power ratio of 100 to 1, arranged on a movable winch mounted on a travelling truck. It is the intention to replace this structure in the near future with permanent works; and at the same time to build a collapsible dam in the river which will admit of obtaining the full head of about ten feet required, during all stages of the river.

Main canal "A" heads at this structure, its capacity being 2,000 cubic feet per second at full supply of ten feet. Its section varies to suit conditions, its maximum section being 60 feet bed width, 120 feet at the water level, with 3 to 1 slopes, and a grade of .o1 per cent. Throughout the greater portion of its length its dimensions are 44 feet bed width, 84 feet on the water line, with 2 to 1 slopes, and a grade of .02 per cent.; which, with an assumed value of n = .025 gives a calculated discharge of 2,050 cubic feet per second. At a point about 21/2 miles below the headgates, this canal was crowded close to the river banks by heavy excavation, and at this point a set of escape or regulating gates was provided, with sill elevation one foot below canal grade. This structure is of timber, and consists of four openings 6 ft. by II ft. each controlled by wooden gates. These are known as balanced pressure gates, and are so designed that they will rise of their own accord when the head against them is about 5 feet. Each consists of a rectangular barrier working freely between parallel walls without guides. Each gate is hinged to four long arms arranged in pairs, the location of the hinges being so chosen that the weight of the gate is balanced by any required pressure. They are made practically watertight by rubber flashings, and are lifted by an ordinary chain windlass provided with pawl and brake.

At a point about 15 miles below the headgates, the main canal makes a vertical drop of ten feet, where an important timber structure was built. The excessive velocity resulting from this drop was taken care of by the contraction of the opening above to 25 feet, and by a water cushion 5 feet deep below, with an enlargement of the opening to 43 feet terminating in wings. Piling was extensively used in this and all



## Spillway, East Branch Secondary Canal "C," Western Section.

other important structures built in the early stages of the project.

About two miles beyond this point, or 17 miles from the headgates, this canal terminates in reservoir No. 1, which, however, is in reality only a balancing pool with slight storage for sudden drafts of water; thus relieving the secondary canals from small fluctuations in head. The reservoir referred to, which is about three miles long and half a mile wide, was formed by the building of an earth dam 2,000 reet long, with a maximum height of 30 feet, faced with heavy rip-rap on the water side. From this reservoir the water is taken out in three secondary canals, known as "A," "B" and "C," having a combined length of about 250 miles. These are each controlled by timber headgates with sill elevation of 3,321.50, and are of a type similar to those described in connection with the main canal spillway.

Numerous large structures are located on all of the secondary canals, including headgates, drops, flumes and bridges.

Secondary canal "A" heads out from the south end of reservoir No. 1, and secondary canal "B" and "C" together are taken out at the north end. Secondary canal "A" at its



Metal Flume, 7 ft. dia. Secondary Canal System, Western Section.

outlet is 18 feet bed width, carrying 8 feet of water, with 2 to 1 slopes, on a grade of .03 per cent.

It drops twice to cross the railway line; and about 15 miles from its head again drops about 30 feet and expands into what is known as reservoir No. 2; at which point its section was changed on account of grade to 22 feet bed width. carrying 6 feet of water, with 2 to 1 slopes, on a grade of .035 per cent. About 30 miles beyond, near Strathmore, it again drops and crosses the railway line, splitting into a north and south branch. North "A" is 10 feet bed width. carrying 3.2 feet of water, with 1 to 1 slopes, on a grade of .06 per cent. South "A" is 18 feet bed width, carrying 4<sup>1</sup>/<sub>2</sub> feet of water, with 2 to 1 slopes, on a grade of .04 per cent. Both continue easterly to the vicinity of Gleichen, covering lands to the Crowfoot Creek at an elevation of about 2,970.

Secondary canals "B" and "C" together utilize a natural channel for three miles from the north end of reservoir No. 1, and there divide, "B" turning easterly and "C" northerly. "B" is 28 feet bed width, carrying 6 feet of water, with 2 to 1 slopes, on a grade of .025 per cent., continuing for four miles to split gates dividing it into a north and south branch. "C" is 40 feet bed width, carrying 6.4 feet of water, with 11/2 to 1 slopes, on a grade of .03 per cent., and serves all the land lying between the Rosebud River and the Serviceberry Creek. At a point about eight miles from its upper end it splits into an east branch-which is 37 feet bed width, carrying 5 feet of water, with 11/2 to 1 slopes, on a grade of .035 per cent.-and a west branch, which is 121/2 feet bed width, carrying 5.7 feet of water, with 11/2 to 1 slopes, on a grade of .04 per cent. The east branch utilizes about ten miles of natural channel, in which 175 feet of grade is disposed of. The west branch crosses the valley of the Crowfoot Creek by a wood stave pipe siphon of 53 inches internal diameter and 1,600 feet long, working under a maximum head of 82 feet, in which 8 feet of grade is used up.