

with the exception of one lot of very heavy stones from a single quarry ; these were badly broken by the first heavy frost of November in that year, and the products of that quarry were condemned for dimension work above low water.

The specifications required the work to consist of the best description of rock-range work, the face stones to be cut, squared, and bedded with one-quarter inch joints, and with the vertical joints cut back at least nine inches from the face ; the ice-breaker faces were to be cut smooth, and drafts cut on all angles ; the shoulders and corners were to be trimmed so as to have no projection exceeding one inch and a quarter, while no projection exceeding four inches was to be allowed on any part of the pier. The whole size of the top of each pier was finished smooth, and the stone bush-hammered, the face of the coping being also trimmed almost smooth. The face stones were fastened together by iron cramps of inch round iron, as high as the top of the ice-breakers, and this system of dowelling was continued at the shoulders up to the overhanging courses, where it was again extended to the whole face. The backing was formed of heavy uncut stone, laid in full mortar beds, the crevices being filled with smaller stones laid also in mortar. The whole amount of masonry was laid in hydraulic mortar, the usual proportions of the mixture being two parts of sand to one of cement ; in the upper courses, which are rarely or never exposed to the water, this mortar was mixed with a paste of fat lime. The hydraulic cement was of the well-known Louisville manufacture, the greater part being purchased from the Falls City Cement Company.

The masonry contract included the beton used and the riprap thrown around the piers, though not the river protection above the bridge. The beton was formed of broken limestone, sand, and cement, the proportions varying with the purpose for which it was used. The stone was broken by hand into pieces that would pass through a three inch ring. The method of preparing the beton for use, was to mix the mortar separately in a grout box, and then pour it with pails over the stone, which had previously been spread evenly over the floor and moistened with water to remove all dirt ; the mixture was then rapidly turned over with shovels and deposited at once in its place. If placed at once under water, it was lowered carefully in boxes of the patterns already described. The beton used at Pier No. 3, was formed of six parts of stone to