DIRECTION FOR USE

FOR THE

MARNA

8–12 HP PETROL ENGINE

2 CYL. TYPE R 2

ENGLISH TRANSLATION

MANDALS MOTORFABRIK
MANDAL

NORWAY

TELEPHONE: 1871

TELEGRAMADDRESS: MARNAMOTOR

Installation of the engine into the boat.

MARNA 2 cyl. Type R2 8/12 HP.

Correct and accurate installation is the fist 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 wooden foundation for the engine must be of first class material, preferably of oak, and it should consist of two beams, of a thickness of 3" and a height of 5". These should be fitted longitudinally into 2, or still better 3 of the thwarts in such a way that their height above the thwarts must not be less than 3". The bolts (preferably copper bolts) are nailed through the plating, the thwarts and the foundation to make the whole system solid. The bolts should be forced through the plating for the outside. The tops of the bolts must be big, wide and flat, their shape corresponding to that of the boat. The MARNA engine, type R2, has been constructed on the assuption that the foremost thwart, into which are fitted the longitudinal beams, is placed just before the flywheel.
On delivery the engine is always provided with a handle for starting from behind. The flywheel should not be used for starting the engine. The smallest distance between the two foremost thwarts carrying the foundation of the engine should be about 18 inches (0.45 m).

The dimensional drawings in the MARNA engine catalogue, type R2, show the normal mounting of this type.

Before the engine is bolted down, it is essential to ensure that the shafts of the engine and the propeller (alternatively the reduction gear) shafts are in alignment, and this should be done as follows: The couplings of the two shafts should be fitted flush into one another, and the propeller shaft turned by hand, then, if correct alignment has been attained, there will be no visible opening between the couplings. It is also necessary to ensure that the foundation members of the engine have been accurately fastened to the longitudinal beams to prevent them from being warped.

The engine is bolted on by means of 4 screws. The best thing is to make use of wooden screws 1/2" x 5" having machine threads of 1/2" at the other end. The nuts can be loosened quite easily if the engine is removed from the boa later on. A lock washer of 1/2" should be placed under each of the foundation bolts. These lock washers will prevent the nuts from loosening.

If the engine has a reduction gear (12 HP, 1500 revolutions), the difference in level of 105 mm between the axes of the shaft belonging to the reduction gear and of the engine must be taken into account. The reduction gear has its own foundation members, which necessitate some extra space on the longitudinal beams. This foundation is to some extent adjustable to ease mounting.

Installation of exhaust pipe, pipe for cooling water and fuel tank with supply pipe.

The intake pipe for the cooling water must be installed in such a way that it is always below the water. Otherwise the pump may suck in some air, thereby stopping to pump water. On the outside of the water intake, a sift should be fastened to prevent sea-weeds etc. from being sucked through the opening. This sift must be securely fastened to the plating of the boat, and the slits of the sift must face backwards. A valve must be installed directly on the coupling of the water intake. Between this valve and the connection on the sucking-side of the water rump a copper pipe of 1/2" must be mounted. The function of this pump is to pump the cooling water into the exhaust piece, thereby cooling it. From this place the water is discharged into the cylinder block and further up into the top covering of the engine and from there through a turncock in 3 parts, which is mounted on the top cover. This pipe makes it possible to lead the warm cooling water 2 ways, either overboard or into the exhaust pipe. The pipe connection between this divided pipe and the exhaust pipe is always installed on the engine when delivered. The other conduit pipe, whose function is to lead the warm cooling water direct from the divided pipe into the sea, must be mounted after the engine has been installed. The most practical procedure is to bend this pipe connection down under the floor and then up on the side of the boat by piercing the plating about 30 or 40 cm above sea level. On the lowest part of this pipe, a turncock should be mounted, so that the pipe can be discharged by frosty weather.

The exhaust pipe must be as straight as possible without too sudden bendings. For this reason, parts of pipes of the type 90° should not be employed. It is normal to make the exhaust pipe of 1/4" galvanized pipes or parts of pipes. The exhaust pipe can very well be put under the floor and led up under the quarter-deck. The outlet should be about 40 cm above sea-level. Such exhaust pipes, put under the floor, must be cooled to prevent fire.
This is done by conducting the cooling water into the exhaust pipe by means of the turncock on the top of the engine.

The engine is started with the triple turncock closed, so that all cooling water is conducted into the copper pipe opening through the side of the boat. Just after the start, the triple turncock is opened , and now the warm cooling water is conducted into the exhaust pipe. At the same time as the water cools the exhaust pipe, it efficiently quells the explosions of the engine, so that no silencer is needed. For this reason these engines are delivered without silencers.

Some time before the engine is stopped, the triple turncock is screwed down, so that the cooling water is discharged directly overboard. Then, for about 1 1/2 min., the engine is run on three quarters of its capacity. After that the explosions will be so powerful that all the remaining water is blown out of the exhaust pipe. It is a bad thing for the exhaust pipe if any water is left in it when the boat is not used f.i. during the night, because this water will evaporate, and the damp may penetrate into the engine and become the cause of formation of rust in the valves etc.

If the owner does not want to have the water in the exhaust pipe itself, it is possible to make an exhaust pipe surrounded by a water jacket. When the cooling water is conducted into this water jacket surrounding the exhaust pipe, the latter will be cooled down. A copper pipe must be placed at the other end of the water pipe for the discharge of the water. On the lowest part (when the boat is lying still) a drain cock must be mounted. Just before the exhaust pipe ends, a silencer is placed. In this case the silencer is not included in the price.

The fuel tank must be mounted in such a way that the conduit pipe is about 20 cm above the intake of the carburettor. Very often the tank is placed under the back part of the boat. But it should be taken into consideration that when the boat is moving, it will rise in the water, and it is necessary to take this into account, so that the difference in level will then be about 20 cm.

The lead (of 5/16" copper pipe) connecting the tank with the carburettor must be laid as straightly as possible. The most practical thing is to place them under the floor. There should be some distance between the exhaust pipe and the floor.

The engine case must be of a solid construction and such that it protects the engine effectively against water. One must take into account that the engine case can easily be removed f.i. when the lubricating oil is changed. An efficient and practical engine case is made by making the back of the case separately and then screwing it onto the foundation of the engine. Both sides and the front are then put together and fastened to the back by means of hooks. In this way the regulation for the gas and the magneto can be mounted on the back of the engine, and it is unnecessary to remove the regulation strings if the 3 other sides of the engine case are taken away. It must also be remembered that it is necessary to have access to the sounding-rod to control the quantity of the oil in the engine. It is practical to make a trap-door (about 130 mm length x 180 mm height) in the "magneto side" of the case. This trap-door may be equipped with tunges, and by opening it, the access to the sounding rod is easy. The flywheel of the MARNA engine, type R2, has been correctly mounted at the factory. If, for some reason or other, it is necessary to take off the flywheel, it must always be turned off by means of 4 screw and a disk. The flywheel must never be removed by striking at the crank-sh

Control of the foundation.

After some time, one or two weeks, the couplings between the engine and the propeller shaft must be loosened again, and it must be ensured that the central line is still correct. It is a fact that the foundation beams tend to warp when imbibed with water.

Lubricating system.

On the front side of the cylinder block is a placard running thus:

Mandals Motorfabrik, Mandal
Lubricating placard for engine type R2.

Change oil for every 250 l of fuel. The oil quantity in the crank case + the pulley case + the coupling box or gear box: 3,5 l. The oil is filled in the top of the rear start trestle (blue cup). Control the sounding-rods every day when the engine is used. The following oils only can be used:

Summer (above 10°C)

Mobiloil A
Esso Motor Oil S.A.E. 30
Shell Motor Oil S.A.E. 30
Energol Motor Oil S.A.E. 30
Caltex Havoline Oil S.A.E. 30

Winter (below 10°C)

Mobiloil Arctic
Esso Motor Oil S.A.E. 20
Shell Motor Oil S.A.E. 20
Energol Motor Oil S.A.E. 20
Caltex Havoline Oil S.A.E. 20

The engine is lubricated by the so-called Circulation System, that is to say, oil is distributed to the bearings and parts by means of a pump. The oil pump is a cog-wheel pump equipped with hardened cog-wheels. Normally this pump does not need any inspection (maintenance). It is situated on the front of the engine and is moved by the front of the camshaft.

The bottom of the crank case is an oil container space for 3 1/2 liters of lubricating oil. At the side of the crank case (under the magneto) there is a sounding-rod for controlling the oil quantity at the bottom of the crank case. The sounding-rod has a mark for the lowest oil level and the highest one.
At the bottom of the crank case there is an oil sift through which the oil passes before going into the sucking tube of the pump. This sift can be removed for cleaning. A crawing of this sift together with an explanation of how it is taken out of the engine is given in the section about the changing of oil.
The pressure pipes of the oil pump are situated inside the engine and cannot be seen from without. A tube conducts the lubricating oil to the foremost frame bearing, and a main pipe passes further on to the hindmost frame bearing. Both these bearings will thus get a complete oil pressure. From the foremost and the hindmost frame bearings passages have been bored in the crankshaft so that the foremost crank bearing is supplied with oil under pressure from the foremost frame bearing, and the hindmost crank bearing is supplied from the hindmost frame bearing. Lubrication of pistons and cylinders is done by pressing the oil through a small opening, which has been bored through every crankshaft bearing up to the cylinders and pistons. The return oil from the crank bearings together with the oil for lubricating the pistons and the cylinders is thrown around in the crank case, thus lubricating the camshaft and the camshaft slides.
The main pipe supplying the hindmost frame bearings with oil is conducted through bored passages and partly through pipes into the pulley case of the engine. The adjustable overflow valve belonging to this system has been placed in the pulley case. The oil penetrating the overflow valve is sprayed against the roller chain of the engine, and the rapidity of the chain will distribute the oil to the parts which are to be lubricated in the pulley case. On the capsule of the pulley case is the opening of a pipe coming from the overflow valve. This pipe is connected with a pressure gauge (manumeter) showing the pressure, in kg/cm^2 with which the oil is pumped. The adequate oil pressure is 2 kg/cm^2 by warm oil and the full capacity of the engine. By slower speed the pressure goes down. The oil pressure can be regulated by unscrewing a small trap-door at the back of the pulley case. The number of the trap-door (drawing nr. Mt 1463, section: Adjustment of the Chain) is 2113 K. When the trap-door has been taken off, the overflow valve appears, and a regulation screw with a screwdriver slot is seen. If this regulation screw is forced inwards, the oil pressure increases, bye the opposite procedure it decreases.
From the hindmost frame bearing a passage has been bored backwards through the crank-shaft. This passage has been continued in the centre of the coupling shaft, and the parts belonging to the gear are lubricated by the oil forced through this passage.

If, when the engine is running, the pressure gauge (manometer) does not show the oil pressure, the engine must be stopped and examined. First it should be ensured, by means of the sounding-rod, that there is the prescribed quantity of oil at the bottom of the crank case. Then it should be examined whether the oil sift in the crank case has been filled up with oil mud to such an extent that a sufficient quantity of oil cannot pass through the sift. The sift can be taken out for cleaning; this is explained in the section: Changing of lubricating oils.

If a renewed examination of the engine shows that the oil pressure gauge (manometer) does not indicate the oil pressure, there is a filler on the oil pump which can be unscrewed. Be means of f.i. an oil can it is possible to pour some new oil (preferably a somewhat thick type) into the hole, and the pump will suck up this oil, which will alleviate the tightening in the pump itself. If the fault has been in the pump itself, it will then begin to pump oil anew. Remember that the above-mentioned filler must be screwed solidly down and that the stuffing under this filler must be in order. Such a packing has been delivered as a spare part.

It may also happen that the pressure gauge (manometer) itself is out of repair. This can be controlled by unscrewing the coupling between the pipe and the pressure gauge, and if the oil circulation is all right when the engine is running, the oil will be pumped out of this pipe. The overflow valve has a ball valve kept in place by a spring, which can be taken out after the regulation screw has been removed.

Control of the oil level in the crank case.

As explained above, there is a sounding-rod at the side of the crank case to ensure that there is an adequate quantity of lubricating oil at the bottom of the crank case. The sounding-rod has a mark for the highest oil level and another for the lowest one. The sounding of the oil level must always take place when the engine is not running, and it is done in this way:
The sounding-rod is unscrewed and taken up. Any oil found on the rod is wiped off by means of some twist. Then the sounding-rod is put back again, but it is not screwed down into its threads. When the sounding-rod is taken up again, it can clearly be seen how high up on the sounding-rod the oil-level has been.
If the sounding indicates that the oil-level has been between the two marks on the sounding-rod, you know that there is an adequate quantity of oil in the engine. If on the other hand the oil-level has gone down to the lowest mark, oil has to be refilled up to the highest mark on the sounding-rod.
This filling of oil is done by screwing the cup up to the top of the chain case (blue cup) and filling the oil there. On the R2 engines there is a connection between the oil in the crank case, the chain case and further backwards to the clutch or gear-box.

It is important that the oil which is filled is of the same mark and quality as the oil which is already in the engine. Therefore one of the oil marks mentioned on the oil placard should be selected. It is also important to stick to what has been decided in this respect. The cup on top of the chain case (blue cup) and cup nr. 800 K have a packing consisting of a rubber circle to keep tight. These circular packings must not be removed, and if destroyed, they must be replaced by new ones. A spare ring is delivered for every engine. The sounding-rod also has a packing consisting of a leather circle to keep tight. Always remember to screw the sounding-rod and the cup for re-filling of oil solidly down. When the cylinder block is drained of cooling-water by opening the cock, it must be ensured that the sounding-rod has been securely screwed down, so that the water cannot penetrate into the chain case of the engine.

Change of oil in the engine.

The lubricating placard tells how often the lubricating oil must be changed in the engine. The oil at the bottom of the crank case is connected with the oil in the pulley case and also with the oil in the coupling- or gear-box.
This regular changing of the lubricating oil in the engine is very important. It is also evident that when the same lubricating oil is used several times, its lubricating capacity will be so much deteriorated that new oil must be substituted for the old one. When the lubricating oil is changed, the trap-door at the side of the crank case is loosened. By means of the suction-pump belonging to each engine the used oil is sucked up from the bottom of the crank case. Later on the sift is taken out, and the oil at the bottom of the sift-container is sucked up. At last the oil mud must be wiped off as well as possible by clean rags of cloth. (Twist must not be employed). The sift is cleaned and put back again. Then 3 1/2 liters of new oil of the correct quality are filled. Filling of oil is most easily done through the top (blue filler) of the chain case. At last the oil level is controlled. It should be ensured that it has reached the highest mark on the sounding-rod.

The lubrication placard only tells how often the oil in the engine must be changed when it has been run completely in. When the motor is new and it is going to be run in, the lubricating oil must be changed for the first time after 100 liters of fuel have been consumed. As the strain on the lubricating oil is greatest during the time which is needed to run in the engine correctly, this first changing of lubricating oil is very important.

Remember also that every engine consumes some lubricating oil when it is used. The consumption of lubricating oil is always greatest during the time needed to run in an engine. Control the sounding-rod on the crank case every day. If the sounding shows a too small quantity of lubricating oil, oil must be filled up to the highest mark on the sounding-rod.

The oil sift can be removed for cleaning through the trap-door at the side of the crank case. This is done by moving the button 2122 K on the drawing Mt 2464 upwards and turning it, together with the soring, completely aside. By now the sift is loose and can be taken away. When the oil sift is mounted, this is first put back, and it is ensured that the sift gear gets into its cavity. The button 2122 K and the soring will turn towards the centre and into their correct positions.

At last we shall mention the places where the lubrication is done by means of grease from grease cups.
The water pump has a grease cup, and this should be turned about half-way round once or twice a day. The bearing of the shaft coming out of the coupling-box is also greased. The cup is turned only about the fourth of a complete round a day.
The reverse bearing and the reverse apparatus are also greased. It is usual to grease half a turn twice a day. The inner tube is also greased, about once a day.

Just after the engine has been mounted in the boat, care should be taken to grease the reverse bearing and the inner stem tube well. They should be greased often, and it should be controlled that these parts are not particularly warm while the engine is running.

Reduction gear.

For the engines equipped with reduction gear, it should be noted that the reduction gear has a lubricating system of its own. This gear consists of two cog-wheels, a small one on the top and a bigger one at the bottom. The gear case itself is oilproof, and at the bottom, there is about 0.5 liter of oil. The lowest cog-wheel is running in the oil, which is thrown around. There is a sounding-rod to control the quantity of oil in the case, and it must be ensured that the oil-level is between the highest and the lowest marks of the sounding-rod. When the oil is changed, the oil may be sucked up through the hole for the sounding-rod by the suction-pump.

The bearing coming out of the reduction gear is greased from a grease cup, and for this grease cup the same rules are valid as those explained about grease cup for the shaft coming out of the coupling box.

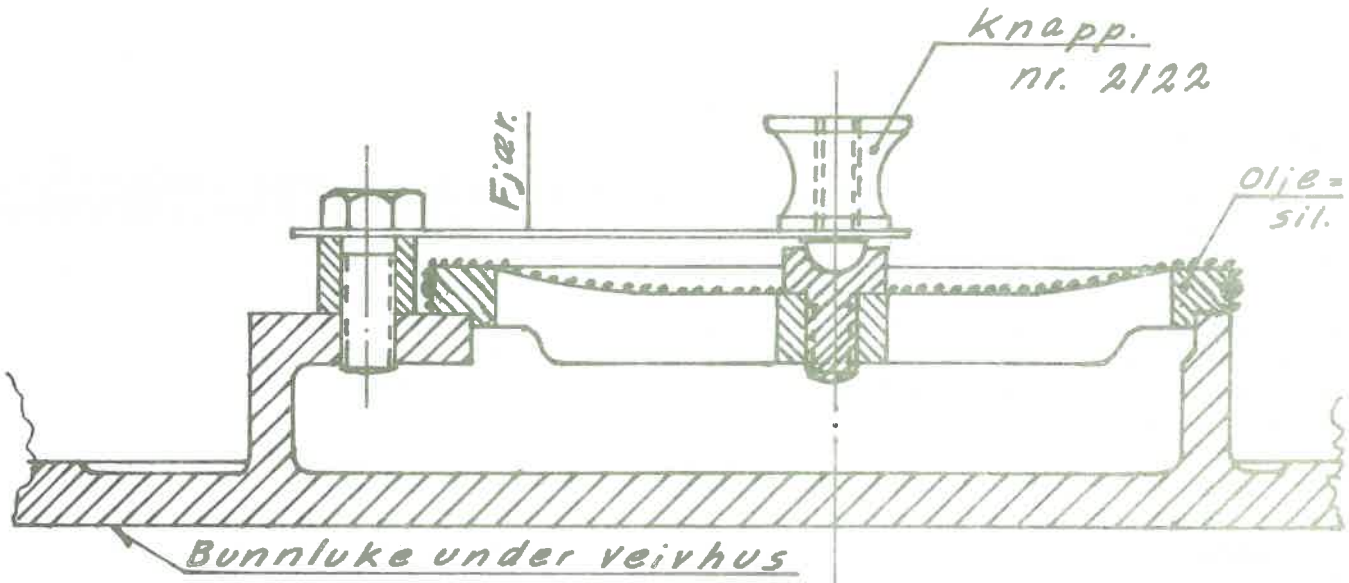
In the reduction gear one of these oil marks must be used:

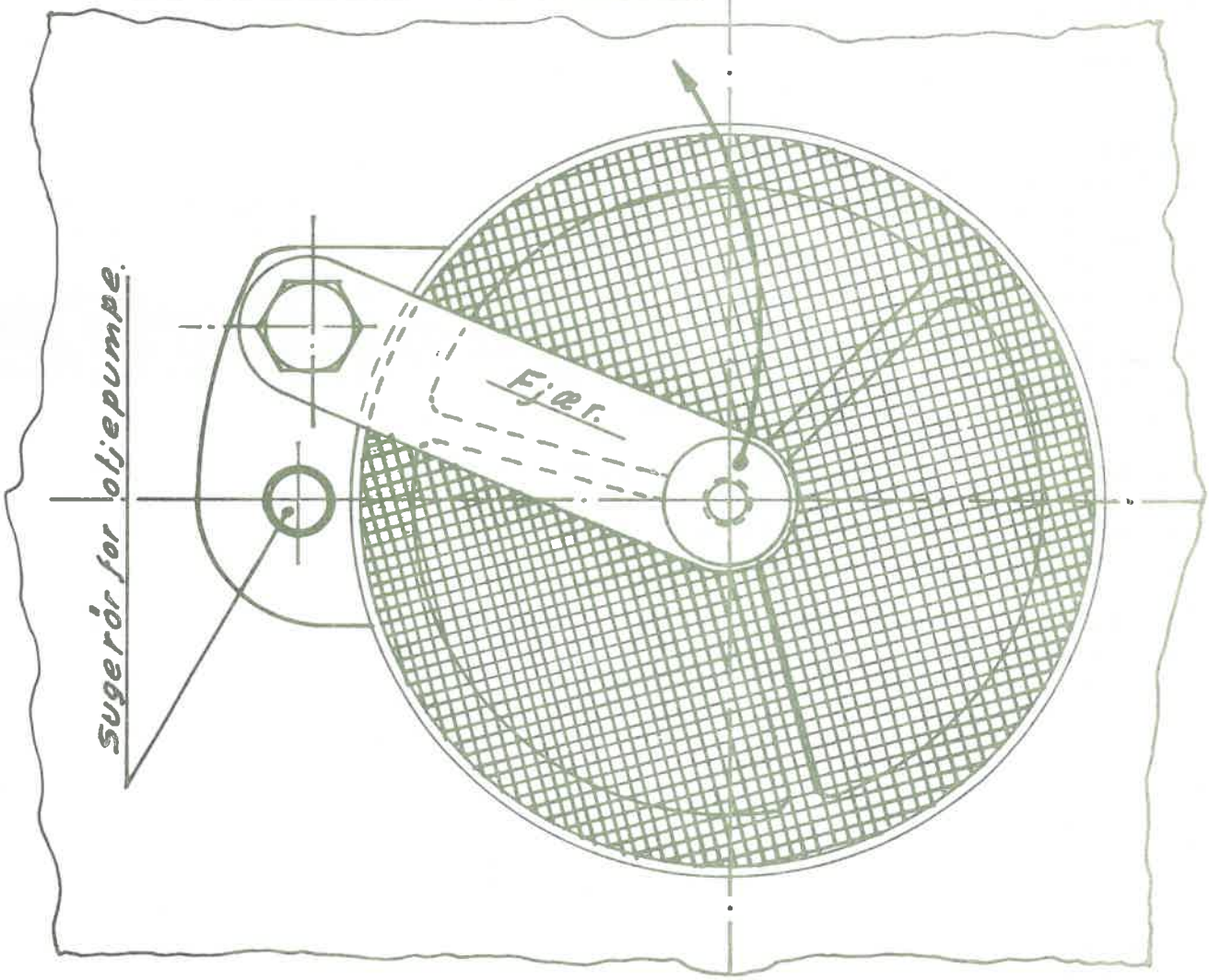
Shell: Dentax, S.A.E. 90

Esso: Esso gear Oil S.A.E. 90

Mobil Oil Nor A/S: Mobilube C 90

Norsk Brændselolje A/S: BP Energol Gear Oil S.A.E. 90





	Målestk. 1:1	Hovedtoleranse ±	Vekt	Matr.
Tegn.		Anm.		Modell
Konfr.		M.type R2		Gruppe nr.
Mandals Motorfabrik Mandal (Norway)		Oljesil.		M. 1464

Electrical equipment.

The MARNA engine, 2 cyl. type R2 8/12 HP is equipped with a high tension magneto with an impulse coupling, and a sparking plug of an adequate heat value should be used in conjunction, as a strong spark is a vital factor in guaranteeing starting. The various manufacturers of plugs employ different designations for the heat value of their own products, but generally speaking, a comparatively hot plug should be selected, and the distance between the electrodes should be approximately 0.7 mm.

The leads from the magneto to the plugs may become worn and creaked after the engine has been in service for some time, and these should be checked to ensure that they retain their insultation, and that they do not short-circuit the system.

The magneto is secured firmly to its bracket, but it can be removed quite easily when necessary, by slackening the lock nut underneath the bracket, and the retaining clamp can then be unscrewed. If magneto failure occurs, the cover should be removed, and the platinum pins examined to find out whether the latter have been burnt. If the platinum pins appear to be all right, a new plug should be tried. The lead should also be examined for possible faults. The platinum pins can be seen when the end cover of the magneto has been taken off. If neither the lead nor the pins appear to be the cause of the failure, the owner should not undertake the repair himself, but return the magneto to the manufacturers or to a qualified workshop, for a complete overhaul. Take care that you always keep a good, dry sparking plug in reserve on board.

The engine is easy to start, because the impulse of the magneto ensures a strong spark from the plug, even if the engine is only turned slowly by hand. The impulse couples out automatically as soon as the engine is running.

The spark emitted by the plug must occur the moment prior to the piston reaching Top Dead Centre position. This is known as Preignition, or, Advanced Ignition, the quantity being dependent on the revolutions of the engine. The appropriate amount of preignition for the MARNA engine, type R2, when at full speed, (and with the magneto adjusted to high ignition) is 10 degrees, the spark emitted by the plug being coincident with the opening of the platinum pin.
The procedure for timing the ignition is this:
An advanced ignition of 10 degrees, as mentioned above, is equivalent to a distance of 27 mm on the circumference of the flywheel. First the top cover of the engine should be loosened, so that the top position of the pistons is found. When the piston of the foremost cylinder is exactly in top position, this should be marked on top of the flywheel. Afterwards a new mark is made on the flywheel, 27 mm to the right from the first mark on the flywheel when you are looking at it from the front side. The ignition will take place exactly when the last mark is on top. The magneto is therefore correctly adjusted, if the platinum pins begin to open when the last mark on the flywheel is on top.

If you prefer measuring the height of the piston under the cylinder top, when the platinum pins should begin to open, this is 0.9 mm.

If the pins do not open at the correct time, an adjustment must be made on the disk attached to the driving shaft of the magneto. This disk is in two parts, with a screw which enables the outer disk to be turned in relation to the inner one. When adjusting the magneto, one turns the outer ring in relation to the inner one, and having obtained the correct point of ignition, one tightens the three screws.

Attention should be given to the fact that there must be a variation between the normal time of ignition of the magneto, and of the impulse, since that of the latter must always occur later than that of the magneto. That is to say, there must be a certainty that the impulse will not operate before the piston reaches Top Dead Centre, as this occurrence can cause back stroke.

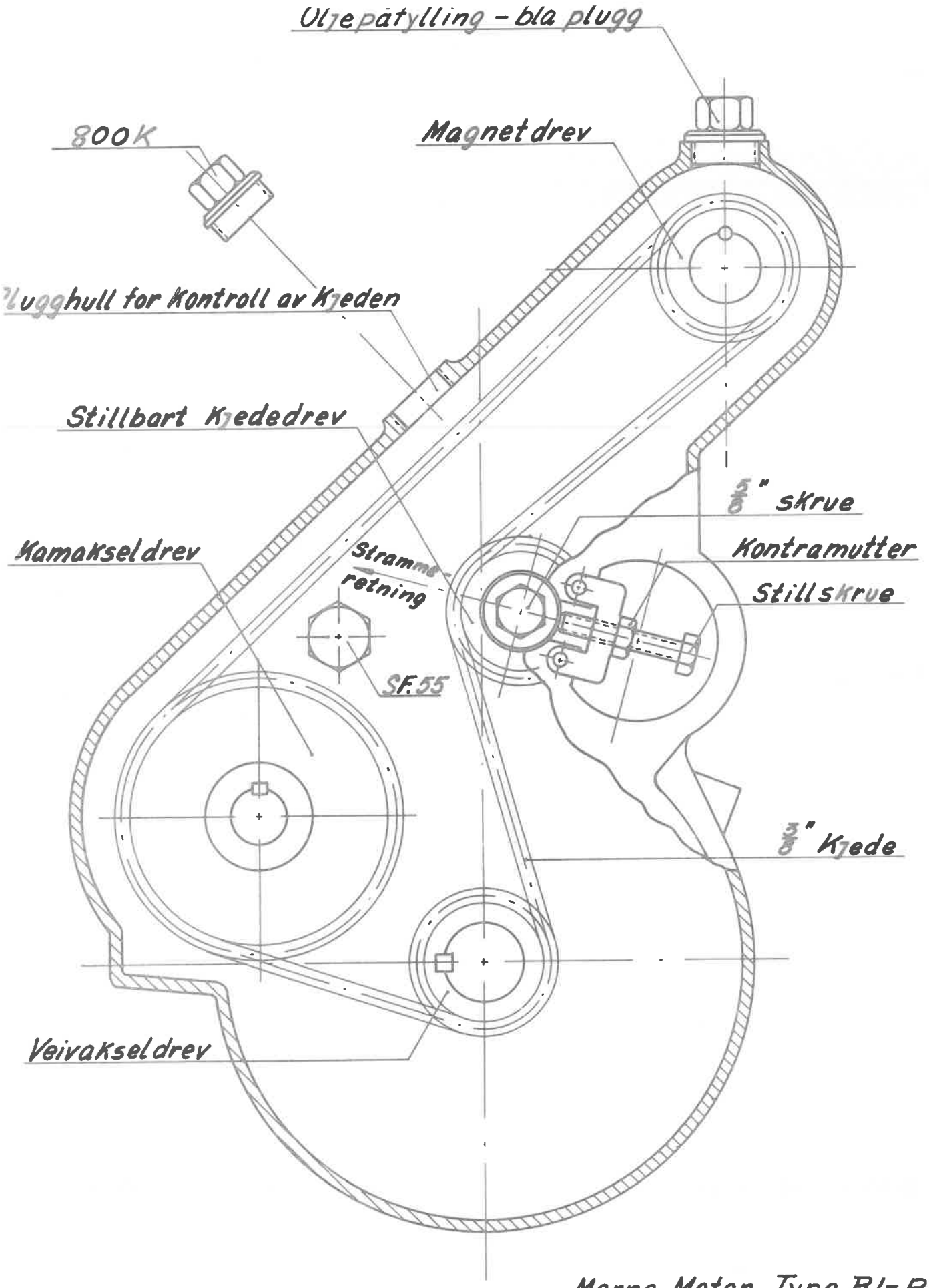
Care must be taken to place the magneto correctly on its bracket. If it is placed awry, this will affect the ignition point. The magneto must be placed longitudinally so that it touches the lead. But it must not be forced down.

Adjustment of the silent chain.

On delivery from the factory the silent chain has been adjusted adequately. The owner should, however, before using the engine, unscrew the plug 800 K (see drawing) on the pulley case. By means of his finger he can easily control the tension when pressing it downwards. This is a good indication later on when it will be necessary to readjust the chain, which will sooner or later happen to all chains. For the MARNA engine, type R2, we can give this control-rule as to how tight the chain must be.

When the plug 800 K has been unscrewed, a folding rule can be put down on the chain. The adequate tightness is when the chain can be pressed downwards about 8 or 10 mm.
If the control shows that the chain has slackened, it must be tightened again. When the chain is to be tightened, the trap-door covering the adjustable tension pulley is loosened. This trap-door is kept in its place by 5 screws. Now the adjustable tension pulley appears, and it is easily seen how the construction works. The 5/8" screw securing the tension pulley is loosened, but not more than that the screw and the disk under the head are loosened. The lock put on the regulation screw is loosened and by screwing the regulation screw inwards, the tension pulley will be displaced, at the same time tightening the chain. When the most adequate tightness has been attained, the 5/8" screw is again firmly secured.

Now the tightness of the chain is controlled through the aperture for the plug 800 K. If the chain is not tight enough, the regulation screw must be adjusted a bit more. At the same time, of course, the 5/8" screw, securing the tension pulley, must be loosened, so that the tension pulley can be displaced.
When adequate tension has been attained, first the 5/8" screw and afterwards the lock nut on the regulation screw are firmly secured. At last the trap-door is replaced and secured.



Marna Motor Type R1-R2.

Mandals Motorfabrik.

Mt. 1463

Normal use of the MARNA engine type R2.

The installation, the lubricating system, the adjustment of the chain and the Solex carburettor have been explained above. When the engine has been fully installed and is going to be tried for the first time, the following points should be considered:

The oil-level in the crank case must be controlled by the sounding-rod. If the engine is equipped with a reduction gear, the oil-level must be controlled there too.
The bilge cock must be open, so that a free flow of water to the Cooling System is assured, and when the engine has been started, the turncock on the top cover must be completely closed, so that the Cooling Water is discharged directly into the sea. When the engine has been started, it will soon be seen whether the cooling water is passing through this discharge pipe. If the motor has a water-cooled exhaust pipe, as explained above, the turn cock must be open immediately after the start, so that the cooling water passes into the exhaust pipe.

The oil pressure should be checked, and it must be remembered to turn the grease cups as explained in the section about the lubricating system. The grease employed must be clean and not very fat and not contain acid.
When starting the engine should be choked one or two times in order to produce a rich mixture in the cylinder. The air intake should be almost fully open, but as soon as the engine has started, it should be throttled down, because if the air intake is opened excessively when the propeller is disengaged, the engine will "race". This is undesirable and should be avoided.
If the engine is equipped with a Clutch and Reverse Apparatus, it will often be found that when the Reverse lever is put fully forward, the full pitch of the propeller blades will be too heavy for the power capacity of the engine. In that case the pitch must be adjusted, so that the engine runs at a full speed of 1000-1200 revolutions per minute, if the engine has no reduction gear. If the engine is equipped with a reduction gear, it can be run up into 1500 revolutions per minute.

The engine should not be run at full speed for a long period, when it is being run in the first times. If the engine is equipped with a carburettor with a permanent needle, no attempt must be made to alter the setting of the full and low speed jets on the carburettor, as these have been correctly adjusted at the factory during the Test Trials of the engine.

Normal Running.

The engine can be considered to have been run in sufficiently after a duration of approximately 50 hours, and it can then be run at full speed whenever and for as long as desired, although racing the engine should be avoided. It is important to ensure that the propeller blades are correctly pitched, and the revolutions of the engine should not exceed 1000-1200 R.P.M., if the engine has no reduction gear. If the engine is equipped with Reduction Gear, it can be run at 1500 R.P.M. These should be checked with a tachometer, although the beat of the engine will soon prove a sure indication of correct or incorrect pitch.

When in shallow water, and in the vicinity of flotsam, driftwood, rocks etc., extreme care should be taken in regard to the propeller blades, as they can be easily bent, or broken, when in contact with such obstruction. If the engine must be used, it is advisable to have full control of the Clutch lever, so that if necessary, the propeller can be disengaged immediately.

The following procedure should be adopted when taking the boat up to a quay: The engine should be throttled down to a suitable low speed when approximately 70-80 yards distant from the objective, and the propeller put into full reverse when the distance has decreased (depending upon such factors as wind, currents and tonnage,) to approximately 30 yards. The propeller should be re-engaged when the boat has approached to within ten to five yards, and the resultant backing will entirely check the forward speed. This instruction, and the same distance of ten to five yards for checking the speed, will also apply to an engine equipped with Gear.

Care of the engine.

Efficient ignition is a primary requirement for the satisfactory performance of a petrol engine, and the magneto must always be kept dry. (Refer to the Magneto, section: Electrical Ignition).
The petrol supply must also be in good order, and the petrol pipe should be blown through, and cleaned 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. 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 loose on its 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 at once supply Spare Parts, and substitutes for the authorised components should not be used.

The Cylinder Head should be removed, and the Piston etc. decarbonised when this is thought to be necessary after a considerable period of use. The valve clerances should also be checked, and the suitable clearance is 0.4 mm. This clearance is necessary, as the valves become warmer than the cylinder, and expand when the engine is running. Therefore, if there is no allowance for clearance, the valves will leak and become burnt, thus causing engine stoppage. We recommend that this work should be carried out at a workshop, (if the special tools required are not available), or if the valve adjustment proves to be difficult.

Starting difficulties.

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 over once or twice. If the spark is weak, this can often be remedied. (Refer to section: Electrical 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 valve-spring, and pressing it upward, then releasing it suddenly. This ought to clear the obstruction, but before doing this ensur that the valve is right down, that is to say, the valve pusher is in its 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 several times.

Running by frosty weather.

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 packet, it will freeze and expand, thereby ruining the Cylinder Block and Cylinder Head, which are both expensive to replace.

When the engine has been stopped, the bilge cock is first closed. Then the drain taps on the Cylinder Block and on the Water-Pump are opened, so that the flow can be clearly seen. It must also be remembered to drain the discharge pipe running from the top cover overboard. This pipe should be equipped with a tap at its lowest point to facilitate the discharging of water.

When the engine is started again, the bilge cock must first be opened. The tap on the Water-Pump must be closed, but the tap on the Cylinder Block must remain open until the Cooling Water can be seen flowing out of the discharge pipe.

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 normal temperature of the engine is 70°C, and thus it is expedient to raise its temperature as soon as possible. An engine always wears more 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 its correct temperature.

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 should 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 oil into the water jacket of the cylinder block, 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 tarred paper or something similar, for the same reason. Before the engine is brought into service again, it should be cleaned internally and externally, and any rust which may have been formed, should be scraped off, the affected portions being repainted with a heat resisting paint. The Crank Case and Reduction Gear must be refilled with fresh oil, and all the grease cups refilled with new good quality oil. Also remember to give the Propeller Head a turn with the grease press. 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 intake filter of the boat and the intake for the Cooling System.

Cooling System.

As the MARNA engine, type R2, is a heat engine, it is obvious that it becomes hot when running, and the correct temperature, after a reasonable period of running is approximately 65°C or when the hand cannot be held with comfort on the Crank Case. 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 affected unless the temperature of the engine clearly rises above 100°C.

The Cooling Water Pump is a cog-wheel pump pulled by the cam-shaft. In this way the cog-wheel pump obtains a speed which is the half of that of the crank-shaft. The Water Pump is secured on a small bracket.

The shaft is coupled to the driving shaft by means of a rectangular piece of metal, which fits into a slot on each of the above-mentioned shafts. This coupling has been purposely weakened by being bored, so that in the event of the engine being turned when the pump frozen, this coupling will give way, thus preventing the cogs from being broken, and the pump being severely damaged. A spare coupling piece is delivered with every engine.

Rear Overhead Starting Crank.

The MARNA engine type R2 is equipped with a Rear Overhead Starting Crank to facilitate starting, and the magneto is mounted on the frame of this assembly, in the opposite direction to the crank, so that it is thus situated in the highest and driest possible position in the boat. The shaft is constructed in such a way that the crank can be engaged in two different positions, proportionate to the position of the piston. When starting, the crank should be engaged in its lowest position and pulled up and over, as it is incorrect to engage at its highest point, so that it has to be pushed downwards. It should be pressed in a little to engage, so that the crank key can be felt when it makes contact, and the crank will automatically disengage and return to its stationary position when the engine has started.

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

The Clutch.

The function of the clutch is to allow the propeller to be disengaged when the engine is running, and it has a cast iron friction spring which expands when the control lever is moved into forward position. The spring then grips a bell coupling, thus connecting the engine and propeller shafts. The forward movement of the control lever forces a tapered cylinder, which allows two arms in the friction spring to bend outwards, and if the clutch becomes slack, the adjustable hardened screws situated on these arms must be tightened. This can be done by loosening the lock nuts, and the screws should then be turned in a clockwise direction until a suitable adjustment has been attained; but always ensure that both arms are equally readjusted if their position is altered. A sliding bearing is situated in the rear of the clutch assembly for the purpose of preventing the penetration of sea water, if the deck becomes awash.This bearing must be lubricated daily if it is to fulfil its purpose. But it should be lubricated rather sparingly.(See section: Lubrication.)

If water does happen to penetrate into the clutch assembly and crank case they must be drained carefully, and then refilled with clean oil. The engine should be run as soon as the refilling has been completed, so that all parts are sprayed with clean oil of high quality.

Propeller Installation.

The MARNA engine type R2 (8HP) is equipped with a 1" propeller shaft, a 1 1/4" tube and a 1 5/8" stern tube.

If the engine has a reduction gear (12 HP), the dimensions of the propeller shaft, the tube and the stern tube are as mentioned above.

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 realed internally 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 propeller head 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 is situated in the head.

Petrol Tank.

A petrol tank is supplied with each engine, also supply pipe from tank to carburettor, and the 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 vacuum occurs in the tank, the petrol will have difficulty in flowing to the carburettor, and a small hole has been bored in the lid of the tank to prevent this contingency.

In the case of the tank being situated under the deck, this hole has been 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.

The MARNA Reverse Apparatus.

The MARNA engine, type R2 8/12 HP delivered with adjustable propeller blades is equipped with a reverse apparatus mounted on the coupling box. Accordingly it does not need a foundation of its own. If the motor is equipped with a reduction gear, the reverse gear is secured to the box of the reduction gear. The latter is equipped with foundation membersadequate for mounting on the longitudinal beams of the foundation of the engine.

The crank moving the reverse apparatus must be turned nearly around to move the propeller blades from maximum forward to maximum reverse.

When the engine itself is mounted, the reverse apparatus must have been taken away from the engine. It is kept in place on the coupling box (alternatively the box of the reduction gear) by four 3/8" screws no.29, see the drawing Mt 1265. The bearing of the reverse apparatus no. 8 is demounted by means of the screws no. 14 and the screws no. 10.

The propeller shaft (with its covering tube) is put through the outer and inner stern tube. The disk coupling is secured to the shaft and the 2 7/16" square headed screws are screwed down a bit. Then the propeller shaft is pulled so far forwards that the disk meets the disk of the coupling shaft. Then the propeller shaft is turned by hand, and if there is no gap between the disks, the direction is correct. Repeat this control when the engine has been completely mounted.

The disk coupling on the propeller shaft is taken off again, and the reverse bearing is mounted at the right distance from the covering tube of the propeller shaft. When the propeller blades have attained their highest pitch forwards, the clamp disk is mounted at a distance of 200 mm from the back of the coupling box (alternatively the back of the reduction gear). The clamp disk no. 12 is pressed on to the pipe by screwing the screw no. 13 as far down as possible. The screw no. 13 and the hexagonal key appertaining to it are made of chromium-nickel steel. This material is very solid. The stuffing box on the covering tube is filled with a packing of tallow and closed. The disk coupling on the propeller shaft is put in its place. The shaft must pass through the hole in its entirety, but no further. The wedge between the shaft and the coupling is adjusted and driven in. The disk coupling on the propeller shaft is now coupled together with the disk coupling on the coupling shaft (alternatively the shaft coming out of the reduction gear).

Now the reverse apparatus is placed, and the 4 3/8" screws no. 29 are screwed down. Then the first half of the reverse bearing no. 11 is mounted and screwed down by means of the 4 screws 3/8" no. 10. It must be ensured that the reverse bearing is in the centre of the propeller shaft.

Now it is possible to try whether the propeller blades have the forward and the reverse pitch desired. By means of this reverse apparatus the pitch of the propeller blades is easily changed without moving the clamp disk no. 12 away from the covering tube. Only the 4 3/8" screws no. 10 are loosened, and the reverse bearing is moved a bit backwards and forwards until the desired pitch of the propeller blades has been attained. Note this advantage.

The grease cup on the reverse bearing greases this bearing. The grease cup no. 27 greases the reverse apparatus.

The ball no. 18, the spring no. 17 and the regulation screw no. 16 keep the reverse apparatus in the position where the crank has been put. In the circumference of the disk no. 15 40 holes have been bored. Therefore the ball passes into one of these holes, and the reverse remains here until the crank is moved.

The Gear.

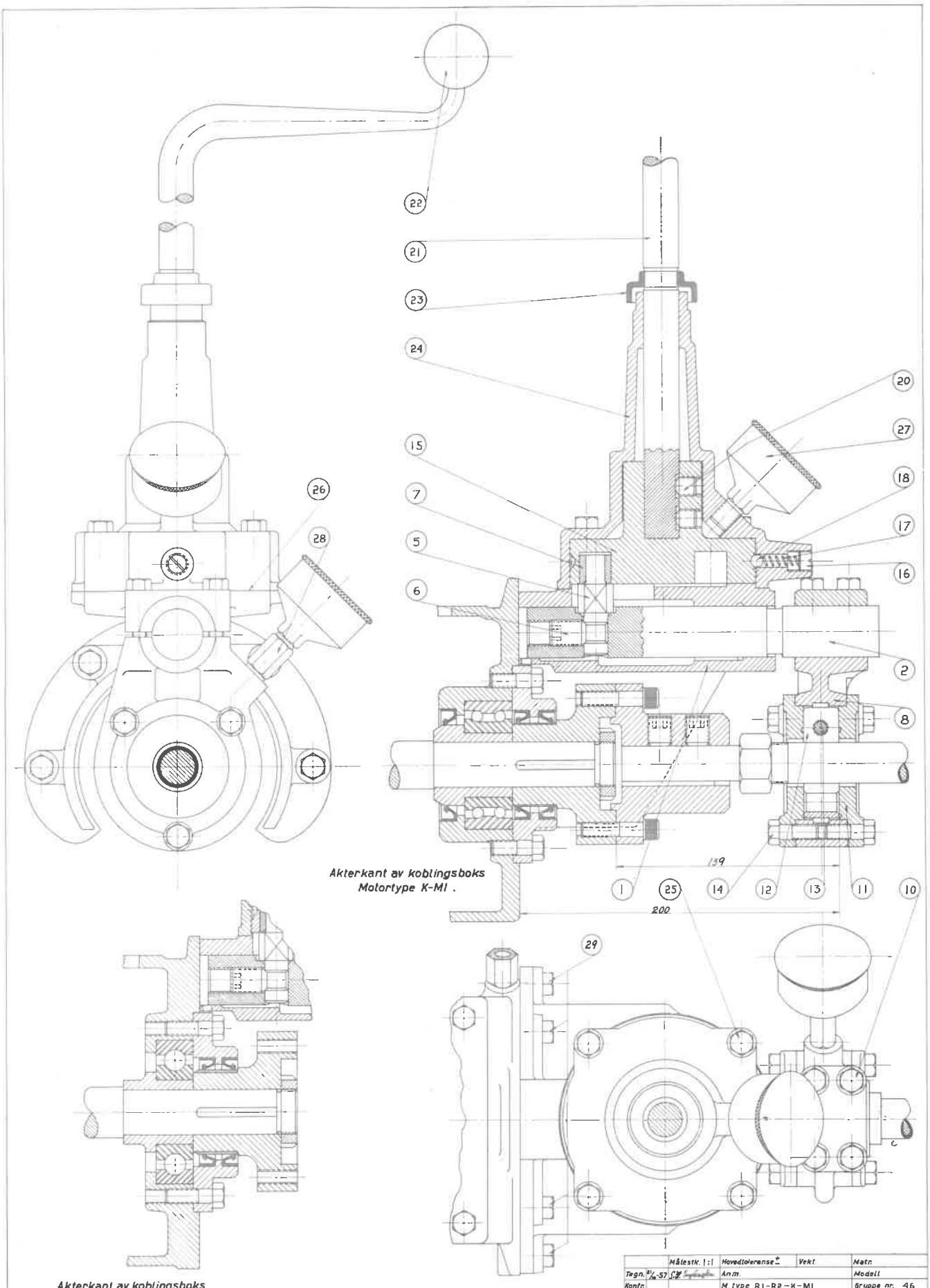
In addition to operating as a clutch forward running, the MARNA gear fulfils the purpose of disengaging the propeller, and of altering the direction of rotation. It is constructed on the Differential Principle, and for forward running it operates approximately the same as a normal clutch. That is to say a cast iron friction spring expands when the gear level is moved forward, and engages firmly in a bell coupling, thus connecting the engine and propeller shafts. The forward movement of the gear lever forces a tapered cylinder rearwards which allows two arms in the friction spring to bend outwards, and if the gear coupling becomes slack, the adjustable hardened screws situated on these arms must be tightened. This can be done by loosening the lock nuts, and the screws should then be turned in a clockwise direction until a suitable adjustment has been attained, but always ensure that both arms are equally readjusted if their position is altered.

When the boat is reversed, the gear lever is moved into the rear positio and an internal steel bar is drawn back, thereby exerting tension on a cast metal expansion band, which grips the internal gear housing and locks it.

Thereafter, and by means of several cog wheels the propeller shaft is driven in counter rotation to the engine shaft. The steel draw bar is connected to the expansion band by a bolt, one end of which contains a roller, the other being threaded for a nut, and lock nut. The purpose of the roller is to facilitate the rearward movement of the bar, and when that is in position, it is retained by the roller engaging in a recess in front of the inclined edge of the bar. It is possible that the front corner of this recess will become warped in the course of time, and the gear will then be unable to function properly. This can be rectified by filing the recess accordingly, and it may also be necessary to adjust the bolt nuts if the gear slips when the boat is being reverse

The oil which is used to lubricate the cog wheels of the gear originates from the Oil Pump, and is fed through the rear crank bearing to the crankshaft from where it is passed into the gear assembly. Thus, the oil which lubricates the gear is the same as is used in the engine.

A ball-bearing together with 2 tightening rings is situated in the rear of the gear assembly. The lubrication of these parts is done as describe in the section about the clutch.



Akterkant av koblingsboks
Motortype K-MI .

Akterkant av koblingsboks
Motortype RI-R2 .

	Målestk. 1:1	Hovedtoleranse ±	Vekt	Matr.
Tegn. 21/6-57		Anm.		Modell
Kontr.		M. type RI-R2-K-MI		Gruppe nr. 46
Mandals Motorfabrik Mandal (Norway)		OMSTYRINGS APPARAT		Mt 1265

Electric starter, dynamo and battery.

If the motor is equipped with an electric starter, a dynamo must necessarily be mounted on the engine to generate charging current for the battery. We shall here give a somewhat more exhaustive description of these 3 parts:

The Dynamo (mounted on MARNA 2 cyl. 8/12 HP engines).

This is a small, regulated voltage, Direct Current dynamo, and it operates with a proportionately high number of revolutions, (this applies to both 6 and 12 Volt types.) These dynamoes are always equipped with a voltage regulator which automatically connects or disconnects the supply, according to the high or low number of revolutions, and connection will normally take place when the engine is running at 600-700 R.P.M. The dynamo will then begin charging the battery, assuming that the latter is not fully charged. This supply will increase a little when the engine develops a high number of revolutions, but it will be reasonably constant even if the engine is running at 800 or 1000 R.P.M. This is known as the charging current, and the amount can be read on the ammeter.
Normal charging current for a 6 volt - 75 watt dynamo will be approx. 12 to 13 amps, decreasing if the battery is almost fully charged. The voltage regulator on this type of dynamo is sealed by the manufacturers, and the guarantee becomes invalid if this seal is broken.
The adjustment of a voltage regulator demands accurate gauges, although it is seldom that any fault occurs. However, in the event of this, the regulator must be returned to the vender to be checked. A dynamo must always be given the utmost protection against water and damp, and must also be maintained in a clean and oil free condition.

The Battery.

The battery is a normal accumulator. A 6 Volt dynamo is used for a 6 Volt battery and a 12 Volt dynamo for a 12 Volt battery.
When the battery is on board, it should be placed in a low wooden box, adapted to the external dimensions of the battery. The bottom and sides of this container must be lined with lead plates, soldered together at the joints, thus making it entirely leak proof. The acid, which drips from the battery in the course of time, will then collect in the bottom of the box, and be prevented from running into the boat. The battery should always be stored in a dry place on board.

The capacity of a battery is indicated in ampere hours (Ah), and 90 Ah is an adequate amount. A battery always requires a little care and attention, and it should be kept as clean and as dry as possible.
Especial attention is required when connecting the leads to the terminals, and both the terminals, and lead clamps, should be well cleaned before connection when the latter must be firmly secured.
The battery terminals should be smeared with vaseline after being connected, as this helps to prevent exidisation, and poor contact caused by the latter.
Precautions should always be taken to ensure that the battery never short-circuits, as the result of this can be directly inflammable, and an acid filled battery should be topped up with distilled water, if the level of the liquid falls below the top of the cells.

Electric Starter.

The starter type which is used on the 2 cyl. R2 8/12 HP engines has an electromagnetic connection from the pinion, - the switch operating a master or control current, which in turn operates the electromagnetic connecting mechanism, thus connecting the starter so that the current is obtained from the battery.

The starter switch itself can be mounted in the position considered most suitable by the individual owner, and in many cases it will be found that this will be on the rear of the engine casing, near to the controls.

A large amperage is brought into use when the engine is electrically started, and therefore the leads between the starter and battery, and from the latter to the engine must be as strongly dimensioned as is shown on the Wiring Diagram, which also indicates how the connection between dynamo-battery starter and, possible, lamps is accomplished.

The lead from the starter to the battery should not be longer than 1.5 metres, and if this length is exceeded, the lead must be of a greater crossection than that which is shown on the Wiring Diagram.

It is important to ensure that all connections make good contact, and especial attention must always be given to this. Care must also be taken in soldering the terminals and clips to their respective leads, and the connecting screws and nuts must be securely tightened, therefore a prudent owner will always entrust the connection of all electrical equipment on board to a skilled mechanic , who is familiar with such work.

Things to be remembered:

First time removal of lubricating oil.

As long as the engine is new, the lubricating oil in the engine must be changed when 100 litres of fuel have been consumed. Later on it is changed as often as commonly prescribed.

Remember that every engine consumes some lubricating oil when being run.

The consumption of lubricating oil is highest at first. Control the oil-level in the crank case every day by the sounding-rod. If the sounding shows a too small quantity of lubricating oil, it must be refilled up to the highest mark. (See page 6).

The sounding-rod and the oil filler must be screwed down solidly. Take care that you always have on board a reserve of lubricating oil of the prescribed quality and a tight box of grease containing no acid.

To be observed: The MARNA type R2 is a high-quality engine requiring the best lubricating oils. Consequently the guarantee becomes invalid if other types of lubricating oils are used than those mentioned in the prescriptions.

Ensure that the engine gets cooling water. Do not forget to pump out all water from the engine in frosty weather.
Remember to empty the fuel tank of water.

If the top cover is taken off, it must be remembered, when it is remounted, that the stuffing of the top cover must be placed with the same side down, as when it was taken off. This is clearly seen when looking at the cavities in the stuffing produced by the 2 cylinder packings.
When tightening the 9 nuts keeping the top cover in place, one begins quite cautiously with number one (see the table at the bottom of this page), and then goes on to number 2 etc. When number 9 is finished, the same process is repeated in the same order several times, the nuts are drawn gradually tighter until the top covers are in their normal position.