

Following are the detailed specifications for the double helical gears which are, of course, the particularly interesting part of the above installation:—

Operating conditions:—The normal rating of the increasing gear will be 160 brake horse-power. The ratio of speed increase is to be 8.35 to 1, the pinion operating at 1,670 r.p.m. and the gear at 200 r.p.m. When operating under the load and speed conditions specified above, the power delivered by the increasing gear shall, after deducting tooth friction, bearing friction, windage and all losses, be not less than 98½% of the power received.

Shape and Pitch Tested

General description:—The De Laval increasing gear . . . after cutting is tested for correct angle, correct shape of tooth and correct pitch, and no gear is used that is not correct and that does not have a perfect contact surface for the whole length of every tooth. The teeth are of such shape as to give as closely as possible perfect rolling contact and no scraping or hand work is permitted, since such hand work would produce imperfect contour of teeth. After cutting, the gear teeth are carefully polished by a special process which eliminates the small inequalities left by the cutting tool, without in the least degree altering the profile of the teeth. The direction of rotation is such that pressure on the pinion bearings is in a downward direction. This relieves the bearing caps from all strains and obviates the possibility of damage in case a bearing cap should become loose. The pressure of the pinion tends to lift the gear, the weight of which is slightly greater than the upward pressure, thus reducing the load on the gear bearings. The pinion is sufficiently large to withstand all bending and twisting forces, and of such length that the bearing pressure is low, preventing squeezing out the film of oil or abrasion of the metal.

Gear case and cover:—The bottom half of the gear case is a single casting, which contains both gear and pinion bearings, holding them in rigid alignment and maintaining the correct spacing between the centres of the gear and pinion, and also preventing any movement which would tend to produce unequal pressure, hammering and vibration that would result in rapid wear of the gear and pinion. The bearing seats are carefully scraped to standard size to permit perfect interchangeability of bearings. The bearing caps are separate, and any one can be removed without disturbing any other part. All parts of the increasing gear that may be disassembled for inspection are furnished with taper dowels to insure correct reassembling, and all working parts are made to standard limit gauges and are strictly interchangeable. The cover is so arranged that it can be removed without disturbing the bearing caps or any other part.

Bearings:—Gear and pinion bearings consist of cast-iron shells lined with high-grade babbitt and ground on all contact surfaces to standard dimensions to insure exact alignment and perfect interchangeability. They are split, to allow of removal without disturbing the shafts, and any bearing can be removed without disturbing any part other than the cap. Pinion bearings are arranged for water cooling and all bearings are provided with oil catchers and all shafts with oil slingers to prevent the creeping of oil along the shafts.

Pinion Cut on Shaft

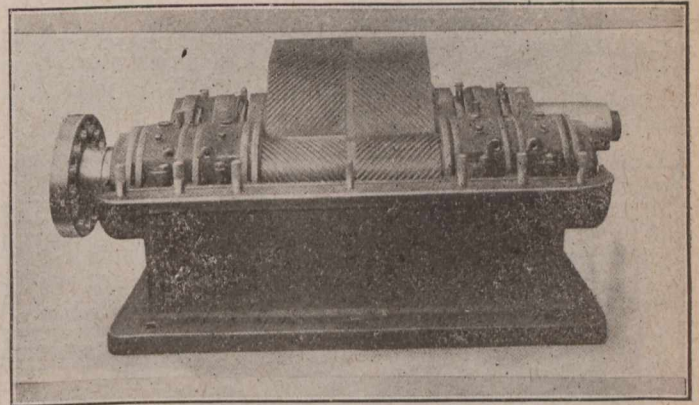
Gear:—The gear consists of a heavy cast-iron centre, on which are shrunk two seamless rolled steel bands in which the gear teeth are cut. The gear centre is of such shape as to have great strength and be free from distortion by excessive strains or rapid temperature changes. The gear bands are of special steel, heat treated to secure uniform material and proper hardness for the gear teeth. The gear, after complete assembling, is carefully tested for static and running balance. The gear shaft is hammer-forged open-hearth steel, ground on all surfaces to standard dimensions. It is fastened in the gear centre by means of a taper fit and key.

Pinion:—The pinion is cut directly on the pinion shaft, which is a special nickel steel forging, oil tempered, to have a hardness much greater than that of the gear bands in

order to provide different quality of metals in contact and to insure long life of the pinion. The pinion is ground on all surfaces and carefully tested for static and running balance.

Oiling system:—The gear and pinion are lubricated by a spray of oil projected against the line of contact of the gear teeth on the entering side, thus insuring ample lubrication. The oiling device is so arranged that it can be examined or cleaned conveniently without lifting the gear case cover or disturbing any other part. The pinion bearings are oiled from a gravity system, with a sight-feed oil glass for each bearing. The oil, after passing through the pinion bearings, flows into the reservoirs of the gear bearings, which are ring oiled, thus replenishing and insuring the proper level of oil in the gear bearing reservoirs. The gear case and cover, as well as all bearing caps, are provided with recessed oil grooves to prevent seepage of oil through the joints. All oil is drained to a common point and returned to the circulating pump. The oil pump is of the positive gear type, driven by means of a worm from the main gear shaft or from the shaft of the driving machine.

Flexible couplings:—The gear and pinion are connected to the driving and driven machines respectively by De Laval flexible couplings. Each coupling consists of two forged steel discs ground and polished on all surfaces, the driving half being fitted with a number of rigid studs which enter



DOUBLE HELICAL GEARS AT CORNWALL, ONT.

holes in the driven half of the coupling, driving the same through the medium of steel lined rubber bushings. This arrangement permits of a certain amount of flexibility and prevents strains on the bearings. The couplings can be quickly disconnected, which permits the removal of one shaft without disturbing the other. Each coupling disc is fastened to the shaft by means of a taper fit and key and locked in place by means of a lock nut.

Bed Plate:—The increasing gear is mounted on a heavy bed plate of the box type, suitably proportioned and arranged for connection to the bed plates of the driving and driven machines.

A discussion has arisen as to whether the new bridge across the Bow River at Banff, Alta., should be steel or concrete. It is stated in a Calgary newspaper that the Department of Public Works has intimated that the cost of a concrete bridge would be \$600,000. C. D. Howe & Co., of Port Arthur, state that they prepared an estimate for the Public Works Department showing that the cost of a concrete bridge would be only about \$240,000.

The executive committee of the Water Works Manufacturers' Association have appointed a sub-committee on special publication, and at the annual convention of the association next week at Buffalo, this sub-committee will report in favor of the publication of a book entitled "History and Activities of the American Water Works Association," to be mailed gratuitously to approximately 5,000 water works officials in the United States and Canada, in order to get new members for the association and to let the officials know more about the manufacturers.