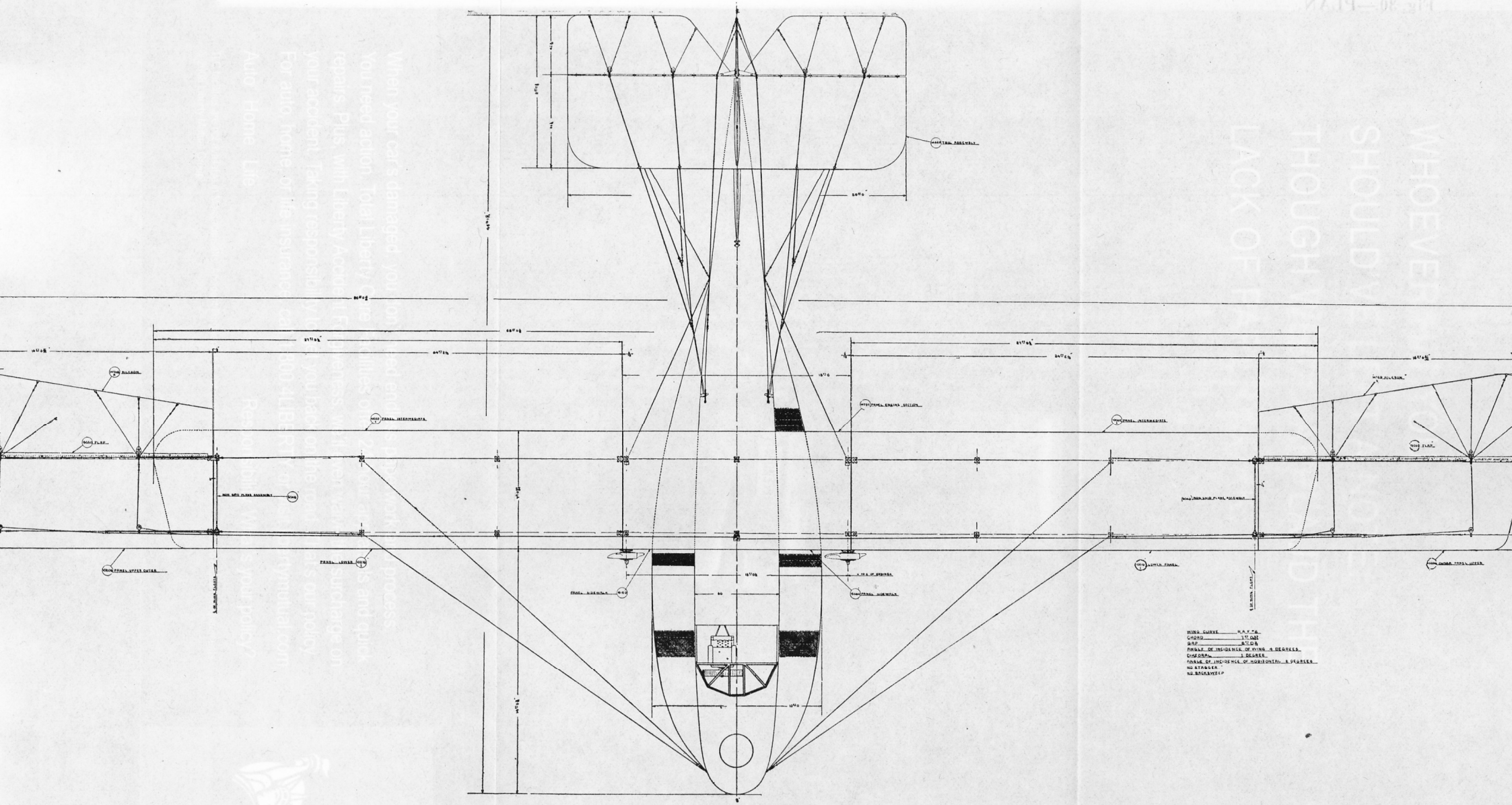

WING CURVE R.A.F. 6
CHORD 1.50 CONST
GAP 5'-0"
ANGLE OF INCIDENCE OF WING 4 DEGREES
DIHEDRAL 1 DEGREE
ANGLE OF INCIDENCE OF HORIZONTAL 0 DEGREES
NO STAGGER
NO BACKWARD

FIG. 30.—Plan.

# THE
# H-16A FLYING BOAT
# HANDBOOK

NAVY DEPARTMENT

BUREAU OF CONSTRUCTION AND REPAIR

JULY, 1918

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JULY, 1918

WASHINGTON
GOVERNMENT PRINTING OFFICE
1918

# H-16A FLYING BOAT HANDBOOK.

## INTRODUCTION.

The following text is designed to give the most satisfactory current practice of handling large flying boats with particular attention to unpacking and assembling. There are various methods of performing the component operations dealt with and no doubt most of these would give satisfactory results but the following, if consistently adhered to, will give good results.

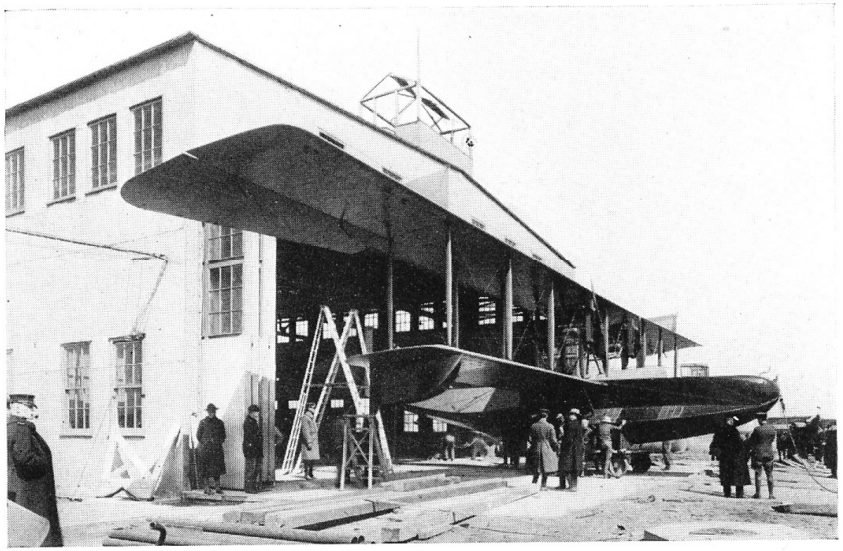


Fig. 1.—General assembly, three-fourths front view.

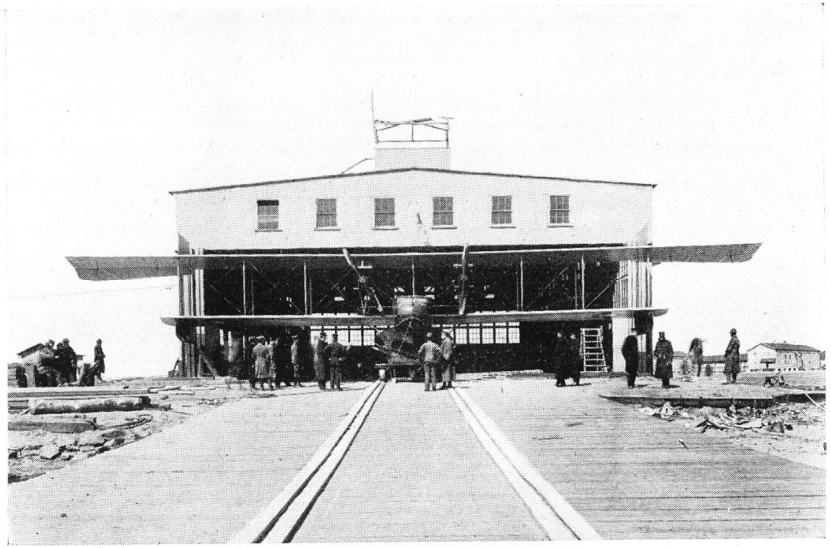


Fig. 2.—General assembly, front view.

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# H–16A FLYING-BOAT HANDBOOK.

## SPECIFICATIONS.

### 1. GENERAL DIMENSIONS

| | |
|---|---|
| Wing span, upper plane | 95 feet $\frac{13}{16}$ inch. |
| Wing span, lower plane | 68 feet $11\frac{3}{8}$ inches. |
| Depth of chord | 7 feet $\frac{49}{64}$ inch. |
| Gap between planes | 8 feet $\frac{9}{16}$ inch. |
| Stagger | None. |
| Total length of machine over all | 46 feet $1\frac{15}{32}$ inches. |
| Total height of machine over all | 17 feet $8\frac{5}{8}$ inches. |
| Normal angle of incidence, both planes | 4 degrees. |
| Dihedral angle | 1 degree. |
| Sweepback | 0 degree. |
| Angle of incidence of stabilizer | 2 degrees. |

### 2. AREAS.

| | Square feet. |
|---|---|
| Upper planes | 601.0 |
| Lower planes | 432.0 |
| Ailerons (each 65.5 square feet) | 131.0 |
| Total supporting surface | 1,164.0 |
| Stabilizer | 108.0 |
| Fin | 34.0 |
| Elevators (each 29.2 square feet) | 58.4 |
| Rudder | 27.9 |

### 3. WEIGHTS.

| HULL. | Pounds. |
|---|---|
| Hull, including soakage | 2,288 |

| WINGS, TAIL, ETC. | Pounds. |
|---|---|
| Wings, struts, tail, etc | 2,014 |

| ORDNANCE EQUIPMENT. | |
|---|---|
| 5 Lewis guns, at 18 pounds | 90 |
| 10 ammunition trays, at 10 pounds | 100 |
| 1 scarf mount | 25 |
| 2 outrigger mounts, at 7 pounds | 14 |
| 1 gooseneck mount | 8 |
| 1 pilot directing bomb sight | 18 |
| 1 bracket for Wimperis high altitude sight | 2 |
| 2 bombs with gear | 580 |
| | 837 |
| Installation | 13 |
| Total | 850 |

| STEAM ENGINEERING EQUIPMENT. | |
|---|---|
| Motors (2, at 852 pounds) | 1,704 |
| Water | 229 |
| Radiators, at 83 pounds, brackets at 5 pounds | 176 |
| Propellers, at 70 pounds | 140 |
| Gasoline pumps, at 18 pounds | 36 |
| Hand pumps, at 5 pounds | 10 |
| Gasoline tanks | 240 |
| Gravity tanks and piping | 45 |
| Sil tanks and piping | 26 |
| Spark and throttle | 2 |
| Tachometers and shafting | 22 |
| Oil pressure gauges | 2 |
| Thermometers | 2 |
| Gasoline gauges | 2 |
| Tools and spare parts | 25 |
| Oil thermometers | 2 |
| Hand cranks, at 13.5 pounds | 27 |
| Exhaust manifolds, at 12 pounds | 24 |
| Total | 2,714 |

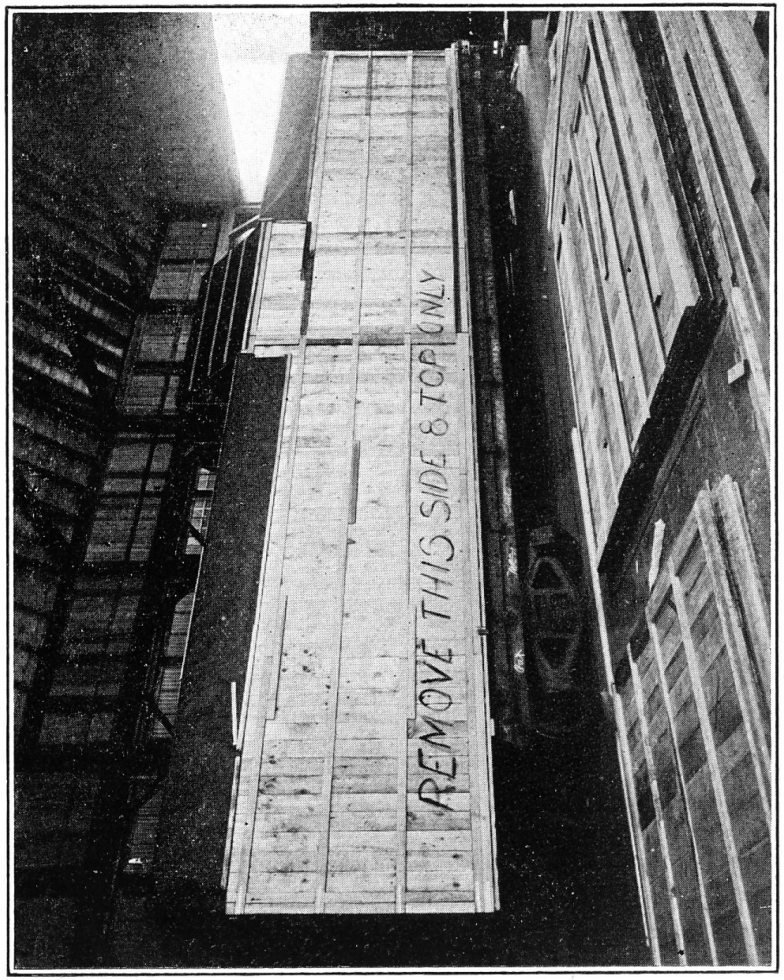



Fig. 3.—Side of hull box.

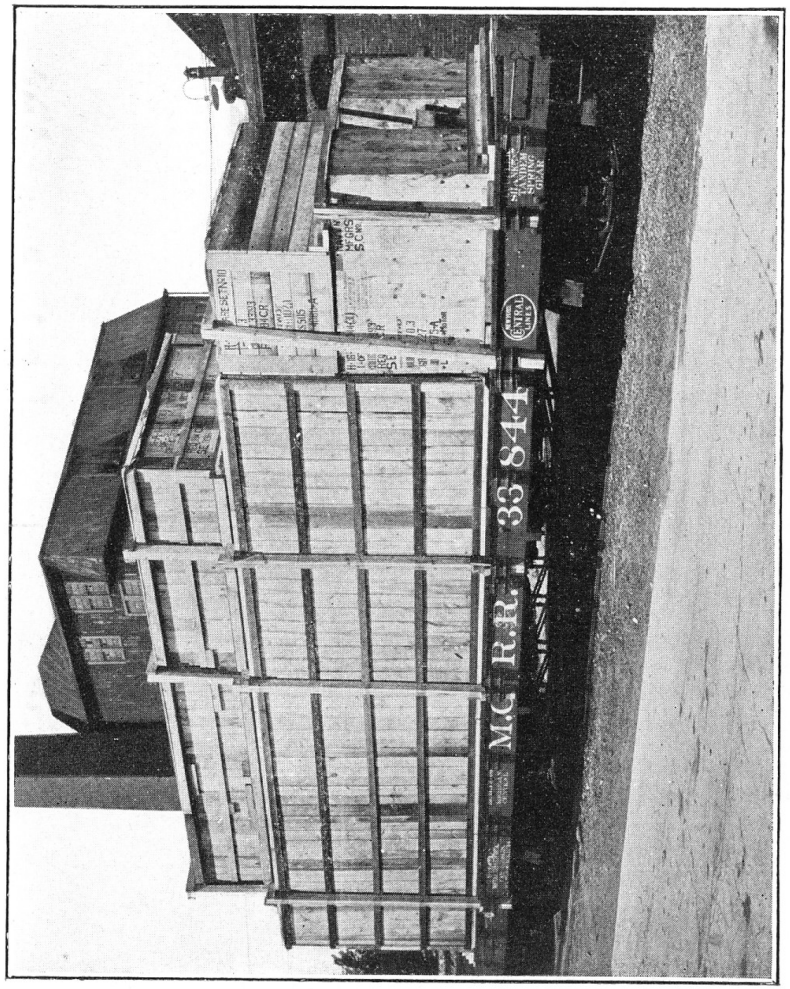



Fig. 4.—Panel, motor and parts boxes.



| | Pounds. |
|---|---|
| **ELECTRICAL EQUIPMENT.** | |
| Storage batteries | 20 |
| Electric lights | 9 |
| Switchboard | 3 |
| Wiring | 10 |
| Intercommunication set | 10 |
| Searchlight | 5 |
| Total | 57 |
| **CONSTRUCTION AND REPAIR EQUIPMENT.** | |
| Bilge pumps | 10 |
| Sea anchors | 15 |
| Air-speed meter | 5 |
| Inclinometer | 1.3 |
| Fire extinguishers (6) | 42 |
| | 73.3 |
| Installation | 1.7 |
| Total | 75.0 |
| **NAVIGATION EQUIPMENT.** | |
| Compass | 4 |
| Watch | 1 |
| Altimeter | 2 |
| Chart board | 2 |
| Flags | 2 |
| Food and water | 21 |
| Pigeons | 5 |
| Binoculars | 2 |
| Total | 39 |
| **MEDICINE AND SURGERY EQUIPMENT.** | |
| Medical emergency kit | 5 |
| **PERSONNEL AND FUEL.** | |
| Crew (4 men, at 180 pounds) | 720 |
| Gasoline (235 gallons) and oil (12 gallons) | 1,554 |
| **Total** | 2,274 |

RADIO EQUIPMENT.

| | Pounds. |
|---|---|
| Radio and installation | 160 |

SUMMARY.

| | |
|---|---|
| Hull (including soakage) | 2,288 |
| Wings, struts, tail, etc | 2,014 |
| Ordnance equipment | 850 |
| Steam Engineering equipment | 2,714 |
| Electrical equipment | 57 |
| Construction and Repair equipment | 75 |
| Navigation equipment | 39 |
| Medicine and Surgery equipment | 5 |
| Personnel | 720 |
| Gasoline and oil | 1,554 |
| Radio | 160 |
| Total weight | 10,476 |

## 4. LOADING.

$$\frac{\text{Total weight}}{\text{Supporting area}}=\frac{10476}{1164}=9.00 \text{ pounds per square foot.}$$

$$\frac{\text{Total weight}}{\text{Rated horsepower}}=\frac{10476}{660}=15.87 \text{ pounds per rated horsepower.}$$

## 5. MOTORS.

| | |
|---|---|
| Two Liberty, 45° Vee, 4-stroke cycle, 12-cylinder, water-cooled, horsepower (rated) of each motor | 330 |
| Bore and stroke | 5 by 7 inches. |
| Fuel consumption per hour | 66.5 gallons. |
| Fuel tank capacity | 324 gallons. |
| Oil capacity | 24 gallons. |
| Fuel consumption per horsepower per hour | 0.55 pound. |
| Oil consumption per horsepower per hour | 0.03 pound. |

## 6. PERFORMANCE.

| | Miles per hour. |
|---|---|
| Speed, maximum, horizontal flight | 95 |
| Speed, minimum, horizontal flight | 56 |

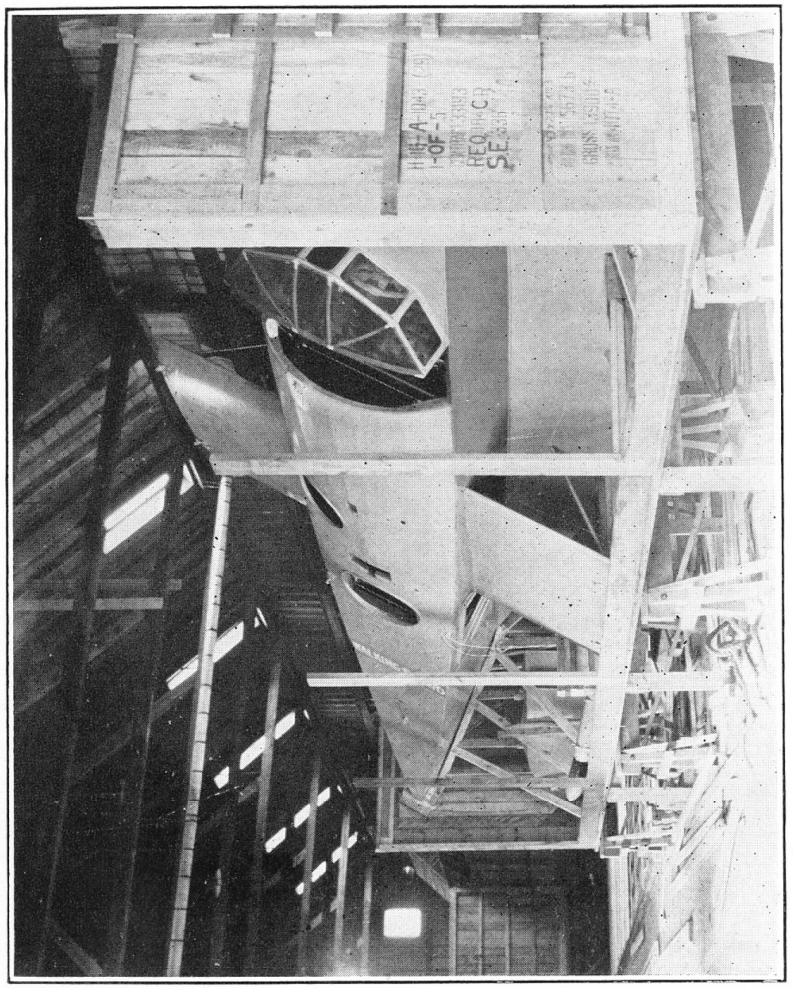


Fig. 5.—Hull box, looking aft.

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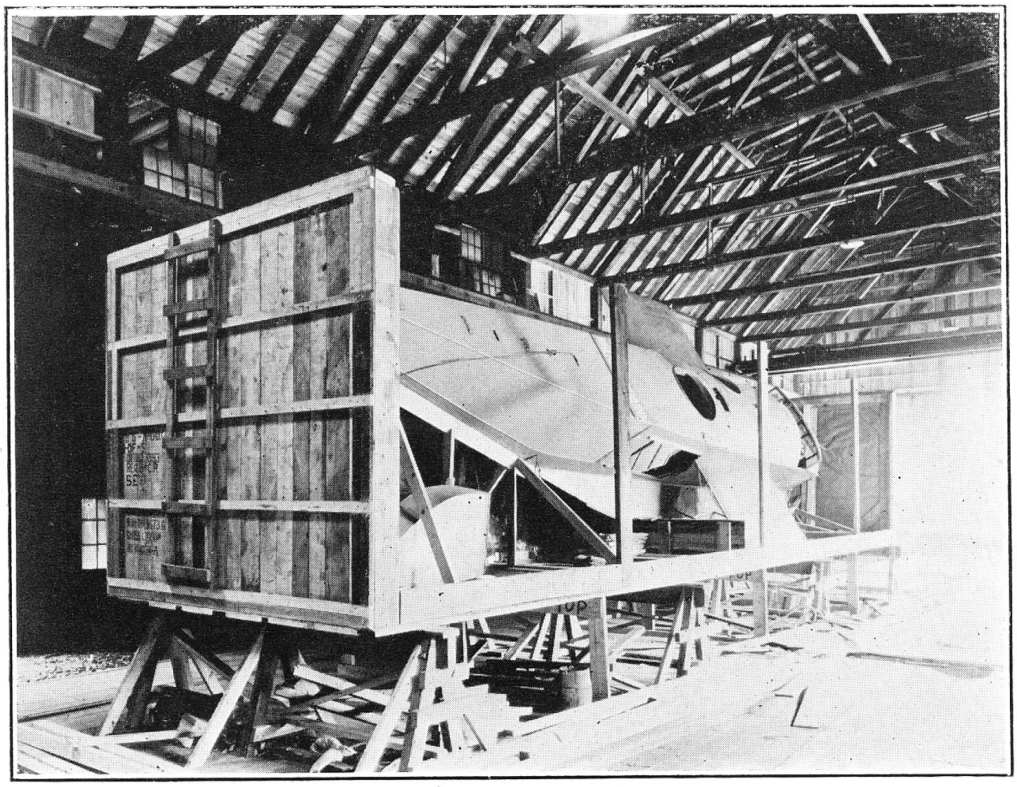


Fig. 6.—Hull box, looking forward.

## INTERPLANE CABLES.

| Location. | Type. | Engine section. | First intermediate. | Second intermediate. | Outer. | Overhang. |
|---|---|---|---|---|---|---|
| Front | Flying | Single $\frac{1}{4}$-inch | Double $\frac{1}{4}$-inch | Double (fore $\frac{1}{4}$-inch, aft $\frac{3}{16}$-inch). | Double $\frac{3}{16}$-inch | 2 wires, each $\frac{5}{32}$-inch. |
| | Landing | Double $\frac{3}{16}$-inch | Double(fore $\frac{1}{4}$-inch, aft $\frac{3}{16}$-inch). | Single $\frac{1}{4}$-inch | Single $\frac{3}{16}$-inch | |
| Rear | Flying | Single $\frac{1}{4}$-inch | Double $\frac{1}{4}$-inch | Double (fore $\frac{1}{4}$-inch, aft $\frac{3}{16}$-inch). | Double $\frac{3}{16}$-inch | 2 wires, each $\frac{5}{32}$-inch. |
| | Landing | Double $\frac{3}{16}$-inch | Double(fore $\frac{1}{4}$-inch, aft $\frac{3}{16}$-inch). | Single $\frac{1}{4}$-inch | Single $\frac{3}{16}$-inch | |
| | | *Center section.* | | | | |
| Stagger | Upper front to lower rear | Single $\frac{3}{16}$-inch | Single $\frac{3}{16}$-inch | Single $\frac{3}{16}$-inch | Single $\frac{3}{16}$-inch | |
| | Lower front to upper rear | Double $\frac{1}{8}$-inch | Single $\frac{3}{16}$-inch | Single $\frac{3}{16}$-inch | Single $\frac{3}{16}$-inch | |

| | |
|---|---|
| Engine bed to hull, front to rear, rear to front | Double $\frac{1}{4}$ inch |
| Engine bed to upper wing, rear spar | Single $\frac{3}{16}$ inch |
| Engine bed to upper wing, front spar | Single $\frac{5}{32}$ inch. |

| | | | |
|---|---|---|---|
| King post brace wires | Front | Inner | Single $\frac{3}{16}$ inch. |
| | | Outer | 2 wires, single $\frac{1}{8}$ inch. |
| | Rear | Inner | Single $\frac{3}{16}$ inch. |
| | | Outer | 2 wires, single $\frac{1}{8}$ inch. |

# INSTRUCTIONS FOR ASSEMBLY.

## METHOD OF SHIPMENT.

(See figs. 3 and 4.)

A complete boat, including the engines, is packed in five (5) separate boxes.

The large box should contain the hull, wing-floats, radiator, engine-bed struts, two (2) small oil tanks, and small parts. (See figs. 12 and 13.)

Boxes No. 2 and 3 contain wing panels, struts, and tail units.

Boxes No. 4 and 5 contain left and right engines.

NOTE.—Detailed packing lists are inclosed in each box. (See figs. 31 to 38, inclusive.)

## HANDLING BOXES.

In handling and hoisting these shipping boxes, care should be taken when using a sling or bridle that the center of lift comes as near the center of gravity of the box as possible. The boxes containing the panels and the motors are readily handled with ordinary tackle. The bridle can be quickly adjusted for the panel boxes, so that the box rides on an even keel. In handling the hull box, special precautions are necessary. Two slings, each located about twelve (12) feet from the ends of the box, should be used. The hoisting should be done slowly, taking care that both ends are lifted simultaneously. Even though the hull and other contents are kept in a fixed position in the box, by the system of braces shown in figures 12 and 13, care should be taken when placing the boxes that the parts marked "TOP" be uppermost. In this position the hull rests unstrained on the box bracings and diagonal felt-lined floors. The following schedule indicates the average weights of the various boxes as shipped:

| | Pounds. |
|---|---|
| (1) Hull box | 14,000 |
| (2) Panel box | 3,200 |
| (3) Overhang panel box | 2,200 |
| (4) Motor box | 1,250 |
| (5) Motor box | 1,250 |



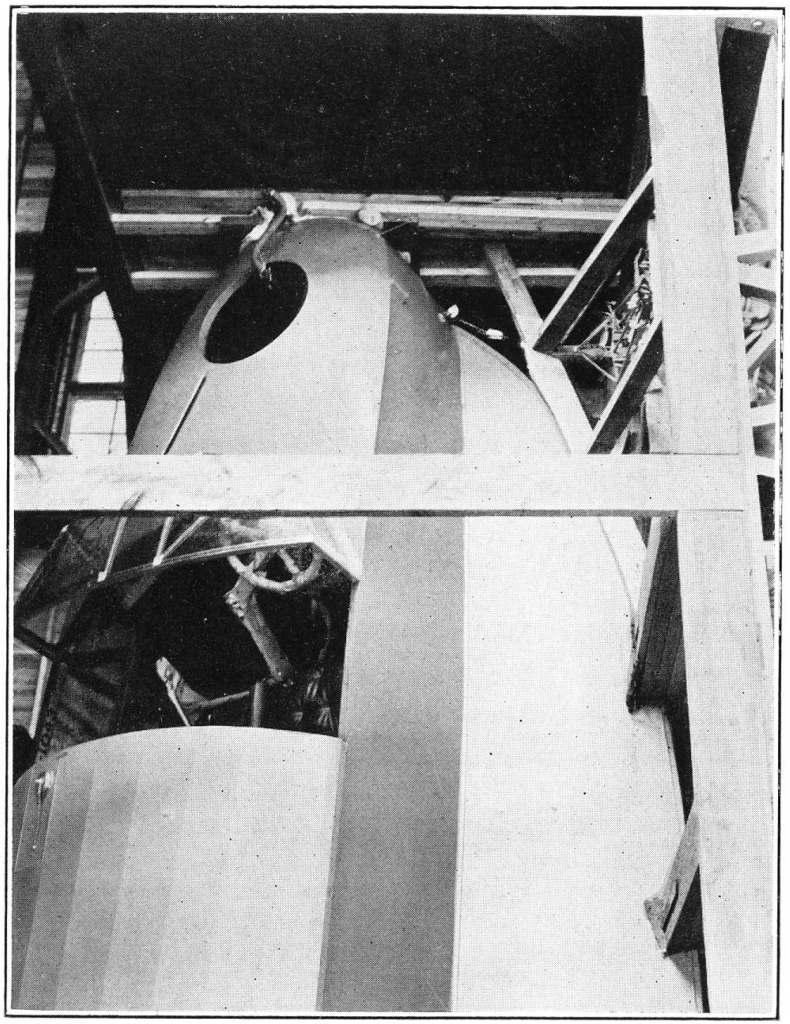


Fig. 7.—Forward end of hull box.

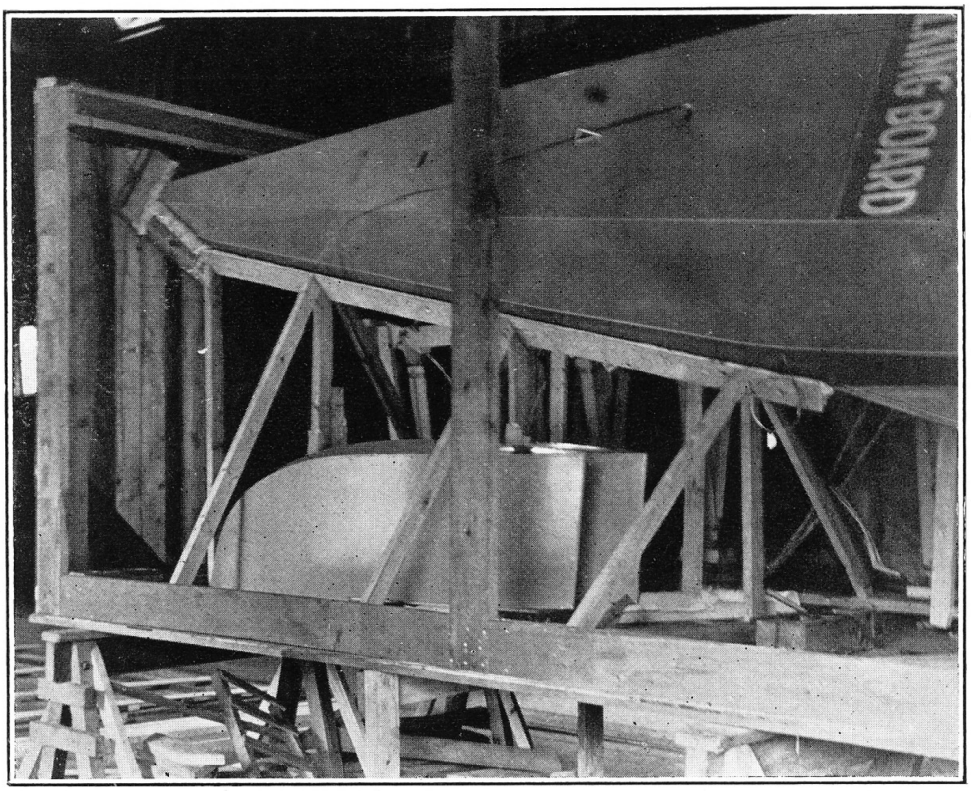


Fig. 8.—Rear end of hull box.

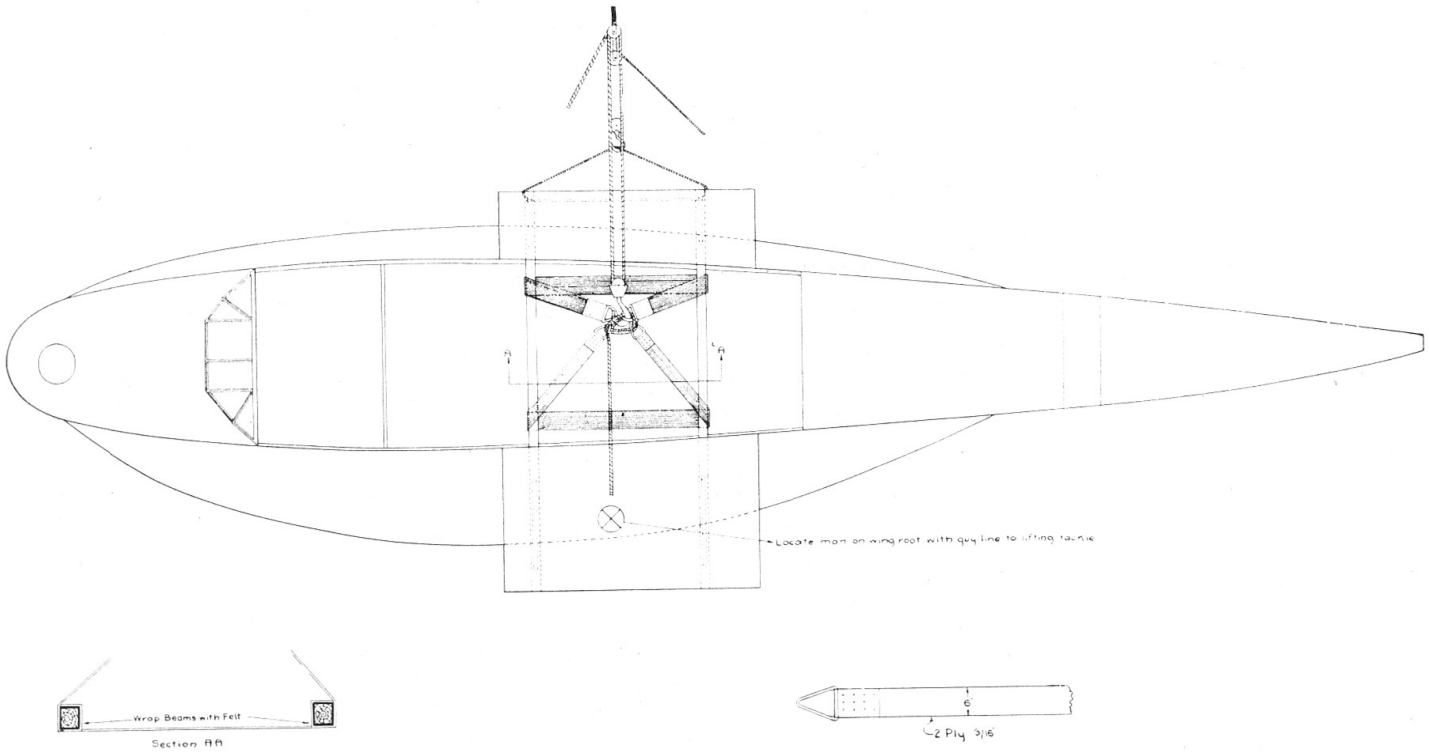



FIG. 9.—Method of lifting hull.

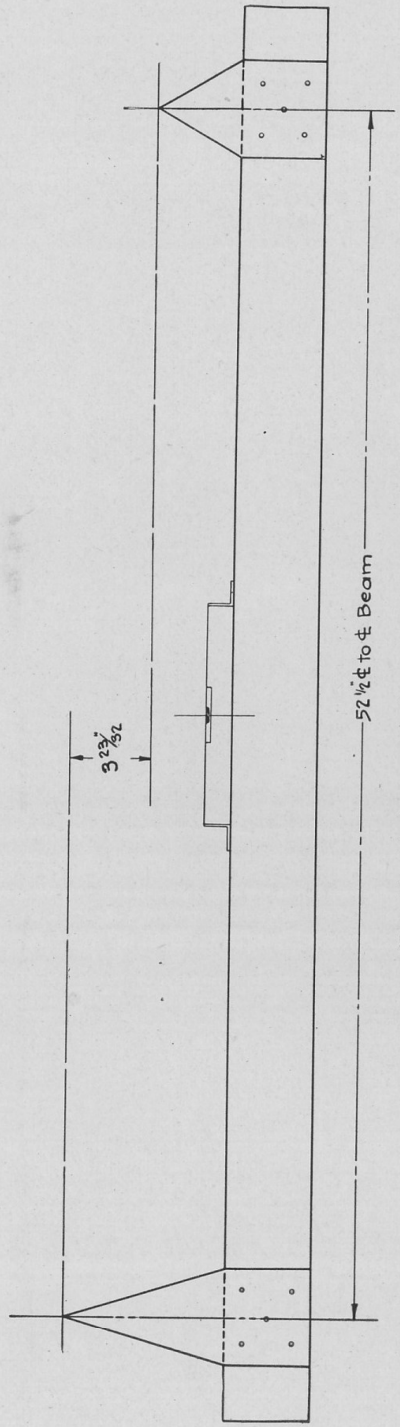



FIG. 11.—Jig for longitudinal alignment of hull.



Before opening the panel boxes, provision should be made for supporting the panels either in cradles, on horses or on soft felt pads. The last method is most convenient if cradles are not handy. The panels may thus be placed on their "leading" edge and supported between uprights fastened to the floor or ground. Exercise extreme caution in opening the panel boxes, that the decking is not splintered or forced into the panels in the box. Remove all the nails from the top side edge of the boxes, thus avoiding the possibility of tearing the panels when they are removed from the box. Do not force any members from the shipping case. Remove the side walls, if there is any evidence of a tight fit. It is safer to break the packing case than to strain a flying unit.

The following blue prints are shipped in each hull packing box:

| Drawing No. | Name of drawing. | Data given. |
|---|---|---|
| 16000 | Erection, front elevation | General dimensions. |
| 16001 | Erection, side elevation | Do. |
| 16002 | Erection, plan view | Do. |
| 10206 | Upper panels | Panel details, and dimensions, hinges. |
| 10032 | ....do | Do. |
| 10219 | Lower panels | Do. |
| 16885 | Engine section, panel | Do. |
| 270400 | Wing wiring diagram | Landing and flying wires, sizes and dimensions. |
| 418400 | Wing fitting diagram | Panel fittings, bolts, etc. |
| 14864 | Hinge center diagram | Panel spacing, for gap and stagger. |
| 14696 | Front lower beam | Panel beam detail. |
| 14697 | Rear lower beam | Do. |
| 14642 | Hull plan | Details of hull, dimensions, etc. |
| 14643 | Hull profile | Details of hull, control location, etc. |
| 14620 | Tail erection | Rudder, fin, stabilizer, elevators. |
| 14640 | Control wiring | Control bridge, lines to elevators, rudder, and ailerons. |
| 14724 | Control erection | Control bridge. |
| 176700 | Motor controls | Magneto, throttle, spark controls. |
| 14730 | Piping diagram | Gasoline lines. |
| 16800 | Engine section assembly | Motor assembly. |

## UNPACKING HULL BOX.

(See figs. 5, 6, 7, 8, and 9.)

1. Remove top and then right side, as marked on box; also nose and tail braces inside box.

2. Remove engine bed, radiator, and small parts from box.

3. Chain block or crane of 3,000 pounds capacity or over should be used in lifting hull from box. It is also necessary to use a block and tackle capable of lifting about 1,000 pounds.

4. The large chain falls or crane should be connected directly over center of boat and fastened to boat by means of supports wrapped around the forward and rear beams with the beams well protected by heavy felt or other means to keep them from being marred or crushed. (A 6-inch interwoven belt, $\frac{1}{4}$ inch thick, is recommended for this purpose.) These supports should be wrapped around beams several times in order to prevent slipping as the boat is tilted when first lifted. (See fig. 9.)

5. Do not attempt to remove the interior bracing of the hull box before the slings are located around the hull. Do not attempt to slide the hull along the fin edge stringers, either before or after the slings are in place.

6. Small tackle should be made fast to outer end of upper sidewalk. This can be accomplished by extending a wire cable underneath sidewalk beam and around metal struts, which should be protected by heavy felt.

7. Small and large tackle should be operated simultaneously in lifting hull clear of cradle and box. Large tackle is to be used to carry the load while small tackle is to be used only to keep boat tilted until free from box.

8. After lifting boat free from cradle either move box from under and lower boat into cradle or swing boat free from box and lower into cradle.

## UNPACKING BOXES NOS. 2 AND 3.

1. Carefully remove top and such bracing as to allow removal of panels, struts, etc.

## UNPACKING ENGINE BOXES NOS. 4 AND 5.

1. Follow instructions printed on boxes.

NOTE.—When hull and parts are first removed from boxes they should be carefully inspected to see that no damage has occurred during shipment.

## ASSEMBLY OF CENTER SECTION.

1. Select a comparatively level spot for cradle and level up boat fore and aft and athwartships. This can be done by using a jig which takes into consideration the angle of attack of four (4) degrees as measured on under side of sidewalk beams parallel to center line of hull. If jig is made to fit these conditions the block on front end of straightedge should be $3\frac{15}{16}$ inches longer than rear block (see fig. 10). Level up boat by making top of jig level on both sides of boat. Be careful to hold points on jig as near centers of beams as possible.

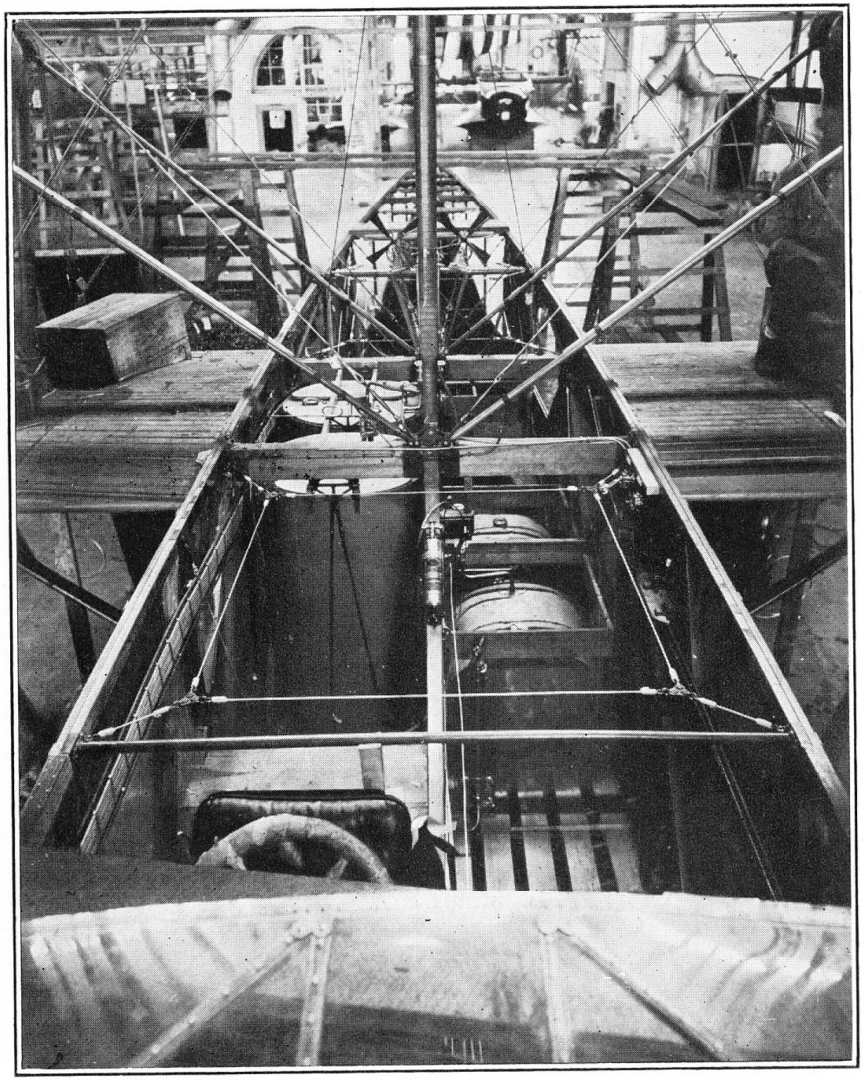


Fig. 18.—Hull showing fuel tanks.

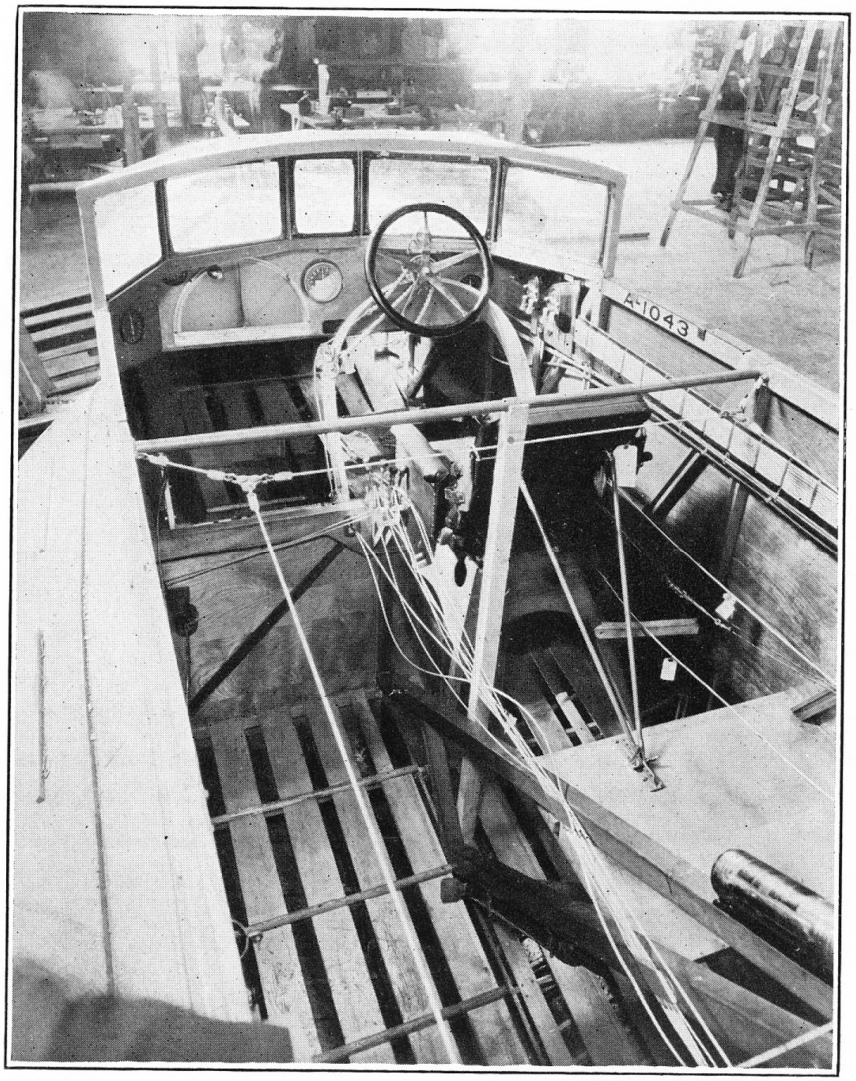



Fig. 19.—Main cockpit.



2. As an alternate method for leveling up the hull longitudinally a jig shown in figure 11 may be used. The points at each end of the jig should be placed on the center line of each beam on the bottom of the sidewalk sections. Since the vertical distance ($3\frac{23}{32}$ inches) between the jig points is fixed, a spirit level resting on the straightedge will indicate the horizontal lines.

3. Level boat across mid-section by straightedge and level set on front and rear beams respectively. Boat can be leveled by jacking up cradle at corners. If boat is moved in any one direction, it should be checked to see that it is still level in any other direction. After checking boat see that sidewalk beams are level laterally. This should be correct unless beams have been damaged in transit.

4. Attach the two center struts (engine section) at center of boat.

5. It is advisable at this point to place engines on engine beds before lifting into position on boat.

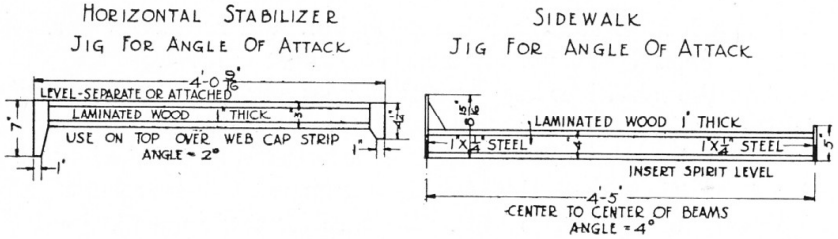



FIG. 10.—Assembly jigs.

6. Lift engine beds with engines assembled thereon into position by using a crane or chain falls. Brace up sidewalk beams by supports at the hinge points until engines and wings are in place and properly supported by wiring, as the weight of engines and wings might cause warping of sidewalks before bracing is completed. Connect all wires, stays and braces. Wires should be fairly taut and can be used to make slight adjustments in engine bed levels. If crane or chain falls are not available, engine beds may first be placed on boats and then engine can be skidded into position on long beams, although this is difficult and should not be attempted unless necessary.

7. Engine beds should be level fore and aft and athwartships when boat is level.

8. Connect up piping and wiring to engine.

9. Lift upper engine wing panel into place, fasten on struts and wires, and connect remainder of piping to gravity tank.

10. Check up level of engine section panel laterally. This should be done with straightedge and spirit level used along beams or by

measuring the distance between upper and lower, front and rear wing hinges, respectively. This distance should be 8 feet $\frac{9}{16}$ inch.

11. To check for zero (0) degree stagger drop plumb bob from leading edge of upper engine section wing panel, outer end. By adjusting stagger wires, the leading edge of upper wing can be brought directly over the leading edge of sidewalk beam.

12. All landing wires should be slightly more taut than flying wires.

13. Radiator can be attached at any time after this.

## ASSEMBLY OF TAIL SURFACES.

14. The tail surfaces can be assembled at any time while the wings are being assembled. (See fig. 27.)

(*a*) Put fin into place and check up vertically. Fin should be exactly vertical when boat is level.

(*b*) Set stabilizer in place over fin and then fasten fin shoe into position.

(*c*) Attach steel stabilizer braces to hull and set stay wires. The stabilizer should be level laterally when boat is level.

(*d*) As the stabilizer has two (2) degrees angle of attack a straight line through the leading and trailing edges should be at an angle of two (2) degrees with the engine bed. This is checked by using a jig along the top of the stabilizer from front to rear beam, along a web section parallel to hull. Measure for angle near fin and near outer ends of stabilizer to see that there is no warp. (See fig. 10.)

(*e*) Attach rudder and elevators at hinge points. Stay wires from horns on rudder and elevators to their respective trailing edges may be used to take out any warp in the trailing edges. Smaller horns on elevators are attached on the under side of elevators. Control wires on elevators should be so adjusted that the elevators are a continuation of a straight line with stabilizer when the control is in neutral position. The control wires should be slightly slack when in neutral position in order not to bind when in extreme positions. Control wires on rudder should be fairly taut, but must not cause binding on rudder pins.

## ASSEMBLY OF OUTER WING PANELS.

15. (*a*) Fasten upper intermediate and upper outer panel together at hinge points (without ailerons). Stand complete upper and lower wings on edge parallel to each other with leading edges on the ground. Connect wings with struts and stay wires. All struts except



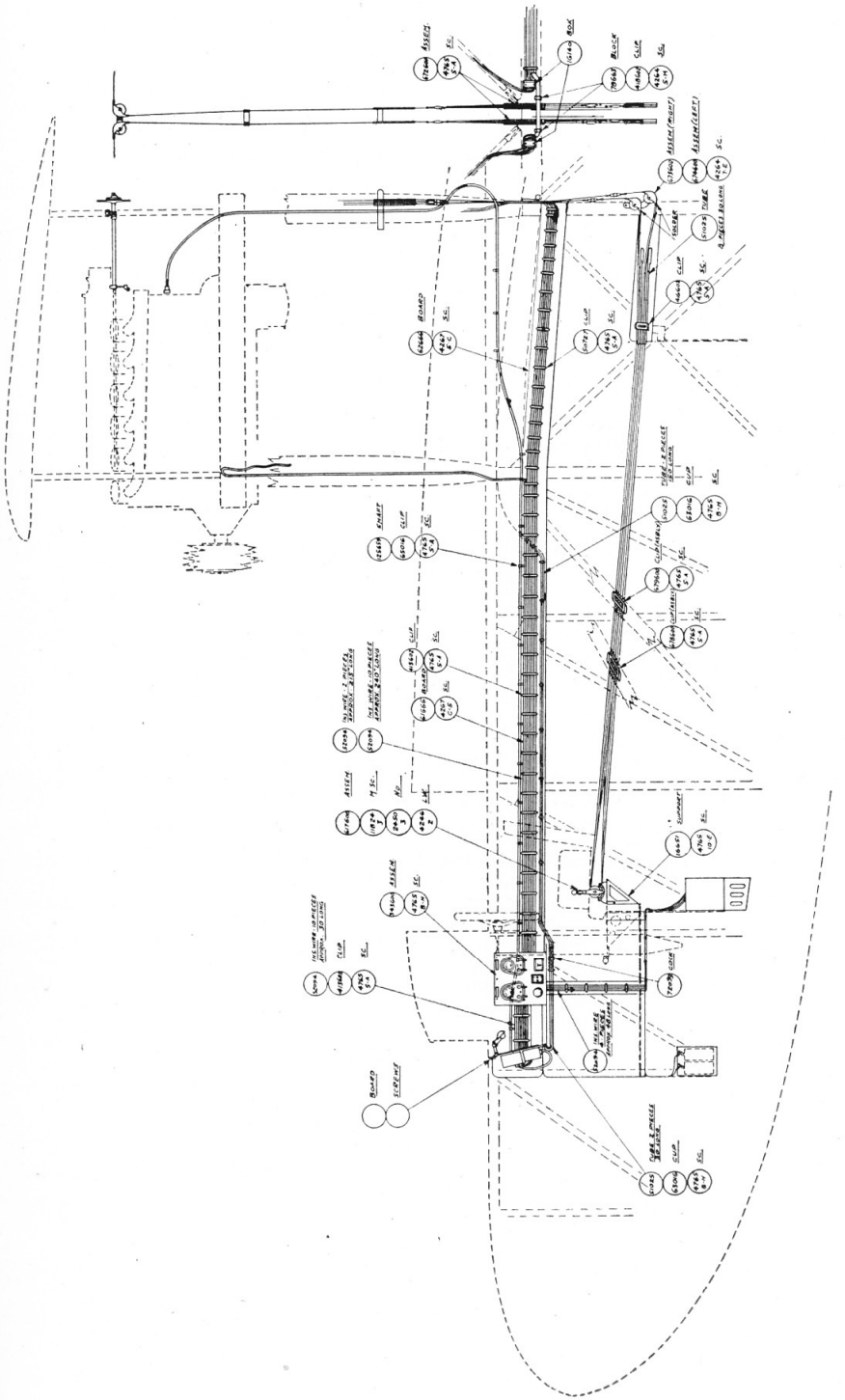



FIG. 21—Motor control.

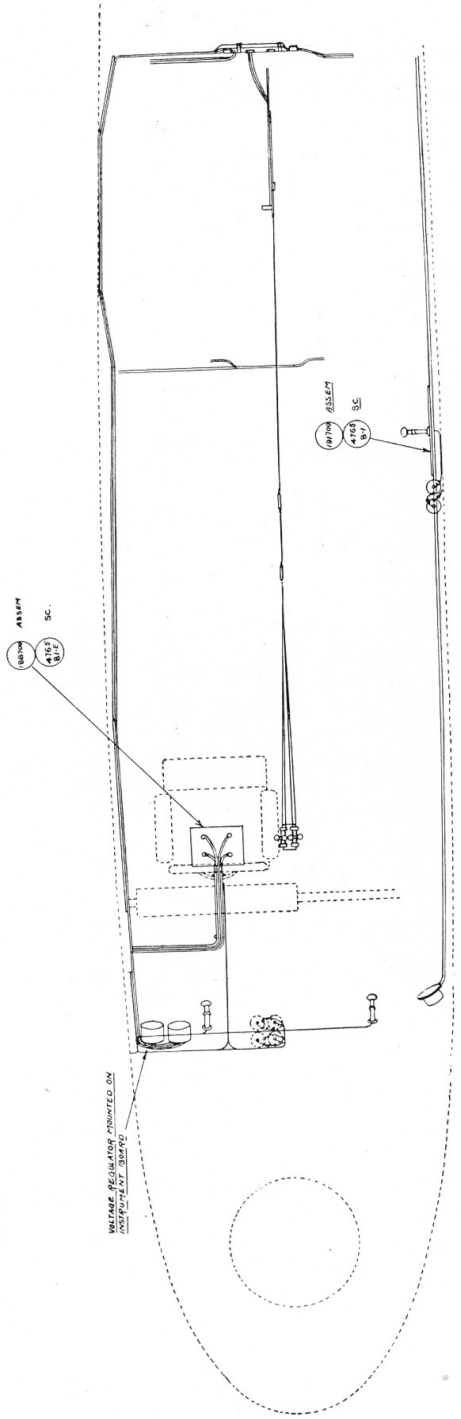



FIG. 22—Motor control



center engine section struts are numbered 1 to 12, reading from port to starboard on front beam 1 to 6, and from port to starboard on rear beam 7 to 12. (See fig. 25.) Tighten wires to approximately flying conditions.

(*b*) Attach king posts and supporting wires and see that top beam is in alignment with non-skid fin perpendicular to it.

(*c*) Care should be taken that flying wires to outer panel overhang are not too taut, as this will cause too much tension in king post brace wires.

16. (*a*) Lift wing panels completely assembled into place and attach at hinge points, holding in position until landing wires are made fast. (About 12 to 15 men are necessary to properly handle the assembled wing.)

(*b*) It is advisable to attach ailerons after wings are in place on account of their size and weight, although this can be accomplished while wings are still on the ground.

(*c*) Connect up all wing-control wires. (See fig. 20.)

(*d*) Adjust interplane wires. In making this adjustment landing wires should be used to get proper alignment before adjusting flying wires. After landing wires have been brought to an approximately correct tension, flying wires should be made taut, but slightly less so than landing wires. Tightening flying wires may throw wings out of alignment, so landing wires should again be checked and adjusted if necessary. Care should be taken that landing wires do not have too much tension.

(*e*) Make adjustment of stagger wires giving both wires approximately the same tension.

(*f*) Make preliminary checking of alignment by eye to see if upper eading edge is parallel to lower leading edge. Sight along wings from center section to see that edges are straight and that ailerons are in line with wings.

(*g*) Check for zero degree stagger by dropping plumb bob from upper leading edge or by eye if plumb bob is not available.

(*h*) The angle of attack of four (4) degrees for lower outer wings can be checked by using the same jig as used on sidewalk beams when leveling up boat. This jig should be held on wing beams near outer end of wings parallel to center line of boat. This checks for any warp in the wings.

(*i*) Check for dihedral by using a long straightedge laid parallel to wing beams with the level tube set at one (1) degree, or by making a bevel board with the required angle of one (1) degree and using spirit level on top edge. This gives an upward slope of wings of one (1) degree if top edge of board is level. (See fig. 14.)

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As an alternate method the adjustable level shown in figure 15 may be used.

(*j*) If desired the four (4) degree angle of attack of upper wing can be checked by seeing that gap between leading and trailing edges of upper

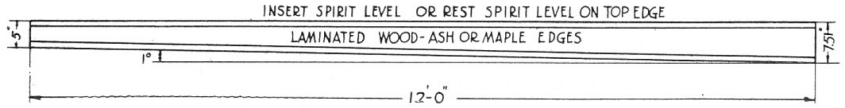



FIG. 14.—Bevel board for dihedral angle.

and lower wings is 8 feet $\frac{9}{16}$ inch. (When struts are in place and stagger is zero (0) degree, the angle of attack of upper wings should be correct.)

(*k*) See that all aileron control wires leading to the three horns are given the same tension.

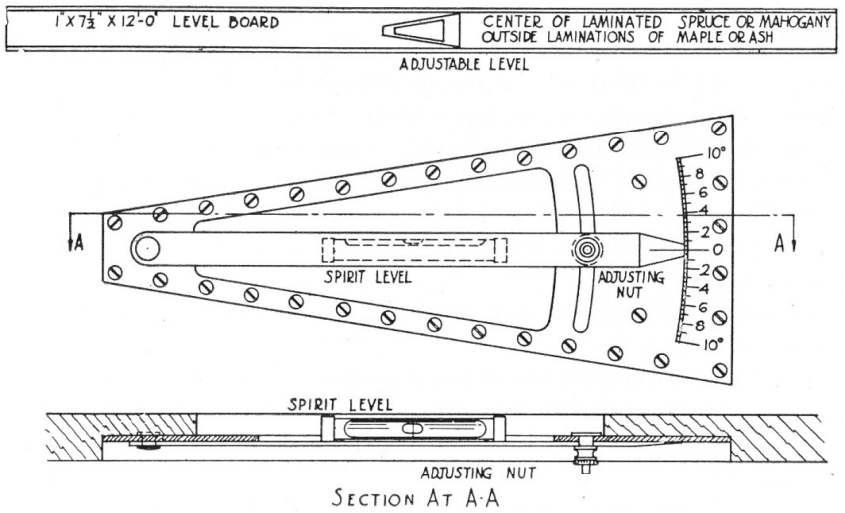



FIG. 15.—Adjustable level for dihedral angle.

17. Attach wing tip pontoons and set wires taut.

18. Attach bomb-dropping devices, being careful not to set U-bolts up harder than necessary to secure them.

19. Check length of drift wires from each side of nose to upper and lower wing panels to see that corresponding wires on each side are equal in length and of the same tension. (This squares the wings with



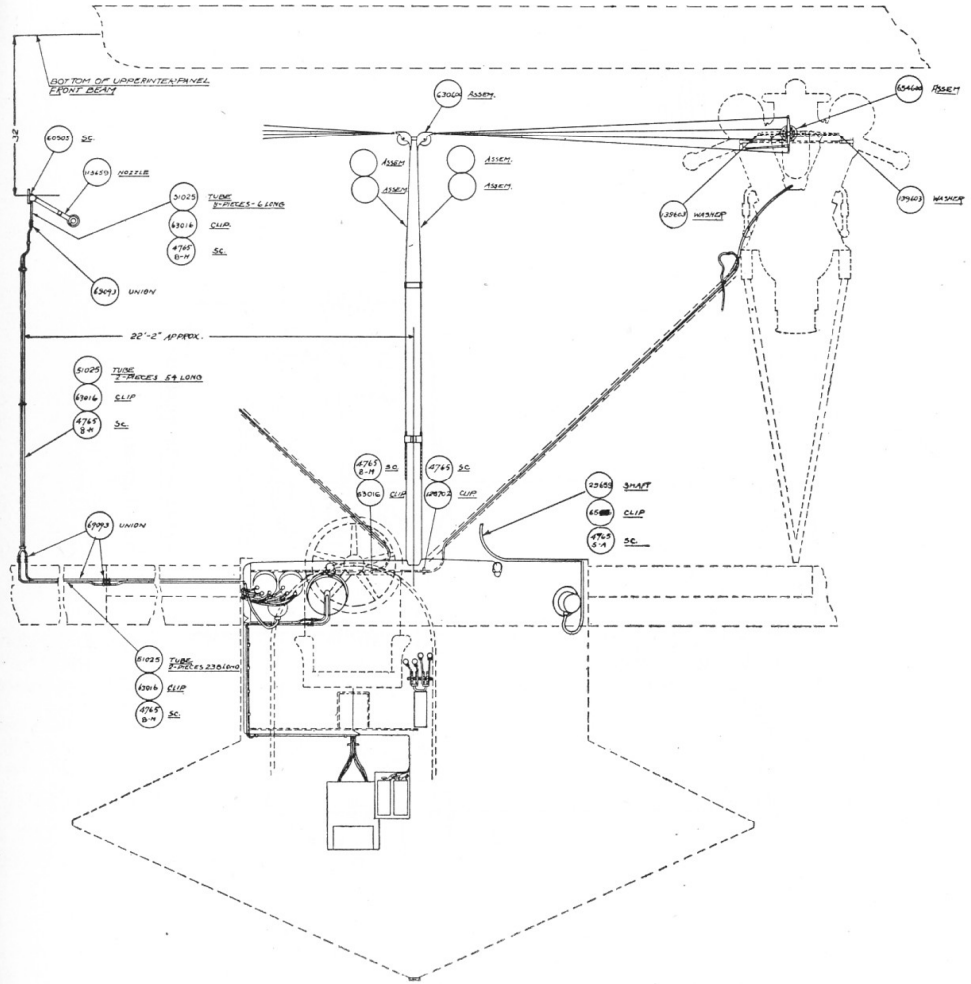



FIG. 23—Motor control.

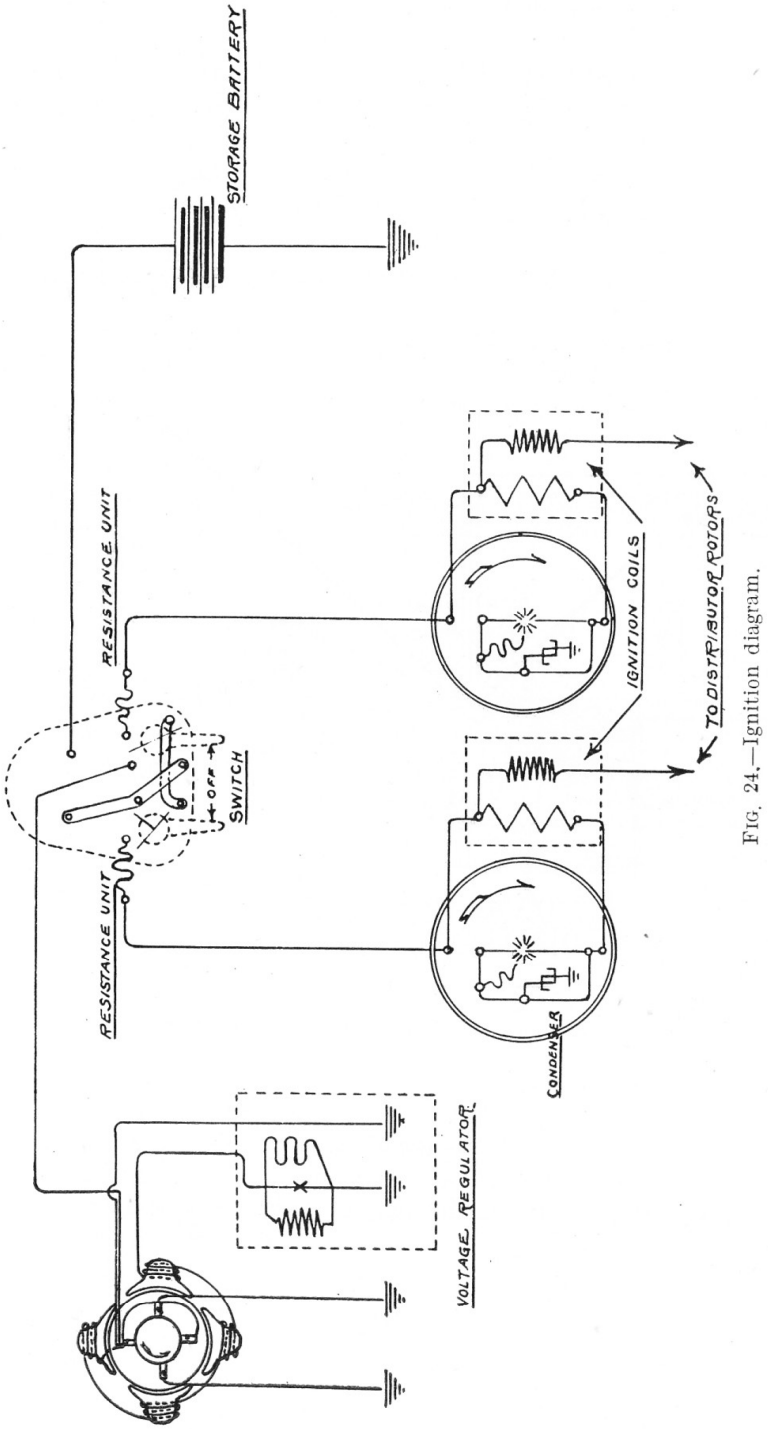



FIG. 24.—Ignition diagram.



the axis of the hull.) Next do the same with wires leading from outer brace of horizontal stabilizer to hull in order to square stabilizer with hull. (See fig. 30.)

20. Make general inspection of all wires, clevises, cotter pins, turnbuckles, pipe lines, wiring, controls, tie-rods through rear of boat and all connections of any kind to see that they are taut and in proper place and shape.

(*b*) Put safety wires on all turnbuckles after final adjustment. Turnbuckles should not show more than three threads outside of barrel, or less than $\frac{3}{4}$ inch of shank when finally adjusted.

21. Attach propellers, guns, and any accessories.

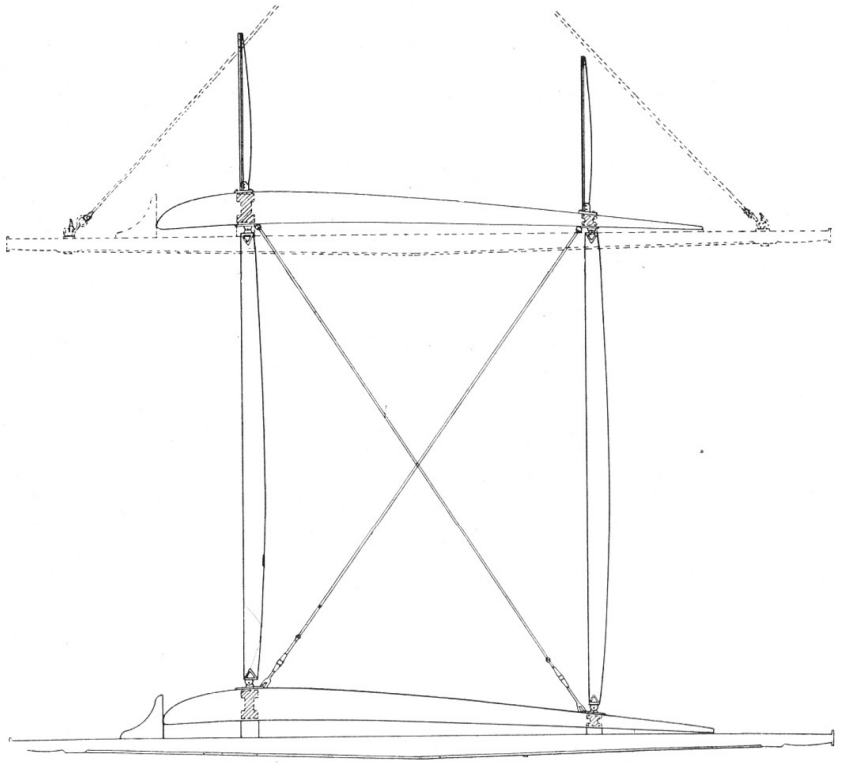


FIG. 17.—Method of carrying panels.

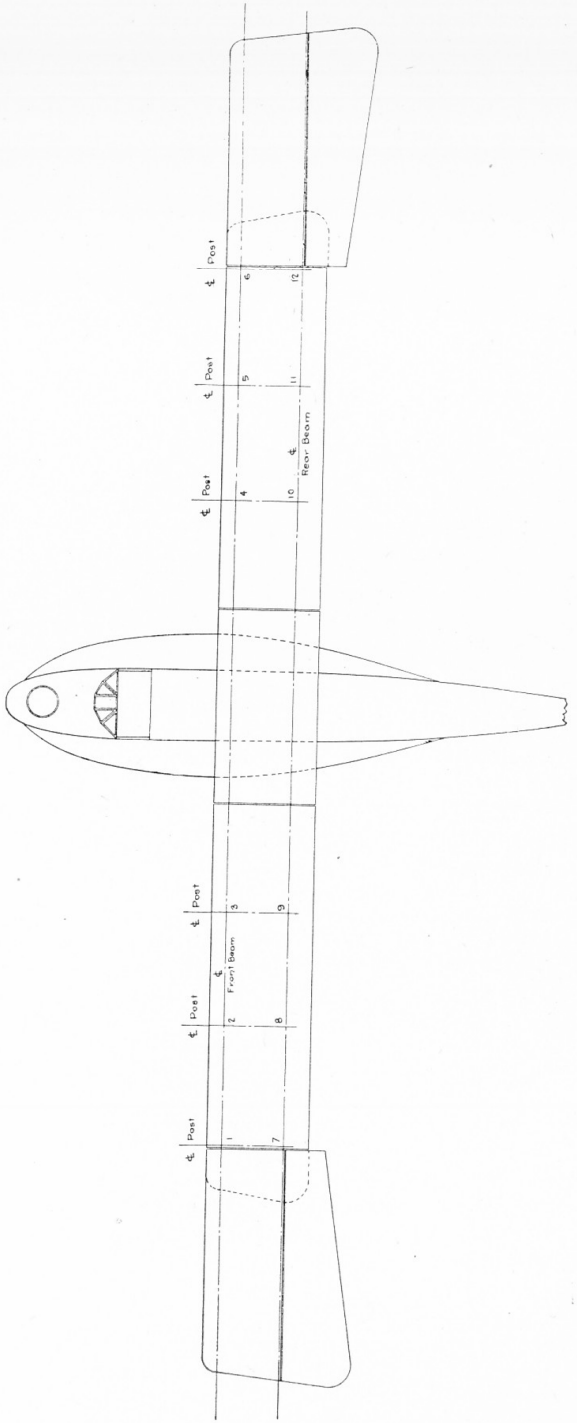



FIG. 25—System of numbering posts.



TABLE NO. I.—*Specific gravity equivalents for degrees Baumé for liquids lighter than water.*

Formula: Degrees Baumé $= \frac{140}{\text{Sp. gr. } \frac{60°}{60°} \text{ F.}} = 130$

[Sp. gr. taken at 60° F. and referred to distilled water at 60° F.]

| Baumé. | Specific gravity. | Pounds per gallon. | Baumé. | Specific gravity. | Pounds per gallon. | Baumé. | Specific gravity. | Pounds per gallon. |
|---|---|---|---|---|---|---|---|---|
| 10 | 1.0000 | 8.33 | 37 | 0.8383 | 6.98 | 64 | 0.7217 | 6.01 |
| 11 | .9929 | 8.27 | 38 | .8333 | 6.94 | 65 | .7179 | 5.98 |
| 12 | .9859 | 8.21 | 39 | .8285 | 6.90 | 66 | .7143 | 5.95 |
| 13 | .9790 | 8.16 | 40 | .8235 | 6.86 | 67 | .7107 | 5.92 |
| 14 | .9722 | 8.10 | 41 | .8187 | 6.82 | 68 | .7071 | 5.89 |
| 15 | .9655 | 8.04 | 42 | .8139 | 6.78 | 69 | .7035 | 5.86 |
| 16 | .9589 | 7.99 | 43 | .8092 | 6.74 | 70 | .7000 | 5.83 |
| 17 | .9524 | 7.93 | 44 | .8046 | 6.70 | 71 | .6965 | 5.80 |
| 18 | .9459 | 7.88 | 45 | .8000 | 6.66 | 72 | .6931 | 5.78 |
| 19 | .9396 | 7.83 | 46 | .7955 | 6.63 | 73 | .6897 | 5.75 |
| 20 | .9333 | 7.78 | 47 | .7909 | 6.59 | 74 | .6863 | 5.72 |
| 21 | .9272 | 7.72 | 48 | .7865 | 6.55 | 75 | .6829 | 5.69 |
| 22 | .9211 | 7.67 | 49 | .7821 | 6.52 | 76 | .6796 | 5.66 |
| 23 | .9150 | 7.62 | 50 | .7777 | 6.48 | 77 | .6763 | 5.63 |
| 24 | .9091 | 7.57 | 51 | .7735 | 6.44 | 78 | .6730 | 5.60 |
| 25 | .9032 | 7.53 | 52 | .7692 | 6.41 | 79 | .6698 | 5.58 |
| 26 | .8974 | 7.48 | 53 | .7650 | 6.37 | 80 | .6666 | 5.55 |
| 27 | .8917 | 7.43 | 54 | .7609 | 6.34 | 81 | .6635 | 5.52 |
| 28 | .8861 | 7.38 | 55 | .7568 | 6.30 | 82 | .6604 | 5.50 |
| 29 | .8805 | 7.34 | 56 | .7527 | 6.27 | 83 | .6573 | 5.48 |
| 30 | .8750 | 7.29 | 57 | .7487 | 6.24 | 84 | .6542 | 5.45 |
| 31 | .8696 | 7.24 | 58 | .7447 | 6.20 | 85 | .6511 | 5.42 |
| 32 | .8642 | 7.20 | 59 | .7407 | 6.17 | 86 | .6481 | 5.40 |
| 33 | .8589 | 7.15 | 60 | .7368 | 6.14 | 87 | .6451 | 5.38 |
| 34 | .8537 | 7.11 | 61 | .7329 | 6.11 | 88 | .6422 | 5.36 |
| 35 | .8485 | 7.07 | 62 | .7292 | 6.07 | 89 | .6392 | 5.33 |
| 36 | .8433 | 7.03 | 63 | .7254 | 6.04 | 90 | .6363 | 5.30 |

TABLE NO. II.—*Metric conversion table.*

[English to metric.]

| English units. | Hundredths of an inch to millimeters. | Feet to meters. | Miles to kilometers. | Gallons to liters. | Pounds to kilograms. |
|---|---|---|---|---|---|
| 1 | 0.254 | 0.30480 | 1.6093 | 3.7853 | 0.45359 |
| 2 | .508 | .60960 | 3.2187 | 7.5707 | .90718 |
| 3 | .762 | .91440 | 4.8280 | 11.3560 | 1.36078 |
| 4 | 1.016 | 1.21920 | 6.4374 | 15.1413 | 1.81437 |
| 5 | 1.270 | 1.52400 | 8.0467 | 18.9267 | 2.26796 |
| 6 | 1.524 | 1.82880 | 9.6561 | 22.7120 | 2.72155 |
| 7 | 1.778 | 2.13360 | 11.2654 | 26.4973 | 3.17515 |
| 8 | 2.032 | 2.43840 | 12.8748 | 30.2827 | 3.62874 |
| 9 | 2.286 | 2.74321 | 14.4841 | 34.0680 | 4.08233 |
| 10 | 2.540 | 3.04801 | 16.0935 | 37.8533 | 4.53592 |
| 11 | 2.794 | 3.35281 | 17.7028 | 41.6387 | 4.98552 |
| 12 | 3.048 | 3.65761 | 19.3122 | 45.4240 | 5.44311 |
| 13 | 3.302 | 3.96241 | 20.9215 | 49.2093 | 5.89670 |
| 14 | 3.556 | 4.26721 | 22.5309 | 52.9947 | 6.35029 |
| 15 | 3.810 | 4.57201 | 24.1402 | 56.7800 | 6.80389 |
| 16 | 4.064 | 4.87681 | 25.7496 | 60.5653 | 7.25748 |
| 17 | 4.318 | 5.18161 | 27.3589 | 64.3506 | 7.71107 |
| 18 | 4.572 | 5.48641 | 28.9682 | 68.1360 | 8.16466 |
| 19 | 4.826 | 5.79121 | 30.5776 | 71.9213 | 8.61826 |
| 20 | 5.080 | 6.09601 | 32.1869 | 75.7066 | 9.07185 |
| 21 | 5.334 | 6.40081 | 33.7963 | 79.4920 | 9.52544 |
| 22 | 5.588 | 6.70561 | 35.4056 | 83.2773 | 9.97903 |
| 23 | 5.842 | 7.01041 | 37.0150 | 87.0626 | 10.43263 |
| 24 | 6.096 | 7.31521 | 38.6243 | 90.8480 | 10.88622 |
| 25 | 6.350 | 7.62002 | 40.2337 | 94.6333 | 11.33981 |
| 26 | 6.604 | 7.92482 | 41.8430 | 98.4186 | 11.79340 |
| 27 | 6.858 | 8.22962 | 43.4524 | 102.2040 | 12.24700 |
| 28 | 7.112 | 8.53442 | 45.0617 | 105.9893 | 12.70059 |
| 29 | 7.366 | 8.83922 | 46.6711 | 109.7746 | 13.15418 |
| 30 | 7.620 | 9.14402 | 48.2804 | 113.5600 | 13.60777 |
| 31 | 7.874 | 9.44882 | 49.8898 | 117.3453 | 14.06137 |
| 32 | 8.128 | 9.75362 | 51.4991 | 121.1306 | 14.51496 |
| 33 | 8.382 | 10.05842 | 53.1085 | 124.9160 | 14.96855 |
| 34 | 8.636 | 10.36322 | 54.7178 | 128.7013 | 15.42214 |
| 35 | 8.890 | 10.66802 | 56.3272 | 132.4866 | 15.87573 |
| 36 | 9.144 | 10.97282 | 57.9365 | 136.2720 | 16.32933 |
| 37 | 9.398 | 11.27762 | 59.5458 | 140.0573 | 16.78292 |
| 38 | 9.652 | 11.58242 | 61.1552 | 143.8426 | 17.23651 |
| 39 | 9.906 | 11.88722 | 62.7645 | 147.6280 | 17.69010 |
| 40 | 10.160 | 12.19202 | 64.3739 | 151.4133 | 18.14370 |
| 41 | 10.414 | 12.49682 | 65.9832 | 155.1986 | 18.59729 |
| 42 | 10.668 | 12.80163 | 67.5926 | 158.9840 | 19.05088 |
| 43 | 10.922 | 13.10643 | 69.2019 | 162.7693 | 19.50447 |
| 44 | 11.176 | 13.41123 | 70.8113 | 166.5546 | 19.95807 |
| 45 | 11.430 | 13.71603 | 72.4206 | 170.3400 | 20.41166 |
| 46 | 11.684 | 14.02083 | 74.0300 | 174.1253 | 20.86525 |
| 47 | 11.938 | 14.32563 | 75.6393 | 177.9106 | 21.31880 |
| 48 | 12.192 | 14.63043 | 77.2487 | 181.6960 | 21.77244 |
| 49 | 12.446 | 14.93523 | 78.8580 | 185.4813 | 22.22603 |
| 50 | 12.700 | 15.24003 | 80.4674 | 189.2666 | 22.67962 |
| 100 | 25.400 | 30.48006 | 160.9347 | 378.5330 | 45.35924 |



TABLE NO. III.—*Metric conversion table.*

[Metric to English.]

| Metric units. | Millimeters to inches. | Meters to feet. | Kilometers to miles. | Liters to gallons. | Kilograms to pounds. |
|---|---|---|---|---|---|
| 1 | 0.03937 | 3.28083 | 0.62137 | 0.26418 | 2.2046 |
| 2 | .07874 | 6.56167 | 1.24274 | .52836 | 4.4092 |
| 3 | .11811 | 9.84250 | 1.86411 | .79253 | 6.6139 |
| 4 | .15748 | 13.12333 | 2.48548 | 1.05671 | 8.8185 |
| 5 | .19685 | 16.40417 | 3.10685 | 1.32089 | 11.0231 |
| 6 | .23622 | 19.68500 | 3.72822 | 1.58507 | 13.2277 |
| 7 | .27559 | 22.96583 | 4.34959 | 1.84924 | 15.4324 |
| 8 | .31496 | 26.24667 | 4.97096 | 2.11342 | 17.6370 |
| 9 | .35433 | 29.52750 | 5.59233 | 2.37760 | 19.8416 |
| 10 | .39370 | 32.80833 | 6.21370 | 2.64178 | 22.0462 |
| 11 | .43307 | 36.08917 | 6.83507 | 2.90595 | 24.2508 |
| 12 | .47244 | 39.37000 | 7.45644 | 3.17013 | 26.4555 |
| 13 | .51181 | 42.65083 | 8.07781 | 3.43431 | 28.6601 |
| 14 | .55118 | 45.93167 | 8.69918 | 3.69849 | 30.8647 |
| 15 | .59055 | 49.21250 | 9.32055 | 3.96266 | 33.0693 |
| 16 | .62992 | 52.49333 | 9.94192 | 4.22684 | 35.2740 |
| 17 | .66929 | 55.77417 | 10.56329 | 4.49102 | 37.4786 |
| 18 | .70866 | 59.05500 | 11.18466 | 4.75520 | 39.6832 |
| 19 | .74803 | 62.33583 | 11.80603 | 5.01937 | 41.8878 |
| 20 | .78740 | 65.61667 | 12.42740 | 5.28355 | 44.0924 |
| 21 | .82677 | 68.89750 | 13.04877 | 5.54773 | 46.2971 |
| 22 | .86614 | 72.17833 | 13.67014 | 5.81191 | 48.5017 |
| 23 | .90551 | 75.45917 | 14.29151 | 6.07608 | 50.7063 |
| 24 | .94488 | 78.74000 | 14.91288 | 6.34026 | 52.9109 |
| 25 | .98425 | 82.02083 | 15.53425 | 6.60444 | 55.1156 |
| 26 | 1.02362 | 85.30167 | 16.15562 | 6.86862 | 57.3202 |
| 27 | 1.06299 | 88.58250 | 16.77699 | 7.13280 | 59.5248 |
| 28 | 1.10236 | 91.86333 | 17.39836 | 7.39697 | 61.7294 |
| 29 | 1.14173 | 95.14417 | 18.01973 | 7.66115 | 63.9340 |
| 30 | 1.18110 | 98.42500 | 18.64110 | 7.92533 | 66.1387 |
| 31 | 1.22047 | 101.70583 | 19.26247 | 8.18951 | 68.3433 |
| 32 | 1.25984 | 104.98667 | 19.88384 | 8.45368 | 70.5479 |
| 33 | 1.29921 | 108.26750 | 20.50521 | 8.71786 | 72.7525 |
| 34 | 1.33858 | 111.54833 | 21.12658 | 8.98204 | 74.9572 |
| 35 | 1.37795 | 114.82917 | 21.74795 | 9.24622 | 77.1618 |
| 36 | 1.41732 | 118.11000 | 22.36932 | 9.51039 | 79.3664 |
| 37 | 1.45669 | 121.39083 | 22.99069 | 9.77457 | 81.5710 |
| 38 | 1.49606 | 124.67167 | 23.61206 | 10.03875 | 83.7756 |
| 39 | 1.53543 | 127.95250 | 24.23343 | 10.30293 | 85.9803 |
| 40 | 1.57480 | 131.23330 | 24.85480 | 10.56710 | 88.1849 |
| 41 | 1.61417 | 134.51417 | 25.47617 | 10.83128 | 90.3895 |
| 42 | 1.65354 | 137.79500 | 26.09754 | 11.09546 | 92.5941 |
| 43 | 1.69291 | 141.07583 | 26.71891 | 11.35694 | 94.7988 |
| 44 | 1.73228 | 144.35667 | 27.34028 | 11.62381 | 97.0034 |
| 45 | 1.77165 | 147.63750 | 27.96165 | 11.88799 | 99.2080 |
| 46 | 1.81102 | 150.91833 | 28.58302 | 12.15217 | 101.4126 |
| 47 | 1.85039 | 154.19917 | 29.20439 | 12.41635 | 103.6173 |
| 48 | 1.88976 | 157.48000 | 29.82576 | 12.68052 | 105.8219 |
| 49 | 1.92913 | 160.76083 | 30.44713 | 12.94470 | 108.0265 |
| 50 | 1.96850 | 164.04167 | 31.06850 | 13.20888 | 110.2311 |
| 100 | 3.93700 | 328.08334 | 62.13700 | 26.41776 | 220.4622 |

TABLE NO. IV.—*Variation of wind velocity with altitude during the day.*

| Elevation. | Velocities in miles per hour. | | | | |
|---|---|---|---|---|---|
| Surface | 5 | 10 | 15 | 20 | 25 |
| 500 feet | 7 | 15 | 21 | 28 | 35 |
| 1,000 feet | 8 | 18 | 26 | 34 | 43 |
| 2,000 feet | 8 | 18 | 28 | 37 | 47 |
| 3,000 feet | 8 | 18 | 29 | 40 | 49 |
| 4,000 feet | 10 | 19 | 29 | 40 | 50 |
| 5,000 feet | 13 | 20 | 29 | 40 | 50 |

TABLE NO. V.—*Variation of direction of wind and altitude.*

[Upper-region winds vary in direction from those near the earth's surface. The amount of deviation is given approximately in the tabulation.]

| Elevation. | Deviation to right in degrees. | Directions. | | | |
|---|---|---|---|---|---|
| Surface | 0 | N | E | S | W. |
| 500 feet | 5 | N. ½ E | E. ½ S. | S. ½ W | W. ½ N. |
| 1,000 feet | 10 | N. by E | E. by S | S. by W | W. by N. |
| 2,000 feet | 16 | N. by E. ½ E | E. by S. ½ S | S. by W. ½ W. | W. by N. ½ N. |
| 3,000 feet | 19 | N. by E. ¾ E | E. by S. ¾ S | S. by W. ¾ W. | W. by N. ¾ N. |
| 4,000 feet | 20 | NNE | ESE | SSW | WNW. |
| 5,000 feet | 21 | NNE | ESE | SSW | WNW. |



TABLE NO. VI.—*Compass points and their equivalents.*

| ° ′ | Points. | ° ′ | Points. | ° ′ | Points. | ° ′ | Points. |
|---|---|---|---|---|---|---|---|
| 0 00 | N | 90 00 | E | 180 00 | S | 270 00 | W |
| 2 49 | N ¼ E | 92 49 | E ¼ S | 182 49 | S ¼ W | 272 49 | W ¼ N |
| 5 38 | N ½ E | 95 38 | E ½ S | 185 38 | S ½ W | 275 38 | W ½ N |
| 8 26 | N ¾ E | 98 26 | E ¾ S | 188 26 | S ¾ W | 278 26 | W ¾ N |
| 11 15 | N by E | 101 15 | E by S | 191 15 | S by W | 281 15 | W by N |
| 14 04 | N by E ¼ E | 104 04 | ESE ¾ E | 194 04 | S by W ¼ W | 284 04 | WNW ¾ W |
| 16 53 | N by E ½ E | 106 53 | ESE ½ E | 196 53 | S by W ½ W | 286 53 | WNW ½ W |
| 19 41 | N by E ¾ E | 109 41 | ESE ¼ E | 199 41 | S by W ¾ W | 289 41 | WNW ¼ W |
| 22 30 | NNE | 112 30 | ESE | 202 30 | SSW | 292 30 | WNW |
| 25 19 | NNE ¼ E | 115 19 | SE by E ¾ E | 205 19 | SSW ¼ W | 295 19 | NW by W ¾ W |
| 28 08 | NNE ½ E | 118 08 | SE by E ½ E | 208 08 | SSW ½ W | 298 08 | NW by W ½ W |
| 30 56 | NNE ¾ E | 120 56 | SE by E ¼ E | 210 56 | SSW ¾ W | 300 56 | NW by W ¼ W |
| 33 45 | NE by N | 123 45 | SE by E | 213 45 | SW by S | 303 45 | NW by W |
| 36 34 | NE ¾ N | 126 34 | SE ¾ E | 216 34 | SW ¾ S | 306 34 | NW ¾ W |
| 39 23 | NE ½ N | 129 23 | SE ½ E | 219 23 | SW ½ S | 309 23 | NW ½ W |
| 42 11 | NE ¼ N | 132 11 | SE ¼ E | 222 11 | SW ¼ S | 312 11 | NW ¼ W |
| 45 00 | NE | 135 00 | SE | 225 00 | SW | 315 00 | NW |
| 47 49 | NE ¼ E | 137 49 | SE ¼ S | 227 49 | SW ¼ W | 317 49 | NW ¼ N |
| 50 38 | NE ½ E | 140 38 | SE ½ S | 230 38 | SW ½ W | 320 38 | NW ½ N |
| 53 26 | NE ¾ E | 143 26 | SE ¾ S | 233 26 | SW ¾ W | 323 26 | NW ¾ N |
| 56 15 | NE by E | 146 15 | SE by S | 236 15 | SW by W | 326 15 | NW by N |
| 59 04 | NE by E ¼ E | 149 04 | SSE ¾ E | 239 04 | SW by W ¼ W | 329 04 | NNW ¾ W |
| 61 53 | NE by E ½ E | 151 53 | SSE ½ E | 241 53 | SW by W ½ W | 331 53 | NNW ½ W |
| 64 41 | NE by E ¾ E | 154 41 | SSE ¼ E | 244 41 | SW by W ¾ W | 334 41 | NNW ¼ W |
| 67 30 | ENE | 157 30 | SSE | 247 30 | WSW | 337 30 | NNW |
| 70 19 | ENE ¼ E | 160 19 | S by E ¾ E | 250 19 | WSW ¼ W | 340 19 | N by W ¾ W |
| 73 08 | ENE ½ E | 163 08 | S by E ½ E | 253 08 | WSW ½ W | 343 08 | N by W ½ W |
| 75 56 | ENE ¾ E | 165 56 | S by E ¼ E | 255 56 | WSW ¾ W | 345 56 | N by W ¼ W |
| 78 45 | E by N | 168 45 | S by E | 258 45 | W by S | 348 45 | N by W |
| 81 34 | E ¾ N | 171 34 | S ¾ E | 261 34 | W ¾ S | 351 34 | N ¾ W |
| 84 23 | E ½ N | 174 23 | S ½ E | 264 23 | W ½ S | 354 23 | N ½ W |
| 87 11 | E ¼ N | 177 11 | S ¼ E | 267 11 | W ¼ S | 357 11 | N ¼ W |

TABLE VII.—*Equivalent value in degrees of each fractional division of the compass to the nearest minute of arc.*

| | ° | ′ |
|---|---|---|
| ⅛ point equals | 1 | 24 |
| ¼ point equals | 2 | 49 |
| ⅜ point equals | 4 | 13 |
| ½ point equals | 5 | 38 |
| ⅝ point equals | 7 | 02 |
| ¾ point equals | 8 | 26 |
| ⅞ point equals | 9 | 51 |

DATE SHIPPED

**PACKING SHEET**

CURTISS AEROPLANE AND MOTOR CORPORATION

SALES ORDER NO._____

CONTRACT NO._____

FORM NO 257-A 9M 4-30-18

Boat Hull **BOX** | MACHINE NUMBER: OURS | CUSTOMER'S | F. O. B. Govt. B.L. | VIA | CAR NO. AND INITIAL | BOX NO.

DIMENSIONS OF BOX: 43' x 12'8¼" x 10'5" VOLUME 5673.6 Cubic Feet

WEIGHTS: NET _____ BOX _____ GROSS _____

SHIP TO

SPECIAL MARKS: Req. C&R-184 / SE 336

THIS SHIPMENT CONSISTS OF _____ CASES AND

| PACKERS CHECK | INSPECTORS CHECK | TOOL CHECK | CHECKERS CHECK | PART NO. | QUANTITY | NAME OF PART |
|---|---|---|---|---|---|---|
| | | | | H-16A | 1 | Boat hull complete with: |
| | | | | | 1 | Nose plate with 4 drift wires with turnbuckles |
| | | | | | 2 | Sidewalks with 4 braces |
| | | | | | 2 | Sidewalk brace wires with turnbuckles |
| | | | | | 2 | Horizontal stabilizer drift wires with turnbuckles |
| | | | | | 2 | " " brace " " " |
| | | | | | 2 | Bolts, nuts & cotters in front stabilizer brace socket |
| | | | | | 2 | Bolts, nuts & cotters in rear lower stabilizer brace socket |
| | | | | | 2 | Bolts, nuts & cotters in rear upper stabilizer brace socket |
| | | | | | 2 | Hold down plates in rear of boat hull |
| | | | | | 2 | Bolts, nuts & cotters in fitting for vertical stabilizer |
| | | | | | 1 | Motor shut off control |
| | | | | | 1 | Seat with cushion |
| | | | | | 4 | Rudder control wires |
| | | | | | 4 | Elevator " " |
| | | | | | 2 | Aileron " " |
| | | | | | 1 | Safety belt |
| | | | | | 10 | Rudder insulated wires leading from shut off control |
| | | | | | 4 | Gas tanks |
| | | | | | 1 | Gasoline hand pump |
| | | | | | 1 | " filler line |
| | | | | | 1 | Aileron control device |
| | | | | | 2 | Throttle control assemblies |
| | | | | | 1 | Bilge pump |
| | | | | | 1 | Gasoline overflow sight |
| | | | | 13870 | 1 | Canvas tool roll to hold the following tools: |
| | | | | K-110 | 1 | 6" screw driver |
| | | | | K-237 | 2 | 1/4" x 5/16" double end wrenches |
| | | | | K-238 | 2 | 3/8" x 7/16" " " " |
| | | | | K-340 | 1 | 9" adjustable auto wrench |
| | | | | 13616 | 1 | 6" combination pliers |
| | | | | 13617 | 1 | 3" screw driver |
| | | | | 13618 | 1 | 3 oz. ball pein hammer |
| | | | | 13619 | 1 | 1/4" cap chisel |
| | | | | 13620 | 1 | 3/8" cold " |
| | | | | 13621 | 1 | 3/32" point nail set |
| | | | | 13522 | 1 | Center punch |
| | | | | 13623 | 1 | Cotter pin extractor |
| | | | | 13758 | 1 | Open end wrench (3/4" opening) |
| | | | | 13759 | 1 | 8" half round file |
| | | | | | 2 | Pyrenes and brackets |

PACKED BY | CHECKED BY | INSPECTED BY | CUSTOMER'S INSPECTOR

FIG. 31.—Hull box packing sheet (1).



SHEET NO._____

DATE SHIPPED

**PACKING SHEET**

CURTISS AEROPLANE AND MOTOR CORPORATION

SALES ORDER NO._____

CONTRACT NO._____

FORM NO. 257-F 30M 2-1-18

Boat Hull **BOX** | MACHINE NUMBER: OURS | CUSTOMER'S | F. O. B. Govt. B.L. | VIA | CAR NO. AND INITIAL | BOX NO.

| PACKERS CHECK | INSPECTORS CHECK | TOOL CHECK | CHECKERS CHECK | PART NO. | QUANTITY | NAME OF PART |
|---|---|---|---|---|---|---|
| | | | | H-16A | 2 | Liberty switches on side board and push button |
| | | | | | 1 | Dash light on front instrument board |
| | | | | | 2 | Oil gauges on rear " " |
| | | | | | 1 | Aeroplane watch |
| | | | | | 1 | Dash light on rear instrument board |
| | | | | | 2 | Spark retards on side of seat |
| | | | | | 2 | Tachometers |
| | | | | | 1 | Altimeter |
| | | | | | 2 | Fahrenheit |
| | | | | | 1 | Battery box |
| | | | | | 4 | Dry cell battery brackets |
| | | | | | 2 | Engine sections complete with: |
| | | | | | | 4 Cables on each |
| | | | | | 4 | Oil tanks |
| | | | | | 4 | " pipes |
| | | | | | 2 | Water pipes |
| | | | | | 4 | Gas lines |
| | | | | | 1 | Fan pump |
| | | | | | 4 | Diagonal braces |
| | | | | | 2 | Center struts |
| | | | | | 2 | Radiators |
| | | | | | 2 | Pontoons |

PACKED BY | CHECKED BY | INSPECTED BY | CUSTOMER'S INSPECTOR

FIG. 32.—Hull box packing sheet (2).

DATE SHIPPED

**PACKING SHEET**

**CURTISS AEROPLANE AND MOTOR CORPORATION**

SALES ORDER NO.

CONTRACT NO.

FORM NO 237-A 5M 4-30-18

BOX | MACHINE NUMBER: OURS | CUSTOMER'S | F. O. B. | VIA | CAR NO. AND INITIAL | BOX NO.

DIMENSIONS OF BOX: Panel
VOLUME
28'2½" x 7'6" x 4'1½"
37.2 Cubic Feet

WEIGHTS: NET Govt. B.L. / BOX / GROSS

SHIP TO

SPECIAL MARKS: Req. C&R-184 SE 336

THIS SHIPMENT CONSISTS OF ____ CASES AND

| PACKERS CHECK | INSPECTORS CHECK | TOOL CHECK | SHIPPING CHECK | PART NO. | QUANTITY | NAME OF PART |
|---|---|---|---|---|---|---|
| | | | | H-16A | 1 | Right upper intermediate panel with: |
| | | | | | 4 | Hinge pins in hinges |
| | | | | | 6 | Post sockets with bolts, nuts & cotters in each |
| | | | | | 22 | Cables & turnbuckles complete attached to underside of panel. |
| | | | | | 1 | Left upper intermediate panel with: |
| | | | | | 4 | Hinge pins in hinges |
| | | | | | 6 | Post sockets with bolts, nuts & cotters in each |
| | | | | | 22 | Cables & turnbuckles complete attached to underside of panel. |
| | | | | | 1 | Right lower panel with post sockets, with bolts, nuts and cotters in each: |
| | | | | | 5 | Clevis pins & cotters in rear inner post sockets |
| | | | | | 5 | " " " " front " " " |
| | | | | | 4 | " " " " rear intermediate post socke |
| | | | | | 4 | " " " " front " " " |
| | | | | | 4 | " " " " rear outer post sockets |
| | | | | | 4 | " " " " front " " " |
| | | | | | 1 | Left lower panel with post sockets, with bolts, nuts and cotters in each: |
| | | | | | 5 | Clevis pins & cotters in rear inner post sockets |
| | | | | | 5 | " " " " front " " " |
| | | | | | 4 | " " " " rear intermediate post socket |
| | | | | | 4 | " " " " front " " " |
| | | | | | 4 | " " " " rear outer post sockets |
| | | | | | 4 | " " " " front " " " |
| | | | | | 2 | Non-skid panels; 1 right and 1 left, with: |
| | | | | | 6 | Cables and turnbuckles on each |
| | | | | | 2 | Ailerons, each complete with: |
| | | | | | 6 | Brace wires ending in 2 wires |
| | | | | | 1 | Rudder complete with: |
| | | | | | 8 | Brace wires in trailing edge clips |
| | | | | | 5 | Hinge pins and cotters in hinges |
| | | | | | 2 | Elevators complete with: |
| | | | | | 8 | Brace wires attached to each |
| | | | | | 1 | Vertical stabilizer complete |
| | | | | | 8 | Aileron horns |
| | | | | | 12 | Horns for tail units |

PACKED BY | CHECKED BY | INSPECTED BY | CUSTOMER'S INSPECTOR

FIG. 33.—Panel box packing sheet.



DATE SHIPPED

**PACKING SHEET**

**CURTISS AEROPLANE AND MOTOR CORPORATION**

SALES ORDER NO.

CONTRACT NO.

FORM NO 237-A 5M 4-30-18

Overhang Panel BOX | MACHINE NUMBER: OURS | CUSTOMER'S | F. O. B. Govt. B.L. | VIA | CAR NO. AND INITIAL | BOX NO.

DIMENSIONS OF BOX: 21'6" x 36¼" x 7'6"
VOLUME
487.1 Cubic Feet

WEIGHTS: NET / BOX / GROSS

SHIP TO

SPECIAL MARKS: Req. C&R-184 SE 336

THIS SHIPMENT CONSISTS OF ____ CASES AND

| PACKERS CHECK | INSPECTORS CHECK | TOOL CHECK | SHIPPING CHECK | PART NO. | QUANTITY | NAME OF PART |
|---|---|---|---|---|---|---|
| | | | | H-16A | 1 | Engine section panel including gravity tank complete with: |
| | | | | | 5 | Engine section brace wires |
| | | | | | 6 | Sockets with bolts, nuts and cotters |
| | | | | | 22 | Cables with turnbuckles complete |
| | | | | | 1 | Right, and |
| | | | | | 1 | Left outer wing panels, each complete with: |
| | | | | | 4 | Cables and turnbuckles complete attached to under-side of panels |
| | | | | | 4 | Clevis pins and cotters in mast wire clips |
| | | | | | 1 | Horizontal stabilizer complete with: |
| | | | | | 6 | Bolts, nuts and cotters in brace clips |
| | | | | | 12 | Hinge pins and cotters in hinges |
| | | | | | 2 | Right upper control wires |
| | | | | | 2 | Left " " " |
| | | | | | 12 | Wing struts |
| | | | | | 6 | Stabilizer braces |

PACKED BY | CHECKED BY | INSPECTED BY | CUSTOMER'S INSPECTOR

FIG. 34.—Overhang panel box packing sheet.

DATE SHIPPED

**PACKING SHEET**

CURTISS AEROPLANE AND MOTOR CORPORATION

SALES ORDER NO.

CONTRACT NO.

FORM NO 237-A 9M 4-30-18

Motor **BOX**

| MACHINE NUMBER OURS | MACHINE NUMBER CUSTOMER'S | F. O. B. | VIA | CAR NO. AND INITIAL | BOX NO. |
|---|---|---|---|---|---|
| | | Govt. B.L. | | | |

DIMENSIONS OF BOX: 6'2⅛" x 2'8" x 4'3"
VOLUME 70.3 Cubic Feet

WEIGHTS: NET / BOX / GROSS

SHIP TO

SPECIAL MARKS: Req. C&R-184 SE 336

THIS SHIPMENT CONSISTS OF CASES AND

| PACKERS CHECK | INSPECTORS CHECK | CHECKERS CHECK | PART NO. | QUANTITY | NAME OF PART |
|---|---|---|---|---|---|
| | | | H-16A | 1 | Right Liberty Motor No. S.E.No. Mfg. No. |
| | | | | 1 | Spark plug wrench |
| | | | | 2 | Deflectors |
| | | | | 1 | Propeller hub |
| | | | | 1 | Radiator outlet hose connection |

PACKED BY | CHECKED BY | INSPECTED BY

CUSTOMER'S INSPECTOR

FIG. 35.—Right motor box packing sheet.



DATE SHIPPED

**PACKING SHEET**

CURTISS AEROPLANE AND MOTOR CORPORATION

SALES ORDER NO.

CONTRACT NO.

FORM NO 237-A 9M 4-30-18

Motor **BOX**

| MACHINE NUMBER OURS | MACHINE NUMBER CUSTOMER'S | F. O. B. | VIA | CAR NO. AND INITIAL | BOX NO. |
|---|---|---|---|---|---|
| | | Govt. B.L. | | | |

DIMENSIONS OF BOX: 6'2⅛" x 2'8" x 4'3"
VOLUME 70.3 Cubic Feet

WEIGHTS: NET / BOX / GROSS

SHIP TO

SPECIAL MARKS: Req. C&R-184 SE 336

THIS SHIPMENT CONSISTS OF CASES AND

| PACKERS CHECK | INSPECTORS CHECK | CHECKERS CHECK | PART NO. | QUANTITY | NAME OF PART |
|---|---|---|---|---|---|
| | | | H-16A | 1 | Left Liberty Motor No. S.E.No. Mfg. No. |
| | | | | 1 | Spark plug wrench |
| | | | | 2 | Deflectors |
| | | | | 1 | Propeller hub |
| | | | | 1 | Radiator outlet hose connection |

PACKED BY | CHECKED BY | INSPECTED BY

CUSTOMER'S INSPECTOR

FIG. 36.—Left motor box packing sheet.

SHEET NO._____

DATE SHIPPED

PACKING SHEET

SALES ORDER NO._____

CURTISS AEROPLANE AND MOTOR CORPORATION

CONTRACT NO._____

FORM NO. 257-F 20M 2-18

WITH Small Parts BOX

| MACHINE NUMBER OURS | MACHINE NUMBER CUSTOMER'S | F. O. B. | VIA | CAR NO. AND INITIAL | BOX NO. |
|---|---|---|---|---|---|
| | | Govt. B.L. | | | |

| PACKERS CHECK | INSPECTORS CHECK | TURN CHECK | CHECKERS CHECK | PART NO. H-16A | QUANTITY | NAME OF PART |
|---|---|---|---|---|---|---|
| | | | | 4048-7 | 6 | Ferrules |
| | | | | -8 | 10 | " |
| | | | | 4145-5 | 2 | Hinge pins |
| | | | | -8 | 2 | " " |
| | | | | 4155 | 2 | Hinges, male |
| | | | | 4157 | 2 | " female |
| | | | | 4167-5 | 6 | Flat hd. pins |
| | | | | -4 | 1 | " " " |
| | | | | -7 | 4 | " " " |
| | | | | 4179-7 | 9 | " " " |
| | | | | -10 | 10 | " " " |
| | | | | 4286-12 | 3 | " " " |
| | | | | -21 | 3 | " " " |
| | | | | 4290-1A | 20 | Cotters |
| | | | | -1B | 20 | " |
| | | | | 4378-4 | 2 | Shackles |
| | | | | 4518-7 | 1 | Flat hd. pin |
| | | | | -8 | 6 | " " " |
| | | | | -9 | 6 | " " " |
| | | | | 4543-38 | 1 | Hex. ball hd. bolt |
| | | | | -39 | 1 | " " " " |
| | | | | 4819 | 1 | Turnbuckle |
| | | | | 5204-1B | 4 | Taper pins |
| | | | | 5249 | 1 | Turnbuckle |
| | | | | 5535-1 | 1 | Shackle |
| | | | | -2 | 5 | " |
| | | | | 5854 | 1 | Turnbuckle |
| | | | | 5855 | 1 | " |
| | | | | 5858 | 1 | " |
| | | | | 5866 | 2 | " |
| | | | | 5867 | 2 | " |
| | | | | 5868 | 1 | " |
| | | | | 6079-38 | 1 | Ball hd. bolt |
| | | | | -40 | 1 | " " " |
| | | | | -48 | 1 | " " " |
| | | | | -42 | 1 | " " " |
| | | | | -49 | 1 | " " " |
| | | | | 6343 | 3 | Hinge pins |
| | | | | 6555-3 | 3 | Nuts, ball hd. cst. |
| | | | | -4 | 6 | " " " " |
| | | | | 6577-1 | 10 | " hex. cst. |
| | | | | -2 | 10 | " " " |
| | | | | -3 | 10 | " " " |
| | | | | -4 | 6 | " " " |
| | | | | 6852 | 1 | Turnbuckle |

PACKED BY | CHECKED BY | INSPECTED BY

CUSTOMER'S INSPECTOR

FIG. 37.—Small parts box packing sheet (1).



SHEET NO._____

DATE SHIPPED

PACKING SHEET

SALES ORDER NO._____

Small Parts

CURTISS AEROPLANE AND MOTOR CORPORATION

CONTRACT NO._____

FORM NO. 257-F 20M 2-18

WITH BOX

| MACHINE NUMBER OURS | MACHINE NUMBER CUSTOMER'S | F. O. B. | VIA | CAR NO. AND INITIAL | BOX NO. |
|---|---|---|---|---|---|
| | | Govt. B.L. | | | |

| PACKERS CHECK | INSPECTORS CHECK | TURN CHECK | CHECKERS CHECK | H-16A NO. | QUANTITY | NAME OF PART |
|---|---|---|---|---|---|---|
| | | | | ~~6664~~ | ~~2~~ | ~~Shackles~~ |
| | | | | 7586 | 1 | Turnbuckle |
| | | | | 10164-2 | 1 | Terminal |
| | | | | 10342-4 | 1 | " |
| | | | | 10342-5 | 1 | " |
| | | | | | ½ | Pint of Valspar Varnish |
| | | | | | ½ | " " Kauri " |
| | | | | | 1 | Yard of linen covering |
| | | | | | 1 | Quart of dope |
| | | | | | 1 | Set of blue prints |

PACKED BY | CHECKED BY | INSPECTED BY

CUSTOMER'S INSPECTOR

FIG. 38.—Small parts box packing sheet (2).

## MEMORANDA.



## MEMORANDA.

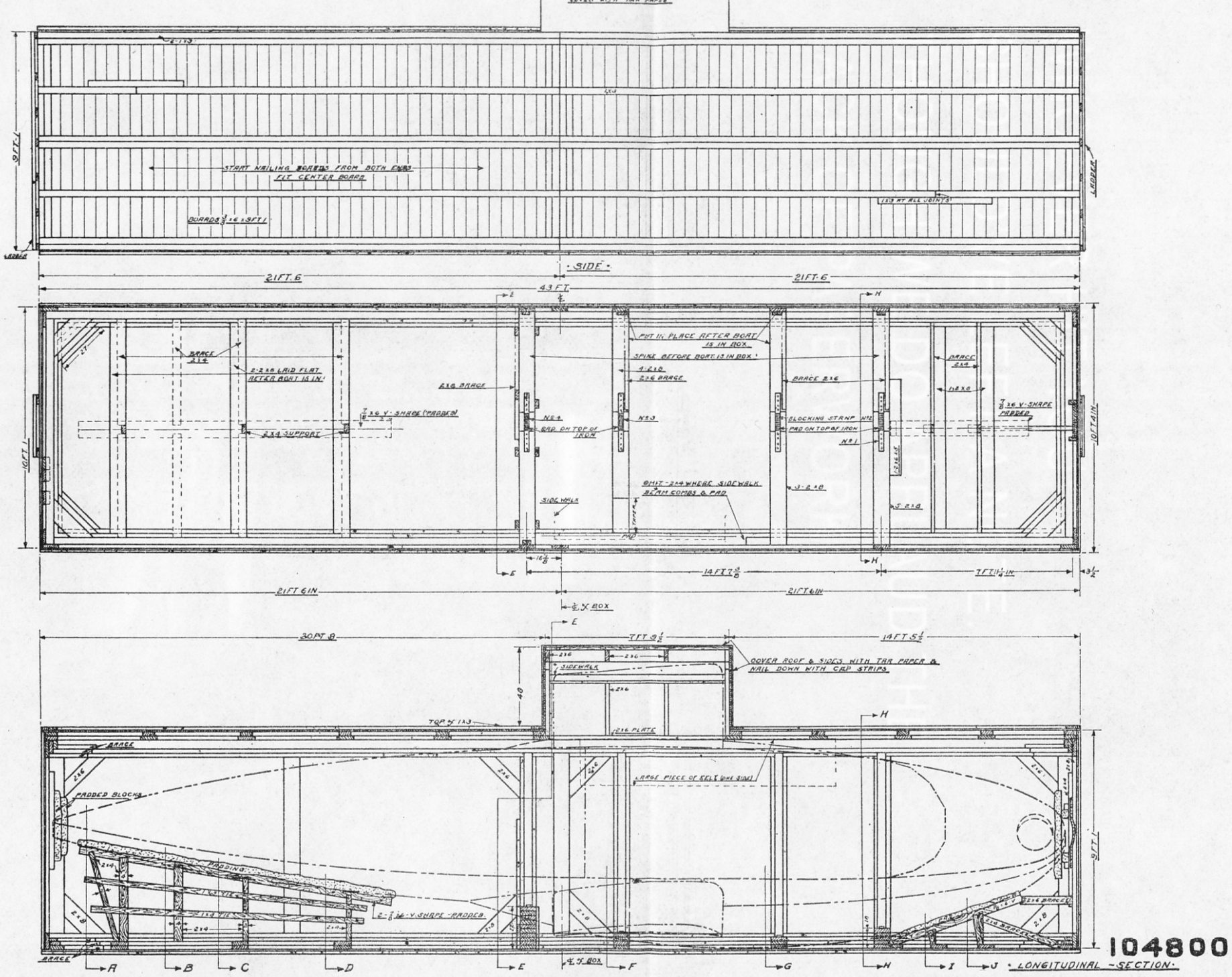
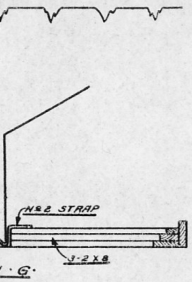
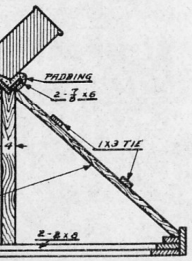



FIG. 12.—Hull box: Longitudinal section, plan and side elevation.

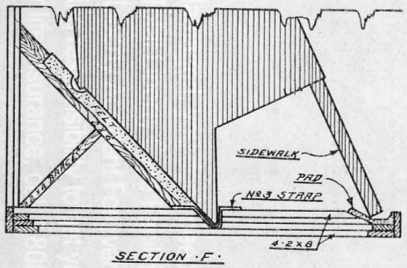



·G·

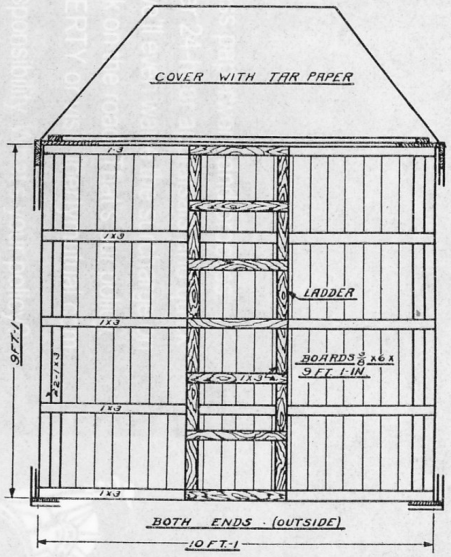


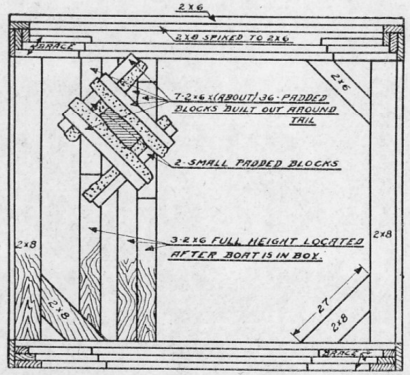

·A·

LIKE ·A·

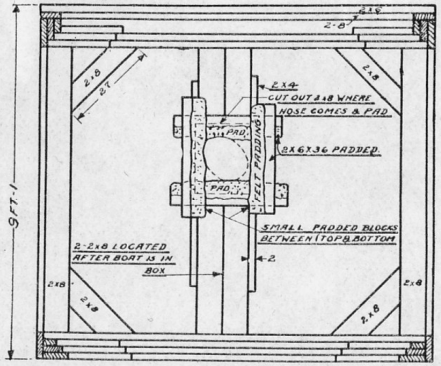



SECTION ·F·




STERN END of BOX




·BOW END of BOX·

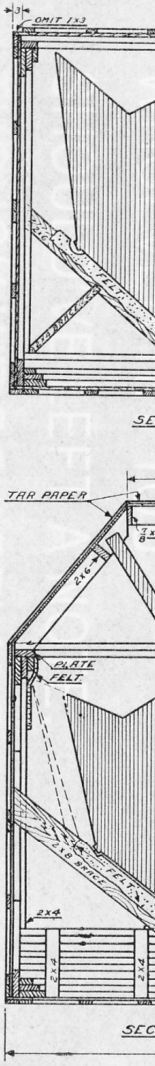



FIG. 13.—Hull box: Transverse sections and end elevation.

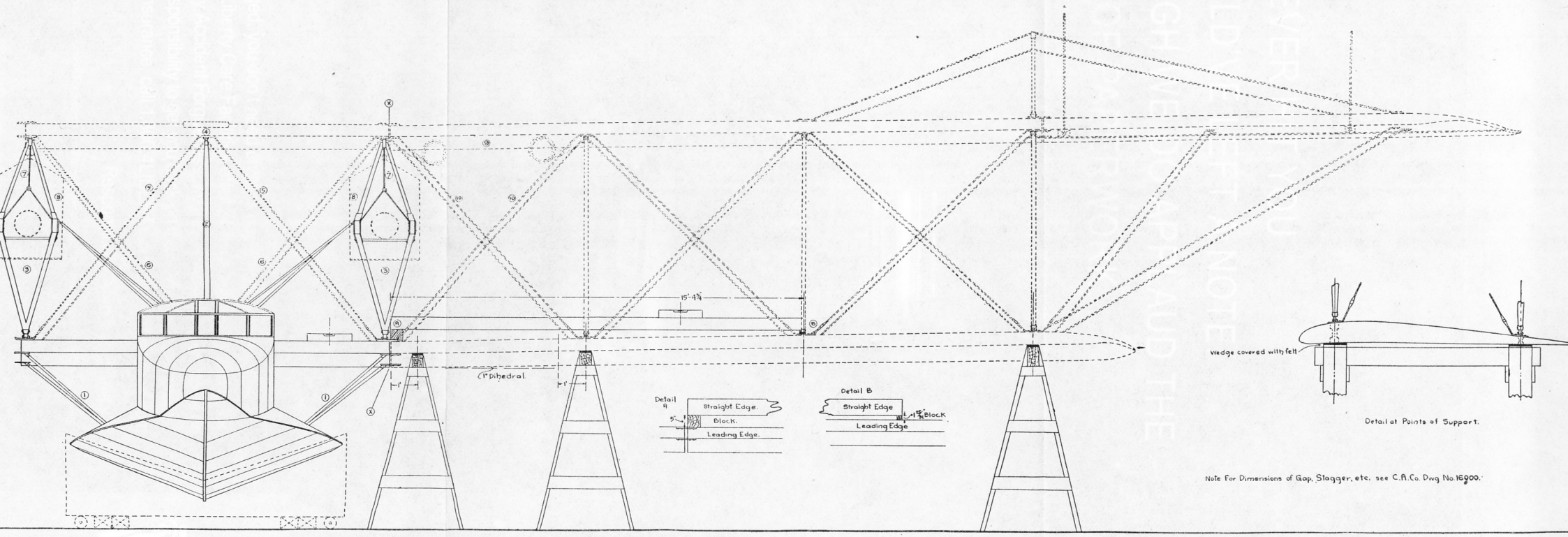



FIG. 16.—Chart of panel erection.

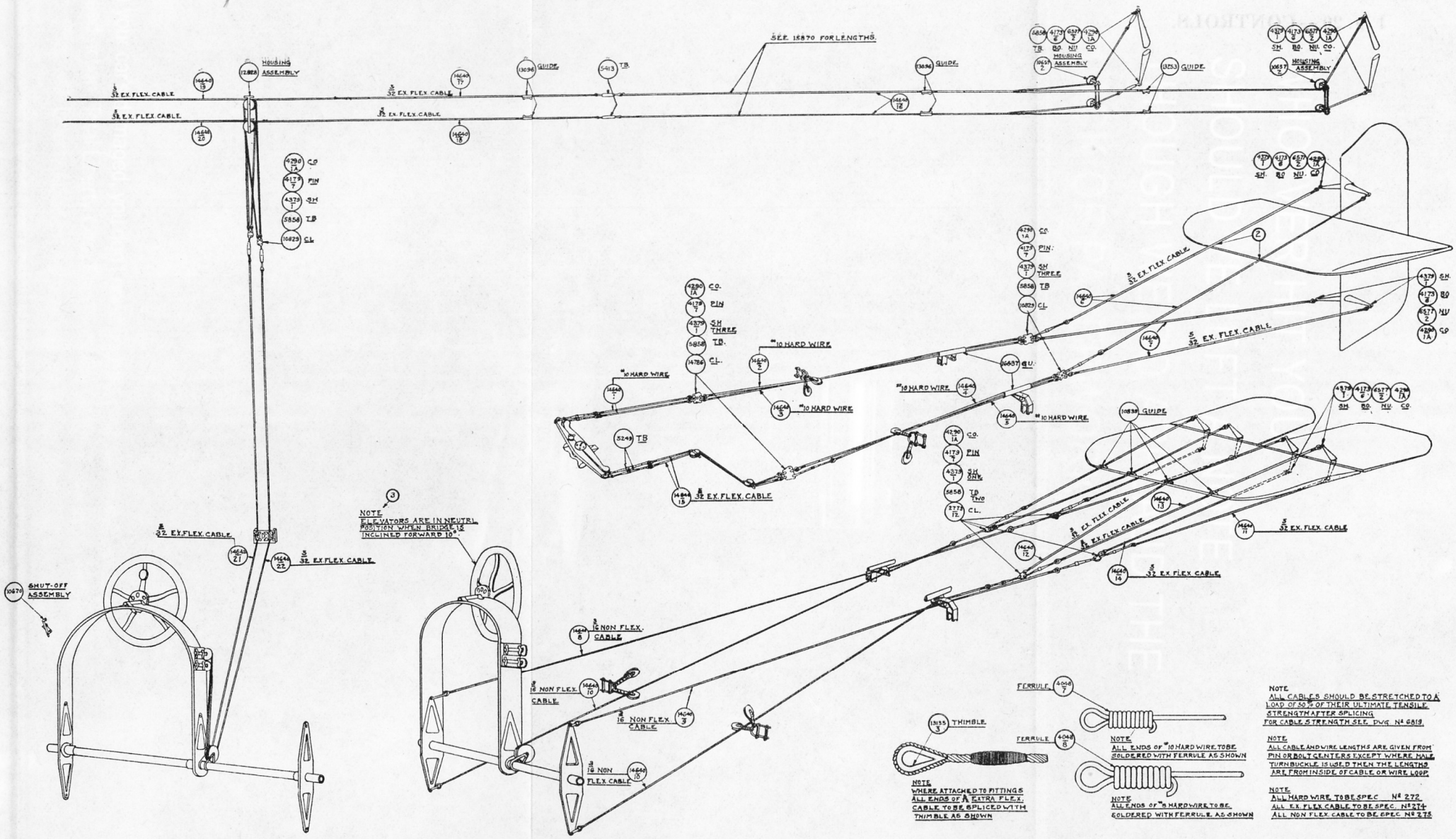



FIG. 20.—Controls.

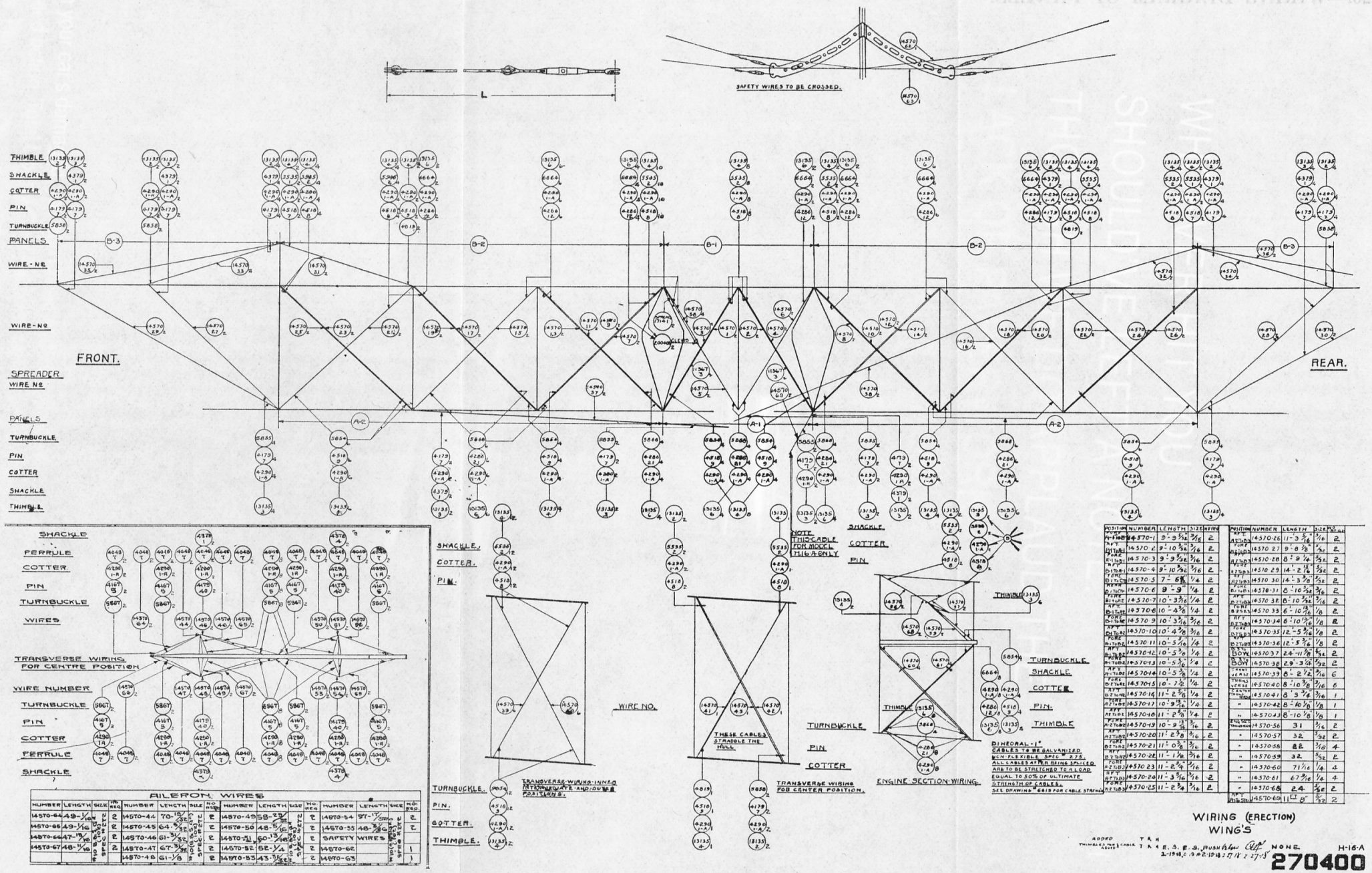



Fig. 26.—Wiring diagram of panels.

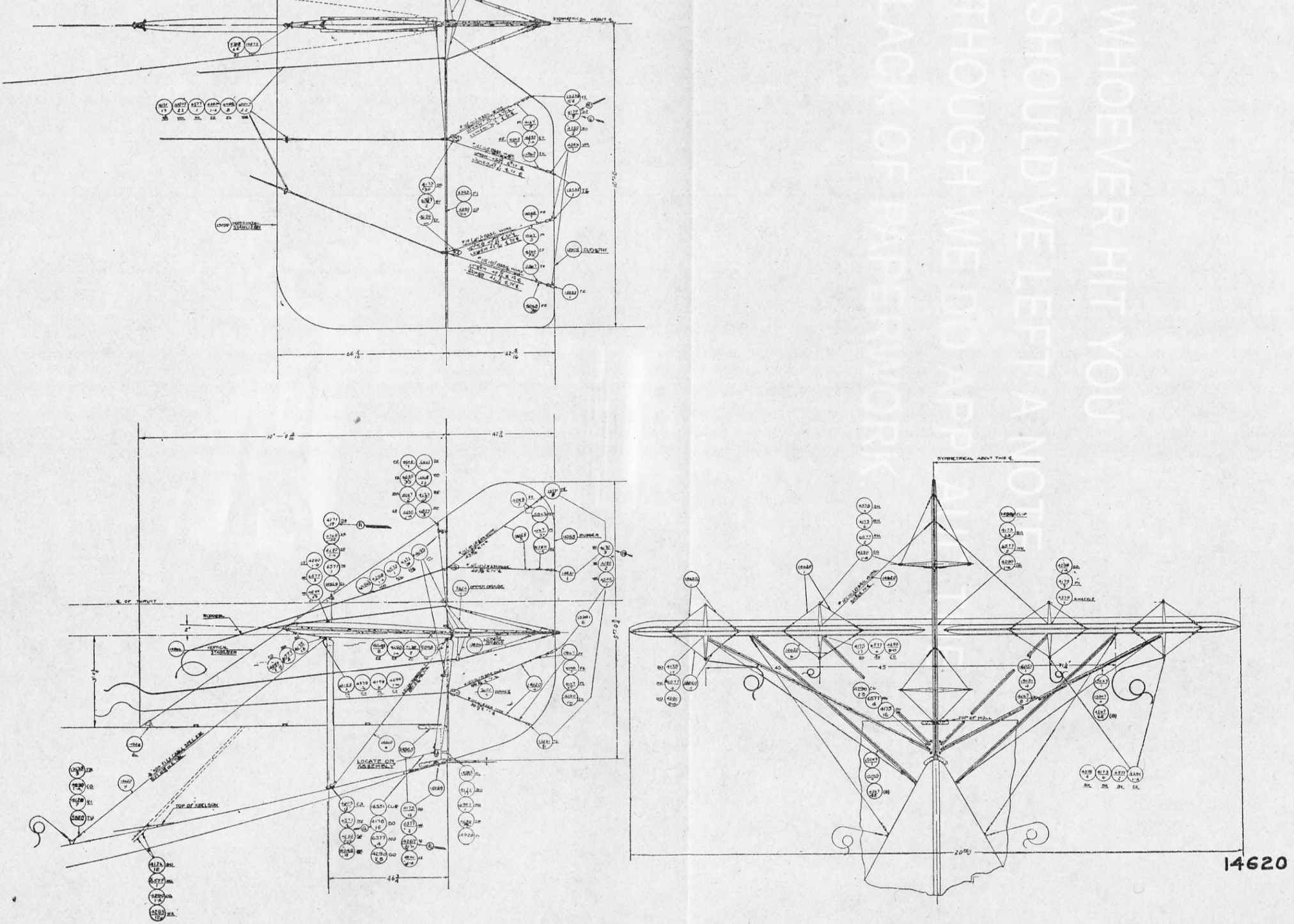



FIG. 27.—Tail unit assembly.

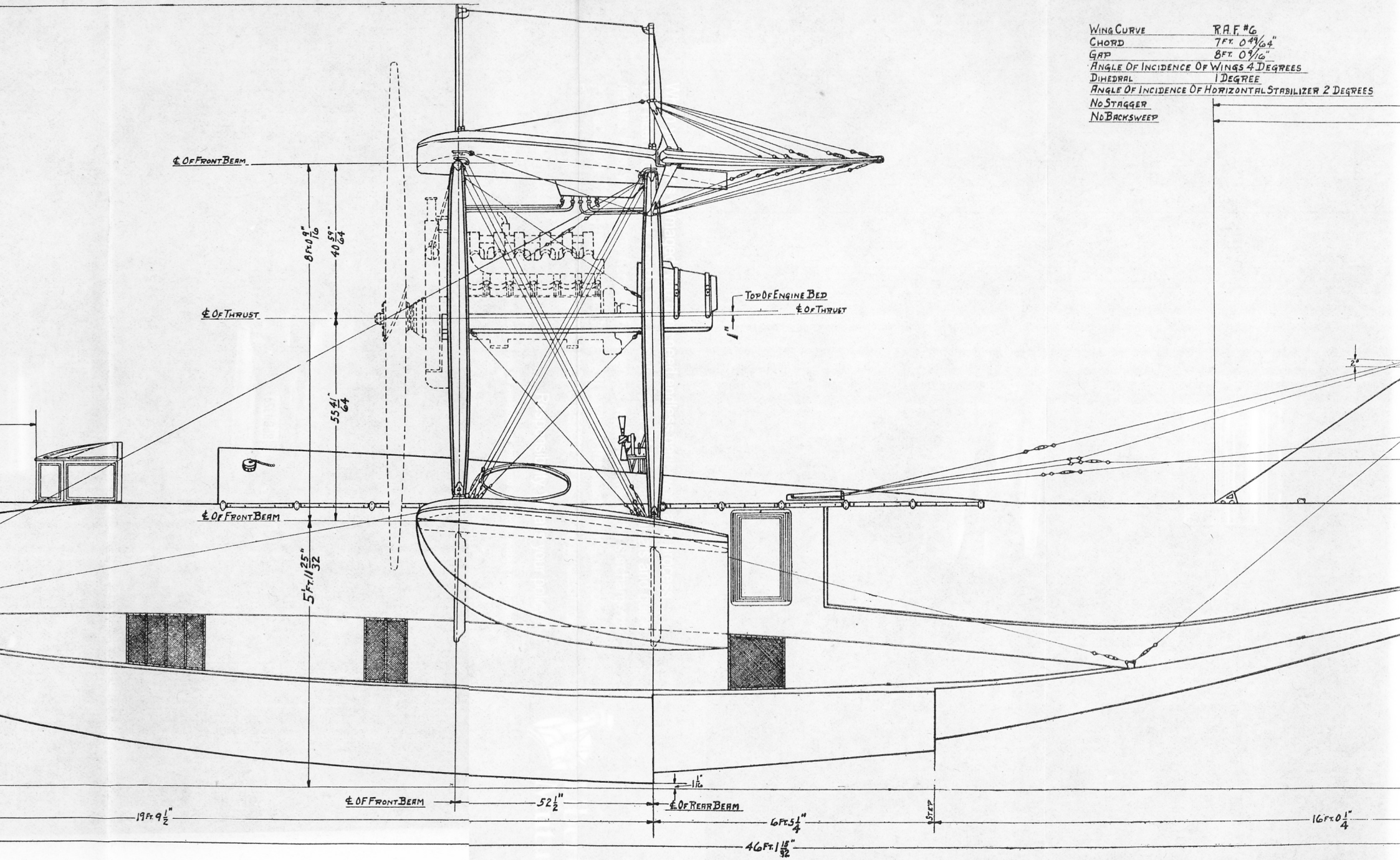



FIG. 28.—Side elevation.

FIG. 29.—Front elevation.