

were frequently made with the measured lines of wharves, piers and docks, and the agreement left nothing to be desired in point of accuracy.

In extending the survey along such parts of the shore as were not occupied by wharves or piers, and which could not be clearly defined otherwise, a leveling instrument was used to mark out the line of mean high water. This plan was ascertained by the observation of a series of day and night tides extending through two lunar months. Tide stations were established at Henderson's wharf (Fell's Point), Woodall's ship yard (Locust Point), Bollman's wharf (Canton), and at Winans' dock in the Patapsco river. The series was recorded at the Fell's Point gauge, and during intervals free from winds and abnormal tides, simultaneous observations were made to determine differences of period of maximum of flood and ebb. These differences were found to be less than 15 minutes, or practically inappreciable in the limited tidal flow of the harbor, which the mean of one hundred and fifteen tides show to be 1.16 feet, or .04 feet less than that established for the station at Fort Carroll. The sounding of the harbor was begun early in October and continued without interruption until that part of the area known as Spring Garden was closed by ice.

During the progress of hydrographic work the shores of the Patapsco river on both sides were surveyed, scale 1:3600 (300 feet to the inch). The space between the head of the basin and the lines of Canton was mapped on the scale of 1:1800 (150 feet to the inch). The hydrographic survey covered the entire area above the line of the Lazaretto and Marine Hospital wharf, excepting the main branch of the river above the Long Bridge. The area of the basin and harbor to the entrance at Fort McHenry was sounded and plotted on the scale of the topographical sheets that covered the same locality.

On June 1, 1877, the survey was resumed at Spring Garden and in the Patapsco (main branch) between the drawbridge and Brooklyn, west of the bridge.

The recorded details show that in the course of the survey 17,400 soundings were made and 1443 angles measured for determining the position of the boat while sounding in midwater. The positions at