AN AMERICAN MODIFICATION OF THE PARSONS STEAM TURBINE.

The steam turbine recently installed by the Allis-Chalmers Company at Utica, N. Y., for the Utica Gas and Electric Company, has aroused a great deal of interest. The turbine is rated at 1,500 kilowatts normal load, and is direct-coupled to a two-phase, sixty-cycle, revolving field alternator, which it drives at a speed of 1,800 revolutions per minute. The interest in the new turbine is due not to any new principle of operation, for in this respect it closely follows the Parsons type, but rather to certain constructional features which mark a distinct advance in turbine building. The improvements relate particularly to the manner of assembling the blades and securing them to the cylinder and spindle, also to the novel method of reinforcing and protecting the tips of the blades.

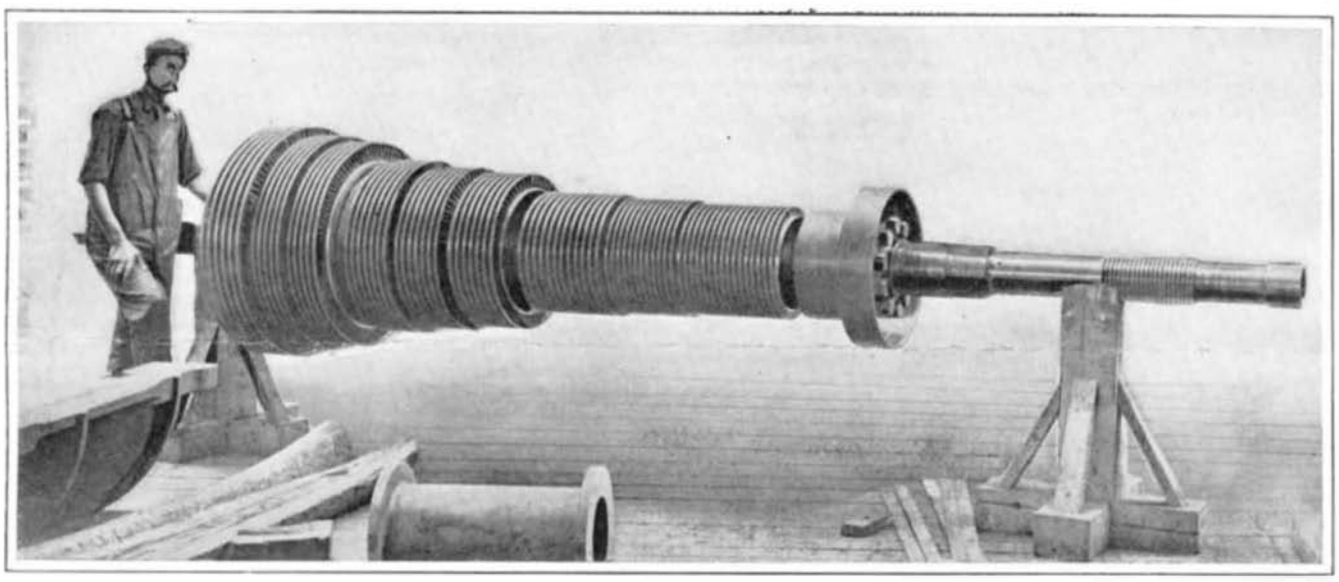
One of our illustrations is a section taken through a portion of the cylinder and spindle showing the blading construction. The blades are formed with dovetailed roots, which are fitted into slots cut in base rings. These rings are also of dovetail shape in cross-section, and are inserted in dovetailed slots cut in the cylinder and spindle respectively, and are secured by key rings in the manner of a lewis bolt. To hold the key rings in place, the slots are undercut, and after the key rings have been driven into position, they are upset into the undercut grooves. The tips of the blades are reinforced by shroud rings of channel form. The blades are secured to these rings by means of shouldered projections, which are inserted in slots in the rings and riveted over. The slots are uniformly spaced and formed at an angle to position the blades at the proper working pitch. All of these operations are performed by machinery, insuring an absolute uniformity of blading. The shroud rings, aside from bracing the ends of the blades and preventing any individual blade from working loose, serve also to prevent stripping of the blades in case of contact between rotating and stationary parts. This has been one of the chief difficulties encountered in previous constructions, a difficulty which inventors have long been striving to overcome. The use of shroud rings also permits a much smaller working clearance, reducing loss by leakage of steam past the ends of the blades, a loss which has been very serious in previous constructions.

The blading is assembled in half rings, and carefully tested before being set in position in the turbine. The outwardly-projecting flanges are then turned and bored to provide the necessary working clearance. Owing to their channel form, the shroud rings afford ample stiffness to the construction. Yet the flanges are quite thin, so that if for any reason one of the moving shroud rings on the spindle should come into contact with the stationary cylinder, or if one of the stationary rings on the cylinder should accidentally touch the moving spindle, the friction would not develop a dangerous degree of heat.

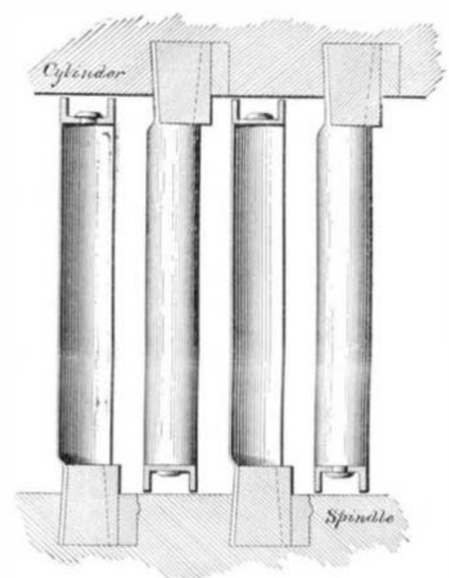
The criticism of this method of blading has been made that the blades are weakened at the root, owing to the dovetail formation. In answer to this, it is claimed that while the cross-sectional area at this point is slightly less than the normal section of the blade, yet owing to its shape the blade is really stronger at the root to resist cross breakage than elsewhere. An accident recently occurred at the West Allis shops which served to show the strength of the turbine blading. A turbine spindle with blades assembled was put into a lathe for the purpose of turning off the shroud rings to give the necessary working clearance, as well as to smooth up the key rings which hold the blading in the dovetail grooves. The workman who was running the tool down between two rows of blades accidentally moved the tool rest too far, so that the back of the tool ran into one of the rows of blades. As a result the blades simply bent over as far as the lathe tool could push them, and the channel shroud ring was distorted by reason of its fastening to the blades, but not a single blade pulled out or broke off at the root, and not a single blade pulled out of the shroud ring or even broke off at that point, where the cross section is less than one-third of the cross section of the root. It was necessary to cut away the shroud ring with a hacksaw before the blades could be removed for the purpose of inserting new ones.

Another feature of this turbine which is likely to arrest attention is the fact that only two balancing pistons are shown. These may be seen at the high-pressure end of the spindle. In previous constructions of this type three pistons are used. As a matter of fact, there are three pistons in the present construction, the third one being applied at the low-pressure end, and being concealed in our photograph behind the large end of the spindle. The advantage of applying the piston at this point is that it relieves the shaft of undue tension, for it will be evident that the greatest axial pressure on the spindle is exerted at the low-pressure end. The piston can also be made smaller than in previous constructions. Instead of using "dummy packing" on these pistons, a packing of radial baffling type has been adopted. That is, the peripheries of the pistons are grooved, and fit into grooved bearings in the cylinder casing. In this manner small axial clearance in the turbine is eliminated.

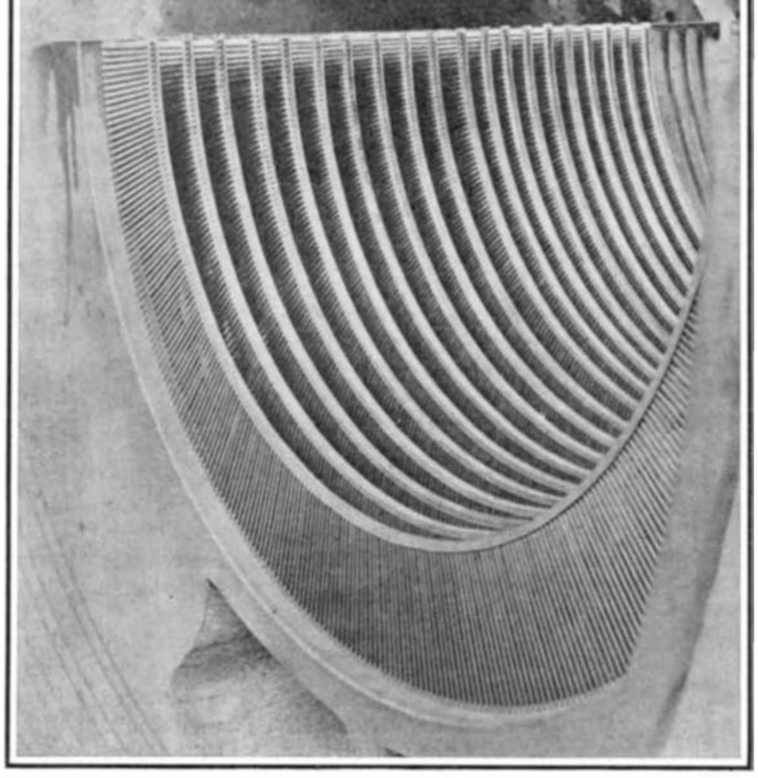
A Portion of the Spindle, Showing the Blading.



The Spindle of the Allis-Chalmers Turbine.



Section Showing the Blading Construction.



Lower Half of the Cylinder, Showing the Blading.

AN AMERICAN MODIFICATION OF THE PARSONS STEAM TURBINE.

Rubber from Bark.

The new processes of extracting rubber from the bark of the plant are attracting some attention. In France, Henri Jumelle succeeded in producing rubber and gutta percha from the plant known as *Mascarenhasia longifolia*. Different methods are used, among which he employs the Deiss process. This consists in grinding up the bark and pounding it in a mortar, leaving it for seven days in half a gallon of sulphuric acid for one pound of bark. The black mass which is formed is washed, and the separation of the rubber from the disaggregated bark is carried out in a roller machine having wood rollers between which passes a stream of hot water. A better method is to pound up the acid paste so as to obtain the rubber more quickly, washing the paste then in a continuous stream of cold water. The rubber which is set free is pressed together in the roller machine and left in the air for twenty-four hours. In this way we obtain 6.20 grammes (about 100 grains) of rubber per pound of bark. Another process consists of grinding and pounding up the dry bark, and the powder which falls at first from the sieve does not contain any rubber. What remains on the sieve is again beaten up and agglutinated in hot water. The paste is triturated by hand and at the end of four hours the rubber is separated. Its color is lighter than the above. The Hamet process consists in leaving the crushed bark for two hours in a tight boiler in a 15 per cent soda solution at 130 deg. C. A black paste is formed which is well agglutinated and the rubber separates out in a few minutes by washing in cold water. It is a grayish-brown, but blackens upon drying. It appears that by the above processes we can obtain some 4 or 5 per cent of commercial rubber from the bark of the plant.

It is not practicable to prevent the smoke evil entirely, but only to mitigate it in a degree. Smoke burning, on the other hand, is an impossibility under the conditions which usually present themselves.