C. A. PARSONS, S. S. COOK & L. M. DOUGLAS.

BLADE SHROUDING FOR STEAM TURBINES.

APPLICATION FILED MAR. 1, 1917.

1,276,405.

Patented Aug. 20, 1918.

2 SHEETS—SHEET 1.

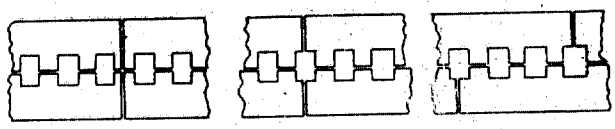


Fig.8. Fig.9. Fig.10.

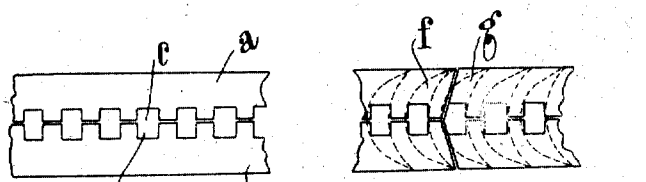


Fig.6. Fig.7.

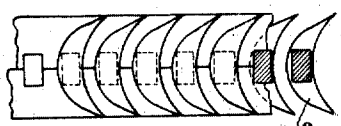


Fig.3.



Fig.4.



Fig.5.

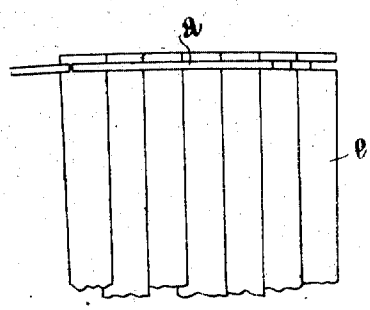


Fig.2.

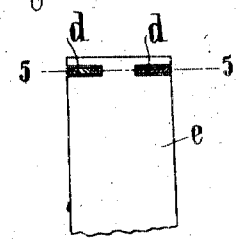


Fig.1.

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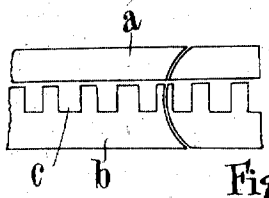
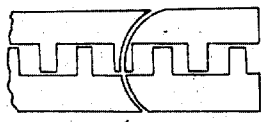


Fig. 11.


Fig. 12.

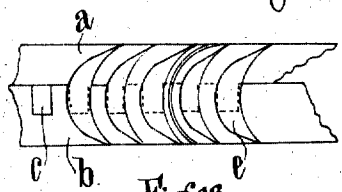


Fig. 13.

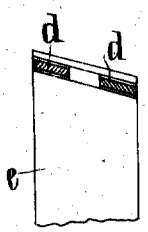


Fig. 18.

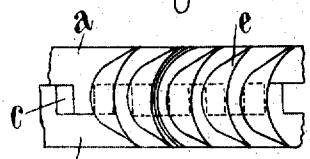


Fig. 14.

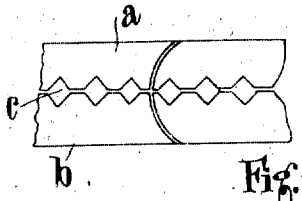


Fig. 15.

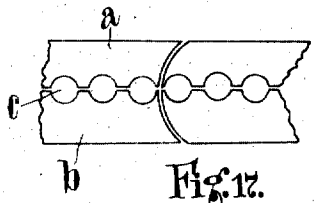


Fig. 17.

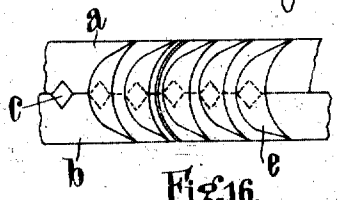


Fig. 16.

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UNITED STATES PATENT OFFICE.

CHARLES ALGERNON PARSONS, STANLEY SMITH COOK, AND LOUIS MORTIMER DOUGLAS, OF WALLSEND, ENGLAND; SAID COOK AND SAID DOUGLAS ASSIGNORS TO SAID PARSONS.

BLADE-SHROUDING FOR STEAM-TURBINES.

1,276,405. Specification of Letters Patent. Patented Aug. 20, 1918.

Application filed March 1, 1917. Serial No. 151,801.

To all whom it may concern:

Be it known that we, CHARLES ALGERNON PARSONS, STANLEY SMITH COOK, and LOUIS MORTIMER DOUGLAS, subjects of the King of Great Britain and Ireland, residing at Turbinia Works, Wallsend-on-Tyne, in the county of Northumberland, England, have invented certain new and useful Improved Blade-Shroudings for Steam-Turbines, of which the following is a specification.

The present invention relates to blade shrouding for steam turbines and has for its object to construct this shrouding and attach it to the blades in such a manner that freedom for expansion of the section of the shrouding is allowed for while all riveting or calking for fixing the shrouding is dispensed with.

Referring to the accompanying drawings:

Figure 1 is an end elevation for a blade with a shroud shown in section.

Fig. 2 is a side elevation of several blades with the shroud attached, while

Fig. 3 is a plan of several blades with the shroud in position.

Fig. 4 shows the end view of a blade machined for shrouding, while

Fig. 5 is a section on the line 5—5, Fig. 1.

Fig. 6 shows the sections of shrouds ready for insertion, while

Figs. 7, 8, 9, 10, 11, 12, 13, and 14, show alternative methods of making the joints at the ends of the section of shroud strip.

Figs. 15 and 16 show diamond-shaped necks on the blades instead of rectangular necks.

Fig. 17 shows circular necks.

Fig. 18 is an example of the shroud applied to blades with diverging radial passages.

In the form illustrated in Figs. 1 to 7, the shroud is made up of short sections, the whole width of the shroud being split longitudinally into two symmetrical pieces *a*, *b*. Notches *c*, *c* are cut on the inner edge of each half of the shroud as illustrated clearly in Fig. 6. Notches *d*, *d*, are also cut on the two sides of each blade *e* close to their ends as shown clearly in Figs. 1 and 5. The split shroud is then assembled on the blade ends as shown at Figs. 2 and 3, the notches in the blades allowing the two parts of the shroud to be brought together in their correct position. The whole is then fastened together by soldering the shroud to the blades and preferably by soldering together the longitudinal edges of the two parts of the shrouds. We use the term "soldering" herein in its common meaning of securing the parts together by the use of another metal as flux, the present invention relating especially to turbines of the type now generally used, in which the blades and shroud are made of brass or similar non-corrosive metal with a steel rotor and casing and with such brass blades and shroud we preferably use silver solder. We prefer to make the shroud strips in short lengths, which are quite free from each other, so as to provide for unequal expansion. This provision is important where the blades and shroud are made of brass or similar material having a different co-efficient of expansion from the rotor or casing, especially when liable to be subjected to the high temperatures of superheated or high pressure steam. The ends of the sections of the shroud may be of the V-shape form shown in Fig. 7, or of either of the forms shown in Figs. 8, 9 and 10. We prefer, however, the method of jointing shown in Fig. 7 in which the sections attached to the blade *f* have no contact with the sections attached to the blade *g*, so that freedom for expansion of the sections is allowed.

Figs. 11, 12, 13 and 14 show two other methods of dividing the shroud while still retaining the rectangular neck on the blades.

Figs. 15 and 16 show an example in which the blades have diamond-shaped necks, suitable grooves to fit these necks being cut in the shrouds.

Fig. 17 shows a modification in which the necks of the blades are circular, while Fig. 18 is a view similar to Fig. 1 showing the shroud applied to blades with diverging radial passages.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. Blade shrouding for steam turbines comprising in combination turbine blades, oppositely disposed notches toward the ends of said blades, a longitudinally divided shroud strip, notches in said shroud strip the two parts of said strip being disposed on each side of said blades in said notches in said blades, said shrouding being secured

rigidly to the blades constructed in sections the ends of adjacent sections not abutting against nor attached to each other and not abutting against nor attached to the blades to which the adjacent sections are attached.

2. Blade shrouding for steam turbines comprising in combination turbine blades, oppositely disposed notches toward the ends of said blades, a longitudinally divided shroud strip, notches in said shroud strip the two parts of said strip being disposed on each side of said blades in said notches in said blades, said shrouding being soldered to the blades and constructed in sections, the ends of adjacent sections not abutting against nor attached to each other and not abutting against nor attached to the blades to which the adjacent sections are soldered.

3. Blade shrouding for steam turbines comprising in combination turbine blades, oppositely disposed notches toward the ends of said blades, a longitudinally divided shroud strip, notches in said shroud strip the two parts of said strip being disposed on each side of said blades in said notches in said blades, said shrouding being soldered to said blades.

4. Blade shrouding for steam turbines comprising in combination turbine blades, oppositely disposed notches near the outwardly projected ends of said blades, a shroud strip divided into several circumferential lengths or sections each longitudinally divided into two half sections with the longitudinal division edges shaped to fit around said blades in way of said notches, said shroud strip being soldered to the blades and the half sections of said strip being disposed on opposite sides of said blades in said notches and the ends of adjacent sections not abutting against nor attached to each other and not abutting against nor attached to the blades to which the adjacent sections are soldered.

5. Blade shrouding for steam turbines comprising in combination turbine blades, oppositely disposed notches near the outwardly projected ends of said blades, a shroud strip longitudinally divided into two half sections with the longitudinal division edges shaped to fit around said blades in way of said notches, the half sections of said strip being disposed on opposite sides of said blades in said notches said shrouding being soldered to said blades.

6. Blade shrouding for steam turbines comprising in combination turbine blades, oppositely disposed notches near the outwardly projected ends of said blades, a shroud strip divided into several circumferential lengths or sections, each longitudinally divided into two half sections with the longitudinal division edges shaped to fit around said blades in way of the said notches, the half sections of said strip being disposed on opposite sides of said blades in said notches, said shrouding being soldered along the longitudinal joints and also soldered to said blades.

7. Blade shrouding for steam turbines comprising in combination turbine blades, oppositely disposed notches near the outwardly projected ends of said blades, a shroud strip divided into several circumferential lengths or sections, each longitudinally divided into two half sections with the longitudinal division edges shaped to fit around said blades in way of said notches, the half-sections of said strip being disposed on opposite sides of said blades in said notches, said half sections being placed in pairs in said notches, each pair being oppositely disposed and soldered to each other along the longitudinal division and also soldered to said blades, the ends of the sections not abutting against nor attached to the ends of adjacent sections and not abutting against nor attached to the blades to which the adjacent sections are soldered.

In testimony whereof, we have affixed our signatures.

CHARLES ALGERNON PARSONS.
STANLEY SMITH COOK.
LOUIS MORTIMER DOUGLAS.