A NEW TYPE OF WATER TURBINE CHAMBER.

At low-head developments it is a common occurrence that during periods of floods the tail race water level raises to a considerable height and the endeavor of the designers of water turbine plants has been to place the electrical machinery and the power house floor above the highest tail



water level experienced. In order to accomplish this use has been made of the arrangement with vertical shaft, whereby it is possible to place the generator at any height above the water level by only lengthening the shaft. However, this arrangement with vertical shaft has various well-known drawbacks as the accessibility of the turbine suffers greatly, and

the dismantling of same is very complicated and requires a long time. The desirability of being able to install at low heads, as above described, horizontally arranged water turbines led the firm of Escher Wyss & Company to the design of a turbine chamber with artificially raised head water level.

In order to ensure proper working of water turbines installed in open water chamber, it is necessary that the turbine be submerged to a certain extent so as to prevent any air from entering the machine, whereby the efficiency and the power would be decreased considerably.

The above mentioned arrangement, with artificially raised water level enables the designer to place the upper edge of the turbine (no matter if the shaft is arranged horizontally or vertically) slightly below the head water level. The advantages of thus placing the machine as much elevated above the tail water (of course within the possibility of proper suction) is: Firstly, that the

direct coupled generator may be located considerably higher above tail water level than previously was possible, and secondly, that the excavation required for the tail race canal, and consequently the expense is reduced to a great extent. It goes without saying that the same advantage is gained if the turbine is of the vertical or horizontal type. This method of artificially raising the head water level is of late very often adopted, and in special cases with the greatest advantage. The patent for this arrangement has been taken out by Escher Wyss & Company in most countries, and the demand for this kind of installations has increased very rapidly, so that quite a number of plants of this type are in operation at the present time. The raising

> of the head water level may be effected in different ways. Reference is directed to the illustrations, Figs. 1 and 2. There will be observed that the wheel pit is covered by a concrete roof, which is made air-tight. By sucking the air which remains between the head water level and the concrete roof the water level is raised gradually until the whole wheel pit is completely filled with water.

> There are two different methods of obtaining this. The first method works automatically in the following way: As soon as the turbines open the water discharges through same and sucks through the pipes "D" attached to the draft chest, the air, thereby gradually the water (of course within the possibility of whole chamber is filled. As soon as the chamber is full an automatic float valve closes the pipes "D" so that no more water is discharged through the draft chest and consequently very little water is actually wasted. The other method

consists of a separate connection between the water chamber and the draft tube, which is opened by hand, and discharges the water through same continuously during the operation of the turbine. In consequence, this quantity of water is wasted.

With the first method the turbine has to be put in operation before the wheel chamber is being filled and the level



raised. With the second method the wheel chamber might be filled and the head water level raised before the turbines are opened and put in operation. Fig. 2 depicts a similar arrangement adapted to a vertical turbine installation.

Fig. 3 shows a cross section of such a water chamber with the turbine units erected. The automatic air sucking