

earth, the building of locks 2 and 3, and the substructure of bridges 3, 4 and 5, and will cost approximately \$5,500,000, exclusive of lock gates, bridge superstructures, valves and other steel work, and cement. Excavation has proceeded very rapidly on this section by means of heavy steam shovels, drag-line excavators and several mule outfits operating in connection with western grading machines. The drag-line excavating machine is undoubtedly a coming machine for many kinds of excavation.

The pondage for lock 1 extends into this section to lock 2, which is situated toward the lower end of the section. At the site of this lock there is a peculiar shaped pit about 175 ft. by 25 ft., enclosed by steel piling, which will be the site of the upper breast wall of the lock. These piles are 45 ft. long and have been driven to refusal. It was expected they would have gone deeper than they actually have, and it is not known exactly what stopped them, as previous borings did not show particularly hard material at the depths at which they stopped. The material inside them is being excavated, the piles in the meantime being supported by heavy wooden bracing, and when solid rock is reached at a depth of about 60 ft. the pit will be filled with concrete and will form the upper breast wall of lock 2. This method of construction was adopted in order to conserve the ground above the breast wall in its natural state, as had the lock pit been excavated in the usual manner it would have been open for two years, during which time a slope probably flatter than 1 to 1 would have formed above the breast wall, as well as along the sides of the pit, whereas the present method will leave the material above the breast wall intact.

A concrete protection extending from a berm 5 ft. wide and located 5 ft. below the water line to a height of 5 ft. above it, is being laid opposite the Engineer's Office at Homer. This protection consists of a 6 in. slab of concrete laid on 12 ins. of broken stone, and it is expected this will serve all purposes better than ordinary stone protection. Below the site of lock 2 the berm has had the slope trimmed and a cut made to grade all at one operation by a drag-line excavator and a very small gang of men.

Above lock 2, there is a 200 acre pondage, at elevation 335.5, on the east side of the canal, retained by an embankment extending from lock 2 to Homer, the upper valley of Ten Mile Creek being utilized for this purpose, the lower portion of the basin being protected on the east side by an embankment. Between locks 2 and 3, at station 297, there will be located bridge 4, a bascule, on which the highway will be carried across the canal prism.

The upper end of lock 3 will be at the point of crossing of the new ship canal by the present canal, and north of the latter the two levels being the same, at elevation 332.0. A moderate sized dam is being built to the east of lock 3 to form a 150 acre pond or equalizing basin for lock 3. These ponds or regulating basins are necessary in order to prevent fluctuations in the levels when a lock is filled or emptied, as the filling of a lock would draw down the water of a 75 acre pond 1 ft. It is therefore advisable to have these ponds as much over 75 acres as possible. Some excavation has been done in the lock pit 3. Bridge 5, a bascule highway bridge, will cross the canal prism at station 374, near the upper end of the section.

The embankments along section 2 are being built by mule teams hauling waggons from the grading machines to the different banks, where the earth is placed in layers and compacted by the wagon wheels after being watered. The slopes are being sodded as the work proceeds. This, it is ex-

pected, will prevent the usual washing out of the slopes and will materially reduce the cost of maintenance of the canal, besides adding to the appearance of the banks.

Baldry, Yerburch and Hutchinson, London, Eng. and St. Catharines, have the contract for section 2, and have sublet portions

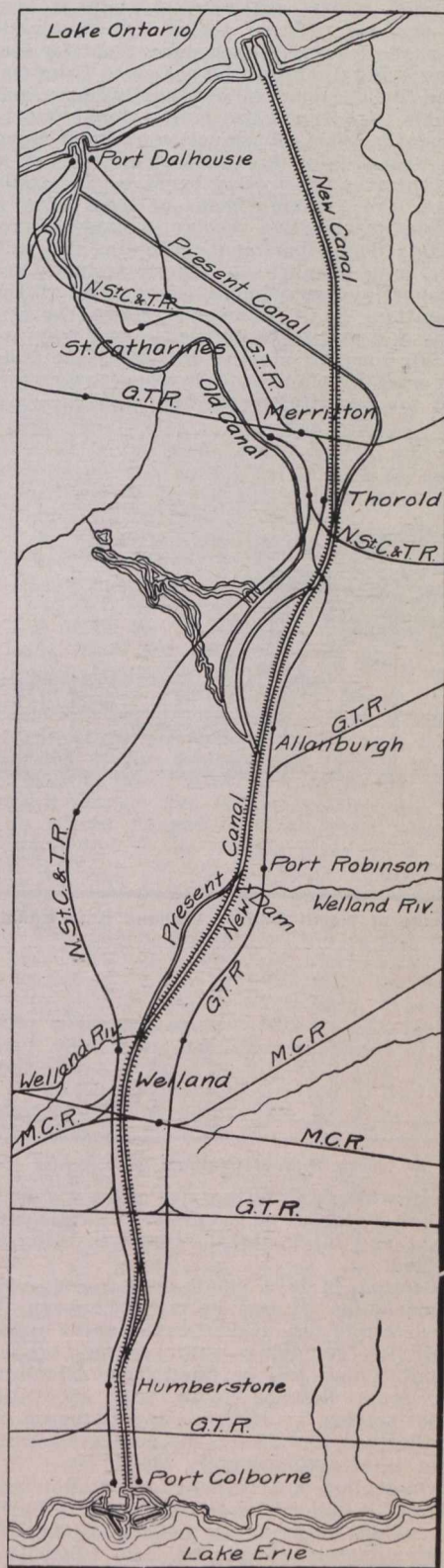
Jos. Riley, sodding finished slopes of canal.

Section 3 covers about 2 miles, situated mostly in the town of Thorold, and the value of the work to be done, not including lock gates, bridge superstructures, valves or Portland cement, is \$10,000,000. There are 3,500,000 cu. yds. of earth, 2,500,000 cu. yds. of rock and 1,500,000 cu. yds. of concrete masonry on this section. Near the lower end of this section, three twin locks in flight will be built, the lower ends of twin locks 4 being located under the G.T.R. main line, where four large steel spans are temporarily carrying the diverted railway. These three locks will lift a vessel 139½ ft. to an 84 acre regulating basin, which will be formed by the large dam now in course of construction on the east side at the head of lock 6. Above this pond will be built single lock 7, the head of the lock being situated at Peter St., Thorold, where a swing bridge crosses the present canal at the head of lock 24. A bascule bridge will be placed over the head of the lock at this point.

In order to carry the double track G.T.R. main line over the works during construction, to allow free passage for the excavated material from the lock pits to the stone crusher, located just north of the main line, and to Lake Ontario, the railway has been slightly diverted to the north, and is carried on four heavy steel spans across the site of the foot of twin locks 4. In order that this diversion might be finally disposed of and cause no further trouble to the G.T.R. or to the contractor, the centre pier upon which one end of these steel spans rest has been sunk through earth and rock, to a depth of 90 ft., to the level of the foundations of the lock, and it will eventually be incorporated in the centre wall of the locks. The side piers have been sunk to about two-thirds of this depth, to the surface of the rock below. This will allow the contractors to excavate the lock pit completely without interfering with the bridge, and allow the lock walls to be built. When the locks are completed, two bascule lift bridges will be placed on the present line of the G.T.R. and the line replaced to its former position. The temporary spans will then be removed. It will be noted that instead of building double track spans, two single track spans have been constructed, the idea being that they will be easier to sell upon the completion of the work, than a double track structure.

The dam at the head of lock 6 is of earth construction having a concrete core wall extending from the rock surface to an elevation about 30 ft. below the top of the dam. The dam will be 75 ft. high at the highest point, and the core wall is built in a trench in the clay overlying the rock, varying in depth from 5 to 30 ft. The good earth from the excavation has been dumped on either side of the dam site, to be afterwards re-handled into the work. The seat of the dam was carefully prepared by removing all loam and other loose material and benching all sloping surfaces. A toe trench was then excavated along the full length of the dam for a few feet in depth into the solid material, and the dam has been built up in layers of approximately 8 to 12 ins., each layer being carefully watered, spread and rolled. The process will be continued to the top, which will use up all the material now along each side of it. A heavy stone talus, consisting of rock from the excavation, will be placed on the down stream side of the dam, to add weight and to prevent sliding, and earth will be dumped on the up stream side after the water has been let in, to reduce the depth of water in the pond to about 10 or 12 ft.

The G.T.R. Port Dalhousie-Port Colborne branch now runs across the sites of locks



Route of Welland Ship Canal.

as follows: Yale and Reagan, portions of excavation work; Hill-Leonard Engineering and Construction Co.; Stein and Reade; Michael Conroy, construction of embankment, about 50 mule teams being at work on this last subcontract; Jos. Battle, concreting, this subcontract is completed; Ernest Bennett, a number of culverts; and