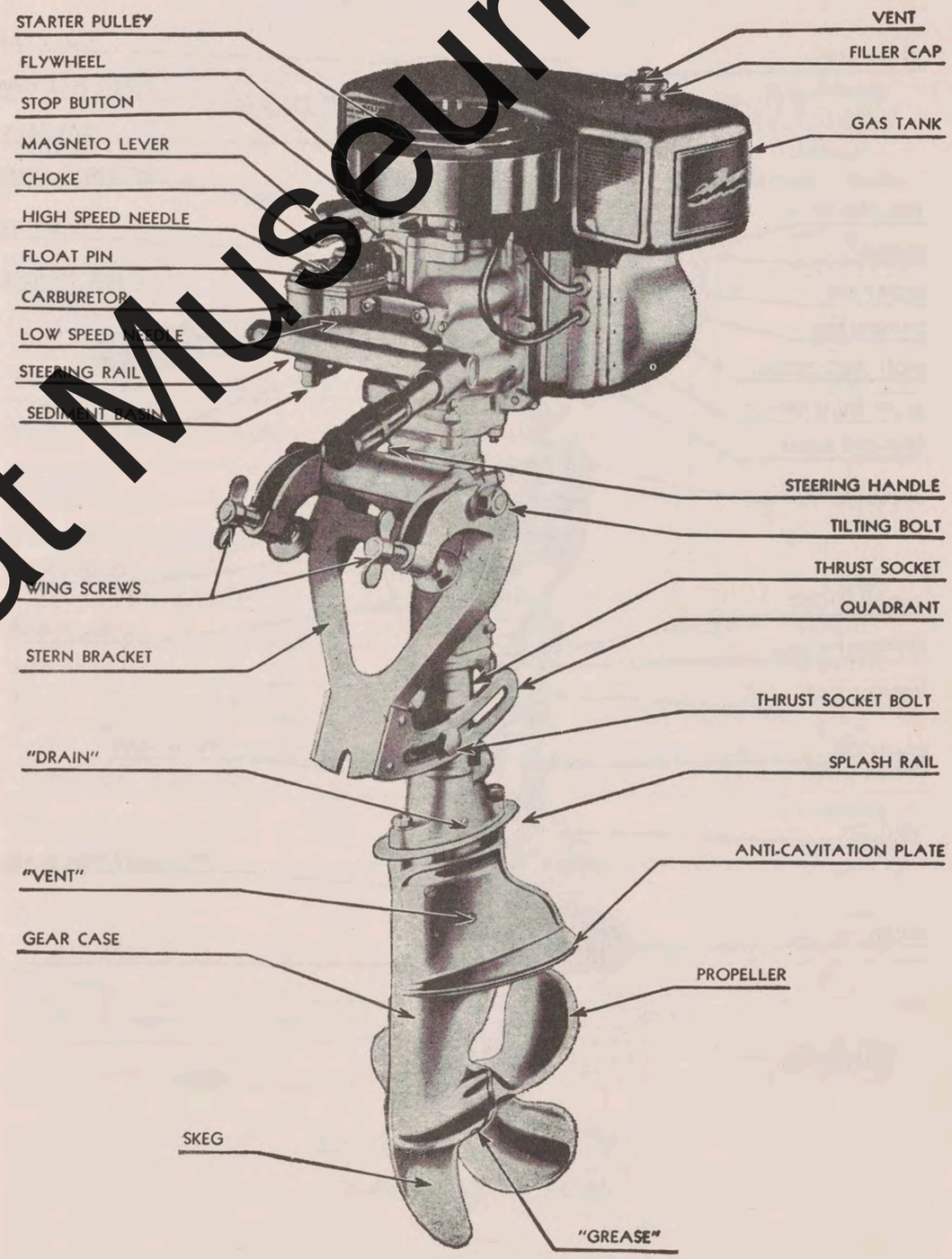
The instructions contained in this booklet are essential and, if closely adhered to, will assist in obtaining the utmost from your Johnson Outboard Motor.

Don't Fail to Register Your Motor

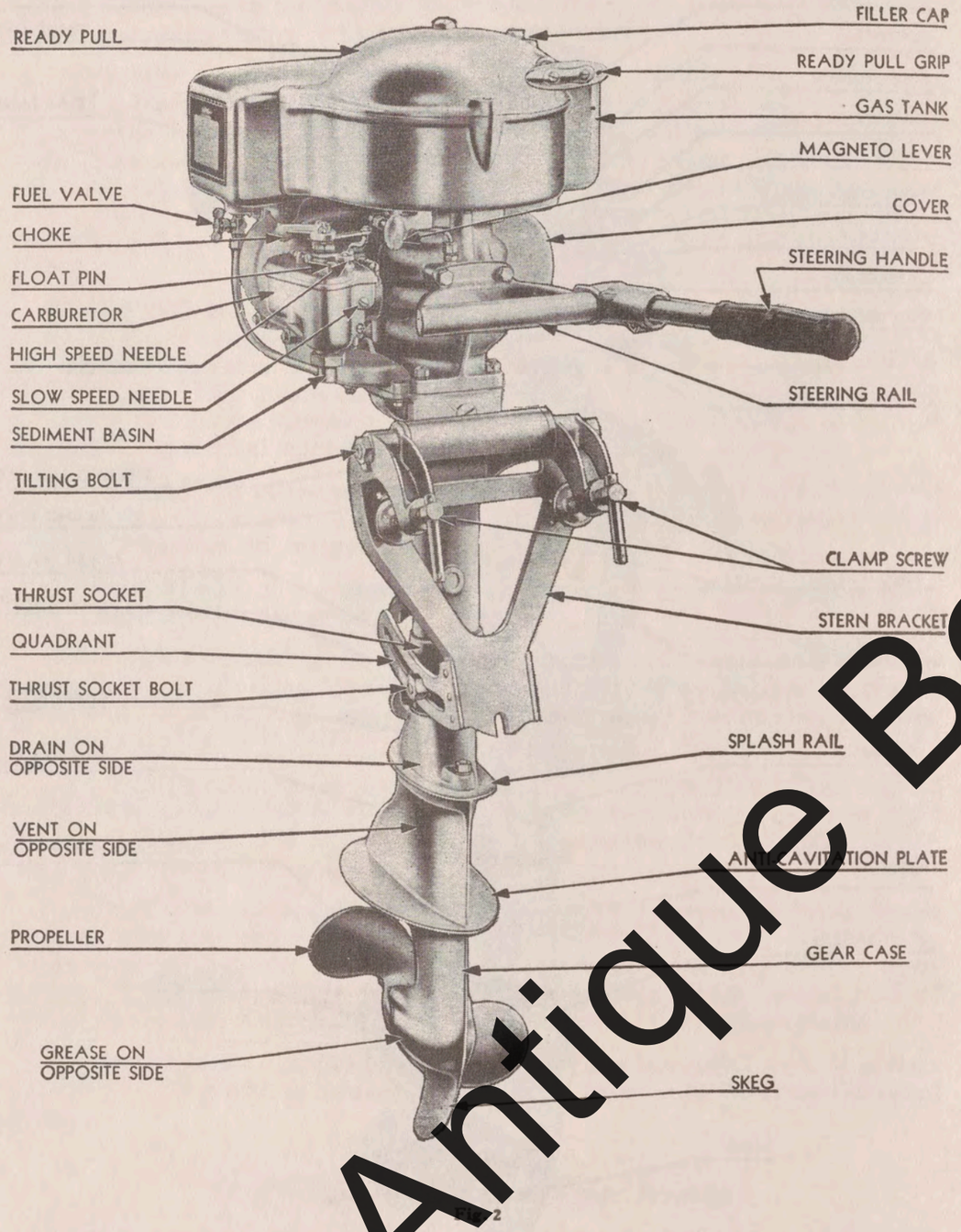
Your motor is known to the factory only by its MODEL and SERIAL NUMBER. This number is located on bottom end of crank case.

Always give the serial number and model when seeking information or ordering parts.

Model KS (E)



Model KD (L)



SPECIFICATION CHART

Mechanical Specifications	Sea-Horse KS(L)-KD-L
POWERHEAD	2-Port Rotary Valve Alternate Firing
Bore and Stroke	2⅛"x1-31/32"
Number of Cylinders	2
O.B.C. Certified Brake H.P. at R.P.M.	9.8 4000
Piston Displacement	13.96 Cu. In.
Weight	64 Lbs.
Propeller Diameter Pitch	9½"x9½" 2 Blade
Fuel Tank Capacity	13 Pints
Starting	Rope
Ignition	Magneto
Make Carburetor	Own
Gear Ratio	14.24
Type of Exhaust	Underwater
Cooling System	Pressure Vacuum
Steering	Full Pivot Rubber Mounted
Reverse	Yes
Stern Height (Maximum) KSL & KDL 21" KS & KD 15"	

NOTE—The letter "L" in parenthesis indicates models with extra long drive shaft casing.

JOHNSON MOTORS
WAUKEGAN, ILLINOIS

The Two Stroke Cycle

The two (stroke) cycle engine, such as used in all Johnson Outboard Motors, differs somewhat from the four (stroke) cycle engine used in your automobile, this difference being due to the method of conducting gases to and from the cylinder while in operation. The two (stroke) cycle engine employs an arrangement of ports rather than mechanically operated valves to accomplish this purpose, as shown in the following illustrations.

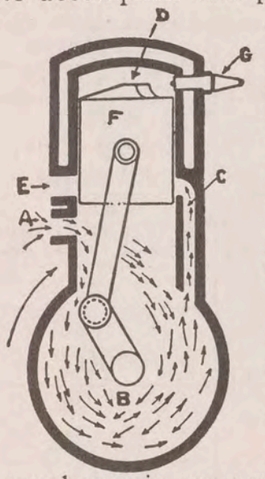
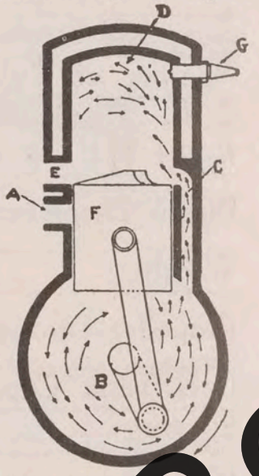


Illustration No. 1

On the first upward stroke of the piston, a partial vacuum or low pressure is created in the crankcase. As the piston progresses in its upward movement and nears the end of the stroke, intake port "A" is uncovered causing fuel vapor from the carburetor to flow into the crankcase—"B". The crankcase is now fully charged. (Three-port type.)

Illustration No. 2



The piston on reaching the end of the stroke reverses its direction and begins a downward movement —covering or closing intake port "A". On its continued downward movement, the vapor charge in the crankcase is compressed until the piston nears the end of the stroke, when the by-pass port "C" is uncovered. This instantly releases the compressed crankcase charge, which flows thru the by-pass and into cylinder "D"—being directed upward by the piston deflector provided for this purpose.

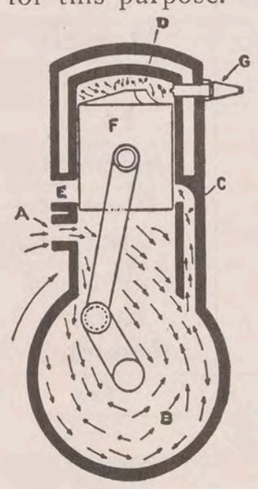
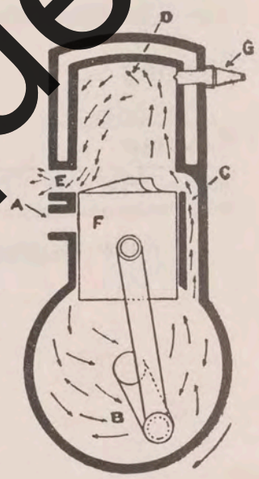


Illustration No. 3

On the following upward stroke, the vapor now having been transferred to the cylinder is compressed and prepared for ignition. However, during this period a second charge has been drawn into the crankcase through intake port "A". There are now two charges—one compressed in cylinder "D" and the charge in the crankcase.

Illustration No. 4



At the end of the compression stroke, a spark, created by the magneto, jumps the gap between the points of spark plug "G" igniting the compressed fuel vapor in cylinder "D". The vapor in burning expands rapidly, forces piston "F" downward to deliver power required to turn the propeller. Power, however, is not delivered throughout the entire length of the stroke, some time is required to rid the cylinder of burned gases and to receive a fresh charge from the crankcase for the succeeding power impulse.

As the piston travels downward on its power stroke, the fresh charge previously drawn into the crankcase is being compressed—Illustration No. 2.

Notice width of exhaust port "E" and by-pass port "C"—"E" is considerably wider than "C", therefore, piston "F" on nearing the end of its stroke uncovers the exhaust port somewhat earlier than it uncovers the by-pass port.

A comparatively high pressure exists within the cylinder at this time, consequently, at partial uncovering of exhaust port "E", the burned gases commence to flow out through the exhaust port. Further travel of the piston uncovers by-pass port "C". The compressed vapor charge now in the crankcase is instantly released, flowing through the by-pass port into the cylinder and directed upward by the deflector. The incoming fresh charge continues to force the burned gases out of the cylinder through the exhaust port and into the atmosphere to complete the cycle.

UPWARD STROKE		DOWNWARD STROKE
Compression	Takes Place in Cylinder	Power Exhaust Intake from Crankcase
Admission of Fuel Vapor	Takes Place in Crankcase	Compression of Fuel Vapor Fuel Vapor Discharge into Cylinder

Model KS(L) alternate firing twin, operates on the same general principle, but the method of inducting the crankcase charge is somewhat different. The intake port, instead of being built into the cylinder wall is built into the crankcase and governed by a similar port or opening machined into the circular throw of the crankshaft. This arrangement is known as the Rotary Valve.

Fuel Mixture

(Lubrication)

Since fuel vapors are first compressed in the crankcase of the engine, the most practical method of lubrication is by mixing the lubricating oil with the gasoline. Lubrication is obtained as the mixture of oil and gasoline enter the crankcase and is later transferred to the cylinders. Oil being less volatile than gasoline, a larger portion of the fuel-oil mixture remains in the crankcase to lubricate the bearings and other moving parts. The remainder enters the cylinder with the pre-compressed charge to aid in the lubrication of piston and piston rings.

It is extremely important that the oil, in the amounts specified, be thoroughly mixed with the gasoline to insure efficient operation of the motor. Use Mobiloil AF or Mobiloil Marine No. 4 or an S.A.E. No. 40 oil of similar character and manufactured by a reputable concern.

To properly mix the oil and gasoline, they should be mixed in a separate container. (Such containers are illustrated in the Johnson Accessory Catalog. If you do not have one, write for it.) Never, except in an emergency, attempt to mix the oil and gasoline in the motor tank. It cannot be thoroughly mixed. Should the motor be started under such circumstances, it will operate for a short period on an intensely rich oil mixture, smoking profusely until the poorly mixed fuel is consumed. It will then continue to

operate almost entirely on gasoline, with little or no lubrication; overheating, seizure and premature wear are the ultimate results.

Avoid expensive repairs—enjoy the qualities built into your motor by thoroughly mixing the oil and gasoline as instructed below:

Mix one (1) pint of oil per each gallon of gasoline. (See above instructions.

Use Mobiloil AF or Mobiloil Marine No. 4 or an S.A.E. No. 40 oil of similar character and manufactured by a reputable concern. BE SURE IT IS THOROUGHLY MIXED. ALWAYS USE FRESH OIL AND GAS.

(Note: The compression ratio of Johnson Outboard Motors is not high enough to warrant the use of gasoline containing ethyl lead (colored) to overcome certain combustion characteristics, common to high compression, high speed engines; however, since most gasolines now on the market contain ethyl lead in various quantities, it can be used successfully.

Due to atmospheric conditions and temperature changes, moisture condensation is more or less continually taking place within the gas tank. This results in water droplets accumulating in the tank, gas line and carburetor which, if excessive, is sufficient to interfere with performance of the motor, causing it to act, in many instances, as though it were starving for gasoline. (Water will not pass through the fine screens and small carburetor jets.) Be sure fuel system is free of moisture—likewise, all fuel should be run through a fine screen before pouring into gas tank. A funnel with screen installed serves this purpose nicely—your Johnson dealer has them.

Attaching the Motor to the Boat

It is essential that the motor be properly mounted on the stern of the boat to get results. The object is to be sure that the propeller operates at correct depth below the surface of the water and that the line of propeller drive is horizontal or parallel to the line of boat travel.

Height of the stern governs the depth at which the propeller operates—the angle of propeller drive being determined by adjustment of the thrust socket. Fig. 3.

For maximum efficiency, **recommended stern height is 15". KSL & KDL 21".**

Should the stern be too high, cavitation will occur (see cavitation, page 20); if too low, a large portion of the gearcase will be exposed below the surface of the water, resulting in excessive drag to retard boat speed.

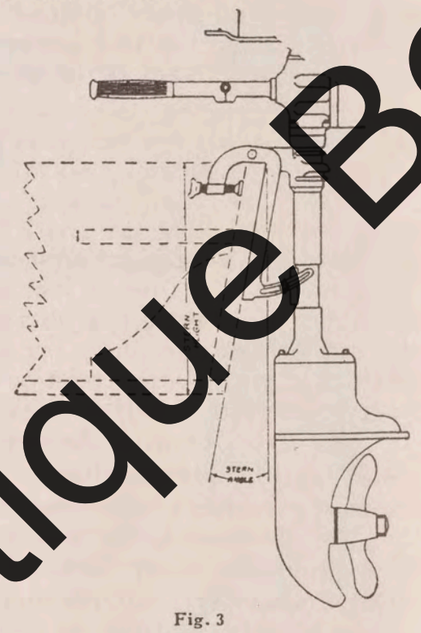


Fig. 3

Thrust Socket Adjustment
(Angle of Drive)

Since most boats are constructed with stern angle, it will be necessary to estimate the proper angle of drive with relation to the angle of stern.

The boat should "plane" or ride on an even keel.

Hang motor on the stern of the boat. Be sure to tighten clamp screws to prevent the motor from dropping overboard on sharp turns. This is IMPORTANT. (Do not use a wrench.)

Tilt motor to estimated angle, loosen thrust socket nut, Fig. 1. Slide thrust socket up on quadrants until it rests firmly against driveshaft housing. Tighten thrust socket nut.

Start motor and operate at full throttle. Should the boat have a tendency to "squat" or ride with the bow high out of the water, it would indicate that the motor was tilted too far from the stern. The angle of drive, being directed downward, will result in a downward thrust on the stern, likewise, the squatting effect.

If the motor is tilted too close to the stern, the boat will be hard to control, with the bow "digging" or plowing into the water. If the larger type of motor is used, and high speed is permissable, ease of control will be greatly impaired to that the boat will tend to "zig-zag" on its course. This is due to upward thrust exerted on the stern.

On the average boat with an evenly distributed load, the thrust socket should be adjusted to permit the driveshaft to operate at right angle to the surface of the water at full throttle.

The Co-Pilot

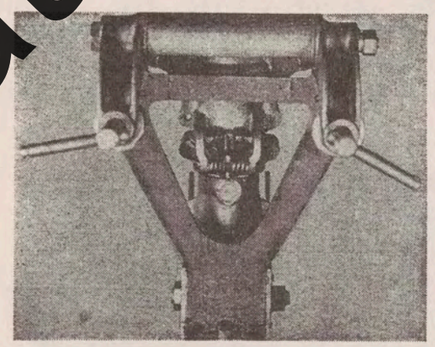


Fig. 4

THE CO-PILOT is an automatic mechanical device to assist in maintaining a true course of the boat whenever the steering handle is left free. This permits moving about in the boat without slowing down or stopping the motor to prevent its swerving to one side or the other. It also is of value when trolling or casting from the boat.

Its construction is simple in that the torque impulses of the motor are absorbed by the two small springs preventing the motor from pivoting in the swivel-bracket. Fig. 4.

Care and Adjustment of Co-Pilot

If for any reason steering is found to be too free or too stiff, adjustment can be obtained by either tightening or loosening the Co-Pilot band screw.

The Co-Pilot is in constant action during the time the motor is being operated and should be oiled occasionally; a drop or two on the Co-Pilot band and swivel bracket from time to time will do.

Adjustment of Swivel Bracket

To obtain adjustment of tilting tension tighten or loosen tilting bolt nut. Fig. 1.

Tension of tilt should not be too great, but just sufficient to maintain the motor in any position of tilt.

To Break in New Motor

(All Models)

Under no circumstances should a new motor be operated at speeds beyond half throttle for at least five hours. This time is required to properly seat the bearing surfaces, pistons, piston rings and cylinder walls.

Performance and long life depend to a great extent on the manner in which the motor was first operated.

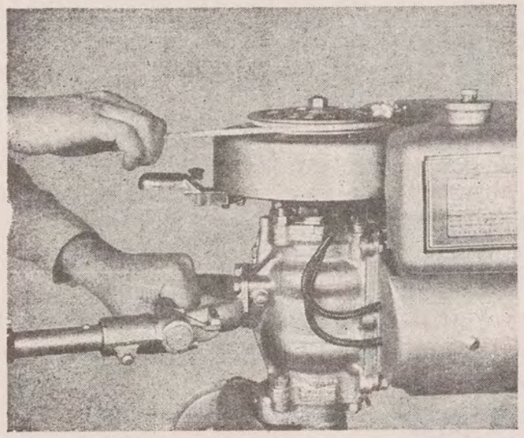


Fig. 5

Starting

Starting Sea Horse motors is accomplished first, by setting position of the magneto lever; second, priming; third, pulling quickly on starting cord grip. Fig. 5. (See starting instructions). Model KD is equipped with ready-pull, simply pull on ready-pull grip.

Controls

Magneto and carburetor levers are synchronized, that is, operating in unison upon moving the magneto lever. Fig. 7. This feature is of value in that any desired speed, within the limits of the motor, can be obtained by merely shifting positions of the magneto lever; for full speed, shift to right; for intermediate and slow speeds shift to left (facing motor).

Lubrication and Care of the Gearcase

Since the gearcase is submerged in water when in use, it is IMPORTANT that the gears, bearings, etc. be properly lubricated at all times.

INSPECTION of the gearcase is necessary at regular intervals to drain accumulation of water which may be present and to refill with fresh gear lubricant. (Remove "vent" and "grease" plugs.) See Figs. 1 and 6.

Fig. 6

Water in the gearcase is injurious if allowed to remain for any length of time, particularly if stored in storage, causing gears, bearings, propeller and pinion shafts to rust and become pitted.

To refill with gear lubricant, place motor in an upright position. Remove lower grease plug and upper vent plug. Fill with MOBILGREASE "UW" or SEA-HORSE GEAR LUBRICANT—using a grease gun or tube inserted through lower opening. Insert lubricant until it flows from the vent opening. Replace plugs—making certain they are secure. (Refer to motor illustration, Fig. 2.

Prior to storage for winter months, be sure to remove all drain, vent and grease plugs to allow any water present in the gearcase and water channels to drain off. This will prevent freezing and bursting of the gearcase, driveshaft housing, water tubes and cylinder blocks, if the motor is

to be exposed to freezing temperatures, likewise, eliminates all danger of rusting.

Costly repairs can be avoided if above instructions are closely adhered to.

See your Johnson dealer or Service Station for inspection and winter storage.

Starting Mixture

Since a rich starting mixture is essential for starting purposes, some arrangement must be built into the carburetor to accomplish it.

Models KS(L) & KD(L) are equipped with carburetor provided with a choke, manually operated to obtain temporary rich mixtures for starting. See Fig. 1.

Starting Instructions

Be sure spark plugs are installed (new motor)

1—Open **air vent** in gas tank filler cap (turn left). Fig. 1.

2—Open **fuel valve** full open. Fig. 2.

3—Unscrew **high speed needle valve** ¾-¾ turn from closed position (right) for cold motor—more if necessary in cold weather.

4—Move magneto lever to extreme left (facing motor), then back to center. See Page 15 (exhaust cutout). (Note. See instructions on page 15 for slow speed adjustment.)

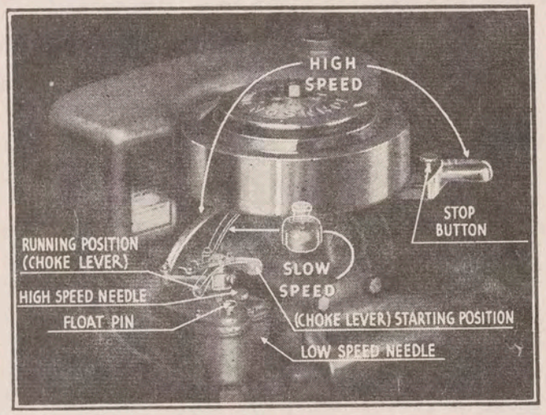


Fig. 7 KS(L) Controls

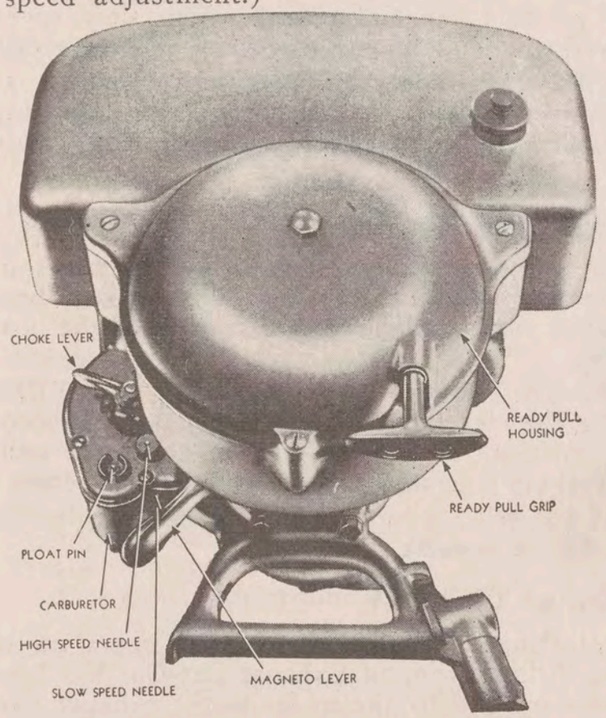


Fig. 8 Showing Controls on Model KD(L)

5—TO START—Move choke lever to extreme right (facing motor). Fig. 7. Press down on float pin and hold until fuel drips from overflow on side of carburetor. Wrap cord around starting pulley (knot of cord in notch of starting pulley). Note—KD is equipped with Ready Pull—pull on Ready Pull grip—pull quickly on starting cord. (Use choke only if necessary to start warm motor.)

6—UPON HAVING STARTED MOTOR—As motor picks up speed, move choke lever back to original position until it snaps into place. Advance spark by moving magneto lever to right (facing motor)—magneto and carburetor levers are synchronized. Close high speed needle (turn right) as desired to obtain

maximum speed. (This adjustment should be made at full spark advance).

7—TO REDUCE MOTOR SPEED—Retard spark by moving magneto lever to left (facing motor.)

8—TO STOP MOTOR—Model KD—move magneto lever to extreme left. Model KS, depress stop button on lever.

9—FLOODED MOTOR—If motor is flooded by overchoking, close high speed needle and crank to start (clean spark plugs if necessary)—as motor picks up speed open high speed needle gradually to running position.

10—TO BREAK IN NEW MOTOR—It is advisable to operate a new motor at approximately seventy-five percent of capacity for the first five (5) hours. During this period operator should familiarize himself with motor controls and observe running condition of motor to guard against overheating.

Carburetor Adjustment

Carburetors are of the full range type, that is, constructed with two jets to insure efficient carburetion throughout the entire speed range of the motor. The slow speed jet provides correct carburetion at slow and intermediate speeds; the high speed jet from intermediate to top speeds. Figs. 1 and 7.

Two adjustments are thus necessary—slow and high speed needles.

Slow speed adjustments are made at the factory and should not be altered unless circumstances require it.

TO ADJUST SLOW SPEED, (slow speed adjustment should be made with retarded spark and at normal running temperature)—Close slow speed screw or needle (turn right until it rests gently on its seat). Open approximately ½ to ¾ turn (turn left). Start motor as instructed and operate at full throttle until it reaches normal temperature. Move magneto lever midway between center position and full retard. Turn slow speed needle to right or left as required to obtain smooth operation at slow speed.

TO ADJUST HIGH SPEED—start motor as instructed. Operate at full throttle and full spark advance until motor reaches normal operating temperature. Turn high speed needle to right or left as required to obtain maximum speed.

Steering and Reverse

Steering is accomplished by moving the steering handle to right or left as desired. The motor pivots in such a way that direction of boat travel is governed by the propeller thrust, enabling full control of the boat the instant the motor is started.

Models KS(L) & KD(L) permits full pivot (360°) steering, REVERSE being obtained by simply raising the steering handle and turning the motor completely around to reverse position. A reverse lock arrangement built into the thrust socket and driveshaft housing prevents tilting in reverse.

CAUTION: Be careful not to strike submerged obstructions when in reverse—**the motor does not tilt in reverse.**

Exhaust Cut-Out

To further facilitate easy starting and to maintain quiet operation of the KS(L) & KD(L) Alternate Firing Twin, an Exhaust Cut-Out has been provided to relieve back pressure created by the under-water exhaust during time of starting.

Located in the passage, conducting exhaust gases to the drive shaft housing, its operation is synchronized with movement of the magneto lever.

By an arrangement of linkage between the cut-out and magneto levers, the cut-out remains closed until the spark is retarded well beyond the center position, to permit quiet operation at intermediate speeds. However, upon advancing from full retard, the cut-out does not close until the magneto lever is moved past center position (starting), thus, relieving back pressure for starting purposes only.

IMPORTANT: To start the KS(L) & KD(L) Alternate Firing Twin, the magneto lever should first be moved to full retard (left facing motor) then back to center to make certain the cut-out is open.

The Magneto

The magneto as provided is a selfcontained unit—requiring no assistance from outside sources such as a dry cell or storage battery to produce the strong spark so essential to easy starting. It consists chiefly of an armature plate, on which are mounted the ignition coil condenser and breaker points and a permanent magnet built into the flywheel.

Its operation is extremely simple. As the pole pieces of the magnet pass over the heels of the coil, a magnetic field is built up about the coil, causing a current to flow thru the primary winding.

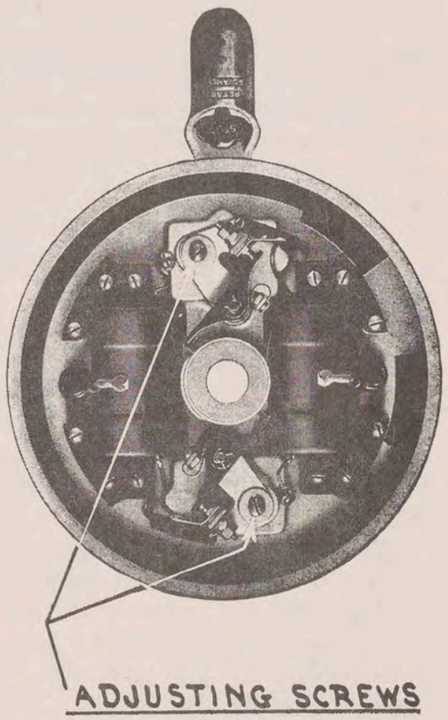
At the proper time, the breaker points are separated by action of a cam, thus breaking the primary circuit. This stops the flow of primary current, which causes the magnetic field about the coil to break down instantly—an electrical current of exceptionally high voltage is induced in the fine secondary windings of the coil, and is carried to the spark plug where it jumps the gap between the points of the plug to ignite the compressed charge in the cylinder.

Care of the Magneto

Due to its simple and rugged construction, the magneto will perform efficiently throughout the entire life of the motor. It requires no lubrication, therefore, little or no attention other than an occasional inspection of the breaker points and electrical connections.

Should you find the motor a bit difficult to start after having used it for some time and have reason to suspect the ignition of being at fault, examine first, condition of spark plugs and connections. If found to be in good condition, the difficulty might be due to pitted or corroded breaker points.

This can be determined by removing the cover plate from the flywheel or magneto dome. An inspection hole in the dome provides access to the breaker points for inspection and adjustment.



Spread breaker points with a blunt instrument. If found to be pitted, place a narrow strip of 00 sandpaper between the points, folded in such a manner that both points can be dressed down simultaneously by drawing back and forth between the points. (Do not use emery cloth.)

Upon completion of this operation, it is well to check the gap between the points. This can be accomplished by turning the flywheel slowly until the points are wide apart. Insert a feeler gauge between the points—correct setting should be .020". Should you find it necessary to make corrections, loosen the adjusting screw. If the gap is too great, move the breaker assembly away from cam; if too narrow, move towards cam.

A screw is provided underneath armature plate to adjust tension of magneto lever.

Be sure the flywheel is secure at all times. TIGHTEN FLYWHEEL NUT OCCASIONALLY ON A NEW MOTOR.

Spark Plugs

Be sure spark plugs are installed (new motor)

Due to the different speeds at which the motor is operated, it is IMPORTANT that spark plugs of certain characteristics be installed. For Model KS(L) & KD(L) Champion No. 5M (Johnson Number 76-112) is recommended.

If a new spark plug is required, consult this chart before making purchase. If in doubt, see your local Johnson Dealer or Service Station. This is important. Unless the correct number and make of spark plug is used, consistent fouling of the plug or pre-ignition is likely to be experienced.

If pre-ignition is taking place, the insulator or porcelain exposed within the cylinder will be pitted or partially burned away. In extreme cases the motor will continue to fire after pressing stop button. Proper functioning of the plug is indicated by a comparatively dry insulator. (Section exposed within cylinder.)

Any tendency towards fouling is noticeable by a black gummy deposit on the insulator. This, however, may not be due entirely to the qualities of the spark plug, but to operation at slow speeds for long periods, such as trolling, or during the breaking-in period of a new motor or to the use of more oil than recommended.

Pre-ignition in an outboard motor frequently leads the operator to believe the carburetor or the gas line at fault or the difficulty due to lack of lubrication, causing sluggish action of the motor. The motor, when cold and just having been started, will operate normally for a short period until it heats up, then slow down or stop as though it was starving for gas. In slowing down, it cools off considerably and begins to operate normally again, but only until the temperature of the spark plug rises, the pre-ignition reappears. Pre-ignition is usually accompanied by rattling noises in the motor.

The spark plugs require very little attention other than occasional removal for inspection, cleaning and adjustment of the points. Correct gap setting .030".

The insulator should be wiped off with a dry cloth regularly, especially if operating in salt water, to remove all traces of moisture or residue which often interferes with starting.

To Remove Flywheel

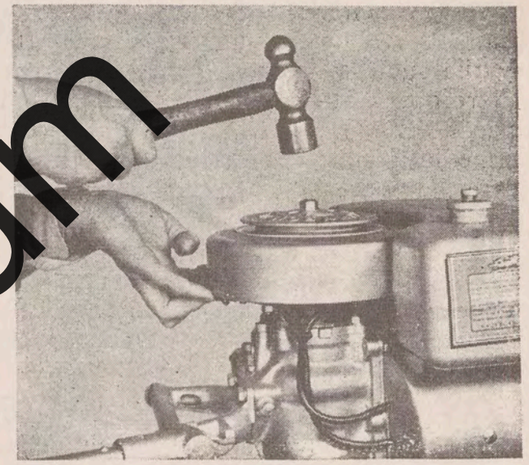


Fig. 9

Unless a flywheel puller is available, it will be necessary to first remove the gas tank from the motor. Remove the flywheel nut; have someone grasp the flywheel rim and exert upward pressure. Hold a block of wood on top of the end of the crankshaft and strike a sharp blow with a hammer. One or two applications of this nature is all that should be necessary.

To Install Flywheel

First, make certain the keys are properly installed in the crankshaft and **fit snugly**. Remove coverplate from the flywheel. Install flywheel, being careful not to jar the keys loose. Place lock washer and nut into position. Draw up tightly on the nut. Replace cover plate. Have someone hold on to the rim of the flywheel to prevent its turning. Attach large wrench to flywheel nut, strike handle of the wrench with a mallet or heavy hammer to draw up as tightly as possible.

Start the motor and operate it for a short period, after which tighten nut in the same manner. One or two similar applications will properly secure the flywheel.

The hub of the flywheel is made of Lynite and can be split—use discretion.

It is IMPORTANT that the flywheel be securely mounted. A loose flywheel will result in expensive repairs—damaging the hub of the flywheel, the crankshaft and other parts.

A loose flywheel frequently results in a noticeable knock in the motor and consistent shearing of the propeller pin without striking underwater obstructions.

To Install Propeller Drive Pin

To install a new drive pin, withdraw cotter pin securing propeller nut. Remove nut, propeller and fragments of sheared pin. Install new pin. Replace propeller and nut. Do not draw up too tightly on propeller nut but just enough to make certain the propeller hub rests firmly against the drive pin. It is possible to partially shear the new pin by drawing up too tightly on the nut. Insert cotter pin and lock in position.

The Cooling System

(Pressure Vacuum Principal Is Applied)

Water thrown from the tips of the propeller blades is picked up by the water scoop, forced thru the water passages and on into the water jackets to carry off excess heat generated within the cylinders. The discharge is conducted thru a second channel or pipe and emitted from the water outlet in the gear case immediately forward of the propeller. Action of the propeller and motion of the boat aid in drawing the heated water from the cooling system.

Note—Water channels are cast-in, thus absence of visible water lines.

At slow or trolling speeds, pressure of the water thrown from the tips

of the propeller blades may not be great enough to force it through the channels and water jackets. Efficient cooling is still maintained, however, by the suction created by water discharging through the return channels. Therefore, since cooling is dependent on both pressure and vacuum at slow speeds, it is IMPORTANT that the motor be speeded up for an instant immediately after starting, to fill the channels and water jackets with water. Failure to do this may result in overheating and seizure—possibly scoring the cylinder walls and pistons.

Overheating is usually accompanied by rattling noises in the motor, causing it to slow down or to stop completely. You should experience no difficulty in determining whether or not such performance is due to overheating—cylinder head should be comparatively warm (warm, but not excessively hot).

Care of the Cooling System *(Salt Water Care)*

The cooling system of all Johnson motors is designed to operate efficiently with the least amount of attention. Unless there is evidence of overheating, you need not be concerned, except where the motor is operated in salt water.

It is IMPORTANT, when operating in salt water, to flush the cooling system with FRESH water—this should be done as soon as possible after removal of the motor from the boat, to reduce the corrosive effects of salt water to a minimum. Flushing can be accomplished by either attaching a hose to the water scoop and running fresh water through it or by operating the motor in a tank of fresh water for several minutes.

Salt water, if permitted to remain in the water channels—particularly the water jackets, will set up sufficient corrosion to clog the water passages. Such a condition would naturally interfere with proper cooling and operation of the motor.

Since models KS(L) & KD(L) does not use a positive rotor pump, it is merely necessary to make certain the water lines and water jackets are clear and free of obstruction. If, however, they are used in extremely sandy water and frequently run over sand bars or rocky sandy lake bottoms, the propeller blades are apt to wear down excessively—to a point where circulation of water through the cooling system is cut off considerably. Any appreciable wear on the tips of the propeller blades will interfere with efficient cooling at slow trolling speeds.

Propellers

The size of the propeller is usually given in two dimensions—the DIAMETER and the PITCH. They are constructed with two or three blades, depending upon the nature of the service.

DIAMETER is the distance from the extreme tip of one blade to the tip of the other—two blade type—or the diameter of the circle described by the periphery of the blades—three blade type.

PITCH is the distance the propeller would advance in one revolution, if operating in a semi-solid substance, no slippage being evident.

FOR EXAMPLE—A 10″ x 12″ propeller will have a ten inch diameter and a twelve inch pitch—theoretically advancing twelve inches per revolution.

But NO propeller is 100% efficient—certain losses prevail under all circumstances. The percentage of loss or slippage frequently runs as low as 10%, on extremely light racing hulls—and upwards of 40 to 60% on the heavier or cruising types.

EFFICIENCY of the propeller depends, to a great extent, upon the shape and weight of the hull. The light weight HYDRO-PLANE type possibly offers the least resistance to forward motion—therefore—high propeller efficiency. The heavier SQUARE STERN types offer the greater resistance, especially if the power applied is insufficient and incapable of planing the boat—resulting in low propeller efficiency.

Keel interference—angle of propeller thrust, with relation to the line of forward motion—depth, at which the propeller operates—marine growth, below the water line—and, of course, the load carried are also factors affecting propeller efficiency.

Johnson propellers are designed especially for Johnson Outboard Motors by Johnson engineers to meet the specific requirements of each model. For maximum propeller efficiency purchase standard Johnson replacement propellers through your local Johnson Dealer or Service Station.

IMPORTANT—Always carry a Johnson designed, Johnson built SPARE propeller—never leave the dock without one.

Cavitation

Cavitation should not be confused with a sheared propeller pin.

Cavitation is a condition created whereby the propeller is forced to operate in turbulent or greatly disturbed water. Consequently, air is drawn from the surface into the propeller stream, which, naturally, lessens the load on the propeller, resulting in the propeller being turned at a high rate of speed. However, since the propeller is acting largely on air and turbulent water, its effectiveness is reduced considerably in that the propeller is merely churning the water rather than propelling the boat.

In most instances, cavitation is brought about by the propeller operating too near the surface of the water or to interferences created by the stern being too high. (See recommended stern heights, Page 11.) A wide keel, extended to the stern of the boat, is often responsible for such interference and can be corrected by tapering to a feather edge—commencing approximately two feet forward of the stern.

Collection of grass and weeds on the gearcase also causes cavitation.

Bent or damaged propeller blades frequently result in excessive vibration and loss in propeller efficiency as well as to contribute towards causing cavitation.

The Ready Pull

This simple device is built into model KD(L) for the express purpose of eliminating the necessity of manually wrapping the cord around the starting pulley for cranking. Fig. 20. It consists of a ratchet plate about which are coiled a return spring and the starting cord and a pawl arrangement mounted on top of the magneto flywheel. Fig. 20.

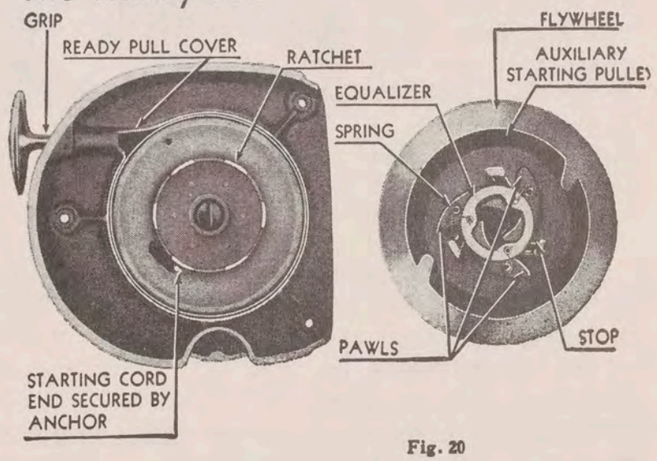


Fig. 20

When at rest, the pawls are held in an extended position by small springs, making a positive connection with the ratchet—thus when pulling on the starting cord grip, cranking effort is applied directly to the flywheel.

Upon having started the motor, the pawls disengage the ratchet automatically due to centrifugal force created by rotation of the flywheel. Once having started, "Ready Pull" mechanism remains idle, consequently since there is no action while the motor is in operation, there can be no wear on any of the parts. It is for this reason very little attention is necessary.

Immediately upon stopping the motor, centrifugal forces cease to act causing the springs to extend the pawls to engage with the ratchet—the "Ready Pull" is then again in position for cranking. Its action is automatic —simply pull on the cord to crank.

Care of the "Ready Pull"—Under no circumstances let the starting grip "snap" back into position after cranking by letting go. Retain hold of the grip until the cord has returned to normal position. Care should be exercised in this respect to prevent possible injury to the "Ready Pull" cover and starting cord.

In event the starting cord should break, remove the "Ready Pull" and crank the motor in usual way by wrapping cord around auxiliary starting plate on the flywheel.

To Install New Starting Cord, Proceed As Follows:

1. Remove "Ready-Pull" from motor.
2. Place in vise as illustrated (assembly can be held fast by placing nut on top of "Ready-Pull" between jaws of vise).
3. Remove fragments of broken or damaged cord.
4. Obtain new cord —use only special cord provided by manufacturer.
5. Insert punch in hole of pulley provided for this purpose. Turn pulley against tension of spring, as indicated by arrow in Fig. 10 until all of tension is taken up, then permit pulley to unwind one (1) turn.
6. Insert new cord as illustrated (End opposite anchor on cord through slot in pulley).
7. Attach grip to cord.
8. Gradually release tension on pulley until all of cord is taken up.
9. Attach "Ready-Pull" to motor.

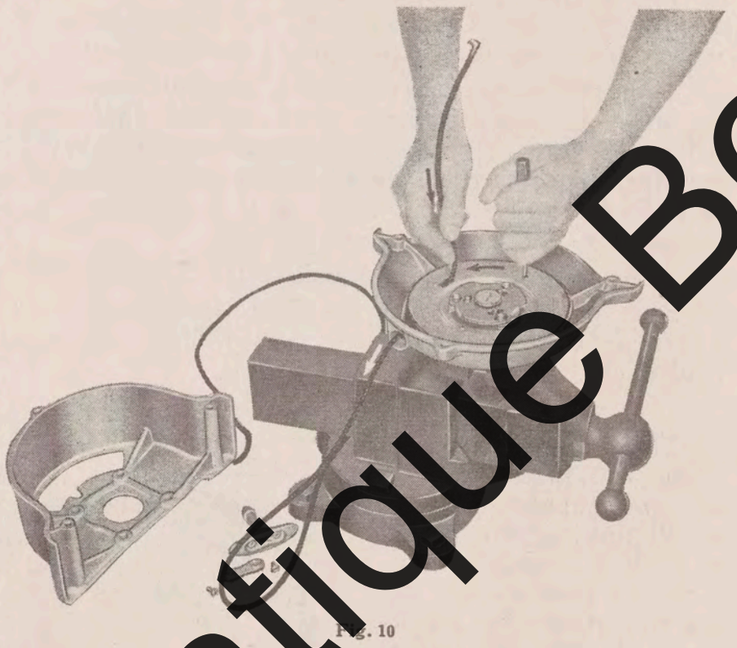


Fig. 10

Care of the Motor

The service obtained from your motor is dependent largely upon the care it is given. The following suggestions will assist you in properly maintaining the motor:

Remove screen from carburetor periodically to free screen and sediment basin of any foreign substance which might have accumulated. Remove and clean screen in tank.

Inspect spark plugs occasionally. Clean and, if necessary, adjust gap. (Correct setting of gap, .030".) Wipe off insulator or porcelain of plug and ignition leads with a dry cloth to remove residue.

Check breaker points as instructed on Page 16.

Be sure flywheel nut is secure.

Draw up on all nuts and screws at least once each season.

Remove drain and vent plugs from gearcase at frequent intervals to drain off water. Refill with MOBILGREASE "UW" OR SEAHORSE GEAR LUBRICANT as instructed on Page 13.

Wipe off motor regularly with a damp cloth. A clean motor is readily accessible for inspection and less apt to foul.

Remove propeller periodically to inspect drive pin. Observe condition of propeller blades. (A spare propeller is a good investment—see your local Johnson Dealer.)

Remove carbon from muffler outlets and exhaust ports each season, also from the exhaust passage in the driveshaft housing. (Excessive carbon accumulation results in loss of power and hard starting.)

Grease thrust socket and reverse lock, oil swivel bracket and co-pilot at regular intervals.

Always store motor in an upright position.

CAUTION—After removing the motor from the boat DO NOT lay it down in such a way that the Lower Unit will be higher than the Power Head as any water remaining in the Exhaust Pipe may run into the Cylinders to cause serious damage. It is further advisable to drain the cooling system prior to transporting motor.

Additional Care of the Motor When Operated in Salt Water

Operation in salt water presents certain conditions, not common to fresh water operation, due to the corrosive effects of salt water on the exposed motor parts.

The suggestions below will assist in reducing the corrosive effects to a minimum:

Remove motor from the boat immediately after salt water operation. If the motor cannot be conveniently removed, tilt gearcase out of water—rinse bright parts off with fresh water. (Never allow the gearcase to remain in the water, when not in use.)

Flush cooling system with fresh water, either by attaching a hose to the water scoop or by operating in a tank of fresh water for several minutes. This is IMPORTANT.

Rinse motor off with fresh water. Go over all lower unit parts with an oily cloth.

The ignition leads and spark plug insulators or porcelains should be wiped frequently with a dry cloth to remove residue.

Hard Starting is Caused By

Failure to open vent in gas tank filler cap.
Clogged fuel line, screens (carburetor and tank) and sediment basin.
Water in carburetor.
Needle valve not properly adjusted. (See starting instructions.)
Fouled or defective spark plugs. (Residue collected on insulator, especially if operated in salt water.)
Loose electrical connections.
Corroded breaker points. See Page 16.
Cut-out closed. See Page 15.
Accumulation of carbon (after long periods of operation) in muffler outlets, exhaust passages, driveshaft housing, exhaust ports and piston ring grooves.

Failure To Start

Vent in gas tank filler cap closed.
Fuel valve closed.
Tank empty.
Needle valve not properly adjusted. (See starting instructions.)
Water in fuel.
Clogged fuel line, screens and sediment basin.
Improperly mixed fuel.
Fouled or defective spark plugs.
Breaker points corroded and pitted.
Spark plug leads disconnected.
Excessive accumulation of carbon (after long periods of operation) in muffler outlets, exhaust passages, exhaust ports and piston ring grooves causing rings to stick.

If Motor is Dropped Overboard

Recover motor from water immediately, if possible.
Remove fuel tank, fuel line, carburetor, magneto (see Pages 6 and 16) and spark plugs. Drain all water that may remain. Wash with gasoline.
Work as much water as possible out of the cylinder and crankcase by turning motor slowly in upright and inverted positions.
Pour a small amount of oil into each cylinder; turn crankshaft to distribute oil.
Blow off armature plate with air pressure, if available; wipe with dry cloth. Place in warm dry place, be sure it is thoroughly dried and that no water remains about the coil.
Replace all parts previously removed. Clean and fill tank with fresh fuel mixture. (Make certain no water remains in tank.)
Start motor as instructed and allow to run until you are reasonably sure no water remains.
CAUTION—Do not under any circumstances attempt to start the motor until the armature plate has been thoroughly dried. Remaining drops of water are likely to set up a short circuit which may result in extensive repairs.
If the motor cannot be started, it should be disassembled at once to remove all traces of water clinging to the inside walls and motor parts. Each part should be dried and coated liberally with oil to prevent rusting. This is IMPORTANT, the motor should be attended to immediately. Consult your local Johnson Dealer or Service Station.

Preparations for Storage

No Outboard Motor should be placed in storage, especially winter storage, without considering the necessary precautions.

Most IMPORTANT—Remove all plugs in the gearcase and driveshaft housing, marked "drain" and "grease," (See Motor Illustration) to allow accumulative water in the gearcase and water remaining in the cooling system to drain off. Failure to take this precaution will result in bursted cylinder clocks, gearcase and possible injury to water channels and water tubes, due to freezing during the cold winter months. To make certain all water has been drained, rock motor from side to side.

If operated in salt water, flush cooling system with fresh water. See Page 22.

Refill gearcase with MOBILGREASE "UW" OR SEAHORSE GEAR LUBRICANT. Fig. 6.

Remove spark plugs—pour about a tablespoon of clean oil through each spark plug opening. Turn flywheel slowly to distribute oil on cylinder walls. Replace spark plugs.

Drain all fuel from gas tank, gas line and carburetor. Remove and clean carburetor and gas tank screens.

Under no circumstances should the motor be stored in an inverted position. It should be hung on a rack similar to the manner in which it is mounted on the boat.

Preparations for Operation After Storage

Remove spark plugs attach ignition leads to some part of motor to prevent injury to the coil. Spin motor with rope to blow out excess oil. Clean and replace spark plugs. Install new plugs if necessary. See Page 17.

Tighten all nuts and screws. MAKE SURE FLYWHEEL NUT IS TIGHT.

Fill gas tank with properly mixed fuel. See Page 10.

USEFUL SEA-HORSE ACCESSORIES

SEA-HORSE GEAR LUBRICANT

A superior quality water proof gear lubricant, put in 12 oz. tubes, recommended for use in the gear case of all Johnson Outboard Motors—"It does not mix with water"—Equipped with tapered nozzle to fit opening in gearcase.

For Safety Your Boat Must Be Properly Equipped

If you use your outboard motor on navigable waterways of the United States you are subject to the Federal Motor Boat Law which became effective April 25th, 1940.

NOTE: Navigable waters under Federal jurisdiction include the ocean and Gulf coasts, bays and rivers tributary to them, the Great Lakes and connecting waterways, any body of water which is customarily used for interstate navigation, or other specifically designated locations. If there is any doubt concerning the status of your locality, you can get a ruling from the Bureau of Marine Inspection and Navigation, Department of Commerce, Washington, D. C.

Under the law you are required to carry the following equipment on board your boat at all times;

1. Life preservers sufficient to sustain afloat every person on board. These may be either life vests or approved floating cushions.
2. An efficient whistle or horn.
3. A fire extinguisher of at least one pint capacity capable of putting out gasoline fires.
4. To be exhibited from sunset to sunrise—
   (a) A bright white light aft to show all around the horizon.
   (b) A combined lantern to show green to starboard (right) and red to port (left) carried in the fore part of the boat.

Federal law also required the numbering of all motor driven boats operated on navigable waters under Federal jurisdiction. However, numbering is not required on rowboats, canoes, or sailboats not exceeding sixteen feet in length which are equipped with outboard motors, but which are designed for and used primarily with other means of propulsion.

Numbers are assigned upon application to the Collector of Customs for your Customs District.

Write OBC for further information.