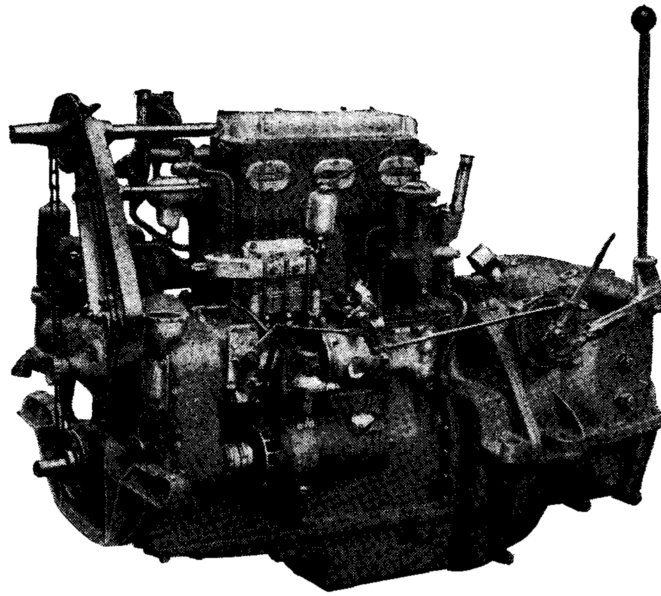
# Marine Engines For Pacific Fishermen . . . (2)

*In this instalment the author discusses engines of below 8 h.p., the advantages of outboard motors, and the installation of marine engines.*

By ARTHUR N. SWINFIELD



This Gardner Model 31W three-cylinder marine diesel engine develops 42 b.h.p. at 1300 r.p.m. Unit construction reversing gear box is incorporated.

THE foregoing comments refer of course to engines in the vicinity of from 8 to 48 h.p. Below 8 h.p., we find innumerable small engines ranging as low as 2½ h.p., in both petrol and diesel models. In this particular field we recognize many makes of outstanding performance. Competition has been, and still is, very keen.

The amount of work done by these small units is prodigious. They are simple to install and are relatively cheap and economical to operate. Every particular manufacturer offers some exclusive feature, and it can be truly said that these "mighty midgets" give real value for money.

Once again they are built as two or four-cycle units, petrol or diesel, etc. One particular make features a variable-pitch, reversing propeller, and this, coupled with a reduction gear, would appear to be an ideal unit.

The variable-pitch propeller is operated by a lever (behind the engine) and by this means the propeller blades can be "twisted" (or pitched) at will, so loading the engine to its maximum efficiency and providing an excellent reverse system without the use of gears, etc. Needless to say, an extra set of blades would be a good investment.

While on the subject of variable-pitch propellers, it should be stressed that these units could well be employed on *any* vessel. Although rather expensive in the larger horsepower groups, this could be offset by the lower price of an engine *without reverse gear.* The method of propulsion is ideal, and it would be almost impossible to overload or underload any motor at any stage of manoeuvring.

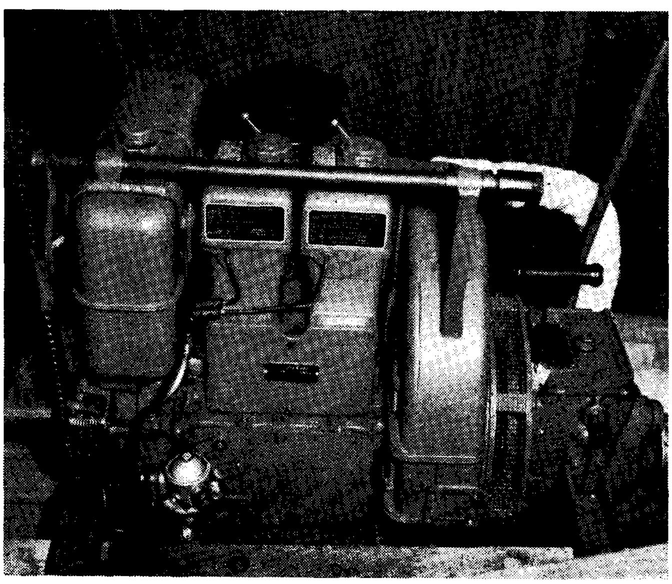
### Starting Sometimes A Problem

In the small horsepower field, starting is sometimes a problem, due to the fact that it is possible to flood the carburettor and even fill the crankcase with petrol. Once this occurs, starting is an arduous business as the method of turning the engine is usually by means of a belt (of leather) wrapped around the flywheel.

A good smooth starting handle is an advantage, especially if in a raised position. All electrical equipment should be tropic-proofed, and the wise operator will always carry a spare magneto and spark plug.

One very important point to remember when buying and subsequently operating a small two-cycle motor is that such a motor depends on its crankcase compression for efficiency. If this compression is lost the engine will operate (if at all) very poorly indeed.

The manufacturer provides for this possibility by fitting two grease cups at the two main bearings. These cups carry the grease to the bearings, sealing the crankcase against leakage and preventing undue wear. Badly-worn bearings do not pay on any engine, least of all on two-cycle motors.



This British-built Lister air-cooled marine diesel with engine-mounted fuel-tank (Model LD2) is designed specially for ease of installation. It develops 7 b.h.p. at 1800 r.p.m. A smaller model, the LD1, develops 3½ b.p.h. at 1800 r.p.m.

### The Outboard Motor

And now, having discussed various features in different types of small marine engines, what of the outboard motor? Here is a most useful member of the marine propulsion family. It is light in weight, readily installed on almost any small craft, economical to operate, almost fireproof, most efficient in performance and relatively cheap.

Maintenance is comparatively easy, as this can be carried out under ideal circumstances away from the boat on a properly-constructed stand. The engine can be kept stowed away under cover when not in use.

Needless to say, there are dozens of different makes, all with "exclusive" features. When making a selection always remember that the sea is just as hard on an outboard motor as any other type, so

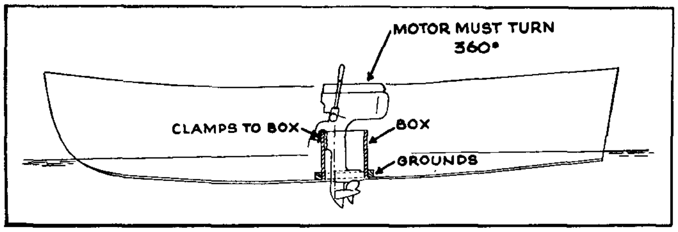
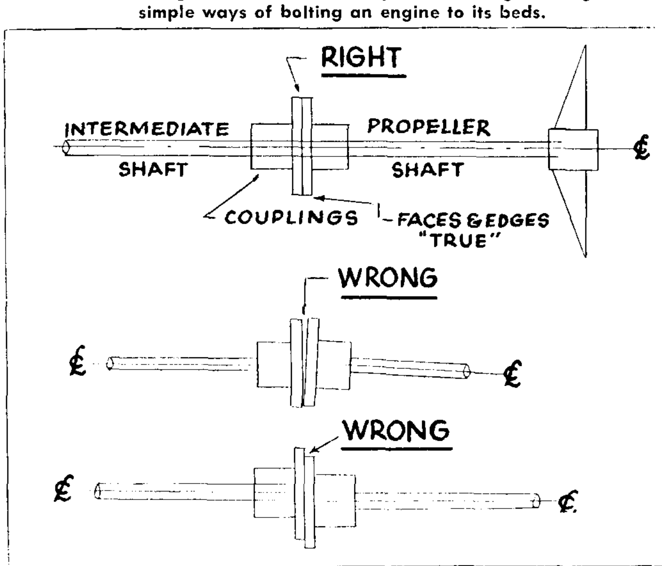
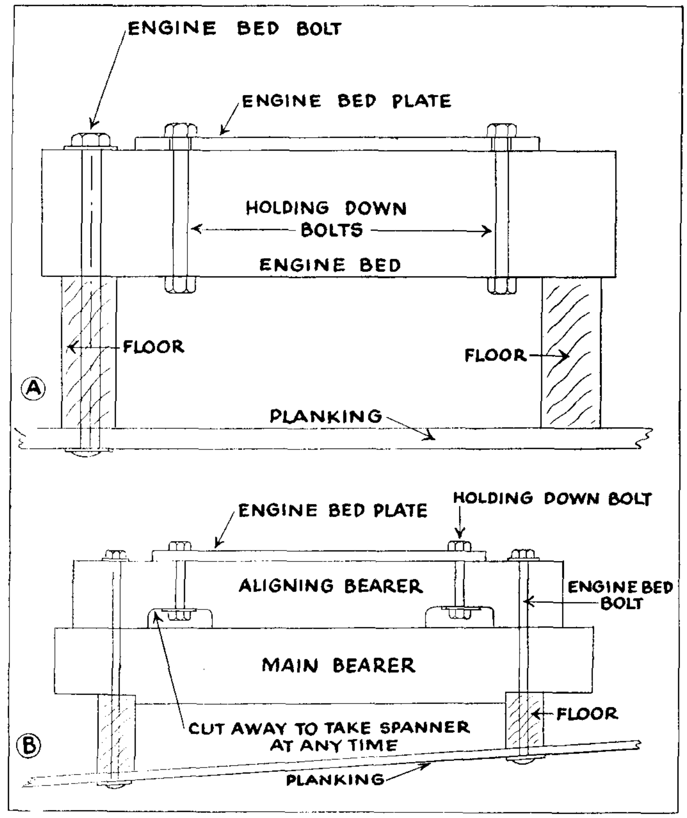



**Fig. 1 (above): Inboard mounted outboard motor. Fig. 2 (below): Accurate shaft alignment is of vital importance. Fig. 3 (right): Two simple ways of bolting an engine to its beds.**




that it is good policy to select the rugged model built to resist the corrosion that goes with salt water and the breakdowns in the electrical system that are only avoided by those skilled in specialized outboard motor manufacture. Too many "gadgets" can become unnecessary liabilities.

In passing, it is interesting to note that a new addition to the outboard field is a 7½ h.p. diesel motor, in both air and water-cooled models. The fire hazard is, of course, reduced as well as fuel bills. This new engine is a product of the United States, where the outboard engine is leaping ahead in popularity.

### Installing An Outboard

The usual method of installing an outboard motor is simply to clamp it on to the transom or stern of the boat, and leave it at that. There are, however, many other ways to instal these versatile motors—one at least of which is very useful, provided the boat remains in reasonably deep water. The rough sketch gives some idea of just how this suggestion can be employed (Fig. 1).

By this means the motor may be used for *any direction* of propulsion, including reverse, simply by rotating the whole unit whilst it is installed in an over-size "centreboard" box. An ideal position would be slightly aft of amidships and to one side of the keel—so as not to weaken the vessel by trying to position the motor on the centre line of the boat.

The author has used this installation on several occasions, with marked success. Needless to say, the outboard motor in question must be capable of being turned completely around in the box. In other words the motor head (complete with tank) rotates with the shaft and propeller through 360 degrees.

One feature of the outboard motor which lends itself to efficient propulsion is the usually excellent ratio between engine revolutions and actual propeller shaft revolutions without any undue weight in the reduction gear drive.

The engine usually 'revs' at a very high rate—whereas the propeller shaft turns at just the right speed to suit the usually excellent propeller supplied complete with the engine. The whole unit, however, could possibly be very inefficient if a lightweight motor and high 'revving' propeller were installed on a heavy, slow-moving hull. For this reason always remember that a heavy, slow boat uses a slow-turning propeller with the maximum diameter, whereas a fast, light vessel can efficiently use a smaller diameter propeller at higher propeller revolutions.

Many outboard manufacturers offer optional propeller revolutions and diameters, as well as long or short drive shafts.

Speaking of actual speed, one good formula is:

$$V = \sqrt{L} \times \sqrt[3]{\frac{1000\, P \times C}{D}}$$

When $V$ = miles per hour,
$L$ = length of boat on waterline,
$P$ = actual shaft horsepower,
$D$ = weight of boat in pounds,
$C$ = a figure varying between 1.0 to 2.5, according to whether the boat is a heavy or light weight vessel. (For a heavy weight boat use 1.0 to, say, 1.6, and for a lighter boat 1.6 to 2.0. For a very light weight boat use from 2.0 to 2.5.)

In passing it might be useful to note that in the formula just given, reference is made to *shaft* horsepower. This is the actual power delivered by the engine through its various components to the propeller. It is not the *rated* horsepower, which is usually higher than the shaft horsepower and which can be very misleading unless taken into proper account.

Every engine produces a certain basic horsepower at peak revolutions. This horsepower should always be checked against certain losses, incurred by the addition of gear boxes, reverse gear units, generator or similar additions to the actual engine. So in order to be sure of the power given at the propeller, always remember to enquire regarding the *shaft* horsepower as against the stated horsepower.

### Installing Marine Engines

The installation of any marine engine is a vital factor in helping the engine to operate efficiently. First and foremost

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this century in increasing the productivity of coconut stands.

With regard to the need for fuller international statistics on coconut production, the Group noted with satisfaction that provision has been made by FAO for the appointment of a regional coconut statistician to conduct small-scale pilot surveys with the aim of evolving suitable methods for the estimation of coconut production.

The Group once again stressed the importance of collecting more accurate statistics for the World Agricultural Census in 1960.

The Group endorsed a recommendation made by the technical sub-committee for the appointment of an expert to study the status of coconut research work in the main copra-producing countries, and exchange of technical information. It was considered he should also study the proposal to establish an International Coconut Bureau.

During the session, information was received from FAO headquarters that funds for the appointment of such an expert had been made available as from January 1959. FAO has accordingly been requested to provide an expert for a period of at least two years to make a detailed study of different methods of drying, and different types of driers. It was recommended that at the end of the experimental studies the expert appointed should conduct a training programme for trainees from copra-producing countries.

An exchange of information took place on some of the serious diseases of the coconut palm, more in particular on the cadang-cadang disease in the Philippines, where it has already killed about nine million palms.

The Group recommended a study of diseases of unknown cause.

The Group expressed its great appreciation of the visits arranged for its members by the Government of the Republic of the Philippines, Philcoa and the Philippines Manufacturing Company, which materially aided the technical sub-committee in its work.

It was felt by all participants that this second session of the FAO Group on Coconut and Coconut Products had been a very successful one.

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the motor should be in complete alignment with the propeller shaft and the intermediate shaft. All shafting should be "true" and couplings properly machined and fitted. Otherwise undue vibration and wear will occur in the stern tube, reduction gear or reverse gear, with subsequent overheating in the affected bearings.

Once the couplings are correctly fitted it is a simple matter to test alignment. Simply push both couplings up close, face to face. If they fit up snug without

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one; he is interested in what goes into it, and what becomes of it, since in all these matters, nuisance and danger to public health may arise from defective planning and construction.

The doctor whose specialty is public health is therefore an essential member of the housing team, and no apology is necessary for his intrusion since housing in its sanitary aspects, including overcrowding, is intimately related to the prevalence and spread of many diseases.

Moreover, the socio-medical problems of income and expenditure in relation to housing, food supply, nutrition and all that goes for happy and healthy living, whether in village or in town, are of intimate concern to the public-health administrator, and there is some danger that concentration on technical specialties within the field may divert the attention from the overall problem.

It is therefore the hope of the writer that these comments on aspects of housing may stimulate consideration not only of the technical details but of the whole problem of housing in its present but much more in its rapidly changing and developing aspects, and of its social implications.

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any sign of an opening, top, bottom, or one side, and both edges fit flush all around the perimeter, the shafts are in alignment. If an opening is showing at any place on the edge of the couplings, or the edges stand out beyond one another, the shafts are not in alignment. The same applies of course, between the engine and shaft couplings (see fig. 2).

The bolting of the engine to the engine beds is also very important. The use should be avoided of "lag bolts" or coach screws, which are hard to install correctly and difficult to keep tight.

Holding-down bolts should *never* pass through the hull planking. Undue leaking will occur, and there is always a grave risk of losing your vessel if the head of the bolt pulls through the planking, due to vibration or undue tightening.

Fig. 3 shows two simple ways of bolting the engine to the beds, with the advantage of being able to tighten up on the bolts at any time. In the sketch, "a" is a very simple bed for a small engine, while "b" depicts a bed for a larger engine. The holding-down bolts in "b" could perhaps go right through both the aligning and main bearer, but if this is impossible then the method shown is quite satisfactory.

*(To be continued)*

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