

A YACHT THAT SAILS ITSELF.

It is the ambition of every builder of sail boats, whether his craft be a diminutive model 2 or 3 feet long, or a giant "ninety-footer" like the "Columbia" or "Shamrock," to produce a vessel that will "point" well and "foot" fast at the same time. Almost anything from a wash tub to the proverbial "haystack," will sail before the wind; but it is when the yachts tighten in their sheets and lay their course to the weather mark that the genius of the yacht builder begins to reveal itself. Unless the wind is blowing in a direction that makes an angle of four or five points with the course, the yacht has to be sailed with the wind alternately on the port or starboard bow. In a full sized yacht the work of putting the vessel about from port to starboard and starboard to port involves the constant shifting of the helm and retrimming of the sails—work which is performed by the crew on board.

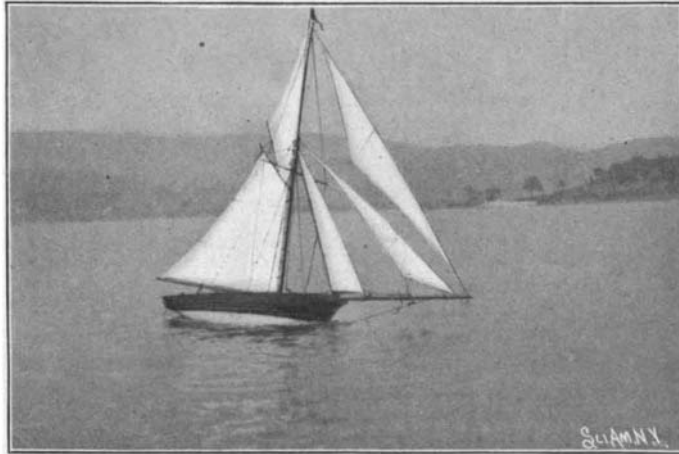
The accompanying illustrations of the little model yacht "Nydia" represent a very ingenious and successful attempt to produce a sailing craft capable of going through all the maneuvers of beating, reaching and running automatically, the helm being put up or down, and the sails sheeted in or slacked off with the precision and regularity which marks the handling of a yacht by an expert crew. The "Nydia" was built and her complicated steering and sail handling mechanism was designed by Mr. H. Consterdine, of Lancaster, England, to whom we are indebted for the accompanying photographs. The various operations involved in putting the helm down and changing the trim of the sails are performed by the joint agency of the wind pressure on the sails, a log which trails in the water astern of the ship, and a set of cogwheels, pulleys and shafts which are carried on the deck. The yacht may be started from a lee shore, and made to perform any desired number of tacks against the wind, at the conclusion of which she will swing around, the main boom will be squared off, and she will return before the wind to the starting point, all these operations being performed without any outside assistance. Moreover, the length of the alternate tacks may be varied by a proper adjustment of the mechanism and, if so desired, the boat may be made to sail on alternate long and short tacks.

The source of power for working the sail and tiller mechanism is the wind, while the trailing log is used for regulating the length of each tack and the time of making the turn at the outer mark. We will suppose that the vessel is started on the starboard tack. The revolutions of the log give motion to a latch or stop-piece, which is in engagement with the tiller. After the proper number of revolutions, the tiller, *D*, is automatically disconnected from the stop-piece when, owing to the fact that the main sheet is belayed to the tiller stanchion, the strain of the sheet will bring over the tiller and cause the helm to be put down, bringing the little vessel around on to the port tack. Running fore and aft on the deck is a connecting-rod, *A*, the after end of which is attached to a little pin carried on the tiller. The movement of the tiller as it is swung to port or starboard thus serves to give the connecting rod a longitudinal movement, which, in its turn, manipulates the foresail and jib as explained before.

The foresail sheet is attached to a little block that slides on an athwartship rail, *B*, which is struck to a curve whose radius is about equal to the length of the foot of the foresail. At the forward end of the connecting rod, *A*, just referred to, is a sliding pin, which releases the foresail sheet sliding block when the helm is put down, and so slacks away the foresail. The connecting rod also serves by its longitudinal movement to let go the jib sheet. Instead of having a jib sheet block sliding on a rail, as in the case of the foresail, the jib is provided with a pivoted boom, which engages with a releasing and holding-fast gear actuated by the connecting rod. The foresail is trimmed to windward by its foot boom engaging with a locking and releasing holder, operated by the fore and aft movement of the connecting rod, and its release takes place when the wind carries the mainsail over to the lee side at the commencement of a fresh tack. The length of each tack is regulated by the set of the blades on the log, which can be altered at will, and also by an intercepting gear between the primary motion shaft and the tiller releasing-gear. The proportionate length of one tack to the other is determined by the relative working positions of the tiller-releaser, and the tiller-engaging peg. These relative positions are adjusted by means of an eccentrically slotted

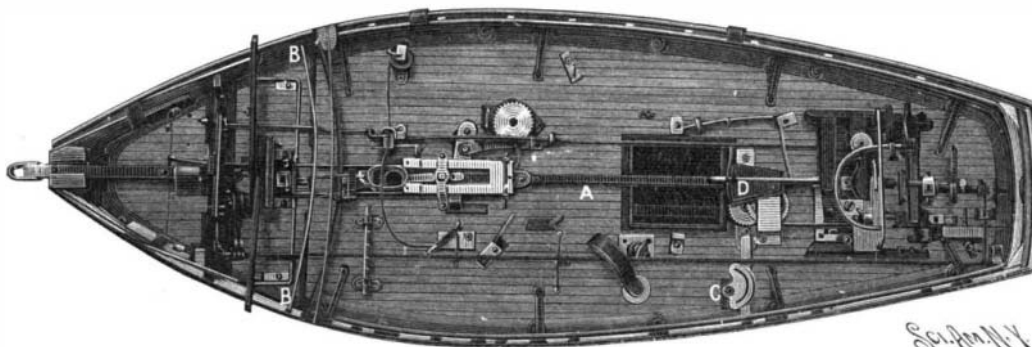
quadrant, *C*, which acts through a lever that serves to hold the releaser.

If it is desired to have the yacht return before the wind to the starting point after beating to the outer mark, it is only necessary to allow a catch or pawl, which is worked by the rotation of the log, to engage with the teeth of a registering wheel, the rotation of



THE "NYDIA" CHANGING TACKS—FORWARD SHEETS SLACKED OFF AND HELM DOWN.

which brings a small peg on this wheel into contact with the main sheet holder after the yacht has covered the required distance. The main sheet being released, immediately pays out, and the little yacht swings around for her homeward journey before the wind. The main sheet runs within a tube on the boom and through the holder, and is then stowed away on a reel which unwinds as the wind squares out the mainsail. The yacht is kept before the wind by the co-



DECK VIEW OF THE "NYDIA," SHOWING THE MECHANISM FOR AUTOMATICALLY WORKING THE SAILS AND RUDDER.

operation of the foresail with the steering apparatus, the foresail serving to keep the tiller in a fore and aft or central position. As long as the foresail is shaking, well and good, the little yacht is dead before the wind; but if the pressure of the wind on the mainsail turns the boat slightly to port or starboard, so as to cause the wind to press on one side of the foresail, this pressure throws a set of wheels into gear, which wind up on a small chain attached to the tiller, and operate



THE SELF-SAILING YACHT "NYDIA" AND HER DESIGNER.

the rudder so as to bring the little craft again dead before the wind, when the wheels immediately become disengaged and the helm is eased. The revolution of the little log, which trails astern merely serves to regulate the engagement and disengagement mechanisms by which the vessel is put about at the end of its tacks, or turned at the outer mark for the run home before the wind. The log also serves to turn the motor shaft, which has been mentioned several times in the above description as assisting in the automatic control of the vessel.

Mr. Consterdine, who is certainly deserving of great credit for his ingenuity and mechanical skill, speaks enthusiastically of the working of his model craft.

If any of our readers who are enthusiasts in model yachting wish for further particulars of the "Nydia," they can secure them by communicating with Mr. H. Consterdine, at Milton House, Littleborough, Lancashire England.

Tile Maps.

In the issue of the SCIENTIFIC AMERICAN for June 2 mention was made of a tile map for railway stations which is being introduced in England by the Northeastern Railway Company. The map is made up of 6-inch tiles and measures about 6 feet square. We have now received further details of this map, which it seems is the first railway map of the kind produced in England, and seems to have been so thoroughly successful as to warrant the expectation that this form of map will have a very useful future, not merely for railway work, but in other fields, among which may be mentioned particularly that of education.

In manufacturing the maps the tiles are made by the ordinary process of mixing various kinds of clay in liquid form. After the necessary treatment the tiles are moulded, placed in the kiln and brought to the condition technically known as "bisque." The drawing of the map is reproduced on copper plates, one plate for each tile, and impressions are made upon specially prepared paper. The prints so prepared are transferred to the surface of the bisque tile, and rubbed into it carefully, to cause the oily ink of the paper impression to adhere to the tile. The paper is then removed by dampening it with water and rubbing it off, the ink being left behind without any danger of injuring the surface of the tile or blurring the fineness or the sharpness of the lines. The tiles are then sent to the kiln to be "hardened on," after which they are put in kilns and fired. They are then taken to the painting room, where the colors are put on by hand, after which they are sent to the enameling kilns. After this third firing they are ready for "slabbing," as the cementing of a design or pattern in tile work is called.

The matter has been brought to our attention by Dr. J. W. Redway, F.R.G.S., who is of the opinion that these tile maps will be eminently suited for scholastic purposes, on account of their durability and the readiness with which they may be permanently placed on the walls of a school or lecture room. He points out that, unlike maps of the common type, they may be freely touched with the "pointer" without any fear of destroying their hard, smooth surface, a feature which should render them particularly valuable for school purposes.

Aerial Telegraphy from Balloons.

A series of experiments has recently been carried out in France by Messrs. Vallot, Jean and Louis Lecarme to determine whether aerial telegraphy can be carried out between the earth and a balloon which floats freely and without earth connections. The ascent was made by M. Vallot, who took the receiving apparatus in the balloon, the transmitter resting on the ground. The experiments seem to demonstrate that the earth wire is not indispensable for transmission under these circumstances, as when the balloon was elevated at a great height the signals were received clearly, even though the two masts were pointing in the same direction. The experiments also show that the difference of potential between the two posts does not appear to influence the reception of the signals, thus confirming the previous experiments in this direction made on Mount Blanc.

A BRITISH School of Archæology is to be opened at Rome. One of the most active promoters of the enterprise is Prof. Charles Waldstein. Prof. Rushworth has been selected as the permanent head of the school.