

Chemical Examination—

1. Ammonia, free, expressed as nitrogen056
2. Ammonia albumenoid, expressed as nitrogen07
3. Nitrates, expressed as nitrogen06
4. Nitrites	None
5. Chlorine	3.24
6. Hardness, total, expressed as CaO	2.20
7. Hardness, permanent	1.40
8. Hardness, temporary80
9. Oxygen consumed, 4 hours at 37° C.	2.7
10. Oxygen consumed, 3 minutes at 37° C.4
11. Solids, total	18
12. Solids, volatile	8
13. Solids, fixed	10
14. Poisonous metals	None

Microscopic Examination—

Vegetable fibres and crystalline matter.

Biological Examination—

Number of bacteria per c.c.	30.
Presumptive test for color bacilli	Negative

Samples of water have been carefully analyzed fortnightly during the past four years, and the number of bacteria per c.c. has varied from 15 to 100, but has averaged throughout the whole period of the work about 40 or 50 per c.c. In spite of the fact that over 800 men were employed upon the works, of whom nearly 600 were employed on lake clearing alone during some months, no

The pipe lines, of which there are three, are connected to the surge tank by means of reinforced plates. The upper ends of the pipes project into the surge tank, and are each provided with a bell-mouth, thus minimizing entrance losses. The pipes are 8 ft. 6 in. diameter and $\frac{1}{2}$ in. thick at their upper ends, and taper to 7 ft. diameter at the power house, where the thickness is $1\frac{1}{8}$ in. About 200 ft. from the power house the pipe lines pass into tunnels driven through rock, which is badly fissured. The slopes range from 28 to 53 degrees. A short distance below the surge tank, a Doble venturi butterfly valve is provided on each pipe line.

The power house building (Fig. 10) is of reinforced concrete construction, and is founded throughout on solid rock. On the main floor, 5 ft. above high-water mark, three hydro-electric units of a combined capacity of 40,500 h.p. have been installed. Each unit consists of one Dick Kerr 8,900-k.v.a., 3-phase, 60-cycle alternator, generating current at 2,200 volts, direct-driven at a speed of 200 r.p.m. by four Pelton-Doble water-wheels of the impulse type, the combined capacity of which is 13,500 h.p. The rotor of the alternator and the four water-wheels are all pressed onto a hollow nickel steel shaft 51 ft. 3 ins. long, and operated in one piece.

At the power house each pipe line divides into four branches, each branch supplying water to one wheel of the unit. On each branch a Doble hydraulically operated gate valve is provided, which controls the admission of

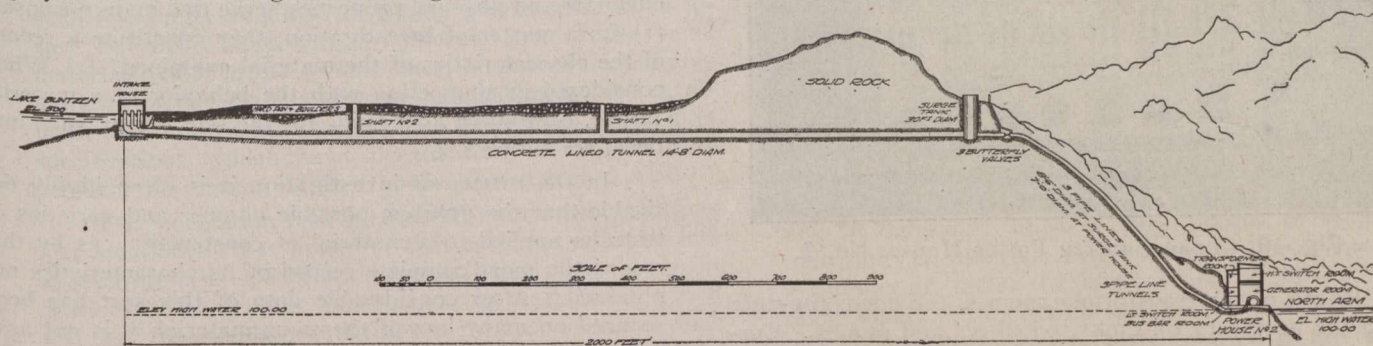


Fig. 9.—Lake Buntzen Power Development, Profile of Tunnel, Penstocks, Etc., of Plant No. 2.

pathogenic organisms were discovered at any time, a result due to the very careful sanitary precautions which were taken in connection with the construction of the works.

Power Plant No. 2, Lake Buntzen.—Owing to the fact that suitable foundations could not be obtained for extending the existing power house of a sufficient size to contain the new units, a new site was decided upon about 2,000 feet south of the existing power house No. 1, and there a new and independent plant has been constructed. The essential features of this new plant are shown in Fig. 9.

Water is obtained from Lake Buntzen through a concrete-lined tunnel 14 ft. 8 ins. internal diameter, and about 1,800 ft. long, driven through solid rock.

At the upper end of the tunnel three 6½-ft. Doble intake valves are provided, which are operated by oil pressure.

In order that better speed regulation of the machines may be obtained, and that the effects of water in the pipe lines, due to sudden changes of load may be reduced, a surge tank is provided at the tunnel portal. This surge tank is 30 ft. in diameter and about 90 ft. high, and is built of riveted steel plates.

water to two needle nozzles, which direct the water to the buckets of each wheel.

The speed regulation of each unit is controlled by a Lombard governor, and two improved relief nozzles, which are controlled by the governor, are provided on each unit.

For excitation purposes, three 300-h.p. exciter units are provided. Each exciter unit is composed of a Dick Kerr induction motor generator set, direct-driven by two Pelton-Doble water-wheels mounted on the end of the shaft. The speed of the exciters is 600 r.p.m.

The excitation voltage is 250, and the voltage regulation on the A.C. bus bars is controlled by Tirrell regulators.

Owing to the great size and weight of some parts of the units, two 50-ton electrically operated travelling cranes are provided. These cranes control the entire length of the main generator room.

Immediately above the generator room is located the high-tension switch room, which also contains lightning arresters, etc. The high-tension switches are of the C.G.E. K-15 type, and are suitable for 60,000 volts. The lightning arresters are of the 4-tank electrolytic type.