H. F. SCHMIDT.

BLADE MOUNTING.

APPLICATION FILED MAR. 31, 1917.

1,289,278. Patented Dec. 31, 1918.

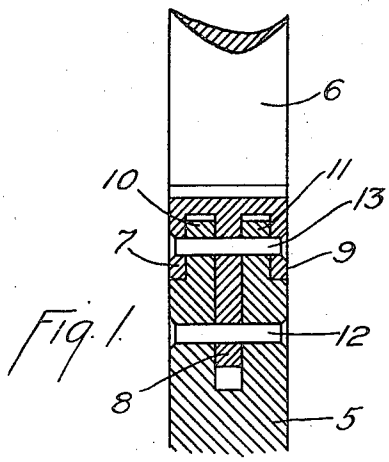


Fig. 1.

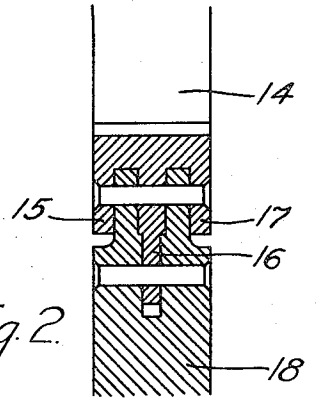


Fig. 2.

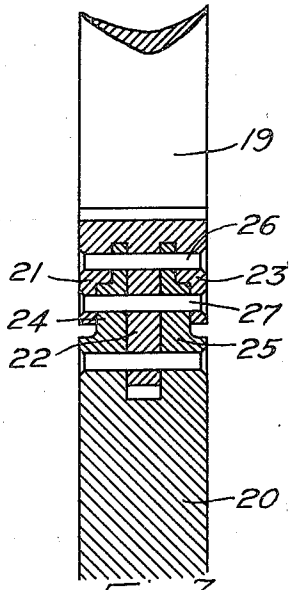


Fig. 3.

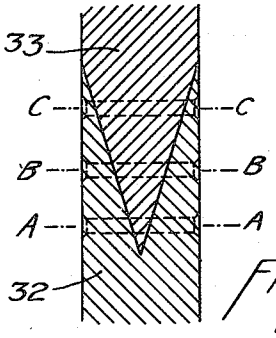


Fig. 4.

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BLADE-MOUNTING.

1,289,278. Specification of Letters Patent. Patented Dec. 31, 1918.

Application filed March 31, 1917. Serial No. 158,977.

To all whom it may concern:

Be it known that I, HENRY F. SCHMIDT, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Blade-Mounting, of which the following is a specification.

This invention relates to blade mountings and has for an object to produce a new and improved blade mounting which is especially adapted to be employed in attaching blades to moving blade carrying elements.

A further object is to produce a blade mounting which includes a riveted joint of greater efficiency than any other riveted blade mounting now in use and known to me.

A further object is to produce a riveted blade mounting in which some of the rivets are subjected to more than double shear.

A further object is to produce a blade mounting of high efficiency, which is simple in design, easy to construct and therefore cheap to build.

A further object is to produce a riveted blade mounting in which means are provided to counteract eccentric loading of the parts forming the joint.

These and other objects are attained by means of the blade mountings described herein and illustrated in the drawing accompanying and forming a part hereof.

In the drawings: Figure 1 is a diagrammatic sectional view of blade mounting embodying my invention.

Fig. 2 is a modification of the blade mounting shown in Fig. 1.

Fig. 3 is a sectional view of another embodiment of my invention.

Fig. 4 is a diagrammatic sectional view of a blade mounting which illustrates one of the objects of my invention.

Turbine blades have frequently been mounted by inserting their shanks in a groove in the blade carrying element and by then securing each blade shank in place with one or more locking members such as rivets. The ordinary construction consists in a single groove in the blade carrying element and a single tongue on the blade shank so that the rivets are in double shear. The result would be the same if the blade shank straddled a single tongue on the blade carrying element. In either construction, the size of the rivet or rivets is limited by the pitch of the blades and consequently by the amount of material which may be left in the shank. The number of rivets of a reasonable size is limited for the same reason. As the number and size of the rivets are limited, the strength and efficiency of the joint are also limited in the single tongue and groove construction.

In my invention I increase the efficiency and strength of the blade mounting by increasing the number of times some of the locking members or rivets are in shear. Although the number and size of the members or rivets are limited as before, the strength of the joint is greatly increased by improving the efficiency of the joint. In carrying out my invention, I preferably provide a multiple tongue and groove joint between the blade shank and the blade carrying element, which is so formed as to throw all or a part of the locking members or rivets in more than double shear and to thereby increase the efficiency and hence the strength of the joint. Obviously this may be done without increasing the weight of the joint, and at substantially the same cost as the cost of the old construction, by increasing the number of tongues in the joint and by decreasing their thickness. It is evident that the efficiency of the joint is further increased by the greatly increased amount of surface, due to the multiple tongue construction, held in frictional engagement by the rivets.

In Fig. 1, I have illustrated a portion of a blade carrying element 5 and a portion of a blade 6, which is mounted on the blade carrying element 5. The shank of the blade 6 is shown as provided with three tongues 7, 8 and 9, which fit into grooves in the blade carrying element 5 and coöperate with two tongues 10 and 11, formed on the blade carrying element 5. The central tongue 8 of the blade shank is shown longer than the two side tongues 7 and 9, so that an inner locking member or rivet 12 passes through only the central tongue 8 and is therefore only in double shear. An outer locking member or rivet 13 passes through the tongues 7, 10, 11 and 9 and is therefore in quadruple shear.

In order for the blade to tear away from the blade carrying element 5, it would be necessary for it to shear off six rivet sections. If the multiple tongue construction were not provided, the total number of rivet

sections to be sheared off would be only four, consequently the strength of the joint has been increased by a shear area equal to twice the section of one of the rivets. This is accomplished without increasing the weight or cost of the joint, consequently the efficiency of the joint is materially improved. This mounting is simple, compact, and makes possible a smooth continuous joint, due to the fit of the tongues 7 and 9 against the blade carrying element 5 as shown.

In Fig. 2, I have illustrated a mounting similar to that shown in Fig. 1, but having a different distribution of the metal in the tongues of the joint. As before, a blade 14 is provided with three tongues 15, 16 and 17, which fit in grooves in a blade carrying member 18. In order to distribute the stresses to the best advantage, I have shown the tongue 16 as having two different thicknesses. As before, this joint has the shearing strength of six rivet cross sections.

In Fig. 3, I have shown a blade 19 mounted on a blade carrying member 20 in such a way that in order for the blade 19 to pull away from the blade carrying member it would be necessary to shear off ten rivet sections. The blade 19 is provided with three tongues 21, 22 and 23, which coöperate with two tongues 24 and 25, provided on the blade carrying member 20. The tongues 21, 24, 23 and 25 are stepped so as to more uniformly distribute the stress throughout the joint. As shown, two rivets 26 and 27 are passed through the tongues 21, 24, 22, 25 and 23 and one rivet is passed through the central tongue 22, which is longer than the other tongues carried by the blade 19. It is evident that the joint could be further strengthened by adding more tongues or more rivets if desired.

In Fig. 4, I have illustrated a theoretical construction in which the amount of metal in the blade carrying element 32 is decreased as the amount in the blade shank 33 is increased, and vice versa. I have indicated three rivets A, B, and C as being passed through the joint. The relatively small amount of metal immediately below the rivet C in the blade carrying element 32 must support only the pull of the one rivet C. Below B the material must sustain the pull of both B and C and is therefore thicker. Below A it must stand the cumulative pull of all three rivets A, B, and C and therefore has substantially three times as much net cross-sectional area. Conversely the material in the blade shank 33 adjacent to the rivet A has to sustain only the pull due to this rivet and therefore the cross-sectional area of the shank is small at this point. At C the shank sustains the cumulative pull of all three rivets and has substantially three times as much cross-sectional area. The construction illustrated in Figs. 1, 2, and 3 are practical applications of the theoretical distribution of stresses mentioned in connection with the construction shown in Fig. 4.

The blade mountings which comprise my invention are simple in construction, light in weight, and compact. The strength and efficiency of the mounting has been greatly increased with practically no increase in weight or initial cost.

While I have described and illustrated several embodiments of my invention, it will be apparent to those skilled in the art that various changes, modifications, additions and omissions may be made in the apparatus illustrated without departing from the spirit and scope of the invention as set forth by the appended claims.

What I claim is:

1. In a blade mounting, a blade shank forming an interleaving joint with a blade carrying element, and a plurality of rivets passed transversely through the interleaving joint, some of said rivets being in more than double shear.

2. In a blade mounting, a blade forming an interleaving joint with a blade carrying element, said joint consisting in part in a single tongue and groove joint and in part in a multiple tongue and groove joint, and rivets passed through both the single and the multiple tongue and groove joints.

3. A blade mounting comprising a blade forming a multiple tongue and groove joint with a blade carrying element, and rivets in different degrees of multiple shear for securing said blade to said blade carrying element.

4. A blade mounting for turbines or similar machines, comprising a blade mounting element, a blade having a mounting portion forming a tongue and groove connection with said element, the length of the tongues being such that rivets passed through the connection pass through different numbers of tongues, and rivets passing transversely through the connection.

5. A blade mounting comprising a blade shank forming a multiple tongue and groove joint with a blade carrying element, the lengths of the tongues being such that rivets passed through the joint at varying distances from the edge of the blade carrying element pass through a different number of tongues.

6. A blade mounting comprising a blade forming a multiple tongue and groove joint with a blade carrying element, and rivets in more than double shear for securing the blade in place.

7. In a blade mounting, a joint between a blade and a blade carrying element in which the cross-sectional area of the metal in each member of the joint increases from a relatively small amount at the extremities of the members to substantially fifty per

cent. of the total cross-sectional area in each member near the center of the joint, and finally to substantially the full width of the joint, in each member at the point therein adjacent to the extremity of the other member.

In testimony whereof, I have hereunto subscribed my name this 30th day of March, 1917.

HENRY F. SCHMIDT.

Witnesses:
C. W. McGHEE,
M. B. GORDON.