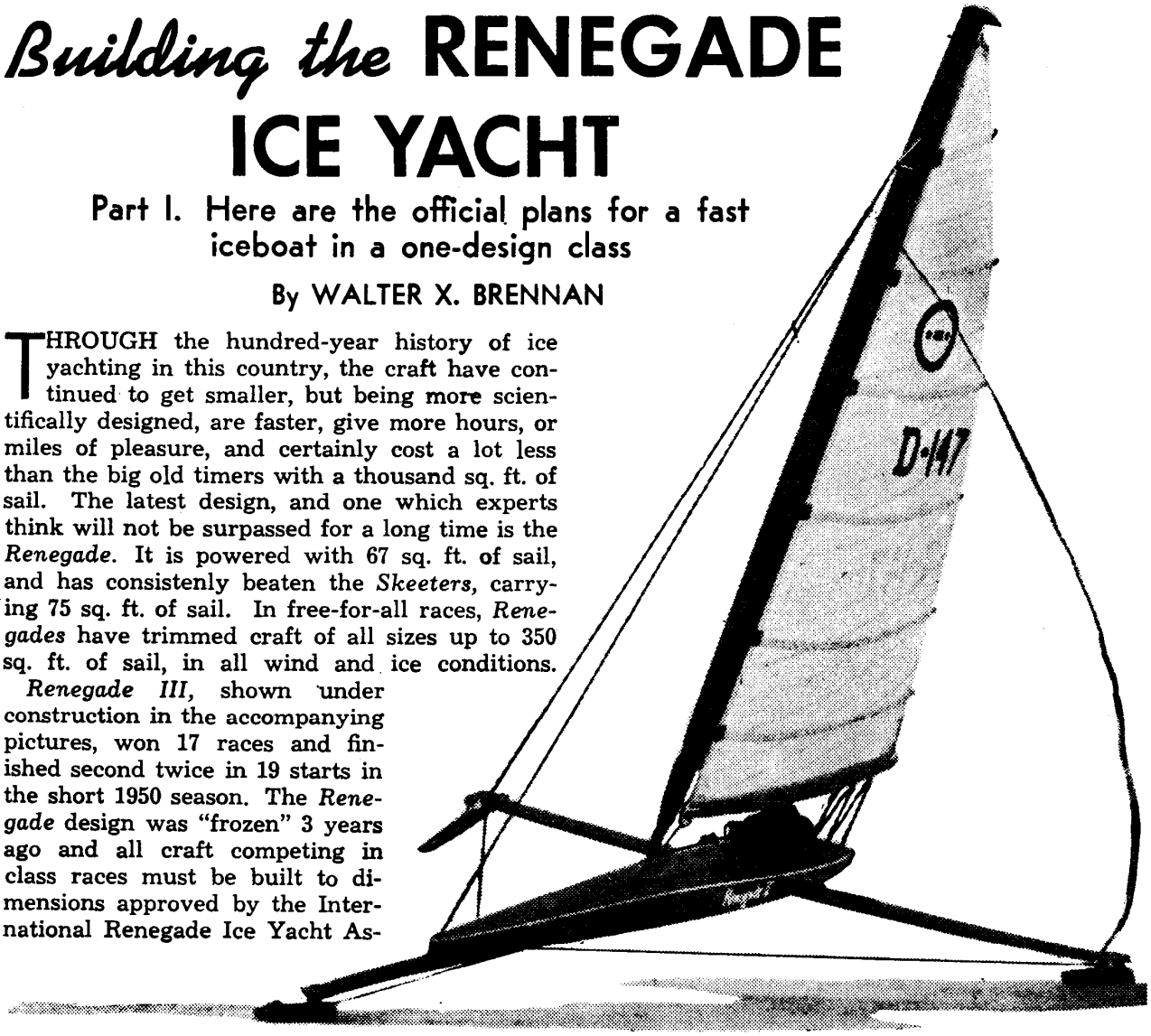
# *Building the* RENEGADE ICE YACHT

## Part I. Here are the official plans for a fast iceboat in a one-design class

By WALTER X. BRENNAN

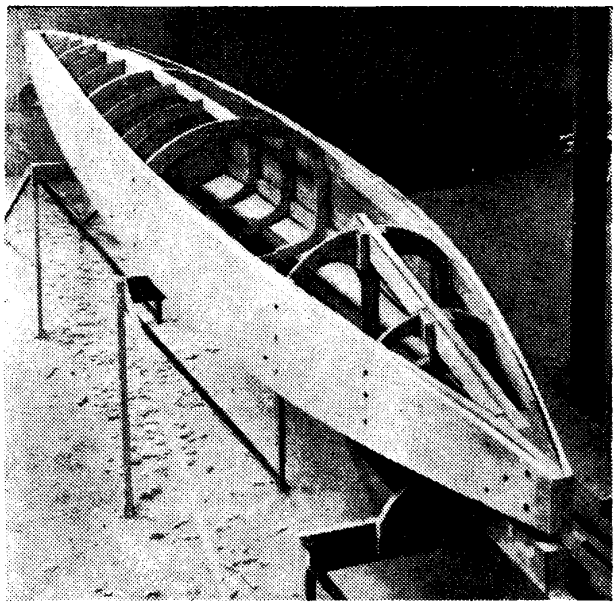



THROUGH the hundred-year history of ice yachting in this country, the craft have continued to get smaller, but being more scientifically designed, are faster, give more hours, or miles of pleasure, and certainly cost a lot less than the big old timers with a thousand sq. ft. of sail. The latest design, and one which experts think will not be surpassed for a long time is the *Renegade*. It is powered with 67 sq. ft. of sail, and has consistenly beaten the *Skeeters*, carrying 75 sq. ft. of sail. In free-for-all races, *Renegades* have trimmed craft of all sizes up to 350 sq. ft. of sail, in all wind and ice conditions.

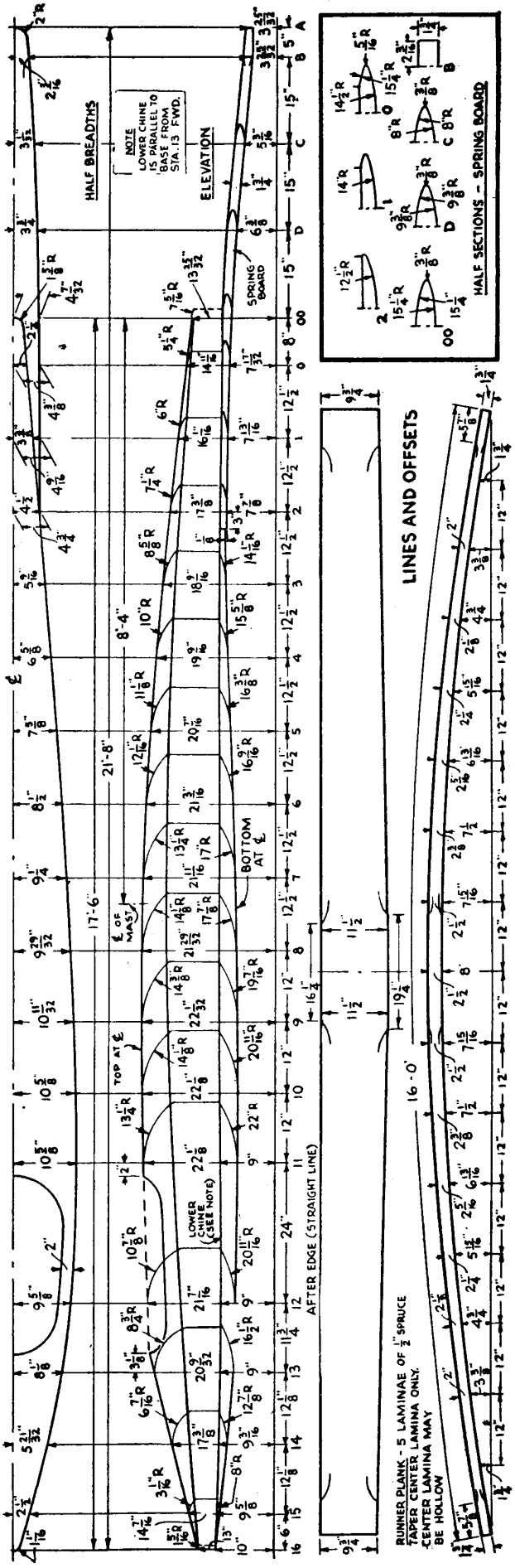
*Renegade III*, shown under construction in the accompanying pictures, won 17 races and finished second twice in 19 starts in the short 1950 season. The *Renegade* design was "frozen" 3 years ago and all craft competing in class races must be built to dimensions approved by the International Renegade Ice Yacht Association, which is a non-profit organization, made up of owners, whose only objective is to promote the class. Dues for the first year are $10, which includes the official set of blue prints and the assignment of a racing number. Dues after that are $3 a year. Nearly a hundred sets of plans have been issued, and it is estimated that more than 100 of the craft have been built.

The plans shown are from the official prints, as designed by the originator of the class, Elmer A. Millenbach. Dimensions were taken from *Renegade II* and *Renegade III* was built exactly to the plans. Those not expecting to compete in class races may vary dimensions and have a workable craft, but this will save little, limit resale value, and produce less performance than might be had. As weights are not limited, considerable latitude is had in the selection of materials and parts. Work and cost can be saved by substituting less costly fittings, materials and finish than shown here. Make fuselage, spring board and runner plank of air dried Sitka spruce as these parts must be strong yet resilient to make the craft ride easily and not shake the wind out of the sails.

First study drawings thoroughly and then draw up the full-sized plans on drawing paper, available in artists supply stores in rolls 42 in. x 10 yds. Shape of fuselage is controlled by line of lower chine, line of top at center, halfbreadths of side, and top and bottom radii. Lay out base line of elevation, centerline of halfbreadth plan, then various stations from A to 16. Lay out complete top view. In the elevation drawing lay out line of lower chine and line of top at center, from halfbreadth offsets, establish vertical lines which represent side of fuselage in section for each station, and on which is located height of



View of fuselage under construction.




lower chine with respect to common base line. With compass set to bottom radius of a given section, and compass point on position of lower chine, strike an arc intersecting section centerline. Then place compass point on this intersection and scribe bottom arc. Intersection of bottom arc with section centerline at each station establishes line of fuselage bottom at center in elevation, with respect to lower chine. Secondly, scribe top arc, passing through centerline at height of fuselage top and intersecting side of fuselage. Latter intersection at each section establishes points through which passes line of upper chine. To lay out cockpit opening, establish a line parallel to side of fuselage and 2 in. inboard of side. Scribe end arcs of such a radius that arcs will pass through given points on centerline and be tangent to line of cockpit sides. All offsets are given to inside surface of top and bottom of fuselage and to outside surface of side panels.

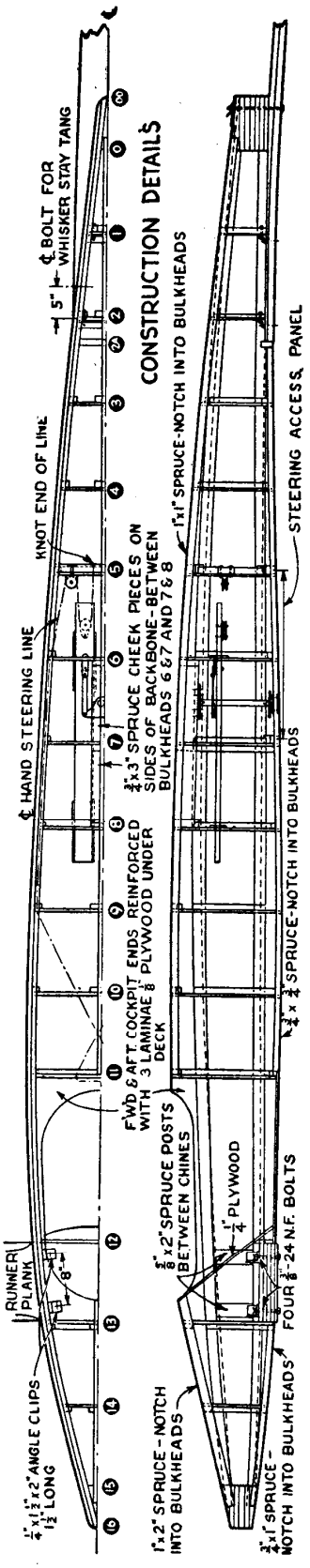
To draw bulkhead pattern, draw common base line near lower edge of paper, erect a vertical centerline, then parallel lines on each side for width of fuselage at this station. Now, taking Sta. 8 for example, measure up 9 in. from base line and draw a horizontal line. Where this intersects vertical lines previously drawn, is the lower chine. Using a compass set at 17⅞ in. radius, scribe an arc through this intersection from a point on centerline. This will give bottom curve and height of bottom along craft's fore and aft centerline, above the common base line.

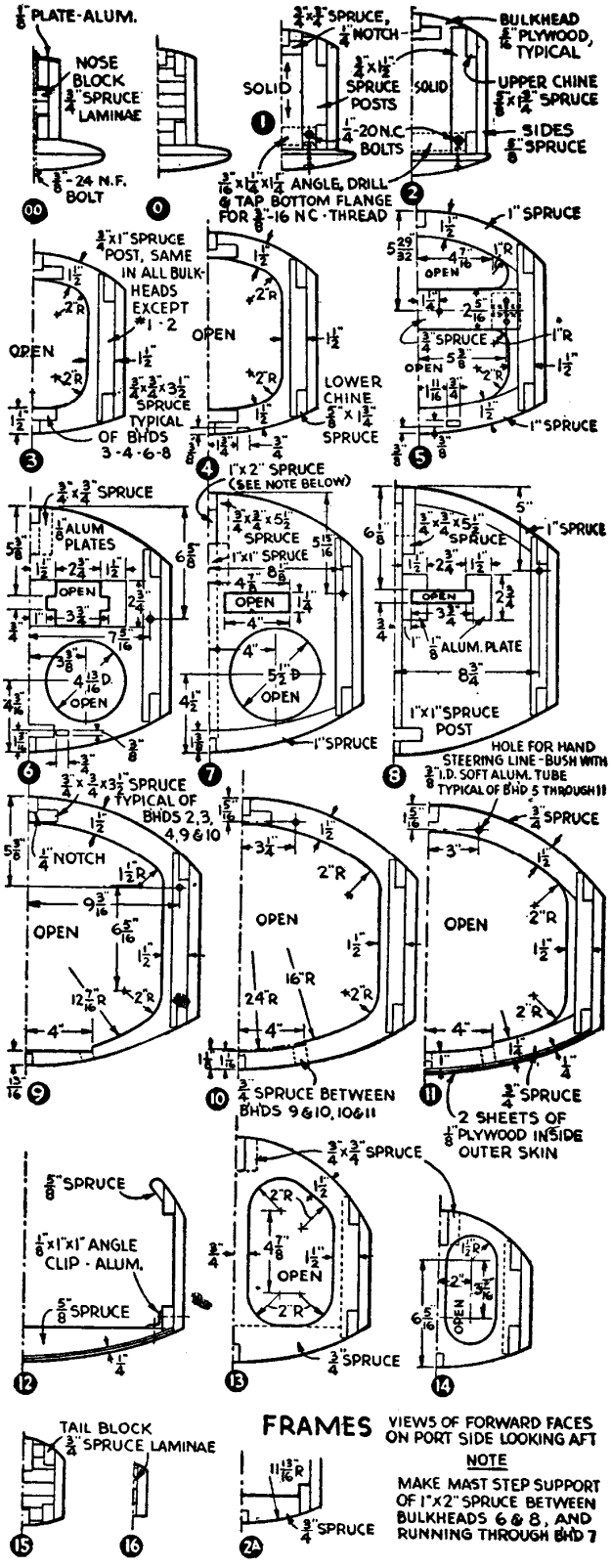
Measuring from this bottom point, along section centerline, $21\frac{29}{32}$ in. up is the top point of the fuselage. Setting compass for 14⅛ in. radius, swing an arc from this top point over to intersect vertical lines which mark sides of craft. In making bulkheads note pattern has dimensions to outside of side panels; thickness of side panels, ⅝ in., should be deducted on each side of pat-

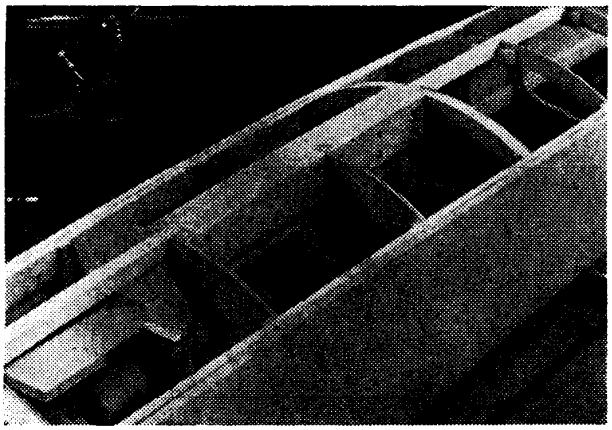
tern. While the ⅛ in. plywood skin adds ¼ in. to overall height of fuselage, this can be disregarded, except at the bottom at Sta. 11 and 12. Because of an added thickness of skin for the cockpit floor, ¼ in. should be deducted.

Build the bulkheads of ¾ in. spruce and 5/16 in. plywood with the exception of top and bottom pieces of No. 5, bottom of No. 7, top of No. 8, top and bottom of No. 11, and bottom of No. 13. These pieces become butt blocks for deck joints and should be 1 in. thick. As glue is used for fabrication, use 1 in. nails to hold parts in place only for assembly. For assembling fuselage, mount at working height a beam about 2 x 10 in. curved to match assembly bottom along centerline. Determine curve by scaling full-sized layouts at each section. Lay ¾ x ¾ in. keel on the beam from Sta. 2A to 11 and mount bulkheads at proper points. Keel aft of Sta. 13 is ¾ x 1 in.

If keel notches in bottom of bulkheads are carefully squared and made a snug fit, erection of bulkheads is easy. Add stringers at top and tack on some temporary trusses along sides. Glue joints. Trim notches in bulkheads for chines; attach chines from inside, or, if from outside, be sure to give clearance for tools when chamfering chine. Make spring board of spruce, in 2 or more laminas (layers). Attach to fuselage with five ⅜ in. bolts from the bottom. Then apply cheek pieces. Now, try fit of rudder pedals through bulkheads Sta. 6, 7, and 8. See that they fit loosely to allow for any future expansion of the material. In attaching chines, start at stern and work forward in pairs. This takes care of sharper bend first, and drawing them together in pairs prevents getting framework out of line. In shaping side panels, attach them temporarily amidships and pull ends into place with a rope. Mark for shape, locate glue points, and drill. Remove for shaping and gluing. Place, and attach with 2 or 3 carefully spaced





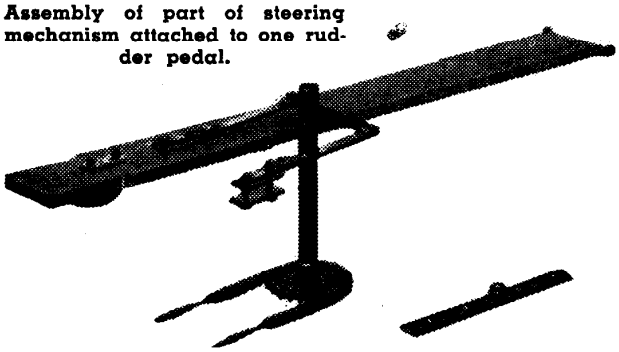
Fuselage, showing mast step and right rudder pedal installation (at left of picture) in place. Left rudder pedal not in place so details can be seen.

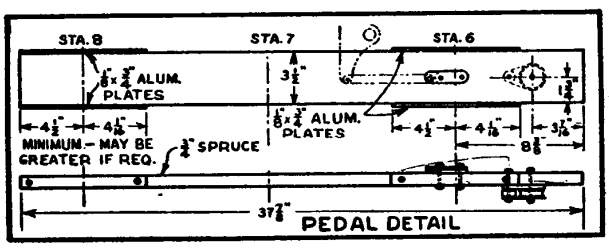
1¼ in. screws at each point. Now, chamfer edges of side panels to fair in with curve of top and bottom of craft. Secure with Weldwood or Kuehl's glue, being sure to glue both surfaces. Fastenings need not be of bronze as ice yachts are not subject to much moisture. Cadmium plated or galvanized will do. Countersink screws in side panels and plug holes. For a really smart craft, apply screws from inside. Make plates, clips and brackets used in fuselage of hard aluminum.

After installing mast step supporting pieces and other inside details, apply decking. Some may prefer to remove fuselage from its mounting and apply bottom first. While not shown in plans, it is wise to install an extra batton on each side ahead of cockpit, to support thin deck in the large areas. They need only be snugly butted in between bulkheads and glued.

Make top and bottom skins (not shown) of ⅛ in. exterior plywood panels with seams on centerline and butts falling on bulkheads No. 5 and 8 on top and on bulkheads No. 5 and 7 on bottom. In attaching deck, place pieces in position, mark for shape and glue-points, and locate with a few pilot screws. Remove, shape, glue, then place in position quickly. Pull edges down snugly with strips laid over edges; then pulled down with nails until dry. Remove strips and fill holes. While there is a slight compound curve to the deck, ⅛ in. material will take shape without trouble. To save material and work, extend deck past curve of cockpit and then fill in narrow strip at side of cockpit with a small piece of material. Set plywood grain with Phenoplast or Firzite. Finish exterior wood parts with good deck paint or spar varnish. For constructing the runner plank, plans show center of the lamination as solid; it will entail less

Assembly of part of steering mechanism attached to one rudder pedal.



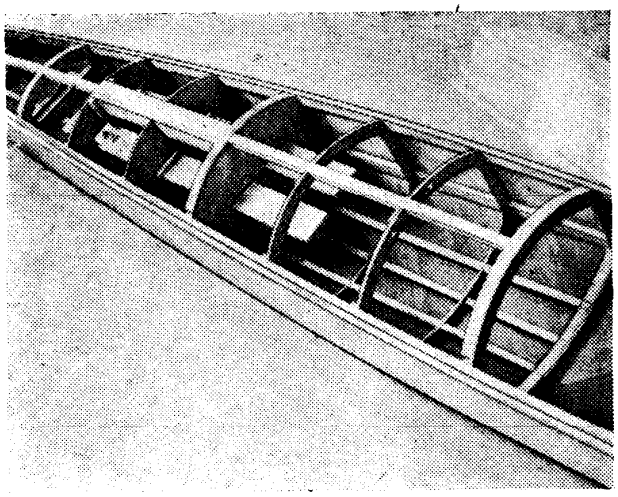



MATERIALS LIST—RENEGADE FUSELAGE

| No. Req'd | Size | Material | Part |
|---|---|---|---|
| 1 | 5/16"x48"x5'0" | exterior plywood | bulkheads |
| 1 | ⅛"x48"x10'0" | exterior plywood | top and bottom skin |
| 1 | ¼"x18"x1'6" | exterior plywood | seat back |
| 2 | ⅝"x10"x18'0" | spruce | sides |
| 4 | ⅝"x1¾"x18'0" | spruce | upper and lower chines |
| 1 | 1"x2"x3'0" | spruce | upper ridge (aft of cockpit) |
| 1 | 1"x1"x12'0" | spruce | upper ridge (fwd. of cockpit) |
| 1 | ¾"x1"x2'6" | spruce | keel (aft of cockpit) |
| 1 | ¾"x¾"x9'0" | spruce | keel (fwd. of cockpit) |
| 1 | ¾"x6"x5'0" | spruce | bow piece |
| 1 | ¾"x8"x3'0" | spruce | sternpiece |
| 2 | ¾"x3½"x3'6" | spruce | steering pedals |
| 1 | ¾"x¾"x6'6" | spruce | cleats for bulkheads |
| 1 | ⅝"x1¾"x2'0" | spruce | " |
| 1 | ¾"x¾"x6'6" | spruce | " |
| 1 | ¾"x1"x18'0" | spruce | " |
| 1 | ¾"x1½"x3'0" | spruce | " |
| 1 | ¾"x1¾"x4'0" | spruce | " |
| 1 | ¾"x2¼"x2'6" | spruce | " |
| 1 | ¾"x2½"x1'6" | spruce | " |
| 1 | ¾"x5½"x2'0" | spruce | " |
| 1 | 1"x1"x2'6" | spruce | " |
| 1 | 1"x1¾"x1'0" | spruce | " |
| 1 | 1"x2½"x2'0" | spruce | " |
| 1 | 1"x3½"x2'6" | spruce | " |
| 1 | ¾"x3"x4'6" | spruce | cheek pieces (between #6, 7 & 8) |
| 1 | 1"x2"2'6" | spruce | backbone support (between #6 & 8) |
| 1 | ⅝"x2"x2'6" | spruce | side braces (fwd. of #13) |
| 5 | ½"x11½"x16'6" | spruce | runner plank |
| 4 | ½"x11½"x16'6" | spruce | } alternate |
| 2 | ½"x2"x16'6" | spruce | } runner plank |
| 2 | ⅞"x9½"x8'0" | spruce | springboard |

Hardware for Fuselage

| | | |
|---|---|---|
| 1 | ⅜"—24 N.F. bolts 7½" long | springboard bolt |
| 4 | ⅜"—16 N.C. bolts 1½" long | springboard bolt |
| 4 | ¼"—20 N.C. bolts 1¾" long | springboard bolt |
| 16 | ¼"—20 N.C. bolts ¾" long | bolts—sta. #6, 8 |
| 4 | ¼"—20 N.C. bolts 1½" long | bolts—sta. #5 |
| 4 | ⅜"—24 N.F. bolts 3" long | runner plank bolt |
| 8 | ⅛"x¾"x8 9/16" aluminum | steering pedal slide plate |
| 1 | ⅛"x6"x12" aluminum plate | sta. #00, 6, 8 |
| 2 | 1¼"x1¼"x 5/16" angle, 6½" long | angles, sta. #1, 2 |
| 2 | 1"x1"x⅛" angle, ⅝" long | angles, sta. #12 |
| 4 | 1½"x2"x¼" angle, 1½" long | runner plank clips |
| #10 F.H. woodscrews, 1¼" long | | woodscrews |
| #12 F.H. woodscrews, 2" long | | woodscrews |
| #8 F.H. woodscrews, 1" long | | woodscrews |
| 1" nails | | nails |



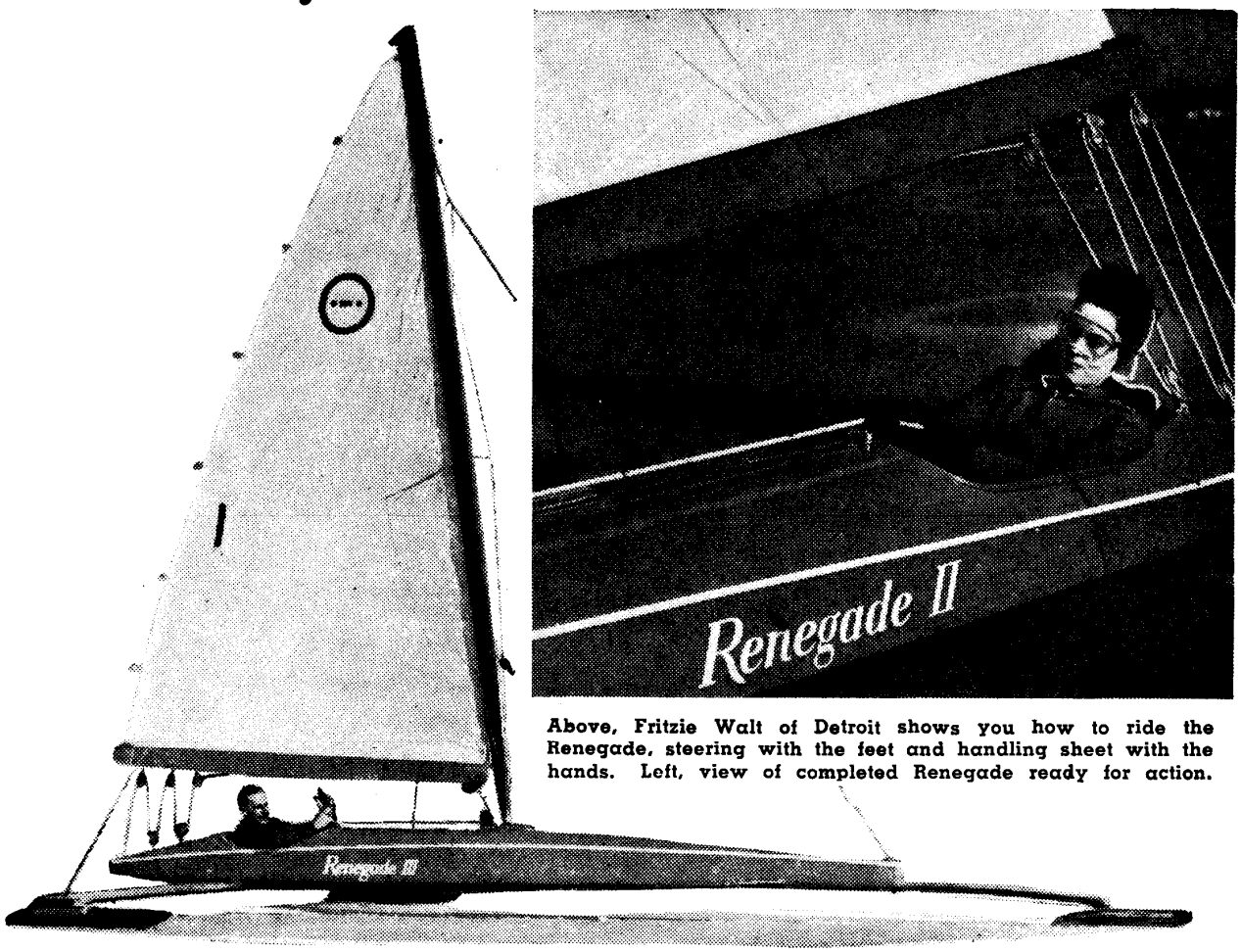
**Fuselage with bottom on. Rudder pedals installed and hand steering line sheaves in place.**

work if you use 2 strips about 2 in. wide. Place cleats across on about 8 in. centers to support outer laminas; 1¼ in. blocks glued in place will serve. Use flat grain boards, that is, grain which runs straight across the long way of the board when looking at the end. In assembling plank, lay lower lamination on bench and place a block under the midpoint. Weight of ends will bring them down to about the proper curve. Fit smaller blocks in along proper curve to give the needed support.

The plans show an 8 in. crown but 4½ in. is recommended. An 8 in. crown was built into the *Renegade II* from which the plans were made and the designer feared he might be criticized for changing the plans, after success of the experimental craft. He built less crown in his following craft and it has been just as successful. Before gluing, make a number of clamps of 2 x 6's of suitable length, pulled together with pairs of carriage or other bolts. Both plank and mast should be clamped every 6 in. while glue dries. To shape glued plank take off slices progressively along edges on first cuts, then go back and take corners off progressively to get symmetrical shape desired. A test for the plank, after it is dressed in cross section, and this is important, is to load midpoint with 575 lbs. of weight. Weight should bring plank, supported only at its ends, down flat. If it is too stiff, material should be shaved off until it meets this requirement. If it is too soft, you will build another one if you wish to get into big league racing. No two planks will come out the same because of varying densities of lumber, grain direction and other factors. If high speeds are hoped for, it pays to give this job particular attention, as the life in the plank is always considered the heart of the craft.

● Part 2, telling how to build the mast, add the fittings and make the final assembly, will appear in the February 1951 issue of SCIENCE AND MECHANICS, on sale Dec. 29, 1950. Watch for it.

# *Building the* RENEGADE Ice Yacht

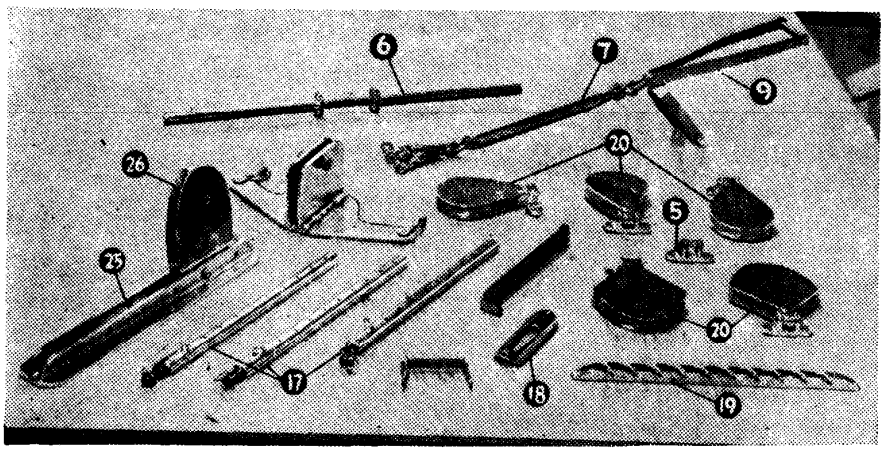



**Above, Fritzie Walt of Detroit shows you how to ride the Renegade, steering with the feet and handling sheet with the hands. Left, view of completed Renegade ready for action.**

## Part 2. The mast, boom and final assembly wrap up the building of this sleek speedster

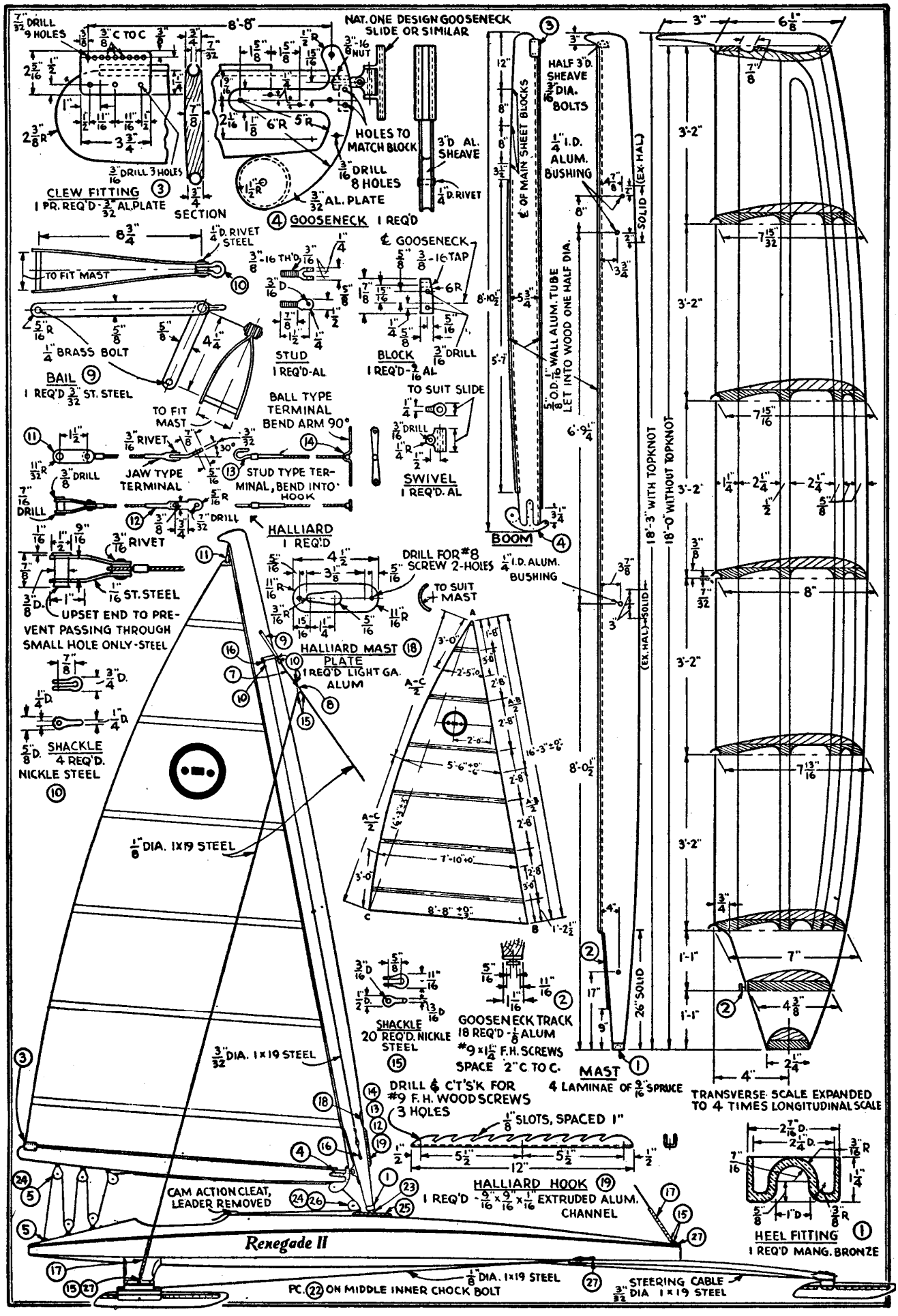
By WALTER X. BRENNAN

BUILD mast of 4 laminations of 9/16 in. spruce to be a constant thickness of 2¼ in. for 14 ft. 6 in. from heel, then tapering to thickness of 1⅝ in. at a distance of 18 ft. from heel. Do all tapering on center laminas. Work to shape progressively as you did the runner plank.




In building the yacht's mast, glue the outside joints first, then hollow out center openings. Taper inside laminas, then clear hole for halliard (see dwg. 3). Notch out for topknot at head of mast. As this is an ornament, and spars usually have natural finish, cross grain or ornamental wood may be used. Next glue center joint, and, when dry, shape to plans. Be sure halliard hole is kept clear of glue. One way is to lay a cord through groove before gluing; after clamping parts together, pull a small piece of cloth through hole with cord to take excessive glue from hole.

The plans call for the finest fittings and metal parts but some substitutions may be necessary. The sheave at top of mast may be an innovation to sailboat builders in that it does not turn. It is a half-sheave, attached to two screws, and

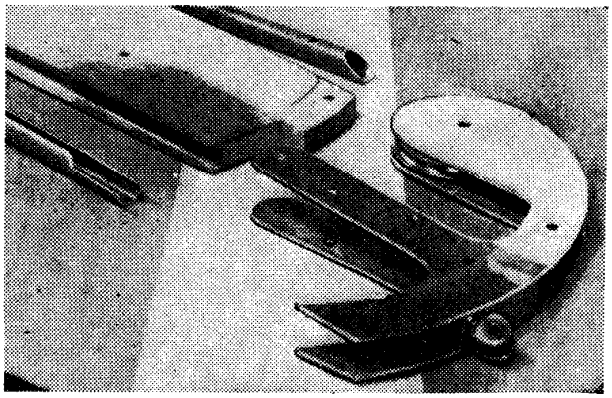

CLEW FITTING
1 PR. REQ'D - 3/32 AL. PLATE
SECTION
NAT. ONE DESIGN GOOSENECK SLIDE OR SIMILAR
HOLES TO MATCH BLOCK
3" D AL. SHEAVE
1/4" D. RIVET
3/16" DRILL 8 HOLES
3/32" AL. PLATE
GOOSENECK 1 REQ'D
BAIL
1 REQ'D 3/32 ST. STEEL
1/4" BRASS BOLT
TO FIT MAST
STUD
1 REQ'D-AL
BLOCK
1 REQ'D-3/16 AL
SWIVEL
1 REQ'D. AL
TO SUIT SLIDE
BALL TYPE TERMINAL BEND ARM 90°
JAW TYPE TERMINAL
STUD TYPE TERMINAL, BEND INTO HOOK
HALLIARD
1 REQ'D
UPSET END TO PREVENT PASSING THROUGH SMALL HOLE ONLY-STEEL
HALLIARD MAST PLATE
1 REQ'D LIGHT GA. ALUM
SHACKLE
4 REQ'D. NICKLE STEEL
1/8" DIA. 1X19 STEEL
3/32" DIA. 1X19 STEEL
CAM ACTION CLEAT, LEADER REMOVED
DRILL FOR #8 SCREW 2-HOLES
TO SUIT MAST
SHACKLE
20 REQ'D. NICKLE STEEL
GOOSENECK TRACK
18 REQ'D - 1/8 ALUM
#9 x 1 1/4 F.H. SCREWS
SPACE 2" C. TO C.
DRILL & C'T'S'K FOR #9 F.H. WOOD SCREWS
3 HOLES
1/8" SLOTS, SPACED 1"
HALLIARD HOOK
1 REQ'D - 9/16 x 9/16 x 1/16 EXTRUDED ALUM. CHANNEL
HALF 3" D. SHEAVE
3/16" DIA. BOLTS
1/4" I.D. ALUM. BUSHING
OF MAIN SHEET BLOCKS
5/16" O.D. 1/16" WALL ALUM. TUBE LET INTO WOOD ONE HALF DIA.
BOOM
1/4" I.D. ALUM. BUSHING
18'-3" WITH TOPKNOT
18'-0" WITHOUT TOPKNOT
MAST
4 LAMINAE OF 9/16" SPRUCE
TRANSVERSE SCALE EXPANDED TO 4 TIMES LONGITUDINAL SCALE
HEEL FITTING
1 REQ'D MANG. BRONZE
Renegade II
1/8" DIA. 1X19 STEEL
PC. 22 ON MIDDLE INNER CHOCK BOLT
3/32" DIA 1X19 STEEL
STEERING CABLE

MATERIALS LIST—RENEGADE RIGGING AND FITTINGS

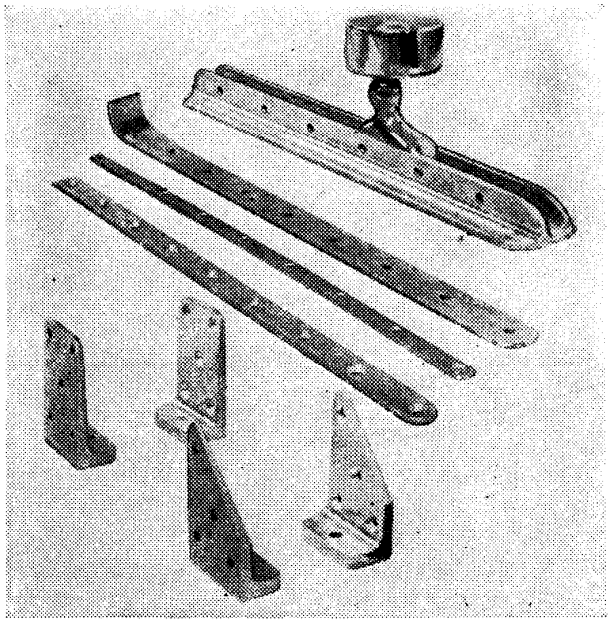
| No. Req'd. | Size | Material | Part |
|---|---|---|---|
| 4 | 9/16" x 8" x 18'-3" | spruce | mast |
| 1 | 7/8" x 5 3/4" x 8'-11" | spruce | boom |
| 1 | 5/8" O.D. x 1/16" wall x 30' 0" | aluminum tubing | mast and boom track |
| 2 | 9/16" O.D. x 1/16" wall x 8" | aluminum tubing | spreader (6) |
| 1 | 5/16" dia. x 37/8" | steel rod | " |
| 2 | 1" O.D. x 5/16" I.D. x 3/16" | aluminum washer | " |
| 4 | 7/16" O.D. x 1/2" | brass bushing | " |
| 2 | 5/8"-18 x 3/4" | cap screw | " |
| 1 | 1/4" dia. | bronze weld rod | head stay link (7) |
| 1 | 1/8"x1 1/2"x2 1/4" | stainless steel | connector (8) |
| 20 | | nickel steel | shackle (15) |
| 2 | | stainless steel | tang (16) |
| 3 | 5/8" O.D. x 1/16" wall x 12" | aluminum tube | turnbuckle (17) |
| 3 | 7/8" dia. x 5/8" long | steel, turn to size | turnbuckle pin |
| 5 | | aluminum | sheet blocks (20) |
| 2 | | " | tiller rope blocks |
| 2 | 1/8" x 34" x 2 7/8" | " | tiller strap |
| 2 | 1/4" x 3/4" x 21/4" | " | tiller pad |
| 2 | 1/16" x 1/2" x 13" | " | tiller link |
| 6 | 1/8" | " | rivets |
| 2 | 3/32" x 5/8" x 6" | " | whisker stay tang (22) |
| 1 | 12" long | extruded alum. | mast step (25) |
| 5 | #12 | wood screws | " |
| 1 | (see detail) | aluminum | ratchet block |
| 1 | section of mast step | alum. extrusion | leader base |
| 1 | (see detail) | bronze | mast step ball (23) |
| 1 | | mang. bronze | mast heel fitting (1) |
| 1 | 1/4" I.D. x 12" | aluminum | bushing for mast |
| 1 | 3" dia. | " | mast head half sheave |
| 2 | 3/16" bolts x 2 1/2" | | mast head sheave |
| 2 | 1/8" x 1 1/2" x 18" | aluminum | gooseneck track |
| 1 | 3/32" x 7" x 18" | " | gooseneck (4) |
| 7 | 3/16" rivets | " | " |
| 1 | 3" dia. sheave | " | " |
| 1 | | swivel, block, stud, slide, aluminum | " |
| 7 | | aluminum | block base (5) |
| 14 | #9 fh screws x 1 1/2" long | | block base |
| 2 | 3/32" x 2 5/16" x 3 3/4" | aluminum plate | clew fitting (3) |
| 3 | 3/16" | rivets | " " |
| 1 | 1/16" x 9/16" x 9/16" | extruded aluminum channel 12" long | halliard hook |
| 3 | #9 | wood screws | |
| 1 | 1 3/8" x 4 1/2" | light gage aluminum | halliard mast plate |
| 2 | #8 | wood screws | |
| 1 | | (as shown) | halliard |
| 1 | 3/32" x 5/8" x 32" | stainless steel | bail |
| 1 | 1/4" | rivet, steel | " |
| 1 | 1/4" dia. | brass bolt | " |
| 4 | | nickel steel | shackles |
| 1 | 3/16" x 4" x 17" | steel | rudder yoke and chock |
| 1 | 3/8" x 5" x 34" | spring or high carbon steel | steering runner |
| 1 pr. | 1/4" x 7/8" x 2" | angle 30 1/4" long | steering runner |

(Continued on page 198)

serves to snub halliard and reduce excessive strain on mast and other parts when sailed hard. Sheave should be hard, to prevent wear. Turn fitting at bottom of mast from 17 or 24 ST hard-



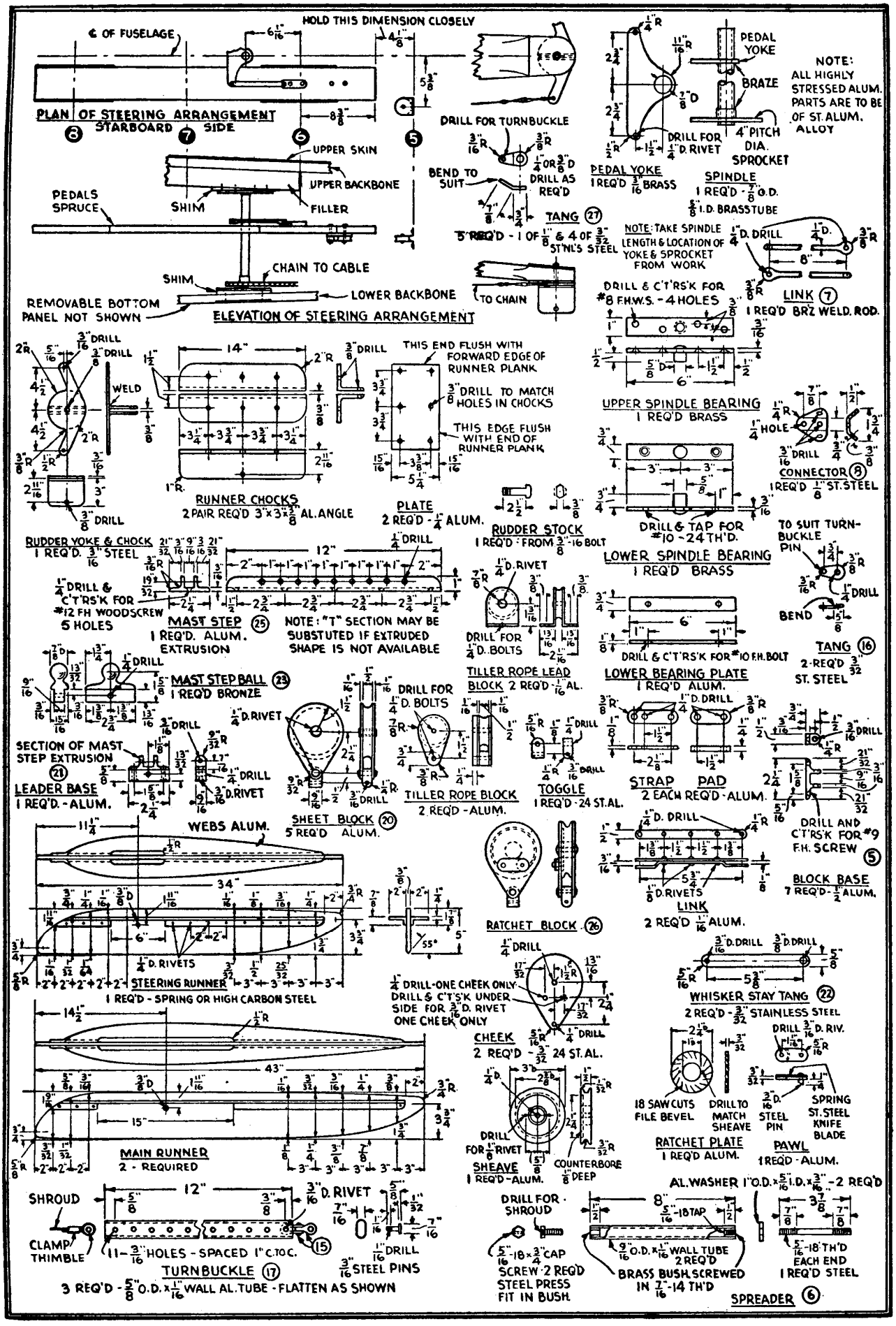
Gooseneck fitting for boom. Split tube at left holds bolt rope of sail. Sheet line leads through tube on opposite side of boom.



Top, mast step track, mast step ball and heel fitting for mast. Center strips, parts of gooseneck track assembly. Below, fittings for attaching fuselage to runner plank.

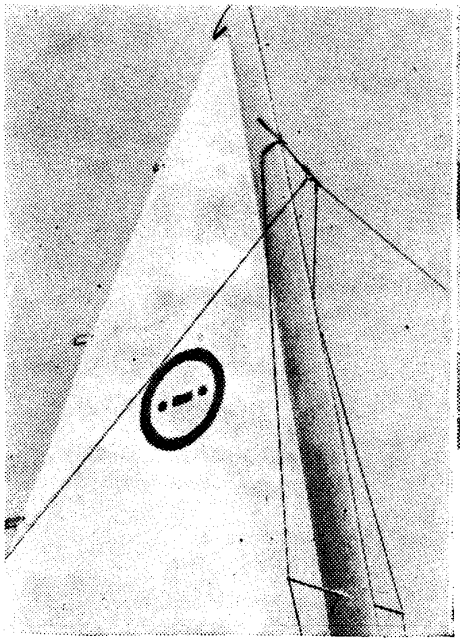
ened aluminum or cast. Ball on which it rests should be cast bronze. Make a pattern and if arrangement can be made at a foundry to cast parts along with something else in the works, castings are not costly. Mount ball fitting on U or T shaped extruded aluminum. Make gooseneck fitting on mast of strips as shown in the photo and attach with 1¼ in. cadmium plated steel screws. Slot tubing along boom and mast for bolt rope of the sail, with an aluminum saw, and attach with 1 in. No. 4, oval head screws, spaced on 6 in. centers.

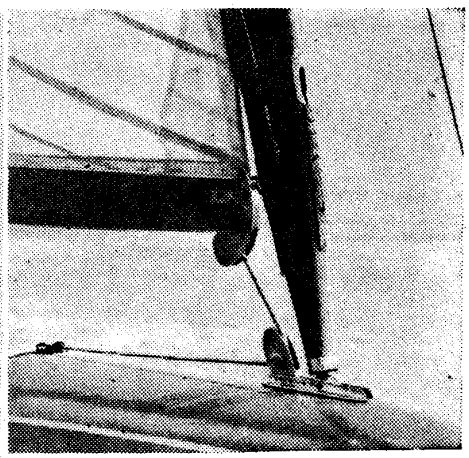
The aluminum tubing along the boom for the sheet is under no stress so can be attached with 1 in. screws on 18 in. centers. Drill a large hole for inserting a screwdriver in outside and drill screw hole opposite. The serious problem for the average builder is swedging fittings to cables. Most sailmakers can do this. As the sail is an important part of the craft and few amateurs are experienced sailmakers, it is best to give that job to a sailmaker that has had ex-


HOLD THIS DIMENSION CLOSELY
℄ OF FUSELAGE
PLAN OF STEERING ARRANGEMENT
STARBOARD SIDE
UPPER SKIN
UPPER BACKBONE
PEDALS SPRUCE
SHIM
FILLER
CHAIN TO CABLE
SHIM
LOWER BACKBONE
REMOVABLE BOTTOM PANEL NOT SHOWN
ELEVATION OF STEERING ARRANGEMENT
DRILL FOR TURNBUCKLE
BEND TO SUIT
TANG (27)
5 REQ'D - 1 OF 1/8" & 4 OF 3/32" ST'NL'S STEEL
TO CHAIN
PEDAL YOKE
BRAZE
DRILL FOR 1/4" D. RIVET
4" PITCH DIA. SPROCKET
PEDAL YOKE
1 REQ'D 3/16 BRASS
SPINDLE
1 REQ'D - 7/8" O.D. 5/8" I.D. BRASS TUBE
NOTE: TAKE SPINDLE LENGTH & LOCATION OF YOKE & SPROCKET FROM WORK
NOTE: ALL HIGHLY STRESSED ALUM. PARTS ARE TO BE OF ST. ALUM. ALLOY
LINK (7)
1 REQ'D BRZ WELD. ROD.
DRILL & C'T'RS'K FOR #8 F.H.W.S. - 4 HOLES
UPPER SPINDLE BEARING
1 REQ'D BRASS
CONNECTOR (8)
1 REQ'D 1/8" ST. STEEL
DRILL & TAP FOR #10 - 24 TH'D.
LOWER SPINDLE BEARING
1 REQ'D BRASS
TO SUIT TURNBUCKLE PIN
BEND
TANG (16)
2 REQ'D 3/32 ST. STEEL
LOWER BEARING PLATE
1 REQ'D ALUM.
DRILL & C'T'RS'K FOR #10 F.H. BOLT
RUDDER YOKE & CHOCK
1 REQ'D. 3/16" STEEL
1/4" DRILL & C'T'RS'K FOR #12 FH WOODSCREW 5 HOLES
MAST STEP (25)
1 REQ'D. ALUM. EXTRUSION
NOTE: "T" SECTION MAY BE SUBSTUTED IF EXTRUDED SHAPE IS NOT AVAILABLE
RUDDER STOCK
1 REQ'D - FROM 3/8-16 BOLT
1/4" D. RIVET
DRILL FOR 1/4" D. BOLTS
TILLER ROPE LEAD BLOCK 2 REQ'D - 1/16 AL.
TILLER ROPE BLOCK
2 REQ'D - ALUM.
TOGGLE
1 REQ'D - 24 ST. AL.
STRAP PAD
2 EACH REQ'D - ALUM.
DRILL AND C'T'RS'K FOR #9 F.H. SCREW (5)
BLOCK BASE
7 REQ'D - 1/2 ALUM.
MAST STEP BALL (23)
1 REQ'D BRONZE
SECTION OF MAST STEP EXTRUSION (21)
LEADER BASE
1 REQ'D. - ALUM.
SHEET BLOCK (20)
5 REQ'D ALUM.
WEBS ALUM.
STEERING RUNNER
1 REQ'D - SPRING OR HIGH CARBON STEEL
RATCHET BLOCK (26)
1/4" DRILL - ONE CHEEK ONLY
DRILL & C'T'S'K UNDER SIDE FOR 3/16" D. RIVET ONE CHEEK ONLY
CHEEK
2 REQ'D - 3/32 24 ST. AL.
SHEAVE
1 REQ'D - ALUM.
COUNTERBORE 1/8 DEEP
LINK
2 REQ'D 1/16 ALUM.
WHISKER STAY TANG (22)
2 REQ'D - 3/32 STAINLESS STEEL
18 SAW CUTS FILE BEVEL
DRILL TO MATCH SHEAVE
3/16" D. STEEL PIN
SPRING ST. STEEL KNIFE BLADE
RATCHET PLATE
1 REQ'D ALUM.
PAWL
1 REQ'D - ALUM.
MAIN RUNNER
2 - REQUIRED
SHROUD
CLAMP THIMBLE
11 - 3/16" HOLES - SPACED 1" C. TO C.
TURNBUCKLE (17)
3 REQ'D - 5/8" O.D. x 1/16" WALL AL. TUBE - FLATTEN AS SHOWN
3/16" STEEL PINS
AL. WASHER 1" O.D. x 5/16" I.D. x 3/16" - 2 REQ'D
DRILL FOR SHROUD
5/16-18 x 3/4 CAP SCREW 2 REQ'D STEEL PRESS FIT IN BUSH
BRASS BUSH SCREWED IN 7/16-14 TH'D
9/16 O.D. x 1/16 WALL TUBE 2 REQ'D
5/16-18 TH'D EACH END 1 REQ'D STEEL
SPREADER (6)
RUNNER CHOCKS
2 PAIR REQ'D 3" x 3" x 3/8 AL. ANGLE
PLATE
2 REQ'D - 1/4 ALUM.
THIS END FLUSH WITH FORWARD EDGE OF RUNNER PLANK
3/8" DRILL TO MATCH HOLES IN CHOCKS
THIS EDGE FLUSH WITH END OF RUNNER PLANK

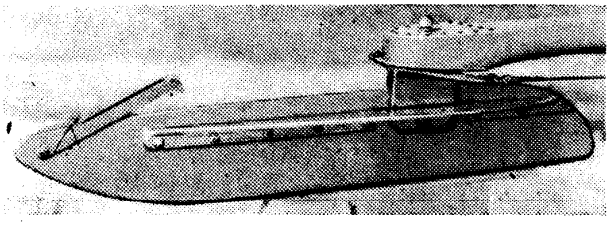
perience in small ice yacht canvas. Preferred material is 8.6 Nylon, the heaviest made. In Wamsutta sail cloth, the material should be of 8 or 10 oz. weight.

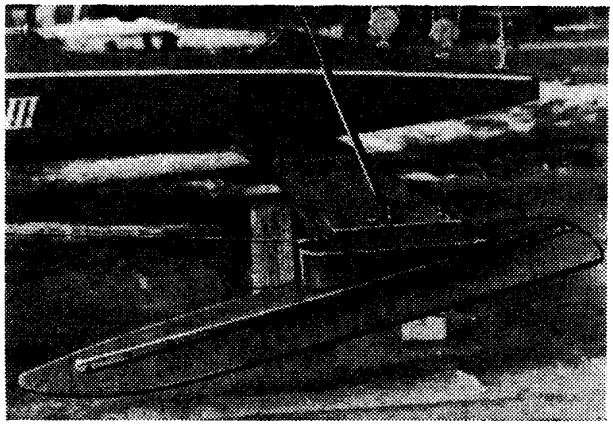
In final assembling, be sure runners are parallel on runner plank. Do this in mounting runner chocks. After assembling and drilling chocks and plate, bolt one set to plank after it is squared. Mount runners in chocks snugly but loosely enough so they will drop under their own weight. Mount other chock and runner





Mast is supported at 2 points, by a ball at the foot (above) and a short pendant at the top (left). Thus mast swings through wide arc and can assume an aerodynamically efficient position in relation to sail. Full length battens in sail avoid flutter.

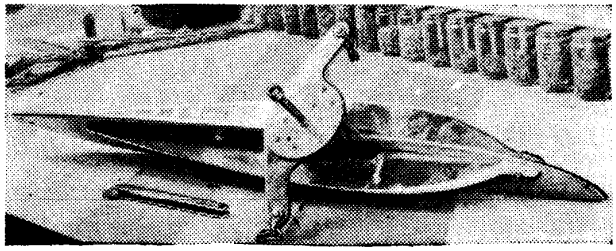




Top, steering runner assembly. Lever at forward end is parking brake which is folded over so point holds in ice. Below, closeup of rear runner.

assembly in position on other end of plank and fasten with 1 bolt. With plank assembly upside down and forward part of runners blocked up to a level position, lay a straight edge across runners' cutting edges. Check distance between forward and after cutting edges to be sure runner tracks are parallel. Squaring chocks only won't do the job as error in grinding cutting edges may get them out of line with sides of runner. After assemblies are in line, drill remaining holes and secure chock. In rigging mast, it may seem that stays are unusually slack. These cables are slack when craft is at rest, but when sailing under pressure, leeward stay will drift far out.

Any good workman can build the *Renegade*.



Steering runner partly assembled.

MATERIALS LIST (Continued from page 196)

| | | |
|---|---|---|
| 2 3/8" x 5" x 43" | spring or high carbon steel | main runner |
| 2 pr. 1/4" x 7/8" x 2" | angle 39 3/8" long | main runner |
| 38 1/4" dia. | rivets | " " |
| 2 pr. 3/8" x 3" x 3" | aluminum angle 14" long | main runner chock |
| 2 1/4" x 5 1/4" x 9 1/2" | aluminum | runner chock plate |
| 1 3/8"-16 | bolt 2 1/2" long | rudder stock |
| 1 1/8" x 3/4" x 1 5/8" | stainless steel | tang |
| 4 3/32" x 3/4" x 1 5/8" | stainless steel | tang |
| 1 3/16" x 2 11/16" x 6" | brass | pedal yoke |
| 1 7/8" O.D. x 5/8" I.D. | brass tube | spindle |
| 1 3/16 x 1" x 6" | brass | upper spindle bearing |
| 1 5/8" dia. stud | " | upper spindle bearing |
| 1 3/16" x 3/4" x 6" | " | lower spindle bearing |
| 1 5/8" dia. stud | " | lower spindle bearing |
| 1 1/8" x 3/4" | aluminum | lower bearing plate |
| 2 (see detail) | " | tiller rope head block |
| 1 4" pitch dia. | | chain sprocket |

RIGGING

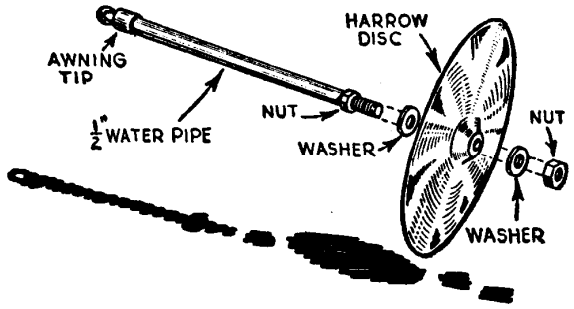
shrouds—1/8" dia., 1 x 19 steel
guy wires—1/8" dia., 1 x 19 steel
stay—1/8" dia., 1 x 19 steel
halliard—1/8" dia., 1 x 19 steel
jumper stay—3/32" dia., 1 x 19 steel
steering cable—3/32" dia., 1 x 19 steel
steering chain—24" long sheet rope
thimbles and clamps as needed
cam action cleat with leader removed, Wilcox Crittenden Co., Fig. 9820.

There are no commercial builders of the *Renegade* craft but should an owner wish to hire the job done, he could turn it over to a boat yard or job out the parts to a carpenter and machinist.

It is a good idea in this, as in any sport, to join the organization which sponsors it. A builder of this particular craft should join the *Renegade* association.

## Harrow Disc Makes Boat Anchor

• To make an anchor for a boat you need a dull harrow disc and some water pipe. Thread pipe at both ends to accommodate fittings. Se-




cure disc to pipe with a nut and washer on each side and install awning tip at opposite end to hold the rope.—Victor H. Lamoy.