Should, however, a wreckage guard subsequently prove necessary, there will be no trouble in attaching one. The inlet openings can be closed by a form of sluice, consisting of loose doors, about 4 m. (13 ft. 2 in.) wide. The fixing and removal of these sluices, as well as of the steel tube-pins, is effected by means of a portable crane on wheels. The intake is calculated for a volume of water of 350 cub. m. (12,600 cub. ft.) per second, which volume, in all probability, after the regulation of Lake Vänern, may be reckoned as available for power purposes under all circumstances throughout the 24 hours. The speed of the water at the inlet is about 1 metre (3 ft. 3 in.) per second. The intake canal is about 1,300 m. (1,418 yards) long, and through its entire length is blasted in rock or lined with brickwork. The portion nearest the intake is proportioned for the same volume of water as the inlet, or 350 cub. m. (12,600 cub. ft.) per second. About 350 m. (1,148 ft.) from the intake the section of the canal is reduced so as to correspond with a volume of 250 cub. m. (9,000 cub. ft.) per second. When the regulation of the Vänern has been completed, another canal, of 100 cub. m. (3,600 cub. ft.) of water per second,

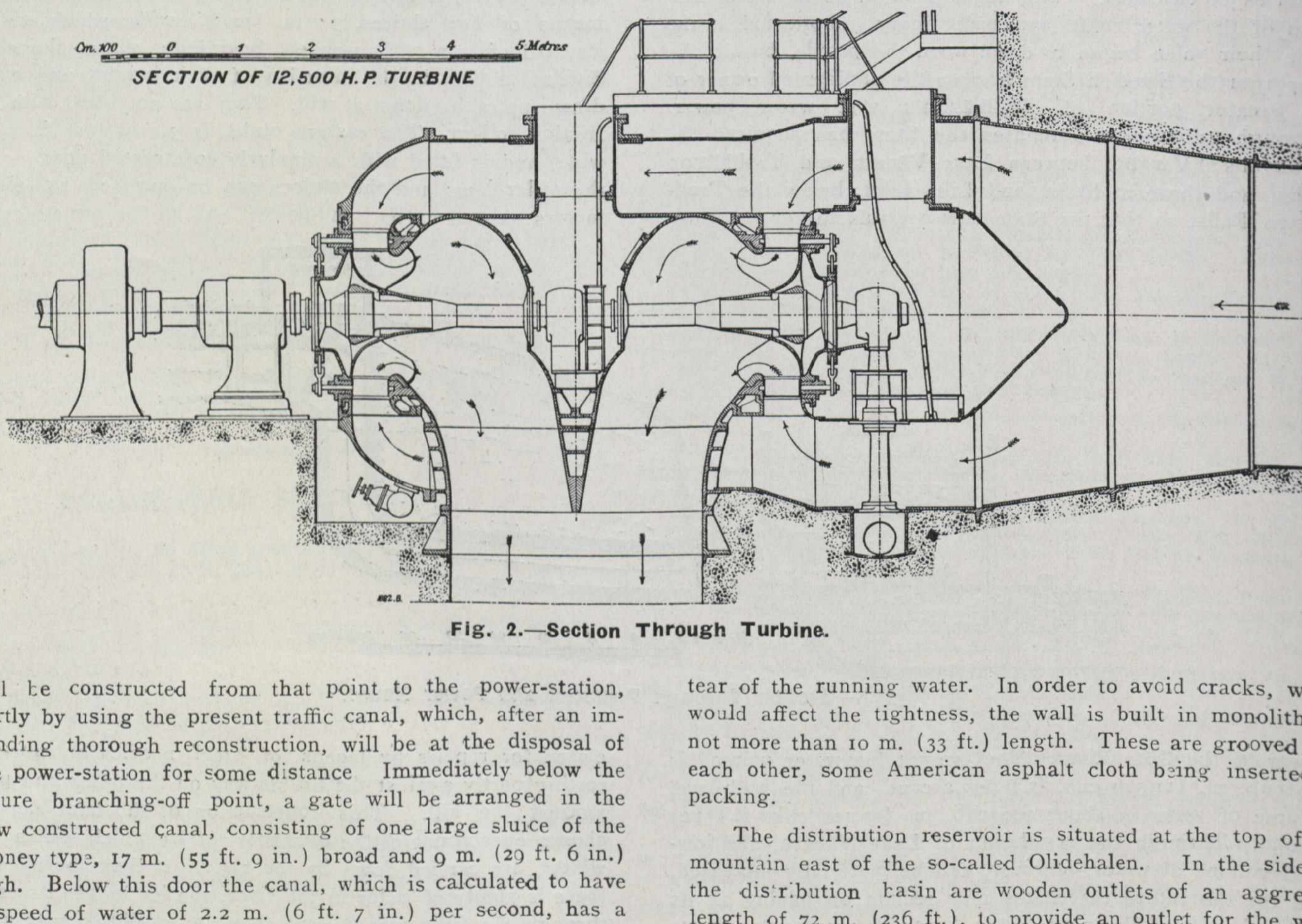

Fig. 2.—Section Through Turbine.

will be constructed from that point to the power-station, partly by using the present traffic canal, which, after an impending thorough reconstruction, will be at the disposal of the power-station for some distance Immediately below the future branching-off point, a gate will be arranged in the now constructed canal, consisting of one large sluice of the Stoney type, 17 m. (55 ft. 9 in.) broad and 9 m. (29 ft. 6 in.) high. Below this door the canal, which is calculated to have a speed of water of 2.2 m. (6 ft. 7 in.) per second, has a sectional area of 114 sq. m. (1,225 sq. ft.) below low water. The form of the section, however, is somewhat variable; generally it is shaped with the view of obtaining a maximum of hydraulic average depth, corresponding to a bottom breadth of 14.2 m. (46 ft. 6 in.) and a depth of 7.7 m. (25 ft. 3 in.); but for a portion, where space is very limited and the natural rock surface is high, the bottom width has been re- (33 ft.). The change from one section to another takes place duced to 10.5 m. (34½ ft.), with a depth of water of 10 m. gradually, whereby the formation of whirlpools is avoided.

At the deepest point of the canal is a discharge opening, which is closed by means of a tightly fitting door. The latter portion of the intake canal, over a distance of about 35 m. (115 ft.), has smooth vertical sides, faced with bricks below the water, and with heavy granite at the water-line. When the turbines were tested, the measurement of the water-flow was taken by means of the well-known method invented by Professor E. Anderson, of Stockholm. Three bridges lead across the canal, two of which are iron bridges, and the third of reinforced concrete. The canal walls are partly built of granite in cement up to a height of from 6 m. to 7 m. (20 ft. to 23 ft.), and partly of concrete at greater heights than 7 m. (23 ft.). The concrete walls are made of concrete of the following mixture:—1 cement, 5 sand. 7 stone. Nearest the rock, however, there is a layer of a mixture of 1 cement and 1 sand, and then a 10-cm. (4 in.) layer of fat concrete (1 cement, 2½ sand, 2½ broken stone), and outside this cement rendering up to 4 m. (13 ft. 2 in.) from the top of the wall. Behind the tight surface of the wall are inserted 50-mm. (2-in.) brick drain-pipes at 0.5 m. (1 ft. 7½ in.) distance from each other, besides requisite collecting-pipes, so that the wall will not be subjected to water pressure from below. The surface, by means of a 0.5-m. (1-ft. 7½-in.) coating of stone set in cement, is protected against the wear and tear of the running water. In order to avoid cracks, which would affect the tightness, the wall is built in monoliths of not more than 10 m. (33 ft.) length. These are grooved into each other, some American asphalt cloth being inserted as packing.

The distribution reservoir is situated at the top of the mountain east of the so-called Olidehalen. In the sides of the distribution basin are wooden outlets of an aggregate length of 72 m. (236 ft.), to provide an outlet for the water flowing through the canal, and thus to prevent an inundation of the power-station, in case the majority of the turbine regulators should be simultaneously closed. The water is led in tunnels from the above-mentioned outlets into the river. Besides the inlets to the conduits there is further an ice-escape at each end of the distribution reservoir. The doors and the guards in front of the conduit inlets are under cover of a building constructed of granite and concrete. A separate tube leads to each turbine, proceeding from a separate chamber, with a double closing arrangement. Within the chamber is the ice-guard, which, if the chamber be closed, can be cleaned independently of the other guards. The sluice of the Stoney type has a width of 8 m. (26 ft. 3 in.) and is