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# *DIRECTION FOR USE.*

FOR THE

# **M A R N A**

5 HP. PETROL ENGINE.

1 SYL. TYPE H.

ENGLISH TRANSLATION.

## C O N T E N T S

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S P E C I F I C A T I O N .THE "MARNA" 5 HP ENGINE. TYPE H.

Capacity. 5 HP ( European ).

Normal Number of Revolutions. 800 : 900 R.P.M.

Bore. 110 m/m.

Stroke. 120 m/m.

Piston Displacement. 1140 cm<sup>3</sup>.

Weight. When equipped with clutch, rear overhead starting crank and variable pitch propeller: 240 kg.

Cylinder Head. Removable and based on the Ricardo Principle.

Cylinder Block and Crankcase. In two parts, which facilitates removal of the Crankcase.

Ignition. First class H.T. Magneto with Impulse Coupling. The megneto being driven by a special pinion.

Piston. Manufactured from the highest quality Cast Iron.

Lubrication. Wick apparatus for the Cylinder, Crank Shaft Bearing and the Pump Eccentric Bearing, and splash lubrication in the Crankcase.

Carburettor. Equipped with adjustable or fixed needle.

Propeller Equipment. Variable pitch two bladed propeller, dia. 415 m/m.  
Shaft and tube of yellow metal.

Shaft Dia. 7/8". Tube Dia. 1.1/8".

Connecting Rod. Manufactured of forged steel in H. Section, which gives the highest security against fractures.

Connecting Rod Bearing. Of special alloyed White Metal, dimension 1.1/4"  $\phi$ . Dimension of Crank Shaft Bearing 1.5/8"  $\phi$ .

Crank Shaft. Forged from highest quality steel, and is of strong proportions, with 1.3/4" in diameter of the bearing.

Timing Shaft. Of Tempered steel and ground on all sliding surfaces.  
Cam and Shaft are manufactured in one piece.

The Timing Assembly consists of three pinions, crank shaft gear adjustable, intermediate pinion, and timing shaft pinion.

Valves. Of Chrome Silicium Alloy Steel. The linings are easily removed.

The valve seats are flush with the top of the Cylinder Block, give good cooling, and easy grinding in of the valves.

Cooling. The Pump is of metal, driven by an eccentric wheel on the Timing shaft.

The "MARNA" 5 HP Type H engine is normally supplied with one of the following three equipments:

Equipment B. Variable pitch propeller.

" F. " " " and clutch

" G. " " " " " , rear overhead  
starting crank.

Equipment B. The engine must be started by means of the Flywheel. The propeller can be adjusted in forward, neutral and reverse, but cannot be disengaged when the engine is running.

Equipment F. The engine must be started by means of the Flywheel. The propeller can be adjusted in the three positions as above, and can be disengaged when the engine is running.

Equipment G. The engine is started with a crank, at rear of the engine. The propeller can be adjusted in the three positions, and can be disengaged when the engine is running.

The "MARNA" 5 HP Type H engine is equipped with the highest quality type of magneto with impulse starter. The magneto is secured to the engine with a clamp, which locks with a simple screw.

The Carburettor is either of F. M. manufacture, with adjustable needle, or of the Simplex, M. A. type with Self Regulation.

## I N S T A L L A T I O N .

Correct and accurate installation is the first requirement for the satisfactory performance of a marine engine, as faulty and inefficient mounting can cause overheating, serious abrasion, loss of power, and excessive vibration, etc.

### The Foundation.

The wooden foundation for the engine must be of first class material, preferably of oak, and it should consist of two beams, of a minimum thickness of 3". These should be firmly fastened longitudinally in the boat so as to avoid undue vibration, and when in position their height above the thwarts should not exceed 2.1/2".

Careful attention to fitting the foundation will pay good dividends.

In most cases the Reversing Apparatus can be mounted on the engine foundation, and therefore the latter should be a proportionate length, while ensuring that there is sufficient clearance at the fore edges for the Flywheel. (Refer to the Diagram, which gives dimensional and positional details for correct mounting).

Before the engine is bolted down it is essential to ensure that the axis of the engine and propeller shafts are in alignment, and this should be done as follows:

The couplings of the shafts should be fitted flush into each other and the propellershaft turned by hand, then if correct alignment has been attained, there will be no visible opening between the couplings. The engine can be finally bolted down on completion of this test, although it will be necessary to check the alignment of the shafts again after the engine is in position, and the couplings must therefore be slackened for this purpose.

### Examination of the Foundation.

After a period of time, the engine and propeller shaft couplings must be slackened yet again, in order that the continued accuracy of the shaft's alignment can be checked. This is necessary as the foundation beams have a tendency to warp when waterlogged.

When mounting the engine ensure that the Flywheel is fastened securely to it's shaft.

### The Exhaust Pipe.

This must be as straight as possible, and free from sharp bends, and if it is to be laid longitudinally under the deck boards, out under the stern counter it will be necessary for it to be cooled. This can be done by the following two methods:

A) A Three ways tap can be fitted to the engine, so that some of the water from the Cooling System can be diverted into the exhaust pipe. In addition to cooling the pipe, this will also considerably muffle the sound effects of the engine's explosions, thus making a silencer unnecessary, although one of these is supplied with each engine.

There is however, one disadvantage in this method, and that is a danger of rust corrosion in the engine due to the penetration of water and saturated steam into the valves and cylinder.

A one cyl. engine never stops momentarily, the piston always going back a little, thus drawing water into the engine.

B) An outer conduit can be fitted to enclose the exhaust pipe, (with the silencer placed as far aft as possible) and water can be diverted from the cooling system again, so that it enters this conduit through a union, placed as rear to the engine as possible, and thus circulates around the exhaust pipe. The silencer should be fitted at the end of this outer tube, in such a way that it passes through the side of the boat, where the water is eventually discharged. The actual exhaust outlet must be a reasonable height above the water line, and a drain cock should be fitted at the lowest point of the tube, for draining the water during frosty weather.

The most economical and convenient method of fitting the exhaust pipe is to lead it direct from the engine manifold, to, and over the side of the boat, with the silencer placed a little distance under the top edge of the side. There is then no necessity for cooling the pipe, but care should be taken that neither the exhaust pipe or the silencer are actually in contact with the boat's wood work, as obviously, there would be danger of scorching and smouldering.

The discharge pipe for the waste water from the engine's cooling system, must in every instance be fitted so that a free flow of water from the engine is ensured, and if some of the water is used to cool the exhaust pipe, (as described above) it must be drained off before the engine is stopped. This precaution will minimise rust damage in the engine.

The discharge pipe itself should be curved down from the union on the cylinder head, past the exhaust manifold, and under, or along the deck to its point of outlet through the boat's side, which should be approx. 12 - 14" above the water line. At the lowest point of the pipe a drain tap should be installed.

#### The engine's Deck Casing.

The wooden deck casing for the engine should be solidly constructed, waterproof and easily removable. The best method of constructing this is to screw the rear section of the casing to the two side walls, with the fore section (in the form of a door) secured by a hook. The controls for regulating the magneto and carburettor should be fastened to the rear section, so that there is no necessity to remove the fore door when the engine is running.

INITIAL RUNNING.

When the engine has been fully installed, and it is ready for the first trial running, the following points should be observed:

Ensure that the bilge cock, from which water enters the Cooling System is open, so that a free flow of water is ensured, and when the engine has been started ensure that the waste water is being discharged from the union on the Cylinder Head. It is important to check this, as there is always a possibility of a leaky packing etc. so that air is drawn into the pump, and obviously, this will cause overheating. If the water is being steadily discharged, the Cooling System is satisfactory. Nevertheless, although everything may appear to be in order, the pump may still not be drawing water, and this trouble can often be remedied by unscrewing the valve cover, and inserting a little lubricating oil into the pump. It should then, in nearly every instance function satisfactorily.

Although it is self evident that the Flywheel must be fastened securely to its shaft, this point should be checked again before the engine is started, as a loose Flywheel can cause a "Knocking" in the engine, and this can be difficult to locate.

Every engine contains a full supply of lubricating oil in the Crankcase before it is despatched from the Factory, but nevertheless, this point should be checked, the correct level being when the projection on the base of the Connecting Rod is just touching the surface of the oil.

The Free Coupling or Clutch must also be checked to ensure that it contains sufficient oil, and the Oil Reservoir, situated on the engine, must be filled up to a point just below the wick insertion tubes. The wicks should be withdrawn when the engine is not running, so as to conserve the oil supply.

At the beginning of the engine's "running in", it is most essential that the Reversing Bearing, sleeve bearing, and the bearing in the rear edge of the Free Coupling or Clutch are carefully greased. The three grease cups should be turned a little, so as to ensure that they contain sufficient grease before each running period, and always ensure that there is a tightly closed container of good quality, acid-free grease in the Boat.

When starting, the engine should be "choked" once or twice, so that there will be a rich mixture in the cylinder, and the air intake should be almost fully open. After starting, the engine should be throttled down to slow speed, as it will "race", if the air intake is nearly fully open, with an uncoupled propeller. This is undesirable and should be avoided.

If the engine is equipped with Free Coupling and Reversing Apparatus, it will often be found that if the propeller blades are set at full pitch and the control lever is put fully forward, this setting is too powerful for the engine's power capacity. If that is the case, the pitch of the blades must be adjusted, until the engine runs at a full speed of 800 - 900 R.P.M.

While the engine is being run in it is a sensible precaution to avoid running at full speed for too long periods. If the engine is equipped with a carburettor of the fixed needle type, for instance a Simplex or M. A., the full and low speed jets should not be interfered with, as they are correctly adjusted at the Factory during test running.

## N O R M A L   R U N N I N G .

The engine is sufficiently run in after a duration of approx. 50 hours, and it can then be safely run at full speed for as long as is desired. But "racing" the engine should be avoided, as a one cylinder engine necessarily vibrates a great deal when it is running at full revolutions.

It is important to ensure that the propeller blades are correctly pitched, and the engine revolutions should not exceed 800 - 900 R.P.M. These should be checked with a tachometer, although the beat of the engine will soon be a sure indicator of correct or incorrect pitch.

When in shallow water, and in the vicinity of flotsam, driftwood, rocks etc. great care should be taken to avoid contact with such obstructions by the propeller, as the blades can be easily bent or broken by impact. It is advisable, when running under the above conditions, to have full control of the Free Coupling lever, so that the propeller can be disengaged instantly, when necessary.

On taking the boat into a mooring or a quay, the following procedure should be adopted:

When approx. 70 - 80 yards distant from the quay the engine should be throttled down to low speed, and when the distance has decreased to approx. 30 yards, (depending on such factors as wind, currents, and the boat's burden) the propeller should be disengaged, and the boat put in full reverse. When only a short distance from the quay, say 5 - 10 yards, the propeller should be engaged again, and with that the boat will go astern, thus entirely braking the forward speed.

## C A R E   O F   T H E   E N G I N E .

If a petrol engine is to work satisfactorily the ignition must be in good order, and the magneto must always be kept dry. (Refer to the section: Ignition). The petrol supply must also be in good order, and the petrol pipe should be blown through and cleared periodically.

The carburettor should be clean, and as after a time a little water will always collect in the Float Chamber (and also in the petrol tank itself) both should be drained from time to time to avoid engine stoppages.

Difficulties with the engine will also be normally avoided if the circulation of the Cooling System is regularly checked, and correct lubrication is of the greatest importance. ( Refer to the Section: Lubrication).

The engine should always be in a clean condition, and any rust should be scraped off, and the affected section repainted with heat resisting paint.

After a time the engine may become loos on it's foundation, owing to vibration, and this point should be checked. The Flywheel should also be checked at regular intervals to ensure that it is firmly secured to its shaft.

The repair and overhaul of the engine should always be undertaken by a skilled mechanic, and it will always pay to have this done at a qualified workshop, or alternatively to return the engine to the Manufacturers. "MARNA"s Agents can generally supply Spare Parts, and substitutes for the authorised components should not be used.

After some time it should be necessary to remove the Cylinder Head and Piston for decarbonisation, and the valve clearances should be checked. The suitable clearance for the Exhaust valve is 0,4 m/m and 0,4 m/m for the Inlet valve. This clearance is necessary, as the valves, getting warmer than the Cylinder, expand, and they can become burnt thus causing stoppages. This work should be carried out by a workshop in case the special tools required are not available, or if the valve adjustment proves difficult.

### S T A R T I N G D I F F I C U L T I E S .

Starting difficulties can usually be traced to faulty ignition or an obstructed petrol supply. When cold the engine should normally start after the carburettor has been choked, although it may be advantageous to prime the engine with a little petrol, sufficient for it to run for one or two revolutions.

If starting continues to be difficult after this, and providing there is good compression, the ignition should be checked. The spark plug should be removed, and the strength of the spark tested, by putting it in contact with the Cylinder Head while the engine is turned once or twice. If the spark is weak, this can quite often be remedied. (Refer to Section: Ignition).

The engine can sometimes be turned without resistance and if this occurs the valves may be sticking, due to dirt, etc. lying in the valve seat. This can often be remedied by inserting a screwdriver into the valvespring, and pressing it upward, then releasing it suddenly. This ought to clear the obstruction, but before doing it, ensure that the valve is right down, that is to say, the valve pusher is in it's lowest position.

If the engine starts and then stops again, the fault is nearly always due to failure of the fuel supply, and the pipe from the tank to the carburettor must be checked for possible obstructions. The carburettor must also be checked. (Refer to Section: Carburettor).

Another reason for this type of stoppage can be an over supply of petrol, which can soak the plug. This must be removed and dried, and while the petrol supply is turned off, the engine should be turned over once or twice.

### F R O S T P R E C A U T I O N S .

Frosty weather is in no way detrimental to the normal running of the engine, providing the following precautions are carried out:

The Cooling System must be drained whenever the engine is not in use, and this should be done when the engine is still warm. It is important to remember that if water remains in the pipe and water jacket it will freeze and expand, thereby ruining the Cylinder Block and Cylinder Head, which are both expensive to replace.

When the engine is stopped, the drain tap on the starboard side of the

Cylinder Block must be opened two or three turns, so that the flow can be clearly seen. The tap on the pump and on the waste pipe should also be opened, providing the latter is so fitted that it cannot be self drained. The bilge cock should be closed.

When the engine is started again ensure that all these taps are open, and that the waste water is being satisfactorily discharged, as if the waste pipe is frozen the pressure from the pump will, having no outlet, burst the cylinder.

It is obviously more difficult to start the engine during cold and frosty weather as the oil is congealed and the bearings work sluggishly. Therefore, extra choking and priming are necessary. It should be remembered that the engine's normal temperature is 70° C, and thus it is expedient to raise it's temperature as soon as possible.

An engine always wears when it is run for many short periods, (with sufficient intervals for it to become cold ) than when it is run for long periods at it's correct temperature.

### M A I N T E N A N C E.

Careful and regular maintenance will always pay good dividends, as it will prolong the life of the engine, and will help in avoiding annoyances such as engine stoppages, and the unnecessary purchase of spare parts. Prevent rust on the iron parts, check the foundation and the propellershaft regularly. Clean the engine at frequent intervals, and if the engine is dismantled the components must be conscientiously and accurately re-assembled. However, maintenance is first and foremost a matter of correct lubrication.

### L U B R I C A T I O N.

The life of an engine is entirely dependent on it's correct lubrication, only the highest quality lubricants should be used, and in fact, only the highest grade automobile lubricating oil is good enough for this purpose.

During the summer, oil of viscosity SAE 30 should be used in the Crankcase, and the Oil Reservoir, and SAE 20 during the winter.

The Free Coupling should always be lubricated with a thinner oil than that used in the Crankcase, as a thicker oil will cause disengaging difficulties. SAE 20 or SAE 10 is suitable for this purpose.

The Crankcase should contain approx. 2 pints of oil, which should then just touch the projection on the Connecting Rod. The engine will become overheated if there is superfluous oil in the Crankcase, and care should be taken to avoid this. A Consistent high level should be maintained in the Oil Reservoir, as the wicks will have difficulty in functioning if the oil level falls too low. The wicks should be inserted whenever the engine is running.

The oil in the Crankcase should be changed periodically, and in the case of a new engine it should be changed after the consumption of every 12 gallons of petrol (approx.) and eventually after every 25 gallons have been consumed.

The Crankcase can be drained by unscrewing the cover on the side of the engine, and the oil can be withdrawn with a suction pump. After this has been done, there may be a sludge deposit at the bottom of the sump, and this should be removed with a whole cloth, the sump being thoroughly cleaned and dried afterwards. Cotton waste or rag must never be used for this purpose, as these materials have a tendency to shred, and if any loose threads remain in the pump they can obstruct the oil channels.

The oil in the Free Coupling should also be changed, but it will only be necessary to do this when there is insufficient oil to cover the rotary parts of the Coupling, or when every 62 gallons of petrol have been consumed.

The grease cups situated on the sliding bearing in the rear edge of the Free Coupling, the Reversing Apparatus, and on the Intermediate Sleeve, must be filled with good quality, non-acid grease daily. The propellerhead must also be regularly filled with grease, or whenever approx. 35 gallons of petrol have been consumed.

#### THE USE OF AN ALTERNATIVE FUEL TO PETROL.

The MARNA engine is constructed to operate on petrol fuel, and as other fuels will never give the same satisfactory result their employment is not recommended. However, if circumstances necessitate the use of a substitute for petrol, the following procedure should be adopted:

The best substitute fuel is a mixture of White Spirit and 1/20 Lubricating Oil. Tractor petrol can also be used. There are certain disadvantages in the use of these fuels, i. e. the engine will be unable to run with advanced ignition, as this will cause knock.

A larger compression chamber will almost certainly be necessary, and as the engine must be started on petrol, before the other fuel can be used, two fuel tanks or a twin tank must be fitted. The switch over of the two fuels should take place when the engine is sufficiently warm after starting. This procedure must be reversed before the engine is stopped, so as to ensure that the supply pipe and the carburettor only contain petrol.

The higher calorific value of substitute fuels is another rather dangerous disadvantage, as this factor is responsible for incomplete combustion. Thus the fuel can easily penetrate between the piston and the cylinder lining to the Crankcase, where it blends with the oil. For this reason it should be an invariable rule to check the quality of this oil very carefully, as the engine can wear out in a remarkably short time.

Every MARNA owner who uses an alternative fuel to petrol, must inevitably reckon on particularly serious engine wear.

#### WINTER STORAGE.

If the boat is to be laid up ashore during the winter months there is one particular point to be observed, for even if the boat is to be stored in a boat house the magneto must be removed and kept in a dry place.

It is obvious that ALL THE WATER MUST BE DRAINED FROM THE ENGINE, and IN EVERY CIRCUMSTANCE IT IS ESSENTIAL THAT THIS IS COMPLIED WITH: It will be advantageous to pour a little oil into the water jacket of the engine, after the water has been drained, to prevent the formation of rust, and if the engine is to stand in a damp exposed place it should be packed with dry cloth, for the same reason.

Before the engine is brought into service again it should be cleaned inside and out, and any rust which may have formed should be scraped off, the affected portions being repainted with a heat resisting paint.

The Crankcase, Free Coupling and the Oil Reservoir must be refilled with fresh oil, and all the grease cups refilled with new good quality grease. The axis of alignment of the engine and propeller shaft must be checked, as the foundation may have warped during the course of the winter.

The petrol supply pipe and the carburettor must also be cleaned, as must the boat's water intake filter, and the intake for the Cooling System

#### C O O L I N G   S Y S T E M .

As the MARNA 5 HP is a heat engine, it is obvious that it becomes hot when running, and the correct temperature, after a reasonable period of running is approx.  $70^{\circ}\text{C}$ , or when the hand cannot be held with comfort on the Crankcase. It is important therefore to realize that engine wear is due more to a low temperature than to a high one, and that a high grade oil will not be ruined unless the engines temperature clearly rises above  $100^{\circ}\text{C}$ .

The Cooling System's pump is a piston pump, and it is operated by an eccentric pulley which is attached to the Timing shaft. Therefore, the pump should receive half the velocity of the propellershaft.

Water enters the Cooling System via a bilge cock, which is fitted so that there is no possibility of air being drawn into the system, and a filter is fastened outside the boat's water intake to prevent the penetration of weed, etc. This filter is fastened with the holes reversed.

The pump valves will wear a little, after some years use, and they ought to be inspected, and ground in, if necessary.

The water is driven from the pump into the Cylinder jacket, circulates the Cylinder and Cylinder Head, and is subsequently discharged from the boat through the waste pipe. After the engine has been started it is most important to ensure that the water is circulating freely because the pump can often be prevented from functioning properly by dirt, etc. lying in the valve seating and thus the engine will very soon become overheated.

If the pump will not work, even although there is apparently nothing wrong with the valves, etc. and if all the taps are open, the circulation can often be started by unscrewing the pump cover for the insertion of a little oil.

The Eccentric Pulley is lubricated direct from the Oil Reservoir.

## C A R B U R E T T O R.

The MARNA 5 HP engine will most often be supplied with one of the three types of carburettor, as under:

### 1. The F. M. Carburettor, with adjustable needle.

#### Operation:

The petrol enters the Carburettor at (a) via the supply pipe from the tank, passes the needle valve (b) and enters the Float Chamber. The Cork float (d) is mounted on a double armed lever, which is pivoted at (c) the other end of which is in the form of a claw. This claw grips in a slot on the needle valve, so that as the float rises, with the inflow of petrol into the Float Chamber, the arm descends, forcing the needle valve downwards, thereby closing the supply of petrol. As the petrol is consumed, the float sinks sufficiently to allow the arm to rise, which in turn allows the needle valve to open the supply of petrol again. Thus there is always a constant quantity of fuel in the carburettor.

The petrol is drawn from the Float Chamber by suction, and passing the needle valve (e) enters the inner chamber, where it mixes with the air, and is subsequently sucked into the engine. The quantity of petrol can be regulated by the forward or backward movement of the adjustable needle (f), and the air supply can also be regulated by adjusting the pressure of the conical spring (h) by screwing or unscrewing the adjustable screw (i). The mixture itself can be regulated by the damper (k) which can be opened to a large or smaller distance.

#### Use with the Engine.

In most cases, it will be sufficient if the adjustable needle (f) is opened approx.  $1/2$  or  $3/4$  turn, and when it is desirable to run at a low speed, the needle should be turned inwards a little, which reduces the quantity of the petrol. Most power is obtained from the engine when the conical spring (h) is fully slackened, but if a little more economy is desired, the adjustable screw should be turned inwards a little, so that the spring presses tighter against the leather packing. However, it is of no avail to screw it too far in, as this only results in a broken spring.

It is of the greatest importance that the engine always receives a suitably blended mixture from the carburettor, as if there is more petrol than air the mixture becomes too rich, so that complete combustion, is difficult to attain. As a result, the engine smokes. If the mixture is too rich, and the engine is running at low speed, misfires will result, and it is quite possible for the engine to only fire every other time instead of in correct sequence (the so-called 8-stroke).

A mixture containing too little petrol will cause a slow speed, in that the engine runs irregularly, and the carburettor will often bang. The correct blending for the mixture should therefore be found as follows:

The adjustable needle (f) should be opened so that there is certainty of the engine being able to start (approx.  $3/4$  - 1 turn of the needle should be sufficient). When the engine has been started, run it at full speed, and close the needle carefully until a decrease in the revolutions can be clearly heard. Thus, it is obvious that the engine requires more petrol, and the needle should be opened again until a satisfactory result is obtained.

### Possible faults which can arise.

The float must always be able to rise and fall freely, and if it becomes crooked, so that it is in contact with the walls of the floatchamber, the needle valve will be unable to operate satisfactorily. Therefore, when fitting the float in position, ensure that it does not touch the walls of the chamber.

There is always a possibility that in time the float can become so saturated with petrol that it loses it's buoyancy, with the result that the level of the petrol rises excessively, thereby flooding the carburettor. A new float should be fitted, and the correct level of the petrol should be a little distance over the nozzle opening (e).

Another fault can arise from the cork packing (o) which can become loose. This should be changed if it is unsound.

The engine cannot be regulated to slow speed if the damper (k) is not fitting level and tight to it's wall, and the conical spring (h) and the leather valve (q) must be in order. If either of these two latter parts become damaged they must be renewed.

Water can often be found in the petrol, and as a rule, it will collect at the bottom of the carburettor. Therefore, a periodic inspection should be made by opening the tap at the base of the carburettor. If water is present, the carburettor should be drained, until only unadulterate petrol remains.

### 2. The Simplex Carburettor. (Self Regulating).

Attention must be paid to the fact that this carburettor demands a differently constructed exhaust manifold so that required for the F. M. type, although the exhaust pipe itself can remain unchanged.

#### Operation.

The petrol supply pipe is connected to the swivel union (N) which can be turned in any direction required by loosening the screw (K), and this screw must also be loosened if the filter (which the petrol must pass) and which is situated in N is to be removed for cleaning.

The carburettor is equipped with two adjustable jets for regulating the quantity of petrol, and full speed is obtained by the adjustment of jet A, while jet B regulates the quantity of petrol required for low speed. The jets are correctly adjusted when the carburettor is despatched from the Factory, but if further adjustment is necessary the following directions should be followed:

#### Jet A. For full speed running.

To adjust this, open the screw A approx. 1 - 1.1/2 turns, or so much that it is certain that there is enough petrol to enable the engine to start. When the engine has become normally warm, the screw should be tightened until the revolutions decrease, or also when there is a banging report from the carburettor. This is a sure indication that the engine requires more petrol, and the screw A must be opened again gradually until a satisfactory result is attained.

#### Jet B. For low speed running.

The adjustment of this jet is entirely opposite to that required for jet A, as the maximum amount of petrol is supplied from B, when the

screw B is fully screwed down.

This screw should be opened a little, so that less petrol is supplied to the engine, and the speed of the latter can be regulated by adjusting screw E, until a satisfactory rate of revolutions have been achieved. The correct quantity of petrol which should be supplied by the jet can also be gauged by careful listening, and as a rule this amount can be obtained by opening screw B approx. a quarter of a turn from it's fully screwed down position.

Any water which may have mixed with the petrol will settle at the bottom of the carburettor, from where it can be removed by means of the drain tap.

The opening or closing of the air damper D regulates the engine's running, and if, when starting, it is necessary for the engine to be choked the damper must be closed, and the engine turned over once or twice.

### 3. The M. A. Carburettor. ( Self Regulating ).

This type requires the same exhaust manifold as does the Simplex.

#### Operation:

This carburettor is a jet type, with adjustable main and slow running jets. It is constructed entirely of metal, and being in two parts is simple to dismantle. The upper and lower sections can be taken apart by removal of the two side screws, but care must be taken that the waste pipe (which is soldered firmly into the upper part) is not detached.

The carburettor is equipped with a metal float, which is controlled by a pivot situated in the centre of the Float Chamber in such a way that the float cannot stick. It operates on the needle valve in the centre, so that the greatest pressure is attained, and the inlet is fitted with a gauge filter for the collection of sludge, which will eventually occur in the petrol.

There is a choke damper, for use when starting and for frosty conditions, together with an air damper for speed regulation, and waste petrol, which may collect in the well at the bottom of the air passage, when the engine is running at low speed, is gathered by the waste pipe fitted to the side of the carburettor.

The adjustable main connecting jet stands on the right side of the carburettor when the air inlet is to one's front. The adjustable low speed jet is situated over the float chamber, under the flange, and the auxilliary jet is screwed into the left side. In addition, an air jet is fitted for the supply of air in the connecting channel. When the carburettor is dismantled, the jet can be seen through which petrol flows, when the engine is running at slow and transitional speeds, and there is a screw situated in the front edge, directly under the flange. This is for air regulation when running at low speed.

The air regulating screw should be opened a little, when the engine is being started, and the low speed jet should be opened about one turn, while half a turn is sufficient for the main jet. After the engine has started, the main jet should be regulated until steady running has been attained, and the most certain method of regulation is: To screw the main jet in until the engine slows down, and then open it again gradually until the engine is running steadily. When this adjustment is made the damper must be fully open.

The low speed jet can be subsequently regulated accordingly, and if the engine has too high a speed, the screw in the front edge of the carburettor should be adjusted until a satisfactory speed is achieved. The engine should then be regulated uniformly in all positions.

All carburettors are tested before being despatched from the Factory, and are therefore correctly adjusted so that under normal circumstances there should be no necessity to alter the settings.

### I G N I T I O N .

The MARNA engine is equipped with a High Tension magneto with an impulse coupling. A strong spark from the spark plug is a vital factor in guaranteeing starting, and different plug manufacturers employ different terms for a plug's capacity. Therefore, a plug of suitable strength should be used, proportional to requirement, and the distance between the electrodes should be approx. 0,8 mm.

Care should be taken to ensure that the lead from the plug to the magneto is well insulated, and that it does not short circuit the current, as after some time it may become cracked.

The magneto is firmly secured, but in such a simple manner that it is easily removable. To do this, the lock nut on the underside of the bracket should be slackened, and then the clamp can be unscrewed. The magneto cannot be wrongly replaced, as the bracket is made on a specially turned pattern.

If magneto failure occurs, a first check should be made to see if the platinum pin is burnt, and if this is apparently in good order, a new plug should be tried, and the lead should be checked. (The pin can be seen when the front cover is removed.) In the event of none of these parts giving cause for the magneto's failure, no self attempt should be made to repair it, but it should be taken to a qualified workshop, or returned to the Factory for overhauling.

A new, dry plug should always be held in reserve, in the boat.

The magneto's impulse is such that even if the engine is only turned slowly by hand, a good spark will result from the plug, and thus the engine is easy to start. When the engine has started, the impulse couples out automatically.

The correct time of ignition for the magneto, when it is retarted, coincides with the Top Dead Centre position of the piston, and ignition occurs at the exact moment when the platinum pin opens. If it is necessary to adjust the magneto, the following points should be observed:

The spring loaded handle of the Flywheel is so bored that it is at it's highest point when the piston is at Top Dead Centre. Thus the engine should be turned very slowly by hand, until the platinum pin is seen to open when the handle reaches its highest point. (The magneto is still at retarded ignition) Suitable advanced ignition is attained by setting the magneto on higher ignition, but careful attention must be given that the normal time of ignition of the magneto, and of the impulse must vary a little, since that of the impulse must always occur later than that of the magneto. Therefore, there must be certainty that the impulse does not operate before the piston has reached Top Dead Centre, or else back stroke can occur.

The time of ignition of a Bosch magneto can be adjusted by loosening the screw situated directly in the front edge of the magneto. When this has been unscrewed, the cover can be pulled off, and two screw heads will be seen. These should be slackened, so that the plate which they hold in place can be adjusted, and this in turn adjusts the impulse release mechanism. The impulse ignition is advanced when the plate is turned against the direction of the arrow, and retarded when turned with it.

### THE REAR OVERHEAD STARTING.

To facilitate starting, and for the sake of convenience as regards position in the boat, a MARNA 5 HP engine can be fitted with a rear overhead starting crank, called back start.

It consists of a frame, which contains a starting shaft, and a chain, for transferring the turning moment of the crank to the engine shaft. The chain is of the following dimensions:  $1/4"$  x  $5/8"$  x 1,04 m/m with a  $5/8"$  chain lock.

The starting shaft is lubricated by means of a grease cup situated in the front edge of the shaft, and this cup should be screwed down a little each day. The shaft is constructed so that the crank can be engaged in two different positions, proportionate to the position of the piston.

When starting, the crank should be engaged when it is in it's lowest position, and then pulled up and over. It is incorrect, to engage it at it's highest point, so that it has to be pulled downwards. To engage it should be pressed in a little, and it is possible to feel the crank key taking grip. When the engine has started, the crank will automatically disengage and return to it's stationary position.

The chain may become so slack, after a long period of use, that it will slap against the inside of the frame, and a thicker packing should then be placed between the coupling and the frame.

The engine's deck casing should preferably be constructed so that only the crank protrudes from it's rear wall, and the crank's shaft should be lubricated at regular intervals with a little oil, at the securing end of the bearing.

### THE FREE COUPLING (CLUTCH).

The function of this coupling is to allow the propeller to be disengaged when the engine is running. It has a cast iron friction spring, which expands when the control lever is put forward, and so grips firmly in a bell coupling, thus connecting the engine and propeller shafts.

The forward movement of the control lever causes a cylinder chaped cone to press rearwards, and two arms in the friction spring are bent outwards. If the coupling should become slack, the two hardened adjustable screwd which are seated on these arms must be tightened. This can be done by loosening the screw's lock nuts, and then the screws should be turned in a clockwise-direction for a siutable distance. However, if the position of the arms is altered always ensure that they are equally readjusted.

There is a sliding bearing situated in the gear edge of the coupling for the purpose of preventing the penetration of sea water, if the

deck and shaft are flooded by a heavy sea. If this bearing is to fulfill it's purpose, it must be lubricated daily, and also after the engine has stopped.

A periodical chack should be made to ensure that the Coupling contains a satisfactory amount of oil. (Refer to Section: Lubrication.)

In the event of the penetration of water into Coupling and Crankcase, they must be emptied very carefully, and then refilled with clean oil. The engine should be started as soon as possible after this has been done so that all parts receive a coating of clean oil.

### R E V E R S I N G   A P P A R A T U S .

The reversing apparatus for the 5 HP engine can be supplied in three types: A. B. and the MARNA Screw Reverse, and it consists of the following main parts: A: Base, B: Slide for the bearing, D: Reversing Bearing, E: Connecting arm for the handle, and H: the tube for the propeller.

All types are lubricated by means of a grease cup, and this should be screwed down a little every day if the engine is in constand use. When it has been screwed as far as it will go, it should be refilled.

The three types work on a common principle. There is a bored steel disc (reversing clip) screwed to the tube, and when the control lever is operated this clip is twisted, thus causing the tube to move longitudinally in connection with the propeller shaft, thereby altering the pitch of the propeller blades. This clip must therefore be screwed firmly to the tube at the point where the propeller attains it's maximum forward and reverse positions.

#### Types A and B.

These two types are equipped with a handle with axial movement for attaining the forward, neutral and reverse positions, and type A has been designed so that it can be mounted on the engine's foundation. This fact should therefore be taken into consideration, when deciding the length of the doudnation, prior to installing, and a suitable distance at the rear of the engine should be allowed for.

Type B is designed for crafts in which the engine is mounted right aft, and also for boats in which a sharply pointed bottom presents difficulty in fitting the more normal type A. But with the exception of this difference in the mounting positions the two types are similar.

There must be a certain friction between the slide B, and the Bearing D in order that the propeller blades maintain the pitch required and do not, at any time, change position on their own volition. This friction can be adjusted by turning nut K.

It is customary to mount the apparatur so that the forward movement of the control lever accords with the forward movement of the boat, but it can be fitted inversely.

### MARNA Screw Reverse.

This is mounted in the same way as Type A, but the handle has a rotating movement for the three positions, and it should be turned approx. 180° from maximum forward to maximum reverse, neutral position being between the two extremes.

The apparatus should be adjusted so that the hand grip points straight ahead when the apparatus is in max. forward position.

The apparatus is easy to handle, with the advantage that a wheel can be substituted for the hand grip, so that with the assistance of a chain, wire, etc. control can be established from ones seated position.

The shaft which transfers the turning movement of the handle to the eccentric fully inside the apparatus, is fitted with a stuffing box which serves to prevent penetration of water, and it must be suitably tightened.

There is a possibility that after a period of use the propeller blades will tend to change their position during speed, and this can be rectified by tightening the stuffing box a little.

### Fitting Regulations for All types.

The apparatus should be carefully directed into position and bolted to it's foundation. This operation is usually extremely difficult, and it can be done as follows:

The two screws (F) which are situated on the side of the apparatus, should be loosened until the slide (B) can be moved in connection with the base, and then the slide and bearing (D) will guide themselves in after the centre of the propeller shaft.

The slide contains reserved sections which allow clearance for the two bolts (F) so that it can rise and fall as the angle with the base changes.

The slide and the bearing should be checked to ensure that they have guided themselves in correctly after the centre of the propeller shaft, and then the bolts should be firmly tightened again. The bearing should then be so fitted that there is no bend in relation to the shaft.

Such a bend may occur later, due to a possible warping of the foundation members, and therefore, particularly in the case of a newly fitted draft, the two bolts should be slackened again in order to straighten the bend.

This simple method of rectifying any bend that may occur is of considerable importance for the life of the propeller tube.

### P R O P E L L E R I N S T A L L A T I O N .

The MARNA 5 HP engine is equipped with a 7/8" propeller shaft, 1.1/8" tube, and a 1.1/2" intermediate tube.

When the shaft has been installed it is important to check that it remains free from bends, as a bent shaft can easily result from a warped foundation. Therefore, a periodical check should be made to ensure that the shaft revolves evenly. (Refer to Section: Installation.)

The stern tube is sealed interally and externally by means of a tallow joint, and this should be checked yearly to ensure that it remains waterproof, otherwise water will enter the boat.

The tube of the reversing apparatus is also similarly sealed with a tallow joint, which should be regularly inspected.

The propellerhead is filled with grease, and this should be checked periodically to ensure that it contains a satisfactory amount. It can be refilled by unscrewing the plug which situated in the head.

### P E T R O L   T A N K .

Each engine is accompanied by a petrol tank, and the supply pipe from tank to carburettor, and this tank must be fitted so that it is at least 8" above the level of the carburettor, as it must be remembered that the boat rises when under way. The supply pipe should be laid as straight as possible, as this facilitates cleaning.

If a cacuum occurs in the tank the petrol will have difficulty in flowing to the carburettor, and a small hole is bored in the lid of the tank to prevent this contingency. In the case of a tank being situated under the deck this hole is bored in the connecting pipe, between the tank and the deck screw cap, and care must be taken to ensure that this hole is not filled.

The petrol will often contain a little water, and the latter can also penetrate into the tank through the filler cap, so the tank should be drained at regular intervals. Water is easily drained, as being heavier than petrol it will always collect at the bottom of the tank.

### O R D E R I N G   O F   S P A R E   P A R T S .

The MARNA engine is being continually improved, and therefore the Manufacturers reserve the right to modify or vary construction at any time, without giving prior warning. It is thus absolutely essential that the type and number of an engine is given, when spare parts are ordered. Noncompliance with this rule will lead to the risk of the receipt of unsuitable components, and delay in despatch.

Each part of the engine has a number. It is not arbitrary, having been built up in a special system, and to ensure convenience in the selection of a required part these are divided into different groups which are as follows:

- |                               |  |
|-------------------------------|--|
| 01. Cylinder.                 | 13. Internal Lubrication System.             |
| 02. Cylinder Head.            | 20. Pinion case.                             |
| 03. Piston - Connecting rod.  | 21. External Lubrication System.             |
| 04. Exhaust Manifold.         | 22. Oil Pump.                                |
| 05.                           | 23. Pressure Valve.                          |
| 06. Carburettor.              | 24. Oil Filter.                              |
| 07. Oil Reservoir with valve. | 30. Magneto, Bracket and Clamp.              |
| 10. Crankcase.                | 35. Cooling System Pump.                     |
| 11. Crank.                    | 40. Rear overhead starting.                  |
| 12. Timing Shaft.             | 45. Coupling (Clutch).                       |
|                               | 46. Reversing Apparatus.                     |
|                               | 47. Variable Pitch Propeller.                |
|                               | 48. Intermediate Sleeve.                     |
|                               | 50. Gear.                                    |
|                               | 51. Fixed Propeller and Intermediate Sleeve. |

The number of the 5 HP Cylinder Head is 70201, the primary figure being 7, the number for the MARNA 5 HP type H. This follows the group number 02 for the Cylinder Head, and finally the figure 01 which is the particular number in the group for the Cylinder Head itself.

Therefore, every component of the 5 HP type H Cylinder Head will be numbered 7-02, these two figures deciding which part of the Cylinder Head is required. For example, the Spark Plug is numbered 70240 while the number for The Piston is 70206.

Instances will occur when parts do not belong to a precise group or engine type, such as nuts, bolts and screws, which only have an ordinary number. For example, 108 which is the number for the bolt which holds the side cover of the crankcase in position. In addition there are a number of standard fittings which are common to all MARNA types, - f. ex. the 1/8" Pipe Threaded Drain cock, which is numbered S.F. 60.

Before a part is ordered, the drawing should be studied, in order to discover the number of the part required, then it should be checked against the List, and ordered as under:

For MARNA 5 HP type H, No. .... Year .....  
One Cylinder Head Gasket. No. 70202.

A rapid and faultless despatch can then be relied on.

In conclusion we should mention that in our opinion a MARNA purchaser will find it profitable to study these Instructions, and to follow the directions as closely as possible.

A MARNA engine, providing it receives care, will give faithful and good service for many years.

C Y L I N D E R.Group 01.

<u>No.</u>	<u>Total.</u>	
70101	1.	Cylinder.
70102	1.	Gasket.
138	4.	Hexagon Nuts 1/2"
70103	6.	Stud Bolts 1/2" (for Cyl. Head).
70104	1.	" " 1/2" ( " Exhaust Manifold).
70105	1.	" ( for Exhaust Manifold ) 3/16".
70106	2.	Valve Guides. Bronze.
70107	2.	Valves.
70108	2.	Valve Springs.
70109	2.	Valve Spring Cups.
70110	2.	Valve Cones.
70111	2.	Plugs. For Water Jacket.
SF. 12	1.	Water Union. 1/2" x 3/4". Pipe Thread.
SF. 2	1.	Oil Union. 1/4" x 1/4".
SF. 60	2.	Drain Cocks. 1/8" Pipe Thread.
70112	2.	Stud Bolts. For Oil Reservoir.
70113	1.	Nameplate.
198	2.	Set Screws. Brass 5/32" x 3/8"

C Y L I N D E R H E A D.Group 02.

70201	1.	Cylinder Head
70202	1.	Cylinder Head Gasket (Copper Asbestos).
138	6.	Hexagon Nuts 1/2".
70203	1.	Seating (or Housing) for Spark Plug.
70204	1.	Gasket for 70203 (Copper Asbestos).
70240	1.	Spark Plug.
70205	1.	Water Pipe Flange Union.
70206	1.	Gasket for 70205.
SF. 10	1.	Union for 70205.
		70205 and SF. 10 combined.
211	3.	Set Screws Brass 5/16" x 3/4"
SF. 71	1.	Priming Cock 1/4" Pipe Thread.

C O N N E C T I N G   R O D .Group 03.

<u>No.</u>	<u>Total.</u>	
70301	1.	Connecting Rod.
70302	2.	Bolts. 3/8" SAE x 1.1/2".
70303	1.	Bolt. 3/8" SAE x 1.1/4".
70304	2.	Washers for above bolts.
70305	1.	Oil Thrower.

P I S T O N .

70306	1.	Piston.
70307	1.	Gudgeon Pin 1".
70308	3.	Compression Rings.
70309	1.	Oil Control Scraper Ring.

E X H A U S T .Group 04.

70401	1.	Exhaust Manifold (for F.M. Carburettor).
138	1.	Hexagon Nut 1/2".
70403	1.	Exhaust Outlet Flange.
70404	1.	Joint. For 70403.
172	2.	Nuts 3/8" x 1.1/2"
70405	1.	Union 1".
70601	1.	F. M. Carburettor 1"
70406	1.	Simplex Carburettor 30 m/m.
	1.	Silencer.
70402	1.	Joint (Copper Asbestos).
70404	1.	" for 70403 (Copper Asbestos).
70401 A	1.	Exhaust Manifold for Simplex Carburettor.

O I L   R E S E R V O I R   W I T H   V A L V E .Group 07.

70701	1.	Base Plate.
70702	1.	Pipe, brass.
		70701 and 70702 combined.
70703	1.	Cover for Oil Reservoir.
SF. 60	1.	Drain Cock. 1/8" Pipe Thr.
135	2.	Hexagon Nuts 5/16" Brass.
70704	3.	Wicks with holders.

O I L R E S E R V O I R W I T H V A L V E (CONTINUED).Group 07.

<u>No.</u>	<u>Total.</u>	
70710	3.	Valve Chambers 1/4" Pipe Thread.
70711	3.	Balls 1/4". Rust free.
70712	3.	Regulating Screws 3/8" SAE.
70713	3.	Pipes. Brass 3/8".
70705	1.	Pipe Copper 1/4" x 260 m/m (for Cylinder).
70706	1.	" " 1/4" x 300 m/m (to Crankshaft Bearing).
70707	1.	" " 1/4" x 160 m/m (to Eccentric Hoop).
SF. 31	3.	" Cone 1/4".
SF. 21	3.	" " nuts 1/4" Pipe Thr.
SF. 30	2.	Double Cones 1/4".
SF. 20	2.	" " Nuts 1/4" Pipe Thr.

C R A N K C A S E.Group 10.

71001	1.	Crankcase.
71002	4.	Stud Bolts 1/2" x 52 m/m.
71003	1.	Front Crankshaft Bearing.
SF. 4	1.	Oil Union 1/4" x 1/4".
71004	1.	Crankshaft Bearing Cover.
71005	1.	Joint (frame cover).
128	5.	Hexagon Bolts 7/16" x 1".
71006	1.	Rear Crankshaft Bearing.
211	1.	Set Screw 5/16" x 5/8".
71007	1.	Thrust Bolt 1/2" SAE x 1.3/4".
168	1.	Hexagon Nuts 1/2" SAE for 71007.
71008	1.	Front Timing Shaft Bearing.
71009	1.	Joint for 71008.
108	2.	Hexagon Bolts 5/16" x 3/4"
71010	1.	Rear Timing Shaft Bearing.
71011	1.	Stop Screw.
71012	2.	Tappet Guide Bush.
71013	2.	Tappet.
71014	2.	Tappet Adjusting Screw 3/8" SAE 1.1/4" (Tempered steel)
166	2.	Tappet Adjusting Screw Lock Nut 3/8" SAE.
71015	1.	Intermediate Pinion Flange.
127	2.	Hexagon Nuts 7/16" x 1/4".

C R A N K C A S E (CONTINUED).

<u>No.</u>	<u>Total.</u>	
71016	1.	Intermediate Pinion.
71017	1.	" " Lining.
71018	1.	" " Gudgeon.
139	2.	Hexagon Nuts 5/8".
71019	1.	Side Cover.
71020	1.	Joint for 71019.
108	4.	Hexagon Bolts 5/16" x 3/4".
71022	1.	Thrust Bolt 1/2" Pipe Th. for Magneto gudgeon.
71024	1.	Air Valve.

C R A N K S H A F T.Group 11.

71101	1.	Crankshaft.
71102	2.	Stud Bolts for Counterpoise.
71103	2.	Counterpoise.
138	2.	Hexagon Nuts.
71104	1.	Crankshaft Gear.
71105	1.	Cotter for 71104 5/16".
71106	1.	Coupling (Only for engines without Free Coupling).
71107	1.	Cotter for 71106 5/16".
192	1.	Grub Screw for 71106 7/16" x 3/4".
71108	1.	Ball Bearing SKF No. 51108.
71110	1.	Flywheel.
71111	1.	Spring loaded handle.
71112	1.	Spring for 71111.
71113	1.	Washer " 71111.
71114	1.	Cotter for Flywheel 5/16".
71115	1.	Nut " " 1" Pipe Th.

T I M I N G S H A F T.Group 12.

71201	1.	Timing Shaft Entire. Special Steel.
71202	1.	Timing Driver. Savaged Steel.
71203	1.	Cotter for 71202 1/4".
71204	1.	Washer " 71202 1.1/2".
159	1.	Hexagon Bolt 1/2" SAE x 1.1/4".
71205	1.	Pump Eccentric.
71206	1.	Washer for Eccentric. 1.1/4".
158	1.	Hexagon Bolt 1/2" SAE x 1".

M A G N E T O B R A C K E T, M A G N E T O A N D  
C L A M P.

Group 30.

<u>No.</u>	<u>Total.</u>	
73001	1.	Magneto Bracket.
73002	1.	Joint for 73001.
108	3.	Hexagon Bolts 5/16" x 3/4".
73003	1.	Lining 31 Ø.
73004	1.	Magneto Drive Shaft (Impulse type).
73005	1.	Magneto Drive.
73006	1.	Stud 1/4".
73020	1.	Brass band.
73021	1.	Base.
	4.	Rivets 3/16".
73022	1.	Brass Bolt 7/16" (Pressure screw).
222	1.	Nut 7/16" for 73022.
73050	1.	Magneto with Impulse without coupling parts.
73058	1.	Guard for Spark Plug.
73059	1.	Rubber Hood 7 m/m.

P U M P, W A T E R C O O L I N G S Y S T E M.

Group 35.

73501	1.	Pump Housing.
73502	1.	Pump Piston.
73503	1.	Eccentric Rod.
73504	1.	Cross Gudgeon for Piston.
73505	1.	Pressure Valve.
73506	1.	Suction Valve.
73507	1.	Pump Cover.
73508	1.	Stuffing Box.
73509	1.	Tallow Joint.
73510	1.	Counter Nut for Stuffing Box.
SF. 60	1.	Drain Cock 1/8" Pipe Th.
SF. 25	2.	Capsule Nut 1/2" Pipe Thr.
73511	1.	Pipe, (flanged) Copper 1/2" x 460 m/m.
SF. 81	2.	Joint for Capsule Nut, Copper Asbestos.
124	2.	Hexagon Bolts 3/8" x 2.1/4".

F R E E C O U P L I N G (CONTINUED).

<u>No.</u>	<u>Total.</u>	
74526	1.	Set Screw for Thrust Washer 74509.
74530	1.	Joint for Bearing Cover 74510.
118	3.	Hex. Bolt 3/8" x 1".
74531	1.	Coupling Shaft (for sliding bearing).
74551	1.	Set Screw 7/16" x 3/4" for bell.
74552	1.	Cotter 5/16" for bell.
74553	1.	Friction Spring.
74554	1.	Cotter 5/16" for 74553.
74555	2.	Coupling Levers.
74556	2.	Adjusting Screws 1/2" SAE for levers (special steel).
168	2.	Hex. Nuts 1/2" SAE.
		Adjusting screw with nuts.
74557	2.	Coupling Lever Roller.
74558	2.	Bolts 10 m/m for rollers.
74559	1.	Coupling Cone.
74560	1.	Half Moon (bronze).
74561	1.	Coupling Fork.
74562	2.	Screws 1/2" SAE for Fork 74561.
192	1.	Set Screw 7/16" x 3/4" for Fork.
74563	1.	Conical Pin.
135	1.	Hexagon Nut for Pin 74563.
108	4.	" Bolts for Cover 5/16" x 3/4".
192	1.	Set Screw for Flange Coupling 7/16" x 3/4".
74564	1.	Cotter for Coupling.
6204	1.	Ball Bearing SKF 6204 (20 m/m).

R E V E R S I N G A P P A R A T U S.Group 46.

74601	1.	Base. Type A or B.
74602	1.	Slide.
74603	1.	Stud Bolt for Wheel. Brass.
74604	1.	Wheel.
74506	1.	Galvanised Pipe 3/8" x 47.
180	2.	Screw Nuts 1/2" x 5" Black.
74606	2.	Washers 1/2" Brass.
74607	2.	Hex. Nuts 1/2" Brass.
74608	2.	Liners (pressure bush for screw nuts).
74609	1.	Securing Piece for handle.
74610	3.	Stud bolts 1/4" Pipe Th. Brass.
74611	3.	Brass Nuts 1/4" " "

F R E E C O U P L I N G (CONTINUED).

<u>No.</u>	<u>Total.</u>	
74526	1.	Set Screw for Thrust Washer 74509.
74530	1.	Joint for Bearing Cover 74510.
118	3.	Hex. Bolt 3/8" x 1".
74531	1.	Coupling Shaft (for sliding bearing).
74551	1.	Set Screw 7/16" x 3/4" for bell.
74552	1.	Cotter 5/16" for bell.
74553	1.	Friction Spring.
74554	1.	Cotter 5/16" for 74553.
74555	2.	Coupling Levers.
74556	2.	Adjusting Screws 1/2" SAE for levers (special steel).
168	2.	Hex. Nuts 1/2" SAE.
		Adjusting screw with nuts.
74557	2.	Coupling Lever Roller.
74558	2.	Bolts 10 m/m for rollers.
74559	1.	Coupling Cone.
74560	1.	Half Moon (bronze).
74561	1.	Coupling Fork.
74562	2.	Screws 1/2" SAE for Fork 74561.
192	1.	Set Screw 7/16" x 3/4" for Fork.
74563	1.	Conical Pin.
135	1.	Hexagon Nut for Pin 74563.
108	4.	" Bolts for Cover 5/16" x 3/4".
192	1.	Set Screw for Flange Coupling 7/16" x 3/4".
74564	1.	Cotter for Coupling.
6204	1.	Ball Bearing SKF 6204 (20 m/m).

R E V E R S I N G A P P A R A T U S .Group 46.

74601	1.	Base. Type A or B.
74602	1.	Slide.
74603	1.	Stud Bolt for Wheel. Brass.
74604	1.	Wheel.
74506	1.	Galvanised Pipe 3/8" x 47.
180	2.	Screw Nuts 1/2" x 5" Black.
74606	2.	Washers 1/2" Brass.
74607	2.	Hex. Nuts 1/2" Brass.
74608	2.	Liners (pressure bush for screw nuts).
74609	1.	Securing Piece for handle.
74610	3.	Stud bolts 1/4" Pipe Th. Brass.
74611	3.	Brass Nuts 1/4" " "

REVERSING APPARATUS (CONTINUED).

<u>No.</u>	<u>Total.</u>	
74612	3.	Brass Locknuts. 1/4" Pipe Th.
118	3.	Hex. Bolts 3/8" x 1".
144	1.	" " 3/8" SAE x 1.1/4".
74613	1.	" socket Wrench.
91	1.	Grease Cup 1/4" Pipe Th. No. 6.
74620	1.	Bearing. Lead Bronze 1.1/8".
74622	1.	Clamp Washer (clip).
74623	1.	Short Handle.

PROPELLER SHAFT.Group 47.

74701	1.	Propeller Head. For 7/8" Shaft and 1.1/8" Tube.
74702	1.	Tube Head for 1.1/8" Tube.
74703	2.	Hex. Bolts for Propeller Head 1/4" Pipe Th.
74704	2.	Propeller Blades.
74705	1.	Flange Coupling for propeller shaft 7/8".
74706	1.	Shaft 7/8" x 2 m. Turned, milled and ready straightened.
74707	1.	Tension Tube 1.1/8"x1.8m. Threaded and " "
74708	1.	Cotter 1/4".
74709	1.	Hex. Nut 5/8" Thread Brass.
74710	1.	Joint nut for Tension Tube.
74711	1.	" for Tube.
74713	1.	Split Pin (Copper Wire).
74714	1.	Cotter for Coupling.
192	1.	Set Screw for Coupling 7/16" x 3/4".
173	4.	Screw Nuts for Coupling 3/8" x 1.3/4".

INTERMEDIATE SLEEVE.Group 48.

74810	1.	Stern Tube. External 1.1/8".
74811	1.	" " Internal 1.1/8".
74812	1.	Stuffing Box for Internal Tube.
74813	1.	" " " External " .
74814	1.	Counter Nut " " "
74815	1.	" " " Internal "
74807	2.	Tallow Joint.
74816	1.	Socket Tube 1.1/2" x 0.65.
74809	1.	" Bolt (Tinned gudgeon 1/2").

I N T E R M E D I A T E S L E E V E (CONTINUED).

<u>No.</u>	<u>Total.</u>	
223	2.	Hex. Nuts 1/2" Brass.
	4.	Wood Screws 1.1/2" x No. 20 (Internal Tube).
91	1.	Grease Cup No. 6. Steel.
SF. 5	1.	Elongation for Grease Cup.

E Q U I P M E N T D E L I V E R E D W I T H  
T H E E N G I N E.

1 Petrol Tank. Galvanized Iron. 30 litres (6 gl. 2 quarts).  
 1 Filling Flange. 1" Pipe Th.  
 1 Screw Cap for Flange.  
 1 Flange for Tank Tap.  
 1 Drain Tap 1/8" Pipe Th.  
 1 Petrol Tap.  
 1 Stuffing Box 3/8" Pipe Th.  
 Conical Pipe Nut 3/8" Pipe Th.  
 1 Spindle.  
 1 Soldered Cone 5/16"  
 1 Copper Pipe 5/16" x 2 m.  
 1 " " 1/2" x 2 m.  
 1 Inspection Tap 1/2" Pipe Th.  
 1 Capsule Nut 1/2" " "  
 1 Joint for Nut. Fibre.  
 1 Bottom Intake.  
 1 " Filter  
 1 Washer for bottom intake.  
 1 10" Adjustable spanner.  
 1 Regulator combined with angle piece for 1 cyl.