

VANE STEERING GEARS

by A. Wilcock

*Reprinted from a series of articles
titled 'Notes for the Novice Model Yachtsman'
which appeared in 'Model Boats'*

MODEL & ALLIED PUBLICATIONS LTD.

13-35 Bridge Street, Hemel Hempstead, Herts.

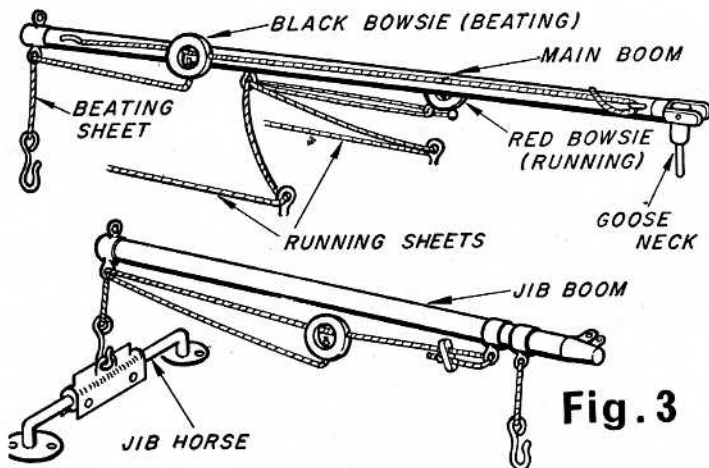


Fig. 3

This booklet is reproduced from a series of articles which appeared in *Model Boats* in 1965. References to "last month", "an earlier article," etc. may therefore be encountered.

Introduction

THIS is the first of a series of articles the intention of which will be to cover, as comprehensively as possible, all aspects of vane steering as applied to steering sailing yachts and in particular model yachts. It is very evident to the author from the questions he is asked at the pondside by free-lance skippers unattached to a club and just enjoying their sailing, and the more sophisticated talk in the clubhouse, that great interest is shown in the vane gear and that it still holds mysteries to many. It will be the intention to resolve these both for the novice and the more experienced. So many of the complications of the gears used by racing skippers are just devices to meet racing regulations without being impeded, or at a disadvantage, that attention will be paid to the simpler devices which can adequately meet the sailing requirements of the free-lance skipper, as well as invariably being easier to construct and therefore within the ability of many more enthusiasts. It must however be said that there is much more fun and satisfaction for even the lone sailer if he has a gear capable of executing the more complicated manoeuvres.

There are many controversial matters and opinions on getting the best both out of a boat and its steering gear. So far as practicable these will be given so that the reader may be led to try methods for himself, even if the author's own opinions are not expressed.

Later in the series designs will be given as well as considerations affecting design to enable and encourage the reader to experiment for himself. We must first, however, turn our attention to more mundane things. It is apparent that many do not realise that a yacht sails, or should sail, primarily on the "set" of its sails and that the steering gear is an adjunct: very necessary on some points of sailing but still an adjunct.

This leads us to the first instructive section under the title of 'Know the Parts', in which the various parts of the hull and rigging are described.

Know the Parts

Before trying to sail a boat it is worth while knowing the names of the various parts and what they are for. The front end of the boat is called the *bow* (pronounced bough) and the back end is the *stern* (pronounced stern, not starn). Looking forward

towards the bow the left hand side is called the *PORT* side while the other is the *STARBOARD*. The cords or wires holding the mast in place are called the *standing-rigging*. The main ones, from the hounds where the jib sail is attached to the foreside of the mast (about three-quarters of the way up from the deck), to the sides of the boat are called the *shrouds*. Their point of attachment to the sides should be behind the mast by about one sixth the width of the boat. These should be very strong to stop the mast giving in a sideways direction under wind pressure. That from the bow to the foreside of the mast, to where the jib is fixed, or to the top of the mast, is the *forestay*. That running from the top of the mast aft to the deck is the *back stay*. With vane steering this stay is invariably split about a quarter of the way up from the deck and secured on the port and starboard sides so that it clears the end of the main boom and also the vane gear. It is desirable to strut the mast above the hounds with *jumper stays*. A worthwhile refinement is to fit *running back stays*: these come from the mast at the point of attachment of the shrouds and jibsail and terminate on the side decks behind the shrouds on runners so that they can be pulled tight backwards or slacked off against the shrouds when not required, a point which will be dealt with in due course. Fig. 1 shows the points already detailed.

This may seem a strange introduction to 'Vane Gears for All', but if you think so, then these introductory pages are just for you. The availability of the correct standing rigging and its correct use will make the world of difference to how your boat will sail.

The cords which hoist or hold up the sails are *halliards*, while those which adjust the swing of the foot or base of the sails are the *sheets*. These working cords (ropes in full size) are called the *running rigging*.

For the sails, the Bermudian sloop rig is now so universally used in model racing yachts that that will be the only one we will consider. This rig consists of two triangular sails. That before (in front of) the mast is called the *jib* and that behind, the *main*. The jib on its forward edge—the *luff*—is attached to the *jibstay*. The head or peak of it is secured to the mast by the jib halliard which is adjustable to enable the tension of the luff to be varied. The bottom edge of the sail is called the *foot*. The forward

corner of it is the *tack* while the back corner, the *clew*. The tack and clew are usually attached to the jib boom. This is usually made of wood in circular, oval, or rectangular cross-section. Where a radial jib-boom is used the tack is attached to the jib stay and the clew to the end of the radial jib. Both these arrangements are shown in Fig. 2. The position of the clew on the end of the boom should also be adjustable as shown.

There are theoretical advantages in using a radial jib which will be described in the next section, but the practical difficulties of a really satisfactory radial jib limit their effective use to the expert modelmaker and skipper. A simple jib boom is shown in Fig. 2 where the jib boom is hooked to the jib rack on the deck from a point (preferably adjustable) near the forward end of the boom. The after edge of the sail—the *leach*—is slightly curved, and may have *battens*—small slips of wood—in pockets to hold out the curve. The threads of the weave of the cloth must run parallel to a line drawn from the head to the clew. The mainsail is attached at its head to the mast by an adjustable halliard as for the jib. The forward edge of the main sail—the *luff*—lies against the mast and is attached to it either by hooks to a jack line secured down the back side of the mast, or is laced to the mast with a continuous fine cord passed round the mast and through eyelets in the luff of the sail. The author favours the latter method and finds it takes no longer to change to a different suit of sails than with hooks and the jack line.

The tack of the sail is secured to the mast immediately above the main boom either by hooking to a suitable screw-eye or a small tie. The boom is again made of wood and is attached to the mast at the design height above the deck by a universal joint known as a *gooseneck* which enables the boom to swing horizontally and let its after end lift. The clew of the sail is attached to the after end of the boom and, as for the jib, should be adjustable. The leach of the mainsail is invariably curved, at least in the top suit of sails, and has battens fitted to hold out the curve. This curve is called the *roach*, it improves the appearance of the sail and gives additional unmeasured sail area in the racing classes. For this reason the length and number of the battens permitted is given in the class rating rules. At the head of the sail a headboard is fitted made of light metal, bone or plastic. This helps to distribute the strain at the top of the sail and enables the sail to

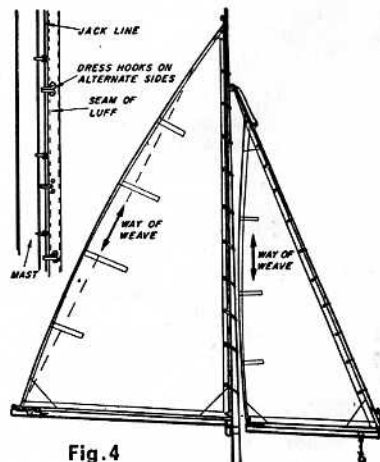
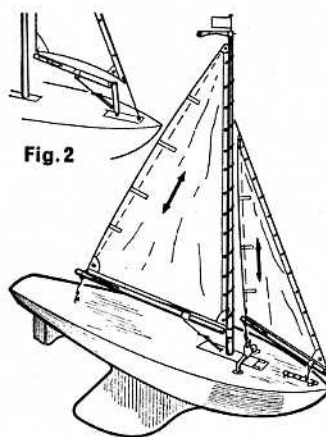
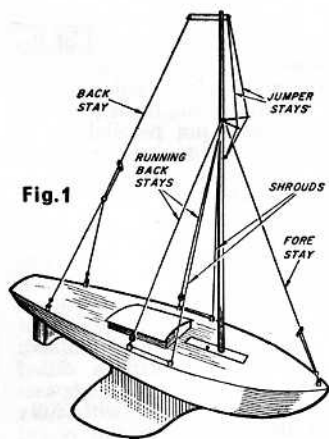
set better. The rating rules again specify the limiting sizes because of the way the sail areas are measured. Clearly these restrictions do not apply to boats not in a rated class and these devices should be used in these cases for appearances' sake and the normal benefits obtained.

An essential main boom fitment for really effective sailing is the *kicking strap*. This is an adjustable cord or wire from the base of the mast where it passes through the deck and directly below the gooseneck to the underside of the main boom making approximately a 60/30 deg. triangle. These various points are illustrated in Fig. 2.

Finally a word about the sheets. These adjust the angle the boom and sail make to the axis of the boat. Since this must be varied for the course being sailed, as will be described later, they must be easily adjusted. *Bowsies*, which are rings of bone or plastic, sliding on *jack lines*—tight cords stretched along the booms—are used for this. Fig. 3 shows a typical rigging of a sheet. Two are required on the main boom and one or preferably two on the jib boom. The jib sheet is attached to the deck, either to a central eye, which is quite adequate for a radial jib boom, or to a horse, which is preferable for the type of boom recommended as shown in Fig. 2. The attachment of the main sheets, one of which is called the *beating sheet* and the other the *running sheet*, will be described when we deal with sail setting.

WE saw in the introduction and rigging for plain sailing the various parts of the standing and running rigging. We can now turn to sail setting and at least start some sailing. Before we do, however, let us just go back a moment and see that our standing rigging—on which much of the performance of our boat depends—is set up correctly. This is done because if you are going to get your boat to sail well you must get into the habit of continually doing this. Racing skippers do it during a race, not only just before the start.

Start by seeing that the shrouds are reasonably taut and hold the mast upright, relative to the hull, in a sideways direction. This is best done with the hull on a stand, either on a table if your boat is small or on the floor if it is one of the larger classes and sizes. If you tighten the shrouds too much you will bend or distort the mast between the hounds and



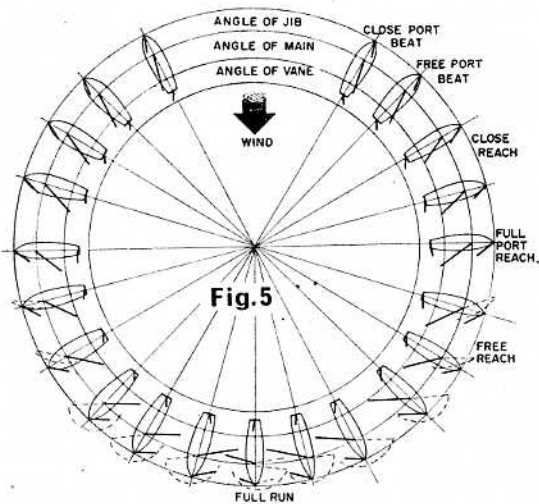


Fig. 5

the deck and this is to be avoided as much as having them so that the mast can wave about. Now adjust the backstay so that the mast leans backwards slightly, say 1 in. for each 2 ft. of mast above the deck; this is called the rake. Finally tighten the forestay until it just holds the mast from being pushed backwards. Now take the boat off its stand and lay it on its side—look down the mast from its top and you should see a fairly straight mast—if not look round to see which part of the standing rigging needs adjusting to make it so. It may be that the forestay only comes up to the hounds and that the backstay is bending the top of the mast backwards from this point, particularly if the mast is light in construction. This can be corrected by fitting jumper stays which is their real purpose. It is easy to see that a main sail with a straight luff can never be properly “set” on a mast bending, as distinct from leaning backwards.

Fig. 4 shows the details of the jib sail. First notice the way of the cloth in the cut. It is important that the leach is parallel to the selvedge of the material. Do not think that the seam on the leach will give adequate strength on crosscut material because it will not. The roach on the jib is quite small, about $\frac{1}{4}$ in. per foot run. Now look at the jib stay and note this is independent of the jib halyard or uphaul and has its own adjustment bowsie—a flat one is most suitable. This separate adjustment enables the lift of the jib boom to be controlled. By putting this bowsie near the bottom it will not be confused with the bowsie near the top used for the setting of the luff of the jib which is the next point to note. Look now to the clew of the sail and see the simple means that can be adopted to set the foot of the sail. Arrange things so that the clew can be hauled back practically to the end of the boom, since the jib must be set so that the sail just clears the mast in swinging from side to side and a long unused end of the boom does not allow this. Part of the metal top to an old fountain pen or lipstick holder will be found useful material to fashion a neat strong end to the boom. The horse, where one is fitted, should allow a boom movement of no more than $12\frac{1}{2}$ deg. each side of the centre line of the boat. This is about the angle for a close beat (see later) and enables the clew to be held down fairly tight, i.e., the horse aids the tension on the jib stay.

Summing up the fitting of the jib we have (1) The way or weave of the sailcloth must be parallel to the free edge (leach); (2) The jib stay must be really tight; (3) The jib boom is hooked to the jib rack on the deck so that its end just clears the mast in swinging from port to starboard. The use of the other hook positions will be discussed in sail trimming.

Before finally leaving the jib it is appropriate to say a few words about radial jibs as mentioned earlier. Looking at the jib arrangement just discussed, two disadvantageous features should be mentioned. The first is that to hold the clew of the sail down the boom is used as a lever with the jib hook as fulcrum and the jib stay pulling on one side of it. Thus, when the jib is set for beating at, say, an angle of 15 deg. to the axis of the boat, the luff of the sail moves slightly to windward and the plane of the sails is no longer on the axis of the boat but slightly to windward at the bow, i.e., the hull is pushed slightly to leeward for a given sail setting relative to the wind. Theoretically then the boat will not sail quite as close to the wind as if the luff of the jib is anchored to the centre line of the boat, which it is with the radial jib. Experience shows that this is only marginal. The other disadvantage is that, because the tack and clew of the sail are secured to the two ends of a continuous boom, the “flow” or bagginess of the sail is final for all angles of sail setting unless one is constantly adjusting the clew. It is generally advantageous to have little flow in the beating or close hauled condition and quite a bit of flow in the reaching/running courses (see later for explanation of courses) and this the radial jib automatically gives. If you want to experiment with a radial jib these are the design points to watch. (1) See that the post on which the radial jib is mounted points towards the hounds, i.e., it is not parallel to the jib stay but is at a slightly steeper angle, and is strong. Since it may be desirable to move it nearer the mast when using the smallest suit of sails a base like a mast slide is a useful foundation. (2) That it is as tall as the sail plan will allow so that the stresses caused by the wind pressure on the sail transmitted at the clew will not cause binding. This is the greatest difficulty to overcome in obtaining a satisfactory radial jib. (3) The kicking strap which controls the lift of the boom must be of metal throughout and the bottle screw strong, as the tension in this link in a strong wind can be very considerable. (4) The distance of the radial jib post behind the jib stay is a matter of opinion but about 1 in. per 10 in. of the foot of the sail is a good starting point.

Now let us turn to the main sail, also depicted in Fig. 4. First note that the cloth runs from the head or peak of the sail to the clew, not parallel to the mast. The latter is the commonest fault noticed with novice made sails, and their baggy leaches can be seen right across the pond. The tack of the sail is hooked immediately over the gooseneck or tied to it. The clew is secured to the end of the boom in an adjustable manner similar to that of the jib. The roach of the mainsail is usually limited by the rating rule giving a limit to the length of battens permitted. Practical considerations limit the roach to 40 to 45 per cent of the length of batten permitted. Where, as a novice, you are not limited by rating rules, again 1 in. per 2 ft. run gives a nice appearance, and you may wish to experiment with fully battened sails. Whether the luff of the sail is cut

