The concrete for the gate house was poured by means of a Smith batch mixer, which was run chiefly at nights, form work being carried on during the day.

The flume was excavated, as in railroad work, by means of wheel and slip scrapers.

The excavation to grade of the 1,550-ft. steel penstock line, 52 inches in diameter, leading to the power house, was followed by the construction of concrete saddles spaced at 20-ft. centres. Four anchor blocks were placed on the line at approximately 400-ft. centres. An interesting feature of the construction of these saddles, etc., was the pouring of concrete by means of chutes over 700 ft. long.

It may be of interest also to note that, owing to the inaccessibility of the site by rail, some little difficulty was experienced in the transportation of plant and equipment. The large shovel was brought into the work under its own steam over a distance of about 7 miles. This took about eight days of ten hours each. When the work was completed the shovel was dissembled and removed in parts. The frame, weighing about 20 tons, was placed on sleighs specially built and equipped with runners 6 inches wide. A snow plow provided a track over about 7 miles of hilly road and the frame was removed by nine teams of horses.

The work was commenced in July, 1914, and the several portions which the contract covered were completed in remarkably fast time. The Hyland Construction Company, Toronto, were awarded the contract, including canal and flume excavation and the construction of the earth dam, gate-house, foundations of steel penstock and the power house.

PROPOSED WATERWORKS EXTENSIONS FOR CALGARY.

CALGARY'S rapid growth during recent years has necessitated many extensions and alterations to its waterworks system. At times the resources of the municipal waterworks department have been somewhat severely taxed, but, the importance of a pure and abundant water supply has been kept clearly in mind and the extensions authorized from time to time were timely and strictly in accordance with the demand of the increasing population.

The system has been in operation since 1891 and is owned by the city. The source of supply is the Elbow River, about 12 miles distant. A gravity pipe line provides about 8,000,000 gallons per day. An auxiliary steam and electric plant increases the capacity, by pumpage from the Bow River of 9,000,000 gallons per day. In 1913 a new pump house was constructed providing for the installation of two 7½ million gallon units, provision also being made for the installation of a 5 million gallon electrically driven pump previously in operation in the former pump house, which had become old and out-of-date.

Looking forward to additional growth, the civic authorities have had under consideration the securing of a more abundant water supply. In 1913 Mr. A. W. Ellson Fawkes, city waterworks engineer, presented a report outlining two feasible propositions. One related to piping by gravity from the head waters of the Elbow River, a distance of from 32 to 39 miles from the city, together with storage reservoirs, dams and other appurtenances. The alternative scheme consisted of a pumping plant within the city limits with the addition of a filtration plant.

In his report, Mr. Fawkes refers to survey work early in 1913 in connection with the first scheme, whereby four probable storage sites, suitable for the construction of dams, were located, and a route for the proposed pipe line established. These sites are situated at 39, 38, 36 and 32 miles respectively from the city, the estimated cost varying from $2,159,673 to $1,718,343. The estimates are based upon market conditions as they obtained at that time. They include wood-stave pipe and various grades of steel and cast iron pipe for the supply line.

As to the city's future requirements, the present consumption of 16,000,000 gallons per 24 hours by a population of 80,000 gives a consumption per capita of 200 gallons. It is suggested in the report that this excessive consumption could successfully be reduced to 125 gallons or less by careful inspection and the introduction of a meter system. Mr. Fawkes estimates the probable consumption 30 years hence as being 50,000,000 gallons per day and his calculations are based upon this amount.

The report recommends that a gravity water system be installed; and that provision be made for 50,000,000 gallons capacity, using a wood-stave pipe line and a masonry dam, the latter to be located at a suitable place within the limits of the Rocky Mountain Forest Reserve; that a suitable site be selected and a large stand-by reservoir be constructed within reach of the city, sometime in the near future. This recommendation was concurred in by Mr. Geo. W. Craig, city engineer.

The scheme is recommended on the following grounds: It provides ample storage for probably 500,000,000 gallons of water which can be increased or decreased according to the height of dam. Frazil ice troubles can be eliminated by placing the intake pipe 20 ft. or so below the level of the water in the storage reservoir. This reservoir will act as a sedimentation or settling basin. Turbidity will be eliminated by placing the intake about 15 ft. above the bottom of the storage reservoir. The location of the supply being in the Rocky Mountain Forest Reserve, which is beyond human habitation, the water would be free from pollution, thus insuring the city a pure supply.

With the aid of controlling valves and surging chambers in the gravity pipe line, demands for water up to 50,000,000 gallons could be easily met. Besides, these valves and surging chambers would prolong the life of the pipe line by relieving it of any undue pressure, and of a static head exceeding 200 ft. at any point, except in the last few miles of pipe line where a static head would be required sufficient to empty into a reservoir at some high ground near the city.

UTILIZING WASTE HEAT OF GAS ENGINES.

A method of utilizing some of the waste heat of the jacket water of a gas engine is described by J. B. Meriam in "Practical Engineer." A small centrifugal pump is used to circulate at high velocity through the jacket and into an adjoining closed tank, which is kept about half full of water, and back to the jacket. Steam escapes at the water level and a pressure of about 25 lb. gauge is maintained. All the heat that the engine gives to the jacket water, estimated at 38% of the heat units in the fuel, is found in the steam. With a well-designed exhaust gas boiler, half of the 38 per cent. of the heat of the fuel which is lost in the exhaust gas could be recovered and added to that recovered from the water jacket. The high speed of the water through the jacket sweeps away any steam bubbles that may form on its surface and thereby avoids the trouble of overheating the cylinder which usually comes from having too high a temperature of the jacket water.