

It will be noticed that these tests were of short duration, but they were amply long to demonstrate the economy of the pumps under the conditions given. The so-called system of "Flying test," in the opinion of the writer, is one of the best when the testing apparatus is electrically operated.

Indicator diagrams, taken from the steam cylinders when running compound and simple, are herewith shown. Fig. 3 is the diagram from the high pressure cylinder and Fig. 2 the diagram from the low pressure cylinder when the pumps were running compound; Fig. 4 shows the diagram from the pump running "simple" (single pump).

The steam valve mechanism is very simple, and is shown by the sectional view of the pump (see Fig. 5); it will be seen that the valve rod (so called) has no valve directly attached to it, as is usual; it merely rotates the auxiliary piston, which latter combines within itself the auxiliary valves. This rotating motion is a great advantage, as it frees the auxiliary piston from possibility of sticking for any reason, causing the pump not only to be positive in its action, but securing uniformity of wear. The rolling movement given this auxiliary piston by means of the "valve rod" and the intermediate swinging pin or tongue opens and closes the auxiliary ports, which, in turn, control the steam to operate the auxiliary piston, moving said piston back and forth across the main steam cylinder. The auxiliary piston, like the main piston, is packed with spring rings.

A plain D slide valve is attached to this auxiliary piston, which valve supplies steam to the main cylinder through the two sets of ports, i. e., the main steam ports and the starting ports. By this cross arrangement of steam chest and valves, the pump can work just as well vertically as horizontally. A drawing giving the general arrangement of the pump and the steam pipes is shown by Fig. 6, particular attention being called to the manner of opening and closing the globe valves and cocks on the steam and exhaust pipes, in order to operate the pumps conjointly as a compound machine or separately as simple pumps.

Let us consider the practical advantage of this unique form of feed pump. It not only represents minimum weight and space, but has the advantage of containing within itself, so to speak, an auxiliary or spare pump, as either side of the pump can be operated independently, as before mentioned, should occasion require. As regards the amount of steam that can be saved by this system, there is no doubt but what the pump will save its own weight in coal in 24 hours' steaming. As an illustration, this particular pair of pumps with the attachments shown weigh about half a ton, and handled during the test at the rate of 17,570 pounds of feed water per hour.

Now this amount of water would supply the boilers necessary to operate a marine engine of the triple expansion type of about 1,100 horse power. The power of the pump as noted in the compound test was 5.61 I. H. P., or about one-half of one per cent. of the power of the engine above given. On the basis of a saving of, say, 70 pounds weight of steam per I. H. P. per hour over and above what would be ordinarily used by a duplex pump of the simple type, it shows a total saving of steam (feed water) of about 393 pounds per hour, or, say, 50 pounds of coal per hour, on a basis of about 8 pounds of water per pound of coal for the rate of boiler evaporation. This gives a total saving of 1,200 pounds of coal per 24 hours, which, it will be observed, is somewhat more than the weight of the pump, so that I am rather understating than overstating the case. Or, as compared with the single system of feed pump, the cross-compound "Simplex" would save its weight in coal in forty (40) hours. There is no doubt but what with larger size pumps, and with steam pipes covered, the economy of the "Simplex" compound would be even better than that shown in these tests.

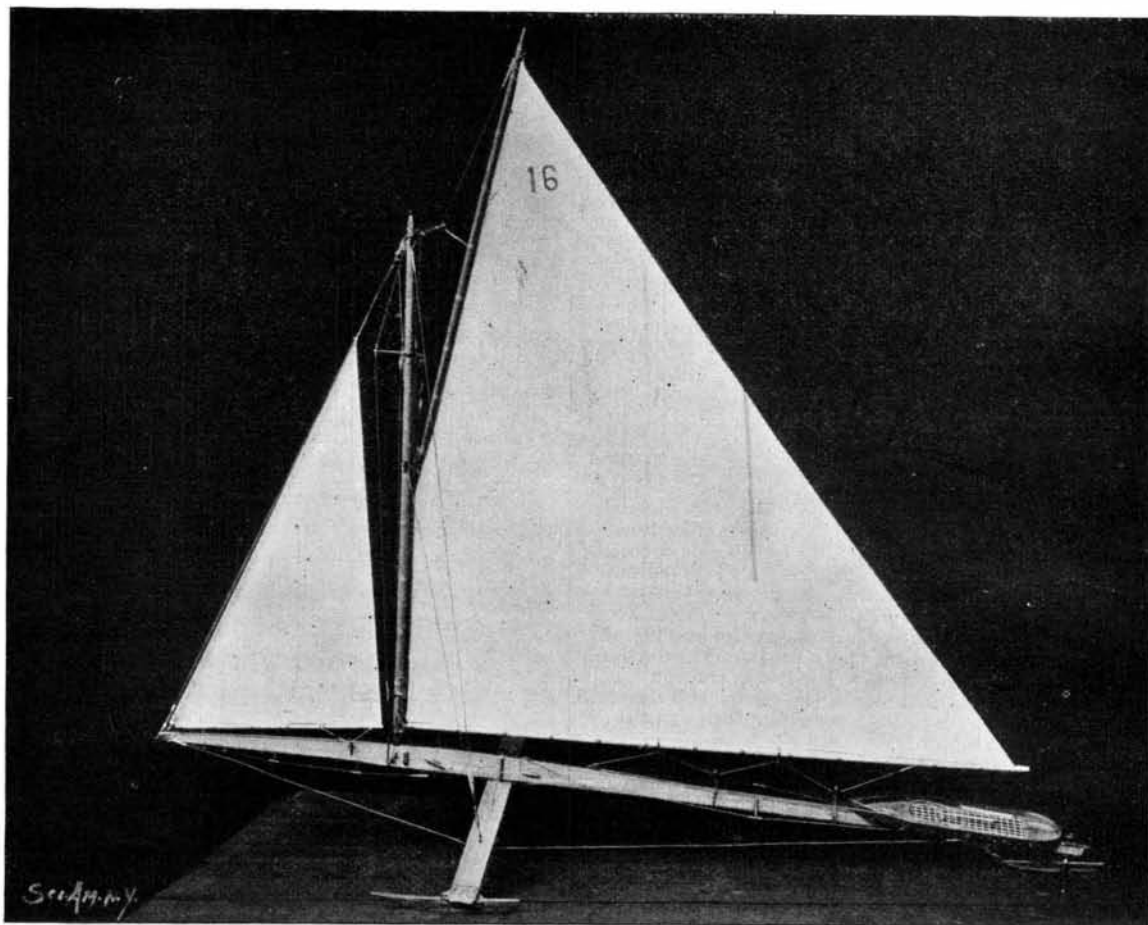
Taking the case of a large transatlantic steamer developing 30,000 I. H. P., which I understand will be

the engine power of the new White Star S. S. "Oceanic" now building, the amount of coal that could be saved on a trip (say of 5½ days) would be about 77 tons by the use of a system of feed pumps of this cross-compound "Simplex" type, as compared with the duplex system; or, a saving of about 44 tons of coal as compared with the single system of feed pump. This saving in coal not only represents an expenditure of many dollars, but also considerable saving of space which could be made available for cargo or other purposes affording a revenue, thus not only

that the writer had the pleasure of examining a set of runners built by Mr. Oliver Booth, at Poughkeepsie, N. Y., in 1790, which are still intact and well preserved.

They are, of course, very crude in form, but they show, nevertheless, the beginnings of the modern ice yacht of 1898. The questions of over-canvassing and center of sail balance have, I am glad to say, nearly disappeared. Before their solution the yachts were hard to sail and steer, and often got beyond the control of the skipper.

Plate B shows by scale the sheer and sail plan



A MODEL ICE YACHT.—DESIGNED AND BUILT BY H. PERCY ASHLEY.

saving money at one end but adding at the other end. Much has been done during the present decade to improve the economy of the steam engine, and some remarkable results have been secured, but very little, however, has been accomplished in the line of steam economy in the auxiliaries, such as steam pumps. There is every reason, therefore, why refinements in this line should be encouraged.

AN UP-TO-DATE ICE SLOOP.

By H. PERCY ASHLEY.

As the cold weather gives warning that winter will soon be upon us, the thoughts of all true sportsmen turn to ice yachting, the king of winter sports. This month all the ice yachts are overhauled and newly rigged, or entirely new boats are built, preparatory to a daring struggle on the frozen surface for the supremacy of their club or locality. It was only a few weeks ago

of an up-to-date ice yacht, carrying 528 square feet of canvas, divided as follows: mainsail, 413 square feet, and jib, 115 square feet; making a total of 528 square feet, which places her as a second class racing ice yacht, with a guaranteed speed of a mile a minute, under favorable circumstances.

The sails are cross cut, as shown in Plate B, and are made from No. 10 duck. The dimensions are as follows: mainsail hoist, 13 feet; gaff, 17 feet; boom, 26 feet; leech, 35 feet; diagonal from jaw of gaff to end of boom, 26 feet. The jib measures as follows: on stay, 23 feet; foot, 12 feet; hoist, 18½ feet; perpendicular from stay to end of jibboom, 10½ feet. The backbone is formed of one single piece of basswood, or selected pine, capped top and bottom with 1 inch cherry or mahogany. The dimensions are as follows: Over all, 43 feet by 14 inches by 5½ inches; tapering at ends to 6 inches by 4¾ inches. For fore and aft curve, see Plate B.

A very delicate question is the running and standing

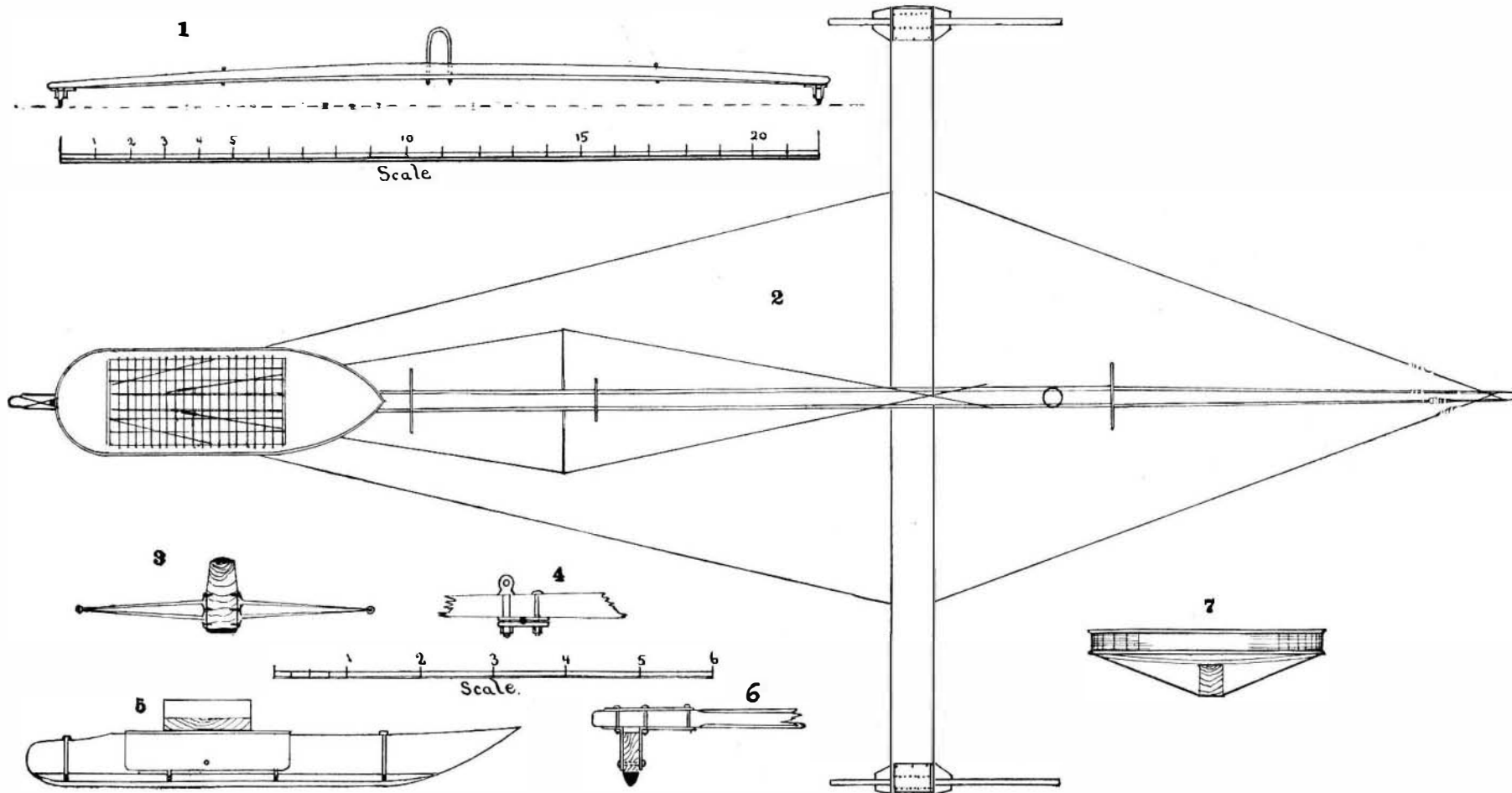
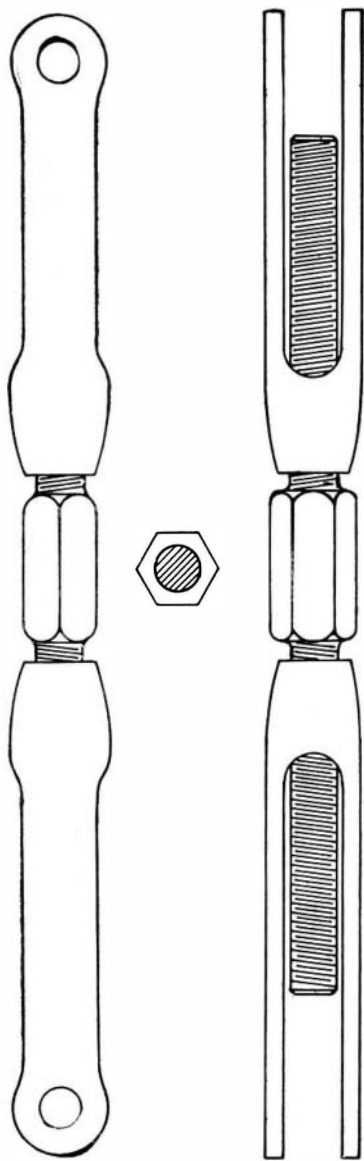


PLATE A.—DECK PLAN AND PARTS OF MODEL ICE YACHT.

rigging, which is rove and set up as follows: The shrouds are four in number, two being set up to port and two to starboard. There is a single turnbuckle on each side of runner plank at the distance marked in Plate A, No. 1. The upper shroud runs from the turnbuckle to the mast head and the other from the turnbuckle to the mast, where it ends just above the jaws of the gaff. The forestay starts in a loop at mast head and ends at the extreme end of the bowsprit. The martingale spreader is placed half way between the truck and the jaws. The martingale stay starts at the mast head, passes through the spreader, and ends at the backbone in a right and left turnbuckle and grip, just forward of the mast. This stay takes up the fore-and-aft strain on the mast. It was fully demonstrated last winter that the method of rigging the peak halyard employed by Com. H. C. Higginson, of Orange Lake I. Y. C., is the most practical one. This method is as follows: a two-part bridle of pliable wire rigging is set up at the gaff. From this is eased a whip or single peak halyard of heavy pliable rigging, which is passed through a metallic block at mast head (see Plate B) and led to backbone from mast head by a double block jig. This insures no give to the peak halyard in a blow or heavy ice. The old fashioned mast hoops have been discarded and in their place is set a patent mast hoist. The jib and main sheet have pliable wire rigging set up with jigs. The spars are all hollow, being served and parceled at stated intervals with light galvanized rigging.

The steering box is of a new design adopted by Com. Anderson, of Lake Pepin, Wis., I. Y. C., and used in the celebrated "Launa" and "Irene." A solid piece of oak 9 $\frac{3}{4}$ feet by 3 $\frac{1}{4}$ feet forms the bottom (see Plate A, Fig. 2). This is surrounded by mahogany rails 4 inches high, bent to shape. It is fastened to the end of the backbone by bow shaped pieces of hickory and iron braces running from the under side of the steering box to the rails (see Plate A, Fig. 7), which hold it firmly in place when coming about. The flooring of the steering box is cut out and laced with light braided linen rigging, thus giving spring and ease to the helmsman over uneven ice. In Plate A, Fig. 3, is shown the midship section of the spreader on the backbone; in Fig. 4, the iron grip on the runner plank for holding bowsprit shrouds and runner backstay, which are one continuous piece, and are tautened by a single turnbuckle just aft of the runner plank. Fig. 5 shows the shape and size of the fore runners by scale.

Fig. 6 is a transverse section of the fore runners in position, showing steel angle plates which hold them in place. It is to be noted that these angle plates (Figs. 5 and 6) have taken the place of last season's oak guides and braces. They are fastened to the runner plank by bolts which penetrate the plank and the steel face plate on top. The runners are pivoted between the angle plates as shown (see Fig. 6). Following are the dimensions of the hull, as given in standard ice yacht



IMPROVED FORM OF TURNBUCKLE.

tables: Length of center timber from rudder post to jib stay, 43 feet; length of center timber from rudder post to center of runner plank, 25 feet; cutting surface between runners, 22 feet; length of fore runners over all, 6 $\frac{3}{4}$ feet; height, including shoe, 8 $\frac{3}{4}$ inches; length of rudder runner, 4 $\frac{1}{4}$ feet. The dimensions of the runner board, which is made either of basswood or of butternut, is 22 $\frac{3}{4}$ feet by 14 inches by 5 $\frac{3}{4}$ inches at center and tapering to 2 $\frac{1}{4}$ at the ends. For full description as to wood and construction of runners, with working draughts, see SCIENTIFIC AMERICAN SUPPLEMENT of February 12, 1898, No. 1154.

UTILITY OF MUSIC IN WAR.

"WHAT do you think of music?" was once asked of an eminent American novelist. "Oh," he replied, "I see no harm in it." This, Mr. Henry T. Finck thinks, illustrates the attitude of many people who consider music but a sort of plaything, and who will be surprised to learn in how many different ways music is and always has been useful to mankind. Mr. Finck thereupon proceeds (The Forum, May) to enlighten such Philistines. He refers briefly to the number of people who find a living in musical art and in the manufactures growing out of it (nearly 250,000, he thinks, in the United States alone); quotes from travelers to show how helpful music is to workmen in different countries both as stimulus and in insuring by its rhythm concert of action in such occupations as rowing; speaks of the various uses from time immemorial in religion, in medical practice (especially with nervous difficulties and in stimulating the brain), and in social life; and ranks it among the moral agencies because of its refining effects and its power to wean young people from debasing pursuits.

The utility of music in matters pertaining to war is also brought out strongly, and to this feature of the case we confine our quotations. The use of music in war signals is first touched upon:

"To the present day, in all the armies of the world, such musical war signals are considered not only useful, but absolutely indispensable. The infantry drill regulations of the United States army give the music and significance of more than sixty trumpet signals—calls of warning, of assembly, of alarm, of service, with such names as 'guard mounting,' 'drill,' 'stable,' 'to arms,' 'fire,' 'retreat,' 'church,' 'fatigue,' 'attention,' 'forward,' 'halt,' 'quick time,' 'double time,' 'charge,' 'lie down,' 'rise,' etc., besides a dozen or more drum-and-fife signals, all of which must be known to the soldiers, to whom they are a definite language, in the sense of Wagnerian Leit-motiv. Every one is familiar with such expressions as 'drumming up recruits,' 'drumming out deserters,' and so on."

But besides its use for signaling, music is used in five other ways for purposes of war: as a valuable adjunct in drill and parade, as (formerly) a means of producing

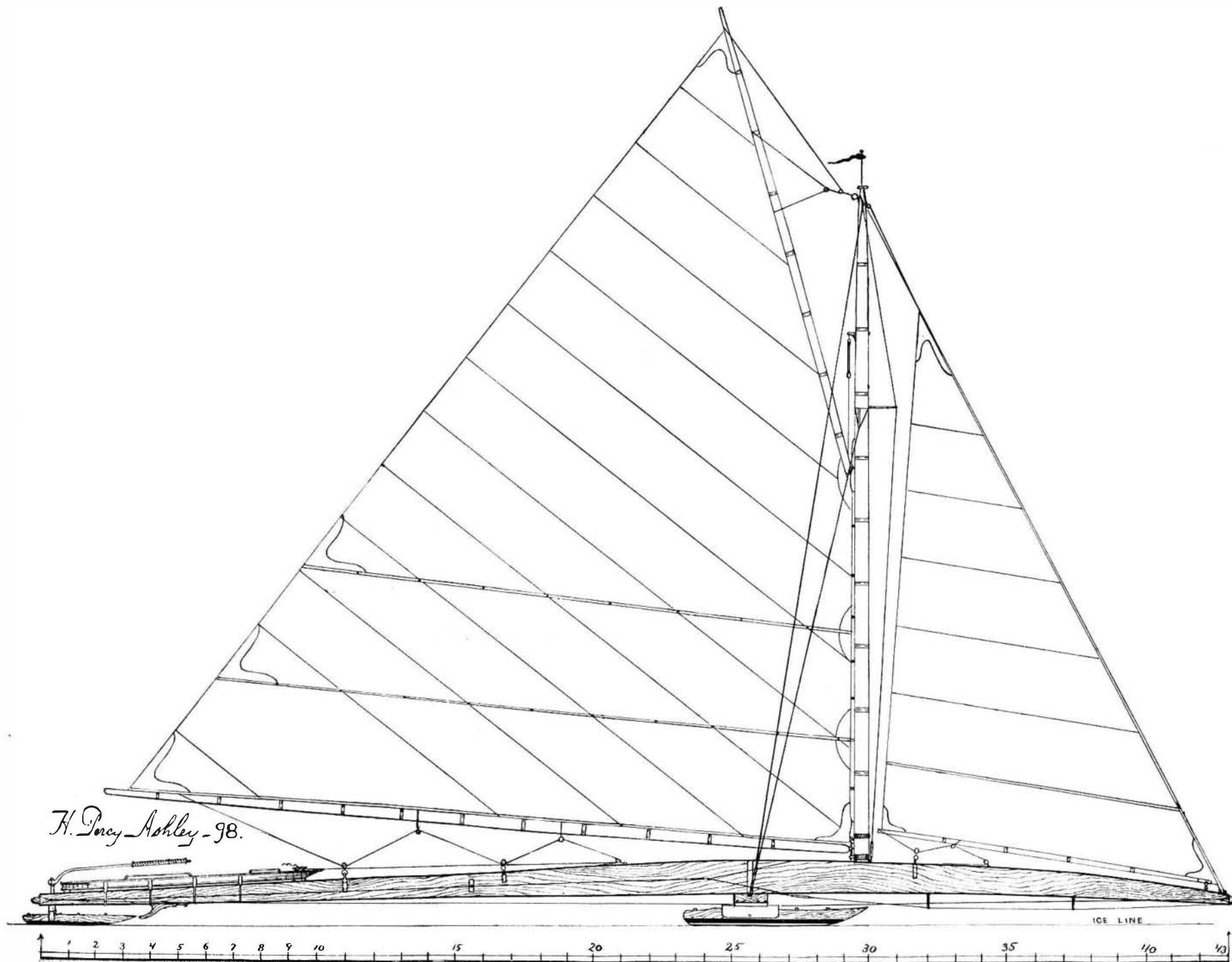


PLATE B.—SHEER AND SAIL PLAN.