

# The Canadian Engineer

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## HYDRAULIC TURBINE DESIGN.

The recent failures of water-wheel casings, as a result of which great damage was done to the power houses and electrical equipment, bring to mind the fact that water-wheel design is as yet in an elementary condition as regards the handling of certain features by the hydraulic engineer. The failures in question and the attendant results were caused by the breaking of the wheel casings. There is little excuse for failures of this nature with the present state of hydraulic theory and structural design.

A few years ago failures of this nature rarely occurred. Now, however, they are becoming increasingly frequent in number. The reason for this increase is hard to see, for the theory of turbine design has advanced very rapidly, until now we have reached a state of near perfection with regard to efficiencies, etc. Likewise, our knowledge of the strength of materials and the stresses induced has developed. Too little account, however, is paid by the manufacturer of hydraulic turbines and the hydraulic engineer to the new conditions which have arisen in connection with water-power development. Many plants are being installed having long penstocks, and these inevitably cause trouble unless handled properly. The difficulties of regulation caused by long feeder penstocks are hard to deal with, and as a result the manufacturer and the engineer have left the question to solve itself. Many plants are now struggling along with practically no regulation on account of the above. Difficulties other than regulation are liable to develop as in the above noted failures. The vibrations and oscillations set up in the penstocks as a result of change of load, or load thrown off, induce excessive pressures in the penstocks and wheel casings. When no account of such excessive pressures is taken, or means furnished to relieve the condition by the installation of relief valves, bursting plates or standpipes, trouble will certainly develop.

In a design which came to the writer's attention recently a small bursting plate was placed at the lower end of a penstock 1,500 feet long, and this was the only provision made for safeguarding the penstock and wheel casing. The specifications for the water-wheel governors did not state the minimum time allowed for full closure of the gates. On investigation it was found that the governors would have to be set for minimum time closure of eight seconds to ensure safety to the penstock. With conditions such as these, is it any wonder that the failures of wheel casings are increasing?

In order to prevent serious criticism, hydraulic engineers must pay more attention to this feature of power plant design. It is often cheaper and easier to neglect the regulation side of the design, but it will be usually found that such neglect is very costly in the end to the power plant owner as well as to the reputation of the engineer.

## WATERPROOFING OF CONCRETE.

The waterproofing of concrete has become very important on account of its widespread use in building and engineering construction. For some time the opinion of engineers who have paid some attention to this phase of Portland cement and concrete has been that little benefit is gained by using the waterproofing mediums now sold on the market. It has been stated by the manufacturers that the use of these so-called integral waterproofing compounds would procure an impermeable con-