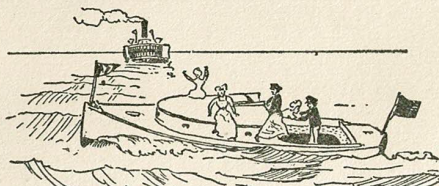


The Ballasting of Motorboats

TO many a comparison of a motorboat with the pendulum of a clock will seem far-fetched, but if you will look carefully into the subject you will find that the principles of the pendulum may be applied to a motorboat with advantage.

A clock may be made to run slow or fast by lengthening or shortening its pendulum; the weights in a boat act in precisely the same manner and cause the boat to roll long, slowly and heavily or to plunge, recover quickly and dance about in so lively a manner that one can scarcely keep his footing. Neither extreme is proper for a good



Crossing the wake of a steamer

sea boat; any sort of a craft can skim about on a smooth, glassy sea in calm weather, but when it blows and a sea forms that begins to make the boats lift and plunge, then the yachtsman begins to learn things about boats that he never dreamed of before.

Take, for example, a boat running with the sea abeam; any one who has been on a motorboat much has met with this experience, if only for the short time in crossing a large steamer's wake where a long line of rollers have to be crossed, and the scattering of the fair ones to get off the cabin-top as the boat rolls heavily from side to side is comical to watch. Any boat will roll under such circumstances, but the easiness or suddenness with which she rolls is the earmark of a well-ballasted or a poorly-ballasted boat.

Motorboats that merely skim about on smooth lakes or rivers do not give reason for a consideration of this problem. But take a fine, large motor yacht—say a hundred feet long—fitted up luxuriously, as many of them are. What comfort would there be for her owner and his guests if she were to roll about like a barrel when a little



The joys (?) of a hard rolling boat are well known to most of us from past experiences.

sea began to run? The owner would get disgusted with his boat in short order.

And on small boats, such as the fleet that came around Cape Cod this year—boats about forty feet long; what pleasure is there if one is to be perpetually tossed about?

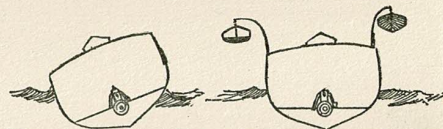
I can remember times at sea, on certain ships, upon

which I have sailed, where men would lose their temper at the way the ship rolled, owing to the way her cargo was stowed, and they'd shake their fist at the deck and condemn her, her owner, her builder and all connected with her. In the case of a small boat the effect is even worse.

Any owner can, by a shifting about of weights, help his boat wonderfully in this respect. Take a boat where all the weights are stowed low and well bunched fore and aft along the center line. Such a craft will roll quickly, fetch up suddenly and nearly throw one off his feet, while if the weights were spread more it would make her roll slower and easier. Heavy water-tanks are often shifted out towards the sides instead of being bunched in the middle and help to remedy rolling. A boat that rolls uncomfortably quick will, when boats are carried on her davits, often be found to roll slowly and easily, just that amount of top weight serving to tame her down. A dismasted craft will pitch one off his feet, yet when she has her masts and sails all on she rolls much more slowly.

All depends upon the shape of the boat, how she is to be ballasted to produce easy rolling. The wide, flat-bottomed craft like Fig. 1, for instance, will need her weights higher and spread out towards the sides far more than a boat shaped like Fig. 2.

The theory of all this rolling motion is summed up in a very few words. There is a certain spot above the water-line about which, like a wheel around its axle, the



A quick, uncomfortable rolling boat is often transformed in a slow rolling one by the addition of some top weights such as boats on davits.

whole boat rolls. This point is termed the *meta center*. It is found by calculations from the plans by listing the boat over at various degrees of heel, and where a vertical line drawn up through the center of buoyancy as she is listed (or heeled) crosses the center line drawn up through the center of the hull, we have the *meta center*. Fig. 3 shows a motorboat's midship section standing upright; Fig. 4 shows this same hull heeled over. Its center of buoyancy, C-B, has shifted out to the left, but not so far as it has in the wide, shallow boat shown in Fig. 5. The weights of the boats, being fixtures; do not move as the boats roll (we are not speaking now of pots, pans and water-buckets that sometimes catch one a rap on the shins, but refer to the boat, engine, etc.), and are always in the center line of the hull. The length of the line D shows how much greater is the leverage that the weight of the hull is acting on in the wide boat than is the case in the narrow one. That is the reason a shallow, flat boat rights herself so much more quickly than a narrow, deep craft.

A boat, in order to be easy in a rough sea, wants but a very short righting lever. It is this proper adjustment of the centers, *center of buoyancy and center of gravity*, by one who understands the subject that produces an easy or a hard rolling boat.

Sailors, who know nothing at all about these mysterious centers, learn by experience how to ballast their boats to make them easy in their movements. You can do