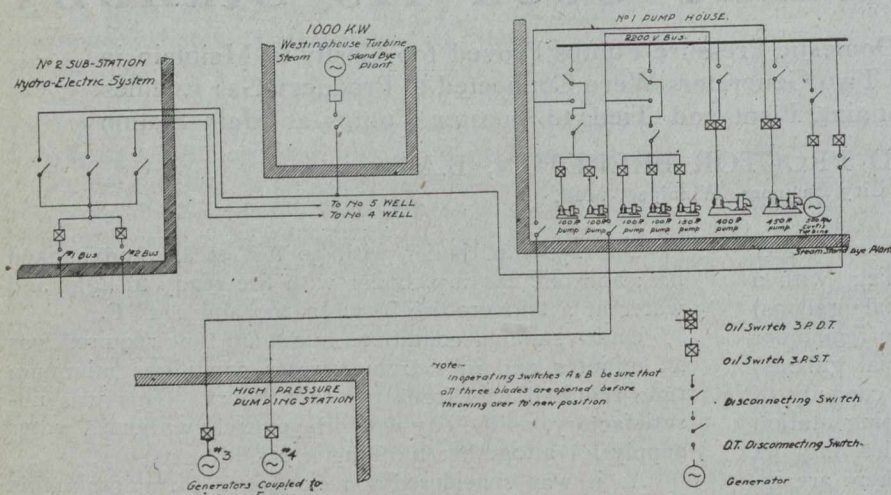


By installing a generator to each gas engine, and connecting to pumps in the booster station described above, the pumps can be operated within the length of time required to bring the gas engines up to speed. Allowing for delays in telephoning instructions, releasing the friction clutch, etc., the operation can be completed in less than five minutes.

Owing to the difficulty in trying to operate the engines in synchronism, separate wires were run from each generator to each pump or pumps.



Line Diagram for 2,200 Volt Switches for Winnipeg Hydro-Electric System, Showing How Generators at High Pressure Station are Tied to Main Pumping Station

Two of the larger units are at present electrified, giving sufficient power to operate pumps having a total capacity of 10 million Imperial gallons per 24 hours. It is considered that this will give sufficient water under the circumstances to cope with any fire which may be ex-

One 450 kw., Bullock, 2,400 volts, 108 amps., 150 r.p.m.

Both are 3-phase, 60 cycles.

The first is belted to the engine shaft by means of a Renold silent chain drive of three strands, each $10\frac{1}{2}$ ins. wide with a circumferential pitch of $1\frac{3}{4}$ ins. The triple pinion is 12.60 ins. diameter by 34 ins. face, with 23 teeth, and the triple sprocket is 32.35 ins. diameter and 34 ins. face, with 58 teeth.

The engine shaft is extended through a cast steel jaw clutch, half of which is keyed to the 22-in. extension above referred to. The clutch is operated by hand wheel through suitable reduction. This shaft is $12\frac{1}{2}$ ins. diameter by 10 ft. 1 in. long, and is provided with two outboard ring oil, brass-lined, heavy bearings, each 22 ins. long, of a pattern identically similar to the outboard bearings on the original engine shaft for the pump drive. The generator shaft is extended to a length of 8 ft. 9 ins. and has a diameter of 6 ins., with two suitable heavy ring oil, brass-lined outboard bearings, each 21 ins. long. The two shafts are on 5-ft.-6-ft. $\frac{5}{16}$ -in. centres.

The second is belted to the engine shaft by means of a two-ply leather belt, 41 ins. wide. The driving pulley is 6 ft. 6 ins. diameter by 44 ins. wide, and the driven 5 ft. $2\frac{3}{8}$ ins. diameter by 44 ins. wide. The engine shaft is extended as in the first instance, is the same diameter, and extended a length of 13 ft. 0 in. The generator shaft is 15 ft. 8 ins. long and $12\frac{1}{2}$ ins. diameter. The outboard bearings are exactly similar to those on the engine shaft. The two shafts are on 38-ft. $4\frac{1}{2}$ -in. centres. An idler pulley with



Shaft Extension to Gas Engine, For Driving Belted Unit.
Photo, July 26th, 1917

pected, and by the use of the fire department's pumping engines, the pressure on the mains may be lowered with a resultant increase in the water supply. There is ample power to handle this extra load on the motors.

Second-hand generators were obtained, the particulars of which are as follows:—

One 350 kw., C.G.E., 2,300 volts, 88 amps., 300 r.p.m.



High Speed Generator Unit With Silent Chain Drive.
Photo, July 26th, 1917

suitable means for adjustment is also provided for adjusting the tension of the belt.

The arrangements of the two units in the above manner was decided upon because the 300 r.p.m. generator, the 41-in. leather belt, and the idler pulley were all on hand.

To connect the 300 r.p.m. generator by leather belt