bays at 25-ft. centres. Two electric cranes, one of them of 120 tons capacity, and equipped with 50-ton trolleys, operate over the entire shop. Another electric crane operates to and fro between the erecting shop and the blacksmith and machine shops which parallel it on either side. There are two machine shops, each 778 ft. long and 60 ft. 9 in. wide. One of these contains the heavier machine tools, while in the other is located the lighter machines. Each is furnished with a high-speed crane. The blacksmith shop is on the opposite side of the erecting shop and consists of two bays, each 332 ft. long, with widths of 60 ft. 9 in. and 50 ft. respectively. Jib cranes handle the material here from the steam hammers, forgings, etc. Alongside this shop are the furnaces, bolt headers and other blacksmith shop machinery. The boiler shop is 352 ft. long, being of the same width as the blacksmith shop and in line with it adjacent to the erecting shop. It is equipped with a 40-ton travelling crane, and several 20-ton trolleys. It has several bays devoted to flue shop and boiler shop tools attended by trolley and jib cranes.

These departments are all housed in a structural steel frame building on concrete foundations. The problems of ventilation and natural lighting were well looked after in the design, with roof monitors, skylights, and swinging sash.

The tender and wheel shop is also of structural steel frame, but with steel roof trusses. It is an L-shaped structure, 80 ft. wide, with lengths of 263 ft. and 180 ft. respectively.

It is equipped with longitudinal tracks of 20-ft. centres, and with a 20-ton high-speed crane. Here repairs are made to locomotive tenders, steam shovels, and maintenance-of-way equipment. The wheel section is provided with steel-tire wheel lathes and other wheel tools.

The pattern shop is 162 ft. long by 31 ft. wide, similarly constructed of steel with concrete foundation. The grey iron foundry building is 203 ft. long by 80 ft. wide, constructed with two bays. The coach repair shop, 362 ft. long and 146 ft. wide, is furnished with 15 tracks at 24-ft. centres. It is of hollow tile construction on concrete foundation. The freight repair shop, 303 ft. by 231 ft., has eight repair tracks arranged in pairs with service tracks between. The blacksmith shop, forges, etc., are situated along one side, in separate rooms.

There is, in addition, a 303 x 80-ft. wood planing mill, a 350 x 90-ft. material platform, a 252 x 60-ft. office building, a boiler house with water tube boilers aggregating 21,000 h.p. in units of 350 h.p. each, set in three batteries of two each. There is a yard crane runway 1,260 ft. long, a coach shop transfer cable, of 150 tons capacity, and a complete set of buildings for the working force.

Ground was broken at Ogden on April 1st, 1912, and on March 17th, 1913, the locomotive shop was in full operation.

REINFORCED CONCRETE DAM FOR OUTLET OF LAKE ST. FRANCIS.

The Quebec Streams Commission is now calling for tenders for the construction of a storage dam at the outlet of Lake St. Francis. By reference to *The Canadian Engineer* for July 8th the reader will note the importance of the proposed St. Francis River regulation in the interest of both water powers and lumber industries along it and its tributaries.

DIESEL ENGINES FOR PRODUCTION OF ELECTRICAL POWER.

ONE of the papers to be read at the Panama-Pacific Convention of the American Institute of Electrical Engineers, San Francisco, Cal., describes the adoption in Europe of Diesel engines of large capacity. The author, Mr. Chas. Legrand, had, in 1912, investigated the suitability of Diesel engines for driving generators of 500 kw. to 1,000 kw. capacity under conditions generally prevailing in mining camps in the southwest. At that time, no American-made engines of sufficient size were available and the investigation was carried on in Europe, mostly in Belgium.

Four-cycle engines of 175 effective b.h.p. per cylinder had been in use for several years and the results of their operation known. Cylinders of 250 effective b.h.p. were made, but Mr. Legrand states he did not see any.

Two-cycle engines of 250 effective b.h.p per cylinder had been in operation for a short time, but no data as to maintenance or repairs was available. Engines with cylinders of 600 effective b.h.p. were under construction after shop experiments had been carried on with one single cylinder of that size. One cylinder of 1,000 effective b.h.p. was being experimented upon, and builders were ready to take orders for engines using this size cylinder. All of the above cylinder ratings were for sea level conditions. The four-cycle engines inspected had trunk pistons air-cooled. The two-cycle engines had water-cooled pistons with cross-head and slides.

All engines used forced lubrication for cylinders. Both types were used successfully to drive alternators in parallel, the generators being equipped with damping windings. For a given number of cylinders, the four-cycle engine required a heavier flywheel. Heavy oils could be used in both types with proper arrangement for heating the oil and using a light oil at start and finish of a run.

The fuel consumption per b.h.p. of a four-cycle engine is from 7 per cent. to 10 per cent. less than that of the two-cycle engine, depending on the load and, for both types, is practically independent of the size of the engine.

The four-cycle engine is simpler, having no scavenging pump or moving water connections to the piston.

The two-cycle engine has no exhaust valve, the exhaust taking place through ports in the cylinder wall; this is an advantage when using oil containing sulphur, as the exhaust valve is principally affected when sulphuric acid is formed in the cylinder and condenses on the seat of the exhaust valve, requiring frequent grinding of this valve.

The scavenging pump is an advantage on engines to be used at high elevations, as by increasing the size of this pump, the pressure in the cylinders at the beginning of the stroke can be increased above atmospheric pressure and restore sea level conditions, if found advisable, at a comparatively small increase of fuel consumption. This could be done on four-cycle engines by the addition of an air pump, but would complicate this type of engine.

The lubricating oil consumption of four-cycle engines is higher per horse-power than that of the two-cycle engine. The total consumption of lubricating oil of a 525-h.p., three-cylinder, four-cycle engine in actual practise being approximately five gallons per b.h.p.-year of engine rating, while that of a five-cylinder, two-cycle engine of 1,250 b.h.p. is 2.5 gallons per b.h.p.-year, both being on sea level rating of engines and for continuous service.