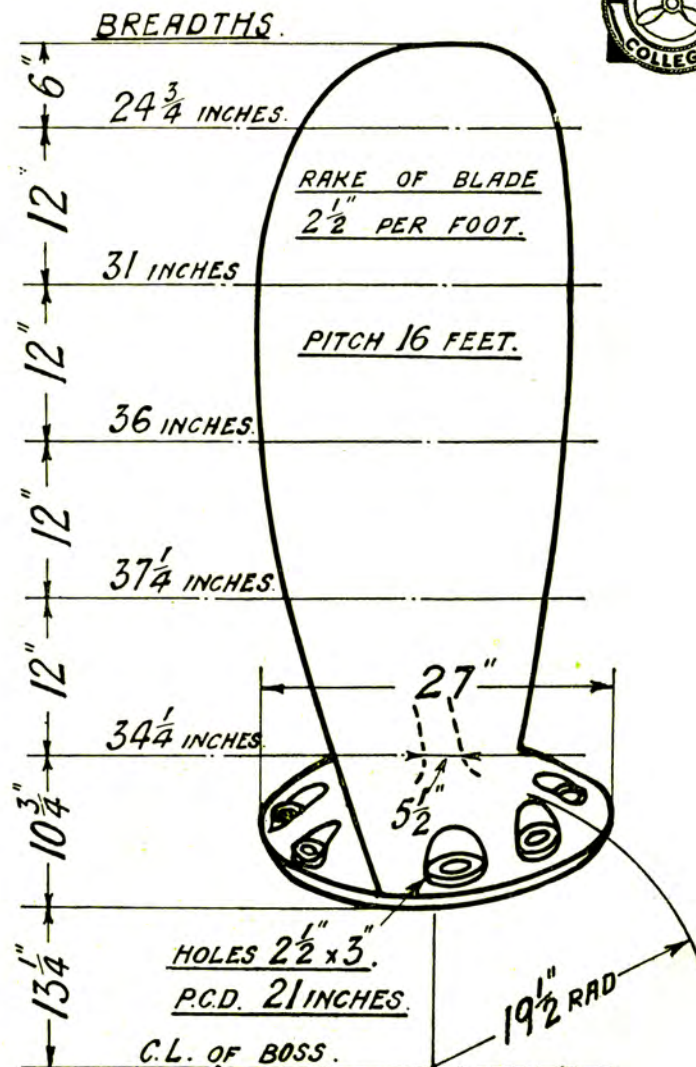


CONE 9" TO 11" DIAMETER BY 3 1/2" LONG.

PROPELLER BOSS.



PROPELLER BLADE.



## PROPELLER BOSS.

*Given to Steam and Motor Candidates.*

### DRAWING No. 1.

Page 58.

Draw (a) *A longitudinal section through boss, with the flange of one blade in position.*

(b) *A plan, showing the disposition of the holes in the flange, and the formation of the root of the blade.*

An end elevation, one half in section, is shown in addition to these asked ; this view shows clearly the various ribs and how the metal around the keyway is strengthened.

The arrow on plan indicates the driving face of propeller blade. It will be noticed that 4 studs are required on the driving side and 3 on the following side.

The key or feather will extend to within  $1\frac{1}{2}$  inches of either end of boss. It will have rounded ends, and will be pinned in place on taper of shaft. The key will bear hard on sides of keyway and be slightly clear on top.

The nuts on flange studs are cap nuts with a pinching pin screwed into the stud, for locking nuts.

When propeller is completely assembled on shaft, the boss around studs is cemented with the object of obtaining a smooth uniform surface and so increase the efficiency of the propeller.

## PROPELLER BLADE.

### DRAWING No. 1.

Page 59.

*Given to Steam and Motor Candidates.*

*Make a working drawing giving all particulars for the construction of propeller blade.*

In this drawing commence by putting in the vertical centre line AC then the blade flange. Next draw in the horizontal lines as given in the pictorial view, at their respective distances from the centre line of shaft ; 13.25 inches to base of blade, 10.75 inches to where root thickness of 5.5 inches is given, and so on to the tip of blade. Adding these sizes we get the radius of the blade to be 6.5 feet which when multiplied by the rake of 2.5 inches per foot, gives the amount the tip of blade is thrown back from the centre line, that is 16.25 inches ( $6.5 \times 2.5$ ). BC is then joined. This will give the line of the driving face of the blade, but in order that metal at root of blade may be disposed in such a manner as will allow 4 studs to be accommodated on the driving side of the flange, the face of blade is moved towards the centre line a distance of 3 inches, as shown. (See note on drawing on page 59). Proceed now to fix thickness of blade tip, say 1 inch and join up with root thickness of  $5\frac{1}{2}$  inches, thus is formed the following face of blade. The root of blade must be brought into flange with large fillets to give the required strength at this part. Thickness sections of the blade are next drawn in position at their respective radii.

The developed area of blade is next formed. Widths are given and these can be divided on either side of centre line at the candidate's discretion. The exact form of the blade in this respect is only got from practical experience.

A pitch angle diagram is shown to the right of the elevation. It is constructed as follows :—

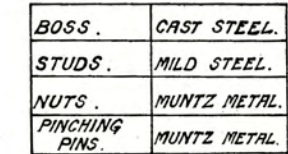
The vertical line TS represents the circumference at the different radii of propeller. TB represents pitch of propeller (Z). To ascertain the length of TB in relation to length of TS we proceed as follows :—By proportion if whole circumference (WC) is taken to be equal to the radius at R feet, what must the length Z be made to equal a pitch of 16 feet. Thus—

$$Z = \frac{R \times P}{WC} = \frac{R \times P}{2 \times 3.14 \times R} = \frac{16}{2 \times 3.14} = 2.55 \text{ feet.}$$

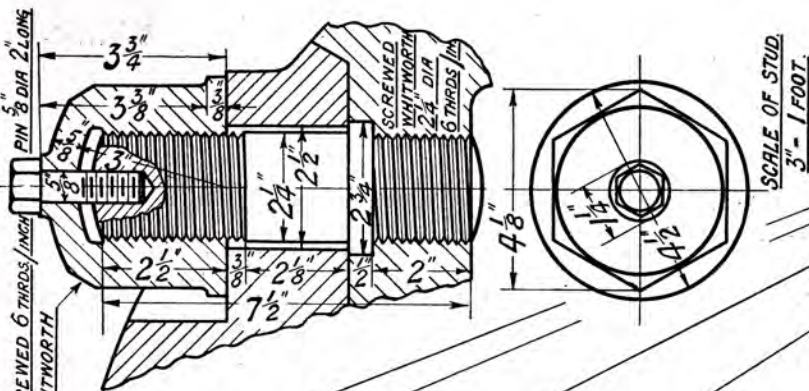
Proceed now with the plan view. The line XY is drawn as explained in drawing and the distance D is got from the elevation. Draw a line parallel to XY and the distance D from it. This gives the position of the driving face of the blade where it meets the flange.

The plan of blade flange shows clearly the disposition of the studs, 4 on the driving side and 3 on the following side. A detail view of stud and cap nut is also shown in which the locking arrangement can be seen.

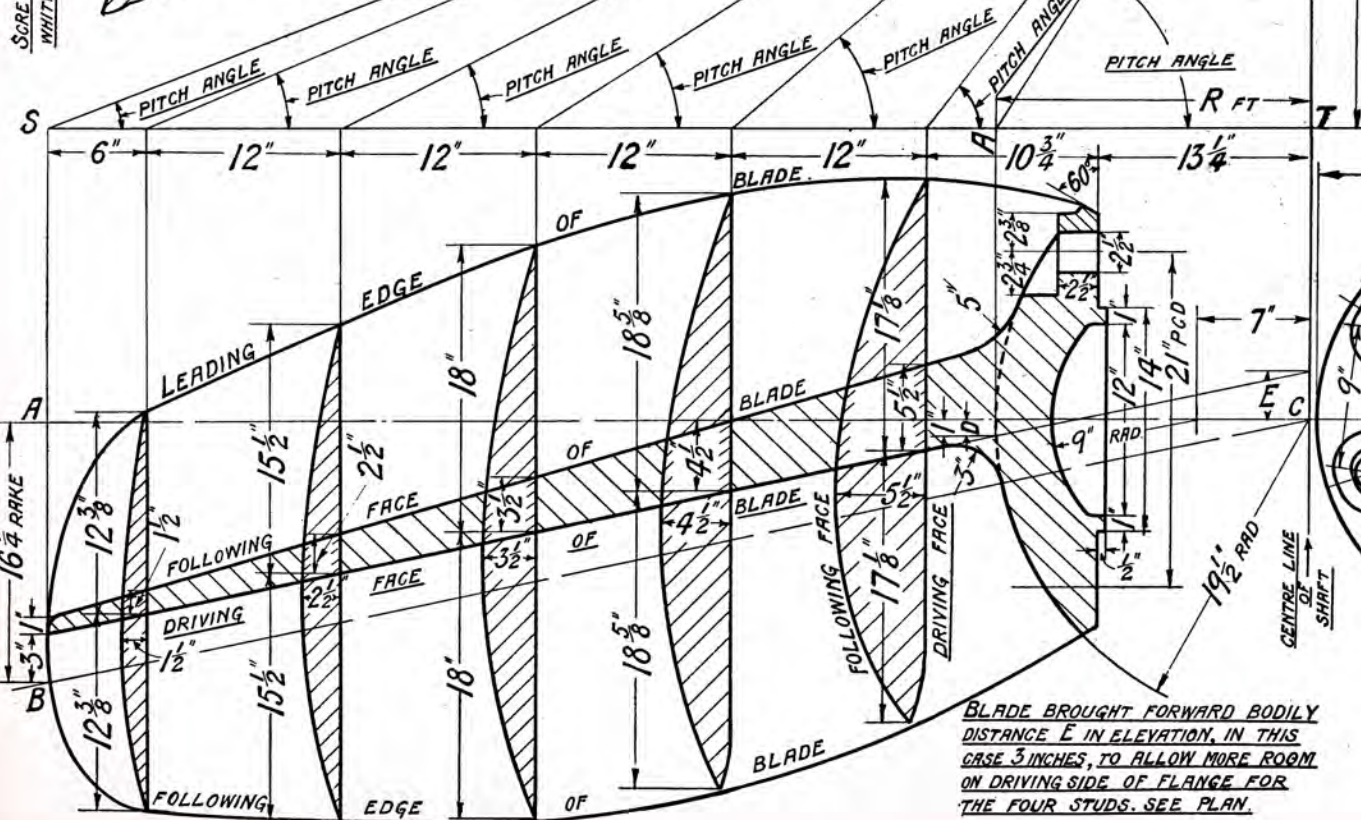




SCALE :- 1" - 1 FOOT.

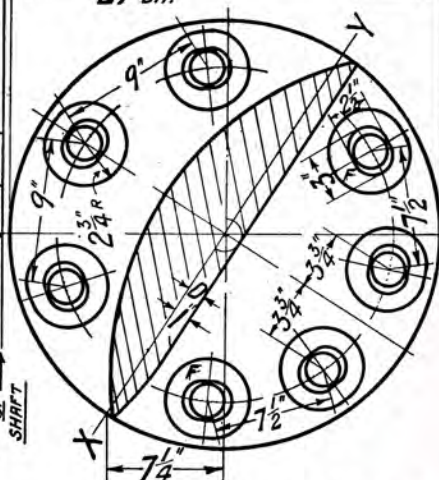


SCALE OF STUD  
3" = 1 FOOT.



THE LINE X.Y. IN PLAN IS PARALLEL TO LINE A.B. IN PITCH ANGLE DIAGRAM. THIS LINE A.B. IS THE DRIVING FACE OF THE BLADE AND FORMS THE ACUTE ANGLE

THE DRIVING FACE OF THE BLADE MAKES WITH THE PLANE OF THE PROPELLER AT A DISTANCE OF R FT. FROM THE CENTRE OF BOSS THIS ANGLE IS CALLED THE PITCH ANGLE. THE LINE S.T. REPRESENTS THE PLANE OF THE PROPELLER. IT WILL BE NOTICED THAT AT DIFFERENT R FT. FROM THE CENTRE OF THE BOSS THAT THE PITCH ANGLE BECOMES LESS. TOWARDS THE TIP.



PROPELLER BLADE.

SCALE - 1" = 1 FOOT.

PITCH 16 FEET.

BLADE BROUGHT FORWARD BODILY DISTANCE E IN ELEVATION, IN THIS CASE 3 INCHES, TO ALLOW MORE ROOM ON DRIVING SIDE OF FLANGE FOR THE FOUR STUDS. SEE PLAN.