General Instruction Book

for

IRON HORSE-
GASOLINE ENGINE

MODELS

AR-535 & UP

Outboard Marine & Manufacturing Co. of Canada Ltd.
PETERBOROUGH, CANADA

11/50

Part No. 401747
WARRANTY

We warrant each new IRON HORSE ENGINE to be free from defects in material and workmanship under normal use and service, our obligation being limited to repairing or replacing at the factory or service station any parts or part thereof which shall, within the warranty period, 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 liabilities in connection with the sale or use of any IRON HORSE ENGINE.

The warranty period is ninety (90) days after delivery of the engine to the original purchaser, except where other special provisions have been arranged. NOTE: ALL WARRANTY IS VOID WHENEVER THE GOVERNOR MECHANISM HAS BEEN REMOVED OR MADE INOPERATIVE, OR WHERE THE ENGINE HAS BEEN REPAIRED OR OTHERWISE ALTERED OUTSIDE THE FACTORY.

Warranty does not include free replacement of parts because of wear occasioned by operation of the engine, or any labor or other charges in connection with the same.

Claims--ALL IRON HORSE ENGINES or parts returned to the factory for inspection, repair or adjustment must be shipped transportation prepaid. Be sure to write a letter advising what is being shipped, how shipped and when arrival at our factory can be expected--also, advise the condition under which the ENGINE is being operated and from whom it was purchased.

By closely following this procedure any delay in handling the claim can be eliminated.

NATION-WIDE SERVICE

In order that the IRON HORSE ENGINE owner can receive the utmost in performance, we have an already established nation-wide network of Service Stations that are not only equipped with special tools to properly service your unit, but also carry a complete stock of parts to fulfill immediately your requirements should the need arise.

These Service Stations are ably assisted by the local IRON HORSE ENGINE Dealer who carries a stock of first-aid repair parts which enables him to make minor and emergency repairs.

In addition to this extensive Service Organization, the Company maintains a complete Service Department at the factory to make more complete this Service to the IRON HORSE ENGINE owner.

The factory Service Department will gladly do their best to answer any inquiries that may arise in connection with the installation, operation, maintenance, or any trouble that may be encountered with the IRON HORSE ENGINE.

A complete list of Service Stations will be found in the back of this Manual.

Outboard Marine & Manufacturing Co. of Canada Ltd.
PETERBOROUGH, CANADA
FOREWORD

This instruction booklet is not a service manual, but a booklet prepared for the express purpose of conveying to the IRON HORSE owner such information as will enable him to understand thoroughly the operation of his engine and the necessary procedure for its proper maintenance.

Dependability and Long Life are built into every IRON HORSE shipped from our factory—this is OUR RESPONSIBILITY. You will no doubt want to take full advantage of these valuable features and to obtain year after year—that DEPENDABILITY, which can be realized only if the engine 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 IRON HORSE.

EXHAUST

THE IRON HORSE ENGINE SHOULD NOT BE OPERATED INSIDE A BUILDING UNLESS THE EXHAUST IS PIPED OUTSIDE, NOR WITH THE EXHAUST OUTLET LOCATED IN SUCH A MANNER THAT THE FUMES WILL BE BLOWN INTO LIVING QUARTERS THROUGH AN OPEN WINDOW OR DOOR. The exhaust pipe should be absolutely leakproof, as short and straight as possible, and should be made of 3/4" pipe, or flexible tubing. (The company can supply at nominal cost flexible exhaust tubing in 8 ft. lengths with couplings.)

If the exhaust pipe rises above the engine, a condensation trap should be provided to prevent moisture from getting into the engine which might result in serious damage. (See Figure.) This is easily accomplished by installing an ordinary pipe T in the exhaust pipe at the lowest point, with a short length of pipe installed in the side opening of the T pointing downward and provided with a drain plug to permit the accumulated moisture to be drained out. This should be done at regular intervals to prevent the trap from becoming full and overflowing into the engine.

Do not support more than one foot of exhaust pipe from the exhaust opening in the cylinder. Any length of pipe over this amount should be provided with additional support to prevent breakage of the cylinder casting.

If the exhaust pipe passes through a wall constructed of wood or other combustible material, plenty of clearance should be provided at this point and the necessary precautions taken to eliminate a fire hazard. The muffler furnished with the
engine should be installed at the end of the exhaust pipe outside the building to silence the exhaust.

REMEMBER--THE EXHAUST FROM ANY GASOLINE-POWERED ENGINE CONTAINS DEADLY POISONOUS CARBON MONOXIDE FUMES AND FOR THIS REASON SHOULD NOT BE OPERATED INSIDE A BUILDING UNLESS THE EXHAUST GASES ARE PIRED OUTSIDE AS OUTLINED ABOVE.

Keep the exhaust pipe as short and straight as possible, and do not use elbows but make long pipe bends where necessary, to eliminate back pressure and prevent excessive accumulation of carbon.

HOW TO START

1. OIL HAS BEEN DRAINED from the crankcase of the engine for shipping purposes--DO NOT ATTEMPT TO START UNTIL CRANKCASE HAS BEEN FILLED WITH OIL. Remove large oil filler plug--pour oil in crankcase to point of overflow. Crankcase holds approximately 3/4 pint. Use a good grade of S.A.E. No. 20 oil (Mobiloil or equivalent).

2. Fill gas tank with regular grade gasoline. Open shut off valve. (Do not use high test gasoline.)

WARNING--Be sure a "fresh" supply of gasoline is used at all times. "Old" gasoline or gasoline left standing over a period of time will form a "gum" deposit which may cause hard starting or erratic performance. Should this condition exist, the deposit can be removed by washing the affected parts in alcohol.

3. Pull out on choke button. (Do not use choke to start when engine is warm unless necessary.)

4. Pull firmly on starter rope. (Engine should start on two or three cranking efforts when cold if choked properly.) Do not allow rope to snap back as damage may result.

IMPORTANT--During extreme cold weather, the oil in the crankcase congeals--becomes thick and "sticky". No effort should be made to start without first warming up, as severe damage may result. Be sure engine can be turned over FREELY before attempting to start.

If engine is to be operated permanently outside at temperatures below freezing--use S.A.E. oil No. 10.

5. Push choke button in gradually upon having started engine.

6. To Stop--Press Button on side of armature plate. (See Illustration on Page 5.) Hold until engine stops turning.
INSTRUCTIONS FOR THE CARE AND MAINTENANCE
OF THE IRON HORSE ENGINE

The Four (Stroke) Cycle

The IRON HORSE operates on the 4 (stroke) cycle principle—requiring four strokes of the piston to complete the events of the cycle—INTAKE, COMPRESSION, POWER and EXHAUST.

Admission of fresh fuel charges and discharges of the burned gases is by way of two poppet valves (intake and exhaust), operated by cams, and timed to open and close at predetermined positions of the piston as follows:

**INTAKE:**
1. Piston moving downward.
2. Intake valve opened by cam.
3. Suction created by downward movement of piston draws fuel vapor from carburetor into cylinder.

**COMPRESSION:**
1. Piston moving upward.
2. Valves closed.
3. Fuel charge compressed.

**POWER:**
1. Both valves closed.
2. Spark ignites compressed fuel charge.
3. Fuel charge burns and expands rapidly—forcing piston down to deliver power impulse. (Piston moving downward.)

**EXHAUST:**
1. Piston moving upward.
2. Exhaust valve opened by cam.
3. Exhaust gases forced out of cylinder into atmosphere.
CARBURETION

Carburetion on the IRON HORSE is provided by a conventional float feed, down draft carburetor. Correct fuel level at high and low speed jets in the mixing chamber is maintained at all times by a float valve in the float chamber—gasoline is gravity fed from the tank located immediately above the engine.

The float valve is operated, through a simple lever arrangement, by a cork float, consequently, when the float chamber is empty, the float is at rest near the bottom of the chamber. The float valve is then off its seat (open) and permits gasoline to flow into the float chamber. As this chamber begins to fill, the float rises and gradually closes the float valve. When the proper level is reached, the float valve closes completely.

On suction impulses of the engine, air is drawn through the mixing chamber of the carburetor, where air and gasoline are mixed to form a combustible vapor which is conducted into the cylinder by way of the manifold and intake valve.

The carburetor is provided with a needle valve to insure correct fuel mixture throughout the entire speed range of the engine.

CARE OF FUEL SYSTEM

No difficulty should be experienced with the fuel system if a good clean grade of gasoline is used and poured into the tank from a clean container and funnel. Be sure funnel is clean. Use fresh gasoline—gasoline left standing for any length of time will result in the formation of gum, which clings to the wall of the gas tank, and clogs small carburetor passages and jets.

Gasoline gum, we are told, is present in all gasolines, and so long as it remains in suspension, it causes no particular harm. But as the gasoline ages, gum commences to accumulate.

This gum has the appearance of a "varnish-like" substance and can be detected very easily by sticking screwdriver into the tank through the filler opening and scraping along the bottom. If gum is present, a sticky formation will be noted. It clings to the inner walls of the tank where it can have no actual effect on starting and running qualities of the engine; however, it does not confine itself to the walls of the tank only, but also collects on the small screen at the bottom of the tank to obstruct free passage of gasoline to the carburetor. In extreme cases, it clogs the small passages in the carburetor and the fuel line as well.

Excessive gum accumulation will naturally interfere with starting and running of the engine. If the fuel supply is shut off by this gummy formation, the engine simply cannot be started. IT MUST HAVE GASOLINE TO START AND RUN.

Gasoline gum is not readily soluble in gasoline, therefore, little good will come of attempting to remove it by washing the affected parts in gasoline. To remove—rinse inside of tank with ALCOHOL or LACQUER THINNER. (Lacquer thinner is highly inflammable—use with caution.)
Gum accumulation in the gas tank and other parts can be reduced to a minimum by always using comparatively fresh gasoline. Since the IRON HORSE uses but very little, gasoline should not be stored in large quantities—keep only a small supply on hand to insure freshness. BE SURE THERE IS NO WATER IN THE GASOLINE TANK AND THAT SCREEN IN THE TANK IS CLEAN.

CARBURETOR ADJUSTMENT

Since all IRON HORSE engines are thoroughly tested before leaving the factory, the carburetor is properly adjusted and should require no further adjustment; however, in event the original adjustment has been altered, proceed as follows:

1. Close adjusting needle until it rests gently on its seat.

   (NOTE—Under no circumstances screw adjusting needle down tightly on seat—so as to do so will injure both the seat and needle and result in failure thereafter to obtain satisfactory carburetor adjustment.)

2. Open adjusting needle approximately 3/4 turn (left).

3. Start engine as instructed and operate until thoroughly warmed up.

4. Apply full load.

5. Turn adjusting needle to right or left as desired to obtain best performance.

Be sure all governor link connections are free, and that there are no indications of binding.
GOVERNOR THROTTLE CONTROL AR-500 SERIES

Since the Iron Horse is designed to operate normally at 1900 to 2000 R.P.M., the carburetor is constructed with a shutter valve which is controlled by a mechanical governor as the engine load varies.

The Governor consists of an air vane and shaft which is mounted with the air vane in the air stream created by the flywheel. This air governor is connected to the carburetor by a crank arm and link.

While the engine remains motionless, the carburetor butterfly valve is held open by a small spring attached to the control link. However, once the engine is started the air stream created by the motion of the flywheel, moves the air baffle, causing movement of the governor arm resulting in partial closing of the butterfly valve, thereby reducing the charge of gas and air admitted to the cylinder. Further increase in engine speed has a considerable effect on the air vane--causing greater action of the governor arm, consequently, closing the shutter valve to a point where a constant speed of 1900 to 2000 R.P.M. is maintained.

Any increase in the load applied will cause a drop in revolutions--reducing the effect of the air stream on the air baffle, resulting in the carburetor butterfly valve being opened by the action of the spring, admitting a larger charge until normal engine speed has been reached. Governor control is adjusted at the factory and should not be altered.

TO ADJUST ENGINE SPEED

Speed of the engine is controlled by action of the governor and tension of the governor spring, therefore any change in the tension of this spring will affect the speed at which the engine is running. It will therefore be seen that normal engine speed may be adjusted to a lower or somewhat higher speed to conform to requirements.
GENERAL INSTRUCTION BOOK

If you have reason to assume the engine is not turning at its recommended R.P.M., (1900 to 2000), apply a speed indicator to the end of the crankshaft to determine definitely at what speed it is operating. If higher than recommended, reduce tension of spring by hooking in one of small holes closer to the governor arm. To increase engine speed, simply increase tension of the spring by attaching it to one of the holes further distant from the governor arm, as indicated by arrows.

(CAUTION: Do not attempt to stretch the governor spring. Any change in length will render it useless so far as obtaining correct speed and speed variation is concerned.)

GOVERNOR THROTTLE CONTROL

The vane consists of a small baffle plate mounted on a shaft to resemble a flag, which is suspended in the air stream of the engine cooling system. The outer end of the shaft is fitted with a lever which is connected to the carburetor throttle lever with a small rod. The Air Vane is designed to close the throttle when the engine is operating. Therefore a counteracting force is required for proper governor control, which is furnished by a spring attached to the lever on the air vane shaft. Note that the opposite end of the spring is anchored to a notched bracket to provide various adjustments.

TO SET ENGINE SPEED

The engine is designed to operate most efficiently at 2250 to 2400 R.P.M. When the engine is motionless, the governor spring holds the carburetor throttle valve open. When the engine is started the R.P.M. will increase until the air pressure on the vane exceeds the tension of the governor spring. The throttle valve then closes until the air pressure on the vane equals the tension of the governor spring. If it is desired to increase the engine R.P.M., simply increase the tension of the spring by anchoring a notch lower down on the bracket. The R.P.M. is reduced by decreasing the spring tension.

Should the carburetor or governor controls at some time be removed from the engine, they should be re-assembled so that the carburetor throttle valve is wide open when the engine is motionless, and spring anchored in the centre notch. In the event the engine R.P.M. is too high, even when the spring tension has been reduced to the minimum, stop the engine and partly close the throttle valve by loosening the set screw in the throttle shaft lever, and turning the shaft slightly to the left, or counter-clockwise. Then tighten set screw. The throttle valve now is not wide open when the engine is motionless. This operation may be repeated if necessary.

RECOIL STARTER

The Model AR-535 and AR-536 are equipped with a self-winding hand starter. When the engine is to be started, grasp the handle of the starter and pull the cord
straight out, not more than 30'. A quick pull is necessary to spin the engine. CAUTION—do not let go of the handle until the cord has fully rewound. If the handle is allowed to snap back, the starter may be damaged.

LUBRICATION

Lubrication of moving parts is accomplished by the SPLASH System. The cam gear operates in a small oil sump, into which the proper amount of oil is metered at all times, in such a manner that oil is picked up between the teeth of the gear and forced out with considerable pressure as the teeth of this gear and the crankshaft gear mesh, as shown. The spray of oil from the gears is then picked up by the revolving crankshaft and distributed throughout the crankcase and cylinder. Thus an ample supply of oil reaches all bearings and bearing surfaces.

There are no additional moving parts required to circulate the oil—if the crankcase has been filled to the proper level, oil circulation commences the instant the engine is started.

COOLING

The IRON HORSE is air cooled, being equipped with cooling fins on the cylinder and cylinder head to radiate excess heat generated within the cylinder. To insure an ample supply of air for cooling purposes under all conditions, a blower system is built into the engine. This blower consists of a series of air fins cast onto the face of the flywheel, which is covered by a shroud to continually direct a blast of air onto the cylinder and head, thus maintaining satisfactory operating temperature.

The cooling system requires no attention—in event of overheating see Trouble Chart, Page 17.

(NOTE:—A solid disc pulley of over 3 1/2" diameter should not be used on the flywheel side; however, if necessary to use a larger pulley, further information is available by writing to the factory.)
When mounting in an enclosure, be sure ample room is allowed for air circulation—provision must be made to permit fresh cool air to enter on flywheel side and sufficient opening to discharge heated air.

THE MAGNETO

The magneto, as supplied on the IRON HORSE, is a self-contained unit requiring no assistance from outside sources such as 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 back of the coil, magnetic field is built up about the armature core. As the plastic breaker point is opened by action of a cam on the distributor shaft, 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 winding of the coil, which is carried to the spark plug where it jumps the gap between the points to ignite the compressed charge in the cylinder.

Due to its rugged construction, the magneto will perform efficiently throughout the entire life of the engine. It requires no lubrication, and therefore no attention other than an occasional inspection of the breaker points and spark plug connections.

SPARK PLUG

A Champion J-6 (14MM), which can be purchased from any Champion dealer, is recommended for use in the IRON HORSE.
CARE OF THE IGNITION SYSTEM

SPARK PLUG—Remove spark plug for occasional inspection, cleaning and adjustment of points.

Correct setting of gap is .030".

Be sure porcelain or insulator is dry and clean before replacing. Wipe off with dry cloth to remove traces of moisture or residue.

Examine for cracked or broken porcelain. (Hard starting, missing and faulty operation are often caused by a defective insulator.)

Test plug by placing body of plug on cylinder head with ignition lead attached—crank engine to observe spark between points. (The spark may not be visible in bright light, nevertheless, a pronounced "snap" is audible if sparking takes place.)

CAUTION: Under no circumstances crank engine with spark wire detached—Doing so may injure coil or condenser.

IMPORTANT—-In event of requiring the installation of a new spark plug—BE SURE TO INSTALL A CHAMPION NO. J-6 (14MM).

MAGNETO—Under no circumstances should the magneto be tampered with unless it is evident that hard starting or faulty operation can be traced to some irregularity in it.

Before attempting to make adjustments, remove ignition lead from the spark plug—hold it approximately 1/8" from cylinder head; crank engine to observe spark. If a weak or no spark appears, the difficulty is most likely due to improperly adjusted, pitted or corroded breaker points.

In this event, it is necessary to remove the flywheel as follows:

-Remove shroud covering flywheel.
-Remove flywheel nut and pulley.
-Have someone grasp rim of flywheel to absorb shock.
-Strike end of crankshaft a light blow with soft hammer or mallet. (Be careful not to injure end of crankshaft.) One or two applications is all that is necessary. Puller may be obtained from Johnson Motors at nominal cost.

Upon removal of flywheel, notice the breaker points are operated by a flat surface machined on the crankshaft.

Examine condition of points by spreading with blunt instrument.

If pitted or corroded, turn crankshaft until points close. Insert small flat file between points—draw back and forth gently to dress down points. Insert new points if necessary.
To check breaker point gap—turn crankshaft slowly until points have opened and are wide apart.

Insert feeler gauge between points—Correct gap setting is .018" - .020".

If necessary to make corrections, loosen breaker plate adjusting screw. Page 12.

Increase gap by moving breaker assembly towards crankshaft—reduce by moving in opposite direction. (Note:—Breaker gap is governed by distance from follower to center of crankshaft when passing over flat section.)

Tighten breaker plate adjusting screw.

Replace flywheel, pulley and nut. (Make certain flywheel key is properly placed in keyway—this is IMPORTANT.)

Tighten nut with large wrench.

Replace shroud. Attach lead to plug—start engine as instructed. Operate ten to fifteen minutes—stop to retighten flywheel nut.

CAUTION—The flywheel is keyed to the tapered end of the crankshaft by a soft aluminum woodruff key. If the flywheel nut is not properly tightened in assembly or should loosen, the power strokes of the engine will cause the key to shear off flush with the crankshaft, without injury to either the crankshaft or zinc flywheel. Ignition timing, however, will be affected, and in this event the engine will commence to run irregularly and ultimately stop. BE SURE THE FLYWHEEL NUT IS TIGHT.

REMOVING CARBON AND CARE OF VALVES

After a long period of operation, it may be necessary to detach the cylinder head to remove carbon from combustion chamber, head of piston and valves.

—Remove carbon by scraping with blunt instrument being careful not to scratch head of the Lynite piston. Wash cylinder head, head of piston, valves and gasket with gasoline.

—Unless the valves and seats are bad, they need not be ground in—since it is necessary to remove only the excess carbon accumulation. This can be accomplished by turning the flywheel slowly until one of the valves has opened, and applying a small quantity of kerosene on the valve and valve seat. Turn flywheel until valve closes—make sure it has seated. Turn valve back and forth with valve grinding tool to work carbon off head and valve seat. Repeat same on both valves.

TO GRIND VALVES—If advisable to grind valves, due to blow-by and loss of compression: (Note—Cylinder is detachable from the crankcase and held in position by five tap bolts; also, that valve stems and spring are entirely inclosed and accessible only upon removal of the cylinder as shown in illustration.)
--Remove shroud, flywheel and armature plate as instructed on Page 13.
--Remove five bolts holding cylinder in position.
--Lift cylinder from crankcase.
--Compress each valve spring to withdraw retainer pins.
--Remove valves, retainers and springs. (Note--Exhaust valve head marked with prick punch.)
--Scrape excess carbon from valve head, stem, valve guide and seat in cylinder block. Wash with gasoline.
--Coat face of valve with medium fine valve grinding compound.
--Replace valve and grind by turning back and forth with valve grinding tool. Be sure valve is seated. One or two minutes of grinding should be sufficient. (A small spring placed under the valve head will simplify this operation.)
--Repeat same process on both valves.
--Wash valves and seats thoroughly with gasoline, being careful that none of the compound is washed into the cylinder.

Insert valves in original position. Check tappet clearance--this is accomplished by seeing that the valve stems (with valves seated) are flush with the base of the cylinder and tappets flush with crankcase bolting face as shown in illustration. Actual tappet clearance is obtained by installing a gasket of suitable thickness--should be .012".

If, after grinding, valve stems are found to protrude beyond the base of the cylinder, simply grind carefully until they are flush. (Make certain face of valve stem is square with stem.) Tappets are adjusted flush at the factory and should require no attention other than inspection.
--Reassemble valves, springs and retainers in the order in which they were disassembled.
--Place gasket in position on crankcase (coat both sides lightly with grease).
--Install cylinder--compress piston rings slightly to permit piston entering cylinder. Be careful not to break or bend rings. A sprung ring will never seal properly.
--Replace cylinder bolts--draw up evenly and tightly.
--Install cylinder head.
Replace armature plate, flywheel and shroud, as instructed on Page 13.

IMPORTANT—Be sure flywheel nut is tight. Operate engine ten to fifteen minutes, then retighten nut.

(CAUTION—It is IMPORTANT that all traces of carbon be removed from valve stem and guide. Failure to do so will result in sluggish valve action, and likewise interfere with efficient operation of the engine and starting qualities.)

TIMING

IGNITION—Since set ignition timing, with no advance or retard, is employed on the IRON HORSE, timing of the ignition is done at the factory and cannot be altered.

Width of the breaker point gap, of course, has some effect on timing; nevertheless if the breaker points are adjusted as instructed on Page 13, timing is correct.

VALVES—The valves are properly timed before it leaves the factory; therefore it should cause no concern. However, if the engine has been completely disassembled and the valves thrown out of time, proceed as follows: Note punch marks on cam and crankshaft gears.

Turn cam gear until the two punch marks are visible.

Insert crankshaft-meshing teeth in such a manner that the punch marked tooth on the crankshaft gear is meshed between the two punched teeth on the cam gear as shown. Complete reassembly of engine.
GENERAL INSTRUCTION BOOK

TROUBLE CHART

FUEL SUPPLY
- Tank empty.
- Fuel line clogged.
- Dirt in screen-tank
- Water or foreign substance in gas tank.
- Engine will not start if flooded. Allow to settle few moments before cranking again.
- Gum in gasoline (see page 4).

CARBURETOR
- Choke not functioning.
- Clogged jets and screen.
- Needle valve worked loose.
- Needle valve improperly adjusted.
- Loosely mounted.

SPARK PLUG
- Ignition lead detached.
- Fouled (carbon or oil)
- Improperly adjusted points.
- Porcelain cracked or broken.
- Porcelain covered with moisture or residue.

MAGNETO
- Pitted or improperly adjusted breaker points.
- Loose electrical connections.
- Defective condenser.
- Defective ignition coil.
- Key sheared off in flywheel.

UNEVEN RUNNING
(SURGING) IS
FREQUENTLY
CAUSED BY
- Defective spark plug.
- Improperly adjusted carburetor.
- Gasoline low in tank.
- Water or foreign substance in gas tank.
- Governor link injured—bent or twisted, causing excessive drag on governor arm and carburetor lever. Should be straight with no indication of binding.
- Loose electrical connections.
- Accumulation on magneto breaker points—pitted or corroded.
- Weak condenser, or ignition coil.

ENGINE
- Loss of compression—
  - Leaky valves.
  - Sticky valves.
  - (Valve stem and guide carboned)
  - Piston rings inactive.
  - (Ring grooves filled with carbon)
  - Governor spring broken or detached.

OVERHEATING
- Restricted air flow around engine.
- Engine over-loaded.
- Leaky valves.
- Piston rings seized in ring grooves.
- Excessive carbon accumulation.

KNOCKING
- Engine not properly mounted (loose).
- Engine over-loaded.
- Belt too tight.
- Carburetor adjustment too rich.
- Excessive accumulation of carbon.
- Flywheel loose.
- Connecting rod loose.
- Wrist pin and piston loose.

*See note on page 11.*
IMPORTANT—The Iron Horse engine is built like the engine in your car or tractor, except that it has but one cylinder. It has a cylinder, piston and rings, crankshaft, connecting rod, cam shaft, tappets, valves and an ignition system, and therefore requires the same attention.

Always use fresh oil as instructed in this booklet—change it regularly and add fresh oil when necessary—use fresh gasoline—pour it into the tank from a clean container.
LIST OF IRON HORSE DISTRIBUTORS AND REPAIR DEPOTS

BRITISH COLUMBIA
Courtney  Seale and Thompson  Modern Electric Co.
Cranbrook  Spurrier's Ltd.  Spurrier's Ltd.
Kelowna  Power Saw Sales and Service  452 Wallace Street
Nanaimo  Kootenay Motors Ltd.  Kootenay Motors Ltd.
Nelson  Northern Hdwe. and Furniture Co.
Prince George  HOFFARS LIMITED  (Parts Distributor)  1790 W. GEORGIA ST.
VANCOUVER
Vernon  Vernon Garage  564 Yates Street
Victoria  Angus Marine Sales

ALBERTA
CALGARY  WILKINSON ELECTRIC CO.
EDMONTON  (Parts Distributor)  127 7TH AVE. W.
GRANDE PRAIRIE  THE J.E. NIX CO.  (Parts Distributor)  10030-109TH STREET
LETHBRIDGE  FEE BROTHERS  (Parts Distributor)
ELECTRO SERVICE  (Parts Distributor)  813 3RD AVENUE S.

SASKATCHEWAN
REGINA  ELECTRIC MOTOR SERVICE  (Parts Distributor)  1734 BROAD STREET
SASKATOON  ASHMAN ELECTRIC SHOP  (Parts Distributor)  261 THIRD AVE.

MANITOBA
Brandon  Breen Motors Brandon, Ltd.
WINNIPEG  BREEN MOTOR CO.  (Parts Distributor)  247 MAIN STREET

ONTARIO
Belleville  Russell Products Co.
Brockville  Henry’s Machine Shop  Fred Gilbert Boat Works
Cobourg  C. H. Davidson
Campbellford  Wilson Motors
Grafton  Snetsinger’s Hdwe.
Dryden  District Hdwe. Electric
FORT WILLIAM  CANADA TIRE AND SUPPLY  (Parts Distributor)  119 S. MAY STREET
Gananoque  Thousand Island Boat Line Repair
Grove Park Lodge PO  Langford’s Pleasure Craft Service  Lake of Bays
Haileybury  Haileybury Garage
Hamilton  Strand Cycle and Sports
Hanover  Tanner and Zister
Huntsville  Huntsville Boat Works  747 King Street
Island Grove  F. H. Johnston
<table>
<thead>
<tr>
<th>Location</th>
<th>Name</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kapuskasing</td>
<td>W. G. Mott</td>
<td>Box 535</td>
</tr>
<tr>
<td>Kemptville</td>
<td>G. W. VanAllen and Son</td>
<td></td>
</tr>
<tr>
<td>KENORA</td>
<td>W. H. MARR LIMITED</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Parts Distributor)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>400 RAILWAY STREET</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R. McLenaghan</td>
<td>105 Lindsay Street</td>
</tr>
<tr>
<td>Kirkland Lake</td>
<td>Harold Wood</td>
<td>Manitoulin Island</td>
</tr>
<tr>
<td>Lindsay</td>
<td>R. C. McGregor</td>
<td></td>
</tr>
<tr>
<td>Little Current</td>
<td>GENERAL MARINE</td>
<td></td>
</tr>
<tr>
<td>LONDON</td>
<td>(Parts Distributor)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>229 HORTON STREET</td>
<td></td>
</tr>
<tr>
<td>Madoc</td>
<td>Chas. M. Derry</td>
<td></td>
</tr>
<tr>
<td>Marmora</td>
<td>W. R. Bonter</td>
<td></td>
</tr>
<tr>
<td>Midland</td>
<td>Midland Boat Works</td>
<td></td>
</tr>
<tr>
<td>New Liskeard</td>
<td>Bartlett's Auto Electric Service</td>
<td></td>
</tr>
<tr>
<td>Niagara Falls</td>
<td>Crawford Motor Sales</td>
<td></td>
</tr>
<tr>
<td>NORTH BAY</td>
<td>YOUNG'S MARINE (Parts Distributor)</td>
<td></td>
</tr>
<tr>
<td>Odessa</td>
<td>John Porter</td>
<td></td>
</tr>
<tr>
<td>Oshawa</td>
<td>Ontario Motor Sales</td>
<td></td>
</tr>
<tr>
<td>OTTAWA</td>
<td>BLAIR EQUIPMENT LTD.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Parts Distributor)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50 QUEEN STREET</td>
<td></td>
</tr>
<tr>
<td>Owen Sound</td>
<td>Frank Slater</td>
<td></td>
</tr>
<tr>
<td>Parry Sound</td>
<td>Wilson Marine Sales and Service</td>
<td></td>
</tr>
<tr>
<td>Pembroke</td>
<td>C. A. Bailey</td>
<td></td>
</tr>
<tr>
<td>PETERBOROUGH</td>
<td>PILON MARINE SALES AND SERVICE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Parts Distributor)</td>
<td></td>
</tr>
<tr>
<td>Picton</td>
<td>Prince Edward Motors</td>
<td></td>
</tr>
<tr>
<td>Port Arthur</td>
<td>C. A. Auld Supply Co.</td>
<td></td>
</tr>
<tr>
<td>Port McNicoll</td>
<td>J. W. Magnus Co.</td>
<td></td>
</tr>
<tr>
<td>Rosseau</td>
<td>Clarence Swift</td>
<td></td>
</tr>
<tr>
<td>Smiths Falls</td>
<td>Rideau Marine Depot</td>
<td></td>
</tr>
<tr>
<td>St. Catharines</td>
<td>Niagara Marine</td>
<td></td>
</tr>
<tr>
<td>St. Thomas</td>
<td>E. S. Walker</td>
<td></td>
</tr>
<tr>
<td>Sturgeon Falls</td>
<td>Archie Merchant</td>
<td></td>
</tr>
<tr>
<td>Sudbury</td>
<td>Sudbury Boat and Canoe Co.</td>
<td></td>
</tr>
<tr>
<td>TORONTO</td>
<td>A. E. BROWN MOTORS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Parts Distributor)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>61 MAIN STREET</td>
<td></td>
</tr>
<tr>
<td>Toronto</td>
<td>CURREY BULMER OUTBOARD CO.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Parts Distributor)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>858 EGLINTON AVE.</td>
<td></td>
</tr>
<tr>
<td>Trent River</td>
<td>Can. Marine Equipment Ltd.</td>
<td>155 King St. W.</td>
</tr>
<tr>
<td>Tweed</td>
<td>Openshaw and Son</td>
<td></td>
</tr>
<tr>
<td>Windsor</td>
<td>C. R. Maguire</td>
<td></td>
</tr>
<tr>
<td>QUEBEC</td>
<td>Morris Willard Battery Service</td>
<td>542 Chilver Road</td>
</tr>
<tr>
<td>Chateauguay Basin</td>
<td>Garage Handfield</td>
<td>12 Morin</td>
</tr>
<tr>
<td>Chicoutimi</td>
<td>Quenneville Reg'd.</td>
<td></td>
</tr>
<tr>
<td>MONTREAL</td>
<td>H. E. HEBERT REG'D.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Parts Distributor)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4291 FRONTENAC ST.</td>
<td></td>
</tr>
<tr>
<td>MONTREAL</td>
<td>P. A. TREMBLAY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Parts Distributor)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4316 ST. CATHERINE</td>
<td></td>
</tr>
<tr>
<td>Montreal</td>
<td>Federal Marine Co.</td>
<td>814 St. James St.</td>
</tr>
<tr>
<td>Province</td>
<td>City</td>
<td>Name</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Quebec</td>
<td>Rouyn</td>
<td>JOS. BASTIEN AND FILS</td>
</tr>
<tr>
<td></td>
<td>Three Rivers</td>
<td>(Parts Distributor)</td>
</tr>
<tr>
<td></td>
<td>Verdun</td>
<td>Tremblay's Sports Center</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Delisle Auto Accessories Ltd.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Paul E. Bergeron Mach.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Verdun Outboard Supplies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1624 St. Philippe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5129 Wellington St.</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>Campbellton</td>
<td>Stewart C. Kelly</td>
</tr>
<tr>
<td></td>
<td>Fredericton</td>
<td>Capital Garage</td>
</tr>
<tr>
<td></td>
<td>Moncton</td>
<td>R. K. Buzzell</td>
</tr>
<tr>
<td></td>
<td>St. John</td>
<td>L. E. WHITTAKER CO. LTD.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Parts Distributor)</td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>Halifax</td>
<td>CLEVE'S SPORTING GOODS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Parts Distributor)</td>
</tr>
<tr>
<td>Newfoundland</td>
<td>St. Johns</td>
<td>CHARLES R. BELL LTD.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Parts Distributor)</td>
</tr>
</tbody>
</table>