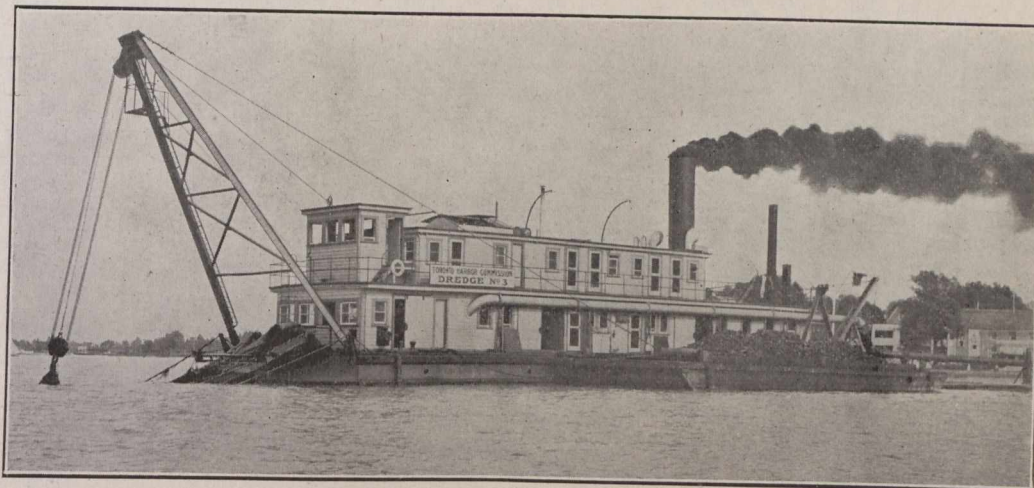


waterfront. During 1912 the Surveys Department had been seriously handicapped by the extreme lack all along the waterfront of bench marks referred to any single datum. The Department of Works of the city had under way at that time the establishment of bench marks throughout the city, but the number they proposed to establish in the region of the proposed work was insufficient. So, early in 1913, the Surveys Department of the Commission set about to establish bench marks that would be readily available when needed during the development of the waterfront. Sea level at New York Harbor was adopted for the datum, the plane of reference being, as stated, found to be 245.00 feet above such datum.

The method of field work did not involve the methods of precise levelling as used in connection with primary geodetic surveys, but only one of sufficient precision as to render the levels more than adequately accurate for any engineering work which might require them. An engineer's Wye level and a self-reading Chesterman rod were used, great care being taken to equalize the back and foresights. For this purpose, as well as to determine more exactly the rod reading, the reading of all three cross wires were taken. Benches were set about one-quarter of a mile apart and four lines of levels, forward and back and forward and back, run the same day and under the same conditions between consecutive benches, different turning, and set-up points being chosen in every instance. The arithmetic mean of these four differences of elevation was taken as the true instrumental difference in elevation between benches.

At 7 p.m. on Wednesday, July 9th, 1913, an evening of absolute calm, the whole Survey's staff were strung out along the entire waterfront from the Humber to Balmy Beach in thirteen locations and exactly at that hour nails were driven into convenient piles or cribs at the exact level of the water. The water lay dead calm, and there was no hesitation in assuming it a level plane. The elevations of these nails were subsequently tied each by four lines of levels to the nearest benches—in no case more than four hundred feet away—including a connection to the initial bench of the level net. On the assumption that while any two adjacent nails might have a difference of elevation, of such as much as 0.03 of a foot (the maximum sum of the personal errors of the two observers probable), yet this difference in elevation could not be exceeded though the observers were stationed at the extreme limit of the waterfront 10 miles apart. In other words, no adjustment was made to the instrumental elevations on the authority of a single water transfer, but only on the evidence of three or four in series. The level net was closed on the city bench marks. No weight was given to the elevations attached to these bench marks in the adjustment of the net, but on the completion of the adjustment, the elevation found for them by this department differed in no case more than a few hundredths of a foot for the elevation obtained for them by the Department of works.

An extensive precise triangulation was proceeded with and completed in December, affording a means of measurement with the transit or sextant of the angles between any three prominent points on the skyline of the city to determine the absolute position of any point. All angles were read 12 times around the circle, bringing the resultant measured angle within a probable exactitude of at least 2 seconds of arc in the harbor. A comprehensive survey was also made locating all intake pipes, sewer outfalls, drains and conduits along the entire waterfront; and another of the northwestern portion of the industrial district showing all existing structures, power lines, water mains, etc. Survey work was executed to facilitate future construction work, such as for the accurate and speedy laying out of boundary lines and locations of the various works. Extensive hydrographic surveys were also made in connection with the contract dredging and some 8,000 soundings, together with over 200 borings, were taken to obtain the nature of the material and the amount available at various depths. After these were effected detailed plans were prepared and tenders called for. The Canadian Stewart Company was awarded the contract at 19¾ cents per cubic yard, which, when the



Harbor Commissioners' Hydraulic Dredge No. 3.

cost of supervision is added, will bring the cost to the Commissioners to practically 22 cents per cubic yard. The preliminary estimate of the engineering department averaged 21.99 cents per cubic yard.

The construction department, in addition to general maintenance of all waterfront properties of the Commission, carried out the supervision of the construction of the Ashbridge's Bay docks, the sea wall from Dufferin Street westerly, the trestle across Keating's Channel to carry temporary tracks into the industrial district, the foundations of the Parkdale Canoe Club's new club house, the dredging of Point Anne Quarry slip and the complete supervision of the dredging equipment of the Commissioners. During the year Dredge No. 1 reclaimed for the city some 3.23 acres south of Hanlan's Point. Dredges Nos. 2 and 3 reclaimed to an average elevation of 250, 16.47 acres; to an average elevation of 249.5, 6.1 acres; to an average elevation of 248.5, 15.79 acres, or a total of practically 40 acres, in the industrial district.

The main work of the designing department consisted of details and final studies in connection with the construction of the government portion of the work; i.e., the eastern and western sea walls, the ship channel, the marginal area, and the northern slip. In addition, detailed