GENERAL INSTRUCTIONS

JOHNSON Sea-horse
OUTBOARD MOTORS

for

Model TN (L)

1950-53

Johnson Motors
WAUKEGAN, ILLINOIS

12,800—6-50—NSP—8167

-302400

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 8) or driving force. The lower unit contains the gearcase, consisting of the gears to drive the propeller, propeller shaft, water pump, 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. See page 16.

LUBRICATION of the **power head** is provided by mixing oil and gasoline in proportion as instructed on page 10. 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 11.

STARTING (cranking) is achieved by setting controls as instructed on page 15 and pulling on starter cord grip.

CONTROL (speed) is by movement of the speed control (magneto) lever. See Figs. 1 and 10. 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.

Johnson Service

It has always been the belief of Johnson Motors that a sale does not complete the transaction between the manufacturer and the buyer. It establishes, rather, a new obligation—an obligation whereby Johnson Motors agrees to assist the buyer in obtaining utmost service from a Johnson Outboard Motor.

With this policy ever utmost in our minds, we have built up an organization that consists of a nation-wide network of Johnson Service Stations to give prompt and efficient service to owners of Johnson Outboard Motors.

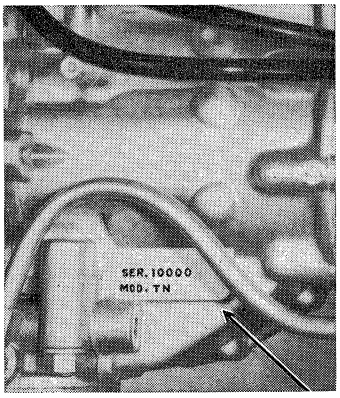
The first step in this structure is the local Johnson Dealer, who is supplied with first-aid parts, enabling him to make emergency and minor repairs. Second, the Authorized Service Station, which carries a stock of parts and equipment necessary to properly service Johnson Outboard Motors. Third is the District Service Station, with a complete stock of parts for all models, tool equipment and factory trained mechanics capable of making extensive repairs.

It has, therefore, been our endeavor to place a Service Station within easy reach of every Johnson Outboard Motor owner and to cooperate in lending our assistance whenever possible.

JOHNSON MOTORS

WAUKEGAN, ILLINOIS

Don't Fail to Register Your Motor



Showing Model and Serial Number

Your motor is known to the factory only by its MODEL and SERIAL NUMBER. This number is located on the side of the cylinder assembly as illustrated.

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

For assistance in case of theft, you should register the serial number of your motor by filling out and returning the registration card, enclosed in the tool kit, to the factory.

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 transportations 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.

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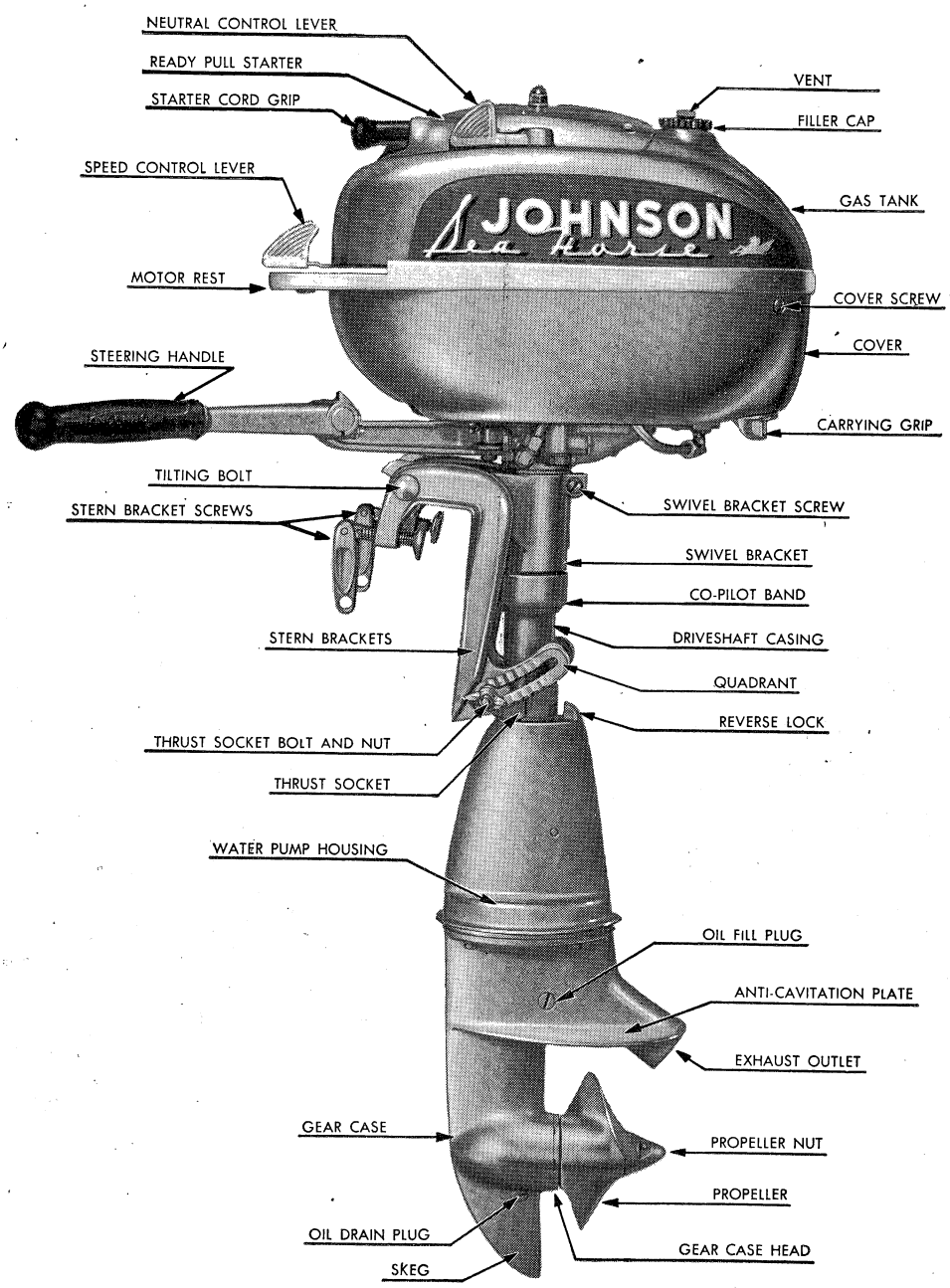


Fig. 1

Model TN (L)

SPECIFICATION CHART

Mechanical Specifications	Sea-Horse TN (L)
POWER-HEAD	Combination 3-Port Rotary Valve Alternate Firing
Bore and Stroke	$1\frac{5}{16}$" x 1½"
No. of Cylinders	2
O.B.C. Certified Brake H.P. at R.P.M.	5.0 4000
Piston Displacement	8.84 Cu. In.
Weight	44 Lbs.
Propeller Dia. Pitch	8" x 7¼
Fuel Tank Capacity	7 Pints
Starting	Ready Pull Starter
Ignition	Magneto
Make Carburetor	Own
Gear Ratio	14-25
Type of Exhaust	Underwater
Cooling System	Vari-Volume Water Pump
Steering	Full Pivot Cushioned
Reverse	Yes
Stern Height (Max.)	TN 15" TN (L) 20"

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.

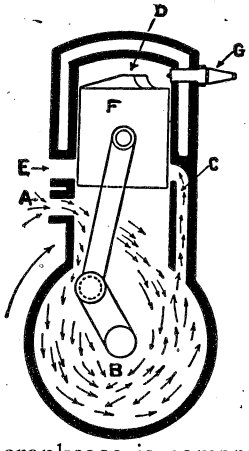
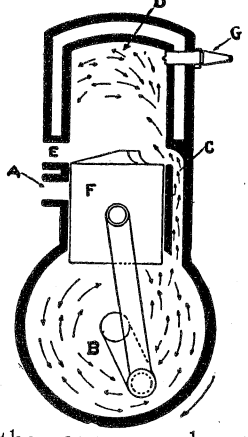


Illustration No. 1

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.

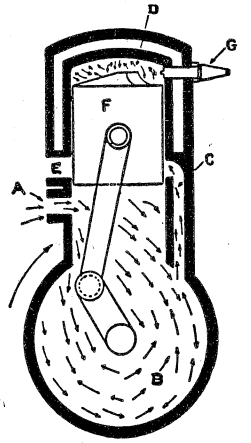
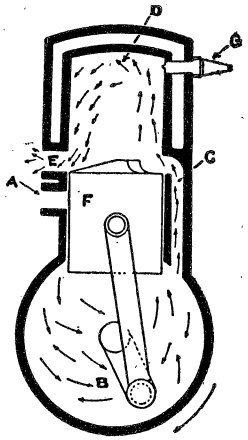


Illustration No. 3

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

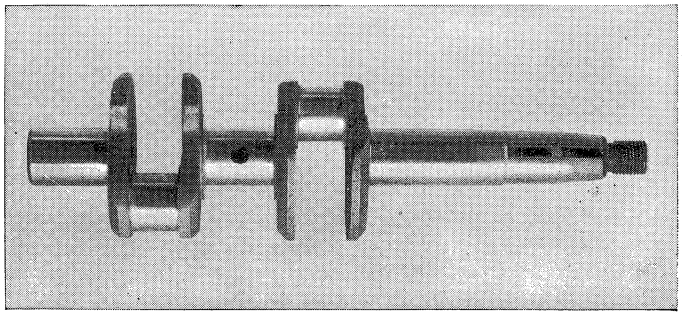


Fig. 2. Crankshaft

Model TN operates on the same general principle as that described above, however, method of crankcase induction differs in some respects. Use is made of two intake ports, that is, one built into the cylinder wall and operated by movement of the piston; the other into the center journal bearing, operated by rotation of the crankshaft. A hole, corresponding to the port (opening) in the center journal bearing, is drilled into the center journal (crankshaft) which leads directly to the crankcase chamber. This arrangement is known as a rotary valve. Figs 2, 14, 15. By combining these features, it is possible to obtain highly efficient carburetion at all times.

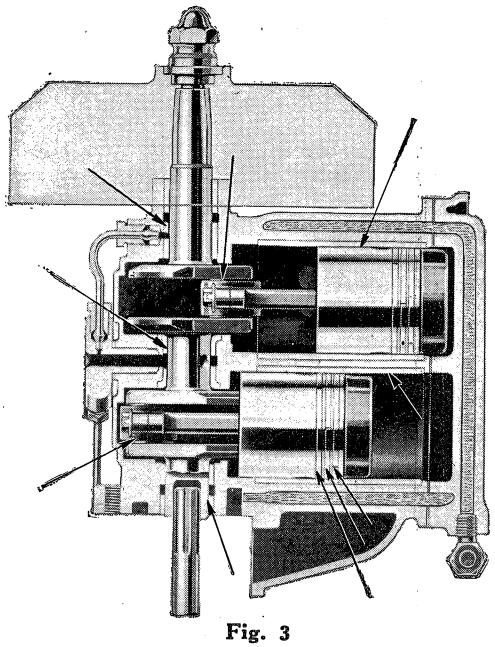


Fig. 3

Fuel Mixture
(Lubrication)

JOHNSON recommends the use of MOBILOIL AF, an SAE No. 40 automotive engine oil which is widely available. Where this oil is not readily available, use MOBILOIL Marine No. 4 or any other first-quality automotive engine oil of SAE No. 40 grade which does not contain harmful or excessive detergent additives.

NOTE: Many first-quality automotive engine oils contain detergent additives which are beneficial in minimizing ring-sticking and the formation of varnish deposits on pistons. These detergents may, under some conditions, when used in two-cycle (outboard) engines, deposit excessive ash on the spark plugs causing missing or failure to fire the charge. **These deposits are not otherwise harmful to outboard engines;** and the detergent additives are beneficial in proper amounts and of suitable character

Where the recommended MOBILOILS are not readily available, other oils may be used, in which case use non-detergent oils.

When changing from one oil to another because of spark plug trouble caused by deposits, it is necessary to thoroughly clean the combustion chambers, ports, and pistons and rings, as otherwise the old deposits may continue to cause spark plug trouble.

It is extremely important that the oil, in the amounts specified, be thoroughly mixed with the gasoline to insure efficient operation of the motor.

To properly mix the oil and gasoline, they should be mixed in a separate container. 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—take advantage of the qualities built into this motor by THOROUGHLY mixing the oil and gasoline as instructed below: ALWAYS USE FRESH MIXTURE OF GAS AND OIL.

Model	Oil Quantity	Capacity of Fuel Tank
TN	½ Pint per Gal. of Gasoline	(Fuel-oil mixture) 7 Pints

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 combustions characteristics, common to high compression, high speed engines; however, since most gasolines now available 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.

Lubrication and Care of the Gearcase

Mobilube GX 90 is recommended for best operation. In the event it is not obtainable, use any good grade of S.A.E. 90 gear oil suitable for automotive hypoid gears. In case of an emergency where neither is available, it is permissable to use an S.A.E. 40 oil, but only until such time as the proper lubricant can be obtained.

Where a complete change of lubricant is required, the fill and drain plugs should both be removed. Drain out all of the oil, water or residue; replace the drain plug, then fill the gearcase through the fill plug with a pump type oil-can as shown. If inserting with a pressure pump, it is advisable to fill from the bottom—"drain" opening. Fill to level of the vent and replace screw.

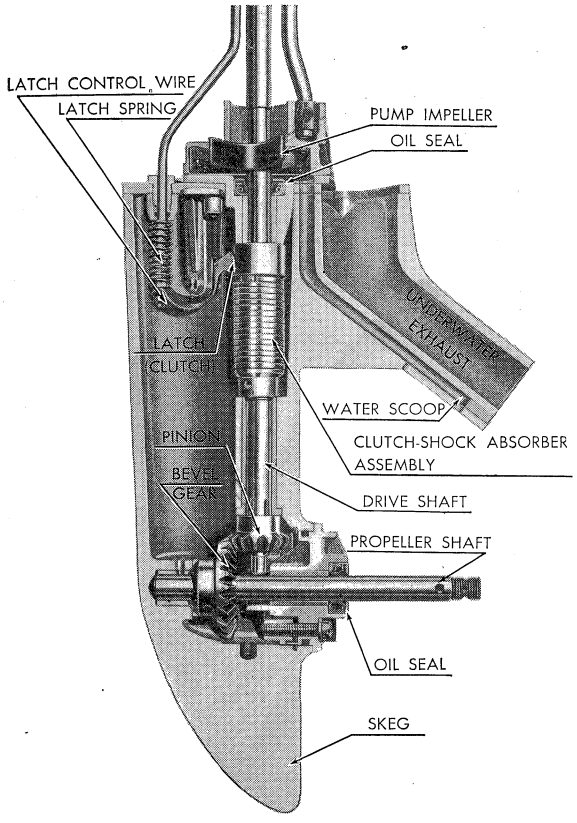


Fig. 4. Sectional View of Gearcase

When checking for water in the gearcase, it is necessary to, first: remove the fill screw; second: loosen the drain screw partly to allow enough of the lubricant to run out to determine whether or not water is present. If

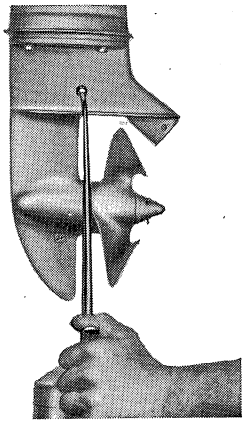


Fig. 5. Inserting Gear Lubricant

no water is present, the drain screw may be retightened without an excessive loss of lubricant. The gearcase should then be filled to the fill plug level and the fill plug replaced. Check condition of gasket on both screws to avoid possibility of leaks. Replace, if necessary.

Attaching the Motor to the Boat

It is essential the motor be properly mounted on the stern of the boat to get results. The object is to be sure the propeller operates at correct depth below the surface of the water and 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. Be sure stern bracket screws are tight at all times—check periodically. Do not use pliers on screws. Use safety chain or rope to guard against loss of motor overboard. (See page 26.)

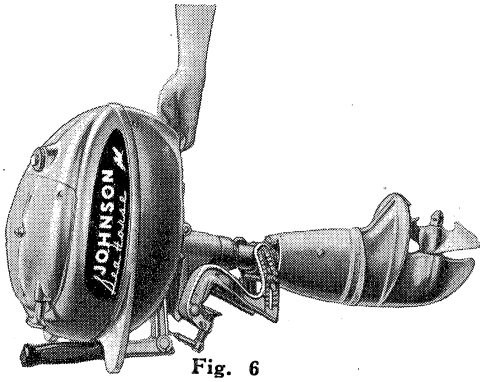


Fig. 6

REMOVING MOTOR FROM BOAT—Lift straight up, hold several seconds to be sure all water drains from under water exhaust. Exhaust channels lead directly to cylinder. (Do not raise lower unit higher than power head before draining, if so water will flow into the cylinder. Result—rust, failure to start and run, and expensive repairs.)

For maximum efficiency, the following stern heights are recommended:

Model	Recommended Stern Height
TN	15 Inches
TNL	20 Inches

Should the stern be too high, cavitation will occur (see cavitation, page 22); 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.

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 (Fig. 7) 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, slide thrust socket up on quadrants until it rests firmly

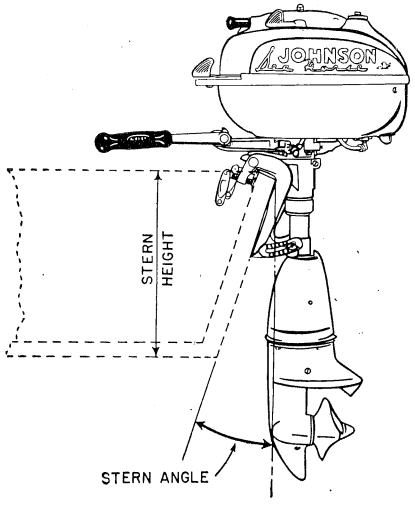


Fig. 7

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. 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

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.

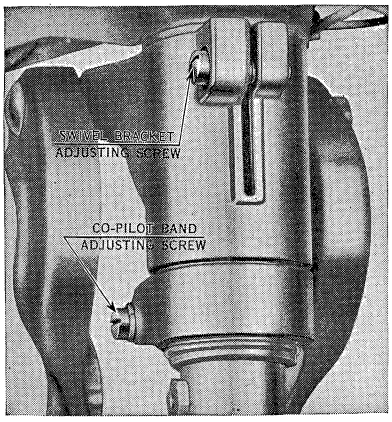


Fig. 8
Showing Swivel Bracket and Co-Pilot.

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 8.

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. Fig. 8.

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 Tilting Tension

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.

New Motor

No breaking-in required. No extra lubrication required.

Starting Mixture

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

Model TN does not employ use of the conventional choke built into the carburetor, but relies on a primer (manually operated) to provide additional fuel for starting purposes.

The primer is operated by depressing the plunger or high speed needle adjusting button as desired to obtain necessary starting mixture.

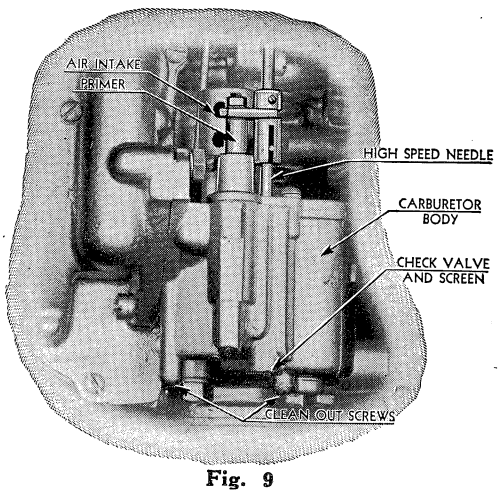


Fig. 9

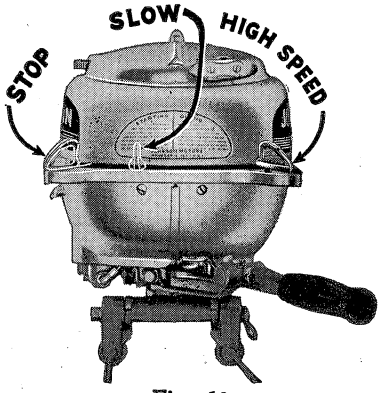


Fig. 10

Controls

Magneto and carburetor levers are synchronized, that is, operating in unison upon moving the magneto (speed control) lever. Fig. 10. 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 (speed control) lever; for full speed, shift to right; for intermediate and slow speeds shift to left (facing motor).

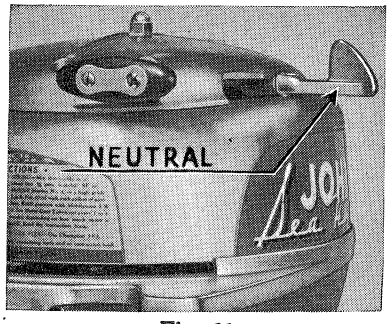


Fig. 11

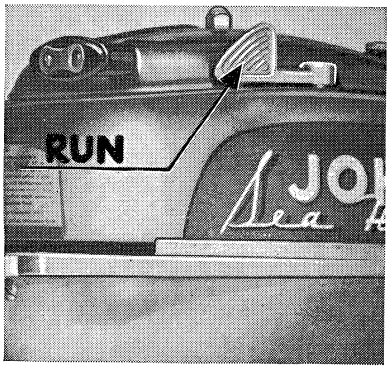


Fig. 12

A "Neutral" arrangement is provided to permit starting the motor "out of gear"—the motor may be started at the dock and operated at idle speed until warmed up or until ready for power application. A clutch mechanism controlled manually, is built into the gearcase (page 22) for this purpose. Control is accomplished by movement of the small lever installed adjacent to the Ready Pull starter—"in gear" when lever is set flush with contour of the fuel tank—"in neutral" when lever is extended.

Note—The neutral control lever cannot be shifted with speed control (magneto) lever advanced beyond "start" position—required to prevent "rac-

ing" of the motor when in neutral. Set speed control lever to start position or within the slow speed operating range when shifting to neutral. The lever cannot be moved when operating at intermediate or high speed—DO NOT ATTEMPT TO FORCE. When docking, move speed control lever within slow speed operating range as desired—shift lever to neutral position.

Starting Instructions

1. Open air vent in gas tank filler cap.
2. Open shut-off valve (gas tank) on left side of motor.
3. High speed needle (carburetor) is properly set at factory, however, in event setting has been altered, it should be unscrewed approximately ¾ turn from closed position, when motor is cold—more if necessary in cold weather. See page 16 for further instructions on carburetor.
4. Move speed control (magneto) lever to "Start" position.
5. Set neutral control lever to "Neutral" position, Fig. 11.
6. Prime—(primer and high speed needle on carburetor are interconnected —press to prime and turn to adjust). Depress primer—needle button three or four times to obtain necessary rich starting mixture, when motor is cold. Fig. 13.
7. Pull rapidly on starting cord.
8. Upon having started the motor, it may be advisable to move the speed control lever slightly to the left (facing motor) to avoid excessive idling speed. Allow motor to operate at "idle" until ready to depart from the dock—move neutral control lever to "running" position. Fig. 12. Advance speed control lever as desired.
9. Close high speed needle (turn right) as required to obtain best setting for maximum speed. This adjustment should be made with full speed control advance. Note—If motor tends to slow down after starting, depress primer-needle button several times. If slowing down persists, open high speed needle slightly (turn left). High speed needle is properly adjusted when motor consistently runs at maximum speed with speed control lever set at full advance position—Fast.

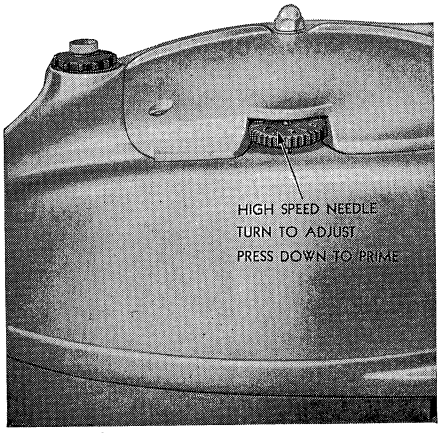


Fig. 13

10. To reduce motor speed, move speed control lever to left (facing motor) as desired.
11. To stop motor, move speed control lever to extreme left (stop position)—hold until motor stops running. Fig. 10.

Steering and Reverse

Steering is accomplished by moving the steering handle to left or right 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.

Full pivot (360°) steering is provided—reverse being obtained by simply raising the steering handle and turning the motor around to reverse position. A reverse locking arrangement built into the thrust socket and drive shaft housing prevents tilting in reverse.

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

Under no circumstances tilt motor out of water by bearing or pushing down on Steering Handle.

Carburetion

Carburetion is of the full range type, thus providing efficient carburetion at all speeds—some departure from customary construction has been made nevertheless, in that only the high speed needle and jet are built into the carburetor body; the slow speed needle and jet are actually not a part of the carburetor proper — this feature is part of the crankcase assembly as shown in Fig. 14 and functions throughout the entire speed range of the motor.

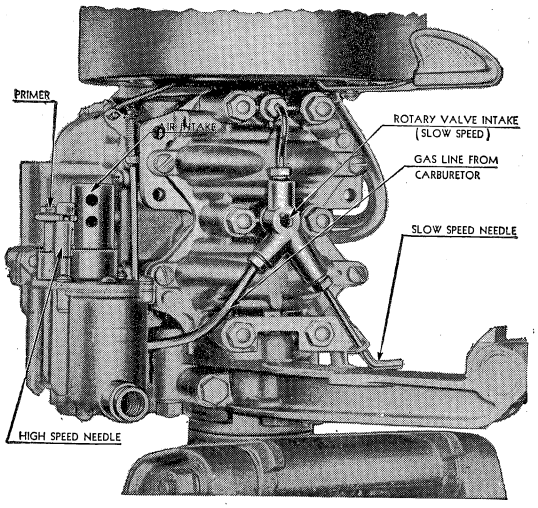


Fig. 14

Since both third port and rotary valve principles are employed, there are two independent systems of carburetion. The carburetor itself is of the conventional type—consisting of a float chamber, mixing chamber, throttle valve, needle for adjusting mixture and a connection to the intake manifold. The carburetor and third port operate only at intermediate and high speeds and cease to function entirely at slow speeds. Slow speed operation is maintained, however, by mixing air and gasoline in the slow speed opening which is conducted to the crankcase chamber by way of the rotary valve. Fig. 14 and 15.

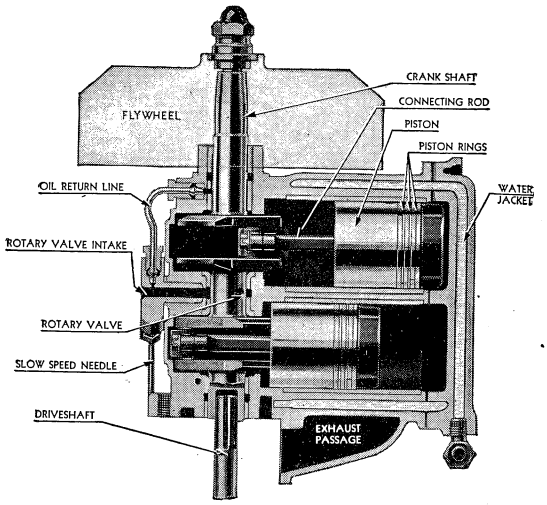


Fig. 15

To adjust carburetor, proceed as follows—(note, carburetion is properly adjusted prior to shipping motors from the factory.)

Some adjustment may however be necessary due to type of service or climatic conditions. There are two (2) adjustments —namely, High and Slow speed.

1. Close slow speed needle, Fig. 14, turn right until it rests gently (do not damage needle seat by screwing down too tightly) on its seat, then unscrew approximately ¾ turn. (Turn left.)
2. Close high speed needle, Fig. 13, turn right until it rests gently on its seat, then unscrew approximately ¾ turn. (Turn left.)
3. Start motor as instructed on page 15.
4. Operate at full speed with spark at full advance until normal motor running temperature is reached. Turn high speed needle to left or right as required to obtain maximum speed.
5. Retard spark by moving magneto lever to position midway between center and full retard (left of center facing motor). Turn slow speed needle, Fig. 16, to left or right as required to obtain smooth and consistent running at slow speeds.

High and slow speed needles should be adjusted separately—adjusted one at a time. Some may prefer to close the high speed needle entirely when making the slow speed adjustment. In this case open the slow speed needle approximately ¾ turn from closed position, start the motor and run until warm. Retard spark to slow speed range, turn slow speed needle to right or left slightly to obtain consistent slow speed operation

Move spark lever to full advance position, gradually open the high speed needle until maximum speed is reached.

Do not change position of the slow speed needle to correct high speed performance. Once the slow speed needle is set, it should require little or no attention—do not change setting unless necessary.

In event the slow speed intake is obstructed with foreign matter, simply open the slow speed needle three or four

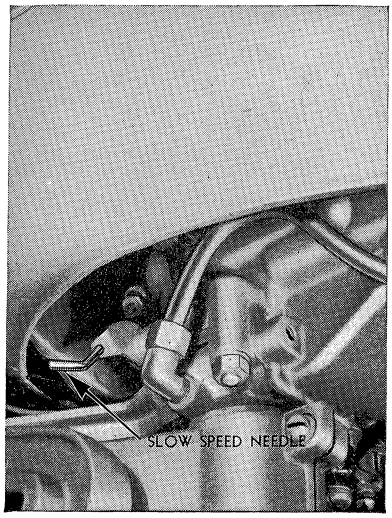


Fig. 16. Showing Location of Slow Speed Needle.

turns—depress primer vigorously several times to force out obstruction. Readjust slow speed needle as instructed above. Be sure check valve screen is clean. (See Fig. 9)

Spark and magneto levers are synchronized, therefore movement of the magneto lever controls both spark and carburetor simultaneously.

THE PRIMER consists of a small cylinder and plunger built into the carburetor body, which, when depressed, forces a small amount of gasoline into the slow speed opening to provide rich starting mixture. Since priming is accomplished through the slow speed opening, the slow speed needle must be open. The motor cannot be primed if the slow speed needle is closed. Do not, however, open the slow speed needle beyond that required for best slow speed operation of the motor.

The Magneto

The magneto is a self-contained unit—requiring no assistance from outside source 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 cast into the magnet rotor.

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 through 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.

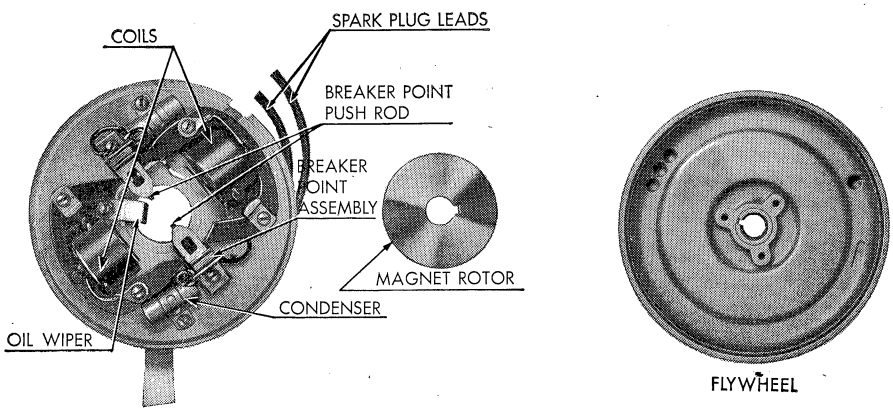


Fig. 17. Magneto Assembly

To Remove Flywheel

In event it becomes necessary to remove the flywheel for inspection or repair of the magneto, remove first the ready pull starter assembly held fast to the gas tank to give access to the flywheel nut. Note that the flywheel is provided with a "puller" plate. Hold flywheel from turning—loosen flywheel nut with socket wrench until shoulder on the nut bears against under side of the puller plate. Continue "unscrewing" the flywheel nut to pull the flywheel free of taper on the crankcase—carefully lift flywheel off.

To Install Flywheel

First, make certain the keys are properly installed in the crankshaft and **fit snugly.** Remove cover plate 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.

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 ADJUST MAGNETO BREAKER POINTS—Since two coils are used (one for each cylinder) two condensers and two sets of breaker points are required, both of which may need occasional inspection from time to time.

Note flat machined on crankshaft and two push rods operating both sets of points are open when respective push rods ride on high side of crankshaft — closed when on flat. Correct breaker point gap setting is .020" (full open).

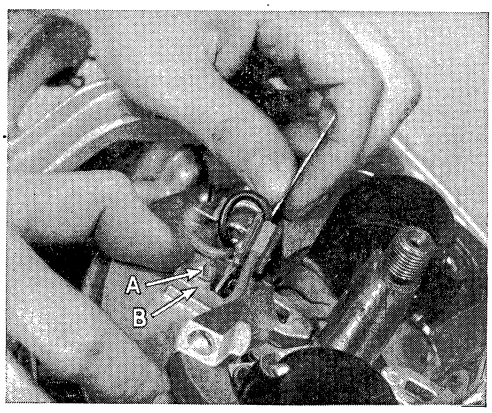


Fig. 18

To adjust gap setting Fig. 18 — loosen screw "a". Turn crankshaft to position where push rod rides high on side. Check gap between points, using .020" feeler gauge as illustrated. If gap is less than .020" push breaker point bracket "b" in (towards crankshaft), sufficiently to obtain correct gap setting. Tighten screw "a". If gap is over .020" slide bracket "b", out (away from crankshaft). Adjust both points in like manner.

Spark Plugs

Due to the different speeds at which the various models operate, it is IMPORTANT that spark plugs of certain characteristics be installed in each model.

The following spark plugs are recommended for:

Model	Our Part No.	Spark Plug	Substitute
TN - TNL	302283	Champion J-6-J	AC 44-M

It is important the correct spark plug be used to avoid consistent fouling or preignition and maintain maximum performance of the motor.

If a new spark plug is required, consult this chart before making purchase. If in doubt, see our 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 cutting out magneto. 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 to the use of more oil than recommended.

Fig 19. Showing Cover Down for Inspection of Spark Plugs

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 were 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, then 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 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 inspect spark plugs loosen the four cover screws and let cover drop down as shown in Fig. 19.

The Cooling System

Water for cooling purposes is provided by action of the Vari-Volume pump, which functions as a displacement pump at slow motor speeds and as a centrifugal pump during operation in the higher speed range (Fig. 20).

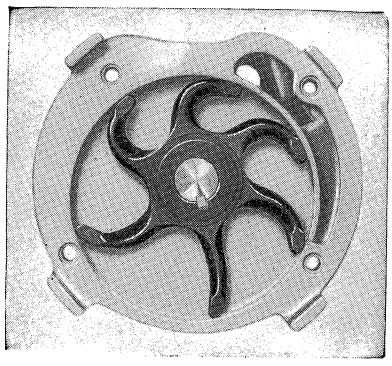


Fig. 20. Vari-Volume Pump

Action of the pump impeller, revolving with the motor driveshaft forces water through the various channels and water jackets to provide a cooling medium—later to be discharged into the driveshaft casing and eventually expelled with the exhaust gases.

No attempt should be made to run the motor out of water.

Functioning of the pump can easily be determined by noting small stream of water discharging from a hole drilled in the elbow attached to the lower side of the cylinder block.

Overheating is usually accompanied by rattling noises in the motor, causing it to slow down or to stop completely.

Care of the Cooling System

It is ADVISABLE, 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 operating the motor in a barrel 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.

AFTER OPERATION IN SALT WATER—rinse off lower unit parts with fresh water and wipe with oily cloth. This will reduce the corrosive effects of salt water to a minimum.

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 8" x 7¼" propeller will have an eight inch diameter and a 7¼ inch pitch—theoretically, advancing 7¼ 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.

Propeller, Model TN—Diameter 8", Pitch 7¼", two (2) blade type.

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 12.) 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 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.

Neutral Clutch

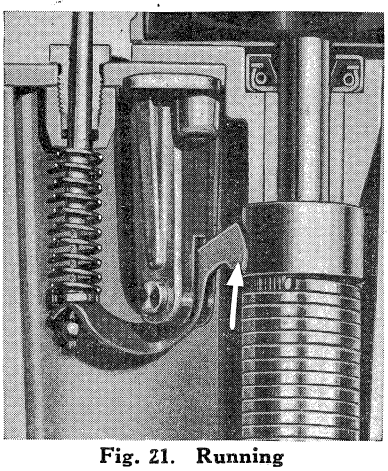


Fig. 21. Running

The neutral clutch consists of steel bushing keyed to the lower driveshaft, an accurately ground steel sleeve driven by the upper driveshaft and a spring which is coiled around both the steel sleeve and the bushing.

Propeller drive is thus accomplished by gripping effect of the clutch spring on the sleeve and bushing created during operation of the motor (Fig. 21).

When set for neutral operation, the latch is lowered (Fig. 22) by movement of the neutral control lever (Fig. 11) to obstruct rotation of the clutch spring. This action causes the spring to unwind and to subsequently release its grip on the steel sleeve

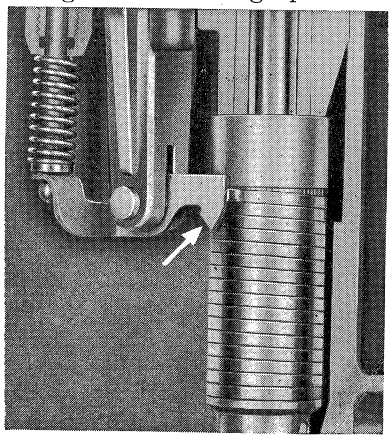


Fig. 22. Neutral

and bushing to permit "slippage" between the upper and lower driveshafts—neutral. When operating "in gear," the latch is lifted (Fig. 21) by moving the neutral control lever to running position (Fig. 12) to resume rotation of the clutch spring and its grip on both the steel sleeve and bushing. Rotation causes the spring to "wind up" to increase its grip as motor speeds up.

Shock Absorber

The propeller shock absorber consists of a comparatively strong spring keyed to the upper driveshaft and inserted tightly into the steel sleeve mentioned above which is actually part of the clutch. Action of the shock absorber is such that in event the propeller strikes an underwater obstruction, the shock absorber spring is caused to "coil" slightly in the steel sleeve to release its grip thereby absorbing shock of sudden impact.

To Install Propeller Drive Pin

If required to install a new drive pin, withdraw cotter pin securing the propeller nut. Remove the nut and fragments of the sheared pin. Note—the propeller pin is installed immediately back of the propeller nut in this case which makes it unnecessary to remove the propeller from the propeller shaft when making the installation. Replace the propeller nut—draw up snugly but not too tightly to result in partial shearing of the pin. Insert cotter pin and lock in position.

The Ready Pull

This simple device is built into model TN(L) for the express purpose of eliminating the necessity of manually wrapping the cord around the starting pulley for cranking. 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. 23.

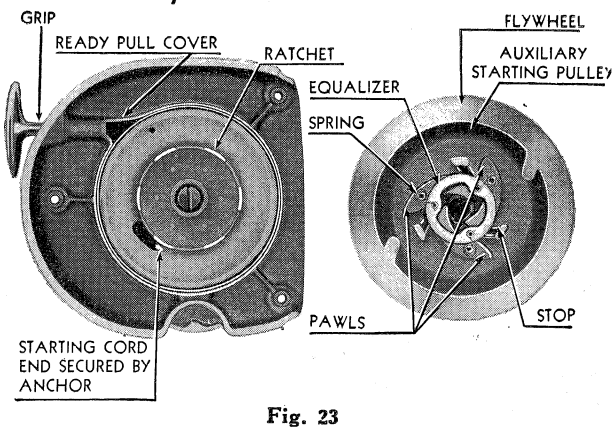


Fig. 23

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 direct 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 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."
2. Remove fragments of broken starting cord.
3. Obtain new cord. Attach grip as shown in Fig. 24. Use only the special cable provided by the manufacturer.
4. Cut a small piece of wood to fit in ratchet as shown in Fig. 25.
5. Turn in anti-clockwise direction (right to left) 7 turns, using marker as indicated. Fig. 25. (Be sure to turn right to left—to do otherwise will damage the recoil spring.)
6. Insert starting cord as illustrated. Fig. 25.
7. Attach grip as shown.
8. Gradually release until all of cord has been taken up.
9. Attach "Ready Pull" to motor.

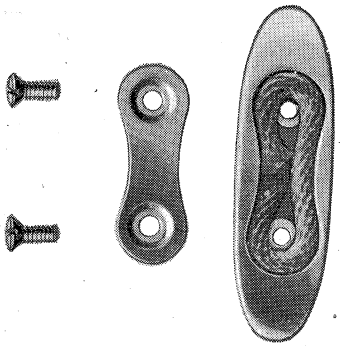


Fig. 24

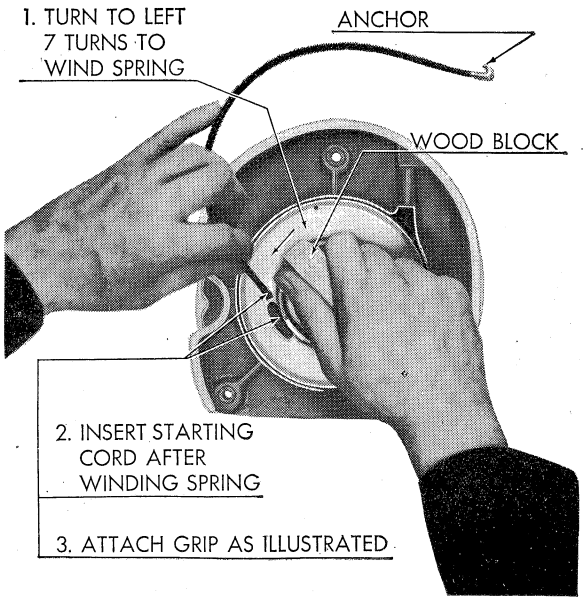


Fig. 25

If Motor is Dropped Overboard

Possibility of this occurrence can be eliminated entirely by exercising a few simple precautions. Make certain the stern bracket clamp screws have been properly tightened to secure position of the motor on the boat. Check screws periodically during operation of the motor to guard against their having worked loose. Attach safety chain or rope to eyelet installed on the swivel bracket bolt for this purpose, anchoring opposite end at some convenient position on the stern of the boat.

However, if the motor unfortunately goes overboard, recover it immediately, if possible.

Remove fuel tank, fuel line, carburetor, magneto and spark plugs. Drain all water that may remain. Wash with gasoline.

Work as much water as possible out of the cylinders 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.

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 "fill," (See Motor Illustrations) 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 blocks, 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 21.

Refill gearcase with gear lubricant—See Page 11.

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.

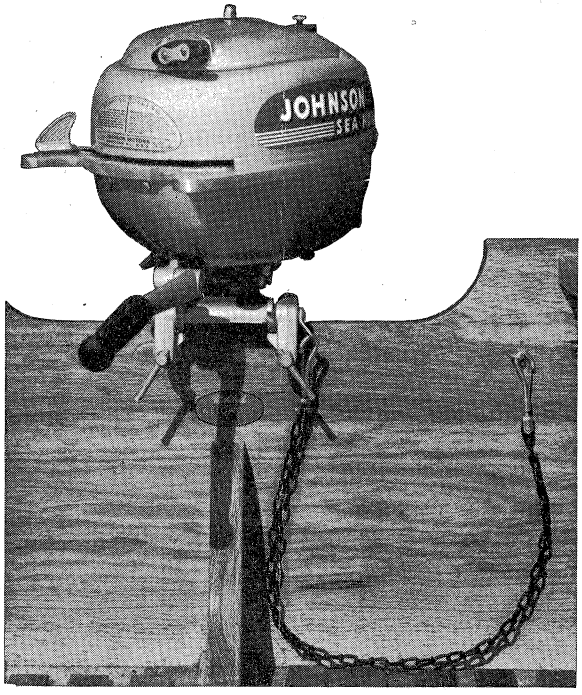
Under no circumstances should the motor be stored in an inverted position. It should be hung on a rack similar to the manner in which it is mounted on the boat.

Preparations for Operation After Storage

Remove spark plugs, attach ignition leads to some part of motor to prevent injury to the coils; spin motor by pulling on starter cord grip to blow out excess oil. Clean and replace spark plugs. Install new plugs if necessary.

Tighten all nuts and screws. Make sure flywheel nut is tight.

Fill gas tank with properly mixed fuel.



Guard against loss of your motor overboard by attaching a safety chain or rope, as above, in event stern bracket loosens up while in operation. BE SAFE—Check screws periodically. Your dealer can provide chain or rope for this purpose.

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.

JOHNSON
SEA-HORSE
MODEL TN

NEW MOTOR—No breaking-in required. No extra lubrication required.

STARTING & OPERATING INSTRUCTIONS

1. **FUEL MIXTURE**—Mix ½ pint of oil to each gallon of gasoline. Use Mobile AF, Mobile Marine No. 4, or an S.A.E. No. 40 oil of similar character. Use any good grade of regular (not premium) gasoline.
2. **ATTACHING MOTOR TO BOAT**—Make sure that motor is properly secured. Do not use a wrench or pliers on clamp screws.
3. **HOW TO START**
   - A. Fully open air vent in gas tank filler cap.
   - B. Open fuel valve underneath gas tank.
   - C. Open high speed needle valve approximately ¾ turn from closed position.
   - D. Set control handle in neutral or forward position.
   - E. Move magneto lever to "Start" position.
   - F. Depress primer 3 to 5 times vigorously, (5 to 8 times if necessary).
   - G. Pull quickly on starting cord (when motor starts additional priming may be necessary to prevent motor from stopping).
   - H. To regulate speed, move magneto lever to desired position.
4. **SLOWING DOWN AND STOPPING**—To reduce motor speed move magneto lever to left or to position marked "slow." To stop motor move magneto lever to position market "stop."
5. **FOR SMOOTHER RUNNING**—After motor has warmed up, readjust high speed needle valve to the point where motor performs most satisfactorily. It may be necessary to open or close needle valve slightly.
   If motor becomes flooded by over priming, close high speed needle valve (not too tightly) and crank until it starts. As motor picks up speed, gradually open needle valve to normal running position.
6. **REMOVING MOTOR FROM BOAT**—Be careful not to tilt the propeller end higher than the motor end, water which is left in the underwater

(OVER)

exhaust passages may run into the cylinders, causing severe damage especially in salt water. Always store motor in an upright position.

7. **NORMAL CARE IN OPERATION.**

A. **LUBRICATION**— The engine (power head) is lubricated by mixing the oil with the gasoline as specified. The underwater gear unit is lubricated with a good grade oil suitable for automotive hypoid gears meeting U.S. Army Spec. No. 2-105B Grade 90, such as Mobilube GX90. Check the quantity of lubricant in the gearcase after 20 gallons of fuel have been used in the motor. See instruction on how to fill gearcase.

B. **COOLING**— Cooling is provided by a vari-volume pump circulating water through the cooling system. Discharge passes into driveshaft casing and is discharged with the exhaust gases underwater.

C. **PROPELLER PROTECTION**— Motor is equipped with a slip clutch for propeller, drive pin and motor protection.

D. **SPARK PLUGS**— Plugs should be cleaned and gap adjusted to .030. Use only Champion No. J6J.

E. **SALT WATER SERVICE**— Remove motor from boat immediately after use, rinse lower unit with fresh water; flush cooling system with fresh water. See instruction book.

F. **STORING AWAY**— When storing motor for any great length of time, or over the winter months, be sure all traces of water are removed from the water channels. Remove old oil in gearcase and insert new. Remove spark plugs and insert a tablespoonful of lubricating oil into each of the spark plug holes. Rotate motor until the oil has been distributed throughout the power head then